AMENDMENT 2 TO THE

FISHERY MANAGEMENT PLAN

FOR THE QUEEN CONCH FISHERY OF

PUERTO RICO AND THE U.S. VIRGIN ISLANDS

AND AMENDMENT 5 TO THE REEF FISH

FISHERY MANAGEMENT PLAN OF

PUERTO RICO AND THE U.S. VIRGIN ISLANDS

(including Final Environmental Impact Statement, Regulatory Impact Review, and Initial Regulatory Flexibility Analysis)

September 22, 2011

National Oceanic & Atmospheric Administration
National Marine Fisheries Service
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701
727-824-5301
727-824-5308 (fax)
http://sero.nmfs.noaa.gov

Caribbean Fishery Management Council
268 Muñoz Rivera Avenue, Suite 1108
San Juan, Puerto Rico 00918-1920
(787) 766-5926 (Phone)
(787) 766-6239 (Fax)
http://www.caribbeanfmc.com

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Please note that this action is presented as an integrated document. It addresses different applicable laws including the National Environmental Policy Act (NEPA). Therefore, the document does not follow a standard EIS format, however, elements of the EIS are present and identified in the following table of contents for the EIS.

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Acronyms/Abbreviations

A	fish returned to shore for ID by interviewer
ABC	acceptable biological catch
ACL	annual catch limit
ACLG	Annual Catch Limit Working Group
ACT	Annual catch target
AM	accountability measure
APA	Administrative Procedure Act
B	Biomass
B1	fish filleted or used for bait but identified by interviewer
B2	fish identified but released alive
$B_{CURRENT}$	current biomass of stock
B_{MSY}	Biomass at MSY
C	Average catch
CCA	Crustose coralline algae
CEA	Cumulative effects analysis
CEQ	Council on Environmental Quality
CFMC	Caribbean Fishery Management Council
CFR	Code of federal regulations
CHTS	Coastal household telephone survey
CPUE	Catch per unit effort
CY	Calendar year
CZMA	Coastal Zone Management Act
DEIS	Draft environmental impact statement
DQA	Data Quality Act
EA	Environmental assessment
EEZ	Exclusive economic zone
EFH	Essential fish habitat
EIS	Environmental impact statement
E.O.	Executive order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
F	Instantaneous fishing mortality rate
FAC	Fisheries Advisory Committee
FAG	Fish aggregation device
FAO	Food and Agriculture Organization (United Nations)
F_{CURR}	Current fishing mortality rate
FEIS	Final environmental impact statement
FL	Fork length
FMP	Fishery management plan
F_{MSY}	Fishing mortality rate yielding MSY
FMU	Fishery management unit
FONSI	Finding of no significant impact
F_{OY}	Fishing mortality rate yielding OY
FR	Federal regulations
GDP	Gross domestic product

GM	Genetically modified
GNI	Gross national income
GNP	Gross national product
HMS	Highly migratory species
IPT	Interdisciplinary Plan Team
ITCZ	Inter-tropical convergence zone
IRFA	Initial regulatory flexibility analysis
IUCN	International Union for the Conservation of Nature
MCD	Marine conservation district
MFMT	Maximum fishing mortality threshold
MMPA	Marine Mammal Protection Act
MRFSS	Marine Recreational Fisheries Statistics Survey
MRIP	Marine Recreational Information Program
MSA	Magnuson-Steven Fishery Conservation and Management Act (Magnuson-Stevens Act)
MSRA	Magnuson-Stevens Fishery Conservation and Management Reauthorization Act
MSST	Minimum stock size threshold
MSY	maximum sustainable yield
NEPA	National Environmental Policy Act
NGO	Non-governmental Organization
NMFS	National Marine Fisheries Service
NMSA	National Marine Sanctuaries Act
NOAA	National Oceanic and Atmospheric Administration
NS	National standard
OFL	Overfishing level
OMB	Office of Management and Budget
OY	Optimum yield
PCE	Primary constituent element
PR	Puerto Rico
PRA	Paperwork Reduction Act
PRDNER	Puerto Rico Department of Natural and Environmental Resources
PSE	Proportional standard error
RA	Regional Administrator of NMFS
RFA	Regulatory Flexibility Act
RIR	Regulatory impact review
SBA	Small Business Administration
SEAMAP	Southeast Area Monitoring and Assessment Program
SEDAR	Southeast data assessment review (stock assessment)
SEFSC	Southeast Fisheries Science Center
SEIS	Supplemental environmental impact statement
SFA	Sustainable Fisheries Act
SSC	Scientific and Statistical Committee
STFA	St. Thomas Fishermen's Association
STJ	St. Johns, U.S. Virgin Islands
STT	St. Thomas, U.S. Virgin Islands

STX	St. Croix, U.S. Virgin Islands
TAC	Total allowable catch
TMCT	Technical Monitoring and Compliance Team
U.S. Caribbean	Caribbean islands of Puerto Rico, St. Thomas, St. John, and St. Croix
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
USVI	United States Virgin Islands
VEC	Valued ecosystem component
VIDPNR	Virgin Islands Department of Planning and Natural Resources

FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS) COVER SHEET

Responsible Agencies and Contact Persons

Lead Agency for EIS:
United States Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701
(727) 824-5301 (Phone)
(727) 824-5308 (Fax)
http://sero.nmfs.noaa.gov/
Contact: Dr. Roy Crabtree,
Regional Administrator

Lead Agency for FMP:
Caribbean Fishery Management Council
268 Muñoz Rivera Avenue, Suite 1108
San Juan, Puerto Rico 00918-1920
(787) 766-5926 (Phone)
(787) 766-6239 (Fax)
http://www.caribbeanfmc.com
Contact: Miguel A. Rolón, Executive Director

Name of Action

Amendment 2 to the fishery management plan for the queen conch fishery of Puerto Rico and the U.S. Virgin Islands and amendment 5 to the reef fish fishery management plan of Puerto Rico and the U.S. Virgin Islands.

Type of Action:

(X) Administrative	( ) Legislative
( ) Draft	(X) Final

Abstract: This amendment to the fishery management plans for reef fish and queen conch in the U.S. Caribbean is designed to bring those fisheries into compliance with the 2007 revisions to the Magnuson-Stevens Fishery Conservation and Management Act. Included are provisions to re-arrange the fishery management units for snapper and grouper, to transition management from the 2005 Comprehensive Sustainable Fisheries Act to the mandated provisions of the MSA, to allocate harvest among island groups (Puerto Rico, St. Thomas/St. John, and St. Croix), to implement certain management details to constrain parrotfish harvest and to limit recreational harvest of snapper, grouper, and parrotfish, to define and implement accountability measures, and to modify framework provisions to ensure a rapid response to developing issues. The present amendment focuses on those species previously defined as undergoing overfishing; a subsequent amendment will address those species not determined to be undergoing overfishing.

Date DEIS files: July 23, 2010 Date DEIS comments due: September 7, 2010
Date FEIS files: October 28, 2011 Date FEIS comments due: November 28, 2011

1.0 EXECUTIVE SUMMARY

The purpose of this amendment is to revise management reference points and status determination criteria for the Caribbean queen conch, snapper, grouper, and parrotfish; specify Annual Catch Limits (ACLs) and Accountability Measures (AMs) for those species or units classified as undergoing overfishing to prevent overfishing of these species or units; establish framework measures to facilitate regulatory modifications; adjust management measures as needed to constrain harvest to specified annual catch limits; and minimize, to the extent practicable, negative socioeconomic impacts that may result from the amendment actions.

To achieve these goals, six actions are included in the amendment. Action 1 amends the unit composition in the Reef Fish Fishery Management Unit. Action 2 revises management reference points to transition U.S. Caribbean reef fish and queen conch management from that established in the Comprehensive Sustainable Fisheries Amendment (Caribbean SFA Amendment) of 2005 (CFMC 2005) to that mandated by the Magnuson-Stevens Fishery Conservation and Management Act as Amended through January 12, 2007 (MSRA). Action 3 works in concert with Action 2 and provides the specific details regarding the distribution and numerical value of ACLs for the various U.S. Caribbean island groups, including Puerto Rico (PR), St. Croix (STX) in the United States Virgin Islands (USVI), and the island group of St. Thomas and St. John (STT/STJ) in the USVI. Action 4 proposes management measures with specific emphasis on harvest prohibitions for three parrotfish species (midnight, blue, rainbow) that serve an essential ecological function and which are relatively large and long-lived. Action 4 also proposes recreational bag limits for reef fish. Action 5 provides alternative guidelines for triggering AMs and for applying those AMs. Finally, Action 6 establishes framework provisions separately for reef fish and queen conch. In concert, these actions serve to provide a basic foundation for reef fish and queen conch fisheries management in the U.S. Caribbean.

<u>Action 1</u>

Two sub-actions are included in Action 1, the first of which addresses amending the U.S. Caribbean grouper complex and the second of which amends the snapper complex (Table 1.0.1). For each of these sub-alternatives, the choice is between taking no action (**Alternative 1**) and amending the complex (**Alternative 2**). In the case of grouper, **Preferred Alternative 2** separates current Grouper Unit 4 (GU4) into GU4 and GU5 by moving misty and yellowedge grouper from GU4 into the new GU5 and adding black grouper to GU4. It is additionally proposed to remove creole-fish from GU3. Both black grouper and creole-fish are rarely caught by commercial fishers, but black grouper apparently are caught by recreational fishers. Therefore, it is important to include black grouper in the U.S. Caribbean reef fish management program to ensure the long-term health and abundance of this population. Both yellowedge and misty grouper are relatively deep-water species that have been improperly grouped with member of GU4 that tend to occupy shallower habitats. In the case of snapper, there is confusion regarding landings of the conspecifics *Pristipomoides aquilonaris* (wenchman) and *P. macrophthalmus* (cardinal snapper). Of specific concern for this amendment is the placement of wenchman in Snapper Unit 2 (SU2) along with queen snapper. Statistical analyses indicate that queen snapper are more closely associated with cardinal snapper based upon habitat utilization and catch patterns, whereas wenchman are more closely associated with members of SU1.

Alternatives included in Action 1 are generally considered to be non-controversial. As noted in Table 1.0.1, there are positive biological and ecological outcomes associated with the action alternative for each of the two sub-actions contained in Action 1.

Action 2

As noted above, Action 2 of the present amendment transitions reef fish and queen conch fisheries management in the U.S. Caribbean from that established by the Caribbean SFA Amendment to that mandated by the MSRA. The former provided a valuable and comprehensive format for fisheries management in the U.S. Caribbean, but was dependent upon data sources of variable accuracy and precision. Moreover, the Caribbean SFA Amendment is not fully compliant with the mandates of the MSRA. Action 2 herein reiterates the management reference points established in the Caribbean SFA Amendment as **Alternative 1** of each sub-action (Table 1.0.2). Unfortunately, the U.S. Caribbean is considered to be data poor with regard to fisheries landings information, severely compromising the Council's ability to establish quantitative benchmarks for those reference points. There are two sub-actions within Action 2: the first addresses reef fish (snapper, grouper, and parrotfish) and the second addresses queen conch. Each sub-action contains three alternatives: **Preferred Alternative 2** derives an average annual landings estimate based upon the longest pre-Caribbean SFA Amendment time series for which the data are considered to be consistently reliable across all islands; **Alternative 3** derives an average annual landings estimate based upon the longest time series for which the data are considered to be consistently reliable across all islands; and, **Alternative 4** derives an average annual landings estimate for the most recent five year period (2003-2007) for which the data are considered to be consistently reliable across all islands. In the case of queen conch and parrotfish, specific fishing level recommendations by the Council's Scientific and Statistical Committee (SSC) are included. Adjustments to account for scientific and management uncertainty are also included as sub-alternatives within each of **Alternatives 2-4**, ranging from 1.0 to 0.50 with 0.85 being the preferred alternative.

Alternatives contained within Action 2 have been controversial. U.S. Caribbean commercial fishers have expressed concern regarding the year sequences to be used, arguing for the year-sequences that provide the highest average annual landings estimate and therefore the largest ACL. But, the greatest controversy has surrounded the choice of "uncertainty" factors. Those factors range from a value of 1.00, in which case there would be no downward adjustment to the average annual landings when deriving the ACL, to a value of 0.50 in which case the average annual landings would be reduced by 50 percent to derive the ACL. Fishers have argued strongly for an 0.85 adjustment factor, whereas other interested parties including representative non-governmental organizations (NGOs) have expressed concern for Caribbean reef resources and argue for a more restrictive uncertainty reduction.

Action 3

Action 3 customizes the ACL-based management reference points for each island group. Action 3 includes three sub-actions (Table 1.0.3). Sub-action 3(a) addresses the need to aggregate reference points for either or both of the snapper and grouper complexes within either or both of PR and the USVI. There remain severe limitations to the reef fish landings data acquired since 1999. For parrotfish, it is not possible to establish reference points for species within the unit because > 99 percent of the data in PR and 100 percent of the data in the USVI are not classified to a particular species. Parrotfish are therefore not included in sub-action 3(a). Similarly, 100 percent of snapper landings in the USVI are not classified, so those data also cannot be used to establish unit-specific reference points. However, less than 10 percent of commercial snapper landings in PR are not classified, so it is possible to use the predominant proportion of snapper landings data from PR to establish unit-specific average annual landings and to thereby derive unit-specific ACLs. Intermediate between the parrotfish and snapper extremes lie grouper. The grouper complex also is not amenable to establishment of unit-specific reference points in the USVI because 100 percent of USVI landings are not classified to species. In PR, generally between 30-50 percent of landings are unclassified, so the Council has a viable choice between managing at the level of the complex versus at the level of the unit. The preferred alternative is to manage snapper in PR at the level of the unit, to manage grouper in PR at the level of the complex, and to manage both snapper and grouper at the complex level in the USVI.

Sub-action 3(b) specifies separate commercial and recreational ACLs in PR based upon the preferred management reference point time series. The two alternatives of this sub-action are to take no action (**Alternative 1**) or to proceed with establishing separate reference points for the two sectors (**Preferred Alternative 2**). This sub-action is specific to PR because adequate recreational landings data are presently not available for the USVI. This sub-action may be revisited as recreational landings data for the USVI become available. Until recreational data are available for the USVI, recreational sector management will follow that of the commercial sector. In other words, in the USVI if the ACL for the commercial sector is met, both the commercial and the recreational sectors will be subject to appropriate AMs. An outcome of **Preferred Alternative 2** would be to separate management of the recreational and commercial reef fish quotas in PR, thereby removing the dependence of each sector on the harvest activities of the other. This outcome is desired by recreational fishers, and particularly by the charter boat industry, who understand that their access to the resource could otherwise be removed upon fulfillment of the overall quota by combined commercial and recreational fishing activities. Note that Action 4(b), discussed below, further addresses the desire of charter boat captains to maintain year-round access to the resource by establishing bag limits.

Sub-action 3(c) provides options to spatially define fishing areas within the U.S. Caribbean. This sub-action serves to clarify how island-specific harvest quotas will be allocated and managed. The no-action **Alternative 1** continues the present situation of U.S. Caribbean-wide reference points. **Preferred Alternative 2** defines geographic boundaries between each island group (PR, STX, STT/STJ) and includes three sub-alternatives describing how to draw those boundaries.

The alternatives contained within Action 3 are generally considered to be non-controversial. Average annual landings levels, from which island-specific ACLs are determined, are based upon historic landings as reported by the fishermen. Furthermore, the derived ACLs differ only slightly with the choice of year sequence, so the practical effect of choosing among year-sequences is minor. No significant concern has been expressed regarding sector-specific management in PR, and only minor concern has been expressed regarding the choice of geographic reference points with which to separate the island groups.

Action 4

Action 4 addresses additional management measures, including species-specific prohibitions on parrotfish harvest, establishment of recreational bag limits, and further reductions in parrotfish harvest (Table 1.0.4). **Alternative 1** of Action 4(a) would make no change to the present regulations regarding harvest of midnight, blue, and rainbow parrotfish, whereas **Preferred Alternative 2** would prohibit harvest of each of these species depending upon the sub-alternative chosen. The sub-alternatives allow for a prohibition on the harvest of each of those three species; combinations of the sub-alternatives would regulate against the harvest of any combination of those three species or all three species if all three sub-alternatives are chosen. Parrotfish are considered to be valued ecosystem components (VECs), and the three largest species that occur in the U.S. Caribbean and that are addressed in this sub-action are considered to be most vulnerable to overharvest because of their large body size, high susceptibility to spear gear, and relatively low resilience compared with the other species of Caribbean parrotfish. Action 4(b) provides a variety of alternatives for establishing recreational bag limits in the U.S. Caribbean. Alternatives include not establishing a bag limit (**Alternative 1**) or establishing a 10-fish (**Alternative 2**), 5-fish (**Alternative 3**), or 2-fish (**Alternative 4**) aggregate bag limit including sub-alternatives for applying these bag limits to snapper, grouper, or parrotfish. Also being considered is a 0-fish aggregate bag limit for parrotfish (**Alternative 5**), a vessel limit (**Alternative 6**) with sub alternatives for a two fisher, three fisher, or four fisher equivalent, an overall aggregate bag limit that allows a fisher a total of 10 fish per day including not more than two parrotfish (excepting midnight, blue, and rainbow parrotfish), including a vessel limit of not more than 30 fish per day of which no more than six can be parrotfish (**Alternative 7**), and **Preferred Alternative 8** which allows an overall aggregate bag limit of 5 fish per day including not more than two parrotfish (excepting midnight, blue, and rainbow parrotfish, for which harvest is prohibited), including a vessel limit of not more than 15 fish per day of which no more than six can be parrotfish. Action 4(c) considers further reductions in allowable harvest of parrotfish on each of the three island groups. **Alternative 1** of Action 4(c) would institute no additional reduction. **Alternative 2** of this action includes three sub-alternatives to reduce parrotfish harvest by an additional 5.8822 percent. **Preferred Sub-alternative 2A** would reduce allowable parrotfish harvest on St. Croix by an additional 5.8822 percent (15,000 pounds) beyond the preferred alternative described in Table 4.2.3, resulting in an

ACL of 240,000 pounds. **Sub-alternative 2B** would reduce allowable parrotfish harvest on St. Thomas/St. John by an additional 5.8822 percent (2,500 pounds) beyond the preferred alternative described in Table 4.2.3, resulting in an ACL of 40,000 pounds., and **Sub-alternative 2C** would reduce allowable parrotfish harvest on St. Croix by an additional 5.8822 percent (4,000 pounds) beyond the preferred alternative described in Table 4.2.3, resulting in an ACL of 64,000 pounds.

It is anticipated that a prohibition on take of midnight, blue, and rainbow parrotfish will not be controversial on St. Croix because, although 65 percent of the average 1999-2007 parrotfish harvest was landed on St. Croix, few of those landed species comprised midnight, blue, or rainbow parrotfish. Bag limits have not elicited much controversy. The additional parrotfish harvest reductions proposed by **Preferred Sub-alternative 2A** was negotiated with the participating fishermen of St. Croix, thereby alleviating much of the controversy regarding this action. Additional reductions proposed for St. Thomas/St. John in **Sub-alternative 2B** and for Puerto Rico in **Sub-alternative 2C** elicited no controversy.

<u>Action 5</u>

The alternatives contained within Action 5 establish procedures for triggering and then applying AMs (Table 1.0.5). Sub-action 5(a) specifies the criteria for triggering AMs. The no action **Alternative 1** simply states that AMs would not be triggered under any circumstances. This alternative does not comply with the mandates of MSRA. Both **Alternative 2** and **Preferred Alternative 3** describe the conditions under which AMs would be triggered, and these two alternatives differ only in that the latter includes a provision that the AM is triggered unless the NMFS' Southeast Fisheries Science Center, in consultation with the Council and its SSC, determines the overage occur because data collection/monitoring improved rather than because catches actually increased. This provision is included to ensure that AMs are implemented because a real change in landings has led to exceedance of an ACL rather than the overage being due to an administrative or bookkeeping factor such as improved reporting of landings. Otherwise, both **Alternative 2** and **Preferred Alternative 3** include three sub-alternatives that provide for AMs to be triggered if the ACL is exceeded based on a single calendar year of landings, the average of the two most recent calendar years of landings, or the preferred alternative which uses an average of the three most recent calendar years of landings. Sub-action 5(b) then provides remedies for an ACL overage. The no action **Alternative 1** does not apply AMs at all, whereas **Preferred Alternative 2** and **Alternative 3** provide for the application of AMs if the ACL is exceeded. **Preferred Alternative 2** requires the length of the fishing season in the year following the overage to be reduced by the amount needed to prevent such an overage from occurring again. Changes implemented by the AM would remain in effect until modified. **Alternative 3** reduces the length of the fishing season following the same protocols as **Preferred Alternative 2**, but also includes a provision to pay back the overage. The provisions of Action 5 have not been controversial.

Action 6

This action includes framework measures designed to provide a mechanism to expeditiously adjust various reference points and management measures. Action 6 contains two sub-actions that are almost identical in nature with the exception that sub-action 6(a) applies to the Council's Reef Fish Fishery Management Plan (FMP) and sub-action 6(b) applies to the Queen Conch FMP. For both sub-actions, **Alternative 1** is the no action alternative and no framework measures would be established. **Preferred Alternative 2** of both sub-actions includes a lengthy list (see Table 1.0.6) of options for adjusting reference points and management measures, the only difference between them being the inclusion of adjustments to the FMUs for the reef fish. **Alternative 3** reiterates the options available in **Preferred Alternative 2** but allows the Council to choose a subset of the full range of options presented in **Preferred Alternative 2**. The options made available by **Alternative 3** are not specified and would be included in the final list at the discretion of the Council. Again, as with Action 5, these actions are generally not controversial.

Table 1.0.1. Comparison of alternatives for Action 1 to amend the unit composition within the snapper and grouper complexes.

Action	Alternatives	Biological Effects	Socioeconomic/Administrative Effects
1(a) Grouper Complex	**Alternative 1**: No action. Do not change the unit composition within the grouper complex.	No direct or indirect effects on the physical, biological, or ecological environment beyond the baseline.	No added economic or social impacts. (-) Long-term negative effects on the administrative environment.
	Alternative 2: (***Preferred***) Separate Grouper Unit 4 into Grouper Unit 4 and Grouper Unit 5. Remove creole-fish from Grouper Unit 3.	(+) Improved monitoring and management of snapper, better alliance of grouper species with species of similar ecological attributes.	No direct socioeconomic effects anticipated. Indirect effects depend upon subsequent regulatory actions. (+) Reduced administrative burden due to removal of creole-fish from consideration, but one-time burden to delete creole-fish from recording forms. Also, addition of black grouper may offset reduction resulting from removal of creole-fish.
1(b) Snapper Complex	**Alternative 1**: No action. Do not change the unit composition within the snapper complex.	No direct or indirect physical, biological, or ecological effects.	No added socioeconomic or administrative impacts.
	Alternative 2: (***Preferred***) Modify the snapper units by adding cardinal snapper to Snapper Unit 2 and moving wenchman into Snapper Unit 1.	(+) More careful and responsive management of cardinal snapper.	No direct socioeconomic effects anticipated. Indirect effects depend upon subsequent regulatory actions. Negligible effects on administrative environment due to addition of cardinal snapper to catch forms. May ease law enforcement burden by eliminating need for officers to distinguish between two closely related species.

Table 1.0.2. Comparison of alternatives for Action 2 regarding management reference points.

Action	Alternatives	Biological Effects	Socioeconomic/Administrative Effects
2(a) Snapper, grouper, and parrotfish	**Alternative 1**: No action. Retain current management reference points or proxies for species or units within the snapper, grouper, and/or parrotfish.	(-) Data are not available with which to accurately estimate catch, stock biomass, and fishing mortality rates. Unit-based data not available.	(-) No added socioeconomic impacts, but incompatible with Alternative 2 of Action 1(a) and Alternative 2 of Action 1(b). No anticipated impact on administrative environment.
	Alternative 2: (***Preferred***) Redefine management reference points or proxies for snapper, grouper, and/or parrotfish based on the longest time series of pre-Caribbean SFA Amendment landings data that is considered to be consistently reliable across all islands.	(+) Accommodates aggregated data available from USVI and to a considerable degree for grouper and parrotfish from PR. (+) Reflects landings prior to implementation of Caribbean SFA Amendment in 2006, thereby approximating sustainable yield.	No direct socioeconomic impacts; indirect impacts dependent upon the AMs, regulations that implement AMs, other regulations, and environmental factors. Stricter catch levels would be anticipated to result in the greatest administrative burden due to more frequent incidents of overharvest.
	Alternative 3: Redefine management reference points or proxies for snapper, grouper, and/or parrotfish based on the longest time series of landings data that is considered to be consistently reliable across all islands.	(+) Accommodates aggregated data available from USVI and to a considerable degree for grouper and parrotfish from PR. (-) Includes landings levels both prior to and following implementation of Caribbean SFA Amendment, thereby complicating interpretation of sustainable yield.	No direct socioeconomic impacts; indirect impacts dependent upon the AMs, regulations that implement AMs, other regulations, and environmental factors. Stricter catch levels would be anticipated to result in the greatest administrative burden due to more frequent incidents of overharvest.
	Alternative 4: Redefine management reference points or proxies for snapper, grouper, and parrotfish based on the most recent five years of available landings data.	(+) Accommodates aggregated data available from USVI and to a considerable degree for grouper and parrotfish from PR. (-) Includes landings levels both prior to and following implementation of Caribbean SFA Amendment, thereby complicating interpretation of sustainable yield.	No direct socioeconomic impacts; indirect impacts dependent upon the AMs, regulations that implement AMs, other regulations, and environmental factors. Stricter catch levels would be anticipated to result in the greatest administrative burden due to more frequent incidents of overharvest.

Table 1.0.2 (continued). Comparison of alternatives for Action 2 regarding management reference points.

Action	Alternatives	Biological Effects	Socioeconomic/Administrative Effects
2(b) Queen Conch Complex	**Alternative 1**: No action. Retain current management reference points or proxies for the queen conch FMU.	(-) Data are not available with which to accurately estimate catch, stock biomass, and fishing mortality rates.	(-) Less socioeconomic benefit relative to the other alternatives. No anticipated impact on administrative environment.
	Alternative 2: (***Preferred***) Redefine management reference points or proxies for queen conch based on the longest time series of pre-Caribbean SFA Amendment landings data that is considered to be consistently reliable across all islands.	(+) Reflects landings prior to implementation of Caribbean SFA Amendment in 2006, thereby approximating sustainable yield.	(+) New targets and thresholds based upon more recent time-series landings data that are considered to be more reliable and not affected by recent regulatory changes. Indirect socioeconomic impacts dependent on alternative chosen, with higher ACL producing larger short-term socioeconomic benefits but lower ACL producing larger long-term benefits. More restrictive ACLs expected to incur more substantial administrative burden due to increased frequency of management actions.
	Alternative 3: Redefine management reference points or proxies for queen conch based on the longest time series of landings data that is considered to be consistently reliable across all islands.	(-) Includes landings levels both prior to and following implementation of Caribbean SFA Amendment, thereby complicating interpretation of sustainable yield.	(-) New targets and thresholds, based upon more recent time-series landings data that are more reliable than baseline but that are affected by recent regulatory changes. Indirect socioeconomic impacts dependent on alternative chosen, with higher ACL producing larger short-term socioeconomic benefits but lower ACL producing larger long-term benefits. More restrictive ACLs expected to incur more substantial administrative burden due to increased frequency of management actions.
	Alternative 4: Redefine management reference points or proxies for queen conch based on the most recent five years of available landings data.	(-) Includes landings levels both prior to and following implementation of Caribbean SFA Amendment, thereby complicating interpretation of sustainable yield.	(-) New targets and thresholds, based upon most recent five-year time-series landings data that are more reliable than baseline but that are affected by recent regulatory changes. Indirect socioeconomic impacts dependent on alternative chosen, with higher ACL producing larger short-term socioeconomic benefits but lower ACL producing larger long-term benefits. More restrictive ACLs expected to incur more substantial administrative burden due to increased frequency of management actions.

Table 1.0.3. Comparison of alternatives for Action 3 regarding annual catch limit allocation/management.

Action	Alternatives	Biological Effects	Socioeconomic/Administrative Effects
3(a) Snapper and grouper unit allocation / management	**Alternative 1**: No action. Retain current reference points for species or units within the snapper and grouper complexes.	(+) Management at most resolved level, allows most sensitive and directed response to changes, provides greatest assurance that a species is not overfished. (-) Species-specific data are not available in USVI, and non-species-specific data comprise a variable component of landings for all groups in PR.	No direct socioeconomic effects. (-) Adverse short-term and positive long-term indirect effects dependent upon other chosen alternatives, AMs, regulations that implement the AMs, other regulations that combine to rationalize the fishery, and other environmental factors. Not consistent with USVI reporting requirements, thereby requiring use of proxies that may allow overfishing and indirectly lower long-term net benefits. (-) Greatest administrative burden due to disparity between desired and realized harvest reporting goals.
	Alternative 2: Define aggregate reference points for the snapper and grouper units: A. PR only B. USVI only C. Both PR and the USVI	(-) Management by complex, for either or both of PR and USVI, disregards applicable species-specific data for snapper in PR and thereby fails to effectively managed snapper in PR at unit level. If sub-alternative B is chosen, grouper in PR are managed at unit level but with inadequate data. In any case, data not fully exploited and species not managed at maximum sensitivity within constraints of data, thereby risking biological over-exploitation of some species.	No direct socioeconomic effects. (-) Adverse short-term indirect effects dependent upon other chosen alternatives, AMs, regulations that implement the AMs, other regulations that combine to rationalize the fishery, and other environmental factors. Alternative 2A not consistent with USVI reporting requirements, thereby requiring use of proxies that may allow overfishing and indirectly lower long-term net benefits. (+) Administrative burden less than that for Alternatives 1 or 3 but dependent upon sub-alternative chosen, with sub-alternative A being most burdensome and sub-alternative C being least burdensome.

Table 1.0.3 (continued). Comparison of alternatives for Action 3 regarding annual catch limit allocation/management.

Action	Alternatives	Biological Effects	Socioeconomic/Administrative Effects
	Alternative 3: Define aggregate reference points for the grouper unit: A. PR only B. USVI only C. Both PR and the USVI	(-) Management of grouper by complex is feasible and probably necessary. However, available USVI landings data do not allow for effective management of snapper at unit level in USVI.	No direct socioeconomic effects. (-) Adverse short-term and positive long-term indirect effects dependent upon other chosen alternatives, AMs, regulations that implement the AMs, other regulations that combine to rationalize the fishery, and other environmental factors. Alternative 3A not consistent with USVI reporting requirements, thereby requiring use of proxies that may allow overfishing and indirectly lower long-term net benefits. Administrative burden falls between 1 and 3, requiring additional record keeping for snapper.
	Alternative 4: (***Preferred***) Define aggregate reference points for snapper and grouper in the USVI and define aggregate reference points for grouper but not snapper in PR.	(+) Allows management of USVI snapper and grouper at complex level, consistent with data. Allows management of PR grouper at complex level, as best supported by available data, while allowing management of PR snapper at unit level. Managing at most resolved level minimizes likelihood that species or units will be overfished with resultant impacts on ecosystem.	No direct socioeconomic effects. Adverse short-term and positive long-term indirect effects dependent upon other chosen alternatives, AMs, regulations that implement the AMs, other regulations that combine to rationalize the fishery, and other environmental factors. (+) Least administratively burdensome of the four alternatives because inherent consistency with present data collection and management efforts in both USVI and PR.
3(b) Commercial and recreational sector allocation / management (PR only)	**Alternative 1**: No action. Do not specify sector-specific annual catch limits.	No direct or indirect biological or ecological effects, because overall ACL remains the same. (-) Physical impacts due to potential increase in trap deployments/recoveries by commercial fishers.	(-) Failure to separate commercial from recreational quota may elicit competition for a single ACL among sectors to the detriment of recreational socioeconomics. No additional administrative burden beyond that resulting from implementation of Action 2(a).

Table 1.0.3 (continued). Comparison of alternatives for Action 3 regarding annual catch limit allocation/management.

Action	Alternatives	Biological Effects	Socioeconomic/Administrative Effects
	Alternative 2: (***Preferred***) Specify separate commercial and recreational annual catch limits based on the preferred management reference point time series.	No direct or indirect biological or ecological effects, because overall ACL remains the same. (+) No anticipated increase in physical impacts because no change in trap deployments / recoveries by commercial fishers.	(+) Each of the recreational and commercial sectors allocated a subset of the total ACL, eliminating competition among sectors. (-) Race for quota may still occur within each sector, may lead to overcapitalization. Actual socioeconomic impacts dependent on if the regulatory and economic environments support such competition. (-) Additional administrative burden resulting from required separation of catches, establishing separate quotas, and particularly from monitoring, managing, and enforcing quotas. (+) Latter will be ameliorated by reduction in competition between sectors, elimination of dependence of one sector on activities of the other, and resultant reduction in conflict between sectors.
3(c) Geographic allocation / management	**Alternative 1**: No action. Maintain U.S. Caribbean-wide reference points.	No change to biological, ecological, or physical environment anticipated.	(-) Potential to create territorial and/or sector competition in the EEZ, possibly resulting in overcapitalization of fishing assets. Little change to the administrative environment.
	Alternative 2: (***Preferred***) Divide and manage annual catch limits by island group (i.e., PR, STT/STJ, STX) based on the preferred reference point time series (Table 4.3.1 and Action 2). A. (***Preferred***) Use a mid-point or equidistant method for dividing the EEZ among islands. B. Use a straight line approach for dividing the EEZ among islands. C. Use the St. Thomas Fisherman's Association line.	With the exception of changes to gear deployment patterns discussed above, no direct or indirect physical impacts expected. (+) Potentially substantial direct and indirect effects to biological and ecological environments. Better distribution of harvest among island groups, decreased likelihood of area-specific overharvest.	(+) Reduced likelihood of direct competition among fishers from different island groups, with maximum socioeconomic benefits accruing to STT/STJ fishers and their communities. (-) Adverse socioeconomic impacts experienced by fishers harvesting from an area that is subsequently closed when its catch limit is met. (-) Increased administrative burden resulting from additional effort to independently track landings, identify potential overages, and reduce harvest in a timely manner. (+) Those deficiencies may be offset to some degree by the smaller universe of stakeholders who must be managed and informed.

Table 1.0.4. Comparison of alternatives for Action 4 regarding management measures.

Action	Alternatives	Biological Effects	Socioeconomic/Administrative Effects
4(a) Species-specific parrotfish prohibitions	**Alternative 1**: No action. Do not establish species-specific prohibitions on parrotfish harvest.	(-) Continued harvest and potentially overharvest of an essential member of the coral reef ecosystem.	No socioeconomic impacts beyond the baseline. No additional direct or indirect administrative burdens are anticipated.
	Alternative 2: (***Preferred***) Prohibit fishing for or possessing in the EEZ: A. Midnight parrotfish B. Blue parrotfish C. Rainbow parrotfish	(+) Potentially substantial physical, biological, and ecological benefits to coral reef ecosystem resulting from increased abundance of species that provide essential ecosystem services.	Anticipate few if any socioeconomic impacts because few recreational fishers report catching parrotfish from the U.S. Caribbean EEZ. Any adverse impacts that are realized would be expected to affect STX fishers more than PR or STT/STJ fishers because the STX fishers rely more on parrotfish catch. (-) Increased direct and indirect administrative burdens due to increased law enforcement obligations and pursuit of violators.
4(b) Recreational bag limits	**Alternative 1**: No action. Do not establish bag limit restrictions on recreational reef fish harvest.	No change to the present situation regarding physical, biological, or ecological impacts to coral reef ecosystems from unlimited recreational harvest of snapper, grouper, and parrotfish in the U.S. Caribbean EEZ.	No socioeconomic impact beyond the baseline is anticipated. No additional administrative burden is anticipated.
	Alternative 2: Specify a 10-fish aggregate bag limit per person (would not apply to a fisherman who has a valid U.S. commercial fishing license) for: A. Species in the snapper complex B. Species in the grouper complex C. Species in the parrotfish unit	(+) Increased benefit to the physical, biological, and ecological environment of the coral reef ecosystem via capping of daily recreational harvest of ecosystem component species, thereby increasing the relative short-term abundance of targeted species. Of alternatives 2-4, this is the minimally beneficial alternative.	(+) Least socioeconomic impact of alternatives 2-4 due to least restrictive bag limit. Largest socioeconomic impact would fall on STT/STJ fishers because those islands have the largest fishable habitat in the EEZ of all islands in the U.S. Caribbean. (-) Increased administrative burden to codify bag limits and to enforce regulations, but little difference in administrative burden among bag limit options.

Table 1.0.4 (continued). Comparison of alternatives for Action 4 regarding management measures.

Action	Alternatives	Biological Effects	Socioeconomic/Administrative Effects
	Alternative 3: Specify a 5-fish aggregate bag limit per person (would not apply to a fisherman who has a valid commercial fishing license) for: A. Species in the snapper complex B. Species in the grouper complex C. Species in the parrotfish unit	(+) Increased benefit to the physical, biological, and ecological environment of the coral reef ecosystem via capping of daily recreational harvest of ecosystem component species, thereby increasing the relative short-term abundance of targeted species. Of alternatives 2-4, this alternative provides intermediate benefits.	Intermediate socioeconomic impact relative to alternatives 2 and 4 due to intermediate bag limit. Largest socioeconomic impact would fall on STT/STJ fishers because those islands have the largest fishable habitat in the EEZ of all islands in the U.S. Caribbean. (-) Increased administrative burden to codify bag limits and to enforce regulations, but little difference in administrative burden among bag limit options.
	Alternative 4: Specify a 2-fish aggregate bag limit per person (would not apply to a fisherman who has a valid commercial fishing license) for: A. Species in the snapper complex. B. Species in the grouper complex. C. Species in the parrotfish unit	(+) Increased benefit to the physical, biological, and ecological environment of the coral reef ecosystem via capping of daily recreational harvest of ecosystem component species, thereby increasing the relative short-term abundance of targeted species. Of alternatives 2-4, this is the most beneficial alternative.	(-) Greatest socioeconomic impact of alternatives 2-4 due to most restrictive bag limit. Largest socioeconomic impact would fall on STT/STJ fishers because those islands have the largest fishable habitat in the EEZ of all islands in the U.S. Caribbean. (-) Increased administrative burden to codify bag limits and to enforce regulations, but little difference in administrative burden among bag limit options.
	Alternative 5: Establish a 0-fish aggregate bag limit per person (would not apply to a fisherman who has a valid commercial fishing license) for species in the parrotfish unit.	(+) Increased benefits to the physical, biological, and ecological environment of the reef fish ecosystem by reducing harvest of valued ecosystem component (VEC) species essential to proper reef function.	(-) Larger negative socioeconomic impact on charter vessels than other recreational fishers. (-) Increased administrative burden to codify and enforce regulations and to manage violators.

Table 1.0.4 (continued). Comparison of alternatives for Action 4 regarding management measures.

Action	Alternatives	Biological Effects	Socioeconomic/Administrative Effects
	Alternative 6: Establish a vessel limit (would not apply to a fisherman who has a valid commercial fishing license) equivalent to the combined bag limit of: A. Two fishers B. Three fishers C. Four fishers	(+) Provides an upper limit to reef fish harvest, thereby ensuring maximum physical, biological, and ecological contributions to reef and reef community health and stability.	The socio economic effects would be experienced by recreational and subsistence fishermen. The smaller the limit, such as the 2-fisher vessel limit, the larger the potential adverse socioeconomic impact to these individuals because there is more of a constraint of catch. Because charter fishing vessels do not target the species in question in federal waters, Alternative 6 should not have an adverse socioeconomic impact on charter fishing businesses.
	Alternative 7: Establish an aggregate bag limit for snapper, grouper, and parrotfish of: 10 per fisher including not more than two parrotfish per fisher or six parrotfish per boat, and 30 aggregate snapper, grouper, and parrotfish per boat on a fishing day.	(+) Provides physical, biological, and ecological benefits via reduction in recreational take of reef fish community constituents including those which provide essential ecological services.	The socioeconomic effects would be experienced by recreational and subsistence fishermen. The smaller the limit, such as the 2-fisher vessel limit, the larger the potential adverse socioeconomic impact to these individuals because there is more of a constraint of catch. Because charter fishing vessels do not target the species in question in federal waters, Alternative 7 should not have an adverse socioeconomic impact on charter fishing businesses.
	Alternative 8: (*Preferred*) Establish an aggregate bag limit for snapper, grouper, and parrotfish of: 5 per fisher including not more than two parrotfish per fisher or six parrotfish per boat, and 15 aggregate snapper, grouper, and parrotfish per boat on a fishing day.	(+) Provides physical, biological, and ecological benefits via reduction in recreational take of reef fish community constituents including those which provide essential ecological services.	The socioeconomic effects would be experienced by recreational and subsistence fishermen. The smaller the limit, the larger the potential adverse socioeconomic impact to these individuals because there is more of a constraint of catch. Because charter fishing vessels do not target the species in question in federal waters, Preferred Alternative 8 should not have an adverse socioeconomic impact on charter fishing businesses.

Table 1.0.4 (continued). Comparison of alternatives for Action 4 regarding management measures.

Action	Alternatives	Biological Effects	Socioeconomic/Administrative Effects
4(c) Additional parrotfish harvest reduction	**Alternative 1**: No action. Do not apply additional reductions to parrotfish harvest from the EEZ of each U.S. Caribbean island group.	(-) Does not account for directed parrotfish harvest and resultant impacts on critical habitat for threatened Acroporid corals.	(+) Maximizes the socioeconomic opportunities for the St. Croix fishing community. No additional administrative impacts anticipated.
	Alternative 2: Provide an additional 5.8822 percent reduction in parrotfish harvest. A. **(*Preferred*)** Provide an additional 5.8822 percent reduction in St. Croix parrotfish harvest to address uncertain effects of that harvest on essential settlement substrate for Acroporid corals. B. Provide an additional 5.8822 percent reduction in St. Thomas/St. John parrotfish harvest to address uncertain effects of that harvest on essential settlement substrate for Acroporid corals. C. Provide an additional 5.8822 percent reduction in Puerto Rico parrotfish harvest to address uncertain effects of that harvest on essential settlement substrate for Acroporid corals.	(+) Provides additional protection for critical Acroporid habitat.	(-) Reduces socioeconomic opportunities although the additional impacts are expected to be minimal. No additional administrative impacts are anticipated.

Table 1.0.5. Comparison of alternatives for Action 5 regarding accountability measures.

Action	Alternatives	Biological Effects	Socioeconomic / Administrative Effects
5(a) Triggering accountability measures	**Alternative 1**: No action. Do not trigger AMs.	No direct or indirect physical, biological, or physical impacts, but would not comply with MSA mandates.	No direct or indirect socioeconomic impacts beyond the baseline are anticipated. No administrative impacts anticipated.
	Alternative 2: Trigger AMs if the annual catch limit is exceeded based upon: A. A single year of landings beginning with landings from 2010. B. A single year of landings beginning with landings from 2010, then a 2-year running average of landings in 2011 (average of 2010+2011), and thereafter (i.e., 2010, 2010-2011, 2011-2012, etc.) C. A single year of landings beginning with landings from 2010, a 2-year average of landings in 2011 (average of 2010+2011), then a 3-year running average of landings in 2012 (average of 2010+2011+2012) and thereafter (i.e., 2010, 2010-2011, 2010-2012, 2011-2013, etc.).	No direct or indirect physical impacts are anticipated. Biological and ecological impacts dependent upon alternative chosen. Alternative 2A is the least precise and may result in unnecessarily triggering AMs, with precision increasing and the likelihood decreasing with each of alternatives B and C.	Without regulations that implement AMs, Alternative 2 would not change existing fishing practices and would have no socioeconomic impacts beyond the baseline. A minor administrative burden is anticipated reflecting increased effort by the SEFSC to tally landings numbers and to provide them to the Council.
	Alternative 3: (***Preferred***) Trigger AMs if the annual catch limit is exceeded as defined below unless NMFS' SEFSC (in consultation with the Caribbean Fishery Management Council and its Scientific and Statistical Committee) determines the overage occurred because data collection/monitoring improved rather than because catches actually increased: A. A single year of landings effective beginning 2010. B. A single year of landings effective beginning 2010, then a 2-year running average of landings in 2011 and thereafter (i.e., 2010, 2010-2011, 2011-2012, etc.). C. (***Preferred***) A single year of landings effective beginning 2010, a 2-year average of landings effective 2011, then a 3-year running average of landings effective 2012 and thereafter (i.e., 2010, 2010-2011, 2010-2012, 2011-2013, etc.)	No direct or indirect physical impacts are anticipated. Biological and ecological impacts dependent upon alternative chosen. Alternative 3A is the least precise and may result in unnecessarily triggering AMs, with precision increasing and the likelihood decreasing with each of alternatives B and C. (+) Includes consultation with scientists and managers prior to triggering AMs, resulting in more reliable and defensible decisions.	Without regulations that implement AMs, Alternative 3 would not change existing fishing practices and would have no socioeconomic impacts beyond the baseline. A minor administrative burden is anticipated reflecting increased effort by the SEFSC to tally landings numbers and to provide them to the Council.

Table 1.0.5 (continued). Comparison of alternatives for Action 5 regarding accountability measures.

Action	Alternatives	Biological Effects	Socioeconomic/Administrative Effects
5(b) Applying accountability measures	**Alternative 1**: No Action. Do not apply AMs.	No direct or indirect physical, biological, or ecological impacts anticipated, but would not comply with MSA mandates.	No direct or indirect socioeconomic impacts beyond the baseline are anticipated. No additional administrative burden is anticipated.
	Alternative 2: (***Preferred***) If AMs are triggered, then reduce the length of the fishing season for that species or unit the year following the trigger determination by the amount needed to prevent such an overage from occurring again. The needed changes will remain in effect until modified.	(+) Reduced fishing season may result in direct increase in individual size and abundance of individuals, but increased regulatory discards also may occur. Indirect impacts via reduced gear interactions and more balanced trophic system also may be realized.	Intermediate socioeconomic impacts relative to alternatives 1 and 3. Likelihood of subsequent overages reduced but no requirement to pay back previous overage. Thus, overall harvest reduction is less than for alternative 3. Moderate impacts to administrative environment emanate from increased burden to alert fishers of closure and to monitor closure, although minimal if any impact on law enforcement is anticipated.
	Alternative 3: If AMs are triggered, then reduce the length of the fishing season for that species or unit the year following the trigger determination by the amount needed to prevent such an overage from occurring again and to pay back the overage. The needed changes will remain in effect until modified.	(+) Reduced fishing season may result in direct increase in individual size and abundance of individuals, but increased regulatory discards also may occur. Indirect impacts via reduced gear interactions and more balanced trophic system also may be realized.	(-) Greatest socioeconomic impacts relative to alternatives 1 and 2. Reducing the likelihood of subsequent overages, combined with a requirement to pay back previous overage, maximizes overall harvest reduction and resultant socioeconomic impacts. Moderate impacts to administrative environment emanate from increased burden to alert fishers to closure and to monitor closure, although minimal if any impact on law enforcement is anticipated.

Table 1.0.6. Comparison of alternatives for Action 6 regarding framework measures.

Action	Alternatives	Biological Effects	Socioeconomic/Administrative Effects
6(a) Establish framework measures for Reef Fish FMP	**Alternative 1**: No action. Do not amend the framework measures for the Reef Fish FMP.	(-) Not allowing regulations to be adjusted through framework would most likely lead to extended delays in implementation of necessary changes. Such a scenario could be biologically or ecologically detrimental since overfishing or other threats would persist and positive opportunities might be lost. No direct or indirect physical impacts are anticipated.	(-) No direct socioeconomic impacts. May result in indirectly lowering long-term net socioeconomic benefits that derive from exploiting the resource. (-) Increased administrative burden because any modifications to regulations would need to be implemented through an FMP amendment.

Table 1.0.6 (continued). Comparison of alternatives for Action 6 regarding framework measures.

Action	Alternatives	Biological Effects	Socioeconomic / Administrative Effects
	Alternative 2: (***Preferred***) Amend the framework procedures for the Reef Fish FMP to provide a mechanism to expeditiously adjust the following reference points and management measures through framework action: a. Quota Requirements b. Seasonal Closures c. Area Closures d. Fishing Year e. Trip/Bag Limits f. Size Limits g. Gear Restrictions or Prohibitions h. Fishery Management Units (FMUs) i. Total Allowable Catch (TAC) j. Annual Catch Limits (ACLs) k. Accountability Measures (AMs) l. Annual Catch Targets (ACTs) m. Maximum Sustainable Yield (MSY) n. Optimum Yield (OY) o. Minimum Stock Size Threshold (MSST) p. Maximum Fishing Mortality Threshold (MFMT) q. Overfishing Limit (OFL) r. Acceptable Biological Catch (ABC) control rules s. Actions to Minimize the Interaction of Fishing Gear with Endangered Species or Marine Mammals	(+) Positive biological and ecological benefits would accrue because regulations could be made or adjusted as new fishery and stock abundance data become available. Alternative 2 provides the most tangible positive benefits because the framework is more comprehensive and provides the Council with more room to move. No direct or indirect physical impacts are anticipated.	Positive long-term indirect socioeconomic benefits accrue from the availability of framework measures to rapidly and comprehensively respond to changing data and information. The administrative burden would be minimized relative to alternatives 1 and 3 because several steps in the lengthy amendment process would be eliminated.

Table 1.0.6 (continued). Comparison of alternatives for Action 6 regarding framework measures.

Action	Alternatives	Biological Effects	Socioeconomic/Administrative Effects
	Alternative 3: Amend the framework procedures for the Reef Fish FMP to provide the Council with a mechanism to expeditiously adjust a subset of management measures outlined in Alternative 2.	(+) Positive biological and ecological benefits would accrue because regulations could be made or adjusted as new fishery and stock abundance data become available. Alternative 3 provides fewer positive benefits because the framework is less comprehensive and provides the Council with fewer options than does Alternative 2. No direct or indirect physical impacts are anticipated.	Positive long-term indirect socioeconomic benefits accrue from the availability of framework measures to rapidly and comprehensively respond to changing data and information. The administrative burden would be intermediate relative to alternatives 1 and 2 because several steps in the lengthy amendment process would be eliminated, but some options included in Alternative 2 are not included here.
6(b) Establish Framework Measures for Queen Conch FMP	**Alternative 1**: No action. Do not amend the framework measures for the Queen Conch FMP.	(-) Not allowing regulations to be adjusted through framework would most likely lead to extended delays in implementation of necessary changes. Such a scenario could be biologically or ecologically detrimental since overfishing or other threats would persist and positive opportunities might be lost. No direct or indirect physical impacts are anticipated.	(-) No direct socioeconomic impacts. May result in indirectly lowering long-term net socioeconomic benefits that derive from exploiting the resource. (-) Increased administrative burden because any modifications to regulations would need to be implemented through a FMP amendment.

Table 1.0.6 (continued). Comparison of alternatives for Action 6 regarding framework measures.

Action	Alternatives	Biological Effects	Socioeconomic/Administrative Effects
	Alternative 2: (***Preferred***) Amend the framework procedures for the Queen Conch FMP to provide a mechanism to expeditiously adjust the following reference points and management measures through framework action: a. Quota Requirements b. Seasonal Closures c. Area Closures d. Fishing Year e. Trip/Bag Limits f. Size Limits g. Gear Restrictions or Prohibitions h. Total Allowable Catch (TAC) i. Annual Catch Limits (ACLs) j. Accountability Measures (AMs) k. Annual Catch Targets (ACTs) l. Maximum Sustainable Yield (MSY) m. Optimum Yield (OY) n. Minimum Stock Size Threshold (MSST) o. Maximum Fishing Mortality Threshold (MFMT) p. Overfishing Limit (OFL) q. Acceptable Biological Catch (ABC) control rules r. Actions to Minimize the Interaction of Fishing Gear with Endangered Species or Marine Mammals.	(+) Positive biological and ecological benefits would accrue because regulations could be made or adjusted as new fishery and stock abundance data become available. Alternative 2 provides the most tangible positive benefits because the framework is more comprehensive and provides the Council with more room to move. No direct or indirect physical impacts are anticipated.	Positive long-term indirect socioeconomic benefits accrue from the availability of framework measures to rapidly and comprehensively respond to changing data and information. The administrative burden would be minimized relative to alternatives 1 and 3 because several steps in the lengthy amendment process would be eliminated.

Table 1.0.6 (continued). Comparison of alternatives for Action 6 regarding framework measures.

Action	Alternatives	Biological Effects	Socioeconomic/Administrative Effects
	Alternative 3: Amend the framework procedures for the Queen Conch FMP to provide the Council with a mechanism to expeditiously adjust a subset of management measures outlined in Alternative 2.	(+) Positive biological and ecological benefits would accrue because regulations could be made or adjusted as new fishery and stock abundance data become available. Alternative 3 provides fewer positive benefits because the framework is less comprehensive and provides the Council with fewer options than does Alternative 2. No direct or indirect physical impacts are anticipated.	Positive long-term indirect socioeconomic benefits accrue from the availability of framework measures to rapidly and comprehensively respond to changing data and information. The administrative burden would be intermediate relative to alternatives 1 and 2 because several steps in the lengthy amendment process would be eliminated, but some options included in Alternative 2 are not included here.

2.0 PURPOSE AND NEED

2.1 Purpose Statement

The purpose of this amendment is to revise management reference points and status determination criteria for Caribbean queen conch, snapper, grouper, and parrotfish; specify annual catch limits and accountability measures to prevent overfishing of these species or units; establish framework measures to facilitate regulatory modifications; adjust management measures as needed to constrain harvest to specified annual catch limits; and minimize, to the extent practicable, negative socioeconomic impacts that may result from the amendment actions.

2.2 Need for Action

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) as revised in 2007 requires that each federal fishery management plan (FMP) specify annual catch limits (ACLs) and accountability measures (AMs) for managed fisheries. These amendments require such measures be implemented in 2010 for fisheries determined by the Secretary of Commerce to be subject to overfishing and in 2011 for all other fisheries. These determinations are documented in the National Marine Fisheries Service's (NMFS) quarterly reports to Congress on the status of U.S. fisheries. The most recent of these reports (second quarter 2011) is accessible online at: http://www.nmfs.noaa.gov/sfa/statusoffisheries/2011/second/Q2_2011_FSSI_nonFSSIstockstatus.pdf

Parrotfish, several species or units within the Caribbean snapper and grouper complexes (Table 2.2.1), and queen conch are currently classified as subject to overfishing and are therefore the focus of this proposed action. The status of these species and units has not been assessed since the Caribbean Fishery Management Council (Council) and NMFS took action to address overfishing through the 2005 Caribbean SFA Amendment (CFMC 2005).

Definition of Terms
(from NOAA Fish Glossary 2006 unless otherwise noted).

Status Determination Criteria (SDC): Objective and measurable criteria used to determine if a stock is being overfished or is in an overfished state according to National Standard Guidelines.

Annual Catch Limit (ACL): The amount of fish allowed to be caught in a year. (http://alaskafisheries.noaa.gov/npfmc/current_issues/ACL/ACL.htm)

Accountability Measure (AM): Management controls to prevent ACLs, including sector-ACLs, from being exceeded, and to correct or mitigate overages of the ACL if they occur (74 FR 3180)

Overfishing: Occurs whenever a stock or stock complex is subjected to a rate or level of fishing mortality that jeopardizes the capacity of a stock or stock complex to produce maximum sustainable yield on a continuing basis.

Maximum Sustainable Yield (MSY): The largest average catch or yield that can continuously be taken from a stock under existing environmental conditions.

Optimum Yield (OY): The harvest level for a species that achieves the greatest overall benefits, including economic, social, and biological considerations.

Table 2.2.1. Composition and current status classifications of managed snapper, grouper, and parrotfish species in the U.S. Caribbean.

Unit (included species)	Overfishing?	Overfished?	Approaching Overfished?	Rebuilding Progress
SNAPPER UNIT 1 (silk, black, vermilion, blackfin)	Yes	No	Yes	N/A
SNAPPER UNIT 2 (queen and wenchman)	Unknown*	Unknown*	Unknown*	N/A
SNAPPER UNIT 3 (gray, lane, dog, mutton, schoolmaster, mahogany)	Unknown*	Unknown*	Unknown*	N/A
SNAPPER UNIT 4 (yellowtail)	Unknown*	Unknown*	Unknown*	N/A
GROUPER UNIT 1 (Nassau)	Yes	Yes	N/A	Year 6 of 25-Year Plan
GROUPER UNIT 2 (goliath)	No	Yes	N/A	Year 6 of 30-Year Plan
GROUPER UNIT 3 (red hind, coney, rock hind, graysby, creole-fish)	Unknown*	Unknown*	Unknown*	N/A
GROUPER UNIT 4 (red, yellowedge, misty, tiger, yellowfin)	Yes	Yes	N/A	Year 6 of 10-Year Plan
PARROTFISH UNIT (blue, midnight, princess, queen, rainbow, redfin, redtail, stoplight, redband, striped)	Yes	No	Yes	N/A

*Data with which to make a determination regarding the overfishing or overfished status for these units is incomplete or unavailable. Reasonably foreseeable significant adverse impacts are not anticipated due to the lack of this information. Summaries of pertinent scientific evidence are included in Section 3.1 (page 48).

The MSA requires that fishery management plans be consistent with ten national standards for conservation and management. Primary among those standards is the requirement to prevent overfishing while achieving, on a continuing basis, the optimum yield (OY) from each sector for the United States fishing industry (MSA, Section 301(a)(1)). To meet this obligation requires establishment of management reference points and status determination criteria that can be used to determine whether each species or unit is overfished, as well as, harvest estimates that are suitable for the determination of rates of harvest relative to maximum sustainable yield (MSY). The harvest activities of all fishing sectors that comprise the commercial and recreational fisheries must be documented to the extent practicable to assure that the goals of the MSA are met. Finally, it is necessary to define actions that will be implemented if harvest levels are exceeded, including a framework for efficient modification of harvest regulations in response to changing conditions and new information.

3.0 INTRODUCTION

3.1 Background

The President signed HR 5946, the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (MSRA) of 2006, on January 12, 2007. While maintaining the requirement that "conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each sector for the United States fishing industry," the MSRA added new requirements to end and prevent overfishing including the use of Annual Catch Limits (ACLs) and Accountability Measures (AMs).

Specifically, the MSRA requires that FMPs "establish a mechanism for specifying annual catch limits in the plan (including a multiyear plan), implementing regulations, or annual specifications, at a level such that overfishing does not occur, including measures to ensure accountability" (MSRA Section 303(a)(15)). Further, the MSRA requires such measures be implemented in 2010 for fisheries determined by the Secretary to be overfished or subject to overfishing and in 2011 for all other fisheries.

Currently, there are five species or units classified as undergoing overfishing in the U.S. Caribbean. These groups are: parrotfish, Grouper Unit (GU) 1 (Nassau grouper), GU4 (tiger, yellowfin, red, misty, and yellowedge grouper), Snapper Unit (SU) 1 (black, blackfin, silk, and vermilion snapper) (Table 2.1.1) and queen conch (*Strombus gigas*). These determinations are documented in the NMFS quarterly reports to Congress on the status of U.S. fisheries. The most recent of these reports (2nd quarter 2011) is accessible online at:
http://www.nmfs.noaa.gov/sfa/statusoffisheries/2011/second/Q2_2011_FSSI_nonFSSIstockstatus.pdf

In an effort to set ACLs for these species and units, the Council, based on advice from its Scientific and Statistical Committee (SSC), convened a Technical Monitoring and Compliance Team (TMCT), whose task was to identify available data in the U.S. Caribbean and to recommend the appropriate data set to a second group, the Annual Catch Limit Working Group (ACLG). The ACLG consisted of federal, state, and local managers, scientists, and constituents. The ACLG was tasked to analyze the available data and make recommendations to the SSC regarding how to best comply with the National Standard (NS) 1 Guidelines (74 FR 3178).

Concurrent with the work of these groups, the Southeast Data, Assessment, and Review (SEDAR) panel convened to evaluate all available data in the U.S. Caribbean in support of ACL development, a summary of which is available at:
http://www.sefsc.noaa.gov/sedar/download/CaribData_Final.pdf?id=DOCUMENT. The SEDAR findings, along with those of the ACLG, were presented to the SSC for development of Overfishing Levels (OFL) and Acceptable Biological Catch (ABC) limits, as required by the NS1 guidelines (74 FR 3178). The SSC developed eight scenarios for evaluation of available data (see Appendix 1). Each species or unit was examined via the

scenario process and appropriate scientific advice was provided based on the outcome of the scenario. For the species and units listed above, the SSC concluded that no OFL or ABC could be determined. Instead, the SSC adhere to the catch level recommendations of the ACLG which were derived from average annual landings in recent years (Note: use of the appropriate "recent years" was based on a case by case basis for each of the species and units). These catch level recommendations will be examined in Action 2 of the management alternatives section.

In addition to providing recommendations to meet the requirements of the NS1 guidelines, the ACLG and SEDAR groups recommended modifications to unit composition within the Council's Fishery Management Units (FMUs). These recommendations were developed based on the empirical landings data, biological characteristics of the species involved, and discussion with fishermen. Specific reorganization recommendations are evaluated in Action 1 of the management alternatives section.

3.2 History of Fisheries Management

3.2.1 Management of the Queen Conch Resources of Puerto Rico and the U.S. Virgin Islands

The United States Virgin Islands (USVI) has the longest history of queen conch regulations in the U.S. Caribbean. The following paragraphs describe the chronology of these regulations in the territorial waters of the USVI, in federal waters, and in the state waters of Puerto Rico.

Queen conch, *Strombus gigas*, has been regulated in the territorial waters of the USVI since 1987, when a prohibition on fishing and possession of conch was implemented in St. Thomas/St. John, but not in St. Croix, from February 15, 1988, to December 31, 1992 (Title 12 V.I.C. §304). The recommendation to establish the closure was done by the St. Thomas/St. John Fisherman's Committee of Overseers because of overfishing and was implemented by the Governor (A.A. Farrelly) as an emergency regulatory action.

In St. Croix, a seasonal closure was implemented in 1988 from August to September and every year thereafter from 1 July to 30 September each consecutive year (Title 12, V.I.R. & R., §304 signed by the Governor on 6 July 1988). Additionally, a size limit of 9 inches (22.9 cm) was implemented and the meats of legally landed conch had to weigh at least three to the pound if cleaned or two to the pound if uncleaned. But, conch had to be landed intact. In 1988, personal use fishers had a limit of six conchs per fisher per day.

The USVI government prohibited harvest in the territorial waters of St. Thomas/St. John between 1992 and 1995.

Revisions to USVI conch harvest regulations, implemented in 1994, included the seasonal closure (July 1 to September 30 of each consecutive year), a 9" length limit or 3/8" (0.95 cm) lip thickness, a requirement that conch be landed intact, a prohibition on throwing the empty shell back in the water, and a bag limit for personal use of 6 conch per day not to exceed 24 per boat. Also in 1994, the commercial bag limit was established at 150 conchs per day. The size and seasonal closure regulations apply to all commercial and recreational fishers in the USVI. These regulations were implemented under Title 12 VIIR, Chapter 9A, §301- 310 dates July 12 1994. [In regulations dated April 26 1994, the USVI government had established a daily limit of 75 conchs for commercial fishers, along with the regulations mentioned above, which subsequently was amended to 150 conchs in July 12 1994.]

On August 24, 2001, the USVI Department of Planning and Natural Resources (VIDPNR) implemented a moratorium on issuance of new commercial fishing permits. The permit moratorium remains in effect. Commercial fishing licenses and vessel registrations have been required in the USVI since 1972 (Act No. 3330). The regulations of the USVI are provided to the public in Fishers Booklets that have been published since at least 1986. The distribution of these booklets has been done through the VIDPNR at the time of registering for a commercial fishing license.

On July 30, 2007, the USVI government announced that the seasonal closure, which normally runs from July 1st through September 30th, would be extended until January 1, 2008. Additionally, it was announced that once the fishing season began there would be a 50,000 pound quota throughout the territory. These regulations were again revised and approved on June 3, 2008. The size limits for conch (9" or 3/8" lip thickness), the prohibition on the sale of undersized conchs, the limit on personal use (6 per day per fisher not to exceed 24 per boat per day), landing conch intact, no possession of meats less than 2 per pound (un-cleaned) or 3 per pound (cleaned) remained in place. The seasonal closure was changed to include the months of June 1st through October 31st or as soon as the annual landings reached the limit of 50,000 pounds per district. The commercial harvest quota was also limited to 200 conchs per day per registered commercial fishing vessel. A requirement for fishers to submit catch reports by the 15th of the following month was implemented with the regulations.

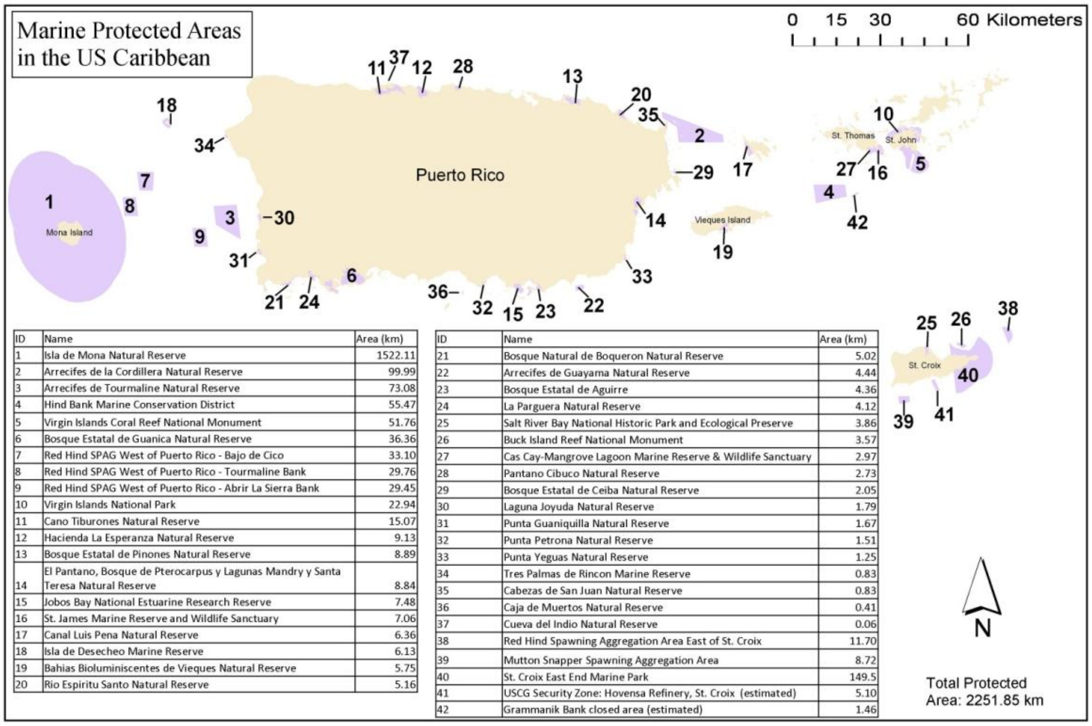
The open season began on November 1, 2008, and on April 6, 2009, the Commissioner of the VIDPNR announced that the quota had been reached in St. Croix and the conch fishery was to be closed on April 30, 2009. On April 21, 2009, the Commissioner of the VIDPNR requested from the CFMC an emergency closure of federal waters (See Regulatory Amendment to the Queen Conch FMP and the following section on Federal Management). The season re-opened on November 1, 2009.

In June 1996, after the USVI revised the territorial regulations for queen conch, the Council proposed a management plan for queen conch to curb overfishing by reducing the mortality on spawning adults and preventing the harvest of immature individuals. That plan accomplished the following: (1) imposed a 9-inch overall minimum size limit or 3/8-inch shell-lip thickness limitation on the possession of queen conch; (2) required that all species in the management unit be landed in the shell and prohibited the sale of undersized queen conch and queen conch shells; (3) established a bag limit of 3 queen conch per day for recreational fishers, not to exceed 12 per boat, and 150 queen conch per day for licensed commercial fishers; (4) closed the harvest season from July 1st through September 30th of each year coincident with the peak spawning period; and, (5) prohibited harvest of queen conch by HOOKAH (breathable air provided by a surface supply apparatus rather than by tanks mounted to the body) gear in the exclusive economic zone (EEZ) to protect deep-water spawning stocks.

The government of Puerto Rico implemented a seasonal closure in state waters in 1997 to protect the spawning population concurrent with the USVI and the federal regulations (July 1st - September 30th of each year). The bag limits for commercial and recreational conch fishers were also established in state waters but the conch did not have to be brought to shore intact. The bag limits of 150 conchs per licensed commercial fisher per day, and three conchs per fisher per day to a maximum of 12 conchs per boat, were also established in 1997 for the commercial and the recreational sectors, respectively. In 2004, the government established a maximum harvest limit of 450 conchs per commercial fishing vessel per day. Commercial fishing licenses have been required in Puerto Rico since 1936, and this regulation was upheld in 1998. Permits for conch were not required until 2004. Although recreational fishing licenses and permits have been required since 1997 (upheld in 1998 and 2004), these requirements have not been implemented. In 2010, the PR government modified the seasonal closure for conch to include the period from August 1st through October 31st each year.

Additional management measures, implemented for the reef fish fishery, also affected queen conch harvest. Seasonal closures for all fishing on the Tourmaline Bank off the west coast of Puerto Rico (closed from December 1 through the last day of February each year; CFMC 1993), the marine conservation districts (MCD) off St. Thomas (closed between December and February each year since 1990 (CFMC 1990), closed year-round since 1999; Coral FMP Amendment 1 (CMFC 1999)), Lang Bank, off St. Croix (closed from December 1 through the last day of February each year; Reef Fish FMP Amendment 2, CFMC 1993) and the mutton snapper area off St. Croix (closed March 1st - June 30th each year; Reef Fish FMP Amendment 2, CFMC 1993) resulted in the prohibition of harvest of queen conch in those areas (Figure 3.2.1).

Further protection was afforded to queen conch beginning in 1996 with the establishment of additional seasonal closures for all fishing at Bajo de Sico and Abrir La Sierra (both closed from December 1 through the last day of February each year) off the west coast of Puerto Rico (CFMC 1996). Compatible regulations were implemented for the Bajo de Sico and Tourmaline Bank areas that were contiguous between federal and local jurisdictions.



ID	Name	Area (km)
1	Isla de Mona Natural Reserve	1522.11
2	Arrecifes de la Cordillera Natural Reserve	99.99
3	Arrecifes de Tourmaline Natural Reserve	73.08
4	Hind Bank Marine Conservation District	55.47
5	Virgin Islands Coral Reef National Monument	51.76
6	Bosque Estatal de Guanica Natural Reserve	36.36
7	Red Hind SPAG West of Puerto Rico - Bajo de Cico	33.10
8	Red Hind SPAG West of Puerto Rico - Tourmaline Bank	29.76
9	Red Hind SPAG West of Puerto Rico - Abrir La Sierra Bank	29.45
10	Virgin Islands National Park	22.94
11	Cano Tiburones Natural Reserve	15.07
12	Hacienda La Esperanza Natural Reserve	9.13
13	Bosque Estatal de Pinones Natural Reserve	8.89
14	El Pantano, Bosque de Pterocarpus y Lagunas Mandry y Santa Teresa Natural Reserve	8.84
15	Jobos Bay National Estuarine Research Reserve	7.48
16	St. James Marine Reserve and Wildlife Sanctuary	7.06
17	Canal Luis Pena Natural Reserve	6.36
18	Isla de Desecheo Marine Reserve	6.13
19	Bahias Bioluminiscentes de Vieques Natural Reserve	5.75
20	Rio Espiritu Santo Natural Reserve	5.16

ID	Name	Area (km)
21	Bosque Natural de Boqueron Natural Reserve	5.02
22	Arrecifes de Guayama Natural Reserve	4.44
23	Bosque Estatal de Aguirre	4.36
24	La Parguera Natural Reserve	4.12
25	Salt River Bay National Historic Park and Ecological Preserve	3.86
26	Buck Island Reef National Monument	3.57
27	Cas Cay-Mangrove Lagoon Marine Reserve & Wildlife Sanctuary	2.97
28	Pantano Cibuco Natural Reserve	2.73
29	Bosque Estatal de Ceiba Natural Reserve	2.05
30	Laguna Joyuda Natural Reserve	1.79
31	Punta Guaniquilla Natural Reserve	1.67
32	Punta Petrona Natural Reserve	1.51
33	Punta Yeguas Natural Reserve	1.25
34	Tres Palmas de Rincon Marine Reserve	0.83
35	Cabezas de San Juan Natural Reserve	0.83
36	Caja de Muertos Natural Reserve	0.41
37	Cueva del Indio Natural Reserve	0.06
38	Red Hind Spawning Aggregation Area East of St. Croix	11.70
39	Mutton Snapper Spawning Aggregation Area	8.72
40	St. Croix East End Marine Park	149.5
41	USCG Security Zone: Hovensa Refinery, St. Croix (estimated)	5.10
42	Grammanik Bank closed area (estimated)	1.46

Figure 3.2.1. Territorial, state, federal (USFWS, USCG) and EEZ Marine Protected Areas in the U.S. Caribbean.

There are other protected areas in the U.S. Caribbean or areas where fishing is restricted or prohibited (e.g., United States Coast Guard (USCG) Security Zones, DOI Monuments) that provide additional protection to the queen conch resources in the region.

In 2005, the Caribbean SFA Amendment provided a rebuilding plan for queen conch as Amendment 1 to the Queen Conch FMP. To implement the rebuilding plan, the Council prohibited commercial and recreational harvest and possession of queen conch in federal waters of the U.S. Caribbean, with the exception of Lang Bank near St. Croix. More specifically, the amendment:

- Established a new Fishery Management Unit for the queen conch;
- Prohibits the harvest and possession of queen conch from the EEZ, west of 64°34'W, East of this coordinate, fishing and possession are prohibited between July and September;
- Where fishing is allowed in the EEZ, conch must be maintained intact and all other regulations of bag limits, gear restrictions, and minimum size apply;
- Prohibits all fishing on Grammanik Bank, south of St. Thomas, from February 1st through April 30th of each year, and;
- Specified an MSY proxy, OY, MSST, and MFMT for the FMUs.

The Council developed a regulatory amendment to the Queen Conch FMP to establish a quota and seasonal closures that are compatible with the USVI (CFMC 2011; 76 FR

23907). The final rule published in the *Federal Register* on April 29, 2011 and became effective on May 31, 2011. Under previous regulations, fishing for and possession of queen conch was prohibited in the Caribbean EEZ, with the exception of an area known as Lang Bank east of St. Croix, which was open to harvest of queen conch from October 1st through June 30th . Prior to the new regulation, when the territorial waters of St. Croix reach their 50,000 pound quota for queen conch, Lang Bank would remain open to queen conch harvest through the end of the fishing season. With the implementation of the new rule, when the territorial waters of St. Croix reach their 50,000 pound quota for queen conch, it will trigger the closure of Lang Bank to queen conch until the start of the next fishing season. Additionally, the Lang Bank seasonal closure is being changed from the previous closure of July 1st through September 30th, to the new closure of June 1st through October 31st, each year.

3.2.2 Management of the Reef Fish Fishery of Puerto Rico and the U.S. Virgin Islands

The Council's Reef Fish FMP (CFMC 1985; 50 FR 34850) was implemented in September 1985. The FMP, which was supported by an environmental impact statement (EIS), defined the reef fish fishery management unit to include shallow water species only, defined various fishing parameters, described objectives for the shallow water reef fish fishery, and established management measures to achieve those objectives.

Amendment 1 to the Reef fish FMP (CFMC 1990; 55 FR 46214) was implemented in December 1990. That amendment was supported by an environmental assessment (EA) with a finding of no significant impact (FONSI). Primary management measures included an increase in mesh size, a prohibition on harvest of Nassau grouper, and establishment of a seasonal closure near St. Thomas, USVI. Amendment 1 also defined overfished and overfishing for shallow water reef fish.

A regulatory amendment to the Reef Fish FMP (CFMC 1991; 56 FR 48755) was implemented October 1991. The primary management measures contained in this amendment, which was supported by an EA with a FONSI, included a modification to the mesh size increase implemented through Amendment 1 and a change in the specifications for degradable panels for fish traps.

Amendment 2 to the Reef Fish FMP (CFMC 1993; 58 FR 53145), implemented in November 1993, was supported by a supplemental EIS (SEIS). That amendment redefined the reef fish fishery management unit to include the major species of deep water reef fish and marine aquarium finfish. Primary management measures implemented through this amendment included gear restrictions, prohibition of harvesting goliath grouper and other aquarium trade species, and creation of various seasonally closed areas. Amendment 2 also applied existing definitions of MSY and OY to all reef fish within the revised FMU, with the exception of marine aquarium finfish. The MSY and OY of marine aquarium finfish remained undefined.

A technical amendment to the Reef Fish FMP (59 FR 11560), implemented in April 1994, clarified the minimum mesh size allowed for fish traps.

An additional regulatory amendment to the Reef Fish FMP (CFMC 1996; 61 FR 64485) was implemented in January 1997. That action, supported by an EA, reduced the size of the Tourmaline Bank closed area that was originally implemented in 1993, and prohibited fishing in two areas off the west coast of Puerto Rico (Abrir La Sierra Bank and Bajo de Sico).

Amendment 3 to the Reef Fish FMP was implemented in 2005 with the approval of the Caribbean SFA Amendment, in which the Council redefined the fishery management units and defined rebuilding plans for overfished species (CFMC 2005). Primary management measures implemented through this amendment are as follows:

- Established new Fishery Management Units (FMU) for reef fish;
- Required that fish traps have an 8 inch by 8 inch panel (with mesh not smaller than the mesh of the trap) on one side of the trap (excluding top, bottom and the side of the door) attached with untreated jute twine (diameter less than 1/8 inch);
- Required that individual traps or pots have at least one buoy attached that floats on the surface;
- Required that traps or pots tied together in a trap line have at least one buoy that floats at the surface at each end of the trap line;
- Prohibited the use of gillnets and trammel nets in the EEZ;
- Established a seasonal area closure in the area known as Grammanik Bank south of St. Thomas;
- Prohibited the use of bottom tending gear (traps, pots, gillnets, trammel nets, bottom longlines) in the seasonally closed areas including Grammanik Bank;
- Required an anchor retrieval system for anyone fishing or possessing Caribbean reef fish species;
- Prohibited the filleting of fish at sea;
- Established seasonal closures (no fishing or possession), every year during the specified months, for SU1 (silk, black, blackfin and vermillion snapper) from October 1 through December 31, GU4 (tiger, yellowfin, yellowedge, red and black) from February 1 through April 30, red hind from December 1 through the last day of February, and lane and mutton snapper from April 1 through June 30, and;
- Established MSY, OY, MSST, and MFMT for the FMUs.

The Council has recently completed a regulatory amendment to the Reef Fish FMP that extends the seasonal closure of Bajo de Sico. Bajo de Sico has been identified as an important spawning site, especially for red hind and possibly other resident grouper including Nassau and yellowfin, as well as an important foraging site for these and other Caribbean reef fish. The Bajo de Sico closed area has been described as a well developed and diverse coral and sponge habitat that provides essential fish habitat (EFH) for Caribbean reef fish. The purpose of the regulatory amendment is to protect red hind spawning aggregations and large snapper and grouper from directed fishing mortality.

Compatible reef fish regulations exist in the U.S. Caribbean for Nassau and goliath grouper; fishing and possession of these species has been prohibited from the shore to the EEZ since 2004 for goliath grouper and since 2006 for Nassau grouper.

Seasonal closures established in the EEZ since 2005 have also been established for some of the same units in territorial and commonwealth waters. Fishing for and possession of Grouper Unit 4, except misty grouper (see Appendix 2), is prohibited in the territorial waters of the USVI and in the EEZ from February 1st to April 30th each year; in Puerto Rico only one species from this group (yellowfin) is regulated during this period. From April 1st through June 30th each year, fishing for and possession of all species in Snapper Unit 3 is prohibited in the EEZ whereas fishing for and possession for lane and mutton snapper is prohibited in the USVI. Fishing for and possession of mutton snapper is prohibited from April 1st to May 31st in Puerto Rico. Fishing for and possession of red hind (Grouper Unit 3) is prohibited from December 1st to last day of February in the EEZ and Puerto Rico but not in the USVI. Fishing for and possession of Snapper Unit 1 is prohibited from October 1st to December 31st in the EEZ and the USVI, but only two species within this group (silk and blackfin) are regulated during these months in Puerto Rico.

Size regulations for yellowtail snapper have been implemented in the EEZ and Puerto Rico but not in the USVI.

Gear restrictions (e.g., mesh size in traps) also provide additional protection to the reef fish resources in the U.S. Caribbean. The mesh size for traps in the U.S. Caribbean is 2" (5.1 cm) rectangular and 1.5" (3.8 cm) hexagonal mesh; the same requirements apply for escape panels, and tying materials have been specified across the jurisdictions. Trammel and gillnets are prohibited in the EEZ and in the USVI; Puerto Rico has regulated the mesh size and length of the nets.

3.2.3 Generic FMP Amendments

The Council submitted the Generic Essential Fish Habitat Amendment to the Spiny Lobster, Queen Conch, Reef Fish, and Coral Fishery Management Plans (Generic EFH Amendment with an EA) to NMFS in 1998 to comply with the EFH provisions of the Magnuson-Stevens Act (CFMC 1998). NMFS partially disapproved that amendment on March 29, 1999, finding that it did not evaluate all managed species or all fishing gears with the potential to damage fish habitat (64 FR 14884). The document was subsequently challenged by a coalition of environmental groups and fishing associations on the grounds that it did not comply with the requirements of the Magnuson-Stevens Act and NEPA (American Oceans Campaign et al. v. Daley et al., Civ. No. 99-982 [D.D.C.]). The federal court opinion upheld the plaintiffs' claim that the Generic EFH Amendment with an EA was in violation of NEPA, but determined that the amendment was in accordance with the Magnuson-Stevens Act. The Council completed the final EIS (FEIS) for the Generic EFH Amendment to comply with the September 14, 2000 court order (CFMC 2004). The notice of availability of the draft EFH EIS was published in the Federal Register on August 1, 2003 (68 FR 45237). The comment period on that document ended on October 30, 2003. The notice of availability for the Record of Decision on the EFH FEIS was published in the Federal Register on May 25, 2004 (69 FR 29693). The Generic EFH Amendment was implemented by the Caribbean SFA Amendment of 2005.

Additional information regarding the management history of the Reef Fish and Queen Conch FMPs can be found in Section 2.2 of the Caribbean SFA Amendment.

3.3 Overview of Data History

The commercial and recreational harvest data available for conducting assessments in the U.S. Caribbean is limited. The available data, previous U.S. Caribbean assessments, and descriptions of some of the limitations have been thoroughly described in various reports including:
Caribbean SFA Amendment (CFMC 2005) available at:
http://www.caribbeanfmc.com;
SEDAR (2009) available at:
(http://www.sefsc.noaa.gov/sedar/download/CaribData_Final.pdf?id=DOCUMENT)
SEDAR 04 (2003-2004) available at:
http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=04);
SEDAR 08A (2005) available at:
http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=08%20A);
SEDAR 14 (2007) available at:
http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=14);
Reports produced by the Fisheries Research Laboratory of the Puerto Rico Department of Natural and Environmental Resources (PRDNER) and available at:
(http://www.drna.gobierno.pr/oficinas/arn/recursosvivientes/negociado-de-pesca-y-vida-silvestre/laboratorio-de-investigaciones-pesqueras-1/publicaciones);
and, reports by the VIDPNPNR Division of Fish and Wildlife available at:
http://www.fw.dpnr.gov.vi/fish/index.htm

Among the primary concerns regarding the data are the scarce, missing, or unreliable information on fishing effort, spatial/geographic patterns, and life history parameters. Although some fishery independent data are available, they are spatially and temporally limited and previous assessments have been unable to incorporate a viable time series into the analyses (SEDAR 2009).

3.3.1 Commercial Data History

Commercial fisheries landings data have been collected since 1974 from St. Thomas/St. John, since 1975 from St. Croix, and since 1967 from Puerto Rico (available in electronic format since 1983 for Puerto Rico). However, most of the USVI landings data have not been recorded to species with adequate reliability so species-specific landings information cannot be utilized to document historical trends. Beginning in 1998 (St. Croix) and 2000 (St. Thomas/St. John), finfish landings have been reliably reported to the complex (snapper and grouper) or unit (parrotfish) level while queen conch landings have been reliably reported to species. At the time of preparation of this document, complete and verified landings data were available through 2007 for both the USVI and Puerto Rico. Moreover, at the September 2009 meeting of the Council, a motion was approved to use

1999 as the earliest year for which data would be considered. Thus, year sequences used to calculate average commercial landings estimates for the purpose of setting ACLs include 2000-2007 for St. Thomas/St. John and 1999-2007 for both St. Croix and Puerto Rico.

During the years of record for both St. Croix and St. Thomas/St. John, landings were reported at the complex or unit level. For the purposes of the analyses presented herein, those complexes/units include conch, parrotfish, grouper, and snapper. As a result, although various units are extant or are being proposed for management, analyses of USVI landings data cannot be resolved to the level of individual unit except in the case of conch and parrotfish. Both grouper and snapper are presently divided into several units and modifications to those units are proposed in this document. It is not possible to resolve the landings data from the USVI to a level that allows consideration of those individual units.

Even in Puerto Rico, with its much longer history of landings being reported to individual species, there are complications with those assignments which compromise some analyses and prevent the successful application of others. For example, during 1999-2007 the annual contribution of unclassified (i.e., not reported to species) grouper ranged between 35-53percent of the classified landings. These unclassified landings can be redistributed among the individual species based upon proportional representation in the catch, but such redistribution is not straightforward particularly within individual years. Also, due to non-reporting, under-reporting, and misreporting of catch, the reported landings from Puerto Rico reflect actual fishing activity to a variable degree. Puerto Rico DNER staff, working with staff from NOAA's Southeast Fisheries Science Center (SEFSC), has developed adjustment factors to account for the lack of complete reporting. Data collected from Puerto Rico, and used in the present amendment for evaluation of various harvest scenarios, have been adjusted to account for reporting problems (Table 5.3.8) but have not been redistributed to account for unclassified landings. Instead, unidentified landings are accounted for as a separate, unclassified group within the respective complex or unit.

Additionally, fish that are caught but subsequently released rather than harvested (i.e., bycatch) are not accounted for in the landings data. Reasons for discarding catch include risk of ciguatera (a sickness caused by eating toxin-exposed fish), regulatory restrictions, catch unmarketable, market saturation with a specific species, or (for lobster) individuals in the catch are carrying eggs (Trumble et al. 2006). Discards may represent a substantial proportion of the total catch and may represent an important source of mortality for some species. For example, St. Thomas fishermen discard as much as 20 percent of their total catch (Figure 2, Trumble et al. 2006). Although some discards survive and 20 percent in this example represents an upper bound, reported landings represent a lower bound and probably underestimate total catch. No suitable method to account for bycatch mortality is presently available. Appendix 3 provides additional details regarding bycatch.

3.3.2 Recreational Data History

There is no comprehensive landings data-collection program for the recreational sector in the U.S. Caribbean. The only continuous data gathering effort exists in the form of the Marine Recreational Fisheries Statistics Survey (MRFSS) program for Puerto Rico, and only for the years 2000 to 2008. Recreational data for the USVI exist both for the fleet that targets pelagic fish and billfish obtained from recreational fishing tournaments, and in snapshot form for the boat-based reef-based recreational fishery. Neither data set is complete. Furthermore, there are no continuous data being collected on two of the most important fisheries in the area, the queen conch and the spiny lobster. These problems should be rectified to a considerable degree with the implementation of the next-generation Marine Recreational Information Program (MRIP), which is expected to expand both the spatial and species coverage of U.S. Caribbean recreational fishing activities.

3.3.2.1 Puerto Rico

Although recreational and sportfishing activities in Puerto Rico are prominent, data on the recreational catch and effort, species composition of the catch, and biological data on the species targeted and harvested are mostly lacking. The only continuous attempt at gathering these data from the recreational fishing sector dates to 2000, when the MRFSS was implemented in Puerto Rico, and which has continued to collect data to date. Recreational fisheries monitoring through the MRFSS follows the same methodology as on the continental U.S. and is briefly described herein. For information on the MRFSS program (now redefined as MRIP), see:
https://www.countmyfish.noaa.gov/), which can be accessed through:
http://www.st.nmfs.noaa.gov/st1/recreational.

In Puerto Rico, the MRFSS program has been conducted through the PRDNER, who generally have provided the intercept and interview personnel although occasionally contracting consultants to carry out the survey. Data are collected on recreational catch and effort targeting reef fish and on coastal and highly migratory pelagic species, but not on invertebrates such as queen conch and spiny lobster (two of the most commercially and recreationally important harvested species). In 2000-2001, the MRFSS program in Puerto Rico included a two-year special survey on conch. This information was used in the development of the 2005 Caribbean SFA Amendment to the FMPs in the U.S. Caribbean. At the time, with only the availability of two years of data, there was indication that the recreational catch in Puerto Rico was a significant proportion of the total landings, accounting in some instances for more than 50 percent of the total landings (including SU2 and GU3) in Puerto Rico. The proportional participation was also significant with over 200,000 participants annually.

The MRFSS program collects data, through telephone interviews, on a two-month wave mode, with six waves per year. The information includes shore line, charter, and private boat modes to account for most of the recreational fishing activity. However, the survey does not target SCUBA divers, a potential major activity in the U.S. Caribbean (García-Moliner et al. 2001).

The Coastal Household Telephone Survey (CHTS) collects information from participants at the end of each two-month wave. Households are accessed randomly from numbers obtained from the telephone book. Following a brief screening, the respondents are questioned about fishing effort from shore and from private boats. Anglers are queried regarding fishing trips taken over the last two months and asked to provide information on the details of the trips:
(http://www.st.nmfs.noaa.gov/st1/recreational).
The information requested includes the fishing mode (shore, charter or private boat), the number of trips taken, and the number of people fishing, among other information. The household information is expanded to determine total participation as the number of trips by county and then expanded again for the whole Island. These data are collected for each of the shore and private modes every two months throughout the year.

Expanded estimates of the recreational catch (in numbers) and effort (number of trips and participants) are always accompanied by a calculation of the proportional standard error (PSE). As an example, in 2008 the total number of participants was estimated at 149,544 (with 127,863 resident participants and 21,681 out-of-state participants) with a PSE of 11percent. These 149,544 participants in the recreational fishery made a total of 798,551 trips (all included: shore, private and charter) with a PSE of nine percent for all modes combined. Landings for 2008 were estimated at 1,910,542 pounds for all finfish species (Table 3.3.1).

The MRFSS includes an at-dock intercept component (Access-Point Angler Intercept Survey), also conducted by PRDNER personnel. The interviews are conducted at fishing access points to identify species landed, individual length-weight, total numbers by species, and effort information. The intercept points are selected following a random stratified design in proportion to the dates, times, and sites of fishing activity. As stated in the MRFSSS overview, funding availability also dictates sampling effort. Intercepts are conducted for each mode separately (private, shore, and charter). Ideally a catch-per-unit-effort (CPUE) estimate could be determined from these interviews. It is the information collected during these interviews that are used for expanding the data to estimate total catch and harvest (Table 5.3.8). This survey in Puerto Rico has met with varying degrees of success due in part to a number of changes in personnel and a lack of adequate personnel to cover areas other than the north coast of the island. This has resulted in very minimal or zero samples, poor species identification, few samples per species for length and weight, and geographical bias of the samples. Attempts have been made to use the catch, effort, and length data in stock assessments for a number of species, including mutton snapper, yellowtail snapper, and yellowfin grouper, and in the determination of ACLs (e.g., SEDAR 2009). Although no complete evaluation of the MRFSS data for Puerto Rico has been conducted to date, both SEDAR (2007) and SEDAR (2009) assessed the MRFSS data and concluded that the data were not sufficient for use in stock assessments.

Among the issues of concern with the recreational data are problems with (1) the accurate identification of species, reflected in the large proportion of landed fish attributed to general (i.e., ‘unclassified’) categories such as ‘groupers’ or *Mycteroperca* spp., (2) the minimal number of individuals measured and the minimal information on complete catches, (3) geographic bias of the samples with most coverage on the north coast of Puerto Rico, and (4) minimal validation of the intercept trips (validation is done through follow-up telephone calls on 10 percent of the interviews). Additionally, there is a need for validating the harvest areas to determine if the catch comes from state waters or from the EEZ. Finally, the primary source of MRFSS information (telephone surveys) reports in numbers of fish harvested and discarded. Weight of the catch is then estimated based on individual weight estimates obtained from the intercept survey.

Table 3.3.1. Recreational landings statistics generated from MRFSS intercept program in Puerto Rico from inception (2000) to the most recent available year.

Year	Mode	Total	Charter	Private	Shore	Participants
2000	Pounds	4,601,741	48,173	4,195,832	357,736	249,868
	Trips	1,332,703	16,899	522,914	792,890	
2001	Pounds	3,301,922	23,281	2,752,165	526,476	222,128
	Trips	1,411,943	10,919	504,349	896,675	
2002	Pounds	2,452,048	22,438	2,236,507	193,103	237,995
	Trips	1,301,059	34,277	572,844	693,938	
2003	Pounds	3,754,963	28,254	3,320,974	405,735	219,910
	Trips	1,111,405	21,764	471,741	617,900	
2004	Pounds	2,145,475	40,435	1,940,892	164,148	163,833
	Trips	1,050,299	22,028	389,469	638,802	
2005	Pounds	1,971,263	41,689	1,835,863	93,711	141,743
	Trips	866,722	17,969	379,910	468,843	
2006	Pounds	955,123	16,823	431,274	507,026	213,005
	Trips	896,582	16,906	386,111	493,565	
2007	Pounds	2,375,687	43,063	2,197,800	134,824	185,429
	Trips	1,080,096	10,734	453,907	615,455	
2008	Pounds	1,910,542	39,974	1,793,360	77,208	149,544
	Trips	798,552	12,623	362,739	423,190	

The MRFSS data do provide a first attempt at accounting for the recreational harvest, which is generally considered to be significant. A summary of all available information for Puerto Rico from the recreational sector, including number of participants, number of trips taken by mode (shore, charter and private boat), and the total catch (all species reported) from 2000 to 2008 is presented in Table 3.3.1. A relatively flat trend in number of fishing trips and pounds landed is present from 2000-2008, except for an as-yet unexplained anomaly in 2006. The percent of trips taken to the shore (53-61 percent) is always higher than the percent of trips taken in private boats (36-45 percent), which in turn is always higher than the number of charter trips (1-3 percent). However, the private boats account for a greater proportion of the landings (45-94 percent of the total) followed by shore landings (4-53 percent) and finally (as expected from much catch and release in the area) by the charters (1-2 percent). The total catch corresponds to the Type A+B1+B2

(A = fish that are brought back to shore for identification by the interviewer, B1 = filleted or used for bait but identified by angler, B2 = identified but released alive). Between the years 2000 and 2008, the total landings from the recreational sector ranged from 955,123 to 4,601,741 pounds (an average of 2,607,640 pounds per year from all finfish species). The number of participants has also varied annually from a low of 141,743 in 2005 to a maximum of 249,868 in 2000.

The MRFSS program also offers information on the total number of trips by mode and area (≤10 miles being roughly equivalent to state waters and ≥10 miles being roughly equivalent to EEZ waters) from 2000 to 2008 (Figure 3.3.1). Twenty percent of the trips taken to EEZ waters were by recreational fishers in private boats, but most recreational trips occur within state waters. The narrowest PSEs are from the private and shore fishing sectors, ranging from 10 to 16 percent, while for the charter mode PSEs range from 40 to 91 percent. The MRFSS sampling was based mostly on the shoreline mode, with limited sampling of private vessels. A specific reporting protocol is being developed for the for-hire sector (G. Rodríguez, PRDNER, pers. comm.).

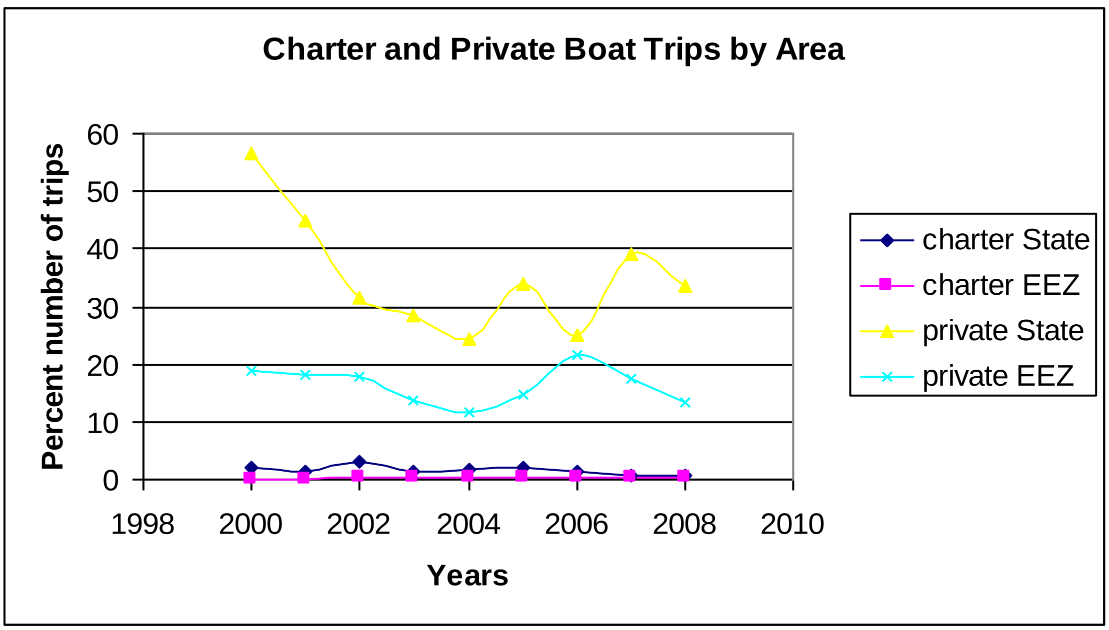


Figure 3.3.1. Charter and private vessel trips occurring within Puerto Rico commonwealth (State) and U.S. Caribbean EEZ waters during 2000-2008.

There is no information on the universe of recreational fishers in the U.S. Caribbean. The National Angler Registry, which began in 2010 as part of the MRIP program, has in its database, as of March 9, 2010, 594 anglers registered as fishing in the EEZ (582 in Puerto Rico and 12 in the USVI) (F. Darby, NMFS/OFS, pers. comm.). There are no state registries of recreational fishers.

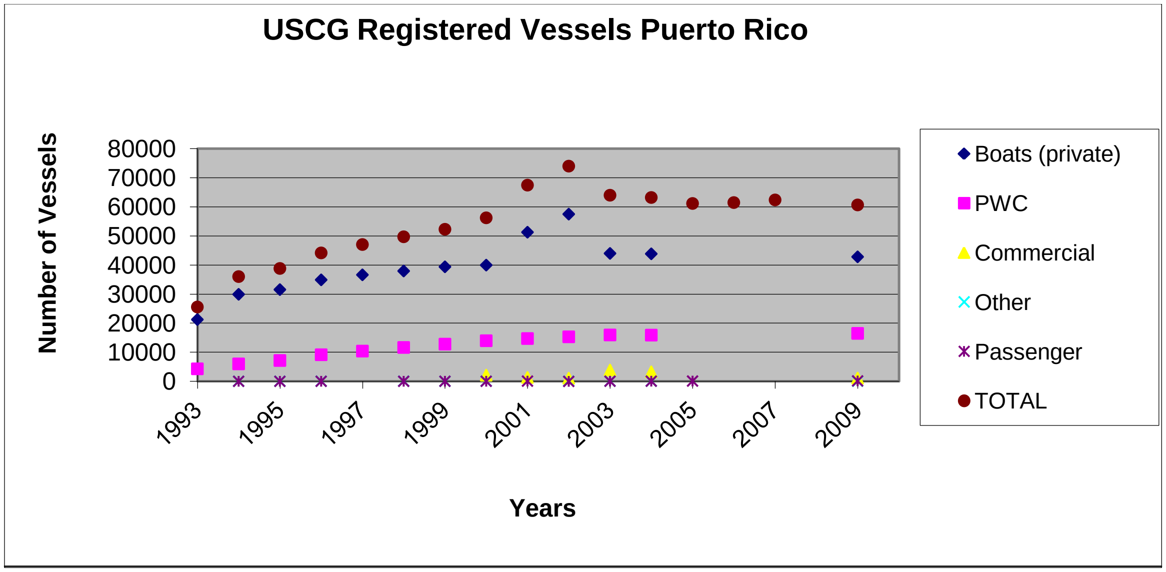


Figure 3.3.2. Recreational and commercial vessel registrations in Puerto Rico as recorded by the United States Coast Guard. PWC = personal watercraft.

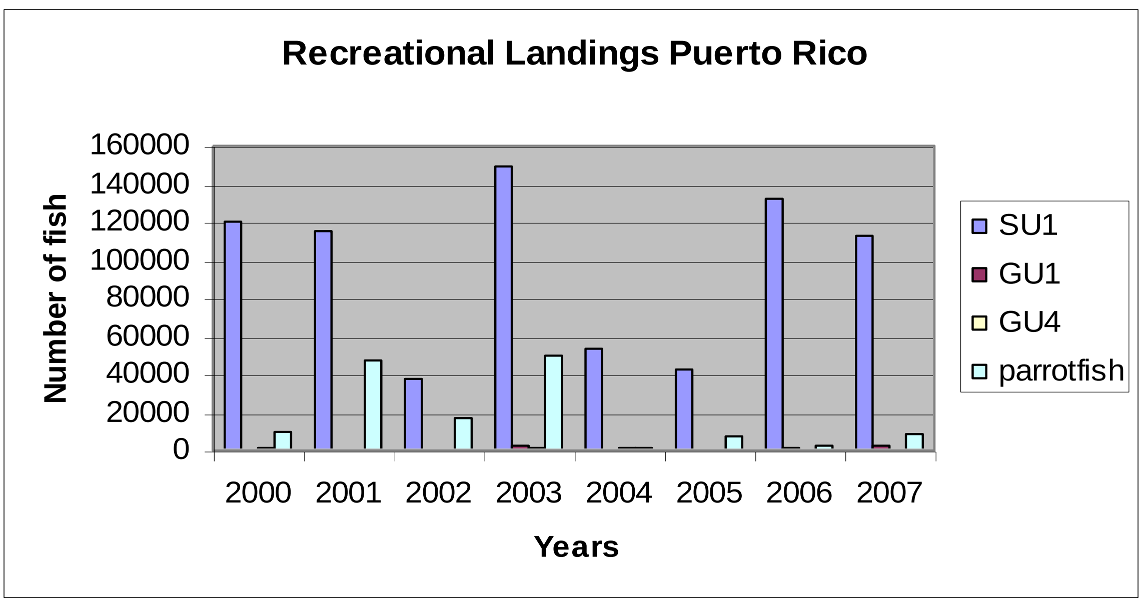


Figure 3.3.3. Estimated number of fish caught each year during 2000-2008 by recreational anglers, reported within each of the SU1, GU1, GU4, and Parrotfish groups.

The number of vessels registered with the United States Coast Guard peaked at 60,640 (Figure 3.3.2) including 1,125 boats registered as commercial fishing vessels in Puerto Rico (A. Cruz, PRDNER, pers. comm.). This boat registry can be used as an indicator of the potential number of recreational fishers in Puerto Rico. Furthermore, “saltwater recreational fishing in Puerto Rico is an important industry generating $754.8 million in trip and durable goods expenditures" (B. Gentner and J. Agar, SEFSC, pers. comm.). Regardless of its limitations, MRFSS provides useful information on the potential impact of recreational harvest on the finfish species considered in this amendment (Table 2.2.1).

Species specific data from the recreational harvest is limited but Figure 3.3.3 shows the total number of fish estimated per year since 2000 for SU1, GU1, GU4 and parrotfish. MRFSS data indicates that large numbers of fish are being landed by the recreational sector most significantly within SU1 (silk, blackfin, black and vermillion snapper). However, the total number of fish reported from the intercepts is limited to 172 silk snapper measured between the years 2000 and 2008; and only 52, 36 and 3 vermillion, blackfin and black snapper sampled during the same time period. A total of 43 individual parrotfish were sampled between 2000 and 2008.

3.3.2.2 USVI

The most recent report on recreational fishing activity in USVI waters (Tobias and Dupigny 2009) reviews the information available for the area, including the surveys on the recreational fishing activity in general (reef fish) included in the Caribbean SFA Amendment to the FMPs (CFMC 2005) and most recently in the Caribbean Fisheries Data Evaluation workshop (SEDAR 2009).

Most of the information on recreational fisheries for the USVI derives from offshore billfish and other pelagic fisheries since the area is well known for game fish. Tobias and Dupigny (2009) summarize the information on the latest recreational fishing survey targeting the pelagic fleet. None of the reports on the recreational fishing activity in the USVI target the fleet harvesting reef fish, lobster, or conch.

Logbook data identify snapper (yellowtail, mutton, and dog), jacks, and grouper (red hind, coney) as being harvested but accounting for less than 2 percent of the total fish reported in the logbooks (Tobias and Dupigny 2009).

Telephone surveys targeting boat-based and shore fishers provide an estimate of 10 percent of the USVI population participating as recreational fishers (Jennings 1992, Mateo 1999). In all cases, pelagic species are the most commonly targeted (Tobias and Dupigny 2009). In St. Thomas/St. John, 7,000 vessels were registered in 20005-2006 and 250 were registered in St. Croix (Tobias and Dupigny 2009), but there is no additional information on the fishing fleet of the USVI targeting reef fish and conch resources.

3.3.2.3 Regulations on licenses and permits

There are no federal licenses or permits issued for the commercial harvest of reef fish and queen conch in the EEZ of the U.S. Caribbean. The Government of Puerto Rico requires commercial fishing licenses for fishing in state waters and an additional permit for harvesting queen conch. In the USVI, a commercial fishing permit is required for all commercial fishers, if fishing with pots, traps, set-nets, or haul seines, even for personal consumption, and if trading or selling any of the catch. Charter operators, if selling the catch, must have a commercial fishing permit. In the USVI there is a moratorium on new commercial fishing licenses since 2001.

In 2010, all anglers fishing recreationally in the U.S. Caribbean EEZ are required to register through the national registry:
http://www.countmyfish.noaa.gov/index.html
if fishing for species other than highly migratory species (HMS) since there are already permits in place for HMS anglers. There are 582 anglers registered in the National Registry from Puerto Rico (Table 3.3.2). Fishing licenses and permits are a legal mandate for recreational harvesters in Puerto Rico although a licensing program has not yet been implemented. In addition to the license, Puerto Rico recreational fishers must have a permit for catching queen conch. In the USVI there are no licenses or permits required for recreationally fishing in territorial waters. However, recreational fishers are required to have permits to fish in three locations (see Section 5.3.3.7). The USVI is currently developing regulations for recreational fishing activity.

Table 3.3.2. Recreational fishing effort estimates for the U.S. Caribbean during 2008-2010.

		Puerto Rico	USVI		
Recreational*	1/1 – 3/1/2010 National Registry**	582	12		
HMS Permits	May 2008***		STX	STT	STJ
	Angling Permit	805	26	28	2
	Charter	21	4	10	7
	General Permit	99	13	6	1
MRFSS	Recreational Participants[$]	149,544			
Vessels	Registered Recreational[#]	60,640			

*Forbes Darby (pers. comm. March 9, 2010 from Scott Sauri)
**Only registered if fishing in the EEZ
***Amendment 4 to the Consolidated Atlantic HMS FMP
[$] http://www.st.nmfs.noaa.gov/st1/recreational
[#]A. Cruz, PRDNER

3.3.2.4 Recreational Vessels and Permits

There are 60,640 recreational vessels registered with the United States Coast Guard in Puerto Rico (Table 3.3.2). A downward trend was detected in the number of private power boats registered in 2003. In 2009 all types of recreational vessels showed a decrease in numbers.

Recreational vessels, except for those targeting Highly Migratory Species (HMS), are not required to have any additional permits for fishing in the U.S. Caribbean. The HMS open access permits are issued to the vessel while the recreational angler National Registry registers fishermen. The HMS permit applies to both state and federal waters while the registry applies only to fishers fishing in the EEZ. Table 3.3.2 compares the number and types of permits/registry for the recreational sector in the U.S. Caribbean.

4.0 MANAGEMENT ALTERNATIVES

The Council has selected preferred alternatives for all actions included in this amendment. Those alternatives are clearly identified within each action.

4.1 ACTION 1: Amend the Stock Complexes in the Reef Fish Fishery Management Unit (FMU)

4.1.1 Action 1(a) Grouper complex

Alternative 1. No action. Do not change the unit composition within the grouper complex.

Alternative 2. **(PREFERRED)** Separate Grouper Unit 4 into Grouper Unit 4 (yellowfin, red, tiger plus black grouper) and Grouper Unit 5 (yellowedge and misty grouper). Remove creole-fish from Grouper Unit 3.

Discussion: Action 1(a) proposes several changes to the grouper units for the U.S. Caribbean, including the removal of creole-fish (*Paranthias furcifer*) from Unit 3, addition of black grouper (*Mycteroperca bonaci*) to Unit 4, and movement of yellowedge grouper (*Epinephelus flavolimbatus*) and misty grouper (*E. mystacinus*) into a Unit of their own (Table 4.1.1).

Alternative 1 is the no action alternative and maintains the present situation. Puerto Rico commercial landings data for both black grouper and creole-fish indicate that they are rarely caught by the commercial sector. An adjusted average of about 15 pounds of creole-fish and 20 pounds of black grouper were reported to have been landed by commercial fishers between 1983 and 2007. These landings averages are essentially inconsequential, although it is unclear whether and to what extent either species is reported in the unclassified category. In contrast to commercial landings, recreational landings of black grouper from Puerto Rico waters are occasionally substantial, with an average of about 500 fish being landed each year during 2000-2007. Creole-fish are absent from the recreational landings during that same period of time. If black grouper are added to the unit, as proposed by **Preferred Alternative 2**, then it has been recommended that they be added to Grouper Unit 4 based upon similar habitat by depth distribution patterns (SEDAR 2009). Because both misty and yellowedge grouper are found at depths much greater than are the other species in current Grouper Unit 4, it is further proposed in **Preferred Alternative 2** to create a new grouper unit (Grouper Unit 5) that will contain these two species. Public testimony supporting the separation of those grouper into two units has been consistent. The Council selected **Alternative 2** as the preferred alternative since this alternative best represents the landings history and ecology of the affected species. This alternative also would aid on-going efforts to collect species-specific data by adding a species (black grouper) that is targeted by recreational fishers but has not previously been included as a managed species.

4.1.2 Action 1(b) Snapper complex

Alternative 1. No action. Do not change the unit composition within the snapper complex.

Alternative 2. **(PREFERRED)** Modify the snapper units by adding cardinal snapper (*Pristipomoides macrophthalmus*) to Snapper Unit 2 and moving wenchman (*Pristipomoides aquilonaris*) into Snapper Unit 1.

Discussion: The wenchman, *Pristipomoides aquilonaris*, is currently included in Snapper Unit 2 (SU2) along with the queen snapper (*Etelis oculatus*). However, the species commonly captured by the commercial sector apparently is locally known (particularly in Puerto Rico) as the wenchman although it actually appears to be *Pristipomoides macrophthalmus*. The latter is commonly referred to as the cardinal snapper. The cardinal snapper clusters strongly with queen snapper based upon analyses of landings records and habitat utilization patterns by depth (SEDAR 2009). In contrast, *P. aquilonaris* is most closely associated with those species comprising Snapper Unit 1 (SU1), again based upon similarities in habitat utilization by depth.

Alternative 1 of Action 1(b) is the no-action alternative. Choosing this alternative would continue a situation in which cardinal snapper are not included in any snapper unit and wenchman are paired with queen snapper in SU2. As noted above, wenchman cluster most closely with members of SU1 based upon patterns of habitat utilization by depth. In the commercial landings records for Puerto Rico dating from 1983 to 2007, no landings of wenchman are specifically recorded although it is unclear whether and to what extent wenchman is reported in the unclassified category. In contrast, cardinal snapper are a common constituent of Puerto Rico commercial landings; cardinal snapper landings have increased considerably in recent years with a peak of 21,482 pounds in 2005. Regardless of any other changes to the snapper units, cardinal snapper (*P. macrophthalmus*) needs to be added to the SU2 in order to account for and properly manage the harvest of this species. The common name in Spanish for both *Pristipomoides* species is “muniama” with the cardinal snapper (*P. macrophthalmus*) referred to as “muniama de afuera” and the wenchman (*P. aquilonaris*) simply referred to as “muniama”. The former was never included in the reef fish FMU and thus needs to be added. Wenchman statistically cluster more closely with the members of SU1 than with members of SU2 based upon habitat occupation by depth. For that reason, wenchman could be moved from SU2 to SU1 as proposed by **Preferred Alternative 2** (Table 4.1.1). Also, whereas the cardinal snapper is the only one of these two species that appears in the commercial landings records for Puerto Rico, it is just the opposite for Puerto Rico recreational landings. There, only the wenchman appears and no cardinal snapper landings have been recorded in the 2000-2007 Puerto Rico MRFSS records. Although it may not be entirely clear which species is being harvested by the recreational and commercial fisheries, or if both are being harvested in a manner consistent with the landings information, these species could be included as members of the managed snapper complex and they could be grouped with those species with which they exhibit the closest ecological alliance. Testimony at the scoping meetings and other Council meetings has been consistent in the proposed changes in **Preferred Alternative 2** to the snapper units. The Council selected **Alternative 2** as the preferred alternative since this alternative best represents the ecologically and managerially most defensible changes to the units. This change also would aid on-going efforts to collect species specific data.

4.1.3 Summary Comparison of Alternatives to Amend the Stock Complexes in the Reef Fish Fishery Management Unit (FMU)

For grouper, **Alternative 1** does not account for the contribution of black grouper to harvest, particularly recreational harvest, in Puerto Rico. For snapper, **Alternative 1** does not account for the substantial contribution of cardinal snapper to commercial harvest. It appears valid to include wenchman in the snapper complex based on recorded landings from the Puerto Rico recreational sector. In the case of each of the grouper (Action 1(a)) and snapper (Action 1(b)) complexes, **Preferred Alternative 2** would account for species for which recreational and/or commercial landings have been recorded and provides the basis for managing these harvested species in an ecologically appropriate manner.

Rearranging the grouper complex has the added advantage of removing yellowedge and misty grouper from membership in Grouper Unit 4, where these two deep-water grouper species were matched with grouper species more characteristic of shallow-water habitats.

Table 4.1.1. Current and proposed units for various species of Caribbean reef fish.

UNIT	CURRENT	PROPOSED
Grouper Unit 3	Red hind Coney Rock hind Graysby Creole-fish	Red hind Coney Rock hind Graysby
Grouper Unit 4	Yellowfin Red Tiger Yellowedge Misty	Yellowfin Red Tiger Black
Grouper Unit 5		Yellowedge Misty
Snapper Unit 1	Silk Black Blackfin Vermilion	Silk Black Blackfin Vermilion Wenchman (*Pristipomoides aquilonaris*)
Snapper Unit 2	Queen Wenchman (*Pristipomoides aquilonaris*)	Queen Cardinal (*Pristipomoides macrophthalmus*)

For both of Actions 1(a) and 1(b), no action **Alternative 1** would have no added economic or social impacts. **Preferred Alternative 2** is an administrative action and would not directly affect the economic and social environment. Its indirect economic and social effects are dependent upon subsequent regulatory actions. Testimony at the scoping meetings and other CFMC meetings has been consistent in the proposed separation of the grouper into two units (Action 1(a) **Preferred Alternative 2**) and the changes to the snapper units (Action 1(b) **Preferred Alternative 2**). The Council selected **Alternative 2** as the preferred alternative for both Actions 1(a) and 1(b) because these alternatives best represent the ecological relationships of the subject species and provide for the most efficient management of the various units. These alternatives also aid in the on-going efforts to collect species specific data.

4.2 ACTION 2: Management Reference Points

The MSA requires that FMPs specify a number of reference points for managed fish stocks, including:

- Maximum Sustainable Yield (MSY) – The greatest amount or yield that can be sustainably harvested under prevailing environmental conditions.
- Overfishing Threshold – The maximum rate of fishing a stock can withstand (MFMT) or maximum yield a stock can produce (OFL), annually, while still providing MSY on a continuing basis.
- Overfished Threshold (MSST) – The biomass level below which a stock would not be capable of producing MSY.
- Annual Catch Limit (ACL) – The annual level to which catch is limited in order to prevent overfishing from occurring.
- Optimum Yield (OY) – The amount or yield that provides the greatest overall benefit to the Nation, taking into account food production, recreational opportunities and the protection of marine ecosystems.

Together, these parameters are intended to provide the means to measure the status and performance of fisheries relative to established goals. Available data in the U.S. Caribbean are not sufficient to support direct estimation of MSY and other key parameters. In such cases, the National Standard 1 (NS1) guidelines direct regional fishery management councils to adopt other measures of productive capacity, including long-term average catch, which can serve as reasonable proxies.

This section describes current reference points or proxies for species or units included in each of the snapper, grouper, parrotfish and queen conch FMPs, as well as alternative MSY proxies, overfishing thresholds, and ACL and OY definitions, considered by the Council to better comply with new mandates added to the MSA through the 2007 MSRA. None of the parameter estimates considered here represents empirical estimates derived from a comprehensive stock assessment; rather, all are calculated based on landings data averaged over alternative time series. The overfished threshold (MSST) of these species or units is currently defined based on the default proxy recommended by Restrepo et al. (1998) and is not being revisited here. That default proxy effectively defines a more conservative threshold for less productive species, such as snapper, grouper, and conch, which are not capable of recovering to B_{MSY} as quickly as other, more productive species.

All the reference points considered here are closely interrelated, and the MSA places several key constraints on what can be considered a reasonable suite of alternatives. OY must be less than or equal to MSY. ACL must be less than or equal to the acceptable biological catch (ABC) level recommended by a Council's Scientific and Statistical Committee (SSC) or other established peer-review process. And the ABC recommendation must be less than or equal to the overfishing threshold.

4.2.1 Action 2(a) Snapper, Grouper and Parrotfish

Action 2(a) proposes to redefine management reference points or proxies for species or units within the snapper, grouper, and parrotfish. The composition and classification of these species and units in NMFS' report to Congress on the status of U.S. marine fisheries is described in Table 2.2.1. Snapper Unit 1, Grouper Units 1 and 4, and the Parrotfish Unit are classified as undergoing overfishing; however, the status of these units has not been assessed since the Council and NMFS implemented measures to address overfishing through the Caribbean SFA Amendment (CFMC 2005). Grouper Units 1, 2 and 4 are classified as overfished and are entering the sixth year of rebuilding plans designed to rebuild those species and units by 2029, 2034 and 2014, respectively.

Alternative 1. No action. Retain current management reference points or proxies for species and units within the snapper, grouper and/or parrotfish.

Alternative 2. **(PREFERRED)** Redefine management reference points or proxies for the snapper, grouper and/or parrotfish based on the longest time series of pre-Caribbean SFA Amendment landings data that is considered to be consistently reliable across all islands.

Alternative 3. Redefine management reference points or proxies for snapper, grouper and/or parrotfish based on the longest time series of landings data that is considered to be consistently reliable across all islands.

Alternative 4. Redefine management reference points or proxies for the snapper, grouper and/or parrotfish based on the most recent five years of available landings data.

Discussion: **Alternative 1** would retain the present MSY proxy, OY, and overfishing threshold definitions specified in the Caribbean SFA Amendment for species and units within the snapper, grouper, and/or parrotfish. These definitions are detailed in Table 4.2.1.

Table 4.2.1. Current MSY proxy, OY and overfishing threshold definitions for species/species units within the snapper, grouper complexes and parrotfish unit.

REFERENCE POINT	Caribbean SFA Amendment Definition
Maximum Sustainable Yield	MSY proxy = C / [(F_{CURR}/F_{MSY}) x (B_{CURR}/B_{MSY})]; where C is calculated based on commercial landings for the years 1997-2001 for Puerto Rico and 1994-2002 for the USVI, and on recreational landings for the years 2000-2001.
Overfishing Threshold	MFMT = F_{MSY}
Optimum Yield	OY = average yield associated with fishing on a continuing basis at F_{OY}; where $F_{OY} = 0.75F_{MSY}$

The current MSY proxy is based on average catch (C) and on estimates of where stock biomass and fishing mortality rates are in relation to MSY levels during the period over which catches are averaged. The overfishing threshold (MFMT) is defined as a rate of fishing which exceeds that which would produce MSY. And OY is defined as the amount of fish produced by fishing at a rate equal to 75 percent of that which would produce MSY. The numerical values associated with these parameters are provided in Table 4.2.2 under the columns titled, “Alternative 1.”

The Caribbean SFA Amendment in which these reference points were established pre-dated the MSRA provisions requiring FMPs to specify ACLs; consequently, the Caribbean SFA Amendment did not explicitly specify this parameter for managed species and units. However, the ABC estimates derived from the Council’s MSY control rule could be considered to represent the ACLs of snapper, grouper, and parrotfish species if no additional action were taken to revise management reference points in this amendment.

The average landings estimate used to calculate the Caribbean-wide MSY proxy for each species or unit was derived from commercial landings data recorded during 1997-2001 for Puerto Rico and during 1994-2002 for the USVI, and recreational landings data recorded during 2000-2001. These time series were considered to represent the longest time periods of consistently reliable data at the time the Caribbean SFA Amendment was approved. Commercial catch data were derived from trip ticket reports collected by the state governments. Recreational data for Puerto Rico were derived from MRFSS. Recreational data for the USVI were derived by assuming the same commercial-recreational relationship and species composition reported by MRFSS for Puerto Rico. Those data indicated recreational catches averaged about 44 percent of commercial landings levels during 2000-2001.

Table 4.2.2. Extant and alternative U.S. Caribbean reference points or proxies calculated based on the alternative time series described in Section 4.2.1. Also included are the average landings (in pounds) for the two years (2006-2007) following enactment of the Caribbean SFA Amendment.

	Maximum Sustainable Yield (MSY) Proxy				**Overfishing Threshold**			
Unit	**Alternative 1**	**Alternative 2 (PREFERRED)**	**Alternative 3**	**Alternative 4**	**Alternative 1 (MFMT)**	**Alternative 2 (OFL) (PREFERRED)**	**Alternative 3 (OFL)**	**Alternative 4 (OFL)**
Queen Conch	452,000	512,718	488,073	525,152	Undefined	512,718	488,073	525,152
Snapper	1,551,000	1,915,759	1,784,439	1,660,868	Undefined	1,915,759	1,784,439	1,660,868
Unit 1	493,000							
Unit 2	151,000							
Unit 3	542,000							
Unit 4	365,000							
Grouper	257,000-289,000	396,483	354,853	337,178	Undefined	396,483	354,853	337,178
Unit 1	2,000-25,000							
Unit 2	2,000-11,000							
Unit 3	158,000							
Unit 4	95,000							
Parrotfish	304,000	507,059	496,656	512,201	Undefined	507,059	496,656	512,201

Table 4.2.2 (continued). Extant and alternative U.S. Caribbean reference points or proxies calculated based on the alternative time series described in Section 4.2.1. Also included are the average landings for the two years (2006-2007) following enactment of the Caribbean SFA Amendment. Note that, for this table only, the queen conch landings for each Alternative represent St. Croix harvest only.

Optimum Yield (OY)/Annual Catch Limit (ACL)										
Unit	**Alt. 1 (OY/ABC)**	**Alt. 2 (c)**	**Alt. 2(d)**	**Alt. 2(e)**	**Alt. 2(f)**	**Alt. 2(g)**	**Alt. 2(h)**	**Alt. 3(c)**	**Alt. 3(d)**	**Alt. 3(e)**
Queen Conch	424,000/ -	107,720	91,562	80,790	53,860	50,000	0	116,899	99,364	87,674
Snapper	1,455,000/1,428,000	1,915,759	1,628,395	1,436,819	957,880	-----	N/A	1,784,439	1,516,773	1,338,329
Unit 1	463,000/370,000									
Unit 2	142,000/151,000									
Unit 3	508,000/542,000									
Unit 4	342,000/365,000									
Grouper	237,000/229,000	396,483	337,011	297,362	198,242	-----	N/A	354,853	301,625	266,140
Unit 1	1,880-23,440/ -						0			
Unit 2	1,880-10,310/ -						0			
Unit 3	148,000/158,000									
Unit 4	89,000/71,000									
Parrotfish	285,000/228,000	507,059	431,000	380,294	253,530	430,000	N/A	496,656	422,158	372,492
Unit	**Alt. 3(f)**	**Alt. 3(g)**	**Alt. 3(h)**	**Alt. 4(c)**	**Alt. 4(d)**	**Alt. 4(e)**	**Alt. 4(f)**	**Alt. 4(g)**	**Alt. 4(h)**	**06-07 Avg.**
Queen Conch	58,450	50,000	0	138,587	117,799	103,940	69,294	50,000	0	149,026
Snapper	892,220	-----	N/A	1,660,868	1,411,738	1,245,651	830,434	-----	N/A	1,321,892
Unit 1										
Unit 2										
Unit 3										
Unit 4										
Grouper	177,427	-----	N/A	337,178	286,601	252,884	168,589	-----	N/A	214,118
Unit 1			0						0	
Unit 2			0						0	
Unit 3										
Unit 4										
Parrotfish	248,328	430,000	N/A	512,201	435,371	384,151	256,101	430,000	N/A	464,819

Because data are insufficient to estimate biomass and fishing mortality rates in the U.S. Caribbean, the remaining information needed to calculate MSY proxies was derived from the informed judgment of the SFA Working Group regarding whether each species or unit was at risk of overfishing and/or overfished during the time period when catches were averaged.[1] This approach followed guidance provided by Restrepo et al. (1998), which notes that "in cases of severe data limitations, qualitative approaches [to determining stock status and fishery status] may be necessary, including [the use of] expert opinion and consensus-building methods." The determinations of the SFA Working Group were based on available scientific and anecdotal information (including anecdotal observations of fishermen as reported by fishery managers), life history information, and the status of individual species as evaluated in other regions. ABC estimates were developed using the natural mortality rate of each species or unit as a proxy for F_{MSY}. The actual yield associated with the current OY definition was estimated to equal 93.75 percent of MSY.

Preferred Alternative 2 would define aggregate management reference points or proxies for snapper, grouper and/or parrotfish based on what the Council considers to be the longest time series of landings data prior to the implementation of the Caribbean SFA Amendment that is consistently reliable across all islands. Specific definitions are detailed in Table 4.2.3. The Council chose to omit several years of landings data collected in Puerto Rico prior to 1999 in favor of selecting a more consistent baseline across all islands, noting the inclusion of those earlier landings data would not appreciably alter the various reference point estimates.

The MSY proxy specified by **Preferred Alternative 2** would equate to average catch, calculated using commercial landings data from 1999-2005 for Puerto Rico and St. Croix and from 2000-2005 for St. Thomas/St. John, and recreational catch data from 2000-2005 for Puerto Rico only. Commercial data would be derived from trip ticket reports collected by the state governments. Recreational data would be derived from the MRFSS.

The overfishing threshold (OFL) would be defined as the amount of landings corresponding to the MSY proxy, and overfishing would be determined to occur if annual catches exceeded the overfishing threshold (**Alternative 2(a)**) or if annual catches exceeded the overfishing threshold, unless scientists (in consultation with managers) attributed the overage to improved data collection and monitoring (**Preferred Alternative 2(b)**).

The OY and ACL would be set as equal values, requiring the Council to consider the socioeconomic and ecological components of OY when determining how far ACLs should be reduced below the overfishing threshold to account for scientific uncertainty in estimating the OFL and management uncertainty in effectively constraining harvest over

[1] The SFA Working Group was a Council-advisory group, which included staff from the Council, NMFS' Southeast Regional Office and SEFSC, USVI and Puerto Rico fishery management agencies, and several environmental non-governmental organizations. The discussion of biomass and fishing mortality rate estimates took place at the October 23-24, 2002 meeting of the SFA Working Group in Carolina, Puerto Rico. Notice of the meeting location, date, and agenda was provided in the *Federal Register* (67 FR 63622).

time. Most of the alternative ACL definitions considered here are more restrictive than the OY definitions contained in the Caribbean SFA Amendment.

Table 4.2.3. Management reference points or proxies proposed for snapper, grouper and/or parrotfish under Alternative 2.

REFERENCE POINT	ALTERNATIVE 2 (PREFERRED)
Maximum Sustainable Yield	MSY proxy = average annual commercial landings from 1999-2005 for Puerto Rico and STX and from 2000-2005 for STT/STJ + average annual recreational catch from MRFSS during 2000-2005 for Puerto Rico.
Overfishing Threshold	
Alternative 2(a)	OFL = MSY proxy; overfishing occurs when annual catches exceed the OFL.
Alternative 2(b) (PREFERRED)	OFL = MSY proxy; overfishing occurs when annual catches exceed the OFL, unless NMFS' Southeast Fisheries Science Center (in consultation with the Caribbean Fishery Management Council and its Scientific and Statistical Committee) determines the overage occurred because data collection/monitoring improved, rather than because catches actually increased.
Optimum Yield/Annual Catch Limit	
Alternative 2(c)	OY = ACL = OFL
Alternative 2(d) (PREFERRED)	OY = ACL = [OFL x (0.85)] for snapper and grouper
Alternative 2(e)	OY = ACL = [OFL x (0.75)] for snapper and grouper
Alternative 2(f)	OY = ACL = [OFL x (0.50)] for snapper and grouper
Alternative 2(g)	OY = ACL = ABC specified by Scientific and Statistical Committee for parrotfish.
Alternative 2(g)i (PREFERRED)	OY = ACL = [ABC specified by Scientific and Statistical Committee for parrotfish x (0.85)]
Alternative 2(g)ii	OY = ACL = [ABC specified by Scientific and Statistical Committee for parrotfish x (0.75)]
Alternative 2(g)iii	OY = ACL = [ABC specified by Scientific and Statistical Committee for parrotfish x (0.50)]
Alternative 2(h) (PREFERRED)	OY = ACL = 0 (Grouper Units 1 and 2, midnight parrotfish, blue parrotfish, rainbow parrotfish)

ACL (= OY) **Alternatives 2(c) through 2(f)** would set those parameters equal to some proportion (100-50 percent) of the OFL to take into account uncertainty, ecological factors, and other concerns. **Alternative 2(g)** would set the ACL (= OY) equal to the ABC recommended by the Council's Scientific and Statistical Committee; however, of the groups considered here, the SSC recommended an ABC only for parrotfish. Those SSC recommendations were 300,000 pounds of whole fish for St. Croix, 80,000 pounds for Puerto Rico, and 50,000 pounds for St. Thomas and St. John. **Preferred Alternative 2(g)i** and **Alternatives 2(g)ii** and **2(g)iii** adjust the SSC recommendation to 85 percent, 75 percent, or 50 percent, respectively, of the SSC's ABC recommendation to account for uncertainty, ecological factors, and other concerns. **Alternative 2(h)** would set the ACL (= OY) equal to zero for Grouper Unit 1 (Nassau grouper) and/or Grouper Unit 2 (goliath grouper), indicating that take of these species should be prohibited to prevent overfishing. The Council chose to include three of the parrotfish (blue, midnight and rainbow) in **Preferred Alternative 2(h)** thereby creating the option to set OY and ACL equal to zero for these species as well.

The specific numerical values associated with the various **Alternative 2** definitions are described in Table 4.2.2 under the columns titled, "Alternative 2."

In Action 2(a), **Alternative 2** was chosen as the preferred alternative because it includes the longest pre-Caribbean SFA Amendment data series for the commercial and recreational sectors. In 2005, implementation of the Caribbean SFA Amendment to the reef fish and conch FMPs included a suite of management measures designed to curb or end overfishing, including for example seasonal and area closures. As a result, the management regime changed drastically in 2005. The Council therefore decided to use the pre-Caribbean SFA Amendment time series for redefining management reference points because that time series does not include post-2005 years that are influenced by those potentially substantial changes in management and resultant reduction in catch. Moreover, Caribbean coral reefs and their associated community experienced a major bleaching event and an above-normal number of hurricanes and storms in 2005 (Wilkinson and Souter 2008), further complicating the interpretation of post-2005 harvest data.

The CFMC chose **Alternative 2(b)** as a preferred alternative in the public hearing draft document to ensure that AMs are not triggered indiscriminately without considering the effect of improved reporting and data collection efforts. The Council recognized the efforts that the local governments, fishers, and the SEFSC are undertaking to provide the necessary information for stock assessments in the region. In making the determination, the agency will assess the quality of the incoming data on an improved and timely schedule, and monitor along with the local governments the quality of the data. Additional information could be collected to determine if the increase in catches is due to more accurate reporting, including increases in the number of complete catches being sampled.

The Council preferred **Alternatives 2(d)**, a scalar of 0.85, for the snapper complex and the grouper complex. For the parrotfish unit, the Council reduced the OFL by 15 percent (**Preferred Alternative 2(g)i**) consistent with the SSC recommendations. This precautionary approach was taken because of both the combined management and scientific uncertainty inherent in the data, and the many changes that have taken place in the U.S. Caribbean since 2005. **Alternative 2(h)** was chosen as a preferred alternative for GU1 (Nassau grouper), GU2 (goliath grouper), and for blue, midnight, and rainbow parrotfish. For Nassau and goliath grouper, fishing and possession of these species already is prohibited in all commonwealth and territorial waters and in the EEZ.

The present amendment includes, as **Preferred Alternative 2** of Action 4(a), a prohibition on fishing for and possession of midnight, blue, and rainbow parrotfish in the EEZ as recommended by the SSC. This alternative, for the three species of parrotfish, responds to the important role these larger parrotfish have on the ecological health of the coral reefs and the testimony at Council public meetings (including scoping meetings on ACLs) on the decrease in numbers of these species on U.S. Caribbean coral reefs.

Alternative 3 would define aggregate management reference points or proxies for snapper, grouper and/or parrotfish based on what the Council considers to be the longest time series of landings data that is consistently reliable across all islands. Specific definitions are detailed in Table 4.2.4.

The Council chose to omit several years of landings data collected in Puerto Rico prior to 1999 in favor of selecting a more consistent baseline across all islands, noting the inclusion of those earlier landings data would not appreciably alter the various reference point estimates.

The MSY proxy defined by **Alternative 3** would equate to average catch, calculated using commercial landings data from 1999-2007 for Puerto Rico and St. Croix and from 2000-2007 for St. Thomas/St. John, and recreational landings data from 2000-2007 for Puerto Rico only. Commercial data would be derived from trip ticket reports collected by the state governments. Recreational data would be derived from the MRFSS. Alternative definitions for the overfishing threshold, OY, and ACL parameters are the same as those considered under **Alternative 2**. The specific numerical values associated with the various **Alternative 3** definitions are described in Table 4.2.2 under the columns titled, "Alternative 3."

Table 4.2.4. Management reference points or proxies proposed for snapper, grouper and/or parrotfish under Alternative 3.

REFERENCE POINT	ALTERNATIVE 3
Maximum Sustainable Yield	MSY proxy = average annual commercial landings from 1999-2007 for Puerto Rico and STX and from 2000-2007 for STT/STJ + average annual recreational catch from MRFSS during 2000-2007 for Puerto Rico.
Overfishing Threshold	
Alternative 3(a)	OFL = MSY proxy; overfishing occurs when annual catches exceed the OFL.
Alternative 3(b)	OFL = MSY proxy; overfishing occurs when annual catches exceed the OFL, unless NMFS' Southeast Fisheries Science Center (in consultation with the Caribbean Fishery Management Council and its Scientific and Statistical Committee) determines the overage occurred because data collection/monitoring improved, rather than because catches actually increased.
Optimum Yield/Annual Catch Limit	
Alternative 3(c)	OY = ACL = OFL
Alternative 3(d)	OY = ACL = [OFL x (0.85)] for snapper and grouper
Alternative 3(e)	OY = ACL = [OFL x (0.75)] for snapper and grouper
Alternative 3(f)	OY = ACL = [OFL x (0.50)] for snapper and grouper
Alternative 3(g)	OY = ACL = ABC specified by Scientific and Statistical Committee for parrotfish
Alternative 3(g)i	OY = ACL = [ABC specified by Scientific and Statistical Committee for parrotfish x (0.85)]
Alternative 3(g)ii	OY = ACL = [ABC specified by Scientific and Statistical Committee for parrotfish x (0.75)]
Alternative 3(g)iii	OY = ACL = [ABC specified by Scientific and Statistical Committee for parrotfish x (0.50)]
Alternative 3(h)	OY = ACL = 0 (Grouper Units 1 and 2 and/or midnight, rainbow, blue parrotfish)

Alternative 4 would define aggregate management reference points or proxies for the snapper, grouper and/or parrotfish based on the most recent five years of available landings data as requested by the Council. Specific definitions are detailed in Table 4.2.5.

The MSY proxy defined by **Alternative 4** would equate to average catch, calculated using commercial landings data from 2003-2007 for Puerto Rico and the USVI, and recreational landings data from 2003-2007 for Puerto Rico only. Commercial data would be derived from trip ticket reports collected by the state governments. Recreational data would be derived from the MRIP. Alternative definitions for the overfishing threshold, OY and ACL parameter are the same as those considered under **Alternatives 2** and **3**. The specific numerical values associated with the various **Alternative 4** definitions are described in Table 4.2.2 under the columns titled, "Alternative 4."

Table 4.2.5. Management reference points or proxies proposed for snapper, grouper and/or parrotfish under Alternative 4.

REFERENCE POINT	ALTERNATIVE 4
Maximum Sustainable Yield	MSY proxy = average annual commercial landings from 2003-2007 for Puerto Rico and the USVI + average annual recreational catch from MRFSS during 2003-2007 for Puerto Rico.
Overfishing Threshold	
Alternative 4(a)	OFL = MSY proxy; overfishing occurs when annual catches exceed the OFL.
Alternative 4(b)	OFL = MSY proxy; overfishing occurs when annual catches exceed the OFL, unless NMFS' Southeast Fisheries Science Center (in consultation with the Caribbean Fishery Management Council and its Scientific and Statistical Committee) determines the overage occurred because data collection/monitoring improved, rather than because catches actually increased.
Optimum Yield/Annual Catch Limit	
Alternative 4(c)	OY = ACL = OFL
Alternative 4(d)	OY = ACL = [OFL x (0.85)] for snapper and grouper
Alternative 4(e)	OY = ACL = [OFL x (0.75)] for snapper and grouper
Alternative 4(f)	OY = ACL = [OFL x (0.50)] for snapper and grouper
Alternative 4(g)	OY = ACL = ABC specified by Scientific and Statistical Committee for parrotfish
Alternative 4(g)i	OY = ACL = [ABC specified by Scientific and Statistical Committee for parrotfish x (0.85)]
Alternative 4(g)ii	OY = ACL = [ABC specified by Scientific and Statistical Committee for parrotfish x (0.75)]
Alternative 4(g)iii	OY = ACL = [ABC specified by Scientific and Statistical Committee for parrotfish x (0.50)]
Alternative 4(h)	OY = ACL = 0 (Grouper Units 1 and 2 and/or midnight, rainbow, blue parrotfish)

4.2.2 Action 2(b) Queen Conch

Action 2(b) proposes to redefine management reference points or proxies for queen conch. Queen conch is currently classified as overfished and subject to overfishing in NMFS' report to Congress on the status of U.S. marine fisheries. However, the status of this species has not been assessed since the Council and NMFS implemented measures to address overfishing through the Caribbean SFA Amendment (CFMC 2005). Queen conch is currently entering the sixth year of a rebuilding plan designed to rebuild the stock by 2019.

Alternative 1. No action. Retain current management reference points or proxies for queen conch.

Alternative 2. **(PREFERRED)** Redefine management reference points or proxies for queen conch based on the longest time series of pre-Caribbean SFA Amendment landings data that is considered to be consistently reliable across all islands.

Alternative 3. Redefine management reference points or proxies for queen conch based on the longest time series of landings data that is considered to be consistently reliable across all islands.

Alternative 4. Redefine management reference points or proxies for queen conch based on the most recent five years of available landings data.

Discussion: **Alternative 1** would retain the present MSY proxy, OY, and overfishing threshold definitions specified in the Caribbean SFA Amendment for queen conch. These definitions are detailed in Table 4.2.6.

Table 4.2.6. Current MSY proxy, OY, and overfishing threshold definitions for queen conch.

REFERENCE POINT	STATUS QUO DEFINITION
Maximum Sustainable Yield	MSY proxy = C / [(F_{CURR}/F_{MSY}) x (B_{CURR}/B_{MSY})]; where C is calculated based on commercial landings for the years 1997-2001 for Puerto Rico and 1994-2002 for the USVI, and on recreational landings for the years 2000-2001.
Overfishing Threshold	MFMT = F_{MSY}
Optimum Yield	OY = average yield associated with fishing on a continuing basis at F_{OY}; where F_{OY} = 0.75 F_{MSY}

The current MSY proxy is based on C and on estimates of where stock biomass and fishing mortality rates are in relation to MSY levels during the period over which landings are averaged. The overfishing threshold (MFMT) is defined as a rate of fishing which exceeds that which would produce MSY, and OY is defined as the amount of queen conch produced by fishing at a rate equal to 75 percent of that which would produce MSY. The numerical values associated with these parameters are provided in Table 4.2.2 under the columns titled, "Alternative 1."

The Caribbean SFA Amendment in which these reference points were established pre-dated the MSRA provisions requiring FMPs to specify ACLs; consequently, the Caribbean SFA Amendment did not explicitly specify this parameter for managed species and units. However, the ABC estimates derived from the Council's MSY control rule could be considered to represent the ACL of queen conch if no additional action were taken to revise management reference points in this amendment.

The average landings estimate used to calculate the MSY proxy was derived from commercial landings data recorded during 1997-2001 for Puerto Rico and during 1994-2002 for the USVI, and recreational landings data recorded during 2000-2001. These time series were considered to represent the longest time periods of relatively reliable data at the time the Caribbean SFA Amendment was approved. Commercial landings data were derived from trip ticket reports collected by the state governments. Recreational catch data for Puerto Rico were derived from a two-month MRFSS survey specific for queen conch. Recreational catches for the USVI were assumed to equal 50 percent of USVI commercial landings based on information from Valle-Esquivel (pers. comm.).

Because data are insufficient to estimate biomass and fishing mortality rates in the U.S. Caribbean, the remaining information needed to calculate the MSY proxy was derived from the informed judgment of the SFA Working Group regarding whether queen conch was at risk of overfishing and/or overfished during the time period when landings were averaged. This is the same approach described in Section 4.2.1 for snapper, grouper, and parrotfish. ABC estimates were developed using the natural mortality rate of queen conch as a proxy for F_{MSY}. The actual yield associated with the current OY definition was estimated to equal 93.75 percent of MSY.

Preferred Alternative 2 would redefine management reference points or proxies for queen conch based on what the Council considers to be the longest time series of landings data prior to the implementation of the Caribbean SFA Amendment that is considered reliable across all islands. Specific definitions are detailed in Table 4.2.7. The Council chose to omit several years of landings data collected in Puerto Rico prior to 1999 in favor of selecting a more consistent baseline across all islands, noting the inclusion of those earlier landings data would not appreciably alter the various reference point estimates.

The MSY proxy specified by **Preferred Alternative 2** would equate to average catch, calculated using commercial landings data from 1999-2005 for Puerto Rico and St. Croix and from 2000-2005 for St. Thomas/St. John. These data would be derived from trip ticket reports collected by the state governments.

The OFL would be defined as the amount of landings corresponding to the MSY proxy, and overfishing would be determined to occur if annual catches exceeded the overfishing threshold (**Alternative 2(a)**) or if annual catches exceeded the overfishing threshold and scientists (in consultation with managers) attributed the overage to increased catches versus improved data collection and monitoring (**Preferred Alternative 2(b)**).

The OY and ACL would be set as equal values, requiring the Council to consider the socioeconomic and ecological components of OY when determining how far ACLs should be reduced below the overfishing threshold to account for scientific uncertainty in estimating the OFL and management uncertainty in effectively constraining harvest over time. Most of the alternative ACL definitions considered here are more restrictive than the OY definitions contained in the Caribbean SFA Amendment.

Table 4.2.7. Management reference points or proxies proposed for queen conch under Preferred Alternative 2.

REFERENCE POINT	ALTERNATIVE 2 (PREFERRED)
Maximum Sustainable Yield	MSY proxy = average annual commercial landings from 1999-2005 for Puerto Rico and STX and from 2000-2005 for STT/STJ.
Overfishing Threshold	
Alternative 2(a)	OFL = MSY proxy; overfishing occurs when annual catches exceed the OFL.
Alternative 2(b) (PREFERRED)	OFL = MSY proxy; overfishing occurs when annual catches exceed the OFL, unless NMFS' Southeast Fisheries Science Center (in consultation with the Caribbean Fishery Management Council and its Scientific and Statistical Committee) determines the overage occurred because data collection/monitoring improved, rather than because catches actually increased.
Optimum Yield/Annual Catch Limit	
Alternative 2(c)	OY = ACL = OFL
Alternative 2(d)	OY = ACL = [OFL x (0.85)]
Alternative 2(e)	OY = ACL = [OFL x (0.75)]
Alternative 2(f)	OY = ACL = [OFL x (0.50)]
Alternative 2(g) (PREFERRED)	OY = ACL = ABC specified by Scientific and Statistical Committee
Alternative 2(h)	OY = ACL = 0

ACL (= OY) **Alternatives 2(c)** through **2(f)** would set those parameters equal to some proportion (100-50 percent) of the average annual landings from 1999-2005 for St. Croix to take into account uncertainty, ecological factors, and other concerns. **Preferred Alternative 2(g)** would set those parameters equal to the 50,000 pound ABC recommended by the Council's SSC for queen conch. **Alternative 2(h)** would set these parameters equal to zero, indicating that queen conch take should be prohibited to prevent overfishing. Note that the EEZ is closed to queen conch harvest west of 64^{o} 34' W, with only the Lang Bank EEZ area east of St. Croix open to queen conch harvest in federal waters. The specific numerical values associated with the various **Alternative 2** definitions are described in Table 4.2.2 under the columns titled, "**Alternative 2**".

Alternative 3 would define aggregate management reference points or proxies for queen conch based on what the Council considers to be the longest time series of landings data that is consistently reliable across all islands. Specific definitions are detailed in Table 4.2.8.

The Council chose to omit several years of landings data collected in Puerto Rico prior to 1999 in favor of selecting a more consistent baseline across all islands, noting the inclusion of those earlier landings data would not appreciably alter the various reference point estimates.

Table 4.2.8. Management reference points or proxies proposed for queen conch under Alternative 3.

REFERENCE POINT	ALTERNATIVE 3
Maximum Sustainable Yield	MSY proxy = average annual commercial landings from 1999-2007 for Puerto Rico and STX and from 2000-2007 for STT/STJ.
Overfishing Threshold	
Alternative 3(a)	OFL = MSY proxy; overfishing occurs when annual catches exceed the OFL.
Alternative 3(b)	OFL = MSY proxy; overfishing occurs when annual catches exceed the OFL, unless NMFS' Southeast Fisheries Science Center (in consultation with the Caribbean Fishery Management Council and its Scientific and Statistical Committee) determines the overage occurred because data collection/monitoring improved, rather than because catches actually increased.
Optimum Yield/Annual Catch Limit	
Alternative 3(c)	OY = ACL = OFL
Alternative 3(d)	OY = ACL = [OFL x (0.85)]
Alternative 3(e)	OY = ACL = [OFL x (0.75)]
Alternative 3(f)	OY = ACL = [OFL x (0.50)]
Alternative 3(g)	OY = ACL = ABC specified by Scientific and Statistical Committee
Alternative 3(h)	OY = ACL = 0

The MSY proxy defined by **Alternative 3** would equate to average landings, calculated using commercial landings data only from 1999-2007 for Puerto Rico and St. Croix and from 2000-2007 for St. Thomas/St. John. These data would be derived from trip ticket reports collected by the state governments. Alternative definitions for the overfishing threshold, OY, and ACL parameters are the same as those considered under **Alternative 2**. The specific numerical values associated with the various **Alternative 3** definitions are described in Table 4.2.2 under the columns titled, "**Alternative 3**".

Alternative 4 would define management reference points or proxies for queen conch based on the most recent five years of available landings data, as requested by the Council. Specific definitions are detailed in Table 4.2.9.

Table 4.2.9. Management reference points or proxies proposed for queen conch under Alternative 4.

REFERENCE POINT	ALTERNATIVE 4
Maximum Sustainable Yield	MSY proxy = average annual commercial landings from 2003-2007 for Puerto Rico and the USVI.
Overfishing Threshold	
Alternative 4(a)	OFL = MSY proxy; overfishing occurs when annual catches exceed the OFL.
Alternative 4(b)	OFL = MSY; overfishing occurs when annual catches exceed the OFL, unless NMFS' Southeast Fisheries Science Center (in consultation with the Caribbean Fishery Management Council and its Scientific and Statistical Committee) determines the overage occurred because data collection/monitoring improved, rather than because catches actually increased.
Optimum Yield/Annual Catch Limit	
Alternative 4(c)	OY = ACL = OFL
Alternative 4(d)	OY = ACL = [OFL x (0.85)]
Alternative 4(e)	OY = ACL = [OFL x (0.75)]
Alternative 4(f)	OY = ACL = [OFL x (0.50)]
Alternative 4(g)	OY = ACL = ABC specified by Scientific and Statistical Committee
Alternative 4(h)	OY = ACL = 0

The MSY proxy specified by **Alternative 4** would equate to average landings, calculated using commercial landings data only from 2003-2007 for Puerto Rico and the USVI. These data would be derived from trip ticket reports collected by the state governments. Alternative definitions for the overfishing threshold, OY, and ACL parameters are the same as those considered under **Alternatives 2** and **3**. The specific numerical values associated with the various **Alternative 4** definitions are described in Table 4.2.2 under the columns titled, "**Alternative 4**".

4.2.3 Summary Comparison of Management Reference Point Alternatives

Specifying the MSY, OFL, OY, and ACL of snapper, grouper, parrotfish and queen conch would not have direct environmental impacts because these parameters (or proxies) simply provide fishery managers with targets and thresholds to use in evaluating fishery status and performance. However, this action would indirectly impact the environment by influencing the development of fishery management actions to prevent overfishing and optimize yield.

The primary differences between the no action and action alternatives considered here are: (1) the no action alternative requires estimates of catch, stock biomass, and fishing mortality rates, whereas action alternatives require only catch estimates; and (2) the no action alternative estimates reference points or proxies at a smaller scale/finer resolution for some groups (i.e., for species or units within the snapper and grouper complexes), whereas action alternatives generally estimate aggregate reference points or proxies only at the complex or unit level.

Theoretically, the biomass and fishing mortality rate-based reference points specified by the no action alternative would be more precise and more effective in preventing overfishing. However, because data are insufficient to estimate biomass and fishing mortality rates in the U.S. Caribbean, these reference points must be calculated based on informed judgment regarding stock status in relation to MSY. Based on extensive feedback from affected fishermen and others regarding the limitations of this approach, and concerns about SFA Working Group determinations of stock status, the action alternatives considered here are based on simpler catch-based proxies, which better reflect the data and are more transparent and operationally useful.

The present practice of defining management reference points at the finest resolution possible could also be considered the ideal approach to monitoring fishery performance. Aggregate reference points would make it more difficult for fishery scientists and managers to monitor the status of individual species or units. SU1 (silk, black, vermilion and blackfin snapper) and GU1 (Nassau grouper) and GU 4 (red, misty, tiger, yellowedge, and yellowfin grouper) are currently classified as subject to overfishing in NMFS' report to Congress on the status of U.S. Fisheries. Grouper Units 1, 2 (goliath grouper) and 4 are classified as overfished and are managed under rebuilding plans. While regulations have been implemented to end overfishing and rebuild these stocks, the response of individual species to these regulations would be less apparent if reference points were redefined at the aggregate level.

However, U.S. Caribbean fishermen continue to report large numbers of unclassified species (unclassified snapper, grouper and parrotfish averaged approximately 6 percent, 33 percent and 90 percent of commercial landings, respectively, during 2006-2007), making it difficult and impractical to monitor fishery performance at the species or unit level. The Council can choose to implement species-specific regulations, such as the current harvest prohibitions on Nassau and goliath grouper, regardless of whether reference points are defined at the individual or aggregate level. Consequently, the action alternatives considered here aim to redefine reference points for aggregate groups rather than for individual species or units within complexes (except snapper in Puerto Rico), an approach that is supported by the NS1 guidelines in situations where data do not support stock-specific monitoring, management, and assessment.

The primary difference between the action alternatives is the time series of landings data on which they are based. The NS1 guidelines caution it is generally best to average catches over as long a time series as possible when using average catch as an MSY proxy to capture the fishery's response to changing conditions. But equally important is the need to base the average on years for which a stable fishery and reliable catch data exist.

The reliability of catch data collected in the early years of the state trip ticket programs has been compromised by a series of periodic lapses in the programs over the years, as well as significant under- and/or mis-reporting and changes in the type of data collected (Valle-Esquivel 2002). Landings in the USVI were historically reported by gear group (e.g., pot fish, net fish), while those in Puerto Rico were reported by species or unit (e.g., Nassau grouper, grouper).

Maximum Sustainable Yield (MSY)

The MSY proxy defined by no action **Alternative 1** averages landings over the longest time period during which data were considered to be relatively stable at the time the Council approved the Caribbean SFA Amendment. Because the Council had fewer years of landings data to work with at that time, that proxy incorporated Puerto Rico and USVI landings data prior to 1999. The MSY proxies evaluated in **Alternatives 2-4** do not use pre-1999 data in average landings calculations because those data were collected by gear type rather than by family group. The Council instead prefers to use data from more recent years, when the data were collected by family group and therefore provide a relatively consistent baseline among all of the islands.

Additionally, in contrast to the no action **Alternative 1**, **Alternatives 2-4** do not attempt to incorporate information on recreational catches of snapper, grouper, and parrotfish in the USVI or on recreational catches of queen conch in Puerto Rico and the USVI because the MRFSS does not provide this information and no alternative data are available to reliably estimate these landings. As a result, the MSYs specified by these alternative proxies are expected to be underestimated to some degree; this is particularly true for the queen conch proxies, which are based solely on commercial landings data. According to MRFSS, recreational fisheries landed about 41 percent, 75 percent, and 12 percent of the total snapper, grouper and parrotfish landings in Puerto Rico, on average, during 2006-2007 (Table 4.3.2), the two years for which data are available following implementation of current management controls to end overfishing.

Preferred Alternative 2 would set the MSY proxy equal to average landings over what the Council considers to be the longest time period prior to the implementation of current management controls for which data are consistently reliable among all islands. **Alternative 3** would set the MSY proxy equal to average landings over what they consider to be the longest time period during which landings data are consistently reliable among all islands, including recent years in which harvest was further constrained by management controls. **Alternative 4** would set the MSY proxy equal to landings averaged over just the last five years for which data are available, two of which are characterized by the more restrictive management controls in place today.

The MSY values specified by **Alternatives 2-4** are greater than those specified by no action **Alternative 1** for snapper, grouper, and parrotfish in aggregate and for queen conch (Table 4.2.2). Of the action alternatives, **Preferred Alternative 2** would specify the highest MSY for the snapper and grouper complexes (1,915,759 pounds and 396,483 pounds, respectively), followed by **Alternative 3** (1,784,439 pounds and 354,853 pounds, respectively), then **Alternative 4** (1,660,868 pounds and 337,178 pounds, respectively). **Alternative 4** would specify the highest MSY for the parrotfish and queen conch (512,201 pounds and 525,152 pounds, respectively), followed by **Preferred Alternative 2** (507,059 pounds and 512,718 pounds, respectively), then **Alternative 3** (496,656 pounds and 488,073 pounds, respectively).

In general, underestimating MSY can result in foregone yield, whereas overestimating MSY can lead to overfishing. However, the MSY values specified by **Alternatives 2-4** for each group are remarkably similar, differing by only 15 percent at most (grouper complex). This indicates that landings were relatively stable over the years in which the Council considers data to be consistently reliable across islands and the choice of MSY proxy is not likely to have a substantial impact on current management controls or long-term yield.

Overfishing Threshold (MFMT/OFL)

The overfishing threshold defined by no action **Alternative 1** is a maximum fishing mortality threshold (MFMT) equal to the fishing mortality rate at MSY. Because this fishing mortality rate is unknown for U.S. Caribbean species, the Caribbean SFA Amendment adopted natural mortality rate as a proxy for this parameter. However, data are insufficient to evaluate the sustainability of current fishing mortality rates relative to this proxy and make a determination as to whether overfishing is or is not occurring. To remedy this, **Preferred Alternative 2** and **Alternatives 3** and **4** propose to specify a catch-based, rather than fishing mortality-based, overfishing threshold, called the overfishing limit (OFL). Annual catches would be evaluated relative to the OFL to determine whether overfishing is or is not occurring. This approach is consistent with the NS1 guidelines, which provide fishery managers the flexibility to determine if overfishing occurs based on either fishing mortality rates or actual annual catch.

Preferred Alternative 2 and **Alternatives 3** and **4** would essentially maintain the same relationship as the no action alternative between the overfishing threshold and MSY. MSY represents the maximum yield a species or unit can provide in the long term, while OFL estimates the amount of annual catch above which overfishing is occurring. In theory, the annual OFL would vary above and below the MSY level depending on fluctuations in stock size. Since both MSY and OFL are related to the highest fishing mortality rate that will not result in overfishing, the long-term average of OFLs would be expected to equate to MSY, provided that stock abundance is high enough to support MSY. But, in practice, the annual OFLs proposed in **Preferred Alternative 2** and **Alternatives 3** and **4** would remain constant at the MSY level until stock biomass can be estimated.

For each of **Alternatives 2**, **3**, and **4**, **Alternative (a)** would result in an automatic overfishing determination if annual catch exceeded the OFL in any given year, whereas **Alternative (b)** would provide scientists (in consultation with managers) the flexibility to evaluate the cause of the reported catch increase prior to making a determination that a species or unit is undergoing overfishing. Specifically, they would consider whether the reported increase represents an actual increase in landings or just improved data collection and monitoring. The intent of this alternative is to eliminate any incentive for fishermen to under-report or misreport catches to avoid exceeding ACLs and triggering associated AMs.

Both the ranking and range of the OFL values specified by the action alternatives is equal to that described for MSY values as these alternatives would set OFL equal to MSY. Landings in 2006-2007 (the most recent years for which data are available) were below the OFLs proposed by **Preferred Alternative 2** and **Alternatives 3** and **4** and below the status quo MSYs for all groups with the exception of parrotfish (Table 4.2.2). This could indicate that actions taken through the Caribbean SFA Amendment to end overfishing, and compatible regulations implemented in territorial waters, are working in most cases. Alternatively, the recent decline in landings may be attributed to a decline in stock abundance. The cause of the higher than expected parrotfish landings has not been determined but may be attributed to the delayed implementation of the gillnet prohibition in USVI waters, increased reporting, or other factors.

Underestimating OFL can result in stricter management controls than needed to prevent overfishing. This would be expected to benefit the physical, biological, and ecological environments but to reduce socioeconomic benefits especially in the short run. Conversely, overestimating OFL can lead to habitual overfishing, triggering resource-intensive administrative requirements and, ultimately, threatening the long-term sustainability of fish stocks and reducing the long term net socioeconomic benefits to fishers, their families, and fishing communities.

Optimum Yield (OY) and Annual Catch Limits (ACLs)

The current OY defined by no action **Alternative 1** is derived from the technical guidance provided by Restrepo et al. (1998), which recommends the target fishing mortality rate be set equal to the average yield available on a continuing basis from fishing at 75 percent of the fishing mortality rate that would produce MSY. The authors of that guidance indicate that fishing at this level adds precaution and maintains stocks at higher biomass levels, while sacrificing only a small amount (~ 6.25 percent) of landings. Because data are insufficient to estimate the fishing mortality rate that would produce MSY, the Caribbean SFA Amendment estimated the OY of each species/unit to equal 93.75 percent of MSY (Table 4.2.2).

While the no action **Alternative 1** does not explicitly define ACLs for snapper, grouper, parrotfish, or queen conch, the ABC estimates specified by the Council's MSY control rule could be considered to represent the ACLs of these species or units if no additional action were taken through this amendment to revise management reference points (Table 4.2.2). However, these ABC values are very uncertain as they were calculated using natural mortality rate as a proxy for the fishing mortality rate that would produce MSY and informed judgment regarding stock biomass. And, because these values were set well below MSY values to address SFA Working Group determinations regarding overfishing, they would prevent the fishery from achieving OY; even though recent landings data indicate that, in most cases, management controls appear to have effectively reduced landings below the overfishing threshold (Table 4.2.2).

To remedy this, **Preferred Alternative 2** and **Alternatives 3** and **4** would set the OY and ACL as equal values, requiring the Council to consider the socioeconomic and ecological components of OY when determining how far ACLs should be reduced below the overfishing threshold to account for scientific uncertainty in estimating the OFL and management uncertainty in effectively constraining harvest over time. This approach leads to OY estimates for snapper and queen conch that are below those estimated in the Caribbean SFA Amendment, regardless of the OY (= ACL) alternative selected. In contrast, most of the OY alternatives would result in larger OY estimates for grouper and parrotfish relative to the no action alternative.

Preferred Alternative 2 and **Alternatives 3** and **4** propose essentially the same suite of OY and ACL alternatives for snapper, grouper, parrotfish, and queen conch; however, the queen conch alternatives differ in that they would set the OY equal to average landings in St. Croix only, rather than to average landings Caribbean-wide. **Alternative (c)** is the most risk prone, proposing to set the OY equal to the OFL. **Alternatives (d)** through **(f)** are progressively more precautionary, incorporating increasingly larger buffers between the OY and OFL, which are recommended in fisheries characterized by scientific and management uncertainty. **Preferred Alternative (g)** would set OY equal to the ABC recommended by the Council's SSC for parrotfish and/or queen conch, and **Preferred Alternative (h)** would set ACL equal to zero for those species that are currently managed under a total harvest prohibition. (i.e., Nassau grouper and goliath grouper) or near total harvest prohibition (i.e., queen conch) and/or for those species that perform an essential ecological function (e.g., large parrotfish).

The NS1 guidelines suggest that ACL and OY should generally be reduced from the overfishing threshold and MSY, respectively, to effectively prevent overfishing. This precautionary buffer is more important for species like snapper, grouper, parrotfish, and queen conch, which are considered to be more vulnerable to overfishing because of life history characteristics (e.g., long-lived, late to mature, etc.) and/or greater susceptibility to harvest.

The relative ranking of the OY and ACL values specified by **Alternatives 2-4** is equal to that described for the MSY alternatives as most of the OY and ACL values are derived in part from the MSY proxy (Table 4.2.2). Excluding consideration of sub-alternatives, **Preferred Alternative 2** would specify the highest OY/ACL values for the snapper and grouper complexes, followed by **Alternative 3**, then **Alternative 4**. **Alternative 4** would specify the highest OY/ACL values for the parrotfish and queen conch, followed by **Preferred Alternative 2** and **Alternative 3**. The OY/ACL values specified for all groups by **Alternatives (c)** through **(f)** become progressively smaller as the precautionary buffers they propose become increasingly larger, whereas the values associated with **Alternatives (g)** and **(h)** are the same across all alternatives.

ACLs effectively limit the total catch of a species, unit, or complex that may be taken in any given year without requiring fishery managers to impose additional management controls. As a result, within the range of ACLs, larger ACLs are likely to support less restrictive management controls than will smaller ACLs, and support higher levels of landings and socioeconomic benefits that derive from those landings. However, larger ACLs also increase the risk of overfishing relative to smaller ACLs and risk smaller net socioeconomic benefits over time, which could lead to more restrictive management that substantially reduces socioeconomic benefits to fishers, their families, and fishing communities because the ACL was incorrectly set too high.

Alternative (f) would be expected to best benefit most snapper and grouper species, as well as their surrounding physical and ecological environment, because it would support the lowest catch level and largest precautionary buffer (50 percent) relative to the other alternatives. The ecological benefits of a large precautionary buffer, as defined in **Alternative (f)** include protecting the essential functions parrotfish perform in coral reef ecosystems. **Alternative (h)** would best benefit Nassau grouper, goliath grouper, and large parrotfish by specifying an OY and ACL of zero for those species. **Alternatives (e)** through **(c)** would progressively reduce the precautionary buffer between the OY and ACL and the overfishing threshold, as well as associated environmental benefits, with **Alternative (c)** being the least conservative of those considered. The environmental benefits of parrotfish **Alternative (g)** are generally intermediate to those associated with **Alternatives (c)** and **(d)**.

Preferred Alternative (h) would be expected to best benefit queen conch and its surrounding physical and ecological environment because it would require fishery managers to prohibit all harvest of that species in federal waters. **Alternative (g)** would be the next most conservative option for queen conch because it would support the lowest catch level and largest precautionary buffer relative to the remaining alternatives. A**lternatives (f)** through **(c)** would progressively reduce this safety margin and associated environmental benefits, with **Alternative (c)** being the least conservative of those considered.

In general, more conservative OY and ACL values would be expected to be more administratively burdensome than less conservative values because they would trigger management review and action more frequently. However, defining the OY (= ACL) as zero for Grouper Units 1 & 2 (Nassau and goliath grouper, respectively) would benefit the administrative environment by supporting the current catch prohibitions. And defining the OY and ACL as zero for queen conch would reduce the administrative burden of implementing compatible in-season closures each year. Additionally, insufficiently precautionary OY and ACL values would have adverse administrative effects if they led stocks to become overfished, triggering resource-intensive MSA rebuilding provisions.

The unavoidable adverse socioeconomic tradeoff that must be considered in determining the degree of precaution to incorporate in the OY and ACL definition is foregone socioeconomic benefits that derive from yield. The more precautionary the OY and ACL, the greater the risk of needlessly reducing yield and associated socioeconomic benefits. Table 4.2.2 compares alternative OY (= ACL) values with 2006-2007 landings data recorded following the implementation of current management controls to end overfishing. Based on this comparison, OY and ACL **Alternatives (e)** and **(f)** could require additional measures to further reduce snapper, grouper, and parrotfish catches depending on the MSY proxy selected by the Council as a continuation of current management controls for those species. While post-Caribbean SFA Amendment landings of parrotfish and queen conch exceed the values specified by OY (= ACL) alternatives under most scenarios, higher than expected landings of these species could be attributed to the delayed implementation of compatible harvest restrictions in state waters.

Due to data limitations, it is not possible to calculate the probability of the various OY and ACL alternatives considered here in successfully preventing overfishing and, thus, maximizing long-term benefits to the physical, biological, ecological, socioeconomic, and administrative environments. Recognizing this will be the case in some fisheries, the NS1 guidelines suggest fishery managers implement the best ACLs possible with existing data, but also look for opportunities to improve data collection in the future so ACL measures prevent overfishing without being overly restrictive.

Alternative 1 is the no action alternative, and it would be incompatible with **Preferred Alternative 2** of Action 1(a) and **Preferred Alternative 2** of Action 1(b). **Alternative 1** would also be incompatible with the present regulatory environment because it would specify ACLs for Nassau and goliath grouper that contradict present regulations.

With regard to Action 2(a), **Preferred Alternatives 2** and **Alternatives 3** and **4** would have no direct economic or social impact. **Preferred Alternative 2** and **Alternatives 3** and **4** would indirectly affect the economic and social environments by fostering regulatory changes that could have short-term adverse economic and social impacts on fishers, their families, and fishing communities, but larger net positive socioeconomic impacts in the long run. The actual impacts, however, are dependent upon the allocation (Action 3), AMs (Action 5), regulations that trigger the AMs (Action 5), other regulations that combine to rationalize the fishery, and other environmental factors.

Alternative 2c of Action 2(a) would specify the highest ACL for each of the Snapper and Grouper units, and **Alternative 4c** would specify the highest ACL for the Parrotfish.

Alternative 2c and **Alternative 4c** could indirectly result in greater economic and social benefits that derive from fishing for snapper, grouper, and parrotfish; however, actual impacts are dependent upon the allocation (Action 3), AMs (Action 4), regulations that trigger the AMs (Action 5), other regulations that combine to rationalize the fishery, and other environmental factors.

Preferred Alternatives 2h and **Alternatives 3h,** and **4h** of Action 2(a) would set the ACL for Grouper Unit 1 at zero and for Grouper Unit 2 at zero and would be consistent with the present regulation that closes these fisheries.

Among the alternatives within **Preferred Alternative 2 of Action 2(a), Preferred Alternative e** would establish the third largest ACL for snapper, grouper, and parrotfish. Consequently, the short-run economic and social benefits that derive from annual catches of snapper, grouper, and parrotfish could be smaller under a regulatory regime supported by **Preferred Alternative 2e** than by **Alternatives 2c** and **2d**. However, the long-run economic and social benefits that indirectly derive from **Preferred Alternative 2e** could be larger.

Alternatives 1 through **4** of Action 2(b) would have no direct economic or social impact. However, **Preferred Alternative 2** and **Alternatives 3** and **4** could indirectly affect the economic and social environments by fostering regulatory changes that could have short-term adverse economic and social impacts on fishers, their families, and fishing communities, but larger long term net benefits. The actual impacts, however, are dependent upon the allocation (Action 3), AMs (Action 5), regulations that trigger the AMs (Action 5), other regulations such as Action 4 that combine to rationalize the fishery, and other environmental factors.

Alternative 1 of Action 2(b) is the no action alternative, and it would be incompatible with the present regulatory environment because it would specify an ACL for queen conch that would be incompatible with present federal regulations that limit queen conch fishing and possession to an area of the EEZ off St. Croix, and with St. Croix's annual limit of 50,000 pounds per year. **Preferred Alternative 2g** and **Alternatives 3g** and **4g** would be consistent with the 50,000-pound limit and Amendment 1 restrictions. **Alternative 2h, 3h,** or **4h** would set the ACL at zero pounds, which could have the largest indirect adverse economic and social impacts on St. Croix's queen conch fishers, their families, and fishing communities. It is expected that **Preferred Alternative 2g** would not indirectly affect St. Croix queen conch fishers because the ACL is equal to St. Croix's 50,000-pound landings limit.

4.3 ACTION 3: Annual Catch Limit Allocation/Management

4.3.1 Action 3(a) Snapper and grouper complex allocation/management

Alternative 1. No action. Retain current reference points for units within the snapper and grouper complexes.

Alternative 2. Define aggregate reference points for the snapper and grouper complexes:

Sub-alternative A. Puerto Rico only

Sub-alternative B. USVI only

Sub-alternative C. Both Puerto Rico and the USVI

Alternative 3. Define aggregate reference points for the grouper complexes:

Sub-alternative A. Puerto Rico only

Sub-alternative B. USVI only

Sub-alternative C. Both Puerto Rico and the USVI

Alternative 4. (**PREFERRED**) Define aggregate reference points for snapper and grouper in the USVI and define aggregate reference points for grouper but not snapper in Puerto Rico.

Discussion: Commercial harvest data have been collected from Puerto Rico and USVI waters for many decades, but as explained in Section 3.3, the USVI landings data were generally reported by gear rather than species until the late 1990s. As a result of those data limitations, USVI commercial landings data only allow analysis to the complex (snapper, grouper) or unit (parrotfish) level since calendar year (CY) 1998 for St. Croix (STX) and since CY 2000 for St. Thomas and St. John (STT/STJ). Moreover, at the September 2009 meeting of the Council a motion to include only data acquired since CY 1999 was presented and passed. Thus, the start date for the alternatives included in this amendment is CY 1999 or later. The rationale for this was because complex- or unit-level data were not available for STT/STJ until CY 2000, so that year represents the earliest start date for STT/STJ. The Council also requested that landings data for Puerto Rico adhere to this start year limitation despite the fact that Puerto Rico data have been reported to species for a longer period of time than complex- or unit-level data have been reported for USVI landings. For all three island groups, commercial landings data were available only through CY 2007 at the time of preparation of this document. Thus, the data record for STX and Puerto Rico is 1999-2007 and for STT/STJ it is 2000-2007. Consequently, reference points for snapper and grouper will be based on similar time periods for all islands.

A tangible goal of fisheries management in U.S. Caribbean waters is to manage at the level of individual species. Considering the large number of species being harvested in U.S. Caribbean waters, and given the data limitations discussed above, adequate data with which to conduct stock assessments and to set reference points for individual species are generally not available for the U.S. Caribbean (SEDAR 2009). Thus, although it is a worthwhile goal to manage at the level of the individual species, in practice this is difficult for many U.S. Caribbean species due to data limitations.

Alternative 1 in Action 3(a) would require that landings data be available for each of the species comprising each unit, with an immediate focus on those species designated as undergoing overfishing. The species or units presently designated as undergoing overfishing include queen conch, parrotfish, Grouper Unit 1 (Nassau grouper), Snapper Unit 1 (silk, black, blackfin, vermilion), and Grouper Unit 4 (yellowfin, red, tiger, yellowedge, misty): http://www.nmfs.noaa.gov/sfa/statusoffisheries/2011/second/Q2_2011_FSSI_nonFSSIstockstatus.pdf.

For the USVI, reference points for individual units within the current snapper and grouper complexes cannot be confidently derived. Similar considerations apply for the proposed units (Table 4.1.1). Although species-specific commercial landings records are available for Puerto Rico, variable proportions of the landings of any species within each of the snapper and grouper complexes are reported to an unclassified category rather than to an identified species category. For grouper, the contribution of unclassified fish ranges from 35-53 percent of the classified landings during the pertinent 1999-2007 period. Determining average landings as a proxy for MSY therefore requires either that landings included in the unclassified category be redistributed among identified species or that those unclassified landings not be included in the determination of the MSY proxy. The former is replete with complications, as no reliable method of redistributing the unclassified landings is available. An approach that was considered involved distributing the unclassified landings among the identified species in direct proportion to the amount of landings recorded each year for each species. However, that approach increases the average annual catch level for those species that are most frequently caught and that therefore would be expected to be most frequently and successfully identified. The result would be to increase harvest pressure on those species that are already experiencing the greatest harvest pressure, while simultaneously reducing harvest opportunities for many species that are less effectively identified but that may serve an essential role in dispersing harvest pressure. The latter method of handling unclassified landings, to ignore them completely, reduces the estimated average annual catch by excluding legitimate and viable harvest. The same considerations apply for snapper although the situation is better because only about 6 percent of the Puerto Rico landings are being reported to an unclassified category. Of course, that still constitutes roughly one of every 20 fish.

Alternative 2 requires defining aggregate reference points for both snapper and grouper. This alternative would support MSY proxy analyses at the level of the complex because those data are available for both the USVI and for Puerto Rico. If this alternative is chosen, landings for all managed species and for the unclassified portion of the landings would be combined within each complex. No redistribution of unclassified landings would be required and the ACL derived from this approach would be based upon all recorded landings within each complex. Because the ACL is comprehensive within each complex, changes in the pattern of identification of the species that comprise the complex would have no effect on the tracking of regulated harvest. Additionally, no burden would be added to the fishermen, managers, or enforcement officers due to biases associated with species-specific identification that would be required in some but not other areas and for some but not other species. Sub-alternatives provide for aggregating data only for Puerto Rico, only for the USVI, or for both island groups. As noted above, if data are aggregated for both snapper and grouper, then aggregation can be accomplished for either island group or for both island groups although the most consistent approach would be to aggregate individually within both of the island groups. Additionally, limitations in the presently available commercial landings data make it very difficult to not aggregate the USVI data (**Sub-alternative 2A**).

Alternative 3 requires defining aggregate reference points for grouper but not for snapper. Thus, commercially landed snapper would be identified to species and the resultant landings data assigned to units as appropriate. Annual catch of grouper would also be identified to species but would be managed as a complex. As discussed above, the option would exist to redistribute (or not) the landings of those snapper that are unclassified, but because the unclassified landings equal only about 6 percent of the classified landings of snapper, the consequences resulting from the choice of redistribution strategies (including not redistributing the unclassified landings) would be considerably less than for grouper. There is a risk with this approach that if reporting to the unclassified category increased, management of the Snapper Unit 1 could be rendered ineffective. However, for snapper in Puerto Rico, the ratio of unclassified to classified commercial landings has remained stable at about 5-7 percent since 1999 and has not exceeded 10 percent since 1983 (Figure 4.3.1). Continuous monitoring of that ratio would provide an early warning that fewer snapper are being identified to species relative to those that are unclassified and would suggest that the cause needs to be investigated.

Considerations regarding the sub-alternatives contained within **Alternative 3** are similar to those for the sub-alternatives contained within **Alternative 2**. Again for the USVI, the available data are not conducive to estimating an MSY proxy for the units that comprise each of the snapper and grouper complexes because species-level data do not exist. Species-level data are available for Puerto Rico and are particularly viable for the snapper units because (as noted previously) roughly 94 percent of commercial snapper landings in Puerto Rico are reported to species. **Sub-alternative 3A** is therefore not easily accomplished although **Sub-alternatives 3B** and **3C** would be.

Preferred Alternative 4 was added at the request of the Council and adopted as the preferred alternative in Action 3(a). In the USVI, the commercial data for snapper and grouper are in aggregate form only, thereby essentially requiring that aggregate reference points be defined for snapper and grouper units in the USVI. This alternative also requires defining aggregate reference points for grouper in Puerto Rico, reflecting a concern by the Council for the large proportion of unclassified landings inherent in the Puerto Rico grouper data. However, based on the availability of species-specific data for snapper in Puerto Rico and on the relatively small proportion of unclassified landings within the snapper category, the Council's preferred option is to define unit-specific reference points for snapper in Puerto Rico. Fewer than 10 percent of the reported commercial landings of snapper in Puerto Rico are not reported to species. Commercial fishers have been reporting by species in Puerto Rico, and increased reporting to species is a goal of ongoing efforts by the local governments, the SEFSC, and the NMFS in cooperation with the commercial fishers of the U.S. Caribbean. NS1 also directs the use of species-specific data when available.

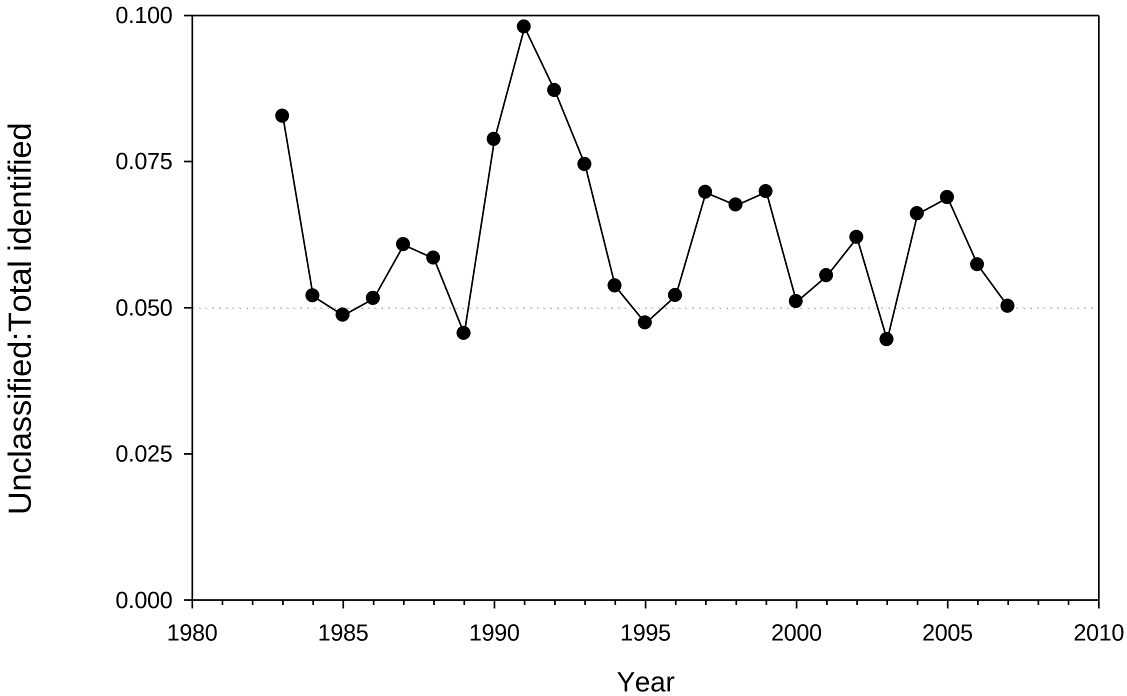


Figure 4.3.1. Ratio of unclassified to total classified (i.e., identified to species) commercial snapper landings in Puerto Rico.

4.3.2 Action 3(b) Commercial and recreational sector allocation/management (Puerto Rico only)

Alternative 1. No action. Do not specify sector-specific annual catch limits.

Alternative 2. (**PREFERRED**) Specify separate commercial and recreational annual catch limits based on the preferred management reference point time series.

Discussion: Action 3(b) applies only to Puerto Rico waters because recreational harvest data are not available for the USVI. In Puerto Rico, the MRFSS program has been underway since 2000. That program obtains estimates of recreational harvest from statistically based telephone surveys and face-to-face intercepts of recreational fishers, for finfish species including snapper, grouper, and parrotfish. Queen conch is not included in the program. The no action alternative (**Alternative 1**) would result in a conglomerate annual catch limit for the recreational and commercial sectors. A single annual catch limit would be established, and when that annual catch is achieved both the recreational and commercial harvest for the specified species, unit, or complex would be subject to application of appropriate in-season AMs, assuming that efforts to improve data collection for both the recreational and commercial fisheries are successful to the point of allowing in-season management. If data collection programs are not sufficient to support in-season management, AMs would be applied in following seasons to account for overages. Concern has been expressed by recreational and particularly charter boat interests regarding this approach. Specifically, it is argued that impacting recreational fisheries when a single annual quota is reached is unfair and economically untenable because the catch and rate of catch would be set by commercial harvesters. **Preferred Alternative 2** avoids that problem by completely separating the commercial and recreational harvest quotas. Each sector would be assigned an ACL based on historic landings for that sector. Thus, this allocation would not change harvest patterns. As each sector achieves their quota either fishing activity by that sector would end or sector-specific AMs would apply, with no implications for the other sector. This alternative would function within the constraints of present data collection efforts via AMs applied in subsequent harvest seasons, with fulfillment of the commercial harvest quota being monitored via commercial catch records and fulfillment of the recreational harvest quota being monitored via MRFSS (or MRIP). However, because there is presently no complimentary data being acquired for the USVI recreational sector, a similar approach will not work there. Instead, at least until a recreational harvest monitoring program is installed in the USVI, a single quota based upon commercial catch records would have to be established for the USVI.

The Council chose **Alternative 2** as preferred in Action 3(b) since the data for the recreational sector are available from 2000 to 2007 for Puerto Rico. The recreational harvest in Puerto Rico is significant and each sector should be allocated ACLs accordingly. The recreational harvest in the USVI appears not to be as significant (based on limited surveys) and efforts are underway by the local government to regulate this sector.

Table 4.3.1. Average annual landings in pounds of conch, parrotfish, snapper, and grouper from each of Puerto Rico, St. Thomas/St. John, and St. Croix for each of the year-sequence (1999-2005, 1999-2007, 2003-2007) alternatives discussed in Action 2 of this amendment. Snapper and grouper units are based upon the proposed species composition as described in Table 4.1.1. Also included are averages for 2006-2007, the two available post-Caribbean SFA Amendment years, for comparison with the year-sequence alternatives. Table A summarizes Puerto Rico commercial landings, Table B summarizes Puerto Rico recreational landings in pounds (numbers of fish reported are in parentheses), Table C summarizes St. Thomas/St. John commercial landings, Table D summarizes St. Croix commercial landings, and Table E provides the summary totals.

A) Puerto Rico average commercial landings

Group/Year Sequence	1999-2005 **(PREFERRED)**	1999-2007	2003-2007	2006-2007
Conch	403,349	369,298	384,584	250,122
Parrotfish	127,980	111,614	101,084	54,332
Snapper				
Unit 1	334,923	294,118	240,463	151,300
Unit 2	171,666	167,075	192,721	151,007
Unit 3	406,794	357,281	321,952	183,987
Unit 4	439,171	394,787	351,629	239,445
Total	1,352,554	1,213,261	1,106,765	725,739
Grouper				
Unit 1	17,469	14,066	7,423	2,152
Unit 2	735	572	995	0
Unit 3	112,875	95,626	79,201	35,254
Unit 4	5,720	5,035	4,710	2,641
Unit 5	9,477	9,356	10,138	8,929
Unclassified	62,563	54,138	44,474	24,649
Total	208,839	178,793	146,941	73,625

B) Puerto Rico average recreational landings

Group/Year Sequence	2000-2005 **(PREFERRED)**	2000-2007	2003-2007	2006-2007
Conch	N/A	N/A	N/A	N/A
Parrotfish	37,042 (22,128)	29,464 (17,853)	25,650 (13,726)	6,730 (5,027)
Snapper				
Unit 1	112,384 (97,879)	135,565 (112,851)	133,829 (120,137)	205,109 (157,768)
Unit 2	40,953 (9,250)	32,846 (7,860)	16,477 (6,027)	8,528 (3,690)
Unit 3	97,833 (91,793)	90,649 (92,272)	83,372 (80,233)	69,097 (93,711)
Unit 4	33,540 (32,783)	29,307 (32,071)	29,587 (34,226)	16,607 (29,935)
Total	284,710 (231,705)	288,367 (245,054)	263,265 (240,623)	299,341 (285,104)
Grouper				
Unit 1	6,172 (574)	7,975 (915)	11,251 (1,289)	13,383 (1,937)
Unit 2	6,501 (716)	4,875 (537)	0 (0)	0 (0)
Unit 3	72,063 (108,149)	62,994 (91,529)	69,430 (98,691)	35,788 (41,671)
Unit 4	4,581 (306)	4,945 (367)	6,162 (437)	6,035 (548)
Unit 5	1,522 (349)	1,142 (262)	1,361 (330)	0 (0)
Unclassified	0 (0)	0 (0)	0 (0)	0 (0)
Total	90,839 (110,094)	81,931 (93,610)	88,204 (100,747)	55,206 (44,156)

Table 4.3.1 (continued). Average annual landings in pounds of conch, parrotfish, snapper, and grouper from each of Puerto Rico, St. Thomas/St. John, and St. Croix for each of the year-sequence (1999-2005, 1999-2007, 2003-2007) alternatives discussed in Action 2 of this amendment. Snapper and grouper units are based upon the proposed species composition as described in Table 4.1.1. Also included are averages for 2006-2007, the two available post-Caribbean SFA Amendment years, for comparison with the year-sequence alternatives. Table A summarizes Puerto Rico commercial landings, Table B summarizes Puerto Rico recreational landings in pounds (numbers of fish reported are in parentheses), Table C summarizes St. Thomas/St. John commercial landings, Table D summarizes St. Croix commercial landings, and Table E provides the summary totals.

C) St. Thomas/St. John average commercial landings

Group/Year Sequence	2000-2005 **(PREFERRED)**	2000-2007	2003-2007	2006-2007
Conch	1,649	1,876	1,981	2,557
Parrotfish	48,818	47,245	49,353	42,528
Snapper	157,382	159,594	156,792	166,231
Grouper	60,999	59,952	64,201	56,812

D) St Croix average commercial landings

Group/Year Sequence	1999-2005 **(PREFERRED)**	1999-2007	2003-2007	2006-2007
Conch	107,720	116,899	138,587	149,026
Parrotfish	293,219	308,333	336,114	361,229
Snapper	121,113	123,217	134,046	130,581
Grouper	35,806	34,177	37,832	28,475

E) Summary U.S. Caribbean average commercial and recreational landings

Group/Year Sequence	1999-2005	1999-2007	2003-2007	2006-2007
Conch	512,718	488,073	525,152	401,705
Parrotfish	507,059	496,656	512,201	464,819
Snapper	1,915,759	1,784,439	1,660,868	1,321,892
Grouper	396,483	354,853	337,178	214,118

Table 4.3.2. Average annual landings during 1999-2005 (Action 2, Preferred Alternative 2) by island group, species or unit, and sector. Also included is the annual catch limit for each category, determined by applying an uncertainty reduction of 15 percent (**Preferred Alternative 2(d)**) to the average annual landings (pounds) for snapper and grouper and to the SSC recommendation (**Preferred Alternative 2(g)i**) for parrotfish. An uncertainty reduction was not applied to the SSC recommendation for queen conch. For comparative purposes, the average landings during 2006-2007 are also included.

Island Group[1]	Species or Unit[2]	Sector	Average landings during 1999-2005[3]	Average[3] times uncertainty factor[4], or Scientific and Statistical Committee recommendation (= ACL)[5]	Average landings during 2006-2007[3,6]
PR	Queen Conch	Commercial	403,349	0	250,122
	Parrotfish		127,980	52,737	54,332
	Snapper Unit 1		334,923	284,685	151,300
	Snapper Unit 2		171,666	145,916	151,007
	Snapper Unit 3		406,794	345,775	183,987
	Snapper Unit 4		439,171	373,295	239,445
	Snapper Total		1,352,554	1,149,671	725,739
	Grouper		208,839	177,513	73,625
	Queen Conch	Recreational[7]	N/A	N/A	N/A
	Parrotfish		37,042 (22,128)	15,263 (9,118)	6,730 (5,027)
	Snapper Unit 1		112,384 (97,879)	95,526 (83,197)	205,109 (157,768)
	Snapper Unit 2		40,953 (9,250)	34,810 (7,862)	8,528 (3,690)
	Snapper Unit 3		97,833 (91,793)	83,158 (78,024)	69,097 (93,711)
	Snapper Unit 4		33,540 (32,783)	28,509 (27,866)	16,607 (29,935)
	Snapper Total		284,710 (231,705)	242,004 (196,949)	299,341 (285,104)
	Grouper		90,839 (110,094)	77,213 (93,580)	55,206 (44,156)
STT/STJ	Queen Conch	Commercial[7]	1,649	0	2,557
	Parrotfish		48,818	42,500	42,528
	Snapper		157,382	133,775	166,231
	Grouper		60,999	51,849	56,812
STX	Queen Conch	Commercial	107,720	50,000	149,026
	Parrotfish		293,219	240,000[8]	361,229
	Snapper		121,113	102,946	130,581
	Grouper		35,806	30,435	28,475

[1]PR=Puerto Rico, STT/STJ=St. Thomas and St. John, STX=St. Croix
[2]Snapper Unit 1 includes silk, black, blackfin, vermilion, and wenchman; Snapper Unit 2 includes queen and cardinal; Snapper Unit 3 includes gray, lane, mutton, dog, schoolmaster, and mahogany; Snapper Unit 4 includes yellowtail.
[3]In pounds of whole fish, for both federal and territorial/commonwealth waters. For recreational data, numbers of individuals are included in parentheses.
[4]Preferred uncertainty factor is 0.85 and accounts for both scientific and management uncertainty. An uncertainty adjustment was not applied to the SSC recommendation for queen conch.
[5]When combined federal and territorial/commonwealth landings reach the annual catch limit, accountability measures will be applied in federal waters only.
[6]2006-2007 represent the most recent years, following implementation of the Comprehensive Sustainable Fisheries Act Amendment, for which landings data were available at the time of preparation of the amendments. This average is for combined federal and territorial/commonwealth waters.
[7]2000-2005 for Puerto Rico recreational data and for STT/STJ data.
[8]In addition to the 15 percent uncertainty reduction proposed in Preferred Alternative 2(g)i, the value of 240,000 pounds also reflects the outcome of applying Preferred Sub-alternative A of Action 4(c).

4.3.3 Action 3(c) Geographic allocation/management

Alternative 1. No Action. Maintain U.S. Caribbean-wide reference points.

Alternative 2. **(PREFERRED)** Divide and manage annual catch limits by island group (i.e., Puerto Rico, STT/STJ, STX) based on the preferred management reference point time series (Table 4.3.1 and Action 2).

Sub-alternative A. (**PREFERRED**) Use a mid-point or equidistant method for dividing the EEZ among islands.

Sub-alternative B. Use a straight line approach for dividing the EEZ among islands.

Sub-alternative C. Use the St. Thomas Fishermen's Association line.

Discussion: Action 3(c) addresses the opportunity to partition the EEZ consistent with the allocation of fishing regulations among the islands (Puerto Rico and STX) or island groups (STT/STJ). Partitioning management among the described islands or island groups has been expressed as a desire of local fishers, the fishing community, and the local governments. Those entities emphasize differences among the islands in terms of culture, markets, gear preferences, and seafood preferences as the basis for such a management regime.

Alternative 1 would maintain the presently extant situation. In that scenario, the U.S. Caribbean would continue to be managed as a single unit. Resource harvested anywhere within the EEZ could be landed on any of the islands or island groups, as long as the fishers are properly permitted, and would therefore count towards the ACL for that resource. Consequently, one island could have negative impacts on the availability of a target stock on another island by impacting present or future harvest of a particular resource.

Preferred Alternative 2 establishes separate ACLs for the individual U.S. Caribbean islands, based upon the combined territorial and EEZ landings for that island (Table 4.3.1). The applicable year-sequence used to determine ACLs are established by the alternatives included within Actions 2(a) and 2(b). An example of what the actual ACLs will be for each species, unit, or island/island group, using Action 2 **Preferred Alternative 2(d)** for snapper and grouper and **Preferred Alternative 2(g)** for parrotfish and queen conch, is presented in Table 4.3.2. Action 3(c) **Preferred Alternative 2** also establishes the boundaries that define the EEZ waters for each island or island group (Figure 4.3.2).

Three alternative EEZ boundary approaches are included for **Preferred Alternative 2** of Action 3(c) and are illustrated in Figure 4.3.2. **Preferred Sub-alternative 2A** uses an equidistant method to partition the EEZ among islands. For this approach, start with the USVI and choose several points equidistant from sections of the southern edge of the territorial boundary of St. Thomas/St. John and the northern edge of the territorial boundary of St. Croix to establish a line separating the two island masses. Draw the line from east, starting at the U.S. Caribbean EEZ boundary, to west toward the Puerto Rico territorial sea boundary. Next, establish several points equidistant from the southeastern edge of the Puerto Rico territorial boundary and the northwestern territorial boundary of St. Croix. Draw the line northeast to southwest. Terminate the line in the northeast where it intersects the previously drawn line separating St. Thomas/St. John and St. Croix. Terminate the line in the southwest upon reaching the 65^0 20' meridian. From that point, extend the line due south to the edge of the U.S. Caribbean EEZ. This described boundary represents the St. Croix portion of the U.S. Caribbean EEZ and the southern portion of the allocated St. Thomas/St. John EEZ.

At the northeastern portion of the Puerto Rico territorial boundary where it intersects with the northwestern potion of the St. Thomas/St. John territorial boundary, establish a line northward parallel with the extreme northeastern boundary of the U.S. Caribbean EEZ and terminate the line where it intersects the edge of the U.S. Caribbean EEZ. This described boundary represents the northern portion of the St. Thomas/St. John EEZ.

The remainder of the EEZ that is not part of the allocated St. Thomas/St. John or St. Croix EEZs will define the allocated Puerto Rico EEZ.

Sub-alternative 2B uses a straight line method to allocate the U.S. Caribbean EEZ among islands. From the east-west portion of the U.S. Caribbean EEZ boundary south of St. Thomas/St. John, extend a line westward to the Puerto Rico territorial boundary. From that point extend a line south to the southern edge of the U.S. Caribbean EEZ. This described boundary represents the St. Croix EEZ and the southern portion of the St. Thomas/St. John EEZ.

From the intersection of the northeastern Puerto Rico territorial boundary and the northwestern St. Thomas/St. John territorial boundary extend a line due north until it intersects with the U.S. Caribbean EEZ boundary. This described boundary represents the northern portion of the St. Thomas/St. John EEZ.

The remainder of the EEZ that is not part of the allocated St. Thomas/St. John or St. Croix EEZs will define the allocated Puerto Rico EEZ.

The layout of the boundaries for **Sub-alternative 2C** are identical to those for **Sub-alternative 2B**, except that the north-south line delineating the boundary between Puerto Rico and St. Thomas follows the 65^o 10' line of longitude and is therefore shifted slightly to the west relative to **Sub-alternative 2B**. The horizontal line defining the boundary between the STT and Puerto Rico EEZs is parallel to that same line in **Sub-alternative 2B**, except that the **Sub-alternative 2C** line is shifted 4.1 nm (7.6 km) to the west of the **Sub-alternative 2B** line on the north side of those two islands and 1.8 nm (3.4 km) to the west of the **Sub-alternative 2B** line on the south side of those two islands.

The Council chose **Alternative 2**, **Sub-alternative A** (Figure 4.3.3) in Action 3(c) as the preferred alternative in the public hearing draft document. The fish will be assigned where they are landed to be counted against the ACL for each island. This alternative reflects the need to monitor landings to determine when ACLs are reached in each of the geographic areas, since AMs will be triggered if the ACLs are surpassed. None of the alternatives are dramatically different but the equidistant alternative chosen by the Council is the most objective alternative.

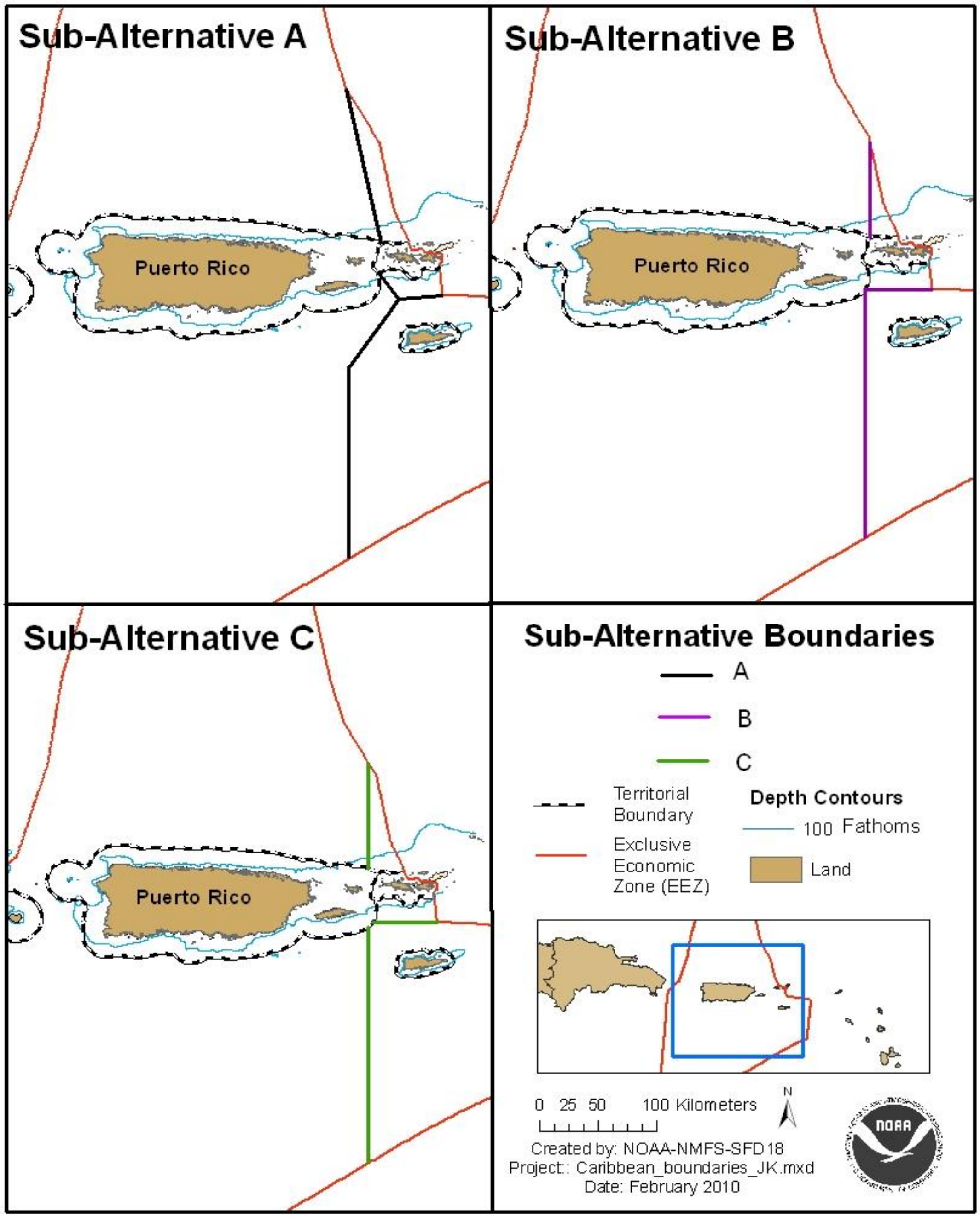
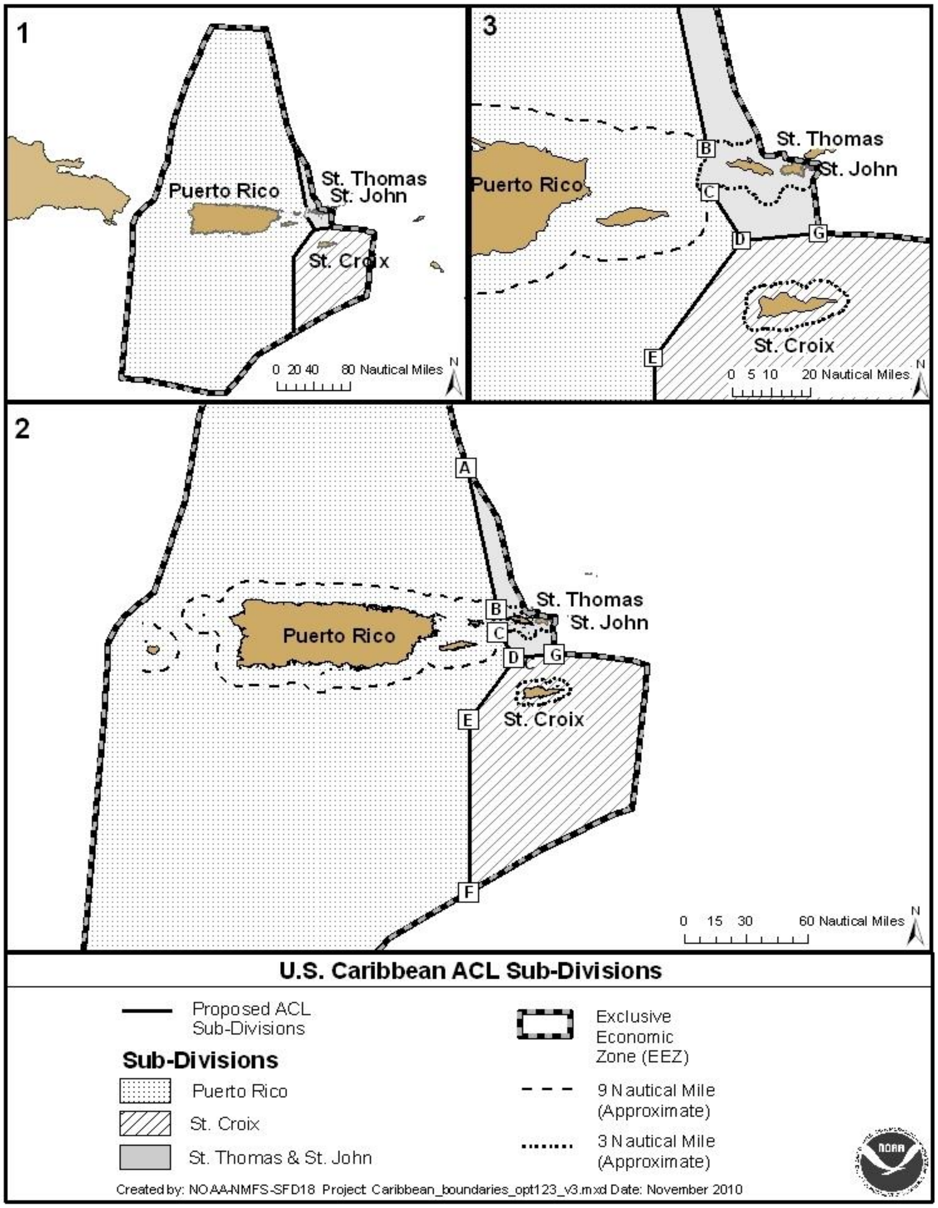


Figure 4.3.2. Alternative proposed boundaries for subdividing the U.S. Caribbean Exclusive Economic Zone by island group. **Sub-Alternative 2A** is the equidistant approach, **Sub-Alternative 2B** is the straight line approach, and **Sub-Alternative 2C** is the St. Thomas Fisherman's Association approach.



Reference Point	Latitude	Longitude	Comments
A	19° 37' 29"	65° 20' 57"	Intersects with the International/EEZ boundary
B	18° 25' 46.3015"	65° 06' 31.866"	Intersects with the EEZ/Territorial boundary
C	18° 13' 59.0606"	65° 05' 33.058"	Intersects with the EEZ/Territorial boundary
D	18° 01' 16.9636"	64° 57' 38.817"	
E	17° 30' 00.000"	65° 20' 00.1716"	
F	16° 02' 53.5812"	65° 20' 00.1716"	
G	18° 03' 03"	64° 38' 03"	

Figure 4.3.3. Detailed boundaries, including coordinates, for subdividing the U.S. Caribbean Exclusive Economic Zone by island group using the equidistant approach (Sub-Alternative 2A).

4.3.4 Summary Comparison of Annual Catch Limit Allocation/Management Alternatives

Action 3(a) provides options to either adhere to the units described in Table 4.1.1 or to aggregate within either or both the snapper and grouper complexes, within either or both of the USVI and Puerto Rico. The no action alternative (**Alternative 1**) provides the highest resolution of data so would best resolve management if adequate data were available with which to determine species-specific ACLs. Unfortunately, as described in Section 3.3, this is not the case. Species-specific landings data are not available for the USVI. Puerto Rico landings ostensibly are collected at the level of species, but in practice that goal is achieved to a variable degree. Snapper data are adequate for consideration at the species level, at least for determination of ACLs, because unclassified landings equate to roughly 6 percent of the classified landings. In contrast, grouper data are less suitable for analysis at the species level because unclassified landings range between 35-53 percent of the classified landings for the period of interest (1999-2007). **Alternative 2** requires that recorded landings be aggregated within each of the snapper and grouper complexes, and this can be accomplished for each of the three proposed sub-alternatives. This alternative does not take full advantage of the available data because adequate species-specific snapper data are available for Puerto Rico. **Alternative 3** appears to take best advantage of the available data to establish ACLs and to thereby manage interrelated stocks of fish as a unit to the greatest extent practicable. Data are aggregated for the grouper complex, for which species-level data are unavailable to a substantial degree. Data are analyzed at the level of the unit for snapper, for which apparently reliable species-level data are available (with a roughly 6 percent error) from Puerto Rico. However, this alternative requires that snapper be managed as individual units in both Puerto Rico and the USVI. Unfortunately, USVI snapper data are not reported to species and therefore unit-level management of snapper in the USVI is not presently possible. **Preferred Alternative 4** specifically addresses the type of data available for each of the snapper and grouper complexes from each of the islands in the U.S. Caribbean. It considers the species-specific data available for snapper in Puerto Rico as well as the aggregate snapper data for the USVI and the aggregate grouper data for both Puerto Rico and the USVI.

Action 3(b) provides options to allocate ACLs between the commercial and recreational sectors. This action is specific to Puerto Rico because adequate recreational harvest data are not available for the USVI. However, recreational landings data are available for Puerto Rico for the years 2000-2007 and commercial landings data are also available for that time period. **Alternative 1** is the no action alternative; no sector-specific ACLs would be specified. This alternative provides the least precise management of the commercial and recreational fisheries. **Alternative 1** does not best utilize the available data. By blending the commercial and recreational data and setting a single ACL for both sectors, it is likely that one sector will exceed what would have been their sector-specific ACL, thereby usurping resource that would otherwise have been assigned to the ACL of the other sector. **Preferred Alternative 2** would result in the setting of separate ACLs for the recreational and commercial sectors. This alternative best responds to the obligations of the MSA National Standards. This approach has the added advantage of utilizing the data as they are reported. Whereas commercial landings are reported in pounds, recreational landings are reported as number of fish (Table 4.3.1). Numbers can be converted to pounds, and those converted weight estimates have been included in Table 4.3.1 as provided by the SEFSC. There is considerable concern among recreational fishers that establishing a single ACL to be shared by the commercial and recreational sectors may simply act to increase the commercial ACL. Concomitant with that would be an increase in commercial effort to take advantage of that increased opportunity. Upon fulfillment of the quota, which may occur relatively early in the calendar year, both the commercial and recreational sectors of the fishery would be subject to AMs dependent upon data availability as noted above.

Action 3(c) addresses the conflict between insular-specific management regimes in territorial waters versus a U.S. Caribbean-wide EEZ. This situation creates problems with properly attributing harvest from the EEZ to the appropriate island or island group. **Alternative 1** maintains the present situation, allowing harvest from throughout the U.S. Caribbean EEZ with resultant landings being counted against a cumulative quota rather than against a quota that is specific to an island or island group. **Preferred Alternative 2** links island-specific quotas with a predefined area, such that upon satisfying an individual species' quota for a particular island or island group, the fishery within that predefined area of the EEZ would be subject to AMs.

Preferred Alternative 4 and **Alternatives 1 through 3** of Action 3(a) would have no direct economic or social impact. However, **Preferred Alternative 4** and **Alternatives 1 through 3** could indirectly affect the economic and social environments by fostering regulatory changes that could have short-term adverse economic and social impacts on fishers, their families, and fishing communities but could have long- term net benefits. The actual impacts, however, are dependent upon the chosen alternatives of the previous proposed actions (Actions 1 and 2), AMs (Action 5), regulations that trigger the AMs (Action 5), other regulations (including Action 6) that combine to rationalize the fishery, and other environmental factors.

Alternative 1, Sub-alternative 2A and **Sub-alternative 3A** of Action 3(a) would not be consistent with USVI reporting requirements that have not specified landings of snapper and grouper by species. **Sub-alternatives 2B, 2C, 3B**, **3C**, and **Preferred Alternative 4** are consistent with USVI and Puerto Rico reporting requirements and would base ACLs on the data as they are reported. Because of this consistency, any one of these five alternatives would support better management of the fishery(ies) and indirectly yield larger long-term net economic and social benefits than **Alternative 1, Sub-alternatives 2A** or **3A**; however, actual benefits are dependent upon the chosen alternatives of the previous proposed actions (Actions 1 and 2), AMs (Action 5), regulations that trigger the AMs (Action 5), other regulations (including Action 6) that combine to rationalize the fishery, and other environmental factors.

Because **Sub-alternative 2A** of Action 3(a) would define aggregate reference points for the snapper and grouper units for Puerto Rico only, it follows that this alternative would, by default, define the targets and thresholds for the snapper and grouper units for the

USVI only. That is problematic, however, because the USVI has not required commercial fishers to report landings of snapper or grouper by species.

Sub-alternative 2B of Action 3(a) would define aggregate reference points for the snapper and grouper complexes for the USVI only, which is consistent with reporting practices in the USVI. When coupled with **Alternative 4c** of Action 2(a), **Sub-alternative 2B** would specify the largest ACL for each of the two complexes in the USVI and would allow for the largest annual aggregate catches which could yield the largest economic and social benefits from the two fisheries. However, the actual impacts would be dependent upon the AMs, the regulations that implement the measures, other regulations, and other environmental factors.

Because **Sub-alternative 2B** of Action 3(a) would establish aggregate reference points for the snapper and grouper complexes for the USVI only, by default, it would also establish reference points for the snapper and grouper units for Puerto Rico. When coupled with **Alternative 2c** of Action 2(a), **Sub-alternative 2B** of this action would allow for the largest annual catch of each snapper unit in Puerto Rico and could indirectly yield the largest economic and social benefits that derive from harvesting these resources. When coupled with **Alternative 2c** of Action 2(a), **Sub-alternative 2B** would allow for the largest annual catch of Grouper Units 1, 2 and 3 in Puerto Rico, and could indirectly yield the largest economic and social benefits that derive from harvesting these resources. **Sub-alternative 2B** of Action 3(a) coupled with **Alternative 4c** of Action 2(a) would allow for the largest annual catch of Grouper Units 4 and 5 in Puerto Rico and could indirectly yield the largest economic and social benefits that derive from harvesting these resources. However, the actual outcomes and rankings are dependent upon the specification of the AMs, regulations that implement those measures, other regulations that rationalize the fishery, and other environmental factors.

When combined with **Alternative 2c** of Action 2(a), **Sub-alternative 2C** of this action would allow for the largest annual catches of snapper and grouper in Puerto Rico, which could indirectly yield the largest economic and social benefits that derive from harvesting these complexes. **Sub-alternative 2C** of this action in combination with **Alternative 4c** of Action 2(a) would allow for the largest annual catches of snapper and grouper in the USVI, which could indirectly yield the largest economic and social benefits that derive from harvesting these complexes. However, the actual outcomes and rankings are dependent upon the specification of the AMs, regulations that implement those measures, other regulations that rationalize the fishery, and other environmental factors.

When coupled with **Alternative 2c** of Action 2(a), **Sub-Alternative 3A** of this action would allow for the largest catch of grouper, which could indirectly yield the largest economic and social benefits that derive from the exploitation of the resource. However, the actual benefits and ranking of the alternatives are dependent upon the AMs, regulations that implement the measures, other regulations, and other environmental factors. Because **Sub-alternative 3A** of Action 3(a) would define aggregate reference points for the grouper complex for Puerto Rico only, it would not change the part of **Alternative 1** of Action 3(a) that would define reference points for units within the snapper complex either for the U.S. Caribbean as a whole or by territory and reference points for units of the grouper complex in the USVI.

When coupled with **Alternative 4c** of Action 2(a), **Sub-alternative 3B** of this action would allow for the largest annual catch of grouper in the USVI, which could indirectly generate the largest economic and social benefits from harvesting the resource. However, the actual benefits are dependent upon the specification of the AMs, regulations that implement those measures, other regulations, and other environmental factors.

When coupled with **Alternative 2a** of Action 2(a), **Sub-alternative 3C** of this action would allow for the largest annual catch of grouper in Puerto Rico and could indirectly result in the largest economic and social benefits that derive from harvesting the resources. When **Sub-alternative 3C** is combined with **Alternative 4c** of Action 2(a), **Sub-alternative 3C** would allow for the largest annual catch of grouper in the USVI and could indirectly result in the largest economic and social benefits that derive from harvesting the resources. However, actual benefits and ranking of the benefits are dependent upon AMs, regulations that implement those measures, other regulations, and other environmental factors.

Preferred Alternative 4 of Action 3(a) applies **Sub-alternative 2B** to the USVI, which is consistent with reporting practices in the USVI. **Preferred Alternative 4** of Action 3(a) applies **Sub-alternative 3A** to Puerto Rico, which would define aggregate reference points for the grouper complex for Puerto Rico only, recognizing that a large percentage of grouper is reported as unclassified. When coupled with **Preferred Alternative 2e** of Action 2(a), **Preferred Alternative 4** of Action 3(a) would allow for the third largest annual catch of each snapper unit in Puerto Rico. However, the actual impacts would be dependent upon the accountability measures, the regulations that implement the measures, other regulations, and other environmental factors.

With regard to Action 3(b), **Alternative 1** and **Preferred Alternative 2** would not have a direct economic or social impact. **Alternative 1**, the no action alternative, would not specify sector-specific reference points, which could cause commercial and recreational fishers to compete for a single ACL. Commercial fishers with larger vessels and gears capable of catching more of the fish in the same or a shorter period of time would be favored over Puerto Rico's recreational and subsistence fishers if there was a race for a single ACL and overcapacity was allowed. **Preferred Alternative 2**, however, would specify separate commercial and recreational annual catch limits in Puerto Rico that are based on the specifications of the MSY, OFL, and OY that are chosen from combining alternatives of Actions 1, 2 and 3a. However, commercial fishers with larger vessels and gears capable of catching more of the fish in the same or a shorter period of time would be favored over Puerto Rico's historic artisanal fishers if there was a race for a commercial ACL and overcapacity was allowed. Such an environment could result in lower long-term benefits that derive from the resource and the ecosystem of which it is part, and a transfer of economic and social benefits from artisanal to industrial fishers. The actual indirect economic and social impacts, however, would be dependent on if the regulatory and economic environments support such competition for an ACL.

Alternative 1 and **Preferred Alternative 2** of Action 3(c) would not have a direct economic or social impact. **Alternative 1**, the no action alternative, would maintain Caribbean-wide reference points and could create territorial and/or sector competition in the EEZ. This alternative also would be in contradiction to present federal regulations that restrict queen conch fishing and possession. If combined with **Alternative 1** of Action 3(b), **Alternative 1** would establish a single ACL for a unit or species for which commercial and recreational fishers of Puerto Rico and the USVI would compete. If **Alternative 1** of Action 3(c) is combined with **Preferred Alternative 2** of Action 3(b), recreational fishers of Puerto Rico would be in competition with recreational fishers of the USVI for the U.S. Caribbean-wide recreational ACL and commercial fishers of Puerto Rico would be in competition with commercial fishers of the USVI for the U.S. Caribbean-wide commercial ACL. Fishers with larger vessels and gears capable of catching more of the fish in the same or a shorter period of time would be favored over other fishers if there was a race for the catch and overcapacity was allowed.

Preferred Alternative 2 of Action 3(c) would divide the Caribbean EEZ into three parts. It would not prevent fishers from each island group (Puerto Rico, St. Thomas/St. John, and St. Croix) from fishing in the EEZ of the other island groups, but their catch would be charged to the island upon which it is landed. Once the ACL for a unit or species is reached on an island, harvest in the EEZ off that island would be subject to appropriate AMs. **Preferred Alternative 2** would not prevent fishermen from fishing for that unit or species elsewhere in the EEZ and landing their catch where the ACL has not been reached, if they are appropriately licensed to do so. It is expected that most fishermen who fish in federal waters do so in the federal waters closest to their home island. It is possible that **Preferred Alternative 2** could have a greater beneficial economic and social impact on St. Thomas/St. John and St. Croix fishers than fishers from Puerto Rico because a larger percent of fishable habitat is found in federal waters off St. Thomas/St. John and St. Croix than in federal waters off Puerto Rico. It is also possible that **Preferred Alternative 2** of Action 3(c) may have a larger adverse economic and social impact on Puerto Rico fishermen than USVI fishermen because Puerto Rico does not limit the number of commercial fishing licenses and the USVI does. USVI fishermen could buy a Puerto Rico commercial fishing license and land their catches in Puerto Rico after the ACL is met in their USVI island areas, but Puerto Rico's commercial fishermen could not similarly buy a USVI commercial license to land their catches in the USVI because of a moratorium on commercial fishing license in the USVI.

4.4 ACTION 4: Management Measures

4.4.1 Action 4(a) Species-specific parrotfish prohibitions

Alternative 1. No action. Do not establish species-specific prohibitions on parrotfish harvest.

Alternative 2. (**PREFERRED**) Prohibit fishing for or possessing in the EEZ:

Sub-alternative A. Midnight parrotfish
Sub-alternative B. Blue parrotfish
Sub-alternative C. Rainbow parrotfish

Discussion: Action 4(a) addresses concerns regarding the harvest of the three largest species of parrotfish (midnight, blue, rainbow) that occur in U.S. Caribbean waters. Regarding those three large parrotfish, concern relates to the potential overharvest of these species due to their combination of large body size, a high susceptibility to spear gear and fish traps (Mumby et al. 2006), relatively low resilience in comparison with other Caribbean parrotfish species, and lack of abundance compared with most parrotfish occupying U.S. Caribbean waters (Table 4.4.1).

Table 4.4.1. Biological characteristics of common U.S. Caribbean parrotfish. Source: Humann 1994 and www.fishbase.org.

Common Name	Genus/species	Max size (cm)	Depth range (m)	Population doubling time	Resilience	Abundance
Blue parrotfish	*Scarus coeruleus*	120	3-25	1.4 - 4.4 yrs	medium	occasional
Midnight parrotfish	*Scarus coelestinus*	77	5-75	1.4 - 4.4 yrs	medium	occasional
Rainbow parrotfish	*Scarus guacamaia*	120	3-25	1.4 - 4.4 yrs	medium	occasional
Queen parrotfish	*Scarus vetula*	61	3-25	<15 months	high	common
Princess parrotfish	*Scarus taeniopterus*	35	2-25	<15 months	high	common
Striped parrotfish	*Scarus iseri*	35	3-25	<15 months	high	common
Redband parrotfish	*Sparisoma aurofrenatum*	28	2-20	1.4 - 4.4 years	medium	common
Redfin parrotfish	*Sparisoma rubripinne*	48	1-15	<15 months	high	common
Redtail parrotfish	*Sparisoma chrysopterum*	46	1-15	<15 months	high	common
Stoplight parrotfish	*Sparisoma viride*	64	3-50	1.4 - 4.4 years	medium	common

Regarding parrotfish in general, these fish provide an essential ecological service to coral reef ecosystems and therefore can be classified as Valued Ecosystem Components (VEC; Beanlands and Duinker 1983, Volety et al. 2009) of U.S. Caribbean coral reefs (which also function as a VEC (Mumby 2006)). Parrotfish are grazers, and since the Caribbean-wide decline of the urchin *Diadema antillarum* in the early 1980s they have become the predominant grazer on many Caribbean reefs (Mumby et al. 2006). The grazing activities of parrotfish act to control the growth of non-calcareous algae and thereby enhance successful settlement and survival of coral propagules (Brock 1979, Steneck 1997). Moreover, as coral cover declines, reversing the decline becomes more difficult and the level of grazing required to reverse the decline increases (Mumby et al. 2007). Parrotfish are therefore an integral and essential component of the coral reef ecosystem.

A variety of parrotfish species inhabit U.S. Caribbean coral reefs. Ten species are presently included in the reef fish FMU (Table 4.4.1, Appendix 2), but at least two other species (greenblotch, *Sparisoma atomarium*, and emerald, *Nicholsina usta*) have been occasionally reported as recreational catch although doubt remains as to the validity of these reports. Greenblotch parrotfish are considered to be large if they reach a size of 3.5 in (7.0 cm) and emerald parrotfish may achieve a size of 7.0 in (15 cm). It is therefore unlikely that either species would be of interest to recreational spear fishers, the gear typically used by recreational fishers to harvest parrotfish because parrotfish generally are not susceptible to hook-and-line fishing. More likely, catch reports involving these two species are in reference to the rainbow parrotfish (*Scarus guacamaia*), which may grow to 3 ft (1 m) and may have a green blotch or emerald color pattern.

Of the ten species included in the unit, the three largest (blue, midnight, rainbow) are of greatest conservation concern because of their hermaphroditism, relatively long population doubling time, low resilience relative to other parrotfish species, susceptibility to spear gear, and low abundance on Caribbean reefs (Table 4.4.1). Moreover, these three species are territorial and haremic (Robertson and Warner 1978), resulting in bias towards terminal phase males and a female-oriented sex ratio (Streelman et al. 2002). Those traits tend to reduce effective population size (the number of males that successfully contribute gametes to the next generation), further exacerbating reductions in overall population size. Thus, although healthy populations of all parrotfish species contribute to healthy coral reef communities, biological characteristics of the three largest species dictate that they be managed with particular caution. In contrast, the seven remaining members of the unit are generally smaller, reproduce at a younger age, and are more resilient to natural and anthropogenic disturbance (Table 4.4.1), thus possessing the potential for more rapid population recovery from mortality events (i.e., are more r-selected *sensu* Ricklefs 1979).

The SSC recommended to the Council that the take of blue, midnight and rainbow parrotfish be prohibited. The conclusion of the SSC was based on the testimony of local fishers regarding an apparently significant decrease in the presence of these fish on shallow water reefs, information from the literature, and the scientists' personal observations and research. Thus, the Council chose the SSC's recommendation (**Alternative 2** in Action 4(a)) as the preferred alternative, including all three sub-alternatives.

4.4.2 Action 4(b) Recreational bag limits

Alternative 1. No action. Do not establish bag limit restrictions on recreational reef fish harvest.

Alternative 2. Specify a 10-fish aggregate bag limit per person per day (would not apply to a fisherman who has a valid commercial fishing license) for:

Sub-alternative A. Species in the snapper complex

Sub-alternative B. Species in the grouper complex

Sub-alternative C. Species in the parrotfish unit

Alternative 3. Specify a 5-fish aggregate bag limit per person per day (would not apply to a fisherman who has a valid commercial fishing license) for:

Sub-alternative A. Species in the snapper complex

Sub-alternative B. Species in the grouper complex

Sub-alternative C. Species in the parrotfish unit

Alternative 4. Specify a 2-fish aggregate bag limit per person per day (would not apply to a fisherman who has a valid commercial fishing license) for:

Sub-alternative A. Species in the snapper complex

Sub-alternative B. Species in the grouper complex

Sub-alternative C. Species in the parrotfish unit

Alternative 5. Establish a 0-fish aggregate bag limit per person per day (would not apply to a fisherman who has a valid commercial fishing license) for species in the parrotfish unit.

Alternative 6. Establish a vessel limit (would not apply to a fisherman who has a valid commercial fishing license) equivalent to the combined bag limit of:

Sub-alternative A. Two fishers

Sub-alternative B. Three fishers

Sub-alternative C. Four fishers

Alternative 7. Establish an aggregate bag limit for snapper, grouper and parrotfish of: 10 per fisher per day including not more than two parrotfish per fisher per day or six parrotfish per boat per day, and 30 aggregate snapper, grouper, and parrotfish per boat per day (would not apply to a fisherman who has a valid commercial fishing license).

Alternative 8. (**PREFERRED**) Establish an aggregate bag limit for snapper, grouper and parrotfish of: five per fisher per day including not more than two parrotfish per fisher per day or six parrotfish per boat per day, and 15 aggregate snapper, grouper, and parrotfish per boat per day (would not apply to a fisherman who has a valid commercial fishing license).

Discussion: As noted in Action 3(b) above, there is concern on the part of recreational fishing interests in the U.S. Caribbean that a conglomerate annual catch limit for the recreational and commercial sectors could create an unfair and economically untenable situation for the recreational fishers, particularly charter boat interests. The concern of the recreational fisher is that, in the race for a single quota, the commercial sector would dominate and there would be substantial losses of socioeconomic benefits to the recreational sector because the combined fishery would become subject to appropriate AMs, possibly before recreational fishers could achieve their historic average annual landings. It was therefore suggested at the December 2009 meeting of the Council, and a motion passed, to establish recreational bag limits for the U.S. Caribbean EEZ. Action 4(b) addresses the establishment of recreational bag limits. The goal of implementing bag limits would be to, when coupled with sector-specific (i.e., recreational and commercial) ACLs, ensure that the recreational ACL for each group is not exceeded until as near as possible to the end of the calendar year.

Bag limits are a common approach to managing harvest in recreational sectors. Typically, bag limit regulations are promulgated to extend the length of the recreational fishing season. The ideal outcome is that overfishing is avoided, using this management strategy, while the resource is available to the recreational angler for the entire year. As landings per angler change, the bag limit can be adjusted to constrain harvest to the quota while ensuring near year-round fishing. Bag limits may be applied on an individual species basis, as an aggregate of a unit, or for an entire fishery.

Deciding at which of those levels the bag limit should be applied depends upon the management objective, the commonalities among species, and the ability of the recreational fisherman to distinguish among species. Choosing an individual versus an aggregate bag limit also may reflect data availability. If data are sufficient only to allow monitoring at a group level, then establishing bag limits at a more resolved level is pointless.

Action 4(b) proposes aggregate bag limits within each of the snapper, grouper, and parrotfish components of the recreational reef fish sector of the U.S. Caribbean EEZ. In addition to the no action alternative, three alternatives are proposed that specify an individual bag limit, from a relatively restrictive 2-fish bag limit (A**lternative 4**) through an intermediate 5-fish bag limit (**Alternative 3**) to the most liberal 10-fish limit in **Alternative 2**. Estimates of percent reduction in harvest for snapper, grouper, and parrotfish depend upon the year sequence chosen (Figure 4.4.1). These year sequences correspond to those presented in Actions 2 and 3 for the recreational sector.

Alternative 5 proposes to establish a zero-fish recreational bag limit for all species of parrotfish in the U.S. Caribbean. This alternative relates directly to Action 4(a) but focuses specifically on recreational harvest of parrotfish due to their essential role in the maintenance of a healthy coral reef ecosystem.

Alternative 6 establishes a vessel limit in addition to the individual harvester's bag limit. For the vessel limit, each individual fisherman on a vessel is allowed to harvest their bag limit, but only to the point at which the vessel limit is achieved. If the vessel limit is equivalent to the bag limit for three fishers, then even if there are more than three fishers on the vessel they will only be able to harvest until that three fisher equivalent is reached. For example, if the individual bag limit is 10 fish and the vessel limit is 30 fish, then even if there are more than three people on the vessel they can harvest no more than the 30 fish vessel limit.

Alternative 7 establishes a vessel limit of 30 fish total per fishing day of aggregate snapper, grouper, and parrotfish but limits the total number of parrotfish to two per fisher up to a maximum of six parrotfish per boat independent of the number of fishers onboard. Each fisher on board a recreational fishing vessel is allowed up to 10 fish per fishing day on a combined catch of grouper, snapper, and parrotfish, but that catch can include no more than two parrotfish within that 10 fish bag limit.

Preferred Alternative 8 establishes a vessel limit of 15 fish total per fishing day of aggregate snapper, grouper, and parrotfish but limits the total number of parrotfish to two per fisher up to a maximum of six parrotfish per boat independent of the number of fishers onboard. Each fisher on board a recreational fishing vessel is allowed up to five fish per fishing day on a combined catch of grouper, snapper, and parrotfish, but that catch can include no more than two parrotfish within that five fish bag limit.

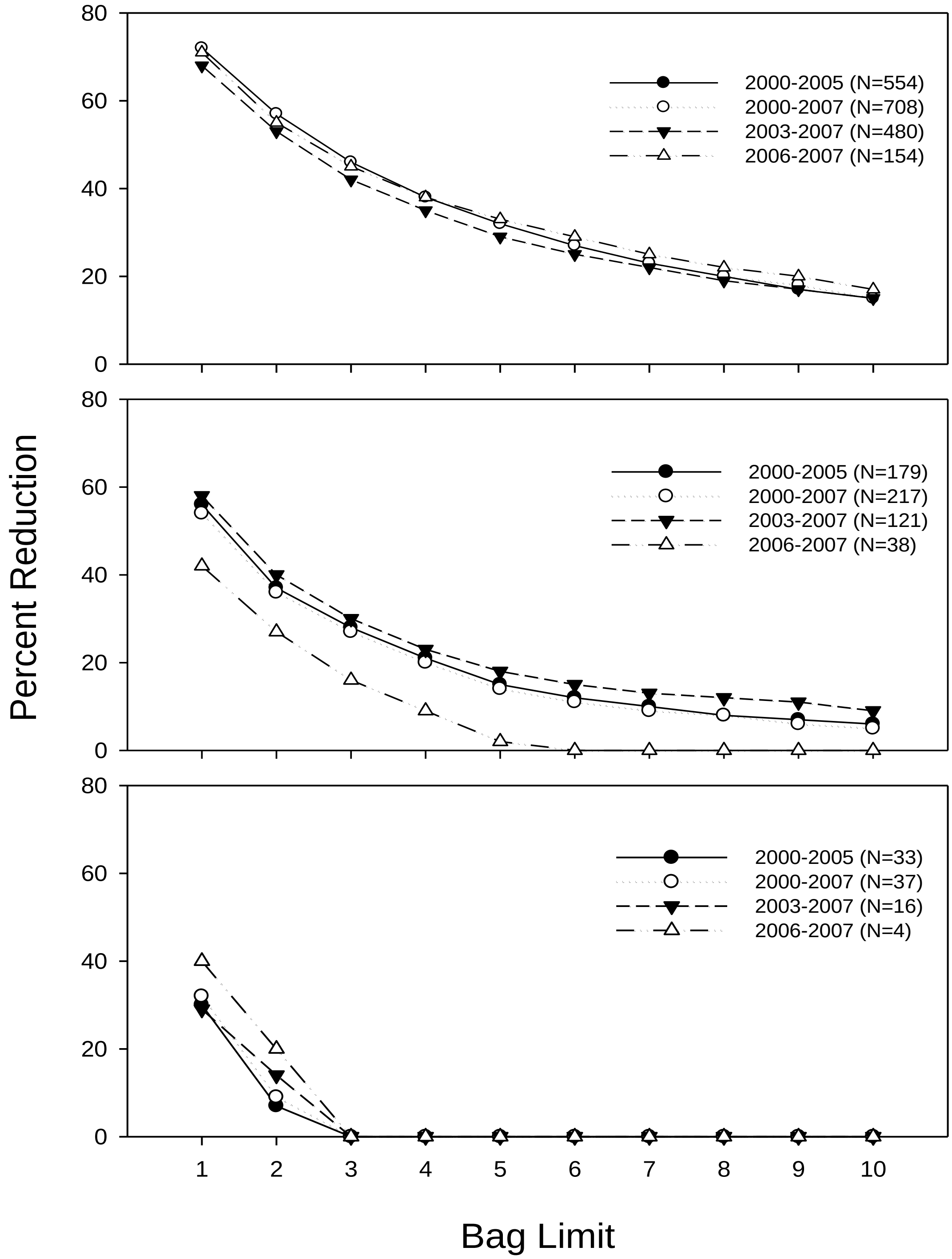


Figure 4.4.1. Estimated percent reduction in harvest of recreational reef fish including snapper (top), grouper (middle) and parrotfish (bottom) for Puerto Rico waters in response to implementation of various bag limits. Each legend references the four year-number of sequences and, parenthetically, the number of intercepts with at least one member of the pertinent group.

4.4.3 Action 4(c) Additional parrotfish harvest reductions

Alternative 1. No action. Do not apply additional reductions to parrotfish harvest from the EEZ of each U.S. Caribbean island group.

Alternative 2. Further reduce parrotfish harvest to address uncertain effects of that harvest on essential settlement substrate for Acroporid corals:

Sub-alternative A. (**PREFERRED**) Apply an additional 5.8822 percent reduction to the OY/ACL identified in Alternative 2(g) for St. Croix parrotfish harvest.

Sub-alternative B. Apply an additional 5.8822 percent reduction to the OY/ACL identified in Alternative 2(g) for St. Thomas/St. John parrotfish harvest.

Sub-alternative C. Apply an additional 5.8822 percent reduction to the OY/ACL identified in Alternative 2(g) for Puerto Rico parrotfish harvest.

Discussion: Action 4(c) further addresses the important contributions of parrotfish to the health and vibrancy of Caribbean coral reefs. As noted in the Discussion section for Action 4(a), although the three species of parrotfish that express the largest maximum size (midnight, rainbow, blue) are of essential importance to Caribbean coral reefs, the other species of parrotfish typically inhabiting those reefs also contribute essential ecosystem services. Landings of those other species from the waters surrounding each of the three U.S. Caribbean island groups are common, but by far the most substantial landings are recorded in St. Croix (Table 4.3.1). Action 4(c) serves to further reduce the ACL for legally caught parrotfish as a means of further increasing the grazing pressure exerted by these species, thereby potentially increasing availability of critical habitat (hard substrate devoid of fleshy macroalgae) for Acroporid corals. **Preferred Sub-alternative A** of **Alternative 2**, reduces the ACL for parrotfish in St. Croix waters by 5.8822 percent (15,000 pounds) from the 255,000 pounds provided for in **Preferred Alternative 2(g)i** of Action 2(a), to 240,000 pounds. **Sub-alternative B** reduces the ACL for parrotfish in St. Thomas/St. John waters from the 42,500 pounds provided for in **Preferred Alternative 2(g)i** of Action 2(a) to 40,000 pounds. **Sub-alternative C** reduces the ACL for parrotfish in Puerto Rico waters from the 68,000 pounds provided for in **Preferred Alternative 2(g)i** of Action 2(a) to 64,000 pounds.

4.4.4 Summary Comparison of Management Measures Alternatives

Action 4(a) addresses the risk of overharvest and resultant disruption of populations of blue (*Scarus coeruleus*), midnight (*Scarus coelestinus*), and rainbow (*Scarus guacamaia*) parrotfish by providing an option to prohibit fishing for these species in the U.S. Caribbean EEZ. **Alternative 1** maintains the status quo, allowing the harvest of the three largest species of parrotfish to continue unabated, subject to the aggregate ACL limitations. **Preferred Alternative 2** prohibits the harvest of various combination of these three species depending upon the sub-alternative or combination of sub-alternatives chosen. Benefits would accrue from regulating against harvest of any of the three species, but the greatest benefit to coral reef health will accrue if commercial and recreational harvest of all three species is eliminated. The reason for this can best be illustrated by a brief discussion of the relationship between parrotfish and corals.

All parrotfish are herbivores, roaming over the bottom and scraping algae off rocks and coral with their stout, fused-teeth beaks. Grazing performs several essential functions in the coral reef ecosystem, including the conversion of primary production to finfish accessible trophic pathways (Mumby et al. 2006). Parrotfish grazing positively conditions substrate for new coral settlement and mediates competition between corals and macroalgae (Brock 1979, Steneck 1997). Such attributes, whether describing a particular species or a familial group, are considered keystone in the operation of ecosystems including coral reef ecosystems (Connell 1978). Consequently, the success and health of corals within the coral reef ecosystem may be partially attributable to parrotfish and other herbivores (e.g., surgeonfish, damselfish, sea urchins).

Alternative 1 of Action 4(a) is the no action alternative and would not have any added short-term economic or social impacts. **Preferred Alternative 2** of Action 4(a) follows logically from **Preferred Alternative 2h** of Action 2(a) for rainbow, blue, and midnight parrotfish and would have direct adverse short-term economic and social impacts on the U.S. Caribbean fishers who take midnight, rainbow, and/or blue parrotfish in the EEZ. It is expected that they could mitigate for loss of harvest of these species from the EEZ, if there is any, by either increasing effort in territorial waters or by targeting other parrotfish or non-parrotfish species in federal waters, subject to any ACL limitations on those species.

None of Puerto Rico's recreational fishers interviewed for MRFSS in 2006 or 2007 reported catching parrotfish in the EEZ. According to a scoping-meeting comment, commercial and recreational fishers in Puerto Rico catch the same kind of parrotfish and in the same areas. That comment suggests **Preferred Alternative 2 (A, B,** and **C)** of Action 4(a) would have little to no economic or social impact on commercial fishers, their families, and fishing communities of Puerto Rico. Testimony at the scoping meetings (see Appendix 7) indicated that the larger parrotfish are considered trophy fish and are hunted to establish spear fishing records.

MRFSS is not conducted in the USVI, so there are no data regarding annual recreational landings of parrotfish or any other species. Hence, the economic and social impacts of **Preferred Alternative 2 (A, B,** and **C)** on recreational fishers of the USVI are unknown.

The economic and social impacts of **Preferred Alternative 2 (A, B,** and **C)** of Action 4(a) on USVI commercial fishers are not fully understood; however, it is likely that St. Croix fishers and their families could experience larger adverse impacts than their counterparts in St. Thomas/St. John, and possibly significantly larger adverse impacts than their counterparts in Puerto Rico, because of the much larger landings of parrotfish in St. Croix relative to other U.S. Caribbean islands (Table 4.3.1). It is expected that they could mitigate for losses of landings of midnight, blue, or rainbow parrotfish by either increasing effort for other parrotfish or other species and/or relocating to territorial waters when or if they are targeting these species; however, the ability to mitigate is conditional upon any ACLs and corresponding regulations that restrict harvest of other species.

There are presently no bag limit restrictions for recreational harvest of snapper, grouper, and parrotfish from Puerto Rico territorial or contiguous U.S. Caribbean EEZ waters. **Alternative 1** of Action 4(b) would maintain this situation. In contrast, implementation of the remaining alternatives would, to various degrees, result in reductions to the daily recreational take of the target species, and the extent of this reduction would depend upon the sub-alternative(s) chosen. For example, implementing a 10-fish aggregate snapper bag limit (**Alternative 2A**) would result in a roughly 15-17 percent reduction in recreational harvest of snapper, depending on the baseline considered (Figure 4.4.1, top panel). Further restricting the bag limit, to a maximum of five snapper per recreational fisher (**Alternative 3A**) or to a maximum of two snapper per recreational fisher (**Alternative 4A**), would further decrease recreational harvest of snapper by roughly 30 percent (range 29-33 percent depending on year sequence) or roughly 55 percent (range 53-57 percent), respectively. Note that these estimates should be considered with caution, keeping in mind several caveats including a relatively low number of intercepts upon which the estimate is based (range of intercepts = 46-121), the possible occurrence of rare events and sampling biases that may influence overall results, that most intercepts are from private rather than charter vessels, and that these estimates are based upon the proposed rather than current units (Table 4.1.1).

A similar outcome was predicted for grouper but with a generally less substantial reduction in harvest. For the 10-fish bag limit scenario (**Alternative 2B**), the estimated reduction in harvest is approximately 5 percent, but the range of variation resulting from the choice of year sequence (0-9 percent) is wider compared with the outcome for snapper (Figure 4.4.1, middle panel). Outcomes for the **Alternative 3B** five-fish scenario (roughly 12 percent reduction, range = 2-18 percent depending upon year sequence) and the **Alternative 4B** two-fish scenario (roughly 35 percent reduction, range = 27-40 percent depending upon year sequence) follow a pattern similar to that for snapper. Note that the same caveats apply for the grouper estimates as were described above for snapper.

It is rare for a recreational fisher in Puerto Rico to harvest more than two parrotfish during a fishing trip, and there are no records of fishers harvesting five or more parrotfish during a single trip during 2000-2007. Thus, the **Alternative 2C** 10-fish aggregate bag limit and the **Alternative 3C** 5-fish aggregate bag limit likely would have no effect on recreational parrotfish harvest. Implementation of the **Alternative 4C** two-fish recreational bag limit would reduce harvest by roughly 12 percent (range = 7-20 percent) each year. Again, note that the same caveats apply for the parrotfish estimates as were described above for snapper.

Action 4(b) **Alternative 1** is the no action alternative, which would not establish a recreational bag limit in the EEZ. It would not have an economic or social impact beyond the baseline, although it may result in more frequent ACL overages and resultant implementation of AMs.

Alternative 2 of Action 4(b) would allow larger recreational catches per person than **Alternative 3**, and **Alternative 3** would allow larger recreational catches per person than **Alternative 4**. Hence, among these three alternatives, **Alternative 4** would likely have the largest adverse economic and social impacts and **Alternative 2** would likely have the lowest if recreational fishing of snapper, grouper and parrotfish species occurs in federal waters. However, **Alternative 5** would essentially prohibit recreational fishing of parrotfish in federal waters, and would have the largest adverse economic impact among Alternatives 2 through 5 for parrotfish. **Alternative 5** could be especially harmful to subsistence fishers of the USVI, especially St. Croix, because ethnographic evidence suggests they are more dependent upon parrotfish than their Puerto Rican counterparts.

The largest adverse economic and social impacts of **Preferred Alternative 8** and **Alternatives 2 through 7** of Action 4(b) could be on recreational fishers of St. Croix and St. Thomas/St. John because more fishable habitat is in the EEZ off St. Thomas/St. John and St. Croix than in the EEZ off Puerto Rico. **Alternative 6**, **Alternative 7**, and **Preferred Alternative 8** boat limits could adversely affect charter vessel operations because their catch of parrotfish and combined catch of snapper, grouper, and parrotfish would be limited, which could discourage anglers from buying their services.

Both **Alternative 7** and **Preferred Alternative 8** of Action 4(b) include a combination of a daily personal limit and a daily vessel limit. **Alternative 7** combines personal daily limits of two parrotfish per person and 10 snapper, grouper, and parrotfish combined per person with vessel limits of six parrotfish per boat and 30 snapper, grouper, and parrotfish combined per boat. The vessel limits are three times the personal limits, which is equivalent to **Alternative 6B**, which is smaller than **Alternative 6C**. Consequently, the adverse economic and social impact on charter vessel operations could be larger with **Alternative 7** than **Alternative 6C**. **Preferred Alternative 8** combines personal daily limits of two parrotfish per person and five snapper, grouper, and parrotfish combined per person with vessel limits of six parrotfish per boat and 15 snapper, grouper, and parrotfish combined per boat. Again the vessel limits are three times the personal limits, which is equivalent to **Alternative 6B**, which is smaller than **Alternative 6C**. Consequently, the adverse economic and social impact on charter vessel operations could be larger with **Preferred Alternative 8** than **Alternative 6C**.

If the economic and social cost of **Preferred Alternative 8** is greater than the economic and social cost of obtaining a commercial fishing license, the least cost option for a charter fishing operation or recreational fisher would be to purchase a Puerto Rico commercial license. The cost of a Puerto Rico commercial license for a nonresident is $250, which is good for four years and can be renewed. The cost for a Puerto Rico resident is $10, which may be good for only one year because it is a beginner license. A resident must show sales of catch to get a non-beginner license. The most likely least cost option for the average charter fishing operation or recreational fisher would be to substitute fishing in territorial waters for federal waters when it is intended that landings of the species would exceed the recreational bag limit(s) or vessel limit.

Preferred Sub-alternative 2A of Action 4(c) would apply an additional 5.8822 percent reduction to the St. Croix Parrotfish ACL, reducing the allowable harvest from the 255,000 pounds that would be established by **Preferred Alternative 2(g)i** of Action 2(a) to 240,000 pounds. **Sub-alternatives 2B** and **2C** would apply similar 5.8822 percent reductions for the islands of St. Thomas/St. John and Puerto Rico, respectively. **Alternative 1** would have the least adverse economic and social impact on U.S. Caribbean fishers because it would not further reduce any of the parrotfish ACLs. **Preferred Sub-alternative 2A** would have the largest adverse economic and social impact on parrotfish fishermen of St. Croix, because it would further reduce the St. Croix Parrotfish ACL and likely further reduce annual landings. **Sub-alternatives 2B and 2C** would have the largest adverse economic and social impacts on fishermen of St. Thomas/St. John and Puerto Rico, respectively, because each one further reduces the island area's Parrotfish ACL and likely further reduces its annual landings. If **Preferred Sub-alternative 2A** and **Sub-alternatives 2B and 2C** were combined, the combination would have the greatest adverse economic and social impact on fishermen of the U.S. Caribbean.

4.5 ACTION 5: Accountability Measures

Accountability Measures (AMs) are defined as management controls to prevent ACLs, including sector-specific ACLs, from being exceeded, and to correct or mitigate overages of the ACL if they occur (74 FR 3180).

4.5.1 Action 5(a) Triggering accountability measures

Action 3 includes alternatives to establish and allocate ACLs. If an ACL is exceeded, AM alternatives are provided to redress overages. Action 5 alternatives are presented in two parts, the first of which addresses the triggering of AMs and the second of which addresses the actual actions needed to redress overages. Note that landings averages are calculated based on the calendar year in all instances.

Alternative 1. No Action. Do not trigger AMs.

Alternative 2. Trigger AMs if the annual catch limit is exceeded based upon:

Sub-alternative A. A single year of landings beginning with landings from 2010.

Sub-alternative B. A single year of landings beginning with landings from 2010, then a 2-year running average of landings in 2011 (average of 2010+2011) and thereafter (i.e., 2010, 2010-2011, 2011-2012, etc.).

Sub-alternative C. A single year of landings beginning with landings from 2010, a 2-year average of landings in 2011 (average of 2010+2011), then a 3-year running average of landings in 2012 (average of 2010+2011+2012) and thereafter (i.e., 2010, 2010-2011, 2010-2012, 2011-2013, etc.).

Alternative 3. (**PREFERRED**) Trigger AMs if the annual catch limit is exceeded as defined below unless NMFS' SEFSC (in consultation with the Caribbean Fishery Management Council and its Scientific and Statistical Committee) determines the overage occurred because data collection/monitoring improved rather than because catches actually increased:

Sub-alternative A. A single year of landings effective beginning 2010.

Sub-alternative B. A single year of landings effective beginning 2010, then a 2-year running average of landings effective 2011 and thereafter (i.e., 2010, 2010-2011, 2011-2012, etc.).

Sub-alternative C. (**PREFERRED**) A single year of landings effective beginning 2010, a 2-year average of landings effective 2011, then a 3-year running average of landings effective 2012 and thereafter (i.e., 2010, 2010-2011, 2010-2012, 2011-2013, etc.).

Discussion: Alternative 1 would maintain present status and no trigger would be set to put corrective action into place. Consequently, **Alternative 1** would not achieve MSA compliance.

Sub-alternative 2A of **Alternative 2** would trigger AMs based on a single year of landings beginning with the 2010 landings data. By adopting this alternative, the decision as to whether the ACL has been exceeded would be based on one year of landings data. Currently, the process used to consolidate and summarize landings data (i.e., make them available for use) takes approximately two years. The landings data is initially acquired from fishers through each local government's fishery statistics program (often referred to as trip tickets in Puerto Rico and commercial catch reports in the USVI), is proofed by the local government then electronically transferred to the SEFSC. The PRDNER and the VIDPNR require commercial fishers to report landings or trip tickets monthly. Upon receipt, the SEFSC formats and stores landings data files and provides them to scientists and managers upon request for analysis or decision making. There may be as much as a two-year lag between the time landings are recorded and the data are released for management applications. For **Sub-alternative 2A**, when landings data become available, they represent a single point of comparison to the established ACL. Consequently, the first one-year comparison to the originally established ACL should occur in 2012 or 2013. After that point in time, annual single-point comparisons can be made to existing ACLs.

In order to overcome the challenges of monitoring highly variable landings, **Sub-alternative 2B** would trigger AMs based on a single year of landings beginning in 2010, and then a 2-year running average of landings in 2011 (average of 2010+2011) and thereafter (2010, 2010-2011, 2011-2012, etc.). By adopting this alternative, the decision as to whether the ACL has been exceeded would initially be based on landings from a single year but subsequent comparisons would be based on two-year running averages of landings. Landings data can be highly variable; therefore, comparing average landings with the ACL can buffer peaks in landings that may reflect sampling or reporting variability rather than true estimation of actual harvest. While such a comparison is more robust than **Alternative 1** and **Sub-alternative 2A**, a two-year average provides little information with regard to precision of the comparison.

Similar to **Sub-alternative 2B, Sub-alternative 2C** would trigger AMs based on a single year of landings beginning in 2010, then a 2-year average of landings in 2011 (average of 2010+2011), then a 3-year running average of landings effective 2012 and thereafter (i.e., 2010, 2010-2011, 2010-2012, 2011-2013, etc.). By adopting this alternative, the decision as to whether the ACL has been exceeded would initially be based on landings from a single year but in 2011 the comparison would be based on a two-year landings average (2010-2011), and subsequent comparisons would be based on 3-year running average of landing (2010-2012, 2011-2013, etc.). Such a comparison is more robust than **Sub-alternatives 2A** and **2B** because it provides more information than a 1- or 2-year landings average with regard to precision of the comparison.

The explanation of **Preferred Alternative 3** is similar to that for **Alternative 2** above but **Preferred Alternative 3** includes a provision that the AM is triggered unless the NMFS' Southeast Fisheries Science Center, in consultation with the Council and its SSC, determines the overage occurred because data collection/monitoring improved rather than because catches actually increased. A data collection improvement program is under development by the SEFSC and is focused to provide more precise and accurate landings information for the U.S. Caribbean, and there is a real possibility that more accurate and comprehensive landings data will be collected for each island mass. The SEFSC and the SSC will provide an analysis of the information and consult with the Council before any determination is made. A single year of landings beginning in 2010, for application to harvest activities in the 2011 CY, will be the basis for the initial consultation and subsequent determination regarding the cause of any ACL overage.

Sub-alternative 3B is similar to **Sub-alternative 3A** except that after the initial single-year comparison of 2010 landings with established ACLs, a 2-year running average of landings will begin in 2011 and thereafter (i.e., 2010, 2010-2011, 2011-2012, etc.).

Preferred Sub-alternative 3C is similar to **Sub-alternative 3B** except that after the initial comparison of 2010 landings with established ACLs for application to 2011 harvest activities, and a comparison of the 2010-2011 average of landings with established ACLs for application to 2012 harvest activities, a 3-year running average of landings will begin in 2012 and thereafter (i.e., 2010, 2010-2011, 2010-2012, 2011-2013, etc.). Using two or three year running averages of landings (**Sub-alternative 3B** and **Preferred Sub-alternative 3C**) would provide a mechanism to deal with data uncertainty that may be due to reporting errors, under reporting, and highly variable landings.

4.5.2 Action 5(b) Applying accountability measures

Alternative 1. No Action. Do not apply AMs.

Alternative 2. (**PREFERRED**) If AMs are triggered, then reduce the length of the fishing season for that species, unit, or complex the year following the trigger determination by the amount needed to prevent such an overage from occurring again. The needed changes will remain in effect until modified by the Council.

Alternative 3. If AMs are triggered, then reduce the length of the fishing season for that species, unit, or complex the year following the trigger determination by the amount needed to prevent such an overage from occurring again and to pay back the overage. The needed changes will remain in effect until modified by the Council.

Discussion: Alternative 1 would not apply AMs when the ACL is exceeded and, consequently, would not comply with MSA provisions. Therefore, this is not a viable option when considering AMs. Reducing the length of the fishing season by the amount needed to pay back the overage in addition to shortening the season length to prevent a future overage (**Alternative 3**) would likely have a greater biological benefit than only reducing the length of the fishing season as specified in **Preferred Alternative 2**. However, AMs that shorten the fishing season can increase the magnitude of regulatory discards and may not be as effective as AMs that lower the target level but still allow some landings.

4.5.3 Summary comparisons of accountability measures alternatives

Action 5 alternatives are in two parts: Action 5(a) addresses triggering of AMs; Action 5(b) addresses the actual actions needed to redress overages. For Action 5(a), three alternatives and six sub-alternatives are presented for triggering AMs. **Alternative 1** is the no action alternative, which would retain the status quo and no trigger to put into place corrective action (i.e., AMs) would be set. Consequently, MSA compliance would not be achieved by **Alternative 1**.

Sub-alternatives 2A, 2B, and **2C** would trigger AMs based on a single year, a 2-year running average, and a 3-year running average of landings, respectively. **Sub-alternative 2A**, the single-year-based trigger would be the quickest way to trigger AMs but would be based on the least amount of information and would be susceptible to the largest level of uncertainty. If landings were extremely high one year because of resource abundance, while effort remained constant, the AM might be triggered although resource health was not in jeopardy. On the other hand, if landings remained constant despite very high fishing effort, resource availability may decrease to dangerously low levels but no AMs would be triggered. Consequently, management based on a single year of information may have a high degree of error and may suffer the consequence of triggering AMs prematurely or not at all. Such an approach may not be reliable and could result in significant resource shortage or exacerbate overfishing conditions.

Sub-alternative 2B represents a trigger based on a 2-year running average of landings rather than a single-year, so uncertainty, while still high, would be better than in **Sub-alternative 2A**. **Sub-alternative 2C** relies on 3-years of information rather than a single-year or only 2-years and would therefore be expected to provide the most reliable indicator as to whether AMs need to be applied.

Sub-alternatives 3A and **3B**, and **Preferred Sub-alternative 3C**, are similar to **Sub-alternatives 2A-C** but provide for a determination regarding whether the ACL was exceeded as a result of improved data collection/monitoring efforts rather than because catches actually increased. If improved data collection/monitoring was determined to have caused the ACL to be exceeded, the AM would not be triggered. The addition of such a scientific review would help ensure that fishers are not penalized for increased cooperation and rigor with regard to reporting their landings.

Action 5(b) **Alternative 1** would not apply AMs when the ACL is exceeded and, consequently, would not comply with MSA provisions. Therefore, the no action alternative is not a viable option when considering AMs. Reducing the length of the fishing season by the amount needed to pay back the overage, in addition to shortening the season length to prevent a future overage (**Alternative 3**), would likely have a greater biological benefit than only reducing the length of fishing season as specified in **Preferred Alternative 2**. However, AMs that shorten the fishing season can increase the magnitude of regulatory discards and may not be as effective as AMs that lower the target level but still allow some catch.

Alternative 1 of Action 5(a) is the no action alternative, and would not have an economic or social impact beyond the baseline. Without regulations that implement the AMs, **Alternative 2** and **Preferred Alternative 3** would have no added economic or social impacts. However, **Preferred Alternative 3** could have a smaller indirect adverse economic and social impact than **Alternative 2** because it would include considerations for improvements in reported landings that suggest larger landings but that actually reflect better reporting. Among the sub-alternatives of **Preferred Alternative 3**, **Preferred Sub-alternative C** could have the smallest indirect adverse economic and social impact because it would require inclusion of a 3-year average of landings as opposed to a two-year average (**Sub-alternative B**) or single year of landings (**Sub-alternative A**).

Alternative 1 of Action 5(b) would not apply the AMs and would have no economic or social impact. **Alternative 3** would likely have a larger adverse economic and social impact on fishers, their families and fishing communities than **Preferred Alternative 2** because it would reduce the fishing season by a longer length of time. However, the actual economic and social impacts of either **Preferred Alternative 2** or **Alternative 3** are greatly dependent upon the percent of landings that derive from fishing in the EEZ and the chosen ACLs relative to current landings. With more fishable habitat in their territorial waters, Puerto Rican fishers would be most able to mitigate for any losses of landings due to a shortened federal fishing season by shifting into territorial waters, if the territorial season were to remain open. With the least amount of fishable habitat in territorial waters off St. Thomas/St. John, it is expected that St. Thomas/St. John fishers would be least able to mitigate for lost landings due to a shortened federal fishing season.

Neither **Preferred Alternative 3** of Action 5(a) nor **Preferred Alternative 2** of Action 5(b) would have an economic or social impact on queen conch fishers in Puerto Rico or St. Thomas/St. John because there is no fishing for queen conch in the EEZ off Puerto Rico or St. Thomas/St. John, nor can fishers take conch from the EEZ off St. Croix and transport it through the EEZ for landing in either Puerto Rico or St. Thomas/St. John. Neither **Preferred Sub-alternative 3C** of Action 5(a) nor **Preferred Alternative 2** of Action 5(b) would have an economic or social impact on St. Croix queen conch fishers because **Preferred Alternative 2g** of Action 2(b) would set the ACL for queen conch at 50,000 pounds, which is consistent with the current St. Croix limit set by the USVI.

4.6 Action 6: Framework Measures

4.6.1 Action 6(a): Establish Framework Measures for Reef Fish FMP

Alternative 1: No Action. Do not amend the framework measures for the Reef Fish FMP.

Alternative 2: (**PREFERRED**) Amend the framework procedures for the Reef Fish FMP to provide a mechanism to expeditiously adjust the following reference points and management measures through framework action:

a. Quota Requirements
b. Seasonal Closures
c. Area Closures
d. Fishing Year
e. Trip/Bag Limit
f. Size Limits
g. Gear Restrictions or Prohibitions
h. Fishery Management Unit (FMU)
i. Total Allowable Catch (TAC)
j. Annual Catch Limits (ACLs)
k. Accountability Measures (AMs)
l. Annual Catch Targets (ACTs)
m. Maximum Sustainable Yield (MSY)
n. Optimum Yield (OY)
o. Minimum Stock Size Threshold (MSST)
p. Maximum Fishing Mortality Threshold (MFMT)
q. Overfishing Limit (OFL)
r. Acceptable Biological Catch (ABC) control rules

s. Actions to Minimize the Interaction of Fishing Gear with Endangered Species or Marine Mammals

Alternative 3: Amend the framework procedures for the Reef Fish FMP to provide the Council with a mechanism to expeditiously adjust a subset of management measures outlined in **Preferred Alternative 2**.

4.6.2 Action 6(b): Establish Framework Measures for Queen Conch FMP

Alternative 1: No Action. Do not amend the framework measures for the Queen Conch FMP.

Alternative 2: (**PREFERRED**) Amend the framework procedures for the Queen Conch FMP to provide a mechanism to expeditiously adjust the following reference points and management measures through framework action:

a. Quota Requirements
b. Seasonal Closures
c. Area Closures
d. Fishing Year
e. Trip/Bag Limit
f. Size Limits
g. Gear Restrictions or Prohibitions
h. Total Allowable Catch (TAC)
i. Annual Catch Limits (ACLs)
j. Accountability Measures (AMs)
k. Annual Catch Targets (ACTs)
l. Maximum Sustainable Yield (MSY)
m. Optimum Yield (OY)
n. Minimum Stock Size Threshold (MSST)
o. Maximum Fishing Mortality Threshold (MFMT)
p. Overfishing Limit (OFL)
q. Acceptable Biological Catch (ABC) control rules
r. Actions to Minimize the Interaction of Fishing Gear with Endangered Species or Marine Mammals

Alternative 3: Amend the framework procedures for the Queen Conch FMP to provide the Council with a mechanism to expeditiously adjust a subset of management measures outlined in **Preferred Alternative 2**.

Discussion for Actions 6(a) and 6(b): In order to modify regulations, the Council generally must follow the FMP amendment procedure which takes longer to implement than if the Council had the availability of a framework process. The current process for amending a FMP is not the most expedient possible for making timely pre-season, in-season, or other adjustments (see the above list) to management measures. However, this amendment establishes a process to make changes in a more expeditious manner via a regulatory amendment. Regulatory amendments can be implemented in a shorter period of time than plan amendments because the level of detail may not be as extensive as for the full plan amendment process. In order to complete a regulatory amendment, a framework section must be established for each FMP to which changes will be made.

Action 6 lists the framework measures which may be adjusted under regulatory amendment. This discussion section describes a framework procedure and how each might be achieved. Such a procedure will provide the Council with a mechanism to make management changes in the queen conch or reef fish fisheries in a more timely fashion than provided through the FMP amendment process. Three alternatives are proposed for each of the Reef Fish and Queen Conch FMPs. In each case, **Alternative 1** would not establish framework measures, resulting in the need for more extensive efforts to effect changes in management measures. Also for each of the reef fish and queen conch plans, **Preferred Alternative 2** provides a substantial list of reference points and management measures that may be adjusted via a regulatory rather than a plan amendment. These options provide the Council with the flexibility to respond to changing conditions in a relatively rapid manner. Again for each of the reef fish and queen conch plans, **Alternative 3** provides for the Council to select a subset of reference points and management measures, either choosing some from the full list to leave out or building a list by including only those measures that they specifically choose to include in the list.

Establish an assessment group and adjustments:

The following discussion outlines the procedure by which the Council may make management changes through regulatory amendment. As previously discussed, the purpose of frameworks and regulatory amendments is to provide the most responsive and efficient modifications to management measures. If an additional review process was included, there could be substantial delays, thus resulting in a longer lag time between identification of a problem and implementation of a response.

1. When the Council determines that management measures require modification, the Council will appoint an assessment advisory panel (Group) that will assess the condition of species in the reef fish or queen conch management units (including periodic economic and sociological assessments as needed). The Group will present a report of its assessment and recommendations to the Council.

2. The Council will consider the report and recommendations of the Group and hold public hearings at a time and place of the Council's choosing to discuss the Group's report. The Council may convene its Scientific and Statistical Committee to provide advice prior to taking final action. After receiving public input, the Council will make decisions on the need for change.

3. If changes to management regulations are needed, the Council will advise the Regional Administrator (RA) in writing of its recommendations accompanied by the Group's

report (where appropriate), relevant background material, draft regulations, Regulatory Impact Review, and public comments.

4. The RA will review the Council's recommendations, supporting rationale, public comments, and other relevant information. If the RA concurs that the Council's recommendations are consistent with the goals and objectives of the fishery management plan, the national standards, and other applicable laws, the RA will recommend that the Secretary take appropriate regulatory action for the reef fish or queen conch fisheries on such date as may be agreed upon with the Council.

5. Should the RA reject the recommendations, the RA will provide written reasons to the Council for the rejection, and existing measures will remain in effect until the issue is resolved.

6. Appropriate adjustments that may be implemented by the Secretary include:

    a. Specification of Maximum Sustainable Yield (MSY) or MSY proxy and subsequent adjustment where this information is available;

    b. Specification of an Acceptable Biological Catch (ABC) control rule and subsequent adjustment where this information is available;

    c. Specification of TAC and subsequent adjustment where this information is available;

    d. Specification of Annual Catch Limits (ACLs) and Annual Catch Targets (ACTs), and subsequent adjustment;

    e. Specification of AMs and subsequent adjustment;

    f. Specification of Optimum Yield (OY) and subsequent adjustment where this information is available;

    g. Specification of Minimum Stock Size Threshold (MSST) and subsequent adjustment;

    h. Specification of Maximum Fishing Mortality Threshold (MFMT) or Overfishing Level (OFL) and subsequent adjustment;

    i. Specification (or modification) of quotas (including zero quotas), trip limits, bag limits (including zero bag limits), size limits, gear restrictions (ranging from modifying current regulations to a complete prohibition, including to respond to interactions with listed species), season/area closures (including spawning closures), and fishing year;

j. Initial specification and subsequent adjustment of biomass levels and age structured analyses;

k. Adjustments to the composition of Fishery Management Units (FMUs).

Authority is granted to the RA to close any fishery (i.e. revert any bag limit to zero and close any commercial fishery), once a quota has been established through the procedure described above and such quota has been filled.

If NMFS decides not to publish the proposed rule of the recommended management measures, or to otherwise hold the measures in abeyance, then the RA must notify the Council of its intended action and the reasons for NMFS's concern, along with suggested changes to the proposed management measures that would alleviate the concerns. Such notice shall specify: 1) The applicable law with which the amendment is inconsistent; 2) the nature of such inconsistencies; and 3) recommendations concerning the action that could be taken by the Council to conform the amendment to the requirements of applicable law.

4.6.3 Summary Comparison of Framework Measures Alternatives

Alternative 1 (No Action) would not establish framework procedures for the Reef Fish or Queen Conch FMPs. This would maintain the current procedure for modifying each FMP, potentially extending the time to achieve necessary changes relative to that provided for via a regulatory amendment.

Under **Preferred Alternative 2**, adjustments to everything listed within this alternative could be made with relative ease as new harvest and stock assessment information becomes available. **Preferred Alternative 2** would likely be biologically beneficial for reef fish and queen conch. By establishing framework procedures to allow for periodic adjustments to various management measures, modifications could be effected in a timely manner to implement necessary changes in response to stock assessment results.

Alternative 3 would also provide a framework procedure but would not encompass as comprehensive a list of management measures which may be implemented through regulatory amendment. Under **Alternative 3**, the Council may choose which management measures they want to allow modified through regulatory amendment. This list may include one management measure or multiple measures, depending on what the Council deems appropriate.

Alternative 1 would not support more efficient and effective management of the reef fish or queen conch fisheries. **Preferred Alternative 2** and **Alternative 3** would be expected to increase the efficiency and effectiveness of management change, potentially allowing less severe corrective action when necessary, or the quicker receipt of social and economic benefits associated with less restrictive and more responsive management. **Preferred Alternative 2** would provide a more complete framework than **Alternative 3**

with which the Council can implement regulatory changes. However, under both **Preferred Alternative 2** and **Alternative 3**, positive social and economic effects would be expected in the long term, relative to the no action alternative, from more timely management adjustments.

Alternative 1 is the no action alternative and would have no direct economic and social impacts. It would not establish a framework to authorize setting, adjusting, and implementing ACLs and AMs that could be deemed necessary to improve management of the resource, and hence, could indirectly result in lower long-term net economic and social benefits that derive from exploitation of the resources.

Because **Preferred Alternative 2** and **Alternative 3** would establish such a framework, it is expected that the indirect long-term net economic and social benefits of **Preferred Alternative 2** and **Alternative 3** would be larger than those of **Alternative 1**. The benefits of **Alternative 3** relative to **Preferred Alternative 2** would depend upon the subset of measures within **Alternative 3** that were chosen by the Council.

5.0 AFFECTED ENVIRONMENT

5.1 Physical Environment

The U.S. Caribbean is located in the eastern extreme of the Caribbean archipelago, about 1,100 mi east-southeast of Miami, Florida (Olcott 1999). It comprises the Commonwealth of Puerto Rico in the Greater Antilles and the Territory of the USVI in the Lesser Antilles island chain (Figure 5.1.1), both of which separate the Caribbean Sea from the western central Atlantic Ocean.

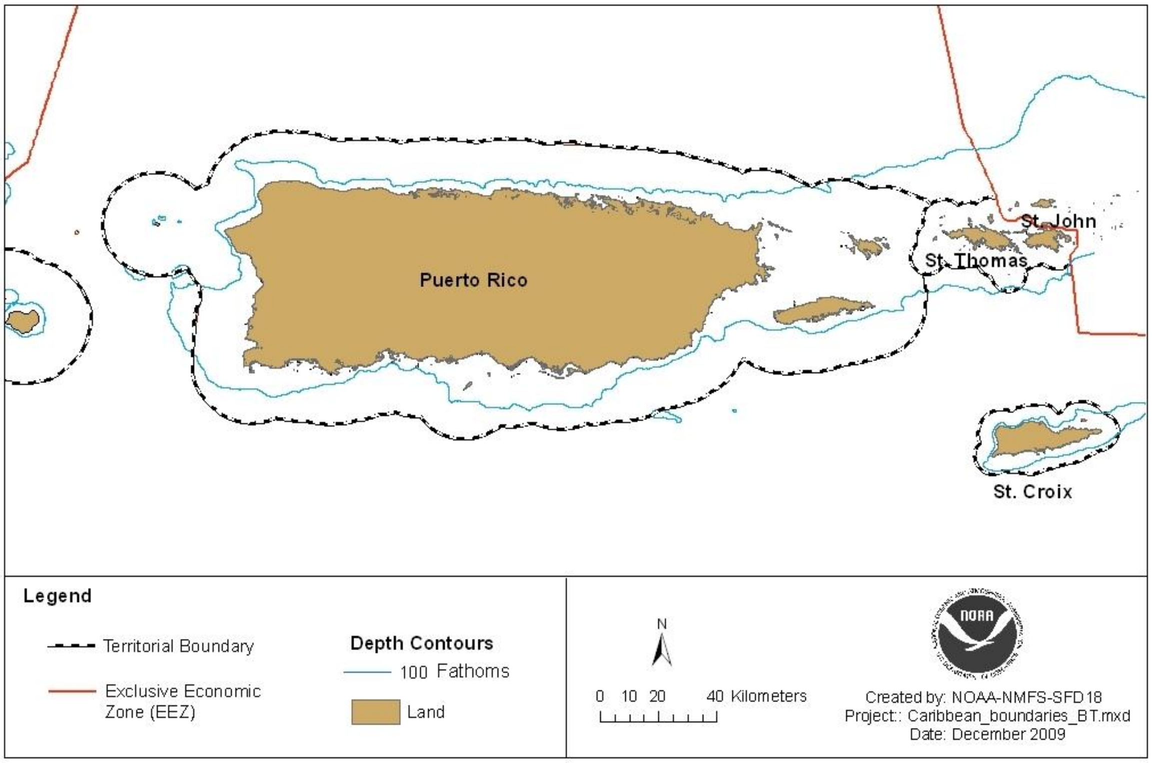


Figure 5.1.1. Map of the U.S. Caribbean.

The USVI are part of the Virgin Islands chain, which lies about 50 mi (80 km) east of Puerto Rico and consist of about 80 islands and cays (Olcott 1999). The USVI include the largest and most important islands of the Virgin Islands chain: St. Croix, St. Thomas, and St. John. Together, their coastlines extend about 175 mi (282 km). St. Croix is located about 40 nm (74 km) south of St. Thomas and St. John (CFMC 2004). Covering about 84 mi^2 (218 km^2), that island is entirely surrounded by the Caribbean Sea. The islands of St. Thomas and St. John are bordered by the Atlantic Ocean to the north and the Caribbean Sea to the south. Their respective areas are about 32 mi^2 (83 km^2) and 19 mi^2 (49 km^2) (Olcott 1999).

The island of Puerto Rico is almost rectangular in shape, about 35 by 110 mi, and is the smallest and the most eastern island of the Greater Antilles (CFMC 1998, Morelock et al.

2001). Its coast measures approximately 700 mi and includes the adjacent islands of Vieques and Culebra. In addition, the Commonwealth includes the islands of Mona, Monito, and various other isolated islands. Deep ocean waters fringe Puerto Rico. The Mona Passage, which separates the island from Hispaniola to the west, is about 75 mi (120 km) wide and more than 3,300 ft (1,000 m) deep. Off the northern coast is the 28,000 ft (8,500 m) deep Puerto Rico Trench, and to the south the sea bottom descends to the 16,400 ft (5,000 m) deep Venezuelan Basin of the Caribbean.

More detailed information on the physical environment can be found in Section 3.1 of the EFH FSEIS (CFMC 2004).

5.1.1 Geology

The shelf shared by the islands of St. Thomas and St. John is about 7.0 nm (12.9 km) wide on the south and 17.4 nm (32.2 km) wide on the north (Goenaga and Boulon 1991). St. Croix, which lies on a different geological platform, is separated from the other islands by a 13,124 ft (4,000 m) -deep trench (CFMC 2004). The St. Croix shelf is much narrower and shallower than that of the northern islands (Goenaga and Boulon 1991), extending only 2.2 nm (4 km) wide in the south, less than 0.1 nm (0.2 km) wide on the northwest, and up to several nautical miles wide in the northeast and on Lang Bank (CFMC 2004).

Puerto Rico shares the same shelf platform as St. Thomas and St. John, and that shelf extends along an east-west axis to the British Virgin Islands (BVI). The St. Croix platform connects through a deep submerged mountain range (including Grappler Bank and Investigador, among other banks in the EEZ) to the southeast platform of Puerto Rico. Section 3 of the EFH-FEIS (CFMC 2004) summarizes the available information on the geology of the U.S. Caribbean.

5.1.2 Oceanography and Climate

The North Equatorial Current is the predominant hydrological driving force in the Caribbean region. It flows from east to west along the northern boundary of the Caribbean plateau and splits at the Lesser Antilles. To the north, the current flows westward along the north coasts of the U.S. Caribbean islands, splitting north of the Mona Channel. The north branch flows north of Silver and Navidad Banks, past the Turks and Caicos, to form the Bahama Current. The south branch parallels the north coast of Hispaniola about 16 nm (30 km) offshore. A small gyre has been documented off the northwest corner of Puerto Rico resulting in an easterly flow nearshore in this area (CFMC 2004). To the south, the current enters the Caribbean Sea through the passages between the Lesser Antilles (Chakalall et al. 1998). The water then continues northwestward as the Caribbean Current, the main surface circulation in the Caribbean Sea.

The Caribbean Current flows about 54 nm (100 km) south of the U.S. Caribbean islands at an average speed of 0.5 to 1 knots (0.9 to 1.9 km^{-hr}) (CFMC 2004). The current is characterized by large cyclonic and anticyclonic gyres. Its flow exits the Caribbean through the Yucatan Strait into the Gulf of Mexico and, to the northwest, into the North

Atlantic (Kjerfve 1981). Its strength is influenced by changes in the position of the Inter-tropical Convergence Zone (ITCZ). It increases in strength during the winter when the thermal equator is farthest south. It decreases in strength during the summer when the thermal equator shifts north, and surface waters in the Caribbean are influenced by increasing precipitation. This is the time of year when the North Equatorial Counter Current is established and surface waters of the equatorial Atlantic are displaced to the east (Kjerfve 1981). Fluctuations in the water mass transport of the Gulf Stream are influenced by seasonal changes in Caribbean surface salinity transport and to wind speed changes in the tropical-subtropical trade wind zone (Kjerfve 1981). Westerly trade wind circulations to the north are responsible for the major wind and wave patterns. High winds occur in the winter; hurricanes in the autumn (CFMC 2004).

The zonal shift of the ITCZ is also responsible for the seasonal change in precipitation in the Caribbean. The dry season occurs when the ITCZ is near the equator (Kjerfve 1981), generally in the late winter to spring (Olcott 1999). The wet season occurs when the ITCZ is at its most northerly position in the Caribbean, generally in the late summer into late fall (Olcott 1999); about 50 percent of the annual rainfall occurs during this wet season. Average annual precipitation ranges from less than 30 in (76.2 cm) to greater than 55 in (139.7 cm) in the USVI.

Most of the precipitation in this region is returned to the atmosphere by evapotranspiration – evaporation from the land and water surfaces and transpiration by plants (Olcott 1999). Surface water salinity changes along with the seasonal change in precipitation, but precipitation affects salinity only indirectly. The discharge from the Amazon, Orinoco, and Magdalena rivers is the main contribution to buoyancy in the Caribbean, increasing silica concentrations, decreasing salinity and increasing chlorophyll and pigments, as well as increasing the input of terrestrial materials (Kjerfve 1981). The plume of the Orinoco River, as tracked by satellite imagery, seasonally penetrates across the Caribbean Basin, potentially exerting a region-wide influence (Kjerfve 1981; Muller Karger et al. 1989). It could be responsible for events of high turbidity and algal blooms that often occur in the Caribbean Basin in October (CFMC 2004). Other oceanographic phenomena influencing the Caribbean Basin include the passage of cyclonic and anti-cyclonic eddies (Corredor et al. 2004).

The USVI has no permanent streams, and outflows only occur during periods of heavy rainfall. But these are sometimes sufficient to muddy coastal surface waters up to 0.5 nm (0.9 km) from shore (CFMC 1985).

Sea surface temperature ranges from a minimum of 77º F (25º C) in February-March to a maximum of about 83º F (28.5 º C) in August-September. Inshore temperatures may be higher (e.g., 86º F or 30º C) due to shallower depths or, in some cases, to thermal plumes from generator plants (CFMC 2004).

Tidal regimes differ between the north and south coasts. The fluctuations range from a diurnal tide of about 3.9 in (10 cm) in the south coast to a semi-diurnal regime of between

24-40 in (60-100 cm) along the north coast, where waves are larger (CFMC 2004). But the astronomical tidal range is slight (8-12 in or 20-30 cm) (Kjerfve 1981).

5.1.3 Major Habitat Types

The coastal-marine environment of the USVI is characterized by a wide variety of habitat types. NOAA's National Ocean Service has mapped 21 distinct benthic nearshore habitat types using aerial photographs acquired in 1999. Those maps document 9 mi^2 (24 km^2) of unconsolidated sediment, 62 mi^2 (161 km^2) of submerged vegetation, 0.8 mi^2 (2 km^2) of mangroves, and 116 mi^2 (300 km^2) of coral reef and hard bottom over an area of 189 mi^2 (490 km^2) in the USVI. Coral reefs, seagrass beds, and mangrove wetlands are the most productive marine habitat areas (CFMC 2004). CFMC (2004) provides an in-depth description of the distribution of these habitats, along with information on their ecological functions and condition.

A general description of the marine environments of the USVI is provided in Island Resources Foundation (1977). The fringing reefs on St. John are said to be poorly developed (Randall 1963). Outside this area, in Coral Bay, a more-mature reef profile is found at Lagoon Point. St. Croix has the most extensive reefs, with many miles of bank-barrier reefs, often with algal ridges, extending in an almost unbroken line from Coakley Bay on the north coast, around the eastern tip to Great Pond Bay on the south coast. There are also numerous fringing and patch reefs. On the north coast, the eastern shelf is up to several miles wide and is rimmed by emergent Holocene reefs, considered to be the best developed on the island. The western portion is less than 0.1 nm (0.2 km) wide and is traversed by two small submarine canyons; in the Salt River and Cane Bay areas, the edge of the shelf drops precipitously into great depths and the reefs form a vertical wall supporting abundant growths of black coral. The south shore has a shelf up to 2.2 nm (4.0 km) wide (Hubbard et al. 1981). The reef zonation of the entire island has been mapped from aerial photographs for the Bureau of Land Management.

These environments are threatened by human activities, such as coastal development and fishing activities, but also by natural factors, such as El Niño Southern Oscillation events and hurricanes, which leave habitats more vulnerable to human disturbance. Climate changes resulting from global warming are also a threat. Bryant et al. (1998) reports that almost two-thirds of the mapped coral reefs in the Caribbean are at risk and one-third are at high risk of impact resulting from increasing water temperatures.

In Puerto Rico, 49 km^2 of unconsolidated sediment, 721 km^2 of submerged vegetation, 73 km^2 of mangroves, and 756 km^2 of coral reef and colonized hard bottom were mapped (Kendall et al. 2001). About eighty different bottom types are found around Puerto Rico and the USVI (CFMC 1984, CFMC 1994). The bottom types vary with depth and consist of combinations of gravel, rock, sand, mud, and clay. The bottom types greatly influence which organisms are found in each habitat.

All of these habitats are described in as much detail as available in Section 3.2 (3.2.1 through 3.2.11) of the EFH-FEIS (CFMC 2004) and any additional information will be included in the 5-year review of the Generic EFH Amendment to the FMPs under development at the present time. The 5-year EFH-FEIS review will incorporate all new and recently acquired information on the description of the 30 to 50 m depth marine environments of Puerto Rico and the USVI (e.g. García-Sais et al. 2003 (http://www.caribbeanfmc.com)).

Additional information on regional habitat types can be found in Section 3.2 of the EFH FSEIS (CFMC 2004).

5.2 Biological Environment

5.2.1 Conch

5.2.1.1 Queen conch (*Strombus gigas*)

The term "conch" usually refers to gastropods of the family Strombidae (Genus *Strombus*), but is often applied to large, usually edible, gastropods in other families as well. As defined by the Caribbean Council's Queen Conch FMP, the Caribbean conch resource is composed of 13 species of gastropods within the families Strombidae, Cymatiidae, Cassidae, Turbinellidae, Fasciolariidae, and Trochidae. But only one species, the queen conch (*Strombus gigas*), has been the focus of fishery management measures defined in that FMP (CFMC 1996, 2005). Its scientific name *Strombus gigas* means "giant spiral shell."

The queen conch occurs in semi-tropical and tropical waters of the Atlantic Ocean, ranging from south Florida (USA) and Bermuda to northern South America, including the Caribbean Sea (Rhines 2000). This species is taken in both commercial and recreational fisheries. The conch is an invertebrate with a hard shell and a soft body, which consists of the black speckled foot, the visceral mass within which resides the thoracic and abdominal organs, two slender tentacles, a "head" with bright yellow eyes perched on the end of two protruding stalks, and a snout-like mouth (proboscis) which the conch extends to graze on algae. Enclosing the foot and head is a snug, orange or yellow fleshy covering called the mantle, which secretes the shell and also houses the feathery gills that allow the conch to extract oxygen from the water. The queen conch's shell is its most striking feature. Adults have a heavy shell with a broad, flared lip that is a glossy pink, orange, or yellow on the interior. The outside of the shell is marked by a blunt crown of spines that project from each whorl of the spiral. Queen conchs are "right-handed," meaning that as the observer looks at the pointed crown, the spiral coils to the right. A brown, papery layer called the periostracum covers the shell and collects silt, bacteria, and algae, which help to disguise the animal. The periostracum flakes off when the shell is removed from the water and dried. A queen conch shell can be as long as 12 inches and weigh as much as 5 pounds. (FWC FWRI 2006)

The Queen Conch FMP (CFMC 1996) and the CITES (2003) report provide detailed descriptions of the biology and life history of the queen conch. To summarize this information, this species generally occurs on expanses of shelf to about 250 ft (76 m) depth. It is commonly found on sandy bottoms that support the growth of seagrasses, primarily turtle grass (*Thalassia testudinum*), manatee grass (*Syringodium filiforme*), shoal grass (*Halodule wrightii*), and epiphytic algae upon which it feeds (Randall 1964; Stoner and Waite 1990). Queen conch also occurs on gravel, coral rubble, smooth hard coral or beach rock bottoms, and sandy algal beds (CFMC 1996). Additional information on queen conch habitat in deeper water (30-50 m) indicates that the species occurs on rhodolith reefs, a habitat that functions as a foraging ground for conch (García-Sais et al. 2010). Sandt and Stoner (1993) have shown that queen conch actively select among their habitats, with juveniles being more selective than adults, and are dependent on certain habitat requirements. The most productive nurseries occur in shallow (5-6 m deep) seagrass meadows (Stoner 1997). Juveniles exhibit a strong preference for intermediate densities of seagrasses, whereas adults show less habitat specificity (Stoner and Waite 1990).

Adult queen conch grow to 6-12 in (15-30.5 cm) in length (CFMC 1996), weigh about 4.4 lb (2 kg) on average, and generally live 6 to 7 years; although they may survive as many as 26 (Rhines 2000) or even 40 (CFMC 1996) years in deep water habitats. Growth in shell length generally ceases at the time of sexual maturity, after which growth occurs primarily through the thickening of the shell, especially at the lip (CFMC CFRAMP 1999). The shell length of an adult queen conch can progressively decrease with age due to bioerosion of the shell. The flaring of the lip starts at an age of approximately two to four years and lasts for approximately seven to ten months, or longer (Glazer and Berg 1992). While Rhines (2000) reports age at maturation as 3.5 - 4 years, the average age of maturation for both sexes of queen conch off Puerto Rico is reached at approximately five years (Appeldoorn 1994) whereas off St. John it is 3 years (CFMC 1996).

Sexes are separate and fertilization is internal. Copulation can precede spawning events by several weeks (CFMC 1996). Research indicates the lack of reproduction in low-density populations is related primarily to the lack of encounters between females and males. In the Bahamas, Stoner and Ray-Culp (2000) found that reproduction increased proportionally with density levels (due to increased likeliness of encounters) and remained stable near densities of 200 individuals^{-ha}. This highlights the importance of maintaining stock density above a critical level to prevent recruitment failure. In Puerto Rico, surveys undertaken in 1996 found densities of 7.4 individuals^{-ha} on the East Coast and 8.5 individuals^{-ha} on the West Coast (Mateo et al. 1998). For St Thomas, juvenile density of 1.9 individuals^{-ha} was observed in 2001, while adult density in St Croix waters was around 26-27 individuals^{-ha} (Gordon 2002). Recent fishery independent surveys show a marked increase in both juvenile and adult densities in Puerto Rico and the USVI (N. Jimenez, PRDNER, pers. comm.; S. Gordon, VIDPNR, pers. comm.). Rhines (2000) reports the peak reproductive season extends from April to August. Peak spawning activity in the U.S. Caribbean appears to occur from May through September, corresponding to the highest water temperatures (CFMC 1996). Spawning occurs in aggregations (CFMC 1996). Egg masses are composed of a number of gelatinous egg strings, usually deposited in clean coral sand with low organic content but sometimes also in seagrass habitat (CFMC 1996). Fecundity is highly variable: individual strings may contain as many as 185,000 - 460,000 eggs (Rhines 2000); egg masses, from 310,000 - 750,000 eggs. Females commonly spawn 6-8 times per season and produce 1-25 egg masses per season (CFMC 1996).

Embryos hatch into planktonic larvae (Colin 1978, Rhines 2000) after a period of about 5 days. Larvae spend between 18 and 40 days in the water column before settling and metamorphosing into adults. Little is known about recruitment patterns. Some studies have concluded that the majority of larvae are retained locally (e.g., within the area where they are spawned); others, that larvae could be transported 26 mi (43 km) per day, or 540 mi (900 km) during the 3-week larval period depending upon current patterns. Eggs hatched off Puerto Rico and the USVI may supply conch to areas located downstream, such as Haiti, the Dominican Republic, and Cuba. Conversely, islands situated upstream in the Caribbean arc may provide conch that settle in Puerto Rico and the USVI (CFMC 1996). However, evidence of local entrainment of larvae suggests that it is important to focus primarily on management of the local conch stock.

Juveniles settle in shallow subtidal habitats where they spend much of their first year buried in the sediment (CFMC 1996, CFMC CFRAMP 1999, Rhines 2000). At shell lengths ranging from 2.0-3.0 in (5-7.5 cm), young juveniles begin to emerge and take up an epibenthic existence. Some studies have documented a habitat shift at the time of emergence, from the area of settlement into nearby seagrass beds. Queen conch exhibit two general patterns of migration. The first is an ontogenetic migration into deeper water, a pattern which generally becomes more pronounced in large juveniles (CFMC CFRAMP 1999). Aggregations of over 100,000 juveniles have been reported in the Bahamas (CFMC 1996). The second migration is related to spawning. Conch generally move inshore to spawn as temperature begins to increase in March, and return to deeper water in October. This migration is manifested as a general shift in the distribution of conch, with conch in deep water migrating but still remaining deep relative to conch in shallow water areas (CFMC CFRAMP 1999).

Queen conch larvae feed on plankton (Rhines 2000). Juvenile and adults graze on algae and seagrasses (Rhines 2000; Sefton and Webster 1986). Foraminiferans, bryozoans, and small bivalves and gastropods have also been found in conch stomachs but were probably ingested accidentally while grazing (Rhines 2000). Feeding has been observed in sand flats and shallow, sandy lagoons (Sefton and Webster 1986), particularly in turtle grass beds (Colin 1978; Sefton and Webster 1986), on hard bottom habitats, and in rubble (Rhines 2000).

Juveniles are preyed on by a variety of gastropod mollusks, cephalopods, crustaceans, and fish (Colin 1978). Adults are preyed upon by crabs, turtles, sharks, and rays (Rhines 2000). The hermit crab (*Petrochirus diogenes*) expropriates the shell of the queen conch after consuming the animal. The conchfish (*Astrapogon stellatus*), and possibly a porcellanid crab, have commensal relationships with the queen conch; the former spends the day within the conch's mantle cavity, emerging at night to feed (Colin 1978).

5.2.1.2 Other Caribbean conch resources

Less is known about the biology and status of the 12 other Caribbean conch and gastropod species. The Council included 8 of these species (Atlantic triton's trumpet, *Charonia* *variegata;* cameo helmet, *Cassis madagascariensis*; green star shell, *Astraea tuber;* hawkwing conch, *Strombus raninus;* milk conch, *Strombus costatus;* roostertail conch, *Strombus gallus;* true tulip, *Fasciolaria tulipa;* West Indian fighting conch, *Strombus pugilis*) in the management unit for data collection only because they are occasionally marketed, but their economic importance to U.S. Caribbean fisheries has not been assessed. The milk conch (*Strombus costatus*) and West Indian fighting conch (*Strombus pugilis*), are used for food, but to a lesser extent than queen conch. Four additional species (Caribbean helmet, *Cassis tuberosa;* Caribbean vase, *Vasum muricatum;* flame helmet, *Cassis flammea;* West Indian top shell, *Cittarium pica*) were originally included in the management unit but were removed as part of the Caribbean SFA Amendment. Those four species are occasionally collected for their shells (the Atlantic triton's trumpet is also principally collected for its shell). The West Indian top shell occurs in the intertidal zone and is often consumed by locals. A more detailed summary of the available information on the biology and life history of these species can be found in the Council's Caribbean SFA Amendment (CFMC 2005).

5.2.2 Reef Fish

The reef fish FMU was originally established within the Council's Reef Fish Fishery Management Plan (CFMC 1985; 50 FR 34850) implemented in September 1985, and were further modified by Amendment 2 in November 1993 (CFMC 1993; 58 FR 53415) and by the Caribbean SFA Amendment in May 2005. At present, over 137 reef fish species comprise the FMU (four groups are listed at the genus level and there are several species within each of these groups, so the exact number of species comprising the FMU is not fully defined). Of the 137+ species, 55 are associated with the aquarium trade (this includes the four groups listed at the genus level), leaving 82 reef fish species subject to management by the Council. The present amendment addresses the MSRA mandates for at total of five units comprising 21 species of reef fish considered to be overfished and/or undergoing overfishing. Another amendment is under development by the Council to address the remaining 61 species in the FMU. The 21 species in this amendment comprise Snapper Unit 1 (black snapper, *Apsilus dentatus*; blackfin snapper, *Lutjanus buccanella*; silk snapper, *L. vivanus*; and vermilion snapper, *Rhomboplites aurorubens*), Grouper Unit 1 (Nassau grouper, *Epinephelus striatus*), Grouper Unit 2 (goliath grouper, *E. itajara*), grouper Unit 4 (red grouper, *E. morio*; yellowedge grouper, *E. flavolimbatus*; misty grouper, *E. mystacinus*; tiger grouper, *Mycteroperca tigris*; yellowfin grouper, *M. venenosa*) and 10 species of parrotfish (midnight parrotfish, *Scarus coelestinus*; blue parrotfish, *Sc. coeruleus*; striped parrotfish, *Sc. croicensis*; rainbow parrotfish, *Sc. guacamaia*; princess parrotfish, *Sc. taeniopterus*; queen parrotfish, *Sc. vetula*; redband parrotfish, *Sparisoma aurofrenatum*; redtail parrotfish, *Sp. chrysopterum*; redfin parrotfish, *Sp. rubripinne*; stoplight parrotfish, *Sp. viride*). Brief descriptions are provided for two other species of reef fish because proposed management measures may include them, which would require their addition to the Caribbean Council's Reef Fish FMU: cardinal snapper, *Pristipomoides macrophthalmus* and black grouper, *Mycteroperca bonaci*. Many other fishes have distribution that overlap the targeted assemblage, compete for resources, and may be directly (e.g., Snapper Units 3 and 4), and/or indirectly affected by the proposed management measures. Brief descriptions of attributes for those species can be found in the Caribbean SFA Amendment (CFMC 2005) and are hereby incorporated by reference.

5.2.2.1 Grouper, hind, and sea bass, Serranidae

The Serranidae family contains 449 species in 62 genera, distributed in tropical and temperate oceans across the globe. These species are monoecious, with some functional hermaphrodites (Nelson 1994 in Froese and Pauly 2002). Protogynous hermaphroditism is known to occur in several species of grouper, although in related serranids synchronous hermaphroditism is also encountered. A broad overlap of the length distributions of the sexes is encountered in most species and suggests that there is no close correlation of age or size with sexual transition (Thompson and Munro 1974a). Seven genera are represented in the Caribbean reef fish fishery management unit: *Epinephelus*, *Mycteroperca*, *Hypoplectrus*, *Liopropoma*, *Paranthias*, *Rypticus*, and *Serranus*. Many grouper, but especially the largest *Epinephelus* species, appear to be the resident apex predators of the reef systems that they inhabit (Huntsman et al. 1999). Except for annual spawning aggregations, most species are solitary fishes and tagging studies have shown that grouper are generally resident on a particular reef for long periods of time (often years). This specificity to home range and spawning aggregation sites and the relatively slow growth rate of grouper make them particularly vulnerable to over-fishing (Heemstra and Randall 1993).

5.2.2.1.1 Yellowedge grouper, *Epinephelus flavolimbatus*

The yellowedge grouper occurs in the Western Atlantic, ranging from North Carolina (USA) to southern Brazil, including the Gulf of Mexico and the Caribbean Sea. Its flesh is considered to be of good quality, and is marketed fresh. It is taken in both commercial and recreational fisheries (Heemstra and Randall 1993).

A solitary and demersal species, the yellowedge grouper occurs in rocky areas and on sand mud bottom, ranging from 64-275 m (210-892 ft) depth. On soft bottoms, the yellowedge grouper is often seen in or near trenches or burrow-like excavations. This fish is of low resilience in rebuilding from low abundance, with a minimum population doubling time of 4.5 - 14 years (K= 0.10; t_{max}=35). Maximum reported size is 115 cm (45 inches) TL (male); maximum weight, 18.6 kg (41 pounds; Heemstra and Randall 1993). Estimated size at maturity and age at first maturity are 50.5 cm (20 inches) TL and 6.2 years, respectively (Froese and Pauly 2002). In the northeastern Caribbean, individuals in spawning condition have been observed in April (Erdman 1976). Spawning is reported to occur during April through October in the South Atlantic (Keener 1984) and May through September in the Gulf of Mexico (Bullock et al. 1996). Maximum reported age is 32 years (Heemstra and Randall 1993). Natural mortality rate is estimated at 0.20 (Ault et al. 2002). It feeds on a wide variety of invertebrates (mainly brachyuran crabs) and fishes (Heemstra and Randall 1993). *Epinephelus flavolimbatus* is listed as “vulnerable” by Ferreira and Peres (2008) owing to an overall 30 percent decline from fisheries catch data throughout much of its range, although catch data suggests much higher declines in some areas. Generation length has been assumed during the assessment as 10 yrs (most certainly an underestimate) and the general biological characteristics of the species, including longevity, formation of aggregations for spawning, and its high desirability in regional fisheries, combined with a lack of effective management of multi-species fisheries in much of the region and pressure on such stocks predicted to increase, make this a vulnerable species. The yellowedge grouper has been managed under a seasonal closure (spawning months) in federal waters since 2005 and in the USVI since 2006 (February through April). Puerto Rico has not implemented a seasonal closure for the species.

5.2.2.1.2 Goliath grouper, *Epinephelus itajara*

The goliath grouper, formerly known as the "jewfish," occurs in the Western and Eastern Atlantic, and in the Eastern Pacific Ocean. In the Western Atlantic, its range extends from
Florida (USA) to southern Brazil, including the Gulf of Mexico and the Caribbean Sea. Considered to be of excellent quality, its flesh is marketed both fresh and salted. It is targeted in both commercial and recreational fisheries (Heemstra and Randall 1993). But the take and possession of the goliath grouper has been prohibited in both federal and state waters of the USVI since 1993 and 1990, respectively. Puerto Rico implemented new regulations on March 12, 2004, to prohibit the possession or sale of goliath grouper. In many areas of the Caribbean, this species and most of the larger grouper are considered ciguatoxic.

A solitary species, the goliath grouper inhabits rock, coral, and mud bottom habitats from shallow inshore areas to depths of 100-150 m (328-482 ft.; Heemstra and Randall 1993, NMFS 2001a). Juveniles are generally found in mangrove areas and brackish estuaries. Large adults also may be found in estuaries. They appear to occupy limited home ranges with little inter-reef movement (Heemstra and Randall 1993).

This species is of low resilience, with a minimum population doubling time of 4.5 - 14 years (K=0.13; tm=5.5-6.5). Maximum reported size is 250 cm TL (98 inches; male); maximum weight, 455 kg (1003 pounds; Heemstra and Randall 1993). NMFS (2001a) reports that males generally range in size between 80-210 cm TL; females, from 30-220 cm (12-87 inches). Estimated size at maturity and age at first maturity are 98 cm TL and 4.3 years, respectively (Froese and Pauly 2002). In the eastern Gulf of Mexico, males were found to mature at 110-115 cm (43-45 inches) TL, and females at 120-135 cm (47-53 inches) TL (Bullock et al. 1992), at approximately 6 years of age. Ault et al. (2002) estimate natural mortality rate to be 0.13. Fish taken from exploited populations range to 37 years of age. But it is likely that this species could live much longer than 40 years if left unexploited (NMFS 2001a).

This species exhibits definite or strongly suggestive indications of sex reversal (protogynous hermaphrodite) (Thompson and Munro 1974a). It forms consistent aggregations (always containing the largest, oldest individuals in the population), but only during the spawning season (Coleman et al. 2000). Aggregations off Florida declined in the 1980s from 50-100 fish to less than 10 per site. Since the harvest prohibition, aggregations have rebounded somewhat to 20-40 fish per site. Spawning in that area occurs in July through September over full moon phases. Fish may move up to 100 km from inshore reefs to the offshore spawning aggregations in numbers of up to 100 or more on ship wrecks, rock ledges, and isolated patch reefs along the southwest coast (NMFS 2001a). In the northeastern Caribbean, individuals in spawning condition have been observed in July and August (Erdman 1976). Bullock et al. (1992) reported that goliath grouper spawn during June through December with a peak in July to September in the eastern Gulf of Mexico.

This fish feeds primarily on crustaceans, particularly spiny lobsters, as well as turtles and fishes, including stingrays.

5.2.2.1.3 Red grouper, *Epinephelus morio*

The red grouper occurs in the Western Atlantic, ranging as far north as Massachusetts (USA) to southern Brazil, including the Gulf of Mexico and Caribbean Sea. This species is taken in both commercial and recreational fisheries, and is utilized in the aquarium trade. It is marketed both fresh and frozen (Heemstra and Randall 1993).

A sedentary species, the red grouper is usually found resting on rocky and muddy bottoms, from 5-300 m (16-984 ft) depth. It is uncommon around coral reefs. Juveniles can be found in shallow water, but adults are usually taken in waters deeper than 60 m (197 ft). This fish is of low resilience, with a minimum population doubling time of 4.5 - 14 years (K=0.1-0.18; t_m=4-6; t_{max}=25; F_{ec}=1.4 million). It is a protogynous hermaphrodite. Maximum reported size is of male fish is 125 cm (49 inches) total length (TL); maximum weight, 23 kg (51 pounds). The world record for hook and line is 17.7 pounds, from Cape Canaveral, Florida (Heemstra and Randall 1993). Size at maturity and age at first maturity are estimated as 47.1 cm (19 pounds) TL and 5.2 years, respectively (Froese and Pauly 2002). Most females transform to males between ages 7 to 14. Maximum reported age is 25 years (Heemstra and Randall 1993). Estimated natural mortality rate is 0.18 (Ault et al. 1998). In the northeastern Caribbean, individuals in spawning condition have been observed from February through May (Erdman 1976). It feeds on a wide variety of fishes and invertebrates (Heemstra and Randall 1993). Although the species has been considered to be rare in commercial catches, large individuals have been reported from the USVI (D. Berry, USVI commercial fisher, pers. comm.). Red grouper have been managed under a seasonal closure (spawning months) in federal waters since 2005 and in the USVI since 2006 (February through April). Puerto Rico has not implemented a seasonal closure for the species.

5.2.2.1.4 Misty grouper, *Epinephelus mystacinus*

The misty grouper occurs in both the Western and Eastern Atlantic Ocean. In the Western Atlantic, it ranges from Bermuda and North Carolina (USA) to Mexico, including the Gulf of Mexico and Caribbean Sea. This species is taken in both commercial and recreational fisheries, and is marketed fresh (Heemstra and Randall 1993).

The misty grouper is a solitary, bathydemersal, deep-water species, ranging from 30-400 m depth. Juveniles occur in shallower waters. Virtually nothing is known about the age, growth, and reproduction of this species. Maximum reported sizes are 160 cm (63 inches) TL and 100 cm (39 inches) TL for males and females, respectively. Maximum reported weight is 107 kg (236 pounds; Heemstra and Randall 1993). Estimated size at maturity is 81.1 cm (32 inches) TL; natural mortality rate, 0.14 (Froese and Pauly 2002). In the northeastern Caribbean, individuals in spawning condition have been observed in January, April, August, and November (Erdman 1976). Prey items include fishes, crustaceans, and squids (Heemstra and Randall 1993). Misty grouper is part of GU4, however, it is not managed under a seasonal closure (spawning months) in federal and state waters, as the other species in this group.

5.2.2.1.5 Nassau grouper, *Epinephelus striatus*

The Nassau grouper occurs in the tropical Western Atlantic, ranging from Bermuda, the Bahamas, and Florida (USA) to southern Brazil. It is not known from the Gulf of Mexico, except at the Campeche Bank off the coast of Yucatan, at Tortugas, and off Key West. This species is a popular food fish and also is utilized in the aquarium trade (Heemstra and Randall 1993). However, the take and possession of Nassau grouper has been prohibited in federal waters since 1990. Furthermore, Puerto Rico implemented new regulations on March 12, 2004, to prohibit the possession or sale of Nassau grouper and the USVI implemented new regulations in 2006. Olsen et al. (1984) report that Nassau grouper can be ciguatoxic.

The Nassau grouper occurs from the shoreline to at least 90 m depth. It is a sedentary, and reef associated species, usually encountered close to caves; although juveniles are common in seagrass beds (Heemstra and Randall 1993). Adults lead solitary lives outside of spawning aggregations (NMFS 2001b).

This fish is of low resilience, with a minimum population doubling time of 4.5 - 14 years (Musick et al. 2000 in Froese and Pauly 2002). Maximum reported size is 122 cm (48 inches) TL (male); maximum weight, 25 kg (55 pounds; Heemstra and Randall 1993). Size at maturity and age at first maturity are estimated as 47.5 cm (18 inches) TL and 6.9 years, respectively. Approximate life span is 31.9 years (Froese and Pauly 2002); maximum reported age, 16 years (Heemstra and Randall 1993). Ault et al. (1998) estimate natural mortality rate to be 0.18.

This fish was initially characterized as a protogynous hermaphrodite. But recent investigations of histological and demographic data, and the nature of the mating system, indicates that Nassau grouper may not be strictly protogynous. Thus, it has been characterized as gonochoristic (separate sexes), with a potential for sex change (NMFS 2001b). One study reported 785,101 eggs for a specimen of 35.8 cm (14 inches) SL (Thompson and Munro 1974a).

The Nassau grouper aggregates to spawn at specific times and locations each year (Coleman et al. 2000; Sadovy et al. 1994), reportedly at some of the same sites utilized by the tiger, yellowfin, and black grouper (Sadovy et al. 1994). Concentrated aggregations of a few dozen (NMFS 2001b) up to 30,000 Nassau grouper have been reported from the Bahamas, Jamaica, Cayman Islands, Belize, and the Virgin Islands (Heemstra and Randall 1993). Spawning aggregations composed of about 2000 individuals have been documented north and south of St. Thomas, USVI, at 10-40 m (33-131 ft) depth, from December through February, around the time of the full moon (Rielinger 1999).

According to NMFS (2001b), spawning aggregations occur in depths of 20-40 m (66-131 ft) at specific locations of the outer reef shelf edge always in December and January around the time of the full moon in waters 25-26 degrees C (77-79 degrees F). Thompson and Munro (1974a) indicate that the spawning season probably extends from January to April in Jamaican waters. They report that spawning aggregations lasting up to two weeks have been encountered annually during late January to early February around the Cayman Islands (Thompson and Munro 1974a). In the northeastern Caribbean, individuals in spawning condition have been observed in March (Erdman 1976).

It is a top-level predator. Juveniles feed mostly on crustaceans, while adults (>30 cm; >12 inches) forage alone, mainly on fish (NMFS 2001b), but also on crabs and, to a lesser extent, other crustaceans and mollusks (Heemstra and Randall 1993).

5.2.2.1.6 Black grouper, *Mycteroperca bonaci*

Black grouper occur in the Western Atlantic from Bermuda and Massachusetts to southern Brazil, including the southern Gulf of Mexico, Florida Keys, Bahamas, Cuba, and throughout the Caribbean (Bullock and Smith 1991, Brulé et al. 2003). Black grouper are found on rocky substrates including ledges and outcrops, and on coral reefs, in depths from 10 to at least 100 m (33 to 330 ft; Brulé et al. 2003). Black grouper commonly occupy habitats with substantial relief such as spur-and-groove coral reefs (Sluka et al. 1998, 2001), and during most of the year appear to exhibit considerable site fidelity (Lindholm et al. 2005). However, they may expand their home range when forming spawning aggregations, generally during winter and early spring (Eklund et al. 2000). These spawning aggregations may be spatially confined (100 m^2 (1,076 ft^2) area or less) and occur over the deep forereef slope rather than within the reef itself, thereby expanding the domain of essential habitat characteristic of the species (Eklund et al. 2000).

Black grouper have a grayish or dark brown head. The body is similarly colored but has close-set, irregular spots which join to form chain-like horizontal streaks. The upper side of the body sometimes has 7 or 8 columns of rectangular dark blotches, the first above the opercle and the last on the caudal peduncle. The pectoral, soft dorsal, and anal fins are dusky brown but become orange at their margins. Black grouper attain at least 133 cm (52 inches) total length and a weight of 65 kg (143 pounds). Mowbray (1950) reported that *M. bonaci* at Bermuda attain a weight of 81 kg (179 pounds).

Adult black grouper feed primarily on fishes (Randall 1967) and juveniles prey mainly on crustaceans (Thompson and Munro 1978, Bullock and Smith 1991).

Smith (1959) presented evidence for protogynous hermaphroditism in this species. Bullock and Smith (1991) reported ripe females of 50 to 100 cm (20 to 40 inches) and ripe males 96 to 116 cm (39 to 46 inches) from the Gulf of Mexico. The population is primarily female at sizes below 110 cm (43 inches) and primarily male at sizes above 115 cm (45 inches) with an overall sex ratio of 1 male to every 4 females (Brulé et al. 2003). Specimens in spawning condition were caught on the Campeche Bank in July and August (Smith 1961) but have been reported throughout the year in the southern Gulf of Mexico (Brulé et al. 2003). As noted above, black grouper form spawning aggregations beginning in January and gradually dissipating into the early spring (Eklund et al. 2000), with peak gonadosomatic index in January and February (Brulé et al. 2003). Black grouper has been managed under a seasonal closure (spawning months) in federal waters since 2005 and in the USVI since 2006 (February through April).

Black grouper is one of the most important species harvested in Bermuda and also in the southern Gulf of Mexico, Cuba, and the east coast of Venezuela.

5.2.2.1.7 Yellowfin grouper, *Mycteroperca venenosa*

The yellowfin grouper occurs in the Western Atlantic, ranging from Bermuda to Brazil and Guianas, including the Gulf of Mexico and Caribbean Sea. This species is taken in both commercial and recreational fisheries, and also is utilized in the aquarium trade. Although often implicated in ciguatera poisonings, it is a desirable food fish. Even large (5-10 kg; 11-22 pounds) fish taken from areas that are considered to be safe are sold in markets (Heemstra and Randall 1993).

The yellowfin grouper occurs from 2-137 m (7-450 ft) depth. Juveniles are commonly found in shallow turtle grass beds; adults, on rocky and coral reefs. This fish is of low resilience, with a minimum population doubling time of 4.5 - 14 years (K = 0.09-0.17; t_{max} = 15; Fecundity = 400,000). Maximum reported size is 100 cm TL (male); maximum weight, 18.5 kg (41 pounds; Heemstra and Randall 1993). Size at maturity and age at first maturity are estimated as 45.6 cm (18 inches) TL and 3.7 years, respectively. Approximate life span is 16.9 years; natural mortality rate, 0.18 (Ault et al. 1998). This fish is believed to be a protogynous hermaphrodite. One studied specimen contained a total of 1,425,443 eggs (Thompson and Munro 1974a). The yellowfin grouper reportedly aggregates at some of the same sites utilized by the tiger, Nassau, and black grouper (Sadovy et al. 1994). Three spawning aggregation sites have been documented off the USVI. Sites located north and south of St. Thomas are utilized from February through April. A third site located in the USVI National Park off St. John, USVI, is utilized year-round. Individuals aggregating at that site number about 200 (Rielinger 1999). Spawning has been observed in Puerto Rican waters in March. Most spawning appears to occur in Jamaican waters between February and April (Thompson and Munro 1974a). It feeds mainly on fishes (mostly on coral reef species) and squids (Heemstra and Randall 1993). The yellowfin grouper has been managed under a seasonal closure (spawning months) in federal waters since 2005, the USVI since 2006 and in Puerto Rico since 2010 (February through April). Additionally, the known spawning aggregation site, Grammanik Bank off St. Thomas, has been protected under a seasonal area closure since 2004.

5.2.2.1.8 Tiger grouper, *Mycteroperca tigris*

The tiger grouper occurs in the Western Atlantic, ranging from Bermuda and south Florida (USA) to Venezuela and, possibly, Brazil, including the Gulf of Mexico and Caribbean Sea. Easily approached, this species is taken in commercial fisheries and also is utilized in the aquarium trade (Heemstra and Randall 1993). Dammann (1969) reports that tiger grouper can be ciguatoxic.

A solitary species, the tiger grouper inhabits coral reefs and rocky areas, from 10-40 m (33-131 ft) depth. This fish is of low resilience, with a minimum population doubling time of 4.5 - 14 years (K=0.11; tm=6.5-9.5). Maximum reported size is 101 cm (40 inches) TL (male); maximum weight, 10 kg (22 pounds; Heemstra and Randall 1993). Size at maturity and age at first maturity are estimated as 39.9 cm (16 inches) TL and 5.8 years, respectively. Approximate life span is 26 years; natural mortality rate, 0.116 (Ault et al. 2002). The size-sex ratios described in a Bermuda study indicate this fish is probably a protogynous hermaphrodite (Heemstra and Randall 1993). It forms aggregations at specific times and locations each year, but only during the spawning season (Coleman et al. 2000, Matos-Caraballo and Posada 1998). A presumptive courting group of three tiger groups also has been observed off the Bahamas, indicating that courtship also may occur in small groups (Sadovy et al. 1994).

One known aggregation site in the U.S. Caribbean is a well-defined promontory of deep reef known as "El Seco," which is located about 4.7 nm (8 km) east of Vieques Island, Puerto Rico. This site was discovered in the early 1980s by a local diver-fisher who also encountered large numbers of yellowfin grouper at the site. The site differs from other aggregation sites described for western Atlantic grouper in that it is relatively level, rather than near a distinct shelf-edge break. Other aggregation sites also have been reported, but not confirmed, including one site north of Vieques Island and another off St. Thomas, USVI. Apparently, both of those sites are used by the yellowfin grouper as well. Aggregating tiger and yellowfin grouper were observed at a site off Guanaja Island, Honduras, that is also used by aggregating Nassau and black grouper (Sadovy et al. 1994).

The "El Seco" tiger grouper aggregation is routinely targeted by fishermen using spear guns and hook and line gear. This fish is only infrequently taken outside of the aggregation season and is not taken by fish traps in the area (Matos-Caraballo and Posada 1998; Sadovy et al. 1994). The aggregation begins about two days after the full moons of February and March and last for about 5-6 days (Matos-Caraballo and Posada 1998). Females taken from the "El Seco" aggregation in 1997 and 1998 averaged 46.2 cm (18 inches) TL and 48.2 cm (19 inches) TL, respectively; males averaged 53.4 cm (21 inches) TL and 54.0 cm (22 inches) TL, respectively. The female to male ratio was 1:6.4 in 1997 and 1:12.0 in 1998 (Matos-Caraballo and Posada 1998). White et al. (2002) reported that spawning aggregations of tiger grouper occur one week following the full moon during January through April off Puerto Rico. The tiger grouper has been managed under a seasonal closure (spawning months) in federal waters since 2005 and in the USVI since 2006 (February through April). Puerto Rico has not implemented a seasonal closure for this species but the landings from the aggregation in Vieques are monitored every year.

The tiger grouper ambushes a variety of fish species, and frequents cleaning stations (Heemstra and Randall 1993). Off the island of Vieques, predation on tiger grouper by sharks at the time of capture is high (one for every six tiger grouper caught during the seasons of 1997 and 1998), and should be considered in the estimation of the number of fish that are being removed, directly or indirectly, from the population (Matos-Caraballo and Posada 1998).

5.2.2.2 Snapper, Lutjanidae

The Lutjanidae family contains 103 species in 17 genera, distributed in the tropical and subtropical Atlantic, Indian, and Pacific Oceans (Nelson 1984). These fishes are generally slow-growing and moderately long-lived. Sexes are separate (Thompson and Munro 1974b). Some species are sequential hermaphrodites, but no indications of hermaphroditism have been observed for Caribbean Council-managed species. Genera represented in the Caribbean reef fish fishery management unit include *Apsilus, Etelis, Lutjanus, Ocyurus, Pristipomoides,* and *Rhomboplites*.

Most species are believed to exhibit sexually dimorphic growth rates and sizes at maturity (Thompson and Munro 1974b). These fishes are generally serial spawners, releasing several batches of eggs over a spawning season that sometimes extends year round (SAFMC 1999). Spawning activity generally peaks in the spring and summer months in the northeastern Caribbean (Erdman 1976). Annual fecundity reportedly ranges from one hundred thousand eggs released by young snapper and smaller species, to millions of eggs released by older snapper and larger species (SAFMC 1999; Thompson and Munro 1974b).

All species have complex life histories, with most dependent on different habitats during the egg, larval, juvenile, and adult phases of their life cycle. Eggs and early larvae are typically pelagic (AFS 2001). No long-lived oceanic larval or post-larval phases have been reported for snapper, as have been reported for many other reef fish families. Thus, they probably have a relatively short planktonic larval or post-larval life (Thompson and Munro 1974b). Larvae settle into various nearshore nursery habitats such as seagrass beds, mangroves, oyster reefs, and marshes (AFS 2001). Very early juvenile stages of snapper are not often seen but do not appear to be as secretive as hinds and grouper (Thompson and Munro 1974b).

Adults are generally sedentary and residential. Movement is generally localized and exhibits an offshore-inshore pattern, usually associated with spawning events. Many species have been reported to form mass spawning aggregations, where hundreds or even thousands of fish convene to reproduce (Rielinger 1999). Other species also aggregate to swim (Froese and Pauly 2002; SAFMC 1999). Generally, larger snapper inhabit deeper areas than smaller snapper, although there are many exceptions.

Juveniles occupying inshore areas generally feed on shrimp, crab, worms and small fish. Fish becomes a more important component of their diet as they grow and move offshore

(SAFMC 1999). On reefs, snapper must certainly compete among themselves for food and space. A 1967 study reported that snapper in the Virgin Islands feed primarily on crabs and fishes, with shrimps, lobsters, gastropods, stomatopods and octopus completing the diet (Thompson and Munro 1974b). Competition with grouper (Serranidae), jacks (Carangidae), moray eels (Muraenidae) and grunts (Pomadasyidae) probably also occurs, although the extent of competition is not known. Predators of juvenile snapper include large carnivorous fishes, such as jacks, grouper, sharks, barracudas, and morays, as well as large sea mammals and turtles (SAFMC 1999). Major reef predators such as sharks, grouper and barracuda are probably the most important predators of adult snapper (Thompson and Munro 1974b).

5.2.2.2.1 Black snapper, *Apsilus dentatus*

The black snapper occurs in the Western Central Atlantic, off the Florida Keys (USA), and in the western Gulf of Mexico and Caribbean Sea. This species is considered to be a good food fish (Allen 1985). But Halstead (1970) reports that black snapper can be ciguatoxic.

A demersal species, the black snapper is primarily found over rocky bottom habitat, although juveniles are sometimes found near the surface (Allen 1985). It moves offshore to deep-water reefs and rocky ledges as it grows and matures (SAFMC 1999). Allen (1985) reports depth range as 100-300 m (328-984 ft). The findings of a Caribbean study indicate that it is most abundant at depths of 60-100 m (197-328 ft) off Jamaica (Thompson and Munro 1974b).

Maximum reported size is 65 cm (26 inches) TL (male). Maximum reported weight is 3,2kg (7 pounds; Allen 1985). Size at maturity and age at first maturity estimated in Froese and Pauly (2002) are 34.9 cm (14 inches) TL and 1 year, respectively. Observed maximum fork lengths (FL) of catches taken in a Jamaican study were 56 cm (22 inches) FL and 54 cm (21 inches) FL for males and females, respectively; estimated mean sizes of maturity, 43-45 cm (17-18 inches) FL and 39-41 cm (15-16 inches) FL for males and females, respectively (Thompson and Munro 1974b). Aida Rosario (PRDNER, pers. comm.) reports that females with ripe gonads were collected from December to May and from August to September, and were collected with the highest frequency in March and September. In the northeastern Caribbean, individuals in spawning condition have been observed from February through April, and in September (Erdman 1976). Thompson and Munro (1974b) report that, off Jamaica, the greatest proportions of ripe fishes were found in January-April and September-November. Approximate life span is 4.4 years; natural mortality rate, 0.30 (Ault et al. 1998). Large catches occasionally obtained over a short period of time suggest a schooling habit for this species (Thompson and Munro 1974b). Prey includes fishes and benthic organisms, including cephalopods, tunicates (Allen 1985), and crustaceans (Thompson and Munro 1974b).

The black snapper is a member of SU1, a unit that has been managed since 2006 under an October through December seasonal closure in both the EEZ and in the territorial waters of St. Thomas/St. John. A similar October-December seasonal closure has been in effect since 2007 in Puerto Rico, but that closure applies only to silk and blackfin snapper.

5.2.2.2.2 Blackfin snapper, *Lutjanus buccanella*

The blackfin snapper occurs in the Western Atlantic, as far north as North Carolina (USA) and Bermuda, south to Trinidad and northern Brazil, including the Gulf of Mexico and Caribbean Sea (Allen 1985). This species is very common in the Caribbean, particularly in the Antilles. It is considered to be a good food fish, but can be ciguatoxic (Allen 1985).

The blackfin snapper is a demersal species, found from 20-200 m (66-656 ft) depth. Adults inhabit deeper waters over sandy or rocky bottoms, and near drop-offs and ledges. Juveniles occur in shallower waters, often between about 35 and 50 m (115-164 ft; Allen 1985), and sometimes in small schools (Thompson and Munro 1974b). Suitable bottom type is probably more important than depth in influencing the distribution of this species. Most fish taken in fish traps during a 1978 survey off Puerto Rico were captured at 75-110 m (246-361 ft) depth (Boardman and Weiler 1979).

This species is moderately resilient, with a minimum population doubling time of 1.4-4.4 years (K = 0.10 - 0.70). Maximum reported size is 75 cm (39 inches) TL (male); maximum weight, 14 kg (31 pounds) Allen 1985). The modal lengths for male and female blackfins taken in the Puerto Rican survey were 26 cm (10 inches) FL and 23 cm (9 inches) FL, respectively. Maximum size was 47 cm FL. Estimated lengths of maturity for females and males were 20 cm (8 inches) FL and 38 cm (15 inches) FL, respectively (Boardman and Weiler 1979). Size at maturity and age at first maturity are estimated in Froese and Pauly (2002) as 34 cm (13 inches) TL and 1.9 years, respectively. Approximate life span is 8.2 years; natural mortality rate, 0.23 (Ault et al. 1998).

The findings of Boardman and Weiler (1979) indicate that spawning occurs year-round in the U.S. Caribbean, in relatively large numbers. In the northeastern Caribbean, individuals in spawning condition have been observed in February, April, and September (Erdman 1976). Ripe fishes have been observed in Jamaican waters in February-May and in August-November, with maxima in April and September (Thompson and Munro 1974b). Allen (1985) identified fishes as the primary prey. Thompson and Munro (1974b) report that the main items in the stomachs of this species taken at the Virgin Islands were isopods (37.5percent) and fish (33.3 percent), with shrimps, spiny lobsters, crabs, octopus and squid making up the rest of the diet. Tunicates have been found in the stomachs of some adults (Thompson and Munro 1974b).

The blackfin snapper is a member of SU1, a unit that has been managed since 2006 under an October through December seasonal closure in both the EEZ and in the territorial waters of St. Thomas/St. John. A similar October-December seasonal closure has been in effect since 2007 in Puerto Rico for this species.

5.2.2.2.3 Silk snapper, *Lutjanus vivanus*

The silk snapper occurs in the Western Atlantic, as far north as Bermuda and North Carolina (USA), southward to central Brazil. It is most abundant around the Antilles and the Bahamas. A good food fish, this species is taken in both commercial and recreational fisheries. It can be ciguatoxic (Allen 1985).

The silk snapper is mainly found from 90-140 m (295-459 ft) depth, commonly near the edge of the continental and island shelves, but also beyond the shelf edge to depths of 300 m (984 ft). Adults are generally distributed further offshore than juveniles (SAFMC 1999), and usually ascend to shallow water at night (Allen 1985). Suitable bottom type is probably more important than depth in influencing the distribution of this species. According to Rivas (1970), silk snapper are the only deep water snapper found over mud substrate in the Western Atlantic. Most fish taken in fish traps during a 1978 survey off Puerto Rico were captured at 112-165 m (368-541 ft) depth. Silk snapper have been reported to school in size groups (Dammann et al.1970). Boardman and Weiler (1979) suggest that silk snapper are commonly associated with blackfin snapper and vermillion snapper, though silk snapper are usually found at a slightly deeper depth.

This species is of low resilience, with a minimum population doubling time of 4.5 - 14 years (K = 0.09-0.32; tm = 5). Maximum reported size is 83 cm (33 inches) TL (male); maximum weight, 8,320 g (18 pounds; Allen 1985). The predominant lengths for males and females surveyed with trap gear in Puerto Rican waters were 29 cm (11 inches) FL and 26 cm (10 inches) FL, respectively, as determined from length-frequency curves. But trap-caught silk snapper tend to be smaller than those caught by hook and line gear. The maximum size of fish taken in that study was 71 cm (28 inches) FL. Females and males appeared to mature at 50 cm (20 inches) FL and 38 cm (15 inches) FL, respectively (Boardman and Weiler 1979). Size at maturity and age at first maturity are estimated in Froese and Pauly (2002) as 43.4 cm (17 inches) TL and 6.3 years, respectively. A Jamaican study estimates mean sizes of maturity as 55-60 cm (22-24 in) FL in males and 50-55 cm (20-22 in) FL in females (Thompson and Munro 1974b). The approximate life span of this fish is 28.7 years; natural mortality rate, 0.23 (Ault et al. 1998). However, Tabash and Sierra (1996) suggested a maximum life span of seven years and estimated an M using Ralston's (1987) method to be 0.86, which was also advocated by the SEDAR process.

The findings of Boardman and Weiler (1979) indicate that this species spawns year-round in the U.S. Caribbean, in low percentages. But the small number of ripe fish observed in that study may have been due to the majority of the catch being smaller than estimated size at maturity. Apparent peaks in spawning in July-September and October-December were probably due to chance collection of spawning groups of a few large fishes (Boardman and Weiler 1979). In the northeastern Caribbean, individuals in spawning condition have been observed from February through April, and in September and November (Erdman 1976). Ripe fishes have been observed off the coast of Jamaica in March-May and August, September and November (Thompson and Munro 1974b).

Prey items include mainly fishes, shrimps, crabs, gastropods, cephalopods, tunicates and some pelagic items, including urochordates (Allen 1985). The main items in the stomachs of fishes captured off the Virgin Islands consisted of fish (50.1 percent), shrimp (17.8 percent), and crabs (11 percent), with isopods and other invertebrate groups completing the diet (Thompson and Munro 1974b).

The silk snapper is a member of SU1, a unit that has been managed since 2006 under an October through December seasonal closure in both the EEZ and in the territorial waters of St. Thomas/St. John. A similar October-December seasonal closure has been in effect since 2007 in Puerto Rico for this species.

5.2.2.2.4 Cardinal snapper, *Pristipomoides macrophthalmus*

Little is known of this relatively deep water snapper. Males have been recorded to reach a length of 50 cm (20 inches) TL with average lengths around 30 cm (12 inches) TL. The estimate of size at first maturity is 18 cm (7 inches) TL. This fish in benthopelagic and occurs at depths ranging from 110 – 550 m (361-1,804 ft; Allen 1985). Most commonly found in deeper waters of the shelf near the edge of the continental slope and feeds on small fishes and larger planktonic animals. Cardinal snapper have been recorded to occur in the Western Central Atlantic, Straits of Florida, Bahamas, Greater Antilles, and the Caribbean coast of Nicaragua and Panama. It is distinguished from other snapper by possessing 10 dorsal spines, 11 dorsal soft rays, 3 anal spines, and 8 anal soft rays. The species is described as having a large eye and a short and blunt snout. Its pectoral fins are long, extending to the level of anus. The scale rows on back are parallel to lateral line. The back and upper sides are pink-red with a silvery sheen, grading to silvery ventrally; the fins are translucent to pink. It supports a minor commercial fishery. This species is harvested with the queen snapper (*Etelis oculatus*) of SU2 (E. Piñeiro, PR commercial fisher, pers. comm.). The identification of the species has been confirmed by A. Rosario (PRDNER, pers. comm.).

5.2.2.2.5 Wenchman, *Pristipomoides aquilonaris*

The wenchman occurs in the western Atlantic, ranging from North Carolina to Guiana, including the Caribbean Sea. Although considered to be a good food fish, this species is believed to be of minor importance to commercial fisheries (Allen 1985). Olsen et al. (1984) report that wenchman can be ciguatoxic.

The wenchman is a demersal species, found from 24-370 m (79-1214 ft) depth. Maximum reported size is 56 cm (22 in) TL, and males are generally the larger of the two sexes; maximum weight, 1,990 g (4.4 pounds) (Allen 1985). Size at maturity is estimated as 32 cm (13 in) TL; natural mortality rate, 0.44 (Froese and Pauly 2002). Its diet is composed primarily of small fishes (Allen 1985).

This species, as part of SU1 if the change is approved with this amendment, has been part of SU2 (in the same management unit as the queen snapper) and there has been no management in place in the U.S. Caribbean.

5.2.2.2.6 Vermilion snapper, *Rhomboplites aurorubens*

The vermilion snapper occurs in the western Atlantic, ranging from Bermuda and North Carolina to Brazil and including the Gulf of Mexico and the Caribbean Sea (Allen 1985).

The vermilion snapper is a demersal species, commonly found over rock, gravel, or sand bottoms near the edge of the continental and island shelves (Allen 1985). Suitable bottom type is probably more important than depth in influencing the distribution of this species (Boardman and Weiler 1979). According to Allen (1985), this fish is found in moderately deep waters from 180-300 m (591-984 ft). But most fish taken in fish traps during a 1978 survey off Puerto Rico were captured at 75-110 m (246-361 ft) depth (Boardman and Weiler 1979). Vermilions often form large schools; particularly the young, which generally occur at shallower depths (Allen 1985).

This fish is moderately resilient, with a minimum population doubling time of 1.4 - 4.4 years (K = 0.20; tm = 3; t_{max} = 10; Allen 1985). Maximum size and weight reported by Allen (1985) is 60 cm (24 inches) TL (male) and 3,170 g (7 pounds), respectively. The modal length of both males and females collected in a three-year fish trap survey in Puerto Rican waters was 23 cm (9 inches) FL; maximum size, 38 cm (15 inches). Size at maturity was 14 cm (5.5 inches) FL (males) and 20 cm (8 inches) FL (females) (Boardman and Weiler 1979). Size at maturity and age at first maturity for this species are estimated in Froese and Pauly (2002) as 34.5 cm (14 inches) TL and 3.3 years, respectively. Maximum reported age is 10 years (Allen 1985); natural mortality rate, 0.23 (Ault et al. 1998).

According to Boardman and Weiler (1979), this fish spawns year-round in the U.S. Caribbean and in relatively large numbers. Erdman (1976) reports that the majority of fishes collected off the south coast of Puerto Rico in February, March, April, and June had sub-ripe or ripe gonads. A study off Jamaica captured one active male during May, and one ripe and three active females during October (Thompson and Munro 1974b). Prey items include fishes, shrimps, crabs, polychaetes, other benthic invertebrates, cephalopods, and planktonic organisms (Allen 1985).

The vermilion snapper is a member of SU1, a unit that has been managed since 2006 under an October through December seasonal closure in both the EEZ and in the territorial waters of St. Thomas/St. John. A similar October-December seasonal closure has been in effect since 2007 in Puerto Rico, but that closure applies only to silk and blackfin snapper.

5.2.2.3 Parrotfish, Scaridae

The family Scaridae contains 83 species in 9 genera, distributed in the Atlantic, Indian, and Pacific Oceans (Nelson 1994 in Froese and Pauly 2002). The 10 species in the Caribbean reef fish fishery management unit belong to one of two genera: *Scarus* or *Sparisoma*. All these species are marketed for food and landings are increasing as other traditionally marketed species decline and market demand increases. In St. Croix, parrotfish are considered to be an important component of the commercial fishing sector and this group often represents the highest level of finfish landings on the island. With the exception of the midnight parrotfish, *Scarus coelestinus*, all are utilized in the aquarium trade (Sadovy 1991).

Parrotfish are tropical shallow-water fishes, which commonly occur on or adjacent to coral reef habitat, but also can be found over rocky shores and substrates. They have a tendency to exhibit residential behavior for variable periods of time, but may move over distances of up to several hundred meters during feeding (Reeson 1975). These fishes are herbivores. Most species feed on algae scraped from dead coral substrates. The common practice of consuming and crushing bits of rock along with the algae to aid in the digestive process make these fishes some of the most important producers of sand on coral reefs (Nelson 1994 in Froese and Pauly 2002).

Parrotfish are diurnally active, feeding during the day and resting at night. They tend to aggregate in shallow waters near dusk, then move to deeper areas before nightfall. Mixed species aggregations may occur, or the schools may also contain representatives of other families. For example, it is common around Jamaica to find members of the Surgeonfish (Acanthuridae), Goatfish (Mullidae), Grunt (Pomadasyidae) and Wrasse (Labridae) families in association with the usually numerically dominant striped parrotfish (*Scarus croicensis*) (Reeson 1975).

Many species undergo sex reversal, with an initial phase of both males and females, and the latter changing into a brilliantly colored male terminal phase. Terminal males dominate several females. These fishes are pelagic spawners (Nelson 1994 in Froese and Pauly 2002); some spawn in pairs; others in small groups or aggregations (Reeson 1975). Juveniles are present in the northeastern Caribbean year-round (Erdman 1976). Moray eels are believed to be important predators. Other predators include grouper, jacks, and snapper (Reeson 1975). With the exception of the midnight parrotfish, all species in the Caribbean fishery management unit have been known to cause ciguatera poisoning.

High landings of parrotfish, most prominently in St. Croix, were reported by fishers using nets (gill and trammel nets). These gears were banned from the U.S. Caribbean EEZ in 2005. The USVI also banned the use of trammel and gill nets in the Territory in 2006. Puerto Rico regulated the length and the mesh size of nets in 2004. Parrotfish are also harvested using traps and for this gear the regulations of mesh size, the use of biodegradable material and the requirement of an escape panel are the same throughout the U.S. Caribbean.

5.2.2.3.1 Midnight parrotfish, *Scarus coelestinus*

The midnight parrotfish occurs in the western Atlantic, ranging from Bermuda to Brazil and including the Caribbean Sea (Robins and Ray 1986).

The midnight parrotfish occurs from rocky coastal reefs to seaward reefs, in depths of 5-75 m (16-246 ft). It is often encountered in schools, feeding on algae along with surgeonfishes. Maximum reported size is 77 cm (30 inches) TL (male); maximum weight, 7,000 g (15 pounds; Robins and Ray 1986). The midnight parrotfish has been observed to spawn in pairs. A Jamaican study reported that the highest proportion of active and ripe fishes was confined to the period between January and May. Spawning appears to be confined to the warmer months of the year in Bermuda (Reeson 1975). The midnight parrotfish, along with the blue and rainbow, is one of the largest species of parrotfish.

5.2.2.3.2 Blue parrotfish, *Scarus coeruleus*

The blue parrotfish occurs in the western Atlantic, ranging from Maryland and Bermuda to Brazil, including the Caribbean Sea (Robins and Ray 1986).

The blue parrotfish inhabits coral reef habitat, occurring from 3-25 m (10-82 ft) depth. Juveniles are found on seagrass (*Thalassia*) beds. Maximum reported size is 120 cm (47 inches) TL (male) (Robins and Ray 1986). Estimated size at maturity is 62.9 cm (25 inches) TL; natural mortality rate, 0.43 (Froese and Pauly 2002). This fish is known to form large spawning aggregations (Robins and Ray 1986). In Jamaican waters, the highest proportion of active and ripe fishes occurs between January and May (Reeson 1975). Dietary items include benthic plants and small organisms in the sand (Robins and Ray 1986).

5.2.2.3.3 Rainbow parrotfish, *Scarus guacamaia*

The rainbow parrotfish occurs in the western Atlantic, ranging from Bermuda to Argentina and including the Caribbean Sea (Robins and Ray 1986).

The rainbow parrotfish is found from 3-25 m (10-82 ft) depth. Juveniles are commonly encountered in mangrove areas. It inhabits a home cave at night and when threatened. Maximum reported size is 120 cm (47 inches) TL (male); maximum weight, 20 kg (44 pounds; Robins and Ray 1986). Estimated size at maturity is 62.9 cm (25 inches) TL; natural mortality rate, 0.43 (Froese and Pauly 2002). In Jamaican waters, the largest proportion of active and ripe fish appears to be confined to the period between January and May (Reeson 1975). In the northeastern Caribbean, individuals in spawning condition have been observed in June and July (Erdman 1976). This fish feeds primarily on benthic algae (Robins and Ray 1986).

5.2.2.3.4 Striped parrotfish, *Scarus croicensis*

The striped parrotfish occurs in the western Atlantic, ranging from Bermuda to northern South America (and possibly Brazil) and including the Gulf of Mexico and Caribbean Sea (Böhlke and Chaplin 1993).

The striped parrotfish is found in shallow, clear, waters from 3-25 m (10-82 ft) depth. It is a schooling species, and generally occurs over seagrass (*Thalassia*) beds, but also is found in rocky or coral areas. Maximum reported size is 35 cm (14 inches) TL (male)

(Böhlke and Chaplin 1993). Size at maturity is estimated in Froese and Pauly (2002) as 21.2 cm (8 inches) TL; natural mortality rate, 0.61. A study conducted in Bermuda reports that males mature at 11-13 cm (4-5 inches) SL and females at 9-10 cm (3-4 inches) SL (Reeson 1975). Supermales spawn individually with striped females, while sexually mature males in the striped phase spawn in aggregations (Böhlke and Chaplin 1993) of up to 400 individuals (Reeson 1975). One spawning aggregation site has been documented off the southwest coast of Puerto Rico. Striped parrotfish have been observed to spawn at that site in winter months at about 20-30 m (66-98 ft) depth (Rielinger 1999). This species has been observed to spawn in the Virgin Islands in February, March, April, June, and August. Deeper reef fronts (15-20 m; 49-66 ft) appear to be the focal points for spawning groups. It has been observed to migrate daily among specific routes (Reeson 1975). It feeds on plants (Böhlke and Chaplin 1993).

5.2.2.3.5 Princess parrotfish, *Scarus taeniopterus*

The princess parrotfish occurs in the western Atlantic from Bermuda to Brazil and throughout the Caribbean Sea (Robins and Ray 1986).

The princess parrotfish is found on coral or rock bottoms, from 2-25 m (7-82 ft) depth. Juveniles often occur in association with seagrass (*Thalassia*). Maximum reported size is 35 cm (14 inches) TL (male) (Robins and Ray 1986). Size at maturity is estimated as 21.2 cm (8 inches) TL; natural mortality rate, 0.88 (Froese and Pauly 2002). This species appears to spawn throughout the year in Jamaican waters, with the highest proportion of ripe fishes occurring in December and January (Reeson 1975). It feeds on plants in large aggregations, and sleeps in a mucus cocoon (Robins and Ray 1986).

5.2.2.3.6 Queen parrotfish, *Scarus vetula*

The queen parrotfish occurs in the western Atlantic from Bermuda to northern South America and throughout the Caribbean Sea (Robins and Ray 1986).

The queen parrotfish inhabits coral reefs and adjacent habitats from 3-25 m (10-82 ft) depth. It is often observed in groups of one supermale with several young adults, most of which are believed to be females. Maximum reported size is 61 cm (24 inches) TL (male) (Robins and Ray 1986). Size at maturity and age at first maturity are estimated as 30.6 cm (12 inches) TL and 1.1 years, respectively. Approximate life span is 4.8 years; natural mortality rate, 1.05 (Froese and Pauly 2002). In the northeastern Caribbean, individuals in spawning condition have been observed in January, February, May, June, and August (Erdman 1976). Spawning pairs have been observed in August and January off the Virgin Islands and Puerto Rico, respectively (Reeson 1975). The queen parrotfish feeds on algae and sleeps in a mucus cocoon (Robins and Ray 1986).

5.2.2.3.7 Redband parrotfish, *Sparisoma aurofrenatum*

The redband parrotfish occurs in the western Atlantic from Bermuda to Brazil and throughout the Caribbean Sea (Robins and Ray 1986).

The redband parrotfish inhabits coral reefs, occurring from 2-20 m (7-66 ft) depth. Juveniles are usually found in adjacent seagrass beds. It is often observed resting on the sea bottom, either solitary or in small groups. This species is moderately resilient, with a minimum population doubling time of 1.4 - 4.4 years (K=0.20). Maximum reported size is 28 cm (11 inches) TL (male) (Robins and Ray 1986). Size at maturity is estimated as 17.4 cm (7 inches) TL; natural mortality rate, 1.14 (Froese and Pauly 2002). Reeson (1975) reports that spawning has been observed to occur off the Virgin Islands in the months of March, April, June, and August. Individuals have also been observed in spawning condition in the northeastern Caribbean during February and December (Erdman 1976). Ripe fishes have been caught in both the nearshore and offshore environment, and pair spawning has been observed (Reeson 1975). The redband parrotfish feeds on plants (Robins and Ray 1986).

5.2.2.3.8 Redtail parrotfish, *Sparisoma chrysopterum*

The redtail parrotfish occurs in the western Atlantic from southern Florida to Brazil and throughout the Caribbean Sea (Robins and Ray 1986).

The redtail parrotfish occurs in coral reefs and adjacent habitats to depths of 15 m (49 ft). Juveniles most commonly inhabit seagrass beds. Maximum reported size is 46 cm (18 inches) TL (male) (Robins and Ray 1986). Size at maturity and age at first maturity are estimated in Froese and Pauly (2002) as 23.9 cm (9 inches) FL and 0.9 years, respectively; approximate life span, 3.6 years. Estimated size at 50 percent maturity based on fishery independent and dependent data collected from Puerto Rican waters is 23.5 cm (9 inches) FL (females). Transitional fish ranged from 20.1 cm FL to 24.8 cm FL (Figuerola Fernández and Torres Ruiz 1997). No estimate of natural mortality rate is available for this species. Spawning period is protracted. According to Figuerola Fernández and Torres Ruiz (1997), no peaks are apparent in the U.S. Caribbean, but spawning activity appears to decrease during the summer (May through August). Data from a Jamaican study indicate that the highest proportion of active and ripe fishes occurs between January and May (Reeson 1975). The redtail parrotfish feeds on benthic algae and seagrasses (Robins and Ray 1986).

5.2.2.3.9 Redfin parrotfish, *Sparisoma rubripinne*

The redfin parrotfish occurs in both the eastern and western Atlantic. In the western Atlantic, this species ranges from Massachusetts to Brazil and throughout the Caribbean Sea. It is apparently absent in the Gulf of Mexico (Randall 1990).
The redfin parrotfish inhabits coral reefs and seagrass beds to depths of 15 m (49 ft). Maximum reported size is 47.8 cm (19 inches) TL (male) (Randall 1990). Size at maturity and age at first maturity are estimated as 28.3 cm (11 inches) TL and 1.2 years, respectively. Approximate life span is 4.9 years; natural mortality rate, 1.05 (Froese and Pauly 2002). Spawning usually occurs in small groups (Randall 1990), but also in pairs. Deeper reef fronts (15-20 m; 49-66 ft)) appear to be the focal points for spawning groups. Data collected in a Jamaican study indicate that the highest proportion of active and ripe

fishes occurs between January and May. Ripe males and females have been collected in all months of the year off the Virgin Islands (Reeson 1975). The redfin parrotfish feeds on benthic algae and seagrasses (Randall 1990).

5.2.2.3.10 Stoplight parrotfish, *Sparisoma viride*

The stoplight parrotfish occurs in the western Atlantic from southern Florida to Brazil and throughout the Caribbean Sea (Cervigón et al. 1992).

The stoplight parrotfish inhabits clear water coral reefs, occurring from 3-49 m (10-161 ft) depth. Juveniles may be found in seagrass beds and other heavily vegetated bottoms. This species is strictly diurnal, and spends the night resting on the sea bottom. It occurs singly or in small groups. Maximum reported size is 64 cm (25 inches) TL (male); maximum weight, 1,600 g (3.5 pounds). This fish is a protogynous hermaphrodite, functioning first as a female and, later, as a male (Cervigón et al. 1992). Size at maturity is estimated in Froese and Pauly (2002) as 36.1 cm (14 inches) TL; natural mortality rate, 0.66. Size at 50 percent maturity estimated from a survey conducted off Puerto Rico is 20.5 cm (8 inches) FL (females) (Figuerola Fernández and Torres Ruiz 1997). A Bermuda study reports that males mature at 16-20 cm (6-8 inches) SL and females at 16.3 cm (6 inches) SL (Reeson 1975).

Spawning period is protracted. According to Figuerola Fernández and Torres Ruiz (1997), no peaks are apparent in the U.S. Caribbean, but spawning activity appears to decrease during the summer (May through August). Pair spawning has been observed in May off the Virgin Islands (Reeson 1975). This fish feeds primarily on soft algae, but also has been observed to graze on live corals, such as *Montastrea annularis*. It produces a significant amount of sediment through bioerosion using its strong beak-like jaws and constantly regrowing teeth (Cervigón et al. 1992).

5.2.3 Protected Species, Including Threatened and Endangered Species

NOAA Fisheries is responsible for the protection of threatened and endangered species under the Endangered Species Act (ESA) of 1973 and the Marine Mammal Protection Act (MMPA) of 1972. The ESA promotes the protection of the ecosystems on which threatened and endangered species depend and a program for the conservation of threatened and endangered species. ESA-listed species under the purview of NOAA Fisheries that occur in the action area include hawksbill sea turtle (*Eretmochelys imbricata*), green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), humpback whale (*Megaptera novaeangliae*), blue whale (*Balaenoptera musculus*), fin whale (*B. physalus*), sei whale (*B. borealis*), sperm whale (*Physeter macrocephalus*), elkhorn coral (*Acropora palmata*), and staghorn coral (*A. cervicornis*). The MMPA establishes a national policy to prevent marine mammal species and population stocks from declining beyond the point where they cease to be significant functioning elements of the ecosystems of which they are a part. All marine mammals, regardless of their listing status under the ESA, are protected under the Marine Mammal Protection Act.

The National Marine Fisheries Service requested in 2011 a reinitiation of the Section 7 consultation regarding the Reef Fish FMP and Amendment 5 to that FMP. Amendment 5 to the Reef Fish FMP proposes harvest reductions for seven parrotfish species and a prohibition on harvest of three parrotfish species throughout the U.S. Caribbean, as described and discussed in Action 2(a), Action 4(a), Action 4(b), and Action 4(c) of the present document. These harvest regulations respond to the important role that parrotfish play as grazers within coral reef communities, functioning to reduce cover of macroalgae and thereby increase the availability of critical settlement habitat for listed Acroporid corals (*Acropora palmata* and *A. cervicornis*). The requested consultation is under review but is expected to be completed in September 2011, prior to final approval of the proposed actions by the Secretary of Commerce.

5.2.3.1 Marine Mammals

Marine mammals are primarily ocean-dwelling animals including cetaceans (whales, dolphins, and porpoises), sirenians (manatees), and pinnipeds (seals). Cetaceans are divided into two groups, the toothed whales, which also include dolphins and porpoises, and baleen whales. Baleen whales are usually larger than toothed whales and have baleen plates rather than teeth that enable them to filter water in order to separate out food such as krill and small fish. Baleen plates are flat and flexible with frayed edges that look like hair. In fact, the plates are made of the same material as hair, keratin.

NMFS lists five species of marine mammals, which are known to transit through waters around Puerto Rico and the USVI, as being in danger of extinction under the ESA. The most common marine mammals under NMFS' jurisdiction that are found in the area are the humpback whale, in particular during its winter migration along the west coast of Puerto Rico and the bottlenose dolphin (*Tursiops truncatus*). Only the whale species listed as endangered are discussed in more detail below.

According to the MMPA 2011 List of Fisheries (75 FR 68468, November 8, 2010) (http://www.nmfs.noaa.gov/pr/pdfs/fr/fr75-68468.pdf), the West Indian manatee (Antillean subspecies) has been removed from the list of species/stocks incidentally killed or injured in the Category III ‘‘Caribbean gillnet’’ and ‘‘Caribbean haul/beach seine’’ fisheries. The Caribbean snapper-grouper and other reef fish bottom longline/hook-and-line, pelagic hook-and-line/harpoon, mixed species trap/pot, and spiny lobster trap/pot have not resulted in the documentation of any death or injury to marine mammals as a result of these fisheries and are also in Category III (75 FR 68468).

5.2.3.1.1 Humpback Whale (*Megaptera novaeangliae*)

The humpback whale is a large baleen whale and was listed as endangered throughout its range under the ESA on June 2, 1970. Humpbacks are considered depleted under the MMPA.

The humpback whale is distributed worldwide but is less common in Arctic waters. Humpback whales migrate seasonally. During the winter, which is their breeding season, they are typically found in temperate and tropical waters. In summer, which is their feeding season, humpbacks are usually in higher latitude waters of high productivity. There are currently four recognized stocks of humpback whales in the U.S. designated based on geographically distinct winter ranges: The Gulf of Maine stock (previously known as the western North Atlantic stock), the eastern North Pacific stock (previously known as the California-Oregon-Washington stock), the central North Pacific stock, and the western North Pacific stock.

Humpback whales are affected by human activities in many parts of their range, which may impede recovery of the species. Humpback whales were historically hunted for their meat and blubber. Entanglements and collisions with vessels are factors that may slow recovery of the population. Disturbance by whale watching may also be an issue in some areas of the humpback's range as this industry continues to grow. In Puerto Rico, there are several businesses dedicated to whale watching during the winter migratory season in the area of Rincón. Pollution and habitat alteration and destruction from coastal development may also affect humpback whales.

A visual and passive acoustic survey of the area around Puerto Rico found winter aggregations of humpbacks around Cabo Rojo and the northern shore of Mona Island that appear to be as dense as those in waters of the Dominican Republic (Swartz et al 2001). The highest concentrations of humpbacks have been found to occur along the northwestern coast of Puerto Rico (especially Punta Higuero in Rincón and Punta Agujereada in Aguadilla), Cabo Rojo, and Mona Passage, near Saba Bank, the northern VI and off the east end of St. Croix in waters less than 200 meters deep (CFMC 2004). In April 2008, a female gave birth in Guayanilla Bay and then continued migrating through Mona Passage. Thus, the area contains groups of humpback whales, in particular during their winter migration between November and May.

5.2.3.1.2 Blue Whale (*Balaenoptera musculus*)

The blue whale is listed as endangered under the ESA and protected under the MMPA. Blue whales are also listed as endangered under the International Union for Conservation of Nature's (IUCN) Red List of Threatened Species.

The blue whale, a baleen whale, is the largest animal ever known to have lived on Earth. Blue whales are found in oceans worldwide and are separated into North Atlantic, North Pacific, and Southern Hemisphere populations. The blue whale has also been subdivided into three subspecies: *B. musculus intermedia* found in Antarctic waters, *B. musculus musculus* found in the Northern Hemisphere, and *B. musculus brevicauda* found in the southern Indian Ocean and southwest Pacific Ocean. In the U.S., blue whale stocks are divided into the western North Atlantic stock, the eastern North Pacific stock, and the Hawaiian stock. The stocks of blue whales were severely depleted by past hunting activities. Now, blue whales are at least occasionally injured or killed by ship collisions based on observations in California and the Gulf of St. Lawrence.

The blue whale is considered an occasional visitor in the U.S. Atlantic EEZ. Neither the southern limit of its range nor its population size are clearly defined (NMFS 2002). Blue whales are found both on the continental shelf and far offshore in deep water. While the Navy's Sound Surveillance System program has tracked blue whales in the North Atlantic, including subtropical waters north of the West Indies (NMFS 2002), no blue whales have been reported in waters of Puerto Rico or the USVI.

5.2.3.1.3 Fin Whale (*B. physalus*)

The fin whale was first listed as endangered under the ESA on June 2, 1970. It is now designated as endangered throughout its range.

Fin whales were greatly depleted by whaling but large numbers of these species still remain worldwide. These whales are still hunted in Greenland as part of permitted aboriginal subsistence hunting and Japan is beginning to kill these whales as part of its scientific program. Other potential threats to finback whales are collisions with vessels, entanglement in fishing gear, habitat degradation, and disturbance from low-frequency noise. In addition, because fin whales rely on large schools of fish for their diet in many areas, trends in fish populations, whether driven by fishing operations, human-caused environmental deterioration, or natural processes, may strongly affect the size and distribution of fin whale populations (NMFS 2006).

Populations of fin whales in the North Atlantic, North Pacific, and Southern Ocean probably mix rarely (if at all), and there are geographical populations within these ocean basins (NMFS 2006). In U.S. waters, fin whales are divided between the North Atlantic and North Pacific (Alaska (Northeast Pacific), California/Washington/Oregon, and Hawaii) stocks. Fin whales do not have an obvious north/south migration pattern like other baleen whales. However, acoustic studies indicate that there is a southward movement in the fall into the West Indies. Limited sightings of fin whales are reported for Puerto Rico and the USVI, in particular in the winter (December-January), which corresponds with the breeding season of this species (CMFC 2004). However, reports do not distinguish between fin and sei whales, which are very similar in appearance. Sighting off Puerto Rico have been in the area north of Mona Island and south of Cayo Ratones, Salinas. More sighting occur around the Virgin Islands, south of St. Thomas and west and east of St. Croix (CFMC 2004).

5.2.3.1.4 Sei Whale (*B. borealis*)

Sei whales are another of the baleen whales and were listed as endangered under the ESA on December 2, 1970 and are considered depleted under the MMPA.

Sei whales are divided into two subspecies: *B. borealis borealis* in the Northern Hemisphere and *B. borealis schlegellii* in the Southern Hemisphere. Sei whales occur in subtropical, temperate, and subpolar waters worldwide. Sei whales in U.S. waters have been divided into four stocks: Hawaiian, Eastern North Pacific, Nova Scotia, and Western North Atlantic. There are no current population estimates for the stocks in Nova Scotia and the Western North Atlantic. Sei whales were greatly depleted by past commercial hunting and whaling. Ship strikes and interactions with fishing gear, such as traps and pots, may affect current populations of sei whales.

Sei whales are commonly found in the Gulf of Maine and on Georges Bank and Stellwagen Bank in the western North Atlantic during the summer. However, the entire distribution and movement patterns of this species are not well known. Some populations of sei whales may migrate seasonally toward lower latitudes during the winter and higher latitudes during the summer. Limited sightings of sei whales have been reported from the U.S. Caribbean, both inshore and offshore near the shelf edge. Some of these reports may actually be for fin whales as these two species are difficult to separate visually in the field. Sightings have been from north of Mona Island and south of Cayo Ratones, Salinas, in Puerto Rico and around the Virgin Islands, south of St. Thomas and west and east of St. Croix (CFMC 2004).

5.2.3.1.5 Sperm Whale (*Physeter macrocephalus*)

Sperm whales are the largest of the toothed whales. Sperm whales were listed as endangered under the ESA in 1970 and are considered depleted under the MMPA throughout their range.

Sperm whales inhabit oceans worldwide. Sperm whale migrations are not as well understood as those of most baleen whales, although their distribution is likely dependent on their food source and breeding conditions. In temperate and tropical waters, there appears to be no obvious seasonal migration. In U.S. waters, sperm whales have been divided into five stocks: California-Oregon-Washington, North Pacific (Alaska), Hawaiian, Northern Gulf of Mexico, and North Atlantic. Hunting of sperm whales in the past greatly depleted all populations of this species. Sperm whales are still targeted in a few areas such as Indonesia and Japan in limited numbers but there is some evidence that illegal hunting in some areas of the world is still occurring. Sperm whales may be harmed by ship strikes and entanglement in fishing gear, though the tendency of sperm whales to be in extremely deep offshore waters may reduce the probability of these interactions. Coastal pollution and noise in areas of oil and gas exploration and commercial shipping may also affect these whales.

Both large and small adults and calves and juveniles occur in the southeastern Caribbean, in particular sightings have been from the leeward sides of islands (NMFS 2002). Sightings off Puerto Rico and the USVI reported sperm whales off the coast of Mona Island in the Mona Passage, off the coast of Rincón, Ponce, San Juan, and Loíza, south of Vieques, and between St. Thomas and St. Croix (CFMC 2004). Swartz et al. 2001 detected sperm whales in deep waters, in particular in areas of high bottom relief, southwest of Puerto Rico and in Mona Passage using acoustics.

5.2.3.2 Sea Turtles

Sea turtles are important components of tropical seas and the marine food web. However, due to historical overfishing of all sea turtle species for use of their meat as well as for use of their shell in artisanal and utilitarian articles, sea turtles are considered to be threatened or in danger of extinction in the United States and in other countries.

The U.S. Caribbean provides nesting, foraging, and developmental habitat primarily for three species of sea turtles listed as endangered or threatened under the ESA: the leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), and green (*Chelonia mydas*). Nesting by the loggerhead sea turtle is infrequent and these animals are only rarely seen in waters around Puerto Rico and the USVI.

Sea turtles that nest in the U.S Caribbean have similar life cycles. Basically, all the species migrate, at least short distances, from the feeding areas to the breeding grounds, which are near nesting areas. Following breeding, the males are thought to return to the feeding areas while the females move to nesting areas. Females return to the feeding areas and begin to prepare for the next reproductive season once nesting is complete. In order to ensure reproductive success, most sea turtles exhibit iteroperous reproduction, which means they produce their offspring in a series of separate events. Several clutches are laid during nesting season and, in tropical areas, nesting is often year-round with peak periods.

Based on stranding data for western Puerto Rico, including Guánica, Lajas, Cabo Rojo, Mayagüez, Añasco, Rincón, and Aguadilla for the period from 1999-2007 (PRDNER 2008a), fishing gear impacted several species of sea turtles. Hawksbill and green sea turtles were particularly affected by fishing gear and most interactions with fishing gear resulted in mortality. PRDNER notes that these numbers are very low as they depend upon PRDNER receiving a stranding report from the public or another agency or finding the animals while on patrols. Stranding data included two hawksbill sea turtles killed by entanglement in fishing line; one green and two hawksbill sea turtles with fishing hooks in their throats that were rehabilitated and liberated; one green turtle that drowned entangled in a fish trap; two hawksbill sea turtles killed by spear guns; four green sea turtles entangled in nets one of which was found alive and liberated, five hawksbill sea turtles entangled in nets two of which were found alive, rehabilitated and later liberated, and one leatherback killed by entanglement in a net (PRDNER 2008a). Note that a ban on nets (gill and trammel) went into effect in the U.S. Caribbean EEZ in 2005 and in the territorial waters of the USVI in 2006.

5.2.3.2.1 Hawksbill Sea Turtle (*Eretmochelys imbricata*)

Hawksbill sea turtles were listed as endangered in 1970 under the ESA.

Hawksbill sea turtles are found in tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans. In the continental U.S., the species is recorded from all the gulf states and along the eastern seaboard as far north as Massachusetts, with the exception of

Connecticut, although sightings north of Florida are rare. Nesting occurs principally in Puerto Rico and the USVI, where the species is very common. Hawksbill sea turtles nest year-round in the area and adults and hatchlings can be found in waters throughout the year. The two most important nesting sites are Mona Island off Puerto Rico and Buck Island off St. Croix. Mona Island supports one of the largest nesting populations of hawksbills in Puerto Rico. For this reason, the United States Fish and Wildlife Service designated the beaches of Mona Island as critical habitat for hawksbill sea turtles under the ESA, and NMFS designated the waters up to three nautical miles around Mona and Monito Islands as critical habitat.

The greatest threat to hawksbill sea turtles is poaching as their eggs, shell, and meat continue to be in demand. Stranding data from PRDNER (2008a) for the period from 1999-2007 contain reports of seven hawksbill deaths as a result of illegal poaching and the successful rehabilitation and liberation of three others that were hunted illegally. This is an underestimate as these are only the animals recovered by PRDNER. Another threat is boat strikes. PRDNER (2008a) stranding data indicate that five hawksbills were killed by boat strikes during 1999-2007 and these are only the animals that were reported. Coastal development may also affect these animals through the loss or degradation of habitat, pollution, and entanglement in or ingesting of marine debris. Hawksbills are also impacted by interactions with fishing gear as indicated above. Note that a ban on nets (gill and trammel) went into effect in the U.S. Caribbean EEZ in 2005 and in the territorial waters of the USVI in 2006.

5.2.3.2.2 Green Sea Turtle (*Chelonia mydas*)

Green sea turtles were listed as threatened except the breeding population off the Florida coast and the Pacific coast of Mexico, which are listed as endangered under the ESA. The species was listed on July 28, 1978. NMFS has designated critical habitat for green sea turtles as the area up to three nautical miles around the Island of Culebra and its surrounding islands and cays.

In the southeastern U.S., green sea turtles are found around the USVI, Puerto Rico, and the continental U.S. from Texas to Massachusetts. Adults and juveniles of this species can often be seen in the USVI and Puerto Rico, particularly in the area of Culebra. Green sea turtle nests in Puerto Rico are reported in Manatí, Loíza, Fajardo, Ceiba, Naguabo, Culebra, Vieques, Caja de Muertos, Mona Island, and larger cays within the La Cordillera Reefs Natural Reserve off the coast of Fajardo based on annual PRDNER nesting surveys.

Green sea turtles are still threatened by illegal poaching of eggs, juveniles and adults. Stranding data from PRDNER (2008a) for the period from 1999-2007 contain reports of five green sea turtle deaths as a result of illegal poaching and the rehabilitation and liberation of two others that were hunted illegally. This is an underestimate as these are only the animals recovered by PRDNER. Two green sea turtles were killed by boat strikes during 1999-2007 based on PRDNER (2008a) data. Coastal development may also affect these animals through the loss or degradation of habitat, pollution, and entanglement in or ingesting of marine debris. Green sea turtles are also impacted by interactions with fishing gear as indicated above. A ban on nets (gill and trammel) went into effect in the U.S. Caribbean EEZ in 2005 and in the territorial waters of the USVI in 2006.

5.2.3.2.3 Leatherback Sea Turtle (*Dermochelys coriacea*)

Leatherback sea turtles were listed as endangered throughout their range on June 2, 1970 under the ESA. NMFS has designated critical habitat for this species around Sandy Point, St. Croix, USVI due to the importance of this area as a nesting beach and the concentration of leatherbacks in the water in this area during the nesting season.

The range of this species extends from Cape Sable, Nova Scotia, south to the U.S. Caribbean. Adults and juveniles of leatherback sea turtles can be observed in particular during their nesting peak in April-August. In Puerto Rico, leatherbacks nest on beaches in Mayagüez, Mona Island, Añasco, Isabela/Quebradillas, Guánica, Arecibo, Manatí, Isla Verde, Loíza, Río Grande, Luquillo, Fajardo, Humacao, Vieques, and Culebra based on annual PRDNER nesting surveys. The greatest concentration of leatherback nests in Puerto Rico is in the area of San Miguel, Luquillo/Fajardo.

Leatherbacks are still occasionally hunted for meat or their eggs are collected illegally, although this threat is only during the nesting season as the rest of the time these turtles are offshore. Leatherbacks can become entangled in fishing gear, in particular longlines, and are susceptible to injuries from marine debris, which they frequently ingest. A ban on nets (gill and trammel) went into effect in the U.S. Caribbean EEZ in 2005 and in the territorial waters of the USVI in 2006. It is anticipated that this ban will reduce or eliminate interactions between leatherbacks, and gill and trammel nets. Leatherbacks are also vulnerable to impacts from boat collisions and the death of a leatherback off Sandy Point, St. Croix, was reported by the Department of Planning and Natural Resources during the 2008 nesting season due to a boat strike.

5.2.3.2.4 Loggerhead Sea Turtle (*Caretta caretta*)

The loggerhead sea turtle was listed as threatened throughout its range on July 28, 1978. In the Atlantic, loggerheads are found from Newfoundland to Argentina.

Loggerhead sea turtle nests in Puerto Rico have been reported by PRDNER in Loíza, Humacao, Vieques, and Culebra, but nesting is infrequent and these turtles are not common in waters of Puerto Rico and the USVI. PRDNER (2008a) stranding data did contain a report of a loggerhead that was injured off the west coast of Puerto Rico in an attempt to hunt the animal but the animal was rehabilitated and released.

Marine debris, dredging impacts related to habitat loss as well as direct injury to these turtles, bycatch during commercial fishing operations, collisions with vessels, entanglement in discarded fishing gear, and coastal pollution are some of the threats facing loggerhead sea turtles. Again, the ban on gill and trammel nets that went into effect in the U.S. Caribbean EEZ in 2005 and in the territorial waters of the USVI in 2006 would be expected to reduce interactions between those gears and loggerhead sea turtles.

5.2.3.3 Corals

Coral reefs cover less than 2 percent of the marine bottom worldwide. However, they provide around 25 percent of all the known marine organisms (Buddemeier et al. 2004). The complex of organisms, including corals, other invertebrates, algae, and vertebrates like fish and sea turtles, and their interactions form the coral reef ecosystem. Corals include hard or stony corals, soft corals, black corals, and hydrocorals. Corals are mainly colonial organisms, although a small percentage of corals are solitary. The basic individual is termed a polyp and it is a small animal with tentacles around an opening that functions as a mouth. The complex of many polyps forms a coral colony (this is what we normally identify as a coral in the field). The individuals that form a coral colony are interconnected by tissues that enable them to exchange nutrients and other compounds. The complex of many hard coral colonies cemented and established at a site forms the principal structure of a coral reef. Two of the hard corals, elkhorn (*Acropora palmata*) and staghorn (*A. cervicornis*) were listed as threatened on May 9, 2006. Elkhorn and staghorn corals were very common in the Caribbean and were the main components of reefs in shallow waters until the 1970's when they began to suffer from diseases and natural events like hurricanes, and began to die throughout their range.

Critical habitat was designated by NMFS for elkhorn and staghorn corals on December 26, 2008. The primary constituent element (PCE) of critical habitat for elkhorn and staghorn corals is substrate of suitable quality and availability, in water depths from the mean high water line to 30 m, to support successful larval settlement, recruitment, and reattachment of fragments. Substrate of suitable quality and availability means consolidated hardbottom or dead coral skeletons free from fleshy macroalgae and sediment cover.

While algae, including crustose coralline algae (CCA), and fleshy and turf macroalgae, are a natural component of healthy reef ecosystems, the recent increase in the dominance of fleshy macroalgae as major space-occupiers on many Caribbean coral reefs impedes the recruitment of new corals. This "phase shift" (sensu Jompa and McCook 2002) in benthic community structure (from the dominance of stony corals to that of fleshy algae) on Caribbean coral reefs is generally attributed to the greater persistence of fleshy macroalgae under reduced grazing regimes due to human overexploitation of herbivorous fishes (Hughes 1994) and the regional mass mortality of the herbivorous long-spined sea urchin (*Diadema antillarum*) in 1983-84 (Carpenter 1990). Although herbivorous fish and particularly parrotfish are able to substantially compensate for the loss of grazing coverage provided by *D. antillarum* (Carpenter 1990), chronic harvest of these herbivores has reduced that capacity for compensation. Reduced abundance of herbivores and particularly parrotfish on Caribbean coral reefs can, in part, be attributed to the use of fish traps as large-bodied parrotfish are susceptible to fish traps (Rakitin and Kramer 1996). As a result, fleshy macroalgae are better able to colonize coral skeletons and other available substrate, preempting space available for coral recruitment. Further, increased nutrients from land-based sources contribute to the phase shift by increasing the growth rate of macroalgae (Waritan and Fong 2008, Sjöö and Mörk 2008, Smith 2008). Increased nutrient loads can also alter the species of macroalgae growing on the reef and simultaneously decrease the efficiency of grazers. Thus, it is a combination of increased nutrients under reduced grazing regimes that reduces the availability of appropriate substrate for acroporid recruitment (Jompa and McCook 2002).

The persistence of fleshy macroalgae under reduced grazing regimes has impacts on CCA growth, which may reduce settlement of coral larvae as CCA is thought to provide chemical cues for settlement. Most CCA are susceptible to fouling by fleshy algae, particularly when herbivores are absent (Steneck 1986). As Mumby et al. (2007) demonstrated via a modeling analysis, an unexploited community of parrotfish can maintain approximately 40 percent of the reef in a permanently grazed state but overfishing reduces this capacity to about 5 percent. Most grazing thresholds lie near the upper level observed for parrotfish in nature, suggesting that reefs are highly sensitive to parrotfish exploitation (Mumby et al. 2007). Patterns observed in St. Croix waters also indicate a strong positive correlation between CCA abundance and herbivory (Steneck 1997). A study in which Miller et al. (1999) used cages to exclude large herbivores from the study site resulted in increased cover of both turf algae and macroalgae, and decreased CCA coverage. In experimental microcosm studies, Brock (1979) found that, at low densities of parrotfish (<0.6 parrotfish or <9 g wet weight/m^2) and in the absence of other grazers, the benthic community structure proceeded to macroalgal dominance; at intermediate levels of parrotfish grazing intensity (0.6 to 1.5 parrotfish or 9 to 17 g wet weight/ m^2) a diverse community developed.

High grazing activity in exposed situations appears to favor CCA and thus coral recruitment. This suggests parrotfish may serve as a keystone species (Paine 1969) and that fishing effects on parrotfish grazing may profoundly influence coral dynamics (Mumby et al. 2007). Therefore, active management of parrotfish is both highly desirable and a feasible conservation goal (Mumby et al. 2007). In 2005 and 2006, gill and trammel nets were banned from the U.S. Caribbean EEZ and from the territorial waters of the USVI. The primary reason for the ban was the unprecedented use of these nets by SCUBA divers to herd parrotfish into the nets, a practice that resulted in large numbers of parrotfish being harvested (CFMC 2005).

In addition to the designation of critical habitat for *Acropora* species, NMFS finalized a 4(d) rule that took effect on November 21, 2008. This rule extends the "take" prohibitions of the ESA to elkhorn and staghorn corals. The only exceptions are activities that contribute to the conservation of threatened coral species, including scientific research and enhancement activities conducted under seven specific existing federal, state, or territorial research permitting programs, and restoration activities carried out by an authorized federal, state, territorial, or local natural resource agency.

5.2.3.3.1 Elkhorn Coral (*Acropora palmata*)

Elkhorn corals are commonly found on the seaward face of reefs in turbulent, shallow water, including the reef crest and spur-and-groove zone. Colonies may be exposed at low tide. Historically, elkhorn was the primary builder of shallow reef crest areas, commonly known as the elkhorn zone, in the western Caribbean. In Puerto Rico, the most well known elkhorn reef is in Rincón on the west coast within the area known as Tres Palmas that has been designated a Natural Reserve and was recently established as a no-take area through PRDNER Administrative Order Number 2008-32. Reefs in the area of La Parguera in Lajas and several of the coral cays in Cabo Rojo and Guánica were created by elkhorn corals, although many of these reefs now contain only skeletons of this species and an abundance of algae, sponges, and other hard and soft corals. Recent surveys indicate that large elkhorn reefs are present off the north coast, particularly in the area of Manatí and Vega Baja.

Due to the preference of this species for shallow waters, it is prone to impacts from recreational boating, maritime activities, coastal development, and fishing gear.

5.2.3.3.2 Staghorn Coral (*A. cervicornis*)

Staghorn corals are commonly found in depths between 5-15 m. This species may be found interspersed among colonies of elkhorn coral but staghorn coral is more frequently found in more protected, deeper water seaward of the elkhorn zone where there is more protection from waves. Staghorn coral is the primary reef builder in mid-depths in the western Caribbean. In Puerto Rico, staghorn corals were once common behind the elkhorn zone but are now limited to scattered colonies around coral cays and other reef areas. This species continues to co-occur with elkhorn coral and it is still common to observe at least a few colonies in areas where live elkhorn coral is present. Staghorn corals may also be found in deeper areas and are even reported along the shelf edge in some areas such as La Parguera in Lajas.

Because this species occurs in nearshore waters, it too is prone to impacts from recreational boating, maritime activities, coastal development, and fishing gear.

5.3 Description of the Economic and Social Environment

5.3.1 Introduction

The fisheries of Puerto Rico and the USVI provide food, livelihoods and income to Puerto Ricans and U.S. Virgin Islanders. The two commercial fisheries have been characterized as “artisanal” because the commercial fishing vessels tend to be less than (and commonly much less than) 45 feet long, have small crews, participate in multiple fisheries, and yield smaller revenues and/or their seafood processors are small-scale producers. Fishing vessel permits are not required to commercially harvest any of the species in the five groups experiencing overfishing in federal waters of the U.S. Caribbean.

Puerto Rico is surrounded by a narrow insular shelf where waters are less than 650 meters deep. The shelf varies in width from less than 1.2 mi (2 km) northwest of the island to greater than 15 mi (25 km) southwest of the island (Renken et al. 2002). The insular shelf of the southwest coast is relatively broad compared to the rest of the island. The east coast lies on the same geological platform as the USVI of St. Thomas and St. John. On the north, south and east coasts the insular shelf breaks precipitously at depths less than

656 ft (200 m). Historically, most of Puerto Rico's fishing (except that targeting SU1 and SU2) has occurred on the insular shelf, which has an area of 1,764 nm^2 (6,050 km^2) and which is the platform from the coastline to the 100-fathom (600 feet or about 183 meters) isobath (Collazo and Calderón 1987/88). The area of fishable habitat is about 2,467 nm^2 (8,462 km^2) (CFMC 2005: 19). About 4.7 percent (116 nm^2 or 398 km^2) of the fishable area is in the U.S. Caribbean EEZ (CFMC 2005). Puerto Rico's state waters comprise an area of approximately 3,832 nm^2 (13,160 km^2) (Puerto Rico Coastal Zone Management Program 2007), and the territorial waters of the USVI are approximately 437 nm^2 (1,564 km^2) in size (Island Resources Foundation 2002). The USVI shelf encompasses an area of approximately 630 nm^2 (2,161 km^2). Of that area, 38 percent (240 nm^2 or 823 km^2) occurs in the U.S. Caribbean EEZ. The bulk of the shelf occurs off St. Thomas and St. John, with a 291 nm^2 (998 km^2) total area in territorial waters and a 218 nm^2 (748 km^2) total area in federal waters. St. Croix has 98 nm^2 (336 km^2) of fishable habitat in territorial waters and only a 21 nm^2 (72 km^2) area off its east coast that resides in the EEZ.

Fishing areas shift with regulatory change, land use and development, land-based pollution, and other factors, such as climate change. For example, water temperature increased in both Guayanilla and Tallaboa Bays of Puerto Rico as a result of hot water discharged by the Central Costa Sur Power Plant, and cloro was discharged by PPG Industries that had a significant adverse impact on marine and coastal resources on the south coast (Pérez 2005: 235). Fishers that operated in the bays had difficulty selling their catches because buyers and consumers feared the fish were tainted with cloro or another contaminant. In response, some fishers went into deeper waters, which was difficult for those with small vessels and modest fishing gear to do. Access to fisheries also has been challenged in both Puerto Rico and the USVI, and privatization of beach front areas continues to reduce public access to fisheries. Fishing behavior in the U.S. Caribbean is also altered by changes in the global and local economies; for example, changes in the price of oil and recent declines in local and external tourism have impacted local fisheries.

5.3.2 Puerto Rico Fisheries

5.3.2.1 Overview of Puerto Rico geography and fishing locations

Approximately 40 percent of Puerto Rico consists of mountains, 35 percent of hills, and 25 percent of plains. It is this topography, coupled with a tropical climate and soils that largely lack depth and plant materials, that has limited agricultural development on the island. The central portion of the island is mountainous, but the bulk of the island's population lives on the low-lying flat coastal plains. According to Macari and Hoyos (2005: 278), the coastal areas, especially in the western areas of the island, "are extremely vulnerable to earthquake-induced hazards." The concentration of Puerto Rico's population in low-lying coastal areas, the island's confined harbors, and its Caribbean location make it vulnerable to natural disasters, such as hurricanes, tropical storms, earthquakes, flooding, mudslides, tsunamis, and drought.

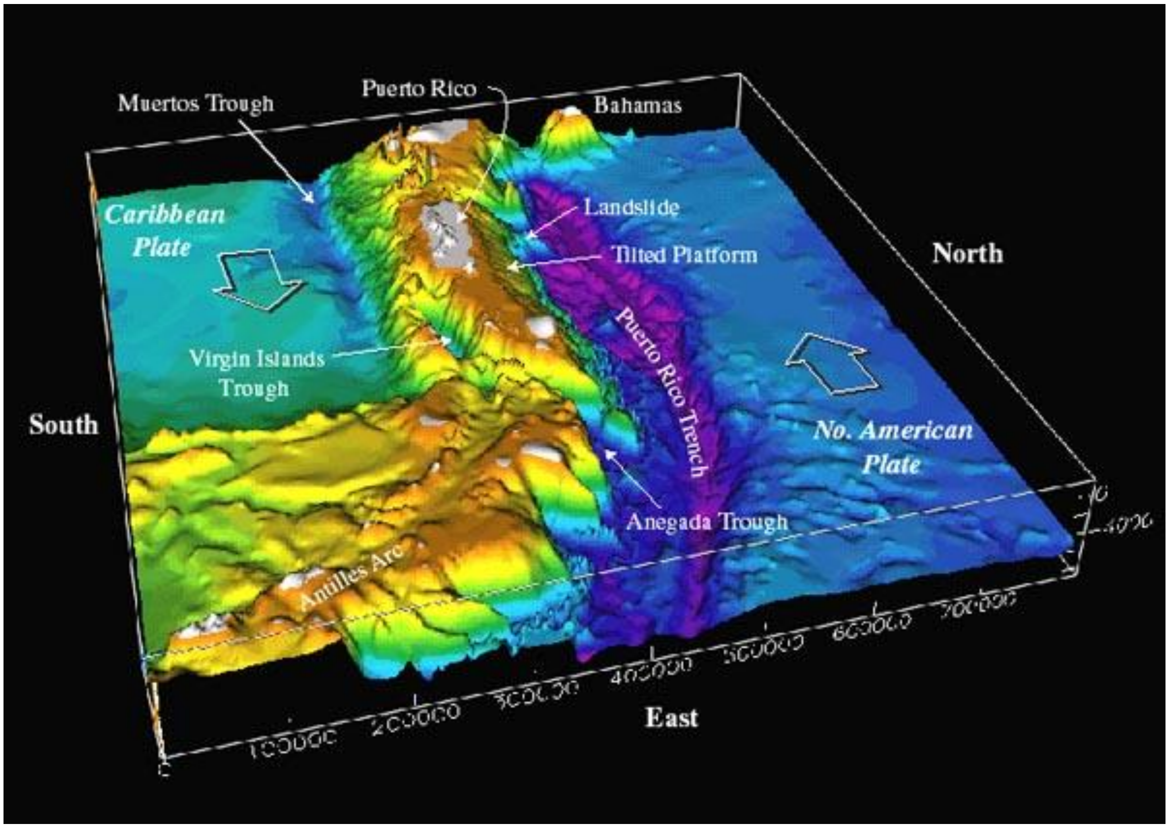


Figure 5.3.1. Puerto Rico's coastal topography. Image Source: NOAA Ocean Explorer. Obtained online at:
http://oceanexplorer.noaa.gov/explorations/03trench/trench/media/trench.html.

Table 5.3.1. Reported commercial fishing trips per year per coast. Source: Matos-Caraballo 2007.

Coast	Trips Per Year			Percent of Total Trips Per Year		
	2004	2005	2006	2004	2005	2006
North	3,414	2,502	1,537	10.4%	9.0%	5.9%
South	8,965	7,281	8,075	27.4%	26.1%	31.1%
East	5,319	3,790	2,923	16.3%	13.6%	11.2%
West	14,977	14,320	13,461	45.8%	51.3%	51.8%
Total	***32,675***	***27,893***	***25,996***	***100.0%***	***100.0%***	***100.0%***

Puerto Rico's geography, especially its narrow insular shelf, influences fishing locations and targeted species. North coast fishers are limited by a narrow shelf, adverse weather, high wave action during six months of the year, and a coastal topography that offers few protected areas in which to anchor fishing boats (Figure 5.3.1). These conditions result in fewer reported commercial fishing trips by north shore fishers than their counterparts on the other coasts (Table 5.3.1). Conditions also discourage the use of traps and SCUBA and instead north coast fishers use lines and nets. In 2008, 88 percent of north coast fishers reported targeting reef fish (yellowtail snapper, trigger fish, and parrotfish), 65 percent targeted pelagic species, and 53 percent targeted baitfish. Fewer north coast commercial fishers fished in oceanic waters in 2008 than in 2002, according to the commercial fishing censuses conducted in those years (Table 5.3.2). During the same period, there were dramatic increases in the percentage of north coast commercial fishers who fished along the shore and on the shelf break.

Table 5.3.2. Geographic locations of commercial fishing by coast and percentage of commercial fishers by coast, 2002 & 2008. Source: Matos-Caraballo 2004, Matos-Caraballo and Agar 2011.

		Percent of Interviewed Fishers who fished in these locations, 2002 & 2008			
Year	**Coast**	**Shore**	**Insular Shelf**	**Shelf Break**	**Oceanic Water**
2008 N= 868	North	67	90	84	46
	South	22	93	45	25
	East	48	84	67	61
	West	14	70	51	26
2002 N= 1,163	North	17	82	8	68
	South	7	92	19	30
	East	13	94	18	35
	West	15	69	30	42

Features that make the south coast more suitable for fishing operations than the north coast include a somewhat less abrupt drop-off, the presence of a number of cays and sandy beaches that make the use of beach seines (banned in PR state waters in 2004 and enforced in 2007) possible, and less exposure to storms, which is more conducive for the use of fish traps and pots. The size of the insular shelf area off the south coast is about 360 nm^2 (1,237 km^2), which is about 1.85 times the size of the shelf off the north coast (Collazo and Calderón 1987/88). South coast fishers make more trips annually than those on the north and east coasts according to the 2002 and 2008 survey of commercial fishers (Table 5.3.2). The percentage of south coast commercial fishers who fished in oceanic waters increased from 2002 to 2008, which is contrary to what happened on the north and other coasts. In fact, the percentages of south coast commercial fishers fishing along the shore, shelf break, and oceanic waters rose substantially in 2008 (Table 5.3.2). Of the commercial fishermen surveyed for the 2008 census, 57 percent and 45 percent targeted lobster and conch, respectively; 88 percent stated that they harvested reef fish species (yellowtail snapper, mutton snapper, lane snapper, porgy, parrotfish, hogfish and grunts), and 40 percent said they fished for deep-water snapper (silk snapper). Griffith et al. (2007) divide the south coast into west, central and east sections. In the central portion of the south coast, there are two fishing zones and eight fishing areas, which are particularly popular among fishers from Ponce and other nearby municipalities (Griffith et al. 2007). The larger of these two zones extends farther from the coast. One of the eight areas near the larger zones includes relatively rich fishing grounds off the island of Caja de Muertos, which are only a few miles offshore and a favorite for both recreational and commercial fishers. Along the eastern end of the south coast are two zones close to the fishing ports of Port Arroyo and Bahía de Jobos.

The 785 nm^2 (2,693 km^2) of insular shelf area off the east coast is the largest of the four coasts, and it represents 46 percent of Puerto Rico's insular shelf (Collazo and Calderón 1987/88). East coast fishers rank third behind their west and south coast counterparts in the number of annual trips they make (Table 5.3.1). East coast commercial fishers decreased fishing in oceanic waters and increased fishing along the shore and shelf break from 2002 to 2008 (Table 5.3.2). In 2008, about 76 percent of interviewed east coast fishers reported that they harvested reef fish (yellowtail, lane and mutton snapper; hogfish; porgies; grunts and parrotfish), 72 percent targeted deep-water snapper species (silk and queen snapper), 67 percent pelagic species (mackerel), 65 percent spiny lobster, 35 percent queen conch, and 33 percent baitfish (Matos-Caraballo and Agar 2011). Griffith et al. (2007) identify the east coast fishing zone as a triangular region north of Vieques and west of Culebra; however, there are additional fishing areas. According to Griffith et al. (2007), 14 of the east coast's popular fishing areas are in waters off Puerto Yabucoa, Cayo Batata, Bajo Parse, Puerto Humacao, Puerto Naguabo, Isla Palominos, Arrecifes de la Cordillera, Cayo Luis Peña, Cayo Norte, Bajos Grampus, Punta Vaca, Puerto la Esperanza, Puerta Punta Mula, and Punta Conejo.

The west coast is about one-third the length of either the north or south coast; however, its insular shelf area of 362 nm^2 (1,243 km^2) is greater than the shelf areas of the north and south coast (Collazo and Calderón 1987/88). Along the west coast is the Mona Passage, which contains islands, deep water, rocky stretches of bottom, and shallower inshore, muddy and rocky bottom areas that are easily accessible in small vessels (Griffith and Valdéz-Pizzini 2002). According to Griffith et al. (2007), the west coast has the largest fishing zone with over 30 fishing areas within the zone. West coast commercial fishers account for the majority of the commonwealth's annual fishing trips, from 46 percent in 2004 to 52 percent in 2006 (Table 5.3.1). In 2008, 65 percent of interviewed west coast fishers reported fishing for reef fish (yellowtail, lane and mutton snapper), 51 percent fished for deep-water snapper (silk and queen snapper), 47 percent targeted spiny lobster, 35 percent targeted queen conch, 26 percent fished for pelagic species, and 18 percent for baitfish (Matos-Caraballo and Agar 2011). Fewer west coast commercial fishers fished in oceanic waters in 2008 than 2002, which mirrors what occurred on the north and south coasts. However, unlike their counterparts on the other coasts, more west coast fishers did not fish inshore waters in 2008 than in 2002. In 2008, significantly more fishers on the west coast fished at the shelf break than in 2002, and there was a small increase in the percentage of these fishers who fished on the shelf in 2008 (Table 5.3.2).

Surveys of Puerto Rico's commercial fishers have shown that they operate in more than one location, and they shift locations over time. For example, in 1996, 31 percent of commercial fishers fished inshore waters, which fell to 17 percent in 2002, then rose to 32 percent in 2008. During the same years, 46 percent of commercial fishers fished in oceanic waters in 1996, 48 percent did in 2002, and 36 percent in 2008. One factor that led to the decrease in fishing in oceanic waters and increase in fishing along the shore in 2008 was the price of gasoline (Matos-Caraballo and Agar 2011), which rose significantly from 2004 to 2008. According to *The San Juan Star* on June 23, 2008, "rising costs of fuel are taking a heavy toll on businesses as [commercial fishers] fight to make a living." Commercial fishing vessels in Puerto Rico tend to be small, landing up to but usually less than 50 pounds per day, while it costs $20 to $30 to fuel the boat for that day. According to the same article, in order to lessen the adverse impacts from rising fuel costs, commercial fishers raised the price of fish and the example given was raising the price of red snapper from $3.50 to $5.00 per pound.

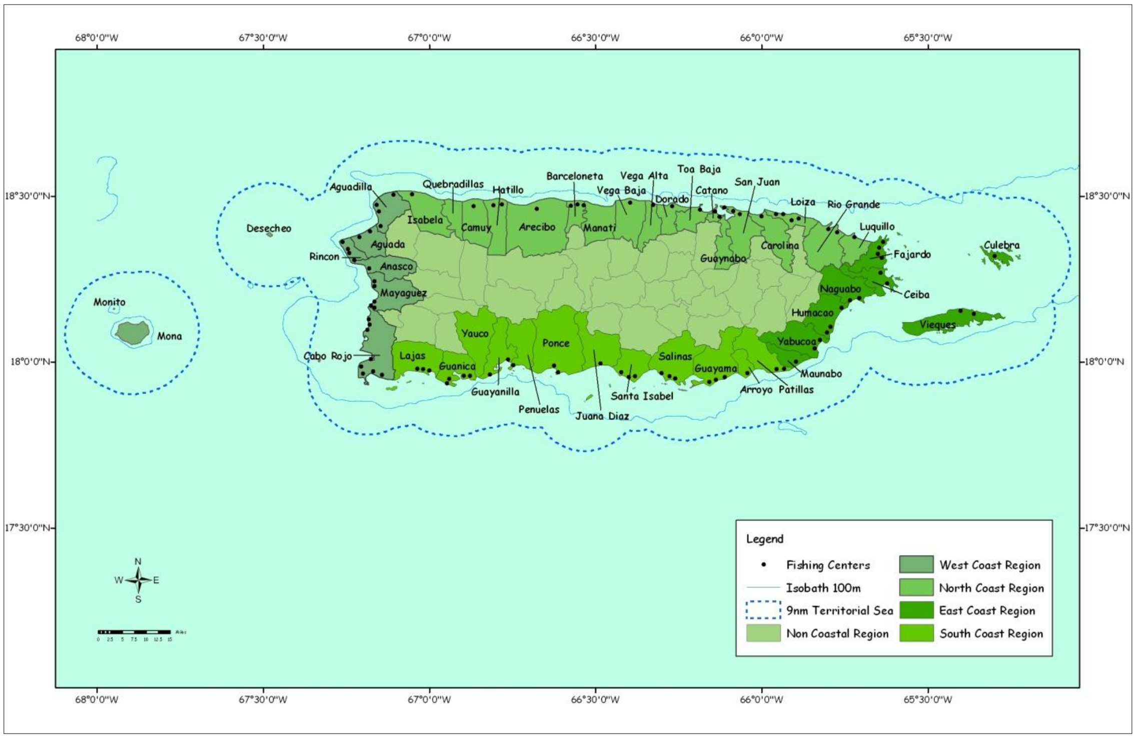


Figure. 5.3.2. Distribution of fishing centers in the Commonwealth of Puerto Rico. Source: Matos-Caraballo and Agar 2011.

5.3.2.2 Puerto Rico commercial fishing centers and associations

There are 78 municipalities in Puerto Rico, of which 44 can be considered coastal communities (Figure 5.3.2). Eighteen of these municipalities are along the north coast, 12 along the south, eight along the east, and six along the west coast. Forty-three of these municipalities have official fishing centers (landing areas), and the number of these centers has changed over time. Suárez-Caabro (1975) reported 90 fishing centers (centros pesqueros) in 1972, which declined later that decade to 75 fishing centers in 43 coastal municipalities (Weiler and Suárez-Caabro 1986). There were 88 fishing centers in 1985, 92 in 1996, 100 in 1997 and 92 in 2002 (Griffith et al. 2007; Matos-Caraballo 2000 for 1996 figure, and Matos-Caraballo et al. 2002 for 2002 figure). Matos-Caraballo (2007) reports there were 88 official fishing centers in 42 of the municipalities from 2004 through 2007. That rose to 92 fishing centers in 2008 (Matos-Caraballo and Agar 2011).

Table 5.3.3. Municipalities ranked by 1999-2003 landings (pounds) and their number of landing centers. Source: Griffith et al. 2007: Table I.1, p. 11.

Rank by Landings	Municipality	No. Centers	Coast		Rank	Municipality	Coast	No. Centers
1	Cabo Rojo	7	West		22	Arecibo	North	1
2	Lajas	3	South		23	Loíza	North	1 to 4*
3	Vieques	2	East		24	Vega Baja	North	1
4	Aguadilla	4	West		25	Yabucoa	East	1 to 2*
5	Guánica	3 to 4*	South		26	Añasco	West	1
6	Fajardo	3 to 4*	East		27	Patillas	South	1 to 2*
7	Naguabo	2	East		28	Cataño	North	1
8	Rincón	2	West		29	Río Grande	North	1 to 2*
9	Juana Díaz	2	South		30	Carolina	North	1
10	Ponce	1 to 2*	South		31	Maunabo	South	1
11	Guayama	3	South		32	Culebra	East	1
12	San Juan	3	North		33	Barceloneta	North	2 to 3*
13	Mayagüez	3	West		34	Vega Alta	North	1
14	Humacao	3	East		35	Dorado	North	1
15	Aguada	2	West		36	Manatí	North	1
16	Ceiba	2	East		37	Isabela	North	1 to 2*
17	Salinas	3	South		38	Luquillo	North	1
18	Guayanilla	1 to 2*	South		39	Camuy	North	1
19	Peñuelas	1	South		40	Hatillo	North	1
20	Santa Isabel	3	South		41	Toa Baja	North	1
21	Arroyo	1	South					

*: one or more landing centers reported zero landings in one or more years.

The changing number of fishing centers is due to changes in activity with time. The southern municipality of Yauco does not have and appears to have never had a fishing center, which is why some fishing-related documents suggest that there are 43, not 44, coastal municipalities. Yauco commercial fishers tend to land their catches in Peñuelas (PE). Also, for example, from 1999 to 2003 there were no reported commercial landings in the northern municipality of Quebradillas (QB). Cabo Rojo had the largest number of active landing centers from 1999 to 2003 and ranked first in the number of pounds landed during those years (Table 5.3.3).

One of the primary institutions of Puerto Rico's fishing industry infrastructure is the fishing association, more commonly known as the villa pesquera (Griffith and Valdés Pizzini 2002), which is intended to "allow fishers to organize, centralize, and stabilize their markets; store equipment; and gain access to credit and training." Almost every one of Puerto Rico's coastal municipalities has at least one villa pesquera. The official number has changed over time. In 1985, for example, Gutierrez Sanchez et al. (1986: 2) reported that there were 88 landing centers but only 34 villas pesqueras. Of those 88 landing centers, only 40 had facilities for storing fishing gear, and some of these facilities were modern but others were deteriorating or abandoned. Ten years later, Matos-Caraballo (1997) included a map that located 100 fishing centers. The observation that Gutierrez Sanchez et al. (1986) made about fishing locations remains relevant today, some centers are thriving and others are either deteriorating or abandoned (Griffith et al. 2007).

Sixty-six percent of 1,163 fishers interviewed in 2002 and 61 percent of 868 fishers interviewed in 2008 reported to belong to a fishing association (Matos-Caraballo et al. 2002, Matos-Caraballo and Agar 2011). The relatively small majority of fishers belonging to an association may be surprising given the intent of the villa pesqueras, which should be appealing for all fishers. Membership benefits can include access to lockers, freezers and other facilities, as well, as ability to sell the catch to the association at the landing site. However, the associations vary considerably. Some lack freezers and have piers and other facilities needing repair. Still others have become defunct, while others have become significant political and economic institutions within their communities. Some associations buy fish from both members and non-members. There have been complaints that the Puerto Rican government unfairly distributes its funds to the associations, which creates and exacerbates the differences.

5.3.2.3 Puerto Rico's commercial fishers

The Fishing Law of 1998 (Ley 278) defines a commercial fisher (full time, part time, and beginner) as a person dedicated to fishing and selling the catch for profit, who reports at least 50 percent of his/her income from fishing, and who has a fishing license to that effect. According to PRDNER, Puerto Rican fisheries regulations do not define "commercial fishing" and as a consequence, the application requirements for a commercial fishers' license result in significantly more people having such a license than those who report to be using it. For example, in 2000 and 2004, approximately 5,000 and 3,500 commercial fishing licenses were issued, respectively; although there were only 1,758 and 1,163 "active" commercial fishers in 1996 and 2002, meaning 1,758 and 1,163 commercial fishers reported landings to PRDNER during these respective years (PRDNER 2004). The implementing regulation to require Puerto Rico's commercial fishers to report fishing statistics did not occur until March 11, 2004 (SEDAR 2007: 11). Hence, licensed-commercial fishers who landed catch in 1996 and 2002 and chose not to report those landings are not counted as active fishers, although they were actively fishing and in compliance with commercial fishing regulations at that time. In February 2009, there were 1,129 commercial fishing licenses, and in 2008, there were 868 active commercial fishermen; however, approximately 36 percent of those active commercial fishermen did not have a license (Matos-Caraballo and Agar 2011).

The number of Puerto Rico's active commercial fishers has shown varying trends, increasing dramatically from 800 in 1899 to 2,656 in 1946, declining to 991 in 1969 then rising to 1,872 in 1982, followed by 1,155 in 1992, a rise to 1,959 in 1994 and down to 868 in 2008 (Figure 5.3.3; Matos-Caraballo 1996, Matos-Caraballo and Agar 2011; Cummings and Matos-Caraballo 2003; PRDNER 2004). In 1996, there were 1,758 active commercial fishers and six years later in 2002 there were 1,163, a drop of 595 active commercial fishers. Matos-Caraballo (2007) suggests the 43 percent fall in the number of active fishers during this 6-year period was due to overfished resources, which caused commercial fishers to exit the fishing industry and transfer to construction or agricultural jobs. Others migrated to the mainland U.S. to work in factories or landscaping. Migrating to the mainland, however, does not mean they never return to fishing. According to García-Quijano (2009), former fishers who migrate monitor changes in fisheries in Puerto Rico by communicating with current fishers in the event that the former return to fishing. The 2008 figure of 868 active fishers is the lowest number of active fishers since 1931; however, this figure under-represents the actual number of fishers because a fisher is defined as "active" if s/he reports landings. Hence, non-reporting fishers, who are actively fishing and whether licensed or not, are not included in this figure.

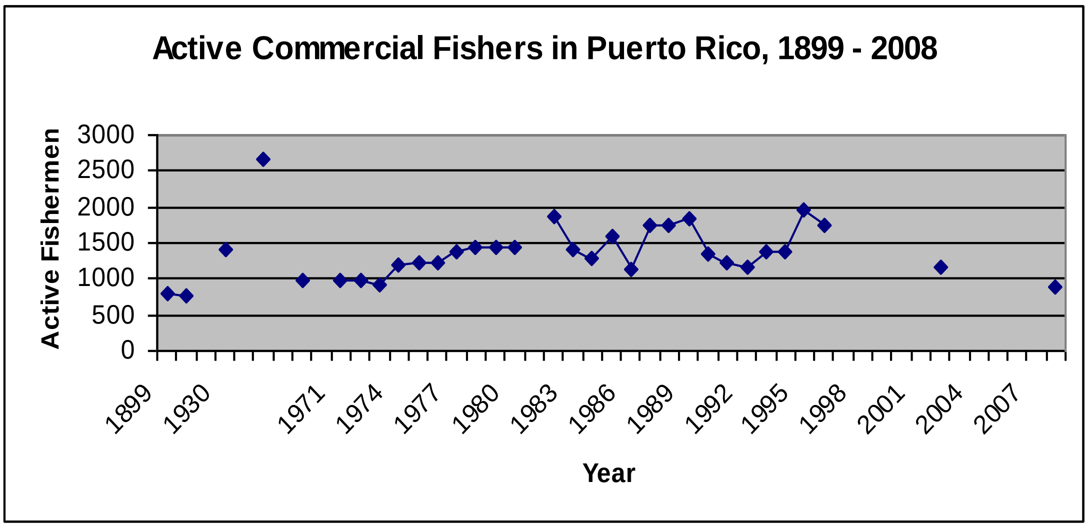


Figure 5.3.3. Number of active commercial fishers in Puerto Rico, 1899-2008. Sources: Matos-Caraballo 1996, Matos-Caraballo and Agar 2011; Cummings and Matos-Caraballo 2003 for 1899 to 1996 figures and PRDNER 2004 for 2002 figure.

Commercial fishing tends not to be a full-time job. Pérez's (2005: 225) survey found that "full-time fishing is not an option for any small-scale fisherman's household in southern Puerto Rico." During economic downturns, fishers are more likely to combine fishing with other occupations in the pursuit of maintaining household incomes. That may require fishers moving to urban areas on the island or to the U.S. mainland. However, that does not mean they abandon or do not return to fishing. Puerto Rican commercial fishers depend more upon fishing when industrial unemployment rises (Pérez 2000: 4). McCaffrey (1999: 112) describes fishing as an "occupational safety net," and according to

Griffith et al. (2007), fishing "absorbs the unemployed and poor during difficult economic times and on the other subsidizes individuals working part-time or full-time in the formal economy." Griffith et al.'s (2007) ethnographic work found that between 40 percent and 45 percent of commercial fishers listed other occupations that were held to supplement fishing incomes.

An active fisherman may report to census workers that s/he is a full-time fisherman, but s/he may not be a licensed full-time fisherman. For example, in 2008, the census indicates there were 650 full-time active fishermen, but, according to the PRDNER, only 394 active fishermen had a full-time license. Similarly, the census indicates there were 218 part-time active fishermen, while PRDNER records show 46 had a part-time license. One explanation for the discrepancy is the presence of the beginner license. In 2008, 117 fishermen had a beginner license (Matos-Caraballo and Agar 2011*)*. An apprentice fisherman may be full-time or part-time. However, even if added to the above full-time or part-time figure, the total number of licensed fishermen was 557, which is 311 less than the number of active fishermen that year. The number of full-time active east coast fishers dropped from 293 in 1996 to 121 in 2008, 80 of those in 2008 had a full-time license. In just six years (from 1996 to 2002), the number of full-time fishers decreased 40.5 percent on the east coast (Table 5.3.4). There was a sharper decline in the numbers of part-time fishers, which resulted in a net loss of active commercial fishers. According to Matos-Caraballo (2007: 8), many part-time commercial fishers retired from fisheries and some turned to illegal fishing (no license, no sales tax, and no reports to PRDNER) after October 1, 2006, when they were required to pay a municipal tax on landings they sold.

If fishers are more likely to combine fishing with other occupations in the pursuit of maintaining household incomes during an economic downturn, a graphical comparison of the number of active fishers and the unemployment rate do not suggest such a relationship. Nonetheless, during times of recession, depression or other economic downturns, such as experienced from 2007 to 2010 in Puerto Rico, commercial fishing increases in importance for fishing households. The unemployment rate in August 2009 was 15.8 percent, and it is expected to rise because of continuing layoffs of private and public sector employees by the end of the year. On August 21, 2009, the Puerto Rico Planning Board announced its preliminary estimate of a decline in the commonwealth's real Gross National Product (GNP) from July 1, 2008, to June 30, 2009, ranging from 4.8 to 5.5 percent. The prolonged and deep recession is the commonwealth's worst economic downturn since the Great Depression. Given this economic downturn, former commercial fishers may be returning to fishing, whether they are defined as "active" or not.

Table 5.3.4. Full-time and part-time active commercial fishers by coast, 1996-2002. Source: Matos-Caraballo 1996, 2004, Matos-Caraballo and Agar 2011.

North							
Year	**Full Time**	**Part Time**	**Total**	**% Full Time**	**% Part Time**	**% Change Full Time**	**% Change Part Time**
1996	211	217	428	49.3%	50.7%		
2002	68	198	266	25.6%	74.4%	-37.9%	-48.1%
2008	105	57	162	64.8%	35.2%	54.4%	-71.2%
South							
Year	**Full Time**	**Part Time**	**Total**	**% Full Time**	**% Part Time**	**% Change Full Time**	**% Change Part Time**
1996	364	78	442	82.4%	17.6%		
2002	136	182	318	42.8%	57.2%	-28.1%	-48.1%
2008	177	56	233	76.0%	24.0%	30.1%	-69.2%
East							
Year	**Full Time**	**Part Time**	**Total**	**% Full Time**	**% Part Time**	**% Change Full Time**	**% Change Part Time**
1996	293	134	427	68.62%	31.38%		
2002	106	148	254	41.73%	58.27%	-40.5%	-39.2%
2008	121	34	155	78.06%	21.94%	14.2%	-77.0%
West							
Year	**Full Time**	**Part Time**	**Total**	**% Full Time**	**% Part Time**	**% Change Full Time**	**% Change Part Time**
1996	394	67	461	85.5%	14.5%		
2002	113	212	325	34.8%	65.2%	-29.5%	-59.3%
2008	247	71	318	77.7%	22.3%	118.6%	-66.5%

The average number of hours a Puerto Rican commercial fisher devoted to different fishing tasks per week in 2008 was approximately 45 hours: approximately 31 hours for fishing, five hours for vessel and engine maintenance, five hours for gear maintenance, and four hours for marketing. There are differences among the coasts. The average west coast fishers spent approximately 48 hours each week working on fishing tasks, compared to approximately 47 hours for those on the south coast, approximately 41 hours for those on the east coast, and approximately 40 hours for those on the north coast (Matos-Caraballo and Agar 2011). The average west coast fisher also spent more time than his/her counterparts on the other coasts maintaining vessels, engines and gears. This latter fact is consistent with the significantly larger number of annual trips made by west coast fishers than those on the other coasts.

Hours devoted weekly to fishing are not constant throughout the calendar year. According to Griffith et al. (2007), commercial fishing effort is highest during the months of May through July and lowest in October and November, although average fishing effort only ranges from 15 to 18 days per month.

According to the 2008 census of commercial fishers, the significance that fishing has to household income varies significantly from coast to coast. On the west coast, 72 percent of fishermen reported 75 percent or more of their household incomes derive from fishing, whereas on the north coast, approximately 30 percent reported fishing contributed from three-fourths to all of their household income. Similarly, approximately 67 percent of east coast fishermen and approximately 62 percent of south coast fishermen reported that fishing contributes from 75 percent to 100 percent of their household incomes. All of the commercial fishermen reported that a portion of their household income derives from fishing.

Commercial fishermen in Puerto Rico retain part of their catch for their own, their family's or community's consumption. Key informants of García-Quijano's ethnographic study of southeastern Puerto Rico fishers from 2003 to 2004 said fishing provides fish for their families and communities, and the emphasis is on "maintenance, subsistence, and reproduction rather than on profit or returns" from fishing (García-Quijano 2009: 6). Agar et al. (2008) also found fish trap fishers to retain part of their catch for household consumption.

The average age of active Puerto Rican commercial fishers has increased since 1995-1996. In 1996, the average age by coast varied from 44 years to 49 years, and in 2008, that distribution changed from 47 to 51 years. In 2008, the average age of an east coast fisher was 51 years (Matos-Caraballo and Agar 2011).

In 1996, there were 427 active fishers on the east coast; in 2008, there were 155. If retiring east coast commercial fishers are not replaced, commercial fishing activity on the east coast could disappear. The Fishing Law of 1998 (Ley 278) specifically distinguishes between commercial and recreational fishers and prohibits the sale of fish by recreational fishers. However, according to Matos-Caraballo (2009), "every successful recreational fisher will sell his catch," and in Puerto Rico there are estimated to be 200,000 recreational fishers. Hence, Matos-Caraballo believes it is likely that recreational fishers will formally enter the commercial fishery in upcoming years.

According to Griffith et al. (2007), most commercial fishers and charter boat operators have one to two crew members (mean of 1.8 and a median of 2), and most of these crew members are friends or family. The largest percentage of the commercial fishers and charter boat captains and crew members (49.4 percent) fish with friends, followed by those who fish with fishing partners (16.2 percent), with children (11.9 percent), and with brothers (7.9 percent). The overwhelming majority of crew members are Puerto Rican. When fishers were asked how easy or difficult it was to find suitable crew, 51 percent of those that answered the question reported that it was "difficult or very difficult" and 37.2 percent of them reported that it was "easy or very easy" (Griffith et al. 2007).

Commercial fishing in Puerto Rico is not restricted to men. This is evidenced by the fact that two of the 20 expert southeastern fishers interviewed by García-Quijano (2009) were female.

Puerto Rican commercial fishers use different methods to market their catch: selling to a fish buyer/house, restaurant, their own fish house, association and/or to others while walking. According to Matos-Caraballo (2004: 61), the percentage of interviewed fishers who sold their catch by walking decreased from 41 percent in 1995/96 to 28 percent in 2002. Perhaps, in response to gasoline price increases, the percentage of those walking rose to 36 percent in 2008 (Matos-Caraballo and Agar 2011). Similarly, while the percentage of those who sold their catch through fishing associations rose from 40 percent to 47 percent from 1995/96 to 2002, the percentage fell to 28 percent in 2008. The percentage of those interviewed who sold their catch to a fish buyer/house fell from 33 percent to 30 percent then rose back to 33 percent during the time periods. For all of the three time periods, more than 50 percent of commercial fishers interviewed sell to a fish house and/or by selling while walking along the highway or from their homes. Matos-Caraballo et al. (2002) attribute the declines of fishers selling their catch to restaurants to restaurants' increased use of imported fish products.

Not all fishers use multiple marketing methods. Of the 868 commercial fishers interviewed in 2008 for the fishing industry census, 768 (87.8 percent) fishers sold their catch using only one marketing method. Of those that used only one method, the largest number of fishers sold all of their catch to a fish house that was not their own, followed by those who sold their catch walking along the street or from their homes, and selling to a fishing association.

The 2008 survey of Puerto Rico's commercial fishers suggests there are coastal differences regarding marketing strategies of fishers. The most popular method of selling catch on the north and south coasts is by walking along the road or selling catch from one's home, while on the east and west coasts more fishers sell some to all of their catch to fish houses (Table 5.3.5). While about 10 percent of the interviewed fishers on the west coast sold catch to restaurants, less than 2 percent of those on the south coast sold to restaurants. Along the north coast more fishers (7.4 percent of those interviewed) sell their catch from their own fish houses, while less than 4 percent of those on the west coast sell catch from their own fish houses. The least popular method on the north, south and east coasts is selling catch to a restaurant, while the least popular method reported on the west coast is selling catch from one's own fish house.

Table 5.3.5. Percent of interviewed commercial fishers by coast that use marketing methods, 2008. Source: Data from Matos-Caraballo and Agar 2011.

Marketing Method	Percent of Interviewed Fishers that Use Marketing Method			
	North	South	East	West
Fishing Association	40.7%	29.6%	25.8%	21.1%
Restaurants	2.5%	1.7%	7.1%	10.1%
Fish House	20.4%	26.6%	38.1%	41.2%
Own Fish House	7.4%	6.4%	7.1%	3.8%
Walking/Home	45.7%	40.3%	38.1%	26.7%

Not all fish caught by commercial fishers are sold and, according to ethnographic wok by Griffith et al. (2007), it is rare for a fisher to sell all of his catch. Part of the catch is kept for home and community consumption. Of 256 commercial fishers interviewed by Griffith et al. (2007), about 74 percent reported using some fish for household consumption. Most of the fishers interviewed for their study "reported giving away some of their catch to neighbors, elderly, family, etc. and we heard in several locations that fish consumption made up substantial portions of the diets of fishers and their families." This demonstrates that a decrease in the commercial catch may not only decrease potential revenues and incomes earned from sales of the catch, but may decrease home consumption of fish within the households of the boat-owning fishers, their crews and community as well.

5.3.2.4 Puerto Rico commercial fishing fleet

As the number of active commercial fishers rose and fell over time, so too did the size of the commercial fishing fleet since 1899. There was an increasing trend from 1899 with 350 active fishing vessels to 1996's high of 1,501. That trend ended after 1996, however, as the number of vessels has fallen since then. In 2008, there were 670 active commercial fishing vessels. The rate of decline has not been the same across the four coasts. The west coast lost 10 percent of its active fishing vessels from 2002 to 2008, while the other three coasts had losses equal or greater than 30 percent from 2002 to 2008 (Table 5.3.6).

Table 5.3.6. Active Puerto Rican commercial fishing vessels by coast, 2002 & 2008. Source: Matos-Caraballo 2004, Matos-Caraballo and Agar 2011.

Coast	2002	2008	Percent Change 2002 - 2008
North	216	134	-38.0%
South	279	176	-36.9%
East	199	124	-37.7%
West	262	236	-9.92%
Total	***956***	***670***	***-29.9%***

The lengths of active commercial vessels have varied slightly since 1969. There are slight differences among coasts. For example, in 2000, there were no active vessels 40 feet or longer on the south coast; however, 2 percent of active vessels on the east coast were of that size. In 2008, the only active commercial fishing vessels 40 feet or longer were on the west coast.

The large majority of commercial vessels have small motors that are gasoline powered, regardless of coast, although the percentage of diesel motors is highest along the west coast. The north coast likely has the largest percentage of motors over 100 horsepower because of the surge conditions off the north coast.

5.3.2.5 Gears used by commercial fishers

Puerto Rico commercial fishers use multiple gears, such as nets, hook-and-line gears, and traps, as well as spears, baskets and gaffs while diving, and typically they use multiple gears per trip (Dennis et al. 1996). For example, fishers may dive while soaking nets. The three most common primary gear types are hooks & lines, traps/pots, and gill nets, and the most common species captured with hook & lines, traps/pots and gill nets are snapper-grouper species (reef fish) and lobster. Most gear is locally made and inexpensive (García-Quijano 2009).

The use of traps has generally declined. According to Griffith et al. (2007), traps have become less popular for a variety of reasons, "including problems with losing traps due to weather or other factors, having traps stolen, the time and monetary costs of trap construction as opposed to other gear, and problems with storing traps while leaving fishing to work in the wage labor sector. According to Griffith and Valdés-Pizzini (2002: 79), full-time trap fishers who use traps as their primary gear report that "they spend two to three hours at a time in trap construction and maintenance." Both Matos-Caraballo (1997) and Valdés-Pizzini et al. (1992) found increases in the use of SCUBA gear as the use of traps/pots declined.

Table 5.3.7. Percent of commercial pounds landed by gear type for 1997-1999 and 2004-2006. Source: Matos-Caraballo 2000, 2007.

		Percent of Pounds Landed by Gear Type				
Year	**Species**	**Hook & Line**	**Nets**	**Traps/Pots**	**Diving**	***Total***
1997	Fish	46.7%	24.8%	22.8%	5.7%	*100.0%*
	Shellfish	0.0%	3.8%	28.7%	67.5%	*100.0%*
	Total	*39.8%*	*21.7%*	*23.7%*	*14.9%*	*100.0%*
1998	Fish	46.3%	25.6%	21.5%	6.6%	*100.0%*
	Shellfish	0.0%	6.0%	24.8%	69.1%	*100.0%*
	Total	*37.9%*	*22.0%*	*22.1%*	*18.0%*	*100.0%*
1999	Fish	49.0%	25.1%	19.6%	6.3%	*100.0%*
	Shellfish	0.0%	6.2%	30.7%	63.1%	*100.0%*
	Total	*40.2%*	*21.7%*	*21.6%*	*16.4%*	*100.0%*
2004	Fish	50.8%	20.7%	20.3%	8.3%	*100.0%*
	Shellfish	0.2%	3.5%	21.7%	74.6%	*100.0%*
	Total	*38.4%*	*16.5%*	*20.6%*	*24.5%*	*100.0%*
2005	Fish	64.3%	12.8%	15.5%	7.3%	*100.0%*
	Shellfish	0.7%	2.5%	22.0%	74.7%	*100.0%*
	Total	*48.4%*	*10.3%*	*17.2%*	*24.2%*	*100.0%*
2006	Fish	55.8%	21.1%	15.4%	7.7%	*100.0%*
	Shellfish	0.3%	4.0%	22.1%	73.5%	*100.0%*
	Total	*42.1%*	*16.9%*	*17.0%*	*23.9%*	*100.0%*

According to Matos-Caraballo (2007), most commercial fishers used hook-and-line gear to obtain their catch. This is evidenced during the two 3-year periods of 1997 to 1999 and 2004 to 2006. During these time periods, hook-and-line gear took the most pounds of fish, varying from 46.3 percent of annual pounds to 64.3 percent of annual pounds landed. Most shellfish, from 63.1 percent of pounds landed in 1999 to 74.7 percent of pounds landed in 2005, were taken by diving. Hook-and-line gear took from zero to 0.7 percent of shellfish during the two 3-year periods from 1997 to 1999 and 2004 to 2006. The percent of landings taken by traps/pots fell from 22.8 percent in 1997 to 19.6 percent in 1999, then rose to 20.3 percent in 2004 to fall to 15.4 percent in 2006 (Table 5.3.7). A more detailed discussion of gears used to catch the species within the FMUs affected by this amendment is presented later in this section.

Among the nets that have been used are beach seines and gill, trammel, and cast nets; however, on March 12, 2007, a beach seine ban was enforced. The most popular net gears are gill and cast nets, although their total use declined from 1996 to 2008. On the west coast, however, more gill nets and cast nets were used during that time period. Along the south coast, significantly more trammel nets were used in 2008, especially lobster trammel nets. Since November 2005, federal regulations have prohibited the use of gill and trammel nets in the U.S. Caribbean EEZ to harvest Caribbean reef fish, which may partially explain the decreased use of these gears, although depth of water in the EEZ does not favor the use of these nets. Fishing with traps/pots, bottom longlines, gill nets, or trammel nets is prohibited year-round in the seasonally closed areas established to protect red hind spawning aggregations as well as the mutton snapper spawning aggregation off St. Croix. This prohibition has been extended by the local governments to areas of shared jurisdiction.

From 1997 through 1999 and from 2004 through 2006, gill nets accounted for the majority of landings (in pounds) for all fish landings reported to be taken by net gear. A large percent of reported landings were by trammel net, locally known as mallorquín. Although at least 10 percent of the pounds landed by nets were taken by beach seine in 2006. The use of beach seines, prohibited since 2007, has been recently authorized by the new Puerto Rico Fishing Regulations 7949 of November 2010.

The use of net gear is contested in Puerto Rico. Among the views of those who oppose net gear are that nets are harmful to marine ecosystems, are barriers to navigation, and are nuisances to recreational fishing and other activities.

Hook-and-line gear includes rod and reel, and long, bottom, hand and troll lines. Hand line is a very important gear in Puerto Rico in part because, compared to other gears, it has the lowest cost. Commercial fishers who use hand lines typically target species of coral reef fishes, mainly those of the families Serranidae, mostly red hind and coney, and Lutjanidae, mostly yellowtail snapper and mutton snapper (Matos-Caraballo 2005). The U.S. Caribbean EEZ has been closed to the possession of mutton snapper from April 1 to June 30 of each year since November 2005, which may partially explain the decreased use of hand line. The local government of Puerto Rico also established, beginning in 2004, a seasonal closure for mutton snapper during the months of April and May.

West coast fishers depend on deep-water hook-and-line fishing in the Mona Passage (Griffith and Valdés-Pizzini 2002: 79). Although the EEZ off the west coast of Puerto Rico has been closed to the possession of red hind from December 1 to the end of February each year since November 2005, and in Puerto Rico state waters since 2004, there is no indication that this closure has affected the use of net gear along that coast.

The total pounds landed by hook-and-line gear decreased from 1997 to 2006, and the pounds landed by each type of hook-and-line gear significantly decreased during this period (Matos-Caraballo 2007). Of the annual catch taken by hook-and-line gear, bottom lines took at least 70 percent of the fish from 1997 to 1999 and at least 75 percent of the fish from 2004 to 2006. With the exception of 1999, rod and reel accounted for less than 0.4 percent of annual catch taken by hook-and-line gear during the two 3-year periods. Troll line ranks second among the hook-and-line gear in terms of catch.

Diving is another means of commercially harvesting fish and shellfish and for some commercial fishers; it is preferred because they can target their catch with great selectivity. Skin diving (or free diving) in shallow waters has a very long tradition, while SCUBA diving's presence in Puerto Rico is no more than 35 to 45 years old. Scuba diving is more frequent than skin diving. The majority of shellfish are taken by diving.

From 1996 to 2008, there was a general decrease in the use of diving and diving gears. In 2008, diving was more prevalent on the west coast. The survey changed categories of gear used with diving from 1996 to 2008. In 1996 and 2002, divers were asked if they used spear, gaff, lace and/or bucket. In the 2008 survey, they were asked if they used snare, spear, gaff, basket, slurp gun and/or ornamental hand nets.

Reported commercial landings from SCUBA diving dwarf reported landings from skin diving during the two 3-year periods of 1997 to 1999 and 2004 to 2006. Scuba diving took from 96.4 percent to 98.3 percent of the fish taken by diving from 1996 to 1999 and from 97.8 percent to 99.3 percent of the fish taken by diving from 2004 to 2006. Similarly, SCUBA diving took from 90.3 percent to 92.6 percent of the shellfish landed from 1996 to 1999 and from 94.5 percent to 98.2 percent of shellfish landed from 2004 to 2006. However, from 1997 to 2006, there was a significant decline in the pounds of fish reported to be landed by SCUBA diving (Matos-Caraballo 2000, 2007).

According to NMFS HMS (2009), U.S. Caribbean commercial fishing associations are looking for fish aggregation or attracting devices (FADs) or anything that could be done to improve their ability to catch fish. Commercial fishers want new FADs while prohibiting recreational fishers from fishing around FADs. A FAD can improve the production of artisanal fishers by lowering fuel costs and reducing the time spent at sea looking for fish. However, a study of six FADS that were deployed off the northeast coast of Puerto Rico from June 1986 to December 1986 by Feigenbaum et al. (1989) concluded that although there was a positive effect on commercial and recreational fisheries, there was not a dramatic increase in harvest. Moreover, five of the FADS were lost, and the study showed that FADs that are successful elsewhere are not adequate to survive ship traffic and fish bites in Puerto Rico waters.

5.3.2.6 Reported and adjusted landings

Puerto Rico Law Number 278 of November 29, 1998, authorized the PRDNER to require commercial fishers to report commercial fishing statistics; however, the implementing regulation (Fishing Regulation 6768 that established a trip-ticket system) did not occur until March 11, 2004 (SEDAR 2007: 11). As an incentive to encourage voluntary reporting, fishers received discounted mooring fees if they submitted their catch records, and they did. However, the 2004 reporting requirement has met much resistance. According to Matos-Caraballo (2007: 8), most fishers believe the government's action was ultimately to eliminate, not protect, the commercial fisheries. In consequence, commercial fishing leaders instructed fishers, many of whom had been friendly with PRDNER staff and voluntarily reported their landings prior to 2004, to stop submitting trip tickets and they have (Matos-Caraballo 2007). García-Quijano (2009) found, as a result of ethnographic work, that official records of landings are unreliable because protesting fishers purposely report inaccurate landings or do not report landings.

Other regulations have also motivated commercial fishers to not report their landings and engage in other acts of civil disobedience (Kirkley et al. 2008). First, commercial fishers oppose the commonwealth's prohibition on fishing for Nassau grouper, although ironically landings of the species are reported. Second, since October 1, 2006, PRDNER staff have observed that "many part-time commercial fishers [have] retired and some of them have become illegal fishers [no license, no reports to PRDNER]" because on October 1, 2006, the Puerto Rican government implemented a sales tax that required commercial fishers to pay a municipal sales tax on the catch that they sold (Matos-Caraballo 2007: 11). Moreover, because of recent changes in federal tax laws, Puerto Rico's commercial fishers are now required to file an income tax return. Although most Puerto Rican fishers presently have a 90-percent exemption from federal taxes if they are considered a bonafide fisher (Puerto Rico Internal Revenue Code of 1994), in the past, they did not have to file an income tax return. Hence, this recent tax-filing requirement has also been an incentive for some to not report their landings (NMFS HMS 2009).

Various methods have been used to adjust the voluntary (before March 11, 2004) and compulsory (since March 11, 2004) reported landings in Puerto Rico in order to generate a more accurate account of commercial fishing activity (Matos-Caraballo 2001, 2007). Without such an adjustment, the significance of existing commercial fishing activity and its impacts on local fisheries and economies would be underestimated and understated. Thus, adjustment factors have been developed and applied to voluntarily reported landings and required trip-ticket reported landings in order to generate more accurate estimates of commercial landings for Puerto Rico's fisheries, including the five fisheries experiencing overfishing. Adjustment factors are used are to estimate actual commercial landings by weight and value in Puerto Rico for the analysis of economic and social impacts of this amendment (Tables 5.3.8 and 5.3.9). Note that the adjustment factors are the same for each year's landings by weight and dollars.

Table 5.3.8. Reported and adjusted landings (pounds) and adjustment factors, 1983-2007.

Year	Total Reported Landings	Total Adjusted Landings	Adj. Factor	Adj. Factor North	Adj. Factor South	Adj. Factor East	Adj. Factor West
1983	3,916,688	6,420,800	1.64				
1984	3,154,298	5,346,268	1.69				
1985	2,855,085	5,098,366	1.79				
1986	2,535,388	3,380,517	1.33				
1987	2,081,941	2,775,921	1.33				
1988	2,013,663	3,595,827	1.79				
1989	2,290,865	4,491,892	1.96				
1990	2,179,705	4,273,931	1.96				
1991	2,458,664	4,820,910	1.96				
1992	2,043,970	3,406,616	1.67				
1993	2,495,161	4,158,601	1.67				
1994	2,708,878	4,232,622	1.56				
1995	3,687,686	5,193,924	1.41				
1996	3,581,209	5,043,956	1.41				
1997	3,804,030	4,876,962	1.28				
1998	3,452,976	4,426,892	1.28				
1999	3,325,991	4,264,092	1.28				
2000	3,244,005	5,691,236	1.75				
2001	3,387,748	4,981,983	1.47				
2002	3,271,960	3,804,605	1.16				
2003	2,387,974	4,230,409		1.96	1.52	1.01	2.33
2004	1,864,679	4,002,550		2.50	3.70	1.52	1.47
2005	1,440,024	5,725,259		1.01	5.00	12.50	1.35
2006	1,311,981	2,380,695		7.69	1.52	3.45	1.01
2007	1,254,156	2,198,377		3.33	1.30	3.70	1.45

Table 5.3.9. Reported and adjusted total ex-vessel revenue (dollars), 1983-2007.

Year	Total Ex-Vessel Revenue		Adj. Factor	Adj. Factor North	Adj. Factor South	Adj. Factor East	Adj. Factor West
	Rep.	Adj.					
1983	4,719,730	7,737,263	1.64				
1984	3,969,018	6,727,148	1.69				
1985	4,004,500	7,150,894	1.79				
1986	3,724,647	4,966,196	1.33				
1987	3,025,652	4,034,203	1.33				
1988	3,096,188	5,528,907	1.79				
1989	3,794,705	7,440,598	1.96				
1990	3,560,764	6,981,890	1.96				
1991	4,292,384	8,416,439	1.96				
1992	3,707,795	6,179,658	1.67				
1993	4,444,681	7,407,802	1.67				
1994	5,156,078	8,056,372	1.56				
1995	7,242,214	10,200,301	1.41				
1996	6,993,718	9,850,307	1.41				
1997	7,607,758	9,753,536	1.28				
1998	7,180,042	9,205,182	1.28				
1999	7,227,771	9,266,373	1.28				
2000	7,062,855	12,390,973	1.75				
2001	7,677,129	11,289,895	1.47				
2002	7,502,764	8,724,145	1.16				
2003	5,621,405	9,785,319		1.96	1.52	1.01	2.33
2004	4,517,619	9,863,395		2.50	3.70	1.52	1.47
2005	3,756,903	15,514,054		1.01	5.00	12.50	1.35
2006	3,721,152	6,650,178		7.69	1.52	3.45	1.01
2007	3,647,144	6,319,083		3.33	1.30	3.70	1.45

5.3.2.7 Puerto Rico Combined Commercial Landings

During the 25-year period from 1983 to 2007, reported commercial landings in Puerto Rico varied from a high of nearly 3.92 million pounds (whole weight) in 1983 to a low of approximately 1.25 million pounds in 2007 (Figure 5.3.4 and Table 5.3.8). Adjusted landings varied from a high of approximately 6.42 million pounds in 1983 to just under 2.2 million pounds in 2007. During the same years, the reported value of commercial landings peaked at approximately $7.68 million in 2001 (adjusted to $11.29 million) and declined to approximately $3.65 million (adjusted to $6.32 million) in 2007 (Figure 5.3.5 and Table 5.3.9).

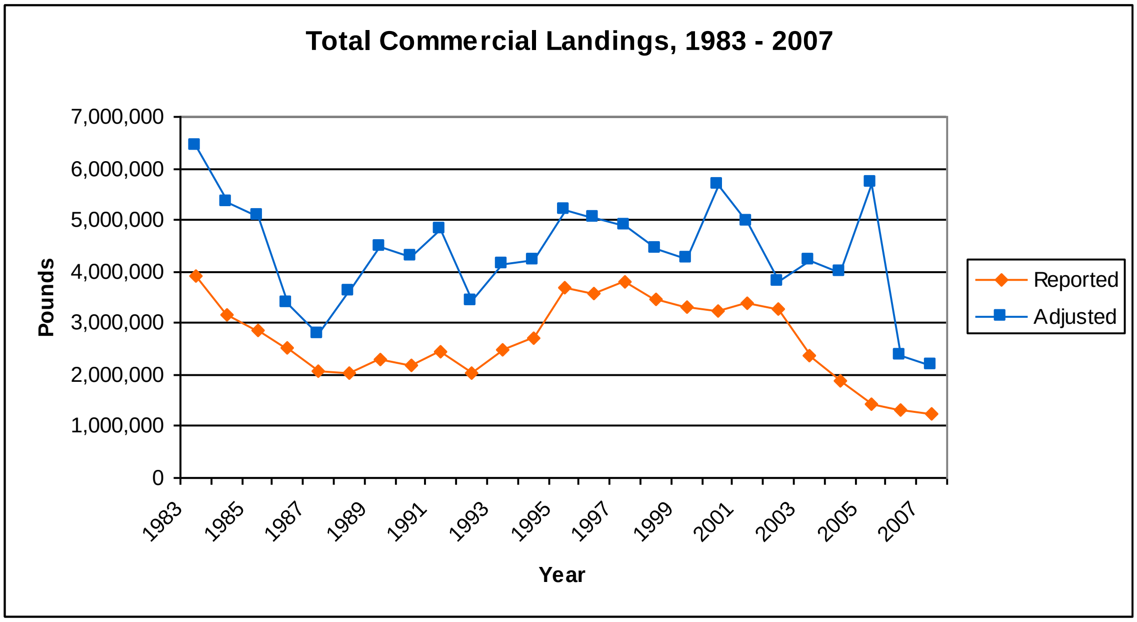


Figure 5.3.4. Total commercial landings (pounds), 1983-2007.

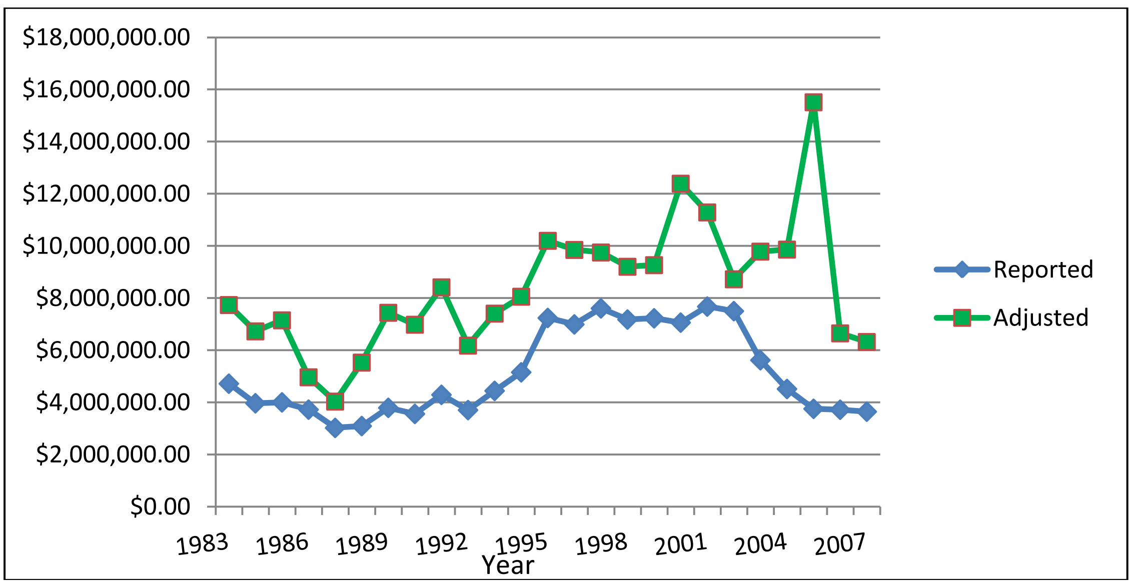


Figure 5.3.5. Ex-vessel revenue (dollars) from total commercial landings, 1983-2007.

Finfish landings account for the majority of Puerto Rico's annual commercial landings, representing from 73 percent to 87 percent of annual landings of all species (in pounds) from 1983 to 2007. However, the proportion of all reported commercial landings attributed to shellfish has increased over this 25-year period as a result of declining finfish landings.

Finfish landings also represent the majority of the ex-vessel revenue from commercial landings, although the contribution has declined since peaking in 1993. In 2007, finfish landings accounted for 55.2 percent of reported and 56.5 percent of adjusted ex-vessel revenues from all commercial landings.

The west coast has consistently been the most productive area in terms of fishing over time (Collazo & Calderón 1987/88, Matos-Caraballo 2007), and reported landings from 1996 to 1999 and from 2004 to 2006, for example, agree. The west coast consistently accounted for most reported landings. From 1996 to 1999, west coast landings represented from 35 percent to 39 percent of annual reported landings in pounds, and from 2004 to 2006, west coast landings represented from 46 percent to 55 percent of annual reported landings in pounds (Table 5.3.10). Along the west coast is the Mona Passage, which is one of the primary fishing grounds for west coast commercial fishers because it is there where snapper, sea basses, grouper, trunkfish, and pelagic species of tuna, jacks, king mackerel, marlin, sailfish, and swordfish are caught.

Table 5.3.10. Percent of annual reported commercial landings (pounds and dollars) from all species by coast, 1997-1999, 2004-2006. Source: Matos-Caraballo 2000, 2007.

Year	Coast	Percent of Landings	Percent of Revenue	Year	Coast	Percent of Landings	Percent of Revenue
1997	North	12.4%	14.3%	**2004**	North	9.0%	8.6%
	South	31.5%	34.7%		South	25.7%	27.5%
	East	18.7%	20.8%		East	19.1%	20.5%
	West	37.4%	30.2%		West	46.2%	43.3%
	All	***100.0%***	***100.0%***		***All***	***100.0%***	***100.0%***
1998	North	12.5%	13.3%	**2005**	North	7.5%	6.7%
	South	30.7%	32.3%		South	23.5%	25.2%
	East	17.7%	17.8%		East	15.2%	16.4%
	West	39.1%	36.6%		West	53.8%	51.6%
	All	***100.0%***	***100.0%***		***All***	***100.0%***	***100.0%***
1999	North	12.7%	13.3%	**2006**	North	4.6%	4.0%
	South	32.7%	33.5%		South	25.9%	27.8%
	East	19.5%	20.5%		East	14.5%	15.0%
	West	35.1%	32.6%		West	55.0%	53.2%
	All	***100.0%***	***100.0%***		***All***	***100.0%***	***100.0%***
3-Year Average	North	12.5%	13.7%	**3-Year Average**	North	7.3%	6.6%
	South	31.6%	33.5%		South	25.0%	26.9%
	East	18.6%	19.7%		East	16.5%	17.5%
	West	37.2%	33.1%		West	51.1%	49.1%
	All	***100.0%***	***100.0%***		***All***	***100.0%***	***100.0%***

The south coast consistently has accounted for the second most landings in both pounds and dollars. From 1996 to 1999, south coast reported landings represented an average of

32 percent of pounds and 34 percent of value of total annual landings. Similarly, the south coast's reported landings represented an average of 25 percent of pounds and 27 percent of value of total annual reported landings from 2004 to 2006. The north coast consistently accounts for the smallest share of reported landings by pounds and dollars.

Monthly landings of fish, excluding shellfish, for each month from January 1997 to December 1999 tend to show the highest monthly landings in March and April, which corresponds to the Christian religious season of Lent. During Lent, demand for seafood tends to increase significantly in Puerto Rico, which motivates increased fishing activity (Griffith et al. 2007). Lent was from February 12 to March 30 in 1997, February 25 to April 12 in 1998, and February 17 to April 4 in 1999. Monthly commercial landings of fish in 2005 and 2006 also show increases in March. Lent was from February 25 to April 11 in 2004, February 9 to March 27 in 2005, and March 1 to April 16 in 2006. Curiously, 2004 does not show similar trends, but this may be partially attributable to the March 11, 2004, regulation that changed reporting of catch from a voluntary act to a mandatory one. Many fishers, who had been voluntarily reporting, did not report in protest of the change. The decline in landings in December 2005 and from December to February in 2006 may partially reflect seasonal closures implemented in November 2005.

In 2008, 868 commercial fishers were interviewed for the most recent survey. Among the questions asked of each fisher was what species they targeted. Across the four coasts, most fishers reported that they target reef fish (Table 5.3.11). On the north, east and west coasts, the second most targeted species are deep-water snapper. The second most targeted species on the south coast is lobster. Deep-water snapper species include silk snapper (Snapper Unit 1), reef fishes includes Grouper Units 1 (Nassau grouper) and 4 (red, misty, tiger, yellowedge, and yellowfin), and parrotfish.

Table 5.3.11. Species targeted by interviewed commercial fishers, 2008. Source: Matos-Caraballo and Agar 2011.

Targeted Species	Percent of Interviewed Fishers				
	North	South	East	West	Puerto Rico
Reef Fishes	88%	88%	76%	65%	77%
Ornamental	1%	1%	2%	2%	2%
Deep-Water Snapper*	72%	4%	72%	51%	56%
Pelagic Fishes	65%	30%	67%	27%	42%
Lobster	28%	57%	65%	47%	49%
Conch	13%	45%	35%	35%	33%
Octopus	2%	19%	0%	1%	6%
Bait	53%	31%	33%	18%	31%
Land Crab	9%	6%	10%	2%	6%
Sirajo Gobies	8%	1%	0%	0%	2%

*At least one of the percentages for the 4 coasts in this row may be under-reported.

5.3.2.8 Per capita consumption and imports of fish and shellfish

The annual per capita consumption of fish and shellfish for human food is low in Puerto Rico. During the three-year period from 2003 to 2005, it averaged to be 1.8 pounds (*Fisheries Statistics of the United States 2008*). That contrasts sharply with average annual per capita consumption of 94.9 pounds in Antigua, 53.4 pounds in the U.S., 29.6 pounds in the USVI, and 22.3 pounds in the Dominican Republic.

Fish or shellfish have not historically been a mainstay of the Puerto Rican diet, although imported codfish has been a significant part of the weekly diet of Puerto Rican families, especially those in rural areas (Fernández et al. 1971). Historically, per capita consumption of fresh and frozen fish and seafood has ranked toward the bottom of per capita consumption of major food groups. For example, of 19 major food groups, per capita consumption of fresh and frozen fish and seafood ranked from last to third from the last from 1950/51 to 1972/73. Per capita consumption of processed fish and seafood ranked higher, but its ranking declined from 1950-51 to 1973-73.

Although Puerto Rico's per capita consumption of seafood is low, the commonwealth imports substantially more pounds of edible fish products than the pounds annually landed by commercial fishers. On average, pounds imported of edible seafood dwarf the pounds landed by commercial fishers annually (Table 5.3.12). From 1999 to 2007, pounds of edible fish products imported annually were on average 28 times larger than the pounds commercially landed annually. During the same period, snapper products represented an average of 1.37 percent of annual imports of edible fish products and similarly, grouper products represented an average of 0.26 percent by weight. Also, conch imports represented an average of one tenth of a percent of annual imports of edible fish products, by weight, during the same 9-year period.

Table 5.3.12. Puerto Rico imports of edible fish products and adjusted commercial landings (pounds), 1999-2007.
Source: NMFS: http://www.st.nmfs.noaa.gov/st1/trade/index.html.

Year	**Pounds**		**Imports ÷ Adj. Landings**
	Imports	**Adj. Landings**	
1999	229,848,577	4,264,092	53.90
2000	195,624,554	5,691,236	34.37
2001	130,457,565	4,981,983	26.19
2002	83,410,049	3,804,605	21.92
2003	89,671,350	4,230,409	21.20
2004	76,628,491	4,002,550	19.14
2005	35,835,074	5,725,259	6.26
2006	79,722,470	2,380,695	33.49
2007	78,560,997	2,198,377	35.74
Average	*111,084,347*	*4,142,134*	*28.02*

5.3.2.9 Commercial sector

5.3.2.9.1 Snapper Unit 1 commercial harvest

Snapper Unit 1 is presently composed of silk (*Lutjanus vivanus*), black (*Apsilus dentatus*), vermilion (*Rhomboplites aurorubens*) and blackfin (*Lutjanus buccanella*) snapper. These species are typically caught at depths ranging from 80 meters to 350 meters. Silk snapper is the indicator species for the unit.

Table 5.3.13. Reported and adjusted landings (pounds) of Snapper Unit 1 as percentages of all species commercially landed, 1983-2007.

Year	Reported Landings			Adjusted Landings		
	Snapper Unit 1	All Species	Percent of All Species from Snapper Unit 1	Snapper Unit 1	All Species	Percent of All Species from Snapper Unit 1
1983	396,343	3,916,688	10.1%	649,742	6,420,800	10.1%
1984	357,156	3,154,298	11.3%	605,349	5,346,268	11.3%
1985	371,827	2,855,085	13.0%	663,977	5,098,366	13.0%
1986	356,898	2,535,388	14.1%	475,864	3,380,517	14.1%
1987	209,399	2,081,941	10.1%	279,198	2,775,921	10.1%
1988	172,843	2,013,663	8.6%	308,648	3,595,827	8.6%
1989	247,800	2,290,865	10.8%	485,883	4,491,892	10.8%
1990	179,375	2,179,705	8.2%	351,715	4,273,931	8.2%
1991	171,495	2,458,664	7.0%	336,265	4,820,910	7.0%
1992	214,040	2,043,970	10.5%	356,733	3,406,616	10.5%
1993	252,207	2,495,161	10.1%	420,344	4,158,601	10.1%
1994	346,201	2,708,878	12.8%	540,939	4,232,622	12.8%
1995	381,463	3,687,686	10.3%	537,271	5,193,924	10.3%
1996	321,423	3,581,209	9.0%	452,709	5,043,956	9.0%
1997	300,475	3,804,030	7.9%	385,224	4,876,962	7.9%
1998	229,730	3,452,976	6.7%	294,525	4,426,892	6.7%
1999	246,922	3,325,991	7.4%	316,567	4,264,092	7.4%
2000	220,957	3,244,005	6.8%	387,643	5,691,236	6.8%
2001	320,868	3,387,748	9.5%	471,865	4,981,983	9.5%
2002	231,059	3,271,960	7.1%	268,674	3,804,605	7.1%
2003	196,018	2,387,974	8.2%	372,234	4,230,409	8.8%
2004	131,818	1,864,679	7.1%	241,719	4,002,550	6.0%
2005	108,678	1,440,024	7.5%	285,765	5,725,259	5.0%
2006	88,425	1,311,981	6.7%	169,913	2,380,695	7.1%
2007	70,681	1,254,156	5.6%	132,688	2,198,377	6.0%
Average	***244,964***	***2,669,949***	***9.1%***	***391,658***	***4,352,928***	***9.0%***

Snapper Unit 1 is composed of important commercial species. During the 25-year period from 1983 to 2007, combined landings of SU1 species represented an average of 9.1 percent (9.0 percent adjusted) of annual commercial landings for all species. Annual reported commercial landings of SU1 species combined varied from a low of 70,681 pounds (adjusted to 132,688 pounds) in 2007 to a high of 381,463 pounds (adjusted to 537,271 pounds) in 1995 (Table 5.3.13). Note that reported pounds landed fell by approximately 19 percent from 2005 to 2006 and adjusted pounds by approximately 41 percent in that time. In 2005, an October through December seasonal closure was established in the U.S. Caribbean EEZ while the government of Puerto Rico implemented in 2004 a minimum size for silk snapper. The minimum size was later rescinded and an October through December seasonal closure established in state waters for both the silk and blackfin snapper.

Table 5.3.14. Ex-vessel revenues (dollars) from Snapper Unit 1 and finfish, 1983-2007.

	Snapper Unit 1 Ex-Vessel Revenues		Finfish Ex-Vessel Revenues		% Finfish Revenues from Snapper Unit 1	
Year	**Reported**	**Adjusted**	**Reported**	**Adjusted**	**Reported**	**Adjusted**
1983	642,214	1,052,809	3,118,241	5,111,871	20.6%	20.6%
1984	584,371	990,459	2,580,801	4,374,240	22.6%	22.6%
1985	710,300	1,268,393	2,750,198	4,911,068	25.8%	25.8%
1986	683,168	910,891	2,603,266	3,471,021	26.2%	26.2%
1987	387,445	516,593	2,175,507	2,900,676	17.8%	17.8%
1988	355,936	635,600	2,048,773	3,658,523	17.4%	17.4%
1989	522,591	1,024,689	2,626,506	5,150,011	19.9%	19.9%
1990	389,005	762,756	2,526,284	4,953,497	15.4%	15.4%
1991	393,056	770,697	3,023,464	5,928,360	13.0%	13.0%
1992	509,122	848,536	2,718,188	4,530,313	18.7%	18.7%
1993	617,704	1,029,507	3,256,633	5,427,722	19.0%	19.0%
1994	859,834	1,343,491	3,776,362	5,900,566	22.8%	22.8%
1995	953,513	1,343,405	5,289,514	7,450,019	18.0%	18.0%
1996	837,276	1,179,262	4,906,958	6,911,209	17.1%	17.1%
1997	769,443	986,465	5,422,712	6,952,195	14.2%	14.2%
1998	643,751	825,322	4,917,691	6,304,732	13.1%	13.1%
1999	702,842	901,080	4,912,010	6,297,449	14.3%	14.3%
2000	631,038	1,107,084	4,888,421	8,576,177	12.9%	12.9%
2001	941,145	1,384,037	5,384,157	7,917,879	17.5%	17.5%
2002	676,228	786,312	5,141,651	5,978,664	13.2%	13.2%
2003	571,664	1,088,372	3,739,175	6,646,332	15.3%	16.4%
2004	404,013	746,552	2,737,777	6,001,433	14.8%	12.4%
2005	342,422	922,332	2,309,731	8,884,820	14.8%	10.4%
2006	301,716	570,210	2,117,209	4,038,619	14.3%	14.1%
2007	240,860	441,256	2,012,864	3,572,308	12.0%	12.4%
Average	***586,826***	***937,444***	***3,479,364***	***5,673,988***	***17.2%***	***17.0%***

During the same 25-year period, annually reported commercial landings of SU1 represented from 7.7 percent to 16.9 percent of all reported commercial finfish landings (pounds), averaging 11 percent. Similarly, adjusted annual commercial landings of the unit represented from 6.8 percent to 16.9 percent of adjusted annual commercial landings (pounds) of all finfish species, averaging nearly 11 percent annually.

Ex-vessel revenues from SU1 landings represent a significantly higher portion of such revenues from finfish species. From 1983 to 2007, reported SU 1 revenues represented from 12 to approximately 26 percent of reported revenues from all finfish landings, while adjusted revenues for the Unit represented from approximately 10 to 26 percent of adjusted revenues from all species (Table 5.3.14). Note that reported ex-vessel revenue from SU1 landings fell from approximately 12 percent from 2005 to 2006 and approximately 21 percent from 2006 to 2007, while adjusted ex-vessel revenue for the unit fell from approximately 38 percent from 2005 to 2006 and approximately 23 percent from 2006 to 2007.

Silk snapper (commonly called chillo) dominates the reported commercial landings of SU1, representing from 100 percent to 83.1 percent of annual landings of the unit from 1983 to 2007. However, reported landings of silk snapper have shown a declining trend since 1983. From 1992 to 2004, 90 percent of silk snapper were caught before reaching the minimum size for sexual maturation of 410 mm fork length (PRDNER 2004). According to Griffith et al. (2007), "[f]ull-time Puerto Rican commercial fishers view fishing as a 'moral' enterprise" and this "implies that they view fishing as a productive use of natural resources that provides some food or subsistence security and is directed toward socially beneficial outcomes, such as raising families." Moreover, as such, the commercial fishers "regard wasting fish, as occurs when they have to discard undersized species, as morally reprehensible."

Vermilion snapper's contribution to SU1's annual commercial landings rose from zero before 1987 to 14 percent in 2001 and then consistently fell after 2001. In 2007, reported landings of vermilion snapper represented 2.2 percent of the reported landings of the unit. Annual commercial landings of black snapper represent less than 1 percent of the unit's annual landings, and blackfin snapper landings represent, on average, 1.6 percent of the unit's annual landings.

Annual reported commercial landings of blackfin snapper do not follow a similar trend, having risen from zero from 1983 to 1987 to a high of 10,650 (18,684 adjusted) pounds in 1999, then falling to 873 (1,419 adjusted) pounds in 2007. Similarly, vermilion snapper landings changed during the same time period, rising from 1,418 reported (2,531 adjusted) pounds in 1988 to 44,794 reported (65,875 adjusted) pounds in 2001, then down to 3,096 reported (14,748 adjusted) pounds in 2007. The increasing trend in blackfin snapper and vermilion snapper landings from the mid 1980s to 2001 coincides with declining landings of silk snapper during that same period.

During the 25-year period from 1983 to 2007, the average nominal annual reported ex-vessel price of silk snapper was $2.54 per pound, while such prices of blackfin, black, and vermilion snapper were $2.63, $1.40 and $2.17, respectively. The prices of the species tend to show a 2-period moving average with a general upward trend (Figure 5.3.6). Note that the price of black snapper tends to be less and many times substantially less than the prices of the other species within the unit.

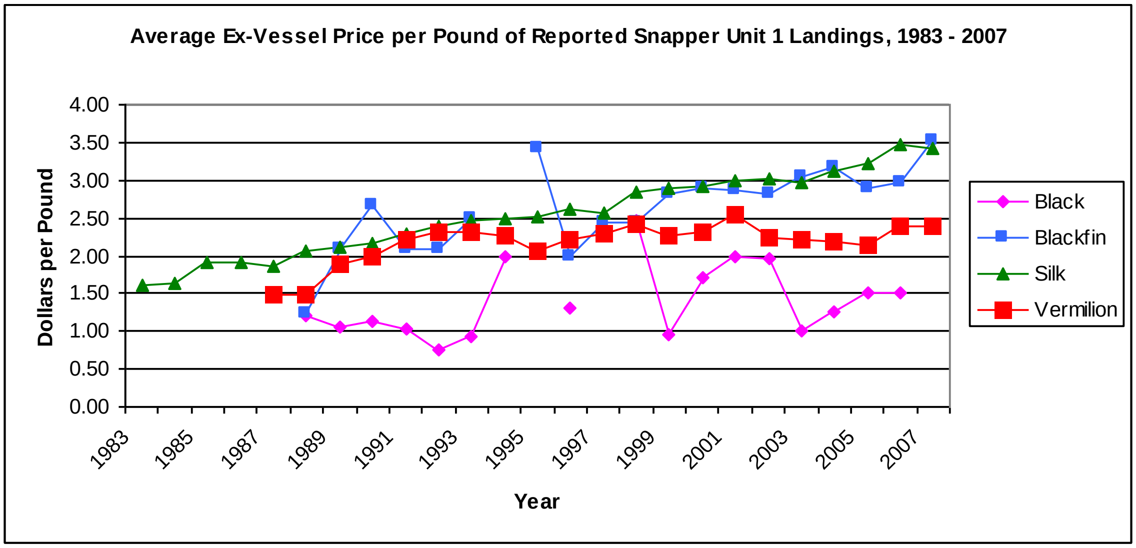


Figure 5.3.6. Average ex-vessel nominal price per pound of reported Snapper Unit 1 landings, 1983-2007.

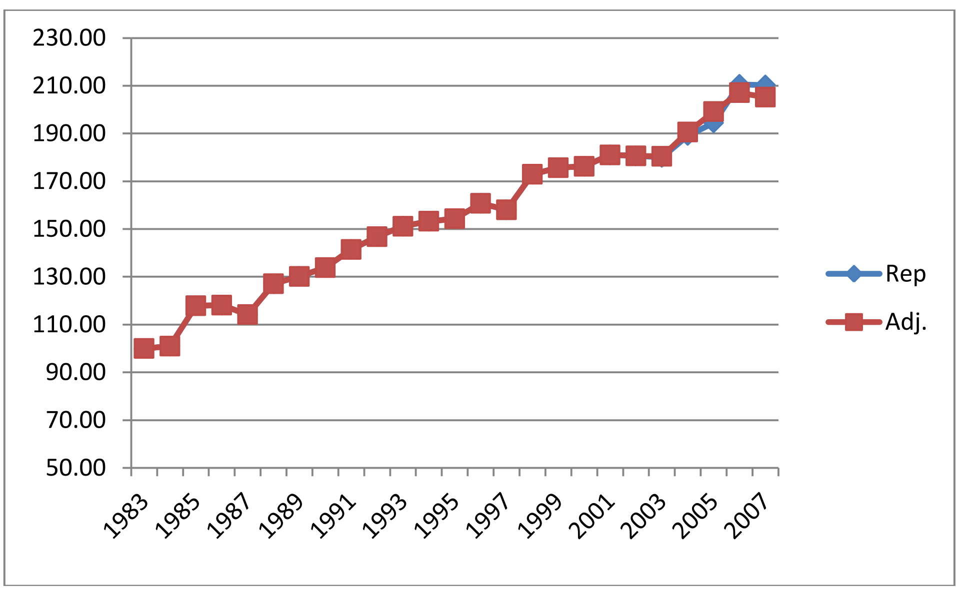


Figure 5.3.7. Ex-vessel price index for Snapper Unit 1, 1983-2007. 1983 =100. Rep. refers to the reported price and quantity and Adj. refers to the adjusted price and quantity.

A graph of the ex-vessel price index for SU 1 in Puerto Rico shows a relatively stable increasing trend from 1983 to 2006 (Figure 5.3.7). The index was obtained for the unit by multiplying the current annual price by the total quantity caught in 1983 (the base year), then dividing the resulting number by the 1983 value to obtain the index:

$$\frac{\text{(100 x Current annual price x 1983 quantity)}}{\text{1983 Annual value}} = \text{Index.}$$

Snapper Unit 1 species are taken by multiple gear. During the two 3-year periods of 1997 to 1999 and 2004 to 2006, for example, the large majority silk snapper was taken by bottom line, which is a hook-and-line gear that is fished first from the bottom then higher and higher in the water column. Bottom line accounted for an average of about 76 percent of annual silk snapper landings from 1997 to 1999 and about 87 percent from 2004 to 2006. Silk snapper was also taken by fish trap and long line, with fish trap ranked a distant second behind bottom line, during these 6 years.

From 2004 to 2006, blackfin snapper were taken with bottom line, fish traps, and long line, and vermillion snapper were taken with bottom line, fish traps, gill nets, long line. During the 3-year period, bottom line yielded 64 percent to 83 percent of annual blackfin snapper and 64 percent to 84 percent annual vermilion snapper landings (in pounds). Fish traps yielded 16 percent to 35 percent of annual blackfin snapper landings and 11 percent to 33 percent of vermilion snapper landings.

Table 5.3.15. Percent of annual landings (pounds) of silk, vermilion, and blackfin snapper by coast, 2004-2006. Source: Matos-Caraballo 2007.

Year	Species	North	South	East	West
2004	Silk	14.4%	8.2%	7.3%	70.0%
2005		10.4%	6.0%	8.5%	75.0%
2006		7.1%	10.9%	11.8%	70.2%
2004	Vermilion	49.4%	4.5%	40.7%	5.4%
2005		32.3%	6.2%	50.3%	11.2%
2006		44.3%	11.1%	27.6%	17.0%
2004	Blackfin	13.1%	19.6%	20.5%	46.7%
2005		3.0%	26.3%	21.6%	49.1%
2006		3.2%	15.6%	12.4%	68.8%
2004	First three combined	16.9%	8.3%	10.1%	64.7%
2005		11.3%	6.5%	10.9%	71.3%
2006		8.2%	11.1%	12.4%	68.3%

Puerto Rico's west coast accounts for the majority of silk snapper commercial landings. During the 3-year period from 2004 to 2006, 70 to 75 percent of silk snapper landings and 47 to 69 percent of blackfin snapper landings (in pounds) were on the west coast (Table 5.3.15). The most vermilion snapper landings were on the east and north coast. The north coast accounted for an average of 42 percent of annual landings (in pounds), closely followed by the east coast with an average of 40 percent of the commonwealth's vermilion snapper landings. The north coast had the least blackfin snapper landings and the south coast the least vermilion snapper landings in all 3 years.

According to Griffith et al. (2007), silk snapper was the most commonly landed commercial species in the west coast municipalities of Añasco, Aguada, and Aguadilla and north coast municipalities of Arecibo, Barceloneta, Vega Baja, Vega Alta, Dorado, and Loíza from 1999 to 2003. Silk snapper was the second most common commercially landed species in the west coast municipality of Rincón and the third most common commercially landed species in the north coast municipality of Isabela (Table 5.3.16). During that 5-year period, landings of silk snapper represented 41 percent of the total pounds of all species landed in Añasco, 13 percent in Aguada, 13 percent in Aguadilla, and 25 percent of total pounds landed in Rincón (Griffith et al. 2007). Vermilion snapper was the second most landed species in Loíza and Rio Grande, representing 8.5 percent and 9.9 percent of each municipality's total landings, respectively.

Table 5.3.16. Municipalities where silk snapper is one of the top three species landed, 1993-2003. Source: Griffith et al. 2007: 11, 12.

Silk Snapper Landings			
Coast	**Municipality**	**As Percent of Total Pounds Landed in Municipality**	**Rank Silk Snapper**
North	Arecibo	32.9%	1st
	Barceloneta	14.2%	1st
	Isabela	12.1%	3rd
	Vega Baja	10.2%	1st
	Vega Alta	10.3%	1st
	Dorado	10.0%	1st
	Loíza	10.5%	1st
West	Aguada	13.0%	1st
	Aguadilla	12.9%	1st
	Añasco	41.0%	1st
	Rincón	25.1%	2nd

Silk and blackfin snapper were identified by Ojeda-Serrano et al. (2007) as having potential spawning aggregation sites. Four silk snapper and two blackfin snapper spawning aggregation sites are located off the southwest coast.

Silk and vermilion snapper landings tend to be the smallest during the months of November and December. That is consistent with federal regulations that prohibit commercial and recreational fishing for, or possession of, vermilion, black, silk, or blackfin snapper in or from the Caribbean EEZ from October 1 through December 31 each year (50 CFR §622.33(a)(6)). In 2006, the lowest monthly landings of blackfin and vermilion snapper occurred during the months of October, November, and December.

Table 5.3.17. Reported and adjusted commercial landings (pounds) of Grouper Unit 4 and all finfish, 1983-2007.

Year	Grouper Unit 4 Landings		Finfish Landings		Percent of Finfish Landings from Grouper Unit 4	
	Reported	Adjusted	Reported	Adjusted	Reported	Adjusted
1983	0	0	3,168,086	5,193,584	0.0%	0.0%
1984	0	0	2,543,721	4,311,392	0.0%	0.0%
1985	0	0	2,318,516	4,140,207	0.0%	0.0%
1986	0	0	2,117,790	2,823,720	0.0%	0.0%
1987	78	104	1,771,152	2,361,536	0.0%	0.0%
1988	460	821	1,615,805	2,885,366	0.0%	0.0%
1989	1,275	2,500	1,919,811	3,764,336	0.1%	0.1%
1990	3,220	6,313	1,873,948	3,674,407	0.2%	0.2%
1991	4,485	8,793	2,110,379	4,137,998	0.2%	0.2%
1992	6,560	10,934	1,775,341	2,958,902	0.4%	0.4%
1993	5,367	8,945	2,134,713	3,557,855	0.3%	0.3%
1994	5,435	8,493	2,303,526	3,599,259	0.2%	0.2%
1995	7,044	9,920	3,153,054	4,440,921	0.2%	0.2%
1996	9,822	13,834	2,994,132	4,217,087	0.3%	0.3%
1997	6,453	8,272	3,225,148	4,134,805	0.2%	0.2%
1998	7,348	9,421	2,830,084	3,628,312	0.3%	0.3%
1999	10,072	12,912	2,723,868	3,492,139	0.4%	0.4%
2000	7,543	13,233	2,640,875	4,633,114	0.3%	0.3%
2001	9,852	14,488	2,805,498	4,125,732	0.4%	0.4%
2002	12,595	14,645	2,688,808	3,126,521	0.5%	0.5%
2003	10,759	19,794	1,921,822	3,429,954	0.6%	0.6%
2004	7,001	11,405	1,408,841	3,064,285	0.5%	0.4%
2005	7,104	19,332	1,081,270	4,199,370	0.7%	0.5%
2006	6,556	9,779	958,683	1,812,116	0.7%	0.5%
2007	7,503	13,361	915,457	1,620,054	0.8%	0.8%
Average	***5,461***	***8,692***	***2,200,013***	***3,573,319***	***0.3%***	***0.3%***

5.3.2.9.2 Grouper Unit 4 commercial harvest

Grouper Unit 4 is composed of five species, including red (*Epinephelus morio*), misty (*E. mystacinus*), tiger (*Mycteroperca tigris*), yellowedge (*E. flavolimbatus*) and yellowfin (*M. venenosa*) grouper. Yellowfin grouper is the indicator species for the unit. Yellowfin grouper is a desirable food fish, although it has often been implicated in ciguatera poisonings. It is also utilized in the aquarium trade.

There were no reported commercial landings of GU4 species from 1983 to 1986. However, from 1987 to 2005 annual commercial landings of GU4 species varied from 104 pounds to 28,896 pounds (Table 5.3.17). Grouper Unit 4 landings represent on average less than half of one percent of annual landings of finfish during the 25-year period; however, the share of finfish landings attributable to GU4 increased from 0.3 percent in 2000 to 0.8 percent in 2008. Note that no yellowedge grouper landings were reported during these years.

Grouper Unit 4 landings also represent a small portion of the value of finfish landings. From 1983 to 2007, the dollar value of reported and adjusted landings of the unit represented an average of 0.6 percent of the dollar value of reported and adjusted landings of all finfish landings. However, that percent has increased from 0.6 percent in 2000 to 1.8 percent in 2007.

Table 5.3.18. Reported commercial landings (pounds) of Grouper Unit 4 species, 1983-2007.

Year	Reported Landings						Percent of Total Unit 4 Landings				
	Yellow-edge	Yellow-fin	Misty	Tiger	Red	Total	Yellow-fin	Misty	Tiger	Red	Total
1983	0	0	0	0	0	0					
1984	0	0	0	0	0	0					
1985	0	0	0	0	0	0					
1986	0	0	0	0	0	0					
1987	0	78	0	0	0	78	100.0%	0.0%	0.0%	0.0%	100.0%
1988	0	460	0	0	0	460	100.0%	0.0%	0.0%	0.0%	100.0%
1989	0	1,249	26	0	0	1,275	98.0%	2.0%	0.0%	0.0%	100.0%
1990	0	558	2,662	0	0	3,220	17.3%	82.7%	0.0%	0.0%	100.0%
1991	0	1,701	2,784	0	0	4,485	37.9%	62.1%	0.0%		100.0%
1992	0	920	5,106	0	535	6,560	14.0%	77.8%	0.0%	8.2%	100.0%
1993	0	1,482	3,885	0	0	5,367	27.6%	72.4%	0.0%	0.0%	100.0%
1994	0	447	4,988	0	0	5,435	8.2%	91.8%	0.0%	0.0%	100.0%
1995	0	827	5,941	151	125	7,044	11.7%	84.3%	2.1%	1.8%	100.0%
1996	0	1,615	5,462	2,745	0	9,822	16.4%	55.6%	27.9%	0.0%	100.0%
1997	0	2,088	4,347	0	18	6,453	32.4%	67.4%	0.0%	0.3%	100.0%
1998	0	1,791	5,557	0	0	7,348	24.4%	75.6%	0.0%	0.0%	100.0%
1999	0	3,348	6,717	0	7	10,072	33.2%	66.7%	0.0%	0.1%	100.0%
2000	0	2,298	5,246	0	0	7,543	30.5%	69.5%	0.0%	0.0%	100.0%
2001	0	3,641	6,183	0	28	9,852	37.0%	62.8%	0.0%	0.3%	100.0%
2002	0	6,916	5,679	0	0	12,595	54.9%	45.1%	0.0%	0.0%	100.0%
2003	0	4,893	5,860	0	6	10,759	45.5%	54.5%	0.0%	0.1%	100.0%
2004	0	2,188	4,786	0	27	7,001	31.3%	68.4%	0.0%	0.4%	100.0%
2005	0	684	6,308	0	113	7,104	9.6%	88.8%	0.0%	1.6%	100.0%
2006	0	975	5,581	0	0	6,556	14.9%	85.1%	0.0%	0.0%	100.0%
2007	0	1,017	6,486	0	0	7,503	13.6%	86.4%	0.0%	0.0%	100.0%
Average	***0***	***1,567***	***3,744***	***116***	***34***	***5,461***	***36.1%***	***61.9%***	***1.4%***	***0.6%***	***100.0%***

For 19 of the 21 years from 1987 to 2007, misty grouper and yellowfin grouper have been the primary species landed in Grouper Unit 4. There have been no reported commercial landings of yellowedge grouper, and the only reported commercial landings of tiger grouper occurred in 1995 and 1996 (Table 5.3.18). Red grouper landings were reported from 1992 to 1999, but sporadically since then. Annual commercial landings of misty grouper have represented more than 50 percent of annual commercial landings of GU4 since 1990, with exception for 2000 and 2002, when yellowfin grouper represented 68 percent and 54.9 percent of annual landings, respectively.

Misty grouper has similarly dominated both the reported and adjusted ex-vessel revenues of GU4 landings since 1990, with the exception in 2002 when yellowfin grouper represented approximately 57 percent of the unit's adjusted ex-vessel revenue as compared to misty grouper which represented 43 percent (Figure 5.3.8).

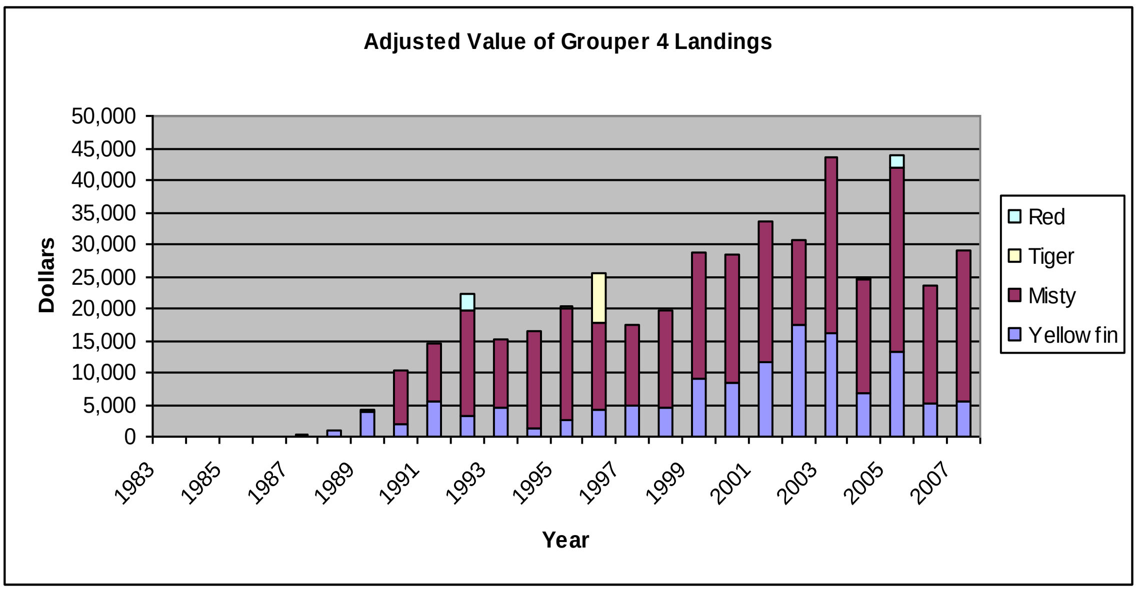


Figure 5.3.8. Ex-vessel revenue (dollars) from adjusted commercial landings of Grouper Unit 4 species, 1983-2007.

The greatest variation in the average ex-vessel price per pound of reported landings for species in GU4 is found in red grouper landings, although red grouper represents a small fraction of the unit's combined landings in pounds. In 1995, the average annual price of red grouper was $0.50 per pound, and from 2003 to 2005, the average annual price was at $3.00 per pound (Figure 5.3.9). The ex-vessel prices of the unit's species tend to follow a 2-year moving average.

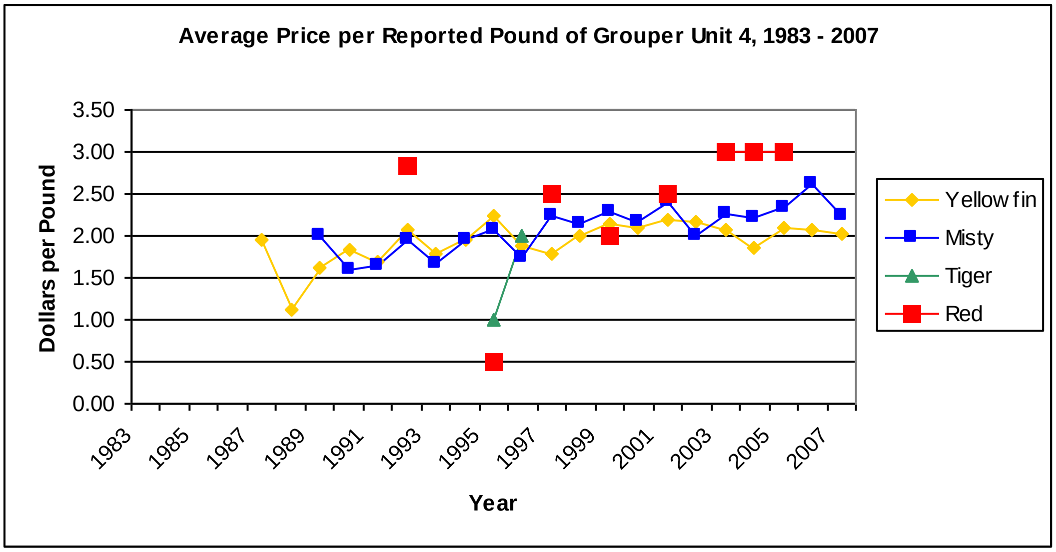


Figure 5.3.9. Average nominal ex-vessel price per reported pound of Grouper Unit 4 species, 1983-2007.

A graph of the ex-vessel price index for GU4 in Puerto Rico shows a relatively stable increasing trend after 1988, with a drop from 2006 to 2007 that parallels the drop in the average ex-vessel price of misty grouper, the species that tends to dominate the unit's landings (Figure 5.3.10).

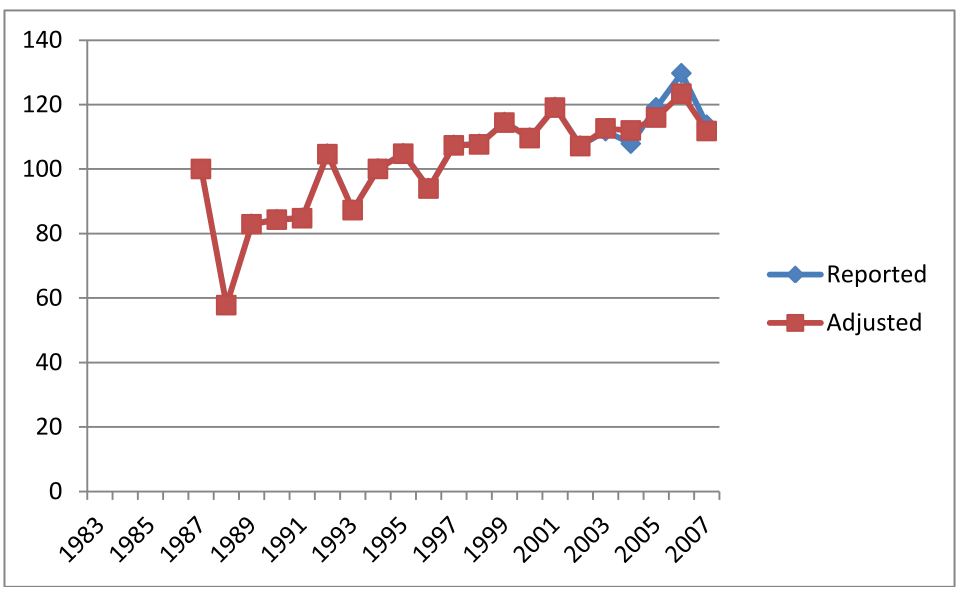


Figure 5.3.10. Ex-vessel price index for Grouper Unit 4 in Puerto Rico, 1987-2007. 1987 = 100.

Commercial landings of misty grouper and yellowfin grouper dominate landings of this unit. Consequently, the remainder of this section on GU4 commercial landings focuses on these two species.

The west coast tends to dominate landings of misty and yellowfin grouper. For example, west coast landings of the two species represent 80 percent to 92 percent of annual landings of misty and yellowfin grouper from 2004 to 2006 (Table 5.3.19). In 2004, the west coast also dominated landings of yellowfin grouper; however, in 2005 and 2006, the east coast had more yellowfin grouper landings.

Table 5.3.19. Commercial landings (pounds) of misty and yellowfin grouper by coast, 2004-2006. Source: Matos-Caraballo 2007.

	Percent of Landings of Misty Grouper			**Percent of Landings of Yellowfin Grouper**		
Coast	**2004**	**2005**	**2006**	**2004**	**2005**	**2006**
North	2.9%	1.3%	0.2%	3.0%	0.5%	0.0%
South	6.2%	5.9%	10.4%	3.7%	11.0%	13.7%
East	10.1%	1.1%	9.3%	27.8%	68.4%	61.9%
West	80.7%	91.7%	80.0%	65.5%	20.1%	24.3%
Total	***100.0%***	***100.0%***	***100.0%***	***100.0%***	***100.0%***	***100.0%***

Misty and yellowfin grouper are taken by multiple gears. Reported commercial landings of misty and yellowfin grouper from 2004 to 2006, for example, were taken by long line, bottom line, troll line, fish trap, and by skin and SCUBA diving. During the 3-year period, most (68.4 - 84.5 percent) misty grouper were taken with bottom line. In 2004, bottom line accounted for most landings of yellowfin grouper; however, in 2005 and 2006, the majority of yellowfin grouper landings were taken by fish traps.

The average ex-vessel nominal price of misty grouper and yellowfin grouper varies considerably by coast. For example, in 2005, yellowfin grouper sold on average for $2.00 per pound on the west coast and $3.00 per pound on the north coast.

According to Griffith et al. (2007), none of the species within GU4 were among the top three species landed in any municipality from 1999 to 2003. However, the generic category of grouper ranked third in species landed commercially in the southern municipality of Ponce.

Ojeda-Serrano et al. (2007) identified 51 potential spawning aggregation sites for species of GU4. Eight of these sites are for red grouper, 17 for tiger grouper, and the remaining 26 for yellowfin grouper. Ten of the yellowfin grouper spawning aggregation sites are along the east coast, which is the coast that accounts for most yellowfin grouper commercial landings from 2004 to 2006. Seven of the yellowfin sites were along the west coast.

According to Matos-Caraballo and Posada (1998), the spawning aggregation site known as "El Seco" is a well-defined promontory of deep reef that was officially discovered in 1982, although Vieques fishers had known about and fished at the site before that date. Tiger grouper were once heavily fished at this and nearby sites during spawning aggregations because the species' aggregation period occurs around the full moons of February and March, which is near the Christian religious holiday of Easter when fish consumption significantly increases (Matos-Caraballo 1997). The aggregation was fished by divers and hook and line but the depths and the number of diving accidents shift effort to hook and line only. A significant decrease in fishing effort on the aggregation sites resulted from the fishers turning to other jobs (charters, transportation) during the years of protesting the NAVY presence in Vieques. Puerto Rico regulations prohibit commercial and recreational fishing for, or possession of yellowfin grouper from February 1 through April 30 each year (PR Fishing Regulations 7949 , Nov. 2010). Federal regulations also prohibit fishing for or possession of yellowfin, as well as for red, tiger, black, and yellowedge grouper in or from the Caribbean EEZ during this period (50 CFR §622.33(a)(4)).

5.3.2.9.3 Grouper Unit 1 commercial harvest

Grouper Unit 1 is composed of Nassau grouper (*Epinephelus striatus*). In Puerto Rico, Nassau grouper is more commonly known as mero cherna or cherna. Since 1990, no person may fish for or possess Nassau grouper in or from the Caribbean EEZ (50 CFR 622.32(b)(1)(ii)). In Puerto Rico, since 2004, no individual may fish for, possess, or offer for sale, Nassau grouper.

Before 1970, Nassau grouper was a common and very important food fish, reaching a weight of 50 pounds (22.7 kg) or more (Sadovy 1993) and in 1990, it remained within the top four species commercially landed in Puerto Rico. According to Sadovy (1993), for many decades at about the time of the full moon each December and January, a small fleet of sloops and dories would sail from fishing villages in western Puerto Rico to the spawning grounds of the species, located on the southwestern corner of the island's insular platform. With thousands of fish in the spawning area, the "catches were spectacular" (Sadovy 1993). By the 1990s, Nassau grouper was rarely landed and those that were landed were juveniles, and since 2000, it has been considered to be extinct for commercial purposes in Puerto Rico (Matos-Caraballo 2000).

Before the ban on Nassau grouper fishing in 2004, reported commercial landings peaked in 1998 at 19,070 pounds; however, it is estimated that actual (adjusted) pounds peaked in 2001. Since the ban, commercial landings of the species have been reported; however, they dropped dramatically in 2004 (Table 5.3.20). Nassau grouper landings represent an average of 0.3 percent of all annual finfish landings during the period from 1983 to 2007, which is equal to the percent of finfish landings attributable to GU4.

Landings of Nassau grouper since 2004 represent illegal economic activity. The reported illegal landings are not to suggest the absence of law enforcement. According to PRDNER's website, Puerto Rican, NOAA, and U.S. Fish and Wildlife Service law enforcement agents found three Nassau grouper on sale at a fish market in Punta Santiago in the town of Humacao in February 2009.

During the 22-year period from 1986 to 2007, the average annual ex-vessel price of Nassau grouper ranged from $1.21 to $1.89 per pound reported. That tends to be significantly lower than the average annual ex-vessel price per pound of silk snapper and vermilion snapper. The ex-vessel price of Nassau grouper also tends to be less than the ex-vessel price of yellowfin grouper and misty grouper.

Table 5.3.20. Reported and adjusted commercial landings (pounds) of Grouper Unit 1, 1983-2007.

	Grouper Unit 1 Landings		Finfish Landings		Percent of Finfish Landings from Grouper Unit 1	
Year	**Reported**	**Adjusted**	**Reported**	**Adjusted**	**Reported**	**Adjusted**
1983	0	0	3,168,086	5,193,584	0.0%	0.0%
1984	0	0	2,543,721	4,311,392	0.0%	0.0%
1985	0	0	2,318,516	4,140,207	0.0%	0.0%
1986	57	76	2,117,790	2,823,720	0.0%	0.0%
1987	320	426	1,771,152	2,361,536	0.0%	0.0%
1988	2,022	3,610	1,615,805	2,885,366	0.1%	0.1%
1989	2,047	4,013	1,919,811	3,764,336	0.1%	0.1%
1990	2,341	4,589	1,873,948	3,674,407	0.1%	0.1%
1991	4,352	8,534	2,110,379	4,137,998	0.2%	0.2%
1992	6,612	11,020	1,775,341	2,958,902	0.4%	0.4%
1993	5,018	8,363	2,134,713	3,557,855	0.2%	0.2%
1994	7,735	12,085	2,303,526	3,599,259	0.3%	0.3%
1995	7,772	10,946	3,153,054	4,440,921	0.2%	0.2%
1996	12,594	17,738	2,994,132	4,217,087	0.4%	0.4%
1997	15,457	19,817	3,225,148	4,134,805	0.5%	0.5%
1998	19,070	24,448	2,830,084	3,628,312	0.7%	0.7%
1999	14,966	19,188	2,723,868	3,492,139	0.5%	0.5%
2000	12,940	22,702	2,640,875	4,633,114	0.5%	0.5%
2001	17,572	25,841	2,805,498	4,125,732	0.6%	0.6%
2002	18,698	21,742	2,688,808	3,126,521	0.7%	0.7%
2003	10,217	17,380	1,921,822	3,429,954	0.5%	0.5%
2004	4,229	7,245	1,408,841	3,064,285	0.3%	0.2%
2005	1,850	8,188	1,081,270	4,199,370	0.2%	0.2%
2006	1,673	2,154	958,683	1,812,116	0.2%	0.1%
2007	1,137	2,150	915,457	1,620,054	0.1%	0.1%
Average	***6,747***	***10,090***	***2,200,013***	***3,573,319***	***0.3%***	***0.3%***

Most commercial landings of Nassau grouper have occurred on the west coast. Before 2004, the north coast had the second most landings; however, from 2004 to 2006, the east coast had the second most landings. Commercial landings of Nassau grouper declined significantly and consistently from 2004 to 2006 on Puerto Rico's north, east, and south coasts; however, landings increased along the commonwealth's west coast from 2005 to 2006.

According to Griffith et al. (2007), Nassau grouper was a primary species of commercial interest in the northwestern coastal municipality of Isabela and eastern island municipality of Culebra from 1999 to 2003, representing Isabela's second most (14.1 percent) and Culebra Island's top (17.2 percent) commercially landed species during that period.

The reported ex-vessel price of Nassau grouper varies by coast, with the highest price on the east coast and lowest on the west coast. For example, in 1997, the average reported ex-vessel price per pound ranged from a low of $1.19 per pound on the west coast to a high of $2.03 on the east coast. The reported ex-vessel price of Nassau grouper tends to be smaller than the reported ex-vessel prices received from sales of silk snapper, vermilion snapper, blackfin snapper, misty grouper, and yellowfin grouper; however, the average reported ex-vessel price of Nassau grouper on the east coast was greater than average reported ex-vessel price of vermilion snapper, misty grouper, and yellowfin grouper in 2004 and 2006.

Nassau grouper has been taken by beach seine, gill net, long line, bottom line, troll line, fish trap, lobster trap, and by SCUBA diving. The illegal landings of Nassau grouper by bottom line increased from 2005 to 2006, while those from other gears decreased. In 2006, landings from bottom line represented about 89 percent of illegal, but reported, commercial Nassau grouper landings.

Monthly landings of Nassau grouper from 2004 to 2006 varied throughout the year, not peaking in December and January as occurred in the earlier decades. From 2004 to 2006, the months with the highest average landings were March, April, May, and September.

Ojeda-Serrano et al. (2007) have identified 15 potential spawning aggregation sites for Nassau grouper in Puerto Rico. Eight of these are along the west coast where most landings of Nassau grouper occur. Aggregations of Nassau grouper have been reported off Mona Island and the south and southwest coasts of Puerto Rico (Sadovy and Eklund 1999).

5.3.2.9.4 Parrotfish commercial harvest

The Caribbean parrotfish unit is composed of 10 species, 6 of the genus *Scarus* and 4 of the genus *Sparisoma*: blue (*Scarus coeruleus*), midnight (*Sc. coelestinus*), princess (*Sc. taeniopterus*), queen (*Sc. vetula*), rainbow (*Sc. guacamaia*), striped (*Sc. croicensis*), redband (*Sparisoma aurofrenatum*), redtail (*Sp. chrysopterum*), stoplight (*Sp. viride*) and redfin (*Sp. rubripinne*) parrotfish. There is no indicator species for this unit.

Parrotfish have been abundant on the reefs of Puerto Rico and in some areas they are a preferred food fish (CFMC 1985). Their Spanish names are: brindao (blue), judío (midnight), loro (princess, queen, striped, redband, redtail, and redfin), guacamayo (rainbow), and chaporra (stoplight).

Not all of the above parrotfish have a category in the trip-ticket form specific to the species. The trip-ticket form has a category for each of the following five species: blue, midnight, rainbow, redtail and stoplight. Three of the other five species (princess, queen, striped) are reported in the generic 'parrotfishes' category. It is assumed here that redband and redfin parrotfish (*Sparisoma aurofrenatum* and *Sparisoma rubripinne*) are also placed within this category when landed.

Table 5.3.21. Reported and adjusted commercial landings (pounds) of parrotfish and percent of finfish landings, 1983-2007.

	Reported Landings			Adjusted Landings		
Year	**Parrotfish**	**Finfish**	**Percent of Finfish Landings from Parrotfish**	**Parrotfish**	**Finfish**	**Percent of Finfish Landings from Parrotfish**
1983	233,619	3,168,086	7.4%	382,982	5,193,584	7.4%
1984	231,387	2,543,721	9.1%	392,181	4,311,392	9.1%
1985	221,378	2,318,516	9.5%	395,318	4,140,207	9.5%
1986	105,546	2,117,790	5.0%	140,728	2,823,720	5.0%
1987	76,852	1,771,152	4.3%	102,469	2,361,536	4.3%
1988	12,208	1,615,805	0.8%	21,800	2,885,366	0.8%
1989	4,278	1,919,811	0.2%	8,387	3,764,336	0.2%
1990	36,848	1,873,948	2.0%	72,250	3,674,407	2.0%
1991	68,051	2,110,379	3.2%	133,433	4,137,998	3.2%
1992	92,118	1,775,341	5.2%	153,530	2,958,902	5.2%
1993	160,195	2,134,713	7.5%	266,992	3,557,855	7.5%
1994	116,023	2,303,526	5.0%	181,286	3,599,259	5.0%
1995	80,191	3,153,054	2.5%	112,945	4,440,921	2.5%
1996	102,870	2,994,132	3.4%	144,888	4,217,087	3.4%
1997	110,978	3,225,148	3.4%	142,279	4,134,805	3.4%
1998	97,556	2,830,084	3.4%	125,072	3,628,312	3.4%
1999	80,719	2,723,868	3.0%	103,486	3,492,139	3.0%
2000	73,115	2,640,875	2.8%	128,272	4,633,114	2.8%
2001	96,761	2,805,498	3.4%	142,295	4,125,732	3.4%
2002	107,544	2,688,808	4.0%	125,051	3,126,521	4.0%
2003	69,586	1,921,822	3.6%	116,002	3,429,954	3.4%
2004	51,678	1,408,841	3.7%	147,492	3,064,285	4.8%
2005	29,383	1,081,270	2.7%	133,262	4,199,370	3.2%
2006	31,576	958,683	3.3%	50,684	1,812,116	2.8%
2007	33,658	915,457	3.7%	57,981	1,620,054	3.6%
Average	***92,965***	***2,200,013***	***4.1%***	***151,243***	***3,573,319***	***4.1%***

Reported commercial landings of parrotfish varied considerably from 1983 to 2007, falling from a high of 233,619 pounds in 1983 to 4,278 pounds in 1989, then rising to 160,195 pounds in 1993 followed by a general decline to 33,658 pounds in 2007 (Table 5.3.21). Parrotfish landings represent an average of 4.1 percent of all finfish landings (pounds) annually.

On average, ex-vessel revenue from all parrotfish landings represents less than 3 percent of the ex-vessel revenue from all finfish landings from 1983 to 2007. Ex-vessel revenue from SU1 landings, by comparison, represents an average of approximately 17 percent of ex-vessel revenue from all finfish landings.

Landings of rainbow, midnight, blue, stoplight, and redtail parrotfish represent a very small portion of all parrotfish landings (Table 5.3.22). At least 98.7 percent of each year's landings of parrotfish are in the generic category, parrotfish, during the 25-year period from 1983 to 2007.

Table 5.3.22. Adjusted Commercial Landings (Pounds) of Parrotfish, 1983 – 2007.

	Adjusted Pounds Landed						
Year	**Parrotfish**	**Rainbow**	**Midnight**	**Blue**	**Stoplight**	**Redtail**	**TOTAL**
1983	382,916			66			382,982
1984	392,181						392,181
1985	395,318						395,318
1986	140,728						140,728
1987	102,469						102,469
1988	21,800						21,800
1989	8,387						8,387
1990	72,250						72,250
1991	133,433						133,433
1992	153,196		333				153,530
1993	266,969				23		266,992
1994	180,818			469			181,286
1995	112,478	354		6	108		112,945
1996	144,760	4	7		117		144,888
1997	142,216			6	56		142,279
1998	124,974			19	78		125,072
1999	103,248	13	24	13	38	149	103,486
2000	128,250			0	21		128,272
2001	142,176			106	13		142,295
2002	124,904	140			8		125,051
2003	115,360	617	8	17			116,002
2004	145,364	2,128					147,492
2005	131,407	1,855					133,262
2006	50,463	220					50,684
2007	57,981						57,981

The average nominal ex-vessel price per pound for reported landings of parrotfish species ranges from $0.54 per pound in 1984 for the generic category, "parrotfishes," to $3.50 per pound in 1995 for rainbow parrotfish (Figure 5.3.11).

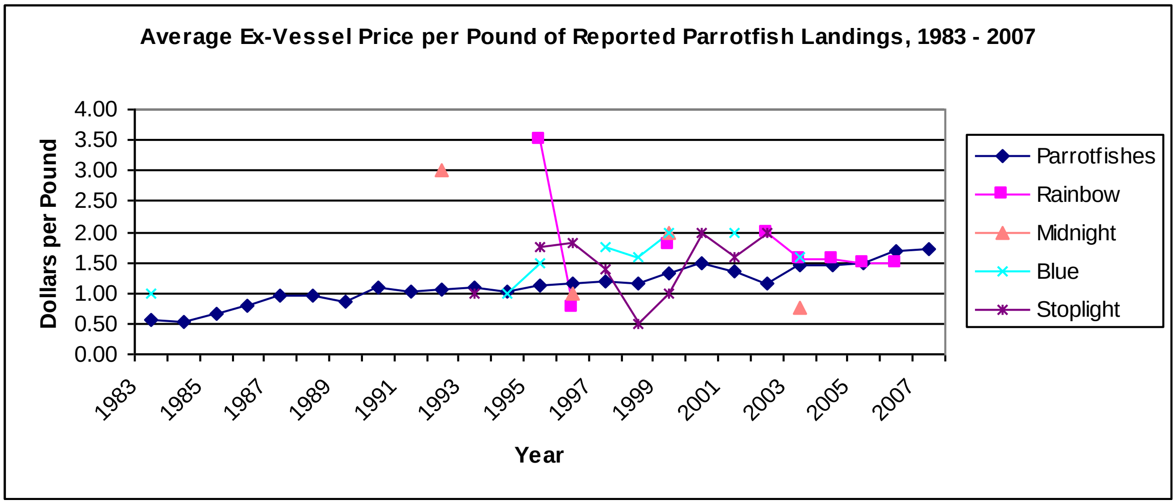


Figure 5.3.11. Average ex-vessel price per pound of reported parrotfish landings, 1983-2007.

A chart of the ex-vessel price index for the parrotfish unit in Puerto Rico from 1983 to 2007 shows an increasing trend after 1984 (Figure 5.3.12).

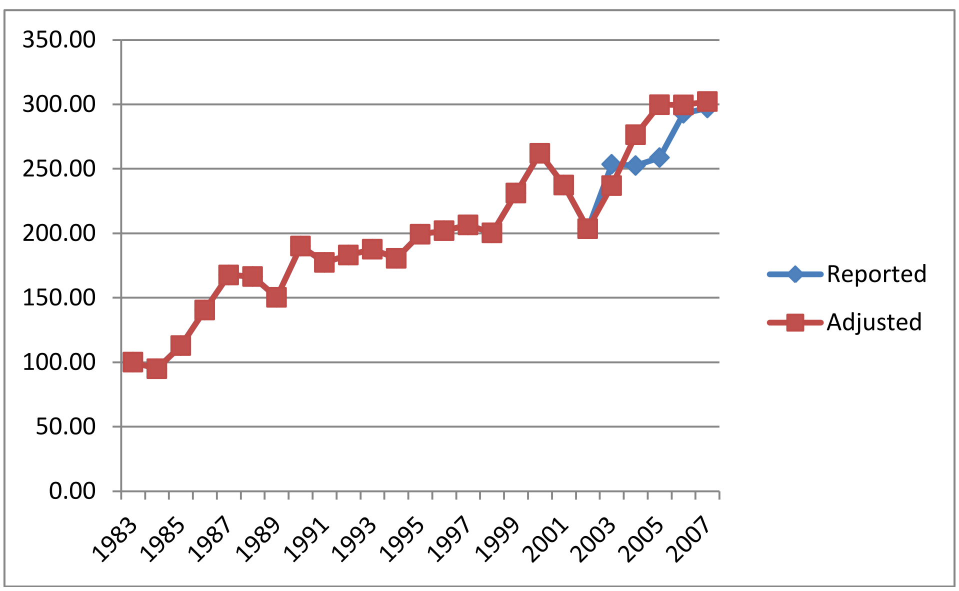


Figure 5.3.12. Ex-vessel price index for parrotfish in Puerto Rico, 1983-2007. 1983 = 100.

The south coast tends to have the highest parrotfish landings. From 1997 to 1999 and from 2004 to 2006, for example, the south coast's average annual share of the state's reported parrotfish commercial landings increased from 48.1 percent (1997 to 1999) to 57.5 percent (2004 – 2007). In second place was the west coast, with an average of 33.6 percent of reported annual parrotfish landings from 1997 to 1999 and 29.3 percent from 2004 to 2006.

From 1993 to 2003, parrotfish were the top species in commercial landings in the southern municipality of Arroyo, accounting for 15.1 percent of Arroyo's total landings (Griffith et al. 2007: 11). Parrotfish was the third most common species landed in the southern municipality of Patillas, representing 6.0 percent of its total landings.

Parrotfish are taken primarily by net gear. For example, most parrotfish commercially harvested during 1997-1999 and during 2004-2006 were taken with net gear, particularly trammel net and gill net. Historically, entanglement nets have been the preferred gear to take parrotfish. However, the use of trammel net has generally declined, and there has been increased use of fish traps and spear to catch parrotfish. Griffith et al. (2007) state the use of trammel net to catch parrotfish is in sharp decline in some areas, particularly the southern municipality of Guánica because its use is considered outdated.

Since November 2005, federal regulations have prohibited the use of gill and trammel nets in the U.S. Caribbean EEZ to harvest Caribbean reef fish, including parrotfish. Also, water depth in the EEZ does not favor the use of these nets. Puerto Rico fishing regulations specify mesh and lengths limits for nets since 2004. The prohibition of the use of bottom tending gear in seasonally closed areas was implemented in both the state and federal waters.

Landings of parrotfish tend to rise during the Christian season of Lent. During the 3-year period from 2004 to 2006, for example, the months with the most commercial landings of parrotfish were February and March, averaging 10 percent and 11.1 percent of annual landings, which is consistent with the increase in demand for fish that typically occurs during those months. The least landings occurred in November to January.

Ojeda-Serrano et al. (2007) have identified 32 potential spawning aggregation sites for parrotfish. Twenty-three of these sites are along the southwest coast. These sites are also consistent with the majority of parrotfish commercial landings being on the west and south coasts.

5.3.2.9.5 Queen conch commercial harvest

The Queen Conch FMU is composed of Caribbean queen conch (*Strombus gigas*), which is commonly known as carrucho in Puerto Rico. Under federal law, no person may fish for, or possess on board a fishing vessel, a Caribbean queen conch in or from the U.S. Caribbean EEZ off Puerto Rico (CFMC 2005).

Puerto Rico Fishing Regulation No. 6768 of 2004 established a closed season from July 1st until September 30th of each year in territorial waters and a size limit of 9 inches (229 mm) shell length or a lip thickness of 3/8 inches (9.5 mm). The new Puerto Rico Fishing Regulations 7949 of 2010 modified the closed season to include the period from August 1st through October 31st each year. Sale of undersized queen conch and queen conch shells is prohibited. In Puerto Rico waters, conch can be extracted from the shell while on the boat, but not while underwater. There are daily commercial catch limits of 150 queen conch per person and 450 per boat, and the use of hookah gear is prohibited.

Queen conch represents a significant portion of shellfish and all commercial landings. On average, queen conch landings have accounted for 43 percent of shellfish annual landings and about 8 percent of all commercial landings, by weight.

Reported and adjusted landings of queen conch have varied considerably since 1983, falling from 398,880 pounds reported and 655,541 adjusted pounds in 1983 to a low of 90,947 reported and 151,578 pounds in 1992, then rising with a general trend after that until 2006 (Table 5.3.23).

Table 5.3.23. Reported and adjusted commercial landings (pounds) of and revenues (dollars) from queen conch, 1983-2007.

	Annual Landings			**Ex-Vessel Revenue of Landings**		
Year	**Reported**	**Adjusted**	**Adj. Factor**	**Reported**	**Adjusted**	**Adj. Factor**
1983	399,880	655,541	1.64	516,171	846,182	1.64
1984	294,773	499,615	1.69	387,010	655,949	1.69
1985	260,825	465,759	1.79	379,932	678,451	1.79
1986	188,360	251,147	1.33	286,977	382,635	1.33
1987	142,994	190,659	1.33	234,247	312,329	1.33
1988	230,702	411,968	1.79	410,526	733,083	1.79
1989	160,247	314,210	1.96	298,930	586,137	1.96
1990	107,964	211,694	1.96	206,079	404,077	1.96
1991	108,084	211,930	1.96	214,112	419,828	1.96
1992	90,947	151,578	1.67	186,531	310,886	1.67
1993	164,590	274,317	1.67	336,146	560,243	1.67
1994	170,802	266,878	1.56	354,179	553,405	1.56
1995	214,231	301,733	1.41	456,212	642,552	1.41
1996	239,817	337,771	1.41	516,822	727,919	1.41
1997	238,619	305,922	1.28	589,189	755,370	1.28
1998	260,905	334,493	1.28	544,162	697,643	1.28
1999	214,044	274,415	1.28	464,327	595,290	1.28
2000	280,658	492,382	1.75	609,707	1,069,661	1.75
2001	244,806	360,008	1.47	577,500	849,265	1.47
2002	235,608	273,963	1.16	544,918	633,625	1.16
2003	188,021	346,654	1.84	451,727	814,832	1.80
2004	216,040	377,685	1.75	508,431	933,088	1.84
2005	175,957	698,335	3.97	450,757	1,978,212	4.39
2006	153,018	241,743	1.58	499,729	773,449	1.55
2007	144,156	258,501	1.79	546,028	931,675	1.71

Reported ex-vessel prices of queen conch have shown a general increasing trend since 1983, rising from an average of $1.29 per pound in 1983 to $3.79 per pound in 2007 for reported landings. The largest increase occurred from 2004 to 2007 (Figure 5.3.13).

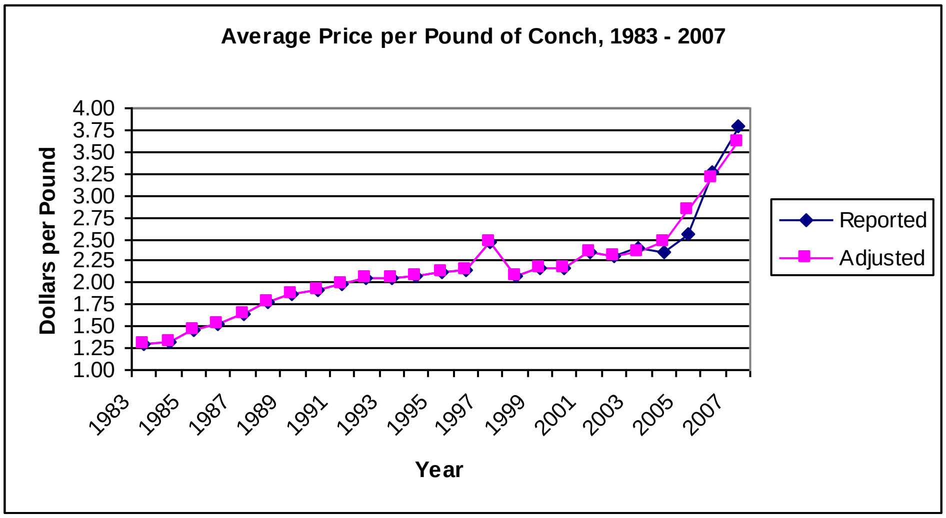


Figure 5.3.13. Average nominal ex-vessel price per pound of queen conch, 1983-2007.

The majority of Puerto Rico's commercial queen conch landings are on the west coast where the wide insular shelf provides extensive conch habitat. West coast landings represented an average of 53 percent of annual landings of conch from 1997 to 1999 and about 67 percent from 2004 to 2006, for example. The east coast also has a relatively wide insular shelf and its landings are second to those of the west coast. Because of its narrow insular shelf, north coast landings represented no more than one percent of annual commercial landings (in pounds) of conch from 1997 to 1999 and no more than 0.2 percent from 2004 to 2006. A 1999 survey of Puerto Rico commercial fishers found 209 conch fishers (Rivera 1999). Over half (108) of these fishers were on the south and southwest coasts, and only 18 harvested queen conch from the U.S. Caribbean EEZ. Since 2005, the EEZ off Puerto Rico has been closed to queen conch fishing.

Puerto Rican commercial fishers predominantly take conch by skin and SCUBA diving. During the 3-year period from 1997 to 1999, for example, from about 96.8 percent to 100 percent of total conch landings were harvested by SCUBA diving. From 2004 to 2006, skin and SCUBA diving accounted for 97.8 percent to 99.6 percent of annual landings of conch. According to Rivera (1999), the average conch fisher fished in a pair, with one fisher diving while the other tended the diver and handled the boat. SCUBA tanks were the main source of air for the diver who usually took 4 to 6 tanks per trip.

Monthly commercial landings of conch tend to vary considerably. For example, from January 2004 to December 2006, landings in July, August, and September combined represented an average of 0.5 percent of annual landings. The highest landings occurred, on average, in October, March, and June.

Table 5.3.24. Distribution of Puerto Rico queen conch fishers by fishing port in 1999. Source: Rivera 1999.

Coast	Fishing Center		Number of Fishers	Percent of Fishers
West	**Municipality**	**Port**	*73*	*34.9%*
	Añasco (AN)	Tres Hermanos	1	0.5%
	Cabo Rojo (CR)	Bahia Sucia	2	1.0%
	Cabo Rojo	Boquerón	7	3.3%
	Cabo Rojo	El Combate	20	9.6%
	Cabo Rojo	Pitahaya	2	1.0%
	Cabo Rojo	Puerto Real	33	15.8%
	Mayagüez (MG)	El Seco	8	3.8%
South	**Municipality**	**Port**	*50*	*23.9%*
	Guánica (GC)	Bahía	6	2.9%
	Guánica	Salinas	10	4.8%
	Guayanilla (GL)	Playa	12	5.7%
	Juana Díaz (JD)	Pastillo	1	0.5%
	Lajas (LJ)	La Parguera	3	1.4%
	Lajas	Papayo	3	1.4%
	Peñuelas (PE)	Tallaboa	15	7.2%
East	**Municipality**	**Port**	*55*	*26.3%*
	Ceiba (CE)	Los Machos	9	4.3%
	Fajardo (FJ)	Las Croabas	2	1.0%
	Fajardo	Maternillo	5	2.4%
	Fajardo	Pto Real	3	1.4%
	Humacao (HU)	Punta Santiago	3	1.4%
	Naguabo (NG)	Hucares	20	9.6%
	Vieques (VQ)	Esperanza	2	1.0%
	Vieques	Morropo	11	5.3%
North	**Municipality**	**Port**	*31*	*14.8%*
	Arecibo (AC)	Jarealito	2	1.0%
	Carolina (CN)	Torrecilla	1	0.5%
	Dorado (DO)	Mameyal	3	1.4%
	Isabela (IS)	Bajura	6	2.9%
	Loíza (LZ)	Ancones	7	3.3%
	Manatí (MT)	Pta Manatí	4	1.9%
	Río Grande (RG)	Mosquito	1	0.5%
	San Juan (SJ)	La Coal	6	2.9%
	San Juan	La Puntilla	1	0.5%
TOTAL			***209***	***100.0%***

In 1999, 113 of 209 conch fishers were located in and between the southwestern municipality of Cabo Rojo (CR) and the southeastern municipality of Peñuelas (PA) (Table 5.3.24). Fifty-two conch fishers, the second largest group, were located in the east coast municipalities of Naguabo (NG), Ceiba (CE), Fajardo (FJ) and Vieques (VQ). A smaller number of conch fishers were located on the north coast. No conch fishers were found in Rincon (RC), Aguada, and Aguadilla along the west coast. The east coast islands of Culebra (CU) and Vieques and the west coast islands of Desecheo, Mona, and Monito have been centers of distribution.

5.3.2.9.6 Snapper Unit 2 commercial harvest

Snapper Unit 2 is composed of queen (*Etelis oculatus*) and wenchman (*Pristopomoides aquilonaris*) snapper. Puerto Rican fishers and the PRDNER do not equate wenchman with *P. aquilonaris*. Instead, wenchman is the common name for cardinal snapper (*P. macrophthalmus*). Hence, landings of wenchman reported by Puerto Rico fishers are landings of cardinal snapper, which are not included in landings of SU2 species.

There are presently no regulations that limit commercial or recreational harvest or possession of queen snapper or wenchman (*P. aquilonaris*) snapper in the U.S. Caribbean EEZ. However, fishers cannot use either gillnet or trammel net to fish for these species in the EEZ.

There have been no reported landings of wenchman snapper (*P. aquilonaris*) from 1983 to 2007, which is consistent with a public comment made at the June 23 to 24, 2009 Council meeting in St. Croix. According to the commenter, there are no landings of *P. aquilonaris* in Puerto Rico.

Reported and adjusted commercial landings of queen snapper have increased during the 25-year period from 1983 to 2007, rising from zero to over one hundred thousand pounds every year since 2001, with the exception of 79,544 reported pounds in 2004 (Table 5.3.25). On average, queen snapper landings represent less than 3 percent of all finfish landings during the 25-year period; however, since 2000, queen snapper landings represent 7.2 percent of reported finfish landings and 5.6 percent of adjusted finfish landings. This increase coincides with declining landings of silk snapper.

The reported ex-vessel revenues received from queen snapper landings has similarly increased from 1987 to 2007, rising from less than $10,000 in 1987 to almost $400,000 in 2007. At the same time, queen snapper's contribution to reported ex-vessel revenues from finfish landings rose from less than half a percent in 1987 to over 19 percent reported in 2007 (almost 17 percent adjusted).

From 1987 to 2000, the average nominal ex-vessel price per pound of queen snapper was under $3 annually. Since 2001, the average annual nominal ex-vessel price has risen from $3.02 to $3.53 per pound.

From 1987 to 2007, the average reported ex-vessel price per pound of queen snapper tended to increase at a higher rate than the average reported ex-vessel price per pound of other species within those groups experiencing overfishing. This increasing difference has made queen snapper a more attractive species to commercial fishers in Puerto Rico.

Table 5.3.25. Commercial landings (pounds) of Snapper Unit 2, associated ex-vessel vessel revenue (dollars) and average ex-vessel price (dollars per pound), 1987-2007.

	Landings		Ex-Vessel Revenue		Average Ex-Vessel Price	
Year	**Rep.**	**Adj.**	**Rep.**	**Adj.**	**Rep.**	**Adj.**
1987	4,378	5,837	9,179	12,239	2.10	2.10
1988	14,759	26,354	29,590	52,840	2.00	2.01
1989	15,405	30,205	33,014	64,733	2.14	2.14
1990	11,379	22,312	26,292	51,554	2.31	2.31
1991	17,763	34,829	39,518	77,487	2.22	2.22
1992	25,260	42,099	58,974	98,290	2.33	2.33
1993	32,310	53,850	79,671	132,785	2.47	2.47
1994	27,731	43,330	70,383	109,973	2.54	2.54
1995	34,114	48,047	93,188	131,250	2.73	2.73
1996	36,671	51,649	95,464	134,456	2.60	2.60
1997	38,770	49,705	109,120	139,897	2.81	2.81
1998	46,070	59,064	132,362	169,695	2.87	2.87
1999	66,682	85,489	197,583	253,312	2.96	2.96
2000	82,825	145,306	243,151	426,581	2.94	2.94
2001	102,137	150,201	308,027	452,981	3.02	3.02
2002	110,058	127,974	339,042	394,235	3.08	3.08
2003	126,999	283,702	407,133	909,728	3.21	3.21
2004	79,544	127,004	256,936	413,600	3.23	3.26
2005	127,879	205,604	422,405	682,245	3.30	3.32
2006	101,748	115,044	346,703	391,903	3.41	3.41
2007	111,125	171,217	391,961	601,490	3.53	3.51
21-yr Average	***57,791***	***89,468***	***175,700***	***271,489***	***2.75***	***2.75***
Average since 2000	***108,498***	***168,678***	***353,172***	***549,455***	***3.25***	***3.26***

Queen snapper was the top ranked commercial species landed in Rincón from 1999 to 2003, representing 28.6 percent of the west coast municipality's commercial landings during that period (Griffith et al. 2007). West coast fishers land substantially more queen snapper than fishers from the other coasts combined. West coast landings of queen snapper represented an average of about 94 percent of the commonwealth's annual landings of the species.

Queen snapper have been caught using long line, bottom line, and fish traps. Bottom line is the favored gear of fishers taking queen snapper. At least 99 percent of annual commercial landings of queen snapper were taken by bottom line from 2004 to 2006.

Reported commercial landings of queen snapper from 2004 to 2006 show a modest deviation by month on average, with June averaging the smallest share of yearly landings and March the greatest share. However, landings in January and February of 2005 were substantially lower than other months of that year and of the same months in 2004 and 2006.

5.3.2.9.7 Cardinal snapper commercial harvest

Cardinal snapper (*P. macrophthalmus*) is a commercial species in Puerto Rico. There were no reports of landings of cardinal snapper prior to 1989, and from 1989 to 1996, there were 4 years with no landings. However, since 1997, there have been landings of the species every year and a general increase in those landings as illustrated in Table 5.3.26; however, the species continues to represent no more than half a percent of annual finfish, with the exception in 2005 when reported landings represented 0.9 percent of reported finfish landings. Nonetheless, the increase is evidence of fishers seeking alternative species to mitigate for reduced landings of other species, especially silk snapper.

Nominal ex-vessel revenues from landings of cardinal snapper similarly represent a very small percentage of ex-vessel revenues from all finfish landings. During the 25-year period from 1983 to 2007, cardinal snapper landings accounted for an average of 0.2 percent of nominal ex-vessel revenues of finfish; however, since 2000, ex-vessel revenues from landings of cardinal snapper have accounted for 0.6 percent of nominal ex-vessel revenues from finfish landings and 0.5 percent of adjusted finfish revenues.

The nominal ex-vessel price of cardinal snapper ranks high among the species discussed thus far, averaging $3.00 per pound of reported landings since 2000 (Figure 5.3.14). From 2005 to 2007, the average nominal ex-vessel price ranged from $3.18 to $3.30 per pound.

The west coast accounted for the majority of cardinal snapper landings from 2004 to 2006, taking from about 71 percent to 83 percent of Puerto Rico's annual landings of the species.

The majority of cardinal snapper are harvested using bottom line. From 2004 to 2006, an average of approximately 90 percent of annual reported cardinal snapper landings (in pounds) were taken with bottom line. This is also the primary gear used to harvest silk, vermilion, blackfin, and queen snapper, as well as misty and Nassau grouper. Gillnet ranked second with an average of 8 percent of cardinal snapper landings during the same time period. Long line and fish trap accounted for the remaining landings of the species.

Table 5.3.26. Commercial landings (pounds) of cardinal snapper and as percent of commercial finfish landings, 1983-2007.

Year	Cardinal Snapper Landings		Finfish Landings		Percent of Finfish Landings from Cardinal Snapper	
	Rep.	Adj.	Rep.	Adj.	Rep.	Adj.
1983	0	0	3,168,086	5,193,584	0.0%	0.0%
1984	0	0	2,543,721	4,311,392	0.0%	0.0%
1985	0	0	2,318,516	4,140,207	0.0%	0.0%
1986	0	0	2,117,790	2,823,720	0.0%	0.0%
1987	0	0	1,771,152	2,361,536	0.0%	0.0%
1988	0	0	1,615,805	2,885,366	0.0%	0.0%
1989	204	400	1,919,811	3,764,336	0.0%	0.0%
1990	84	164	1,873,948	3,674,407	0.0%	0.0%
1991	0	0	2,110,379	4,137,998	0.0%	0.0%
1992	288	480	1,775,341	2,958,902	0.0%	0.0%
1993	1	2	2,134,713	3,557,855	0.0%	0.0%
1994	0	0	2,303,526	3,599,259	0.0%	0.0%
1995	0	0	3,153,054	4,440,921	0.0%	0.0%
1996	0	0	2,994,132	4,217,087	0.0%	0.0%
1997	542	695	3,225,148	4,134,805	0.0%	0.0%
1998	2,302	2951	2,830,084	3,628,312	0.1%	0.1%
1999	3,644	4672	2,723,868	3,492,139	0.1%	0.1%
2000	4,952	8687	2,640,875	4,633,114	0.2%	0.2%
2001	7,165	10537	2,805,498	4,125,732	0.3%	0.3%
2002	6,197	7206	2,688,808	3,126,521	0.2%	0.2%
2003	7,233	12665	1,921,822	3,429,954	0.4%	0.4%
2004	6,278	11133	1,408,841	3,064,285	0.4%	0.4%
2005	10,066	21482	1,081,270	4,199,370	0.9%	0.5%
2006	3,887	6961	958,683	1,812,116	0.4%	0.4%
2007	4,760	8792	915,457	1,620,054	0.5%	0.5%
Average	**2,304**	**3,873**	**2,200,013**	***3,573,319***	***0.1%***	***0.1%***
Average since 2000	***6,317***	***10,933***	***1,682,911***	***3,054,005***	***0.4%***	***0.4%***

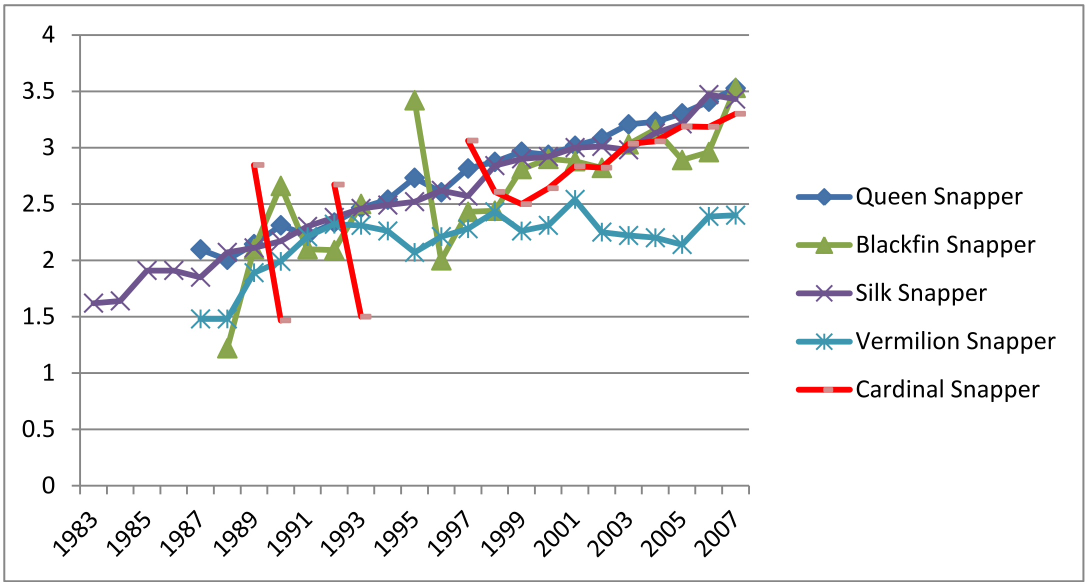


Figure 5.3.14. Average nominal prices (dollars) per pound of various species, 1983-2007.

5.3.2.9.8 Creole-Fish commercial harvest

Creole-fish (*Paranthias furcifer)* is within Grouper Unit 3. The species is widespread throughout its range, and is not targeted by the industry.

5.3.2.9.9 Grouper Unit 2 commercial harvest

Grouper Unit 2 is composed of goliath grouper. Since 1993, no person may fish for or possess goliath grouper in or from the U.S. Caribbean EEZ. Puerto Rico has banned fishing for, possession of, or offering for sale goliath grouper since 2004. Hence, there is no commercial (or recreational) harvest of Grouper Unit 2.

5.3.2.9.10 Black grouper commercial harvest

Black grouper is not a targeted species in Puerto Rico. During the 25-year period from 1983 to 2007, there were only four years with reported (adjusted) landings: 425 pounds in 1990, 12 pounds in 1992, 24 pounds in 1996, and 20 pounds in 2004.

5.3.2.10 Recreational sector

5.3.2.10.1 Introduction

The Magnuson-Stevens Act defines recreational fishing as fishing for sport or pleasure. According to Griffith et al. (2007: 18 f6), the term pescador deportivo (sport fisher) is more common in Puerto Rico than the term pescador recreativo (recreational fisher).

The Magnuson-Stevens Act defines commercial fishing as fishing to produce fish to sell, trade or barter. The definitions of commercial and recreational fishing are presumed to be mutually exclusive. Therefore, recreational fishers, as legally defined, do not sell, trade or barter their catch nor is commercial fishing an act of fishing for pleasure. Such definitions, however, contradict the experiences of fishers in Puerto Rico. Puerto Rican commercial fishers describe fishing as pleasurable, as therapeutic (Griffith et al. 1992). Also, it is a practice of sport fishers, especially of those who enter fishing tournaments, to sell what they catch. For example, according to a 2009 NMFS Highly Migratory Species scoping document, sport fishers sell billfish and coastal pelagics, such as “dorado”, that they land in tournaments to cover the costs of entering the tournament and fuel: (http://www.nmfs.noaa.gov/sfa/hms/Amendment_4_Caribbean/01-15-09_A4_Scoping_Summary_Final.pdf). Enforcement to discourage such practices is compromised by the possibility of intimidation of PRDNER wardens by wealthy sport fishers who are economically and/or politically powerful. Billfish tournament anglers, for example, surveyed in 1993 had a median income of $70,000 to $79,999 if a resident of Puerto Rico and $90,000 to $99,999 if a non-resident (Ditton and Clark 1994).

Tournament fishing is not a new phenomenon in Puerto Rico, and it is central to sport fishing, particularly at prominent marinas and Club Náuticos (Griffith et al. 2007). The Club Náutico de San Juan International Billfish Tournament, for example, began in 1958. The tournament attracts sport fishers from around the world.

There were 124 fishing tournaments visited by PRDNER staff from 1999 to 2002 (Rodríguez-Ferrer et al. 2005). During that 4-year period, the most targeted species were blue marlin (*Makaira nigricans*), mahi-mahi (*Coryphaena hippurus*), and wahoo (*Acanthocybium solandri*). In 2005 and 2006 there were 24 and 28 fishing tournaments, respectively. The tournament season begins in January or February and ends in November. Most tournament fishing occurs on the north coast where billfish, such as blue marlin and sailfish, are the main target. Shore and bottom fishing tournaments are few in number.

Puerto Rican fishing tournament organizers add tourist activities, such as sightseeing, to increase the length of participants’ stay and encourage non-participating family members to come to the island. For example, the Club Náutico of San Juan, which sponsored the 56th International Billfish Tournament, offered a sunset boat parade, fashion show, and multiple sightseeing trips (http://www.sanjuaninternational.com/schedule_ladies.html) for non-participants. These activities increase non-tournament spending.

The MRFSS program began in 1979 and was implemented in Puerto Rico in 1979 and 1981, but was discontinued in 1982 because of lack of funding (Osborn and Lowther 2001). The survey was re-initiated in 2000 and has been ongoing since. Data collection targets, but is not restricted to, the FMUs directly affected by the proposed actions; however, there is no recreational data for queen conch. According to a NMFS HMS (2009) report, Puerto Rican recreational fishers that harvest HMS species do not report their recreationally landed fish because they are afraid they will get a fine.

New technologies, such as electronic navigational systems and more efficient gear, have become available to fishers and pose an increased fishing potential to both the resident fish stocks and pristine coral formations. For example, some recreational fishers are using a new deep jigging technique (La Regata) and fishing at depths of 600-800 ft. In an area such as Bajo de Sico, where the bottom is irregular often with high relief, such fishing gear may become entangled on the bottom (in sponges as well as in hard and soft corals), increasing the potential for damaging the coral reef and other EFH elements.

In 2006, there were an estimated 955,123 recreational fishing trips of which 507,026 were at the shoreline, 16,823 on a charter boat, and 431,274 on private boat (PRDNER 2008b). The following year there were an estimated 1,080,096 recreational fishing trips of which 615,454 were at the shoreline, 10,734 on a charter boat, and 453,908 by private boat (PRDNER 2009).

Most fish caught by recreational fishers are caught in territorial waters. For example, in 2006 and 2007, about 81 percent and 63 percent of recreationally caught fish were caught in territorial waters, respectively. There was a significant increase in the number of fish caught inland from 2006 to 2007. In both years, more fish were caught in territorial waters in May and June than any other location and two-month period.

A significant percentage of the fish caught are released alive. For example, in 2006, 23 percent (195,245) of the 846,998 fish reported to be caught by recreational fishers, were released alive. Of the 140,801 fish caught in the U.S. Caribbean EEZ, about 21 percent of those fish were released alive. Similarly, about 23 percent of the fish caught in territorial waters were released alive and 49 percent of the catch in inland waters was released alive. In 2007, about 17 percent of the fish caught were not kept.

The 2006 MRFSS data suggest that the ratio of fish caught and released alive to fish caught varies substantially through the year. For example, most of the fish caught in the EEZ during the months of May and June of 2006 were released alive, while none of the 9,059 fish caught in September and October were.

According to Griffith et al. (2007), Puerto Rico's recreational fishers come from a broad span of occupations and classes, ranging from skilled professionals to unskilled laborers and the self-employed. Also, the marital status of recreational fishers does not vary significantly relative to that of all fishers; however, while 66 percent of the interviewed fishers were married, 45 percent of males and approximately 40 percent of females in Puerto Rico are married.

Charter boats are used for purposes beyond providing fishing services to anglers. Most of the licensed charter-boat captains interviewed by Griffith et al. (2007) had a "Six-Pack for Hire" license, which enabled them to use their vessels as water taxis. Such a license allows them to offer a range of services, such as sunset cruises, taking divers out to coral reefs, and taking sightseers to phosphorescent bays. Such a wide range of services reduces the adverse impact of slumps in the demand for charter fishing services to these businesses.

5.3.2.10.2 Snapper Unit 1 recreational harvest

Two species of SU1 are reported to be caught by recreational fishers: silk and blackfin snapper. Federal fishing regulation has prohibited recreational fishing for silk, black, vermilion, and blackfin snapper in federal waters from October 1 to December 31 of each year since November 28, 2005. Local regulations establishing a seasonal closure for silk and blackfin snapper was implemented in 2007, changing the regulations of size limits that were established in 2004. Nonetheless, surveyed recreational fishers reported catching and keeping 4,530 silk snapper and 453 blackfin snapper that were taken in the U.S. Caribbean EEZ in November/December of 2006 (*Puerto Rico Marine Recreational Fisheries Statistics Program for the period of January 1, 2006 to December 31, 2006*).

From 2000 to 2007, an annual average of 101,730 individuals of SU1 species was caught by recreational fishers (Table 5.3.27). Silk snapper represents a dominant majority of recreational landings. The second most harvested species within the sub-unit is vermilion snapper. Note that no black snapper have been harvested by recreational fishers since 2002.

In 2006, 131,781 silk snapper were landed by recreational fishers. The following year 136,546 were landed. None of the recreational catches of the species in 2006 and 33 of those caught in 2007 were caught by recreational fishers on a charter boat. At least 90 percent of these silk snapper are caught in territorial waters (90.4 percent in 2006 and 96.4 percent in 2007). Silk snapper are caught during tournament fishing. For example, in 2007, 707.4 kg of silk and queen snapper were caught and boarded by tournament fishers according to the Puerto Rico Marine Recreational Fisheries Statistics Program for the period of January 1, 2007 to December 31, 2007 (p. 11).

Table 5.3.27. Recreational landings (number of fish) of Snapper Unit 1 species.

Year	Silk	Blackfin	Black	Vermilion	Total
2000	82,611	9,267	2,598	25,007	119,484
2001	65,991	4,534	1,381	42,657	114,562
2002	28,168	1,439	0	7,980	37,586
2003	115,176	16,719	0	16,907	148,802
2004	47,390	2,361	0	3,229	52,981
2005	27,804	4,735	0	10,224	42,762
2006	131,781	453	0	453	132,687
2007	136,546	2,838	0	25,594	164,978
Total	***635,466***	***42,345***	***3,979***	***132,051***	***813,842***
Average	***79,433***	***5,293***	***497***	***16,506***	***101,730***

Table 5.3.28. Estimated recreational landings (number of fish) of Snapper Unit 1 species within snapper category and adjusted total recreational landings of SU1.

Year	Snapper Category	% Snapper Unit 1	Added Snapper Unit 1	Reported Total	Adjusted Total
2000	21,898	33.79%	7,400	119,484	126,884
2001	25,005	38.67%	9,669	114,562	124,231
2002	15,259	29.16%	4,450	37,586	42,036
2003	924	45.09%	417	148,802	149,218
2004	476	39.38%	187	52,981	53,168
2005	0	25.39%	0	42,762	42,762
2006	0	53.31%	0	132,687	132,687
2007	18,990	51.32%	9,746	164,978	174,724
Total	***82,551***		***31,869***	***813,842***	***845,711***
Average	***10,319***		***3,984***	***101,730***	***105,714***

Many recreational landings of snapper are placed within a broad category of “Snappers”. From 2000 to 2007, 10,319 snapper were landed by recreational fishers in that broad category, and some of these were species of SU1. Estimates of SU1 species that were landed in the generic category are added to the above figures to estimate the adjusted total recreational harvest of SU1 (Table 5.3.28). For example, in 2004, approximately 39 percent of 476 individuals landed as Snapper are added to the total reported SU1 landings of 52,981 individuals to yield an adjusted figure of 53,168 individuals.

5.3.2.10.3 Grouper Unit 4 recreational harvest

Grouper Unit 4 is composed of red, misty, tiger, yellowedge and yellowfin grouper. In 2006, the only reported recreational landings of a GU4 species were 557 yellowfin grouper, which were caught by fishers on a private boat in territorial waters during the months of January and February (*Puerto Rico Marine Recreational Fisheries Statistics Program (Grant F-42.6 Annual Report for the period of January 1, 2006 to December 31, 2006*). The following year, 352 red grouper were caught off Puerto Rico in the U.S. Caribbean EEZ and kept; these were the only species in the unit to be caught by recreational fishers surveyed that year (Table 5.3.29).

It is estimated that recreational landings of GU4 species are also contained within the broad category of “Sea Basses”. Estimates of the recreational GU4 landings within this broad category are provided in Table 5.3.30.

Table 5.3.29. Recreational landings (number of fish) of Grouper Unit 4.

Year	Red	Misty	Tiger	Yellowedge	Yellowfin	Total
2000	0	445	449	0	0	893
2001	0	0	0	0	250	250
2002	0	0	0	0	0	0
2003	0	0	0	234	935	1,168
2004	0	1,417	0	0	0	1,417
2005	155	0	0	0	0	155
2006	0	0	0	0	557	557
2007	352	0	0	0	0	352
Total	***506***	***1,861***	***449***	***234***	***1,742***	***4,792***
Average	***63***	***233***	***56***	***29***	***218***	***599***

Table 5.3.30. Estimated recreational landings (number of fish) of Grouper Unit 4 species within the "Sea Basses" category and adjusted total recreational landings of GU4.

Year	Sea Basses Category	% Grouper Unit 4	Added Grouper Unit 4	Total Reported	Adjusted Total
2000	2,085	0	25	893	918
2001	316	0	1	250	251
2002	1,025	0	0	0	0
2003	583	0	7	1,168	1,176
2004	238	0	3	1,417	1,419
2005	0	0	0	155	155
2006	0	0	0	557	557
2007	0	0	0	352	352
Total	***4,247***		***35***	***4,792***	***4,827***
Average	***531***		***4***	***599***	***603***

5.3.2.10.4 Grouper Unit 1 recreational harvest

Despite the ban on fishing for or possession of Nassau grouper in Puerto Rico since 2004, recreational fishers are reported to have caught and not released the species in 2006 and 2007. According to Tables 2 and 3 in the Appendix of PRDNER (2008b), none of the 1,771 individual Nassau grouper were released alive. All were caught on private boats during the months of July and August (Table 5.3.31). Note that more Nassau grouper were landed in 2007 than any other year before the ban.

Table 5.3.31. Recreational landings of Grouper Unit 1 (Nassau grouper), 2000-2007.

Year	Nassau grouper
2000	472
2001	402
2002	0
2003	2,100
2004	472
2005	0
2006	1,771
2007	2,102
Total	***7,320***
Average	***915***

5.3.2.10.5 Parrotfish recreational harvest

All of the parrotfish species within the Parrotfish Unit, except midnight parrotfish, were recreationally landed from 2000 to 2007. On average, 3,344 individuals within the unit species were landed annually from 2000 to 2007 (Table 5.3.32). Stoplight parrotfish ranked first in landings, followed by queen and redtail. Not one of the 1,856 princess parrotfish caught in 2006 was released alive, and all were caught in territorial seas. None of the parrotfish in 2006 or 2007 were caught by anglers on charter boats.

Many recreational landings of parrotfish are described as being in the parrotfish family. Other parrotfish landings are added to those identified as species within the Parrotfish Unit to estimate recreational parrotfish landings from 2000 to 2007 (Table 5.3.32).

Table 5.3.32. Recreational landings (number of fish) of parrotfish, 2000-2007.

Year	Blue	Midnight	Princess	Queen	Rainbow	Striped
2000	1,904	0	2,533	1,930	662	0
2001	128	0	2,783	7,839	0	928
2002	0	0	0	1,240	0	0
2003	3,326	0	1,099	12,194	550	0
2004	0	0	0	0	0	0
2005	0	0	3,199	0	0	0
2006	0	0	1,856	0	0	0
2007	0	0	0	0	0	0
Total	***5,358***	***0***	***11,471***	***23,204***	***1,211***	***928***
Average	***670***	***0***	***1,434***	***2,900***	***151***	***116***

Table 5.3.32 (cont). Recreational landings (number of fish) of parrotfish, 2000-2007.

Year	Redband	Redtail	Stoplight	Redfin	Total	Other*	All
2000	0	772	0	1,598	9,399	544	9,943
2001	1,769	2,584	22,336	6,034	44,402	6,848	51,250
2002	0	3,187	719	1,277	6,424	11,115	17,538
2003	4,902	8,782	20,003	4,702	55,558	0	55,558
2004	324	877	439	0	1,640	0	1,640
2005	0	0	0	0	3,199	4,274	7,474
2006	0	0	0	0	1,856	0	1,856
2007	0	1,261	2,970	0	4,231	3,968	8,199
Total	***6,995***	***17,464***	***46,468***	***13,611***	***126,709***	***26,748***	***153,457***
Average	***874***	***2,183***	***5,808***	***1,701***	***15,839***	***3,344***	***19,182***

*: Other includes parrotfish family, emerald, and greenblotch.

5.3.2.10.6 Queen conch recreational harvest

Queen conch is not presently included in the recreational survey. Nonetheless, there are estimates of queen conch recreational landings in Puerto Rico. For example, recreational landings of queen conch in Puerto Rico are estimated at 140,157 pounds in 2000 and 124,085 pounds in 2001 (SEDAR 2007: 54). In comparison to commercial landings for those years, annual recreational landings represented 28.5 percent of estimated actual commercial landings of queen conch in 2000 and 34.5 percent of commercial queen conch landings in 2001.

5.3.2.10.7 Snapper Unit 2 recreational harvest

Queen snapper was the only SU2 species landed by recreational fishers from 2000 to 2007. There were no recreational landings of wenchman. On average 7,860 queen snapper were taken annually by recreational fishers during this time period. Most or all queen snapper are taken in territorial waters. In 2006, for example, all 557 queen snapper were taken in territorial waters by anglers in private boats.

It is reasonable to expect that the generic snapper category includes queen snapper. Estimates of queen snapper landings contained in the generic category are included in Table 5.3.33 to obtain an adjusted total.

Table 5.3.33. Recreational Snapper Unit 2 landings (number of fish), 2000-2007.

Year	Queen	Wenchman Snapper	Total	Snapper Category	% Snapper Unit 2	Added Snapper Unit 2	Adjusted Total
2000	5,718	0	5,718	21,898	1.62%	354	7,194
2001	17,489	0	17,489	25,005	5.90%	1,476	18,618
2002	9,537	0	9,537	15,259	7.40%	1,129	9,555
2003	6,587	0	6,587	924	2.00%	18	6,597
2004	2,822	0	2,822	476	2.10%	10	2,822
2005	13,347	0	13,347	0	7.92%	0	13,347
2006	557	0	557	0	0.22%	0	960
2007	6,824	0	6,824	18,990	2.12%	403	10,215
Total	***62,881***	**0**	***62,881***	***82,551***		***3,391***	***69,308***
Average	***7,860***	**0**	***7,860***	***10,319***		***424***	***8,664***

5.3.2.10.8 Puerto Rico's subsistence harvest

The MSA does not define subsistence fishing, and there are varying definitions used by U.S. Government agencies. The Environmental Protection Agency (EPA), which is charged with providing advisories for contaminated fish in federal waters, defines subsistence fishers as those "who rely on noncommercially caught fish and shellfish as a major source of protein in their diets" (U.S. EPA 2000: 1-6). NOAA Fisheries Strategic Plan (http://www.nmfs.noaa.gov/om2/glossary.html) defines subsistence fishing as "fishing for personal consumption or traditional/ceremonial purposes." NOAA's definition does not limit subsistence fishing to fishing with the purpose of acquiring a major source of protein for personal consumption. For example, for the Pacific halibut fishery of Alaska, NMFS defines subsistence halibut as that "caught by a rural resident or a member of an Alaska Native tribe for direct personal or family consumption as food, sharing for personal or family consumption as food, or for customary trade", where a rural resident is defined by residence in specific communities and Alaskan Native requires membership in specific federally recognized tribes with treaty rights to halibut (Clay et al. 2007).

Commercial, recreational, and subsistence fishing are not so easily divided because a fisher may have multiple reasons for fishing. For examples, a recreational fisher may fish both for food that is a major source of protein for personal or household consumption and as a hobby and social activity; a commercial fisher may fish for both personal or household consumption and the income that derives from sales of a portion of the catch; and a crew member/helper of a commercial vessel may fish solely for a share of the catch that is a major food source for the helper and/or the household.

Ethnographic work in Puerto Rico demonstrates that it is rare for a commercial fisher in Puerto Rico to sell all of his or her catch (Griffith et al. 2007). Part of the catch is kept for home and community consumption. Of 256 commercial fishers interviewed by Griffith et al. (2007), about 74 percent reported using some fish for household consumption. Directing part of one's fishing effort to personal or household consumption is a way to supplement and/or substitute for protein purchased in the marketplace.

The 2008 survey of Puerto Rican commercial fishers found that about 12 percent of the interviewed east coast fishers stated that fishing did not contribute to their household income (Matos-Caraballo 2009), which suggests they fished for subsistence. Similarly, about 5 percent of those on the north coast and 3 percent of those on the south coast stated that none of their household income derived from fishing. However, less than 1 percent of the commercial fishers interviewed on the west coast reported that fishing did not contribute to their household income. One interpretation of these responses is that fishing by these commercial fishers, who do not derive any income from fishing, is exclusively for subsistence.

Griffith et al. (2007) found that there is a difference between recreational fishers who self-identify as fishing exclusively or primarily for food and those that report that all of their catch provides food to their household. Fourteen of 68 recreational fishers identified themselves as fishing exclusively or primarily for food, while 68 recreational fishers stated that all of their catch provides food to their household. However, it can be argued that all 68 fishers engage in subsistence fishing.

Approximately 40 percent of the 68 fishers targeted snapper-grouper species, as well as a few pelagic species (Griffith et al. 2007). Both dorado (also called dolphin), which is a good tasting fish and fun to catch, and sierra/carite (king mackerel) were caught by these fishers. None of these fishers stated that they harvest queen conch and only one reported landing lobster, which suggests subsistence fishing in Puerto Rico is a finfish, not shellfish, harvest activity. Most of the 68 recreational fishers, who are subsistence fishers, use hooks and lines and cane pole.

5.3.3 U.S. Virgin Islands Fisheries

5.3.3.1 Brief overview of U.S. Virgin Islands geography and fishing areas

The fishing industry of the USVI is politically and administratively separated into two districts, St. Thomas/St. John and St. Croix. St. Croix is separated from the Puerto Rico-Virgin Islands platform by the deep Anegada Passage, and a narrow shelf surrounds the island of St. Croix. The shelf descends gradually allowing for reef along most of the shoreline. This leaves areas of the insular shelf both north and south of St. Thomas/St. John as part of the U.S. EEZ.

The concentration of the USVI population in low-lying coastal areas, the island's confined harbors, and its Caribbean location make it vulnerable to natural disasters, such as hurricanes, tropical storms, earthquakes, flooding, mudslides, landslides, tsunamis, and drought.

5.3.3.2 U.S. Virgin Islands commercial fishers

Since 1974, the USVI has required all commercial fishers to have a commercial fishing permit. Helpers are not required to have a commercial fishing permit; however, each commercial fisher must obtain a helper's permit for each helper used or employed (V.I.C., Title 12, Chapter 9A §312). The permitted commercial fisher must be onboard when the "helper" is fishing. Commercial fishers must have the number of helpers indicated on their permit. Although legally defined as helpers, these individuals are also fishers.

In August 2001, the Commissioner of the VIDPNR issued a moratorium on the issuance of commercial fishing licenses. Those individuals that were licensed up to 3 years before August 2001 were allowed to renew their commercial fishing licenses (Holt and Uwate 2004). In 2008, there were 383 licensed fishers: 223 on St. Croix and 160 on St. Thomas/St. John (Figure 5.3.15). These estimates do not include helpers.

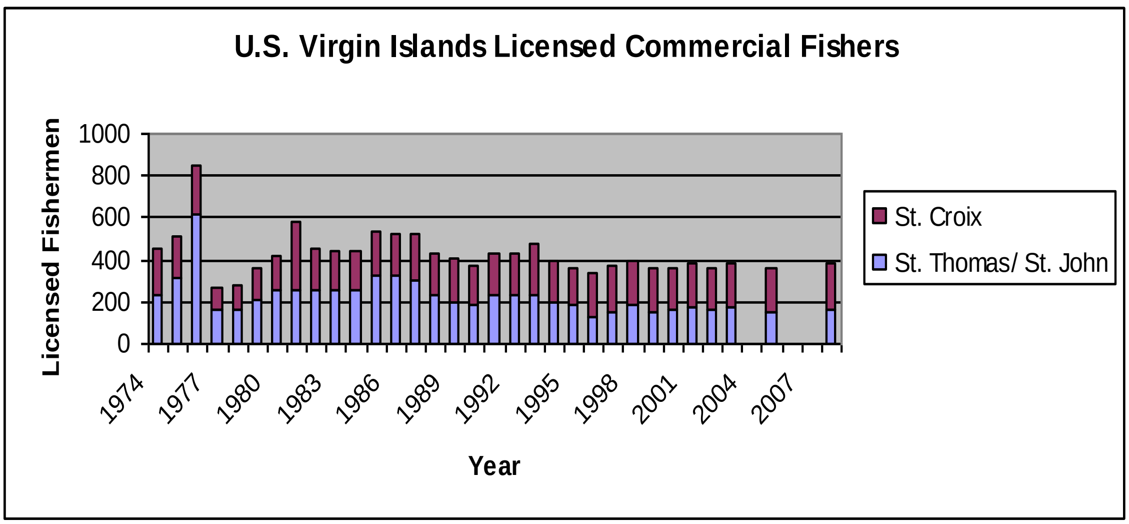


Figure 5.3.15. Number of USVI licensed commercial fishers. Sources: Holt and Uwate (2004) for estimates from 1974 to 2004; CFMC staff for 2005, 2008.

In 2003, a census was conducted of USVI commercial fishers. The following statistics are derived from that census. The average fisher in the St. Thomas/St. John District makes 2.6 fishing trips per week, each on average 8.3 hours long (with an average total of 21.6 hours per week). Similarly, the average St. Croix commercial fisher makes 3.3 trips per week, each of an average duration of 6.7 hours for an average weekly total of 22.1 hours (Kojis 2004). The range of the duration of trips varies substantially across districts. While St. Croix commercial fishers report trips varying from one to 13 hours long, those in the St. Thomas/St. John District report trips varying from 2 to 60 hours long. According to Kojis (2004), none of the St. Croix fishers and only two of the St. Thomas/St. John fishers stated that they made overnight trips.

Two-thirds of commercial fishers in the USVI identified themselves as full-time fishers, devoting more than 36 hour per week to fishing and fishing-related activities, and one-third identified themselves as part-time (36 hours of less) or opportunistic fishers (Kojis 2004). None of the St. Croix commercial fishers identified themselves as charter-boat fishers, while almost one percent of those in St. Thomas/St. John did.

USVI commercial fishers spend hours selling fish and fixing their boats and gear. The average St. Thomas/St. John fisher devotes 8.1 hours to selling fish, 2.9 hours to boat repairs and maintenance, and 4.3 hours to repair gear each week. The average St. Croix fisher spends 6.6 hours selling fish, 3.3 hours fixing a boat, and 4.0 hours fixing gear each week (Kojis 2004). The ranges of hours for selling and fixing the boat and gear were greater in St. Croix than in St. Thomas/St. John, although the average number of hours spent selling fish was greater in St. Thomas/St. John than in St. Croix.

In 2003, none of the St. Thomas/St. John commercial fishers reported making seven trips per week, while 1.4 percent St. Croix fishers reported making seven trips per week (Kojis 2004). Of the St. Croix fishers, the most frequent rate of fishing is three trips per week, while more St. Thomas/St. John fishers make two trips per week than fishers who fish at any other rate. Stoffle et al. (2009) report that St. Croix commercial fishers, who said they fished full-time, stated that they fish roughly 53 percent of the days available for a month, while those that fished part-time fish approximately 40 percent of the days available for a month.

Commercial fishers in the USVI are, as of 2003, on average 50.5 years old, had fished almost 23 years, and planned to continue to fish for the rest of their lives. The average fisher from St. Thomas/St. John was 48.6 years old and had fished 24.8 years. The average fisher from St. Croix was 51 and had fished 21.7 years (Kojis 2004). The range in fishing experience was 2 to 67 years in St. Thomas/St. John and from 0 to 67 years in St. Croix. Almost half of the fishers in St. Thomas/St. John and about 42 percent of St. Croix fishers have 21 years or more of fishing experience.

Over half the commercial fishers in the USVI have not completed high school. The level of education of commercial fishers in St. Croix is significantly lower than in St. Thomas/St. John. More than half of the licensed commercial fishers in St. Croix have only completed elementary or junior high school.

More USVI commercial fishers are black than any other racial/ethnic group (Table 5.3.34). In St. Thomas/St. John, almost half of the commercial fishers have a French ethnic background, while in St. Croix, Hispanics (48.4 percent) and blacks (41.6 percent) represent 90 percent of the district's commercial fishers.

Most USVI commercial fishers do not fish alone. About 79 percent said they fish with helpers and about 17 percent with other commercial fishers. In St. Croix, 89 percent fish with helpers, and in St. Thomas/St. John, 59 percent have helpers (Kojis 2004). Some fishers vary if they fish alone or with others and if with others, who they fish with. If with others, they may be helpers or other commercial fishers.

Table 5.3.34. Distribution of commercial fishers by ethnic group, 2003.
Source: Kojis 2004.

	Percent of Commercial Fishers (335 Respondents)		
Racial/Ethnic Group	**St. Thomas/St. John**	**St. Croix**	**U.S. Virgin Islands**
French	49.1	0.0	16.7
Black French	6.1	0.0	2.1
White	8.8	7.7	8.1
Hispanic	3.5	48.4	33.1
Black	32.5	41.6	38.5
Black Hispanic	0.0	1.8	1.2
East Indian	0.0	0.5	0.3
Total	***100.0***	***100.0***	***100.0***

Most USVI commercial fishers own one boat. In St. Croix, about 76 percent of the fishers own one boat, while about 60 percent of those in St. Thomas/St. John similarly own one boat. None of the fishers in St. Thomas/St. John own more than three boats, while 0.9 percent own four boats in St. Croix.

USVI commercial fishers tend not to derive all of their income from fishing. The average St. Thomas/St. John commercial fisher derives 74 percent of his/her income from fishing, while 60.2 percent of the average St. Croix fishers' annual income derives from fishing (Kojis 2004). Some of the commercial fishers stated that none of their income derives from fishing. This suggests these fishers may be participants in subsistence fishing. Seventy-five percent of St. Thomas/St. John's commercial fishers (75 percent) obtain more than half of their income from fishing, while 54 percent of St. Croix commercial fishers are similarly reliant on fishing.

USVI fishers target reef fish more than any other category of fish. More St. Thomas/St. John fishers target reef fish (77.7 percent) than any other species group. The fewest target deepwater snapper (4.5 percent) (Table 5.3.35). The top ranked species group targeted by St. Croix fishers is reef fish (84.7 percent) followed by deepwater snapper (42.3 percent) and conch (39.1 percent).

USVI commercial fishers tend to target more than one category of fish. Of the eight categories of fish as shown in Table 5.3.35, about 70 percent of St. Thomas/St. John fishers and over 80 percent of St. Croix fishers-interviewed in 2003/04 and who responded to the question-target more than one species.

Table 5.3.35. Percent of USVI commercial fishers that target specific species. Source: Kojis 2004.

Targeted Species	Percent of Interviewed Commercial Fishers		
	St. Croix	St. Thomas/St. Croix	U.S. Virgin Islands
Reef Fish	84.7	77.7	82.3
Coastal Pelagic	37.2	53.6	42.8
Deep Pelagic	33.0	9.8	25.1
Deepwater Snapper	42.3	4.5	29.4
Bait Fish	14.4	29.5	19.6
Conch	39.1	8.9	28.7
Whelk	4.7	14.3	8.0
Lobster	40.5	35.7	38.8

Table 5.3.36. Percent of St. John commercial fishers by landing site, 2003. Source: Kojis 2004.

St. John Fishers' Landing Sites	Number of Fishers	Percent of Fishers
Cruz Bay	5	45.5%
Coral Bay	4	36.4%
St John	1	9.1%
Hansen Bay	1	9.1%
Trailered	1	9.1%
Number of Respondents[1]	***11***	***109.2%***
Number of Responses	***12***	

[1.] Some fishers use more than one landing site.

About 82 percent of St. John commercial fishers land their catches at either Cruz Bay or Coral Bay (Table 5.3.36). No commercial fishers from St. John reported landing their catch outside the island. The top six landings sites in St. Thomas are Frenchtown, Hull Bay, Benner Bay, Seaside Inn at Benner Bay, Water Bay, and Krum Bay. Some St. Thomas commercial fishers land catch in St. John and Puerto Rico (Table 5.3.37).

St. Croix commercial fishers land their catch at 18 different sites on the island. In 2003, one of these fishers also landed fish on St. John (Table 5.3.38). The most popular landing sites in St. Croix are Altona Lagoon (aka Augusta Landing Site), Molasses Dock (aka Krauss Lagoon) and Frederiksted Fishers' Pier. Many St. Croix commercial fishers use multiple landing sites. Approximately 35 percent reported that they use two or more sites to land their catch.

Table 5.3.37. Number and percent of St. Thomas commercial fishers by landing site, 2003. Source: Kojis 2004.

St. Thomas Fishers' Landing Sites	Number of Fishers	Percent of Fishers
Frenchtown	31	33.0%
Hull Bay	15	16.0%
Benner Bay	8	8.5%
Seaside Inn, Benner Bay	7	7.4%
Water Bay	8	8.5%
Krum Bay	6	6.4%
Mandahl Pond	3	3.2%
Red Hook	3	3.2%
Coast Guard Dock	2	2.1%
Brewers Bay	2	2.1%
East Gregorie Channel	2	2.1%
Trailered	1	1.1%
Sapphire	1	1.1%
AYH	1	1.1%
Tropical Marine	1	1.1%
Fish Hawk Marina	1	1.1%
Piccola Marina Dock	1	1.1%
Coki Point	1	1.1%
Magens Bay	1	1.1%
Crown Bay Marina	1	1.1%
Cruz Bay, St. John	1	1.1%
Kill Bay, St. John	1	1.1%
Culebra, Puerto Rico	1	1.1%
Number of Respondents	***94***	***105.3%***
Number of Responses	***99***	

USVI commercial fishers use multiple methods to market their fish; however, the most popular methods are selling the fish whole, gutted or iced in a cooler. The top four methods used by St. Thomas/St John fishers include selling the fish whole, iced, gutted or scaled. Similarly, the top four methods used by St. Croix fishers include selling the fish whole, iced, cleaned, or gutted (Kojis 2004). Fishermen in the USVI generally market their product directly to the consumer or to restaurants (i.e., wholesale or quasi-retail), so it does not reflect a true ex-vessel value (CFMC 2005:379).

Many USVI commercial fishers sell their catch at their landing site. In St. Croix, 24 percent of the fishers sell their catches at the landing site, while 28 percent of those in St. Thomas/St. John similarly sell their catches (Kojis 2004). Significantly more St. Croix fishers (20 percent) bring their catch home than fishers in St. Thomas/St. John (5 percent). This suggests that significantly more St. Croix fishers than St. Thomas/St. John fishers may participate in subsistence fishing.

Table 5.3.38. Landing sites of St. Croix commercial fishers, 2003. Source: Kojis 2004.

St. Croix Fishers' Landing Sites	Number of Fishers	Percent of Fishers
Altona Lagoon	75	37.5%
Molasses Pier	71	35.5%
Frederiksted Fishers' Pier	62	31.0%
Gallows Bay	17	8.5%
Castle Nugent	11	5.5%
Salt River Bay	11	5.5%
Christiansted	9	4.5%
Teague Bay	6	3.0%
Green Cay Marina	4	2.0%
Solitude	4	2.0%
Turner Hole	3	1.5%
Duggans Reef	2	1.0%
Great Pond	2	1.0%
All Landing Sites	1	0.5%
Cane Bay	1	0.5%
Carlton Beach	1	0.5%
Chabert Beach	1	0.5%
Halfpenny Bay	1	0.5%
St. Croix Marine	1	0.5%
St. John	1	0.5%
St. Croix	1	0.5%
Number of Respondents[1]	***200***	***142.5%***
Number of Responses	***285***	

[1.] Some fishers land their catches at multiple sites.

St. Croix commercial fishers trailer their boats. They do so to have the flexibility to react to weather conditions and to make on-the-spot determinations about the types of species to target, the specific areas to fish, and the gear strategy to employ (Stoffle et al. 2009). Furthermore, it may give them other advantages, such as being able to more cheaply store/dock, repair, and protect their boats. Plus, it gives the fishers the ability to move their boats to areas closer to where they live (Figure 5.3.16).

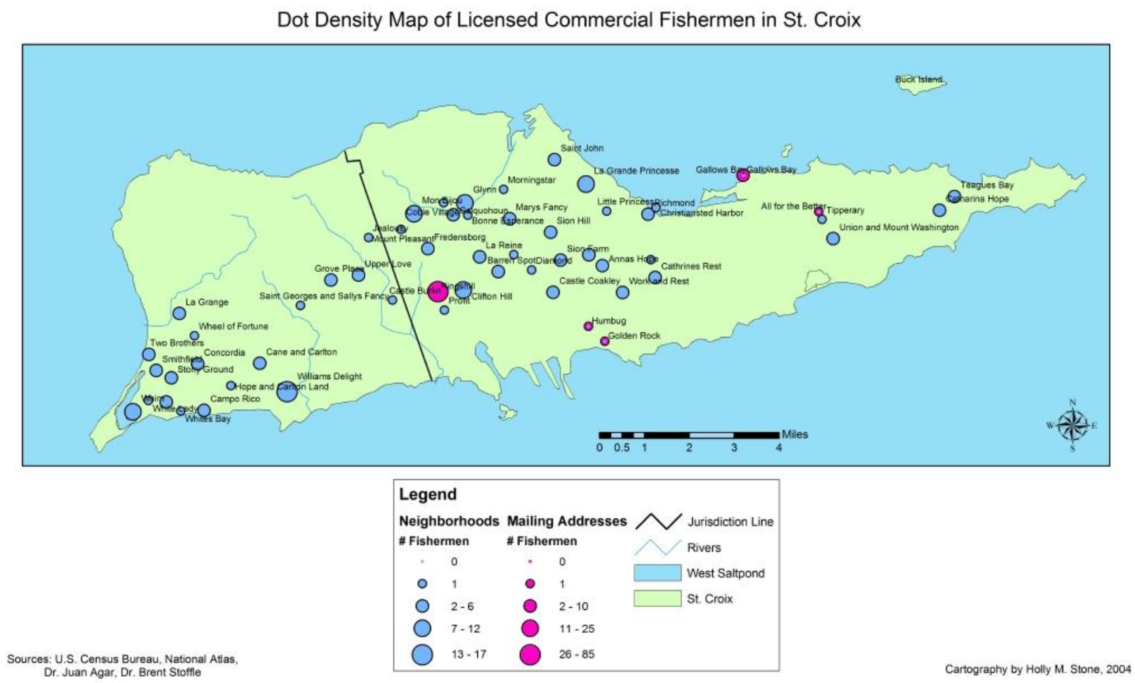


Figure 5.3.16. Dot density map of licensed commercial fishers in St. Croix. Source: Stoffle 2007.

5.3.3.3 U.S. Virgin Islands commercial fishing fleet

In 2003, there were 360 registered boats owned by commercial fishers in the USVI; 135 in St. Thomas/St. John and 225 in St. Croix (Kojis 2004). About 94 percent of commercial fishers in St. Thomas/St. John and 94 percent in St. Croix own or co-own a fishing vessel.

Most USVI commercial fishers who were interviewed owned one boat; however, 6 percent of those on St. Thomas/St. John and 1.9 percent on St. Croix owned 3 vessels (Kojis 2004). One percent of fishers in St. Croix owned 4 vessels, while there were no fishers in St. Thomas/St. John with more than 3 vessels.

About 73 percent of St. Thomas/St. John and 93 percent of St. Croix commercial fishing boats are powered by an outboard motor, and of those with an outboard, most have one outboard engine under 76 horsepower. At least 55 percent of the vessels with an outboard motor have no more than 75 horsepower. Fishers normally use small fiberglass boats under 24 feet in length, and have motors that are generally no larger than 100 horsepower.

The primary fuel used is gasoline. About 83 percent of fishing boats in St. Thomas/St. John with an outboard engine are fueled by gasoline, while 65.7 percent of similar fishing vessels in St. Croix run on gasoline (Kojis 2004).

Most USVI commercial fishing vessels are no more than 25 feet long. Approximately, 91 percent of the fishing vessels of St. Croix, and approximately 74 of the fishing vessels of St. Thomas/St. John are 25-feet long or less.

5.3.3.4 Gears used

According to Kojis (2004), there are distinct differences in the gears used in each district. St. Thomas/St. John fishers commonly use fish traps, modified lobster traps, and plastic lobster traps to target fish and lobster, and to a lesser extent vertical setlines, gill and trammel nets, and SCUBA. In St. Croix, instead of commonly using traps, fishers diversify into other gears such as multi-hook vertical setlines, gill and trammel nets, and SCUBA. Hand lines and rods and reels are also used. Presently, the use of all gill and trammel nets (single or multiple wall entanglement) are prohibited, with the exception of single-wall surface gillnets for the baitfish ballyhoo, gar, and flying fish (V.I.C., Title 12, Chapter 9A, §321-1). Surface gillnets must be tended at all times, may not be more than 1,800 feet long as measured by the float line, and may not be used within 20 feet from the bottom.

Nets have tended to be the dominant gear to target reef fish in St. Croix. The differences in commonly used gear reflect the differences in the insular shelf breaks. While the insular shelf break occurs in waters approximately 100 to 130 feet deep off St. Thomas, it occurs in waters approximately 60 feet deep off St. Croix.

Net fishing is a fairly new technique in the USVI that began in the 1990s as a result of declining catch rates of traps and other gear types during a prolonged economic recession on St. Croix. After Florida's net ban in 1994, gear suppliers, especially gill net producers, began promoting their equipment in the USVI (Rothenberger et al. 2008), and net fishing eventually accounted for a greater proportion of annual landings on St. Croix than traditional fishing gear (Toller and Tobias 2005). The use of gill and trammel nets was banned in July 2006; however, the ban was met with resistance by parrotfish and other species fishers who used one or both nets and continued to use the nets because the ban was not enforced:
(http://pqasb.pqarchiver.com/virginislands/advancedsearch.html?pqatl=pqcom).
Enforcement of the ban did not begin until April 2008.

SCUBA diving has increased as a means of harvesting queen conch, and divers have been going into deeper waters to harvest conch. In 2007, the VIDPNR began seeing divers off St. Croix having serious decompression sickness as they ventured into these deeper waters (Associated Press, July 27, 2007).

Seine net fishing in St. Thomas is carried out by fishers of primarily French descent (MRAG Americas, Inc. 2006). These fishers track schools of fish and observe feeding patterns to surround the schools with nylon nets that they close by free diving in shallow waters from 15 to 40 feet deep (STFA 2008). Approximately 49 percent of the commercial fishers interviewed in 2003 identified themselves as French and 6 percent as Black French (Kojis 2004).

5.3.3.5 Combined commercial landings and per-capita fish and shellfish consumption

During a 32–year period, commercial landings increased significantly, from 273,207 pounds in 1976 to over 2 million pounds in 2006, then fell to approximately 1.6 million pounds in 2007 (Table 5.3.39). Note that there is no adjustment factor applied to these landings. Reported landings and actual landings are presumed to be the same.

Table 5.3.39. Commercial landings (pounds) in the USVI, 1974-2007.

YEAR	Total Commercial Landings				
	St. Croix (STX)	St. Thomas/ St. John (STT/STJ)	USVI	Percent STX	Percent STT/STJ
1974		57,746			
1975		265,512			
1976	48,576	224,631	273,207	17.8%	82.2%
1977	66,511	253,010	319,521	20.8%	79.2%
1978	77,859	458,818	536,678	14.5%	85.5%
1979	78,419	477,641	556,060	14.1%	85.9%
1980	53,454	531,214	584,668	9.1%	90.9%
1981	109,993	518,385	628,377	17.5%	82.5%
1982	170,358	477,581	647,939	26.3%	73.7%
1983	245,306	570,492	815,798	30.1%	69.9%
1984	317,770	606,540	924,311	34.4%	65.6%
1985	192,998	618,118	811,115	23.8%	76.2%
1986	231,027	578,305	809,332	28.5%	71.5%
1987	414,620	539,376	953,997	43.5%	56.5%
1988	403,713	653,297	1,057,010	38.2%	61.8%
1989	289,453	593,318	882,771	32.8%	67.2%
1990	402,243	519,983	922,226	43.6%	56.4%
1991	570,221	587,562	1,157,783	49.3%	50.7%
1992	529,364	721,338	1,250,702	42.3%	57.7%
1993	641,162	784,441	1,425,603	45.0%	55.0%
1994	627,491	716,326	1,343,817	46.7%	53.3%
1995	485,215	662,656	1,147,871	42.3%	57.7%
1996	496,558	629,494	1,126,052	44.1%	55.9%
1997	660,188	732,043	1,392,230	47.4%	52.6%
1998	660,857	611,591	1,272,448	51.9%	48.1%
1999	683,516	599,488	1,283,004	53.3%	46.7%
2000	808,599	619,766	1,428,365	56.6%	43.4%
2001	1,005,010	755,323	1,760,333	57.1%	42.9%
2002	1,112,067	819,407	1,931,474	57.6%	42.4%
2003	992,460	813,652	1,806,112	55.0%	45.0%
2004	1,033,448	810,774	1,844,222	56.0%	44.0%
2005	1,149,330	741,897	1,891,227	60.8%	39.2%
2006	1,257,662	788,216	2,045,878	61.5%	38.5%
2007	877,589	716,110	1,593,699	55.1%	44.9%

The decline in landings in 2007 is most likely attributable to federal and state regulatory actions since 2005. Federal regulatory actions implemented since the 2005 Caribbean SFA Amendment and by the USVI government in 2006 undoubtedly have resulted in reduced commercial landings of all species and reef fish in the territory, and especially St. Croix.

The share of USVI landings by each district has similarly changed significantly. While St. Thomas/St. John accounted for approximately 82 percent of the territory's landings in 1976, by 2006, those islands accounted for approximately 39 percent of combined landings. In 2007, St. Thomas/St. John's share of the territory's landings rose to approximately 45 percent.

The annual per capita consumption of fish and shellfish for human food is higher in the USVI than in Puerto Rico. During the three-year period from 2003 to 2005, it averaged 29.6 pounds, as opposed to 94.9 pounds in Antigua, 53.4 pounds in the U.S., 22.3 pounds in the Dominican Republic, and 1.8 pounds in Puerto Rico.

5.3.3.6 Commercial sector

5.3.3.6.1 Snapper Unit 1 commercial harvest

The USVI requires SU1 commercial fishers to report their landings; however, these landings are placed within the broader category of "snapper". Hence, commercial landings of silk, black, vermilion, and blackfin snapper are not differentiated from other snapper landings in the following summary table of snapper landings.

Table 5.3.40. Commercial landings of snapper and all species, 1998-2007.

Year	STX Commercial Landings			STT/STJ Commercial Landings			USVI Commercial Landings		
	Snapper	All	Percent Snapper	Snapper	All	Percent Snapper	Snapper	All	Percent Snapper
1998	60,654	660,857	9.2%						
1999	64,106	683,516	9.4%						
2000	80,817	808,599	10.0%	150,313	619,766	24.3%	231,130	1,428,365	16.2%
2001	124,056	1,005,010	12.3%	175,338	755,323	23.2%	299,394	1,760,333	17.0%
2002	169,748	1,112,067	15.3%	167,232	819,407	20.4%	336,980	1,931,474	17.4%
2003	133,652	992,460	13.5%	160,223	813,652	19.7%	293,874	1,806,112	16.3%
2004	125,127	1,033,448	12.1%	140,863	810,774	17.4%	265,990	1,844,222	14.4%
2005	150,288	1,149,330	13.1%	150,415	741,897	20.3%	300,702	1,891,227	15.9%
2006	143,828	1,257,662	11.4%	175,097	788,216	22.2%	318,925	2,045,878	15.6%
2007	117,344	877,589	13.4%	157,365	716,110	22.0%	274,709	1,593,699	17.2%
Average	***116,962***	***958,054***	***12.0%***	***159,606***	***758,143***	***21.2%***	***276,568***	***1,716,197***	***16.1%***

More snapper tend to be landed in St. Thomas/St. John (Table 5.3.40). During the period from 2000 to 2007, an average of 55 percent of the territory's annual commercial landings of snapper occurred in St. Thomas/St. John; however, in 2002, more snapper were landed in St. Croix and in 2005, landings were almost equally split between the two districts.

USVI fishers are not required to report the dollar values of their landings. Hence, the dollar value of snapper landings is estimated by multiplying the above reported landings by an estimated average annual price of that species category. Actual prices during the period from 1998 to 2007 are taken from Bennett (2007) and missing prices during the same period are estimated assuming a 2-period moving average.

The estimated ex-vessel revenues from snapper landings in St. Croix from 1998 to 2007 varied from a low of $242,616 in 1998 to a high of $791,055 in 2006 (Table 5.3.41). Ex-vessel revenues from snapper landings in St. Thomas/St. John from 2000 to 2007 varied from a low of $572,693 in 2000 to a high of $805,444 in 2006. Collectively, the value of snapper landings in the USVI ranged from approximately $0.9 million to $1.6 million during the 8-year period from 2000 to 2007.

Most landings of snapper in St. Croix and in St. Thomas/St. John are harvested by line fishing. From 1998 to 2007, line fishing accounted for an average of 66 percent of the pounds of snapper landed annually in St. Croix and approximately 49 percent in St. Thomas/St. John. When combined with other gear, line fishing accounted for 67.3 percent of all snapper landed in St. Croix and approximately 50 percent in St. Thomas/St. John. Traps were second in both districts, while diving ranked third in terms of landings of snapper in St. Croix and seine net ranked third in St. Thomas/St. John.

Table 5.3.41. Estimated ex-vessel revenue (dollars) from snapper landings (pounds) in the USVI, 1998-2007.

Year	STX Commercial Landings			STT/STJ Commercial Landings			USVI Commercial Landings	
	Snapper Landings	Avg. Price per Pound	Total Revenue	Snapper Landings	Avg. Price per Pound	Total Revenue	Snapper Landings	Total Revenue
1998	60,654	4.00	242,616					
1999	64,106	4.00	256,424					
2000	80,817	4.06	328,216	150,313	3.81	572,693	231,130	900,909
2001	124,056	4.12	511,421	175,338	3.72	651,382	299,394	1,162,803
2002	169,748	4.18	710,182	167,232	3.62	605,381	336,980	1,315,563
2003	133,652	4.25	567,352	160,223	4.21	674,538	293,874	1,241,889
2004	125,127	4.35	543,677	140,863	4.46	628,599	265,990	1,172,276
2005	150,288	5.00	751,438	150,415	4.16	626,102	300,702	1,377,540
2006	143,828	5.50	791,055	175,097	4.60	805,444	318,925	1,596,499
2007	117,344	6.00	704,066	157,365	5.00	786,823	274,709	1,490,888

5.3.3.6.2 Grouper Unit 4 commercial harvest

The USVI requires Grouper Unit 4 commercial fishers to report their landings; however, these landings are placed within the broader category of “grouper”. Hence, commercial landings of red, misty, tiger, yellowedge, and yellowfin grouper are not differentiated from other grouper landings in the following summary table of grouper landings.

More grouper are landed in St. Thomas/St. John than St. Croix (Table 5.3.42). From 2000 to 2007, an average of 63 percent of annual territorial landings of grouper occurred in St. Thomas/St. John. From 1998 to 2007, an average of 32,580 pounds of grouper were landed in St. Croix, while from 2000 to 2007, an average of 59,970 pounds were landed in St. Thomas/St. John.

Estimated total ex-vessel revenue from landings of grouper species in St. Croix grew substantially during the 10-year period from 1998 to 2007. They also rose in St. Thomas/St. John. Combined, the ex-vessel revenues from landings of grouper species ranged from almost $300,000 to over $0.5 million.

Most grouper are harvested by commercial fishers using traps. In St. Thomas/St. John, approximately 95 percent of annual commercial landings of grouper are taken by traps and line fishing: 79 percent by traps and 16 percent by line. St Thomas/St. John commercial fishers also use traps in combination with line fishing or diving, seine net, diving with cast net, and diving without added gear, to take grouper.

St. Croix commercial fishers harvest more grouper by line fishing and diving than by using traps. Diving accounts for an average of approximately 40 percent of annual commercial landings of grouper, and line fishing accounts for the same percent. Traps rank a distant third.

Table 5.3.42. Estimated ex-vessel revenue (dollars) from grouper landings (pounds), 1998-2007.

Year	St. Croix (STX)			St. Thomas/St. John (STT/STJ)			USVI	
	Grouper Landings	Avg. Price per Pound	Total Revenue	Grouper Landings	Avg. Price per Pound	Total Revenue	Grouper Landings	Total Revenue
1998	18,204	4.00	72,814					
1999	20,573	4.20	86,405					
2000	23,807	4.40	104,749	49,282	3.96	195,155	73,088	299,904
2001	29,763	4.60	136,908	54,275	3.94	213,843	84,037	350,751
2002	44,291	4.80	212,596	55,196	3.92	216,370	99,487	428,965
2003	45,883	4.40	201,885	65,332	4.36	284,847	111,215	486,733
2004	46,776	4.50	210,490	75,730	4.53	342,676	122,505	553,166
2005	39,551	5.00	197,755	66,321	4.21	279,112	105,872	476,867
2006	33,188	5.50	182,533	60,351	4.73	285,669	93,538	468,202
2007	23,762	6.00	142,572	53,274	5.30	282,351	77,036	424,923

5.3.3.6.3 Grouper Unit 1 commercial harvest

Grouper Unit 1 is composed of Nassau grouper (*Epinephelus striatus*). Harvest of Nassau grouper is prohibited in both territorial and federal waters of the USVI (FishWatch-U.S. Seafood Facts). Since 1990, no person may fish for or possess Nassau grouper in or from the U.S. Caribbean EEZ (50 CFR 622.32(b)(1)(ii)), and no person can fish for or possess the species in the USVI (Virgin Islands Code, Title 12, Chapter 9A, §316-14 (e). Hence, none of the commercial landings of grouper species are expected to include Nassau grouper. Aggregations of Nassau grouper have been reported off St. Thomas and St. Croix (Sadovy and Eklund 1999).

5.3.3.6.4 Parrotfish commercial harvest

Parrotfish have been abundant on the reefs of the USVI, and in some areas they are a preferred food fish (CFMC 1985). There has been a general increase in commercial landings of parrotfish in both St. Croix and St. Thomas/St. John from 2000 to 2007 (Table 5.3.43). During these 8 years, St. Croix's landings accounted for approximately 87 percent of the territory's annual landings of the species, on average. In St. Thomas and St. John, parrotfish are called goo-too, and in St. Croix, they are called bluefish. Female stoplight parrotfish are called redbelly bluefish or Buck Island soldier, and male stoplight parrotfish are called green bluefish.

Parrotfish landings represent a substantial portion of St. Croix's annual commercial landings of all species. During the 10-year period from 1998 to 2007, an average of approximately 31 percent of St. Croix's annual commercial landings derived from parrotfish landings. Parrotfish landings are not so substantial in St. Thomas/St. John; they make up an average of approximately 6 percent of these islands' annual commercial landings of all species.

Table 5.3.43. Commercial landings of parrotfish (pounds) and percent of all landings, 1998-2007.

Year	STX			STT/STJ		
	Parrotfish Landings	All Landings	Percent Parrotfish	Parrotfish Landings	All Landings	Percent Parrotfish
1998	213,459	660,857	32.3%			
1999	235,861	683,516	34.5%			
2000	260,474	808,599	32.2%	35,273	619,766	5.7%
2001	290,499	1,005,010	28.9%	50,260	755,323	6.7%
2002	307,591	1,112,067	27.7%	45,855	819,407	5.6%
2003	262,473	992,460	26.4%	52,854	813,652	6.5%
2004	319,250	1,033,448	30.9%	58,548	810,774	7.2%
2005	376,389	1,149,330	32.7%	50,305	741,897	6.8%
2006	416,074	1,257,662	33.1%	44,237	788,216	5.6%
2007	306,420	877,589	34.9%	40,819	716,110	5.7%
Average	***298,849***	***958,054***	***31.4%***	***47,269***	***758,143***	***6.2%***

The estimated average nominal price per pound of parrotfish ranged from $3.00 to $3.58 per pound from 1998 to 2007 in St. Croix and from $3.13 to $4.2 in St. Thomas/St. John from 2000 to 2007. The majority of ex-vessel revenues from landings of parrotfish in the USVI are attributable to landings in St. Croix. From 2000 to 2007, St. Croix parrotfish landings accounted for an average of 86 percent of the territory's ex-vessel revenues from landings of parrotfish. Ex-vessel revenues from landings of parrotfish ranged from $747,106 to almost $1.5 million in St. Croix during the period from 1998 to 2007, while ex-vessel revenues in St. Thomas/St. John ranged from $119,046 to $202,840 (Table 5.3.44).

Table 5.3.44. Ex-vessel revenues (dollars) from landings (pounds) of parrotfish in the USVI, 1998-2007.

Year	STX			STT/STJ			USVI	
	Parrotfish Landings	**Avg. Price per Pound**	**Total Revenue**	**Parrotfish Landings**	**Avg. Price per Pound**	**Total Revenue**	**Parrotfish Landings**	**Total Revenue**
1998	213,459	3.50	747,106					
1999	235,861	3.38	797,210					
2000	260,474	3.28	854,354	35,273	3.38	119,046	295,747	973,400
2001	290,499	3.13	909,260	50,260	3.31	166,487	340,759	1,075,747
2002	307,591	3.00	922,772	45,855	3.25	149,029	353,446	1,071,801
2003	262,473	3.17	832,039	52,854	3.13	165,169	315,327	997,207
2004	319,250	3.27	1,043,948	58,548	3.46	202,840	377,798	1,246,787
2005	376,389	3.18	1,196,917	50,305	3.96	199,435	426,694	1,396,352
2006	416,074	3.58	1,489,545	44,237	4.10	181,373	460,311	1,670,918
2007	306,420	4.00	1,225,680	40,819	4.20	171,441	347,239	1,397,121

Diving has become an increasingly common method to harvest parrotfish in St. Croix. More than half of the species were harvested by diving in 2006 and 2007. Similarly, nets are commonly used to take the species in St. Croix. For example, in 2007, net gear, alone and in combination with other gear, was used to harvest approximately 45 percent of that year's annual landings of parrotfish. Gear used to harvest parrotfish has changed with time. After 1994, the use of gill and trammel nets increased as fishers switched from pots to the nets. The use of these nets in St. Croix to take parrotfish and other species was banned in July 2006; however, the ban was met with resistance by parrotfish and other species fishers who used one or both nets and continued to use the nets because the ban was not enforced:
(http://pqasb.pqarchiver.com/virginislands/advancedsearch.html?pqatl=pqcom).
Enforcement of the ban did not begin until April 2008. Hence, landings of parrotfish by gear in St. Croix prior to 2008 do not reflect that enforcement.

From 1999 to 2007, the use of gill nets accounted for an average of approximately 31 percent of annual commercial parrotfish landings (pounds) in St. Croix, but in 2007, gill nets accounted for six percent of those landings. Trammel nets, used alone or in combination with other nets, accounted for an increasing percent of commercial landings in St. Croix after 2002, rising to approximately 16 percent in 2007. It is not yet known to what extent annual landings of parrotfish may have declined, if at all, since the enforcement of the net ban began in April 2008. However, that information will become available as 2008 and later landings data are processed, validated, and distributed. St. Croix commercial parrotfish fishers also dive and use seine nets to take significant percentages of the annual landings of the species, and any fishers, who used the nets prior to the ban and its enforcement, may have shifted to seine net, traps or other allowed gear. In 2007, for example, there was a ten percent increase in landings attributed to the use of seine nets and an approximately 18 percent decrease in landings attributed to gill nets (Table 5.3.45).

Table 5.3.45. Percent of St. Croix and St. Thomas/St. John annual commercial parrotfish landings (pounds) that involved use of gill or trammel nets alone or with other gear.

Year	**Percent STX Parrotfish Landings**			**Year**	**Percent STT/STJ Parrotfish Landings**	
	Gillnet	**Trammel net**			**Gillnet**	**Trammel net**
1999	37.59%	0.00%				
2000	30.20%	0.00%		2000	0.00%	0.00%
2001	34.08%	0.00%		2001	0.00%	0.00%
2002	34.55%	0.00%		2002	0.00%	0.00%
2003	35.02%	5.31%		2003	0.12%	0.00%
2004	32.83%	4.94%		2004	0.00%	0.00%
2005	25.56%	6.45%		2005	0.00%	0.00%
2006	23.72%	8.55%		2006	0.00%	0.69%
2007	6.00%	15.63%		2007	0.00%	0.00%

The large majority of parrotfish harvested in St. Thomas/St. John are caught in traps. From 2000 to 2007, an average of approximately 95 percent of the district's annual parrotfish landings was attributable to traps used alone and in combination with line fishing and diving. Diving, alone and in combination with other gears, accounts for approximately four percent of St. Thomas/St. John's annual landings of parrotfish, which differs significantly from diving's contribution to annual parrotfish landings in St. Croix, which is approximately 41 percent.

5.3.3.6.5 Queen conch commercial harvest

Prior to 2000, landings of queen conch were placed in the broader category of conch, whelk, and other mollusks in St. Thomas/St. John, and similarly queen conch was included in the broader category in St. Croix prior to 1998. Landings of conch, whelk, and other mollusks in the territory increased significantly from 1976 to 1997, rising from 802 pounds in 1976 to 52,594 pounds in 1997. The greatest increase occurred in St. Croix with landings rising from 657 pounds to 47,478 pounds over that period.

Commercial landings of queen conch rose significantly in St. Croix from 2000 to 2006, increasing approximately 288 percent during that time. Similarly, conch landings in St. Thomas/St. John also increased during that six-year period, rising approximately 368 percent; however, landing on both island groups significantly declined in 2007 (Table 5.3.46). From 2000 to 2007, landings of queen conch in St. Croix represented, on average, approximately 99 percent of the territory's landings of the species. The average nominal price tends to be higher in St. Thomas/St. John than in St. Croix.

Conch landings represented, on average, approximately 12 percent of all species landed, in pounds, in St. Croix and approximately 0.2 percent of those landed in St. Thomas/St. John during the years from 2000 to 2007.

Table 5.3.46. Estimated ex-vessel revenues (dollars) from conch landings (pounds) in the USVI, 2000-2007.

Year	STX			STT/STJ			USVI	
	Conch Landings	Avg. Price per Pound	Total Revenue	Conch Landings	Avg. Price per Pound	Total Revenue	Conch Landings	Total Revenue
2000	76,999	4.70	361,893	1,083	5.00	5,415	78,082	367,308
2001	113,444	4.55	516,168	1,847	5.00	9,236	115,291	525,404
2002	116,492	4.40	512,565	2,172	5.00	10,860	118,664	523,425
2003	108,174	4.95	535,459	3,339	5.10	17,029	111,513	552,488
2004	125,258	5.15	645,079	1,022	5.85	5,979	126,280	651,057
2005	161,452	4.90	791,112	429	6.05	2,595	161,881	793,708
2006	221,966	5.50	1,220,813	3,989	5.80	23,136	225,955	1,243,949
2007	76,086	6.00	456,516	1,124	6.00	6,744	77,210	463,260
Average	***124,984***	***5.02***	***629,951***	***1,876***	***5.48***	***10,124***	***126,859***	***640,075***

Estimated ex-vessel revenues from conch landings ranged from under $400,000 to over $1.2 million during the period from 2000 to 2007 in the USVI (Table 5.3.46). Ex-vessel revenues from conch landings in St. Croix dominate those in St. Thomas/St. John.

According to an article in the July 30, 2007 issue of the St. Thomas Source (Lohr 2007), over-harvest has been attributed to the export of conch from St. Croix to Puerto Rico. St. Croix queen conch fishers have benefited from higher, and sometimes substantially higher, prices they receive by exporting conch to Puerto Rico's west coast (Lohr 2007).

Harvest of queen conch around St. Croix is artisanal. Most commercial vessels are outboard powered, fiberglass constructed, and less than 26 feet in length (Kojis 2004). In St. Croix, approximately 97 percent of the conch annually landed (pounds) is taken by diving with and without additional gear.

Diving also ranks first in terms of commercial conch landings in St. Thomas/St. John. Queen conch tends to be an incidental catch for St. Thomas/St. John fishers (Valle-Esquivel 2003).

In July 2008, a 50,000-pound annual quota took effect in both St. Croix and St. Thomas/St. John. Within each island group, fishing for queen conch closes when the 50,000-pound limit is met and the season remains closed until November 1. On April 7, 2009, the VIDPNR announced that the St. Croix season would close April 30, 2009, and remain closed until November 1, 2009, because conch landings had exceeded the annual limit of 50,000 pounds (Virgin Islands Daily News, April 8, 2009). According to the VIDPNR, much of the over-harvest of conch has been attributed to the export of conch from St. Croix to Puerto Rico.

All queen conchs must be landed and reported in the island group from which they are harvested. Throughout the USVI, there is a size limit of nine inches (229 mm) shell length or a lip of 3/8 inches (9 mm). Since April 1994, queen conch must be landed whole in the shell and live (subchapter 316-4) and harvest or sale of undersized conch is prohibited. There is presently a commercial harvest quota of 150 conchs per person per day.

The requirement to land conch in the shell created extensive controversy on St. Croix as conch shells piled up at landing sites and on beaches (Gordon 2002). According to Gordon (2002), the landed-in-the-shell requirement was considered the only way to effectively enforce size restrictions; however, because of the controversy and lack of enforcement, regulations have often been ignored, particularly on St. Croix where the conch harvest is larger by comparison to the conch harvest in St. Thomas/St. John (Valle-Esquivel 2003, Gordon 2002).

All conch fishing trips are made on a daily basis, and the fishers return to sell their catch by early afternoon in five-pound plastic bags of cleaned conch (Valle-Esquivel 2003, Rivera 1999). In 1999, the price of such a bag was $20; however, the price tends to vary from $4 to $5 per pound (CFMC 2001). On average, conch fishers make 3.2 trips per week and have two fishers on board (Valle-Esquivel 2003). Most conch are harvested in waters from 17 to 79 feet deep; however, most commercial fishers that target conch use SCUBA gear at depths greater than 120 feet (CMFC 2001).

Rosario (1995) identified 25 fishers in the commercial conch sector from St. Croix in 1995. In 1999, there were 16 full-time and 12 part-time conch fishers in St. Croix and 23 part-time conch fishers in St. Thomas/St. John (Rivera 1999). Kojis (2004) reported that 215 commercial fishers were registered in St. Croix during the fishing year of July 2003 to June 2004, and 84 fishers (39.1 percent) reported harvesting conch. Assuming the 84 conch fishers were the number that harvested conch in the calendar year of 2003, there was a 200 percent increase in the number of conch fishers from 1999 to 2003. Rivera (1999) reported that two of the 28 conch fishers in St. Croix harvested conch from the Caribbean EEZ.

St. Croix queen conch fishers did not fish exclusively for conch. According to Valle-Esquivel (2003), a large majority of conch fishers in St. Croix target lobster and a relatively small percent target octopus as well. Other species harvested by conch fishers are reef fish and coastal pelagic species.

5.3.3.7 Recreational sector

Recreational fishing is a popular past time in the USVI (Jennings 1992, Eastern Caribbean Center 2002, Toller et al. 2005). In 1999, an estimated 11 percent of USVI residents participated in recreational fishing (Mateo 1999), and in the 1990s, $25 million was added to the USVI economy annually from recreational fishing (Hinkey et al. 1994).

In St. Croix, most recreational fishing activities take place on the shoreline, whereas in St. Thomas and St. John most recreational fishermen use boats. The number of shore- and boat-based fishers was estimated to be approximately 11,000 in 2000, and of those fishers, approximately 2,509 were estimated to be boat-based (Eastern Caribbean Center 2002). According to the Eastern Caribbean Center (2002), approximately 53 percent of recreational fishers in the USVI fish in territorial waters. However, as of March 1, 2010, only 12 fishers were registered with the National Saltwater Angler Registry.

The USVI does not require a permit for recreational fishing; however, there are restrictions. Recreational fishers are required to have permits to fish in three locations: Altona Lagoon and Great Pond in St. Croix, and in St. James Reserve and Cas Cay/Mangrove Lagoon Marine Reserves in St. Thomas. Sale of catch by recreational fishers is prohibited, and recreational fishers are not allowed to use the following gears: pots, traps, haul seines, and set-nets, the latter of which are a type of gill net consisting of a wall of fine mesh held up by a float line and anchored on the sea floor. There is also a recreational bag limit of six conchs per person per day, not to exceed 24 per boat per day.

The VIDPNR defines recreational fishing as fishing for the sole purpose of providing food for oneself or one's family or to catch and release fish. Included in this definition are both subsistence fishing and sport fishing. The major participants in sport fishing are tourists who target migratory species, and sportfishing tournaments are popular. Toller et al. (2005) distinguish five types of USVI sportfishing tournaments: shore-based handline, boat-based handline, offshore coastal pelagic, offshore pelagic, and marlin. The numbers and types of fishing tournaments tend to differ between the islands of St. Thomas and St. Croix.

Among non-sport-fishing anglers, the most popular species are snapper (Lutjanidae) and grouper (Serranidae) (Jennings 1992, Eastern Caribbean Center 2002, Toller et al. 2005). A 1986 telephone survey of non-charter boat anglers found grouper and snapper to be the primary target species for 64 percent of anglers on St. Thomas/St. John and for 62 percent of those on St. Croix (Jennings 1992: 345). According to Matter (2007), there were no reports of recreational catch of yellowfin grouper, a member of GU4, from 2000 to 2005.

There are significant differences in the offshore fisheries of St. Thomas and St. Croix. First, the numbers of charter boat operations across the islands differ greatly. In 2002, for example, there was one charter-and-party-boat operation in St. Croix and 12 in St. Thomas and St. John combined, for a total of 13 operations in the USVI (2002 Economic Census). That number has since declined by three. In 2007, there were 10 charter-and-party boat operations in the USVI (2007 Economic Census). Second, the sizes of the offshore recreational fleets are very different. Mateo et al. (2000) estimate the St. Thomas offshore recreational fishing fleets is approximately 150 vessels, of which 40 are seasonal vessels that come from the U.S. mainland for marlin season. In contrast, St. Croix's offshore recreational fishing fleet is comprised of approximately 30 vessels.

The MRFSS program began in 1979 and was conducted in 1979 and 1981 in the USVI; however, it was discontinued in 1982 because of lack of funding. MRFSS was re-initiated in the USVI in 2000, but subsequently has not been continued. Nonetheless, the VIDPNR's Division of Fish and Wildlife conducted a recreational fisheries assessment during the 5-year period from October 1, 2000, to September 20, 2005. The assessment included: 1) a telephone survey of boat-based angling, 2) interviews and logbook records of recreational fishers, 3) intercept surveys of shoreline recreational fishers, 4) a survey of recreational fishers to determine impacts of national monument expansion on St. Croix, 5) collection of pertinent bibliographic materials, and 6) sampling from sportfishing tournaments. For the survey results of sportfishing tournaments, see Toller et al. (2005).

Additional information about St. Croix's and St. Thomas/St. John's recreational fisheries can be found in Stoffle et al. (2009), and Impact Assessment, Inc. (2007), respectively.

5.3.3.8 U.S. Virgin Islands subsistence harvest

Subsistence fishing has been and remains an important part of fishing in the USVI. According to Impact Assessment, Inc. (2007), based on observation and discussions with residents, it is clear that extensive subsistence-oriented fishing is conducted by persons living in relatively less affluent communities throughout St. Thomas, and in the small communities throughout St. John. However, data is lacking for both islands. Additional discussion regarding subsistence fishing in St. Croix and in St. Thomas/St. John can be found in Stoffle et al. (2009) and Impact Assessment, Inc. (2007), respectively.

5.3.4 Brief Economic History and Overview

5.3.4.1 Puerto Rico

Puerto Rico's economy reflects its relationship to the United States, which in turn can be divided into four periods. First is the period of agrarian capitalism from 1898 to the economic crisis of the 1930s; second, the period of state-driven reforms from the early 1940s to the early 1950s; third, the period of industrialization from the early 1950s to the early 1970s; and last, the period of slow economic growth and an increasing state presence from the 1970s to the present (Toro Tulla 2007). A U.S.-dominated plantation system developed and characterized the first period.

Puerto Rico's economic relationship with the U.S. did not begin with the 1898 Spanish-American War. The northeastern U.S., where U.S. sugar refineries were located, received cane sugar produced from Spain's Caribbean colonies, which included Puerto Rico, for decades. In fact, the U.S. became the principal consumer of sugar from Puerto Rico and Cuba in the nineteenth century, as the U.S. consumption of sugar increased from 12.5 pounds to 65 pounds per capita between 1830 and 1900 (Ayala 1999: 17, 30). The relationship between Puerto Rico and the U.S. was so strong that, according to Picó (2006: 233), it was said that "Spain administered [both Puerto Rico and Cuba] for the economic benefit of the United States." Puerto Rico's economy was export-driven.

A discussion of Puerto Rico's economic history should include mention of the doctrine of Manifest Destiny. Manifest Destiny promoted forcible American expansion based on Divine right and racial superiority, and the doctrine referred to two major military events: the 1848 war against Mexico and the 1898 Spanish-American War (Herman 2009: 25). Coupled with the science of Social Darwinism, it was argued that the U.S. was acting in accord with Divine will and the best interests of Puerto Ricans in 1898 by invading the island and overthrowing its government because the ruling Spanish were not benefiting the islanders and both the Spanish and Puerto Ricans, unlike Anglo-Saxons, were incapable of creating a civilized society. The war, and war in general, was also touted as "the one great socializer" of American young men because it was argued that they were elevated physically, morally, and socially by becoming soldiers (Quint 1958: 138). The military action, however, ultimately served U.S. economic interests, especially the American Sugar Trust, which by 1892 controlled 98 percent of sugar refining in the United States, and the American Tobacco Trust.

During the 1898 Spanish-American War, the U.S. invaded the island and set up a blockade, which exposed the colony's inability to feed itself because of extreme reliance on export crops, particularly coffee, sugar, and tobacco. Whereas in 1830, 28.9 percent of the island's cultivated land was devoted to export crops, in 1862, 51.3 percent of cultivated land was so devoted. That trend continued and in 1897, about 63 percent of the island's cultivated land was devoted to coffee (40.9 percent), sugarcane (20.6 percent), and tobacco (1.4 percent) (Dietz 1986: 28). During the U.S. blockade, Spanish ships were kept out and although some ships were allowed to enter, there were shortages of flour, salted meats, potatoes, rice, and many types of canned food. Even plantains were rationed.

By 1898, coffee was Puerto Rico's principle export crop. It was grown in the mountainous regions of the island, which had been until 1800 the site of a subsistence farm economy (Ayala and Bernabe 2007). After 1800, many of those who had been subsistence farmers were forced to work for others, and small neighboring coffee growers became indebted to larger producers by virtue of buying on credit at the larger producers' country stores (ibid). At the same time, the larger producers continuously incurred debt with merchants who sold them processing equipment as they expanded their areas of cultivation. However, coffee was in high demand in Europe and prices were high at the time. The sugar industry, on the other hand, was in disarray. World prices of sugar plummeted after the 1850s with the increase in supply caused by beet sugar producers.

From 1870 to 1900 more sugar was produced from beets than from cane sugar, and by 1900, 65 percent of the world's sugar came from beets (Ayala 1999: 27). In 1876, sugar exports represented 62.5 percent of Puerto Rico's total value of exports while coffee exports represented 17.6 percent. By 1896, coffee exports represented 76.9 percent of the island's total value of exports and sugar exports only 20.7 percent (Dietz 1986: 27, 177 as stated in Ayala 1999: 198).

Puerto Rico's cane sugar producers could not compete with the lower cost competition without modernizing their mills, and at that time, there was insufficient financial capital in Puerto Rico to do so. If they did borrow, it was from merchants or merchant houses, who would charge exorbitant interest rates as high as 1.5 to 2 percent per month (Dietz 1986: 29). Moreover, during the Spanish-American War, the island's principal buyer of sugarcane was on the opposite side. U.S. imports of cane sugar dropped substantially, which encouraged the fast U.S. development of the beet sugar industry.

The transfer of Puerto Rico from Spain to the U.S. was welcomed by sugar mill owners, cane growers, and others involved in the sugar trade because they hoped to gain access to the tariff-protected U.S. sugar market (Ayala and Bernabe 2007: 17). Sugar consumption in the U.S. was continuing to expand. Coffee interests on the island were not similarly hopeful. Although coffee was the island's principal export crop by 1898, Puerto Rican coffee had been sent to Europe, where it received higher prices. While Puerto Rican sugar would be protected in the U.S. market, the island's coffee would have to compete with cheaper Brazilian coffee.

Puerto Rican tobacco farmers also welcomed the new trade status. Puerto Rican tobacco was similar to Cuban tobacco, which was popular in U.S. mainland markets, and the new protected import status meant Puerto Rican tobacco was now less expensive than Cuban tobacco (Levy 2007). In 1899, the Porto Rican American Tobacco Company, a subsidiary of the American Tobacco Company, was incorporated in New Jersey. It formally established the American presence in Puerto Rico's tobacco sector when it purchased two tobacco manufacturing companies in Ponce and San Juan.

After 1898, U.S. horizontally consolidated sugar refining corporations, who were members of the American Sugar Trust, established and operated vertically integrated plantations in Puerto Rico (Ayala 1999). The Sugar Trust oligopoly was formed in 1897 through the alliance of 15 companies, and one of its first acts was to raise the price of refined sugar and reduce the price of unrefined sugar. During the 5-year period from 1897 to 1901, 2 percent of the crops used to produce the U.S. supply of sugar came from Puerto Rico, and that increased to 5 percent from 1902 to 1906.

A general survey of Puerto Rico's fisheries was conducted in 1899 immediately after the U.S. occupation of the island. That was followed by a second survey in 1902 by William Wilcox, an agent of the U.S. Fisheries Commission (Pérez 2005). However, according to the U.S. Department of Commerce's Bureau of Fisheries (1933), no data on catch, fishers, and gears employed were secured from these surveys. Wilcox's report includes a statement that illustrates the movement of individuals from fishing to wage labor (in Pérez 2005):

> During the past few years a steady demand for labor on shore at increased wages has induced the most enterprising of the fishermen to give more time to shore work at the expense of the fisheries.

Sugarcane production, which was expanding in coastal valleys, was likely drawing individuals from fishing to wage labor. According to Pérez (2005), Wilcox suggested that the higher wages may have contributed to the decrease in the importation of dried and canned fish from approximately 17.87 million pounds in 1899 to about 16.76 million pounds in 1902.

The Foraker Act of 1900 allowed for the free trade of Puerto Rican goods into the U.S. market. However, in response to pressure from the beet lobby, who feared large-scale cane production on the island, Congress included in the act a 500-acre limit on the amount of property that could be owned by a corporation in Puerto Rico; however, there were no penalties for non-compliance, which pleased sugar interests in the U.S. northeast (Ayala and Bernabe 2007: 37).

The first colonial Governor of Puerto Rico was Charles H. Allen. During his governorship, the Hollander Act of 1901 was implemented which charged a 2 percent tax on the value of rural land (Ayala 1999, Ayala and Bernabe 2007). According to Ayala and Bernabe (2007: 37), the tax was to force rural peasants and others, who owned land suitable for sugarcane production, to sell their land or either engage in small-scale production or work as laborers to pay the tax. However, there was a wave of protests, which resulted in the tax being reduced to 1 percent. Nonetheless, Allen later became president of the American Sugar Refining Company (1912-1915). By 1910, sugar exports accounted for 64.3 percent of the total value of the island's exports, which was more than a threefold increase from 1896 (Ayala and Bernabe 2007: 198). Sugar production rose from 81,000 tons in 1900 to 349,000 tons in 1910, a 331 percent increase (Ayala and Bernabe 2007: 38). However, real wages of sugarcane workers remained about the same from 1900 to 1914 (ibid, 39).

Unlike what happened in the sugar sector, American investment in tobacco was mostly in manufacturing, not growing tobacco (Levy 2007).

By World War I, Cuba was providing almost half of the U.S. supply of sugar and Europe was producing 50 percent of the world's sugar supply (Hollander 2008). While the U.S. supply of sugar was primarily from sugarcane, the majority of Europe's production was from beets. However, European beet production dropped dramatically between 1914 and 1919 because of World War I, causing European sugar refineries and other sugar interests to demand sugarcane. With the drop in supply, the price of sugar rose substantially. In 1917, the Jones Act replaced the Foraker Act, kept the 500-acre limit, limited the amount of sugar it could refine, and ordered a study of the holdings that violated the acre limit.

According to Ayala and Bernabe (2007: 37), 477 partnerships or corporations had more than the limit. Although the study was submitted to the Committee on Pacific Islands and Puerto Rico, the committee took no action.

During World War I, the U.S. was cut off from its sources of embroidered clothe. In response, the needlework industry rose and increased rapidly in Puerto Rico. By the early 1930s, the industry employed more than 60,000 mostly female workers, which was a figure surpassed only by the sugar industry during the harvest period (Ayala and Bernabe 2007: 46, 47). These women worked in their homes, small to large shops, and larger establishments. According to a report for the U.S. Department of Labor by Manning (1934), 40,000 families, not individuals, were employed in home needlework in 1933.

By the late 1920s, the Aguirre Sugar Company, Fajardo Sugar Company, South Porto Rico Sugar Company, and United Porto Rico Sugar Company were producing about 60 percent of the island's sugar (Ayala 1999: 108). These four companies were vertically integrated with U.S. sugar refineries (Ayala and Bernabe 2007: 38). It was during the 1920s that the island experienced its greatest amount of sugar production. During that decade the Jones Act's limits on the amount of sugar that could be refined on the island acted as a break on further development of sugarcane fields. Another limitation was the Costigan-Jones Act passed by the U.S. Congress in 1934, which established a quota system for all exports of sugar into the U.S. and thereby restricted sugar exports from Puerto Rico to the mainland (Toro Tulla 2007).

Tobacco expanded as well; however, it was largely a small producer's crop. Tobacco can be cultivated on small parcels of land. Consequently, it does not significantly reduce the amount of farmland available for food crops (Toro Tulla 2007). The average tobacco farm in 1909 had 2.7 acres devoted for tobacco and in 1929 that rose to 3.1 acres (Ayala and Bernabe 2007: 42). Cigar and cigarette production, however, expanded substantially after 1900 with the establishment of large-scale machinery. At the same time, regulations were imposed that penalized traditional cigar makers, who used to work at home (Picó 2006). These laws increased the concentration of tobacco manufacturing in urban factories, many of which were owned by external interests. By 1910, there were more workers in cigar and cigarette production than in the centrales (sugarcane grinding plants) of the sugar industry. The cigar and cigarette factories employed an increasingly larger female labor force. In 1910, 30 percent of the 11,118 workers in the tobacco industry were female, and by 1935, 73 percent of 14,712 workers were female. According to Picó (2006: 245), the despalilladoras who stripped the stems from the leaves were the vanguard of the new female working class. Pounds and value of leaf tobacco and cigars exported increased significantly from 1900 to 1920. Subsequently, pre-manufactured tobacco became increasingly important, rising from 22 percent of the value of all tobacco exports in 1910 to 77 percent by 1930 (Ayala and Bernabe 2007: 45). The value of cigar exports declined, however, after the 1920s, which coincided with a switch in the U.S. and island's market to cigarettes produced with North American tobacco (García Colon 2002). By 1940, tobacco leaf represented all tobacco exports. The quantity and value of leaf tobacco by 1939-40 was approximately 17 million pounds with a value of approximately $6 million (Figure 5.3.17).

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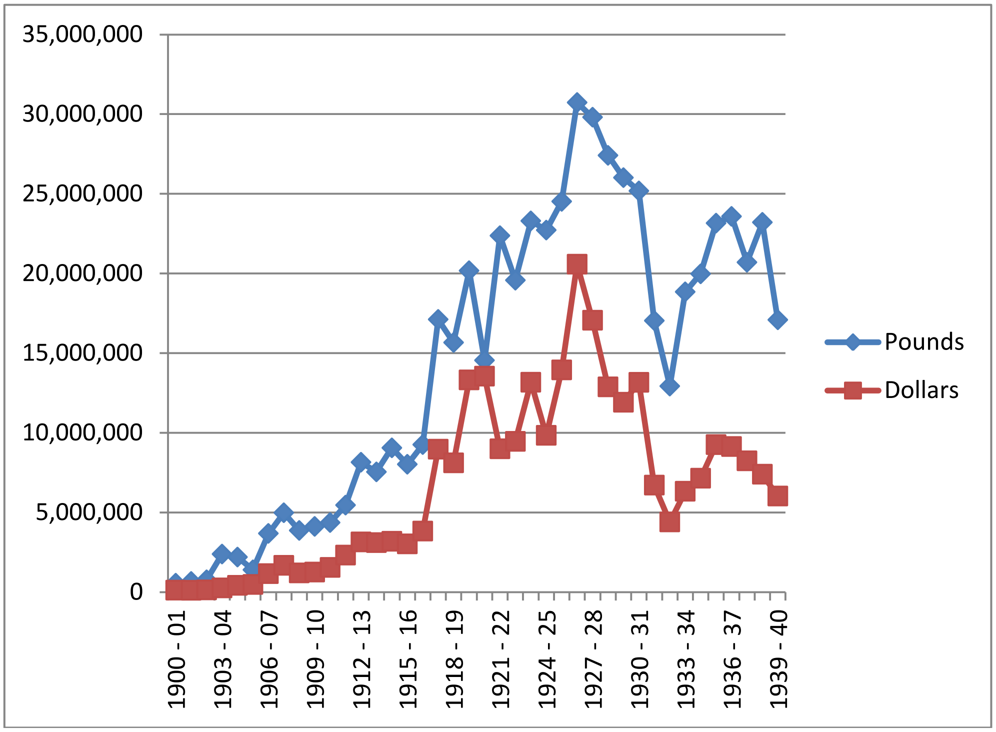

Figure 5.3.17 . Quantity and value of leaf tobacco exports from Puerto Rico to the United States, 1900-1940. Source: Toro Tulla 2007: 54.

Two major hurricanes in 1928 and 1932 contributed to a growing economic crisis by destroying crops, mostly tobacco and coffee, in the eastern central part of the island. The hurricane of 1932 killed 225 people and caused $30 million in damages (García Colón 2002: 47).

It is estimated that the fish catch in Puerto Rico in 1930 was over 3 million pounds with a value of $207,085 (U.S. Dept. of Commerce, Bureau of Fisheries 1933: 429). That same year about 21.5 million pounds of fishery products, mostly dry salt cod, were imported. The annual per capita consumption of fish was about 14 pounds in the "edible portion" as compared to the Virgin Islands' annual per capita fish consumption of 32 pounds (ibid: 111). By comparison, the average per capita consumption of fish and shellfish from 1997 to 1999 was 1.5 pounds and from 2003 to 2005 was 1.8 pounds (live weight).

The Bureau of Fisheries' (U.S. Dept. of Commerce, Bureau of Fisheries 1933: 429) survey conducted from July 15 to November 19, 1931, is "the first statistical and marketing survey made of the fisheries of Puerto Rico." Motivating the call for the survey was a belief that the island's fisheries were inadequate as illustrated by the ratio of pounds landed of fish versus the pounds imported (3 million to 21.5 million) and the following statement (ibid: 110):

> Believing that the fishery resources of Puerto Rico were largely undeveloped and that methods of preserving and marketing fish in the island were inefficient, Gov. Theodore Roosevelt requested the Bureau of Fisheries to make an economic survey of the situation and to suggest procedures leading toward fuller development.

N.D. Jarvis, who conducted the survey, visited 34 fishing localities reported in Puerto Rico and interviewed 80 percent of the fishers who owned boats and gear. The resulting report described the fishing methods and gears used by the fishers, the natural and ecological conditions that limited development of a fishing industry, and ways the fishers marketed their catches (Pérez 2005). Jarvis stated there were three forms to distributing fish after landing: (1) sell the catches to central fish markets in the island's three largest cities (San Juan, Ponce and Mayagüez), (2) peddle the fish on the streets of major coastal towns, and (3) peddle the fish in the countryside (Pérez 2005).

Jarvis also described the methods of handling fish as primitive and unsanitary and the use of ice as almost unknown. Jarvis reported that fish were not gutted or cleaned, and retailers were reluctant to accept dressed fish because of the assumption that gutting was a method to conceal inferiority (Bureau of Fisheries 1933: 111). Much of the fish was stale, and fresh fish was not sold in interior towns and only in small amounts along the coast. It was not surprising that consumption was low because of the fear of food poisoning from eating stale or tainted fish. Also, "considerable amounts of fish" were thrown away because of spoilage, which begged the question, "Why weren't there any fish-reduction plants to take advantage of fish that was otherwise thrown away?" According to the Bureau of Fisheries, there was apparently insufficient catch to operate such a plant profitably.

Jarvis recommended actions be taken to 1) improve the construction of fishing boats and gear, 2) improve fish handling and marketing by using ice to prevent spoilage, 3) improve the display of fish in local markets, 4) create a fish buying and marketing system, and 5) utilize a cash surplus to promote a fish curing industry (Pérez 2005: 82). It was argued that these actions, especially the second and fifth, would reduce Puerto Rico's imports of fish. In response to those recommendations, instruction was given to fishers and others in the proper handling and icing of fresh fish, the preparation of dry-salt fish, the construction of a smokehouse, and the preparation of smoked fish (Bureau of Fisheries 1933: 106).

By 1932, 15 percent of the crops used to produce the U.S. supply of sugar came from Puerto Rico (Ayala and Bernabe 2007: 38). As sugar prices fell substantially during the Depression that started in 1929, so too did Puerto Rico's employment and income, which were so heavily dependent upon sugar exports. With so much land and labor devoted to export, by the early 1930s, 80 percent of the island's food was imported, while per capita income fell about 30 percent from 1930 to 1933 (Ayala and Bernabe 2007). This emphasis on exports contributed to the cost of basic necessities costing 8 to 14 percent more in Puerto Rico than in New York City, while wages in New York City were 4 to 10 times higher (Boris 1996).

The deprivation on the island that resulted from the disastrous reduction in sugarcane exports to the mainland motivated the U.S. government to create the Puerto Rico Emergency Relief Administration (PRERA) in 1933 and the Puerto Rico Reconstruction Agency (PRRA) two years later. Both were extensions of the New Deal from the mainland to alleviate deprivation and poverty.

Largely in response to Jarvis' 1933 report, in 1934 the Puerto Rican government created the Department of Fisheries and Wildlife under the jurisdiction of the Department of Agriculture and Commerce. Pérez (2005) suggests it was the belief that the economic hardships of fishers tended to be much like those of rural coastal agricultural workers that motivated the inclusion of the Department of Fisheries and Wildlife within the Department of Agriculture and Commerce.

By 1935, a third of all cultivated land was devoted to producing sugarcane and another third to coffee and tobacco (Ayala and Bernabe 2007: 35). Only the remaining third was kept for domestic food production. The emphasis on agricultural production resulted in large-scale forest conversion to agriculture. By the late 1940s, forest cover reached a low of 6 percent of the island's area (Helmer 2003).

In 1936, the Puerto Rican Legislature passed Law 83, the Fisheries Law. The purpose of Law 83 was to "'protect and promote the raise of fish stocks, to regulate the fisheries so as to increase their productivity and to develop the resources in the waters surrounding Puerto Rico'" (Pérez 2005: 82).

During the period from 1930 to 1940, the population of the island increased by 21.1 percent, while employment increased by only 1.7 percent (García Colón 2002). By the end of the 1930s, an estimated 60 to 70 percent of the workforce was unemployed.

The economic, social, and political turmoil of the 1930s resulted in the emergence of a new coalition of ruling groups. This coalition led the territorial government to take the first steps to modernize the island. One of the first actions was the Land Law of 1941 and Title V of that law. The intent of the law was to create modern urban communities with the infrastructure and services preferred by factories and suitable for housing of factory workers, while diversifying crop cultivation (García Colón 2002: 9-10). The Water Resources Authority was created in 1941, followed by the Public Transportation Authority, Development Corporation, Development Bank, and Planning Board, which were created the following year. In January 1944, the Puerto Rico Water Resource Authority took over the Puerto Rico Railway Light and Power Company and the Mayagüez Light Power and Ice Company, bringing all electric power utilities in Puerto Rico under its control (Bel 2009).

During World War II (1939-1945), the island experienced many shortages of imported goods caused by the U.S. shifting to war-related production. This illustrated Puerto

Rico's ongoing problem of having a one-sided economy: it could not economically sustain itself.

On May 13, 1941, Puerto Rico Law 157 was established, which provided an annual sum of $25,000 to conduct biological and physical surveys of Puerto Rican marine waters, to patronize fishing cooperatives, and to establish refrigeration facilities (Rodríguez-Pérez 2005, Pérez 2005). That same year the Laboratory for Fisheries Research was created by the Puerto Rican government with assistance from the U.S. Department of Interior. The Lab's first tasks were to increase commercial fish landings, assess the potential for development of an industrial fishing fleet, explore the possibility of "freezing, canning and salting fish in a semi-commercial scale" and initiate research for the improvement of fishing handling and marketing (Pérez 2005: 87).

The Puerto Rico Planning Board was created in 1941, and its role was to guide economic and physical development, establish state-owned industries to demonstrate local production, improve the commonwealth's infrastructure, restructure the University of Puerto Rico, and establish a government structure capable of implementing development plans (Lapp 1995). Both the Planning Board and Development Corporation initiated the implementation of an Import Substitution Industrialization program that established state-owned industries to produce for the local market.

Other public corporations were established: the Aqueduct and Sewer Authority (1945), Communications Authority (1946), and Agricultural Company (1945). One was to provide electricity throughout the island and another to provide drinking water to Puerto Rican homes (Píco 2006: 268). The Metropolitan Bus Authority was also created to provide urban public transportation in the San Juan area. In addition, a Community Education Division was created; health programs were created and extended to rural areas; and other government services were developed for the general population.

Under Law 157 and the Import Substitution Industrialization program, two fishing centers were created, one in Cabo Rojo in 1943 and another in Fajardo in 1944. The purposes of these centers were to purchase and freeze fishers' catches and sell modern commercial fishing gear at affordable prices. On April 26, 1945, the state-owned company, the Puerto Rican Agricultural Company (PRACO), was founded and it operated the two fishing centers. According to Pérez (2005: 88), it was "considered by many government officials to be the precursor of supermarket chains in Puerto Rico." This is illustrated by the fact that in 1946 PRACO sold about $30,000 of fish produced by the two fishing centers and in turn sold 70 percent of it to Plaza PRACO and the remainder to private merchants (Pérez 2005). By the mid 1940s, PRACO had acquired a modern fishing vessel capable of fishing far from Puerto Rican waters and with a capacity for 40 tons of frozen fish. It also owned three other vessels for fishing in Puerto Rican waters.

Many Puerto Ricans were unable to find jobs in the mid 1940s. Consequently, beginning in 1945-46 a large number of Puerto Ricans left for the U.S. in search of jobs and higher wages (Ayala and Bernabe 2007: 179).

In 1947, the Corporación para el Desarrollo de Puerto Rico (Puerto Rico's Development Corporation) was renamed Fomento Económico and placed under the command of University of Chicago economist Harvey Perloff, who was also directing Puerto Rico's Planning Board (Rodríguez-Pérez 2005: 80). Under Perloff's command, the Development Corporation ended its promotion of state ownership and control of capital and began an aggressive campaign to attract foreign investment and control of Puerto Rico's industrialization in 1947 (ibid). This has been called "industrialization by invitation," which involved tax exemptions and subsidies for companies from 10 to 30 years and improved infrastructure (ibid and Colón-Warren & Alegría-Ortega 1998). According to Rodríguez-Pérez (2005: 80), this action made Puerto Rico the first commonwealth or "country in the capitalist periphery to actively adopt 'industrialization by invitation' as its development strategy" and it "became the U.S. 'showcase for development' to the rest of the capitalist periphery."

State-owned enterprises, such as PRACO, were privatized or dismantled within a one-year period to foster development in accord with an Export Promotion Development Model (Rodríguez-Pérez 2005). When PRACO was dismantled in 1947, some of its responsibilities were transferred to the Department of Agriculture and Commerce. The Lab, which had been under PRACO, was closed and its facilities transferred to the University of Puerto Rico's Mayagüez campus.

The Industrial Incentives Act of 1947 exempted qualifying firms from property, excise, and municipal taxes and fees. It also authorized laws that prohibited workers from forming unions in the new manufacturing and government sectors, although as agricultural workers many had been unionized (Rodríguez-Pérez 2005: 84). The number of U.S. firms that took advantage of the subsidies rose from 9 in 1947 to 83 by 1953 (Dietz : 211). With these subsidies and with labor costs that were lower than on the mainland, Puerto Rico became especially attractive to labor-intensive industries such as the textiles and garment industries. However, dismantling of the agricultural sector did not come with guarantees that agricultural workers would find comparable or any jobs in the new manufacturing plants or expanding government sector.

During the 1940s, the primary goals of the fisheries development program were to: 1) procure and distribute materials needed for the construction and replacement of fishing gear and equipment; 2) establish a loan system to enable fishers to purchase boats and fishing gear; 3) construct refrigeration, warehouse and docking facilities in the most important fishing centers of the island; 4) establish modern fish handling, transportation, preservation, and marketing techniques, 5) institute a government fish marketing and distribution system; 6) organize fishers' cooperatives; and 7) educate fishers so as to improve fishing practices and consumers and to increase fish consumption (Pérez 2000).

In the 1940s and 1950s the majority of fishers sold their catches to fish peddlers who walked or rode bicycles or horses in coastal areas but without refrigeration to keep the fish fresh (Pérez 2005: 148). Fishers tended to sell their catches on the beaches where they landed. Only a few middlemen had facilities with refrigeration, but like the peddlers, both middlemen and peddlers bought fish at about 5 or 6 cents per pound and sold it for

15 to 18 cents per pound (ibid). According to Pérez (2005), in some regions, such as Puerto de la Corona and Playa de Guayanilla, the middlemen controlled the means of production by owning fishing vessels and gear and dictated marketing by means of owning cars and trucks that physically distributed the catch during those decades. That control began to erode in the late 1940s, however, as fishers began to acquire their own vessels and gear by using their savings earned from working in both sugar mills and fishing.

Puerto Rico's tourism industry began in 1950 with the construction of the Caribe Hilton. Its success motivated hotel chains to build luxury buildings in El Condado in Santurce and Isla Verde in Carolina (Picó 2006). The number of guests registered in hotels increased substantially from 1950 then peaked in 1980, and with that increase so too was there an increase in employment in the tourism sector (Table 5.3.47).

Table 5.3.47. Number of registered hotel guests, 1950-1984. Source: Picó 2006: 282.

Year	Number of Registered Guests
1950	57,721
1960	207,638
1970	734,981
1975	778,366
1980	817,061
1984	637,944

The Fishermen's Credit Agency was founded in 1958 and placed under the jurisdiction of the Department of Agriculture. Its purpose was to provide loans with the intent of industrializing commercial fishing. In 1959, the Fishermen's Credit Agency, the Economic Development Bank, and the Agricultural Credit Corporation began extending loans to commercial fishers to shift the commercial fleet from open wooden sailboats and open rowboats to boats with an outboard or inboard motor. Territorial-sponsored programs continued to encourage and subsidize the use of small outboard motors in the 1970s (García-Quijano 2009). By 1979, 75 percent of commercial fishing boats had an outboard motor. However, if the primary intent of the loan programs was to industrialize fisheries by eliminating yolas and substituting them with vessels and gears designed for specialized fisheries, they generally failed (Pérez 2005). Puerto Rican fishers' yolas are flexible because they can be used to target multiple species and deploy multiple gears. García-Quijano (2009: 12) found an "emphasis on flexibility and the ability to harvest a variety of species" to be an important theme in interviews with southeastern Puerto Rican fishers.

Heavy industrialization significantly changed Puerto Rico's coastline, especially the construction of petrochemical plants and refineries from the 1950s to the 1970s. These plants required large ships to enter Puerto Rico's bays. In 1958, the Puerto Rico Towing and Boat Service, Inc. started operations and in the early 1960s constructed a small shipyard where the first maritime tugboat to operate in Puerto Rico was built. Tug boats were necessary to guide bigger ships into the bays to service oil refineries and petrochemical plants. In 1959, Union Carbide opened its first plant in the territory to produce ethylene glycol. The emphasis on economic growth through industrialization, especially the construction of petrochemical plants, from the 1950s into the 1970s marked the territory's third economic period. By 1977, there were 51 petrochemical plants on the island, and 27 (53 percent) were operated by CORCO and Union Carbide. By 1978, CORCO was the island's largest employer and it supplied 80 percent of the island's petroleum products. It also was the largest contributor to government revenues among all industrial plants in Puerto Rico.

In 1963 the Program of Minimum Facilities in Fishing Villages was created, which increased fishers' dependence on economic and institutional assistance provided by government agencies (Pérez 2005: 149). Prior to that time, fishers had fished and marketed their catches independently. The construction of fish houses, docks, and lockers for fishers to store gear benefited fishers.

The Agency for Community Action was founded in the early 1970s. One of its primary goals was the creation of a sense of community among the fishers, which it was believed would encourage fishers to experiment with new technologies. The agency gave fishermen's associations that were founded in the early 1970s larger vessels with refrigeration systems, radio and radar, and other technologies. Together, the 1963 program and the Agency for Community Action began to concentrate fishers geographically and politically under a modernist regime of controlling the means of production and levels and distribution of production (Pérez 2005).

In the pursuit of modernizing territorial fishing practices, the Corporation for the Development and Administration of the Lake, River and Marine Resources of Puerto Rico (CODREMAR) with the help of federal and other territorial agencies built landing, storage, marketing, and meeting facilities for commercial fishers all along the coast of Puerto Rico in the early 1980s (Griffith and Valdés Pizzini 2002). The territorial government also gave low interest loans for fishers to purchase and improve fishing equipment and trained them in the use of modern fishing technologies at these sites (Pérez 2005), and CODREMAR established fishers' associations at these official fishing centers.

The fishers' associations linked fishers and fishing communities to government agencies and at the same time, helped bring together a labor force that had traditionally worked independently and separately. These associations were a spatial and political construction that fell under the sphere of the state's modernizing discourse, which promoted centralization, surveillance, and attempts to control fishers' level of production and relations of production (Pérez 2005). At these fishing centers, the government could monitor landings and sales, which were essential to managing Puerto Rico's commercial fisheries. However, fishers were and are not required to be a member of an association. Also, they were and are not required to land their catch at these official landing centers.

CODREMAR was the government organization that monitored fishing activity in Puerto Rico until 1989, and the "official" landing centers were CODREMAR-sanctioned associations. Presently, DNER monitors fishing activities and the official landing centers.

Puerto Rico's economy can be divided into two broad categories; its formal economy and its informal economy. The formal economy is composed of the documented flow of goods and services and employment, and the health of the formal economy is assessed with economic indicators, such as Gross Domestic Product (GDP), Gross National Income (GNI), and the unemployment rate.

Puerto Rico's informal economy (or shadow economy) is composed of those economic activities, both legal and illegal, that are not documented. Schneider (2004) estimates Puerto Rico's shadow economy represented 28.4 percent of its official GDP in 1999/2000, 29.4 percent of GDP in 2001/02, and 30.7 percent in 2002/03.

Per capita food production has declined in Puerto Rico since 1960, while total food production has declined since 1990. The decline in the production of metric tons of cereals has been the most dramatic, falling 84 percent from 1979-81 to 1999-2001 (World Resources Institute 2006). The per capita loss of food production suggests a growing importance of imported food and/or subsistence production.

Over 40 percent of Puerto Rico's domestic income from the mid-1980s to 2006 was derived from manufacturing. Pharmaceuticals accounted for about 40 percent of total value added in manufacturing in 1987 and that share rose to over 70 percent by 2002 (GAO 2006). However, since the 1990s, there has been an increased shift towards a service economy.

Tilapia, shrimp, and other aquaculture products are produced in Puerto Rico. Total sales rose substantially from 1992 to 2002 then declined substantially after peaking in 2002. Tilapia and shrimp sales fell dramatically after 2002. Puerto Rico was the site of an offshore aquaculture operation. Snapperfarm, Inc., which was founded in 1998 and grew cobia, ended operations in 2006.

In 2007, the largest industrial sector by paid employees was retail trade, followed by manufacturing. Of the 13 establishments with paid employees in the forestry, fishing, hunting, and agriculture support sector (Industry Code 11), none of them were in the fishing sector, specifically. The largest industry within the manufacturing sector by number of paid employees and annual payroll for 2007 was chemical manufacturing, and pharmaceutical and medicine manufacturing dominated that subsector (Table 5.3.48).

On December 31, 2005, federal tax incentives for U.S. corporations in Puerto Rico were eliminated with the end of the 10-year phase-out period of Sections 936 and 30A of the U.S. Internal Revenue Code. Under Section 936, U.S. corporations with subsidiaries in Puerto Rico could repatriate profits with no net federal tax liability; however, the Puerto Rican government imposed a maximum 10 percent "tollgate tax" on any repatriated earnings (Dietz 2003). This tax could be reduced significantly by corporations if they deposited their retained earnings within the Puerto Rican banking system for specific periods of time. The belief behind this tax reduction was that it would increase the volume of available loanable funds in Puerto Rico, and the deposits did increase. By 1980, 936 funds represented one-third of all deposits in Puerto Rican commercial banks, and by 1985, over 40 percent. By 2000, the finance, insurance and real estate sector was the largest sector of the economy, accounting for 23.9 percent of GNP.

Table 5.3.48. Puerto Rico business patterns, 2007. Source: U.S. Census Bureau, County Business Patterns.

Industry code	Industry code description	Paid employees	First-quarter payroll ($1000)	Annual payroll ($1000)	Total establish-ments
------	Total	767,247	4,165,403	16,849,370	47,340
11----	Forestry, fishing, hunting, and agriculture support	20 - 99	140	640	13
21----	Mining	1,011	5258	23947	53
22----	Utilities	250 - 499	Withheld*	Withheld*	25
23----	Construction	58,455	234,261	1,000,163	2,911
31----	Manufacturing	109,935	935,836	3,607,428	2,104
42----	Wholesale trade	36,250	292,844	1,188,462	2,330
44----	Retail trade	135,703	493,381	2,074,238	11,196
48----	Transportation & warehousing	16,738	98,909	410,410	1,089
51----	Information	22,459	209,247	819,292	532
52----	Finance & insurance	40,004	400,864	1,491,822	2,159
53----	Real estate & rental & leasing	15,109	74,059	307,023	1,753
54----	Professional, scientific & technical services	31,662	234,683	976,202	4,246
55----	Management of companies & enterprises	5,423	54,905	215,439	99
56----	Admin, support, waste mgt, remediation services	74,893	261,108	1,096,021	1,783
61----	Educational services	34,804	154,910	662,119	768
62----	Health care and social assistance	78,522	361,296	1,537,840	6,993
71----	Arts, entertainment & recreation	4,035	16,316	66,184	445
72----	Accommodation & food services	75,595	229,968	925,693	4,321
81----	Other services (except public administration)	24,590	96,455	397,634	3,631
99----	Unclassified establishments	1,668	5,929	31,139	889

*: Withheld to avoid disclosing data for individual companies.

With the tax repeal, however, went incentives for capital-intensive production of chemicals and pharmaceuticals (Bram *et al*. 2008). U.S. corporations claiming the tax credit have subsequently left the territory.

In August 2009, Puerto Rico Governor Luis Fortuño signed the "Law for the Promotion and Development of Agricultural Biotechnological Businesses in Puerto Rico." The law preempts any local authorities from attempting to regulate agricultural biotechnology. As of that date, there were 11 biotech companies in Puerto Rico. According to Ruíz-Marrero (2004), most genetically engineered corn and soybean seed that is planted in the U.S. comes from Puerto Rico. Puerto Rico offers biotechnology companies benefits such as: no federal income tax; a low corporate income tax rate from 2 to 7 percent, which can be lower than 2 percent in some cases; and, fast-tracking of government and other permits (PRIDCO 2009). As of January 2005, there were 3,483 field tests of genetically modified (GM) crops on the island. Most GM crops are planted in the southern plains between Juana Diaz and Guayama, and they are concentrated in the area between the towns of Santa Isabel and Salinas (Ruíz-Marrero 2009). GM crops are also found in the northern town of Isabela. There is concern that the recent law may encourage biotech companies to use more fertile lands, which could further decrease domestic food production and increase the island's dependence on imported foods.

On September 25, 2009, the Puerto Rican government announced it would be dismissing 16,970 public workers across many agencies and departments to reduce government spending and the public deficit. The more than 16,000 workers adds to the already 7,816 public workers (6,796 temporary workers, 210 "irregular" and 809 "regular" employees) laid off in May (Baltimore Sun, September 25, 2009; CaribbeanBusinesspr.com, September 25, 2009). Most of those laid off in May were temporary clerical workers in the Education, Treasury, and Health Departments (National Conference of State Legislatures: http://www.ncsl.org/?tabid=17244). Up to 30,000 government workers may eventually lose their jobs.

Because of its commonwealth status, once a shipment of a product reaches Puerto Rico, it may not be subjected to further United States Customs Service inspection en route to the U.S. mainland. This fact coupled with its Caribbean location, makes Puerto Rico an excellent gateway for drugs destined for the east coast of the U.S. mainland. According to Taylor (2000), Puerto Rico is the largest staging area in the Caribbean for smuggling Columbian cocaine and heroin into the United States.

Smugglers intentionally travel up the island chains and along the coasts to blend in with other vessel traffic, which minimizes opportunities for detection. Vessels sometimes off-load to Puerto Rican fishing vessels that are positioned from 40 to 150 nautical miles off the coast of Puerto Rico, the Dominican Republic, or in the Leeward Islands. The small, shallow-draft yolas then head back to the east coast of the island where the cocaine is offloaded (Taylor 2000). The yolas can avoid radar detection and venture into shallow coastal waters that large Coast Guard and other law enforcement vessels cannot enter, which is why law enforcement agencies have begun to deploy smaller vessels. See: http://www.uscg.mil/LANTAREA/cgcVenturous/Shoreties04.pdf for a 2009 article on a U.S. Coast Guard cutter deploying a small boat to approach a yola off Puerto Rico that was hauling cocaine from the Dominican Republic. According to Griffith et al. (2007) , in "some rural and isolated communities, the links between fishing, contraband trade, smuggling, and other uses of coastal environments continue to the present, undermining the extent to which fishing has been able to develop as a legitimate (i.e. officially recognized) occupation."

The unemployment rate in August 2009 was 15.8 percent, and it was expected to rise because of continuing layoffs of private and public sector employees by the end of the year, which it did. In January 2010, the unemployment rate was 16.1 percent (http://www.gdb-pur.com/economy/documents/PREI031210.pdf). On August 21, 2009, the Puerto Rico Planning Board announced its preliminary estimate of a decline in the territory's real Gross National Product (GNP) from July 1, 2008, to June 30, 2009, ranging from 4.8 to 5.5 percent. Estimated GDP per capita fell from $18,500 in 2007 to $17,100 in 2009:
(http://www.theodora.com/wfbcurrent/puerto_rico/puerto_rico_economy.html).
The prolonged and deep recession is the territory's worst economic downturn since the Great Depression.

By April 2010, Puerto Rico had spent $2.55 billion of the nearly $6.5 billion it was slated to receive in the American Recovery and Reinvestment Act (ARRA). ARRA infrastructure funding included $180 million to improve public housing projects, $126 million to improve highways and transportation, $91.3 million in drinking water and wastewater projects, $70 million to improve public schools, and $15.5 million in port improvements (Caribbean Business, April 1, 2010).

The Puerto Rico Planning Board projected a 3.6 percent contraction of the island's economy for fiscal year 2010, which ends June 30 (Caribbean Business, April 1, 2010). That follows previous contractions.

5.3.4.2 U.S. Virgin Islands

St. Croix, St. Thomas, St. John, Water Island, and approximately 50 smaller islets and cays were acquired by the U.S. government in 1917 from the Danish government for a price of $25 million ($390 million in 2010 dollars). Motivating the U.S. government's purchase of the islands was its fear that if Germany conquered Denmark during World War I, Germany would attempt to extend its control to Denmark's territories in the Caribbean. Although promised citizenship in 1917, most residents of the USVI did not receive U.S. citizenship until 1927, and it was not until 1932 that citizenship was extended to all U.S. Virgin Islanders.

From 1917 to 1968, the USVI was under direct control of the U.S. Navy (1917 to 1931) and Department of Interior (1931 to 1968), which appointed a governor. In 1969, U.S. Virgin Islanders elected their first governor and in 1972 their first non-voting delegate to the U.S. Congress. The Department of Interior transferred control of Water Island to the USVI government in 1996. In 2005, the USVI government announced plans to further develop Water Island, and to increase the amount of residential housing to deal with chronic shortages on St. Thomas. In 2000, there were 161 residents of Water Island.

The Fishermen's Loan Revolving Fund was created in 1972 with the purpose of providing small, short-term loans to fishers "in order to encourage and promote limited capital commercial fishing operations in the Virgin Islands" (Act No. 3330). Loans could not exceed $1,500 to any individual.

In the 1990s, the U.S. economy grew substantially and had the lowest child poverty rate in 20 years. In the USVI, however, economic conditions for children and families deteriorated during those years (Annie E. Casey Foundation 2002). In 1989, 23.2 percent of all USVI families had incomes below poverty level (29.5 percent in St. Croix, 11.6 percent in St. John, and 17.7 percent in St. Thomas). By 1999, 28.7 percent of all families had incomes below poverty level (34.8 percent in St. Croix, 14.8 percent in St. John, and 23.2 percent in St. Thomas). In 1999, 42.1 percent of families with children in St. Croix had incomes below poverty level, while 18.4 percent of such families in St. John and 23.2 percent of such families in St. Thomas had incomes below poverty level (U.S. Census Bureau 2000). The highest child poverty rates were in the St. Croix towns of Frederiksted (68 percent) and Christiansted (61 percent) and the lowest in West End, St. Thomas (14 percent) (Annie E. Casey Foundation 2002). From 2000 to 2006, 31 percent to 42 percent of children lived in poverty annually and averaged 35 percent (Annie E. Casey Foundation 2002).

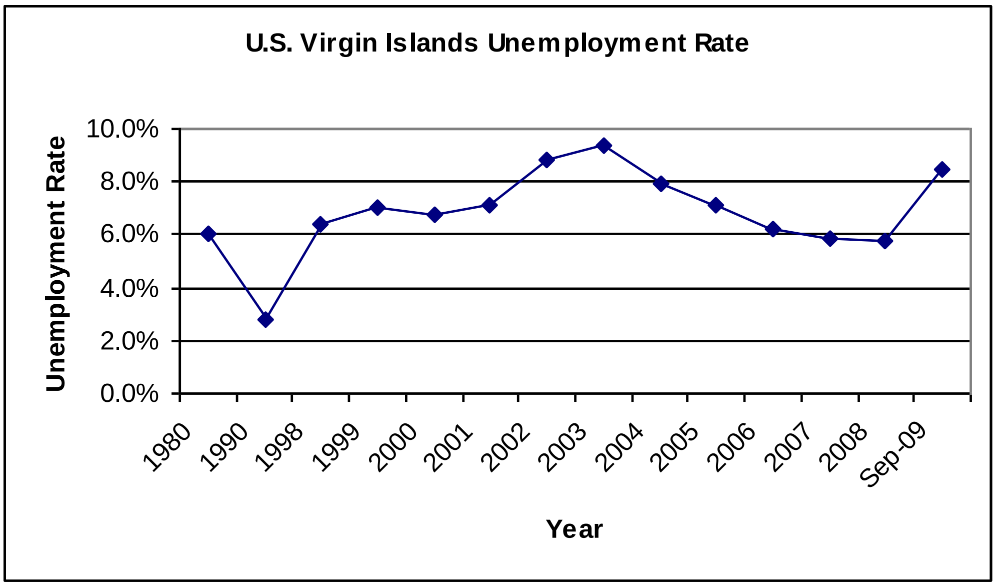

Figure 5.3.18. USVI unemployment rate, 1980-September 2009. Sources: USVI Bureau of Economic Research for 1980 to 2008, USVI Department of Labor for September 2009.

Also like Puerto Rico and the U.S. mainland, the USVI has been experiencing an economic downturn. Unemployment rose from 6.0 percent in September 2008 to 8.5 percent in September 2009 (USVI Department of Labor). Unemployment in St. Croix was 9.9 percent in St. Croix and 7.4 percent in St. Thomas/St. John in September 2009 (Figures 5.3.18 and 5.3.19).

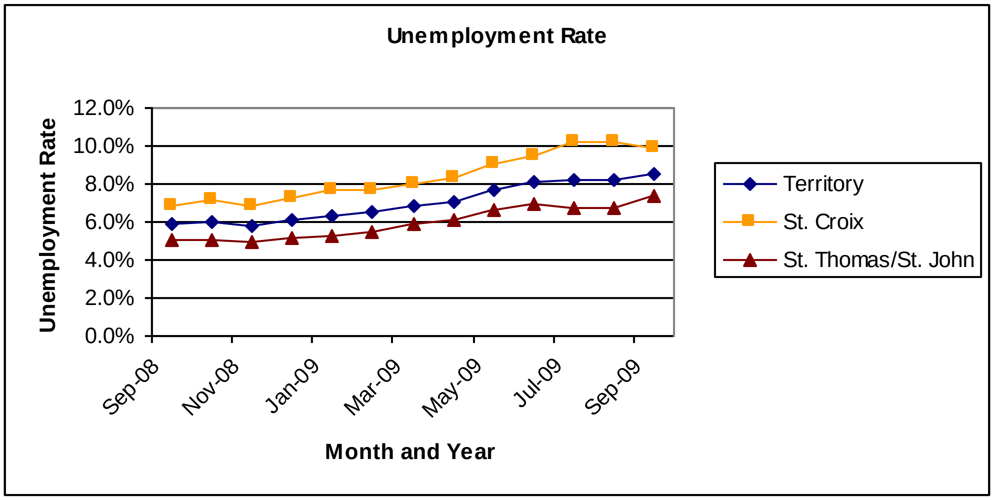

Figure 5.3.19. Unemployment rate, September 2008-September 2009. Source: USVI Department of Labor, Virgin Islands Labor Force Estimates.

Table 5.3.49. USVI supplemental nutrition assistance program participation, fiscal year 2003 to March 2009. Source: USDA, Food and Nutrition Service (www.fns.usda.gov).

Supplemental Nutrition Assistance Program				
FY/Month	**Households (Monthly)**	**Persons (Monthly)**	**Percent Change Households**	**Percent Change Persons**
2003	4,394	12,938		
2004	4,532	13,372	3.1%	3.4%
2005	4,633	13,550	2.2%	1.3%
2006	4,671	13,375	0.8%	-1.3%
2007	4,761	13,281	1.9%	-0.7%
2008	5,036	13,613	5.8%	2.5%
Mar-08	4,957	13,345		
Feb-09	5,864	15,406		
Mar-09	6,184	16,103	24.8%	20.7%

The number of persons and households participating in the Supplemental Nutrition Assistance Program (formerly, the Food Stamp Program) has increased significantly in the past year in comparison with previous fiscal years. Household participation increased by 24.8 percent and participation by persons by 20.7 percent from March 2008 to March 2009 (Table 5.3.49). Such an increase suggests there could be a significant increase in the number of persons and households engaged in subsistence fishing within the same time period.

More workers in the USVI were employed in the arts, entertainment, recreation, accommodation, and food services sector in 2000 than any other sector (Table 5.3.50). This is consistent with the territory's tourism economy. Tourism is the primary economic activity, accounting for 80 percent of GDP and employment. The islands normally host two million visitors a year. Tourism is the primary economic activity, accounting for 80 percent of GDP and employment. In St. Croix, more workers are employed in the educational, health, and social services than any other sector (Table 5.3.50).

Table 5.3.50. USVI selected economic characteristics, 2000. Source: U.S. Census Bureau 2000.

	USVI	St. Croix	St. John	St. Thomas
POPULATION & LABOR FORCE				
Population	108,612	53,234	4,197	51,181
Civilian Labor Force (CLF)	50,933	22,483	2,530	25,920
CLF - Employed	46,565	19,924	2,459	24,181
CLF - Unemployed	4,368	2,559	71	1,739
Percent of unemployed persons	8.6	11.3	2.8	6.7
INDUSTRY OF EMPLOYED PERSONS (16 years and over)				
Agriculture, forestry, fishing and mining	324	177	14	133
Construction	4,900	2,537	318	2,045
Manufacturing	2,754	2,184	52	518
Wholesale trade	912	366	10	536
Retail trade	6,476	2,301	251	3,924
Transportation and warehousing & utilities	3,321	1,088	195	2,038
Information	931	355	25	551
Finance, insurance, real estate, rental & leasing	2,330	976	169	1,185
Professional, scientific, management, etc.	3,058	1,279	181	1,598
Educational, health, and social services	6,742	3,375	207	3,160
Arts, entertainment, recreation, accommodation & food services	7,351	2,262	760	4,329
Other services (except public services)	2,535	1,032	147	1,356
Public administration	4,931	1,992	131	2,808
OTHER SOCIOECONOMIC CHARACTERISTICS				
Mean travel time to work (minutes)	20.3	18.6	16.1	22.1
Persons who work in area of residence	45,456	18,983	2,249	22,654
Per capita Income (dollars)	13,139	11,868	18,012	14,061
Median Household Income (dollars)	24,704	21,401	32,482	26,893
Individuals below poverty level	34,931	20,371	775	13,785
Percent of Individuals below poverty level	32.5	38.7	18.5	27.2

The USVI is a popular tourist and excursionist destination and visitors come to the territory by air and water to significantly increase the number of persons on the islands.

From 2000 to 2007, an average of 2,503.7 thousand persons visited the territory annually, and there was an annual average of 22.6 visitors for each USVI resident during that time period (Table 5.3.51).

Table 5.3.51. Annual visitors to USVI, 1980, 1990, 1997-2007. Source: USVI Bureau of Economic Research.

Year	Visitor Arrivals (in thousands)			Resident Popn.	Visitors/ Res. Popn.
	Total Visitors	Tourists	Excursionists		
1980	1,217.4	380.0	837.4	96,569	12.6
1990	1,811.5	462.5	1,349.0	101,809	17.8
1997	2,128.0	392.9	1,735.1	106,525	20.0
1998	2,138.9	422.3	1,716.6	107,216	19.9
1999	1,964.3	483.8	1,480.5	107,912	18.2
2000	2,395.8	545.9	1,849.9	108,612	22.1
2001	2,497.4	527.2	1,970.2	109,403	22.8
2002	2,336.6	520.2	1,816.4	110,026	21.2
2003	2,392.6	537.9	1,854.4	110,740	21.6
2004	2,619.7	543.6	2,076.1	111,459	23.5
2005	2,601.9	582.1	2,019.8	111,470	23.3
2006	2,574.3	570.0	2,004.3	112,139	23.0
2007	2,611.3	510.5	2,100.8	112,812	23.1
Avg. 2000-07	2,503.7	542.2	1,961.5	110,833	22.6

More visitors go to St. Thomas/St. John than St. Croix, and most visitors arrive by cruise ship. The number of cruise ships has declined since 1990, but not consistently (Table 5.3.52). In 2008, 756 cruise ships arrived in the USVI and during the first 5 months of 2009, 370 ships arrived as opposed to 426 ships that arrived in 2008 during the same 5 months.

The manufacturing sector consists of petroleum refining, textiles, electronics, pharmaceuticals, and watch assembly. The agricultural sector is small, with most food being imported. International business and financial services are a small but growing component of the economy. One of the world's largest petroleum refineries, HOVENSA, is on St. Croix.

Most individuals work on their island of residence, and all have average commutes of less than 25 minutes (Table 5.3.50).

Table 5.3.52. USVI cruise ship arrivals, 1980-2007.

Year	St. Croix Visitor Arrivals (in 1,000s)			St. Thomas/St. John Visitor Arrivals (in 1,000s)		
	Air Visitors (tourists & excursionists)	Cruise Passengers	Actual Number Cruise Ships	Air Visitors (tourists & excursionists)	Cruise Passengers	Actual Number Cruise Ships
1980	133.2	56.4	62	392.7	635.1	821
1990	181.4	13.1	14	510.5	1,117.2	1,140
1997	140.8	178.0	107	368.0	1,560.2	941
1998	135.2	154.3	96	388.2	1,547.1	902
1999	132.4	164.6	89	428.2	1,363.3	776
2000	147.0	232.4	139	480.8	1,719.8	949
2001	136.4	237.4	138	469.6	1,790.5	909
2002	126.8	120.5	71	471.2	1,671.3	812
2003	114.9	23.0	25	505.9	1,751.9	878
2004	130.8	25.0	11	524.2	1,960.9	922
2005	144.5	54.5	48	544.8	1,910.2	814
2006	135.3	35.2	25	535.5	1,901.3	776
2007	132.1	7.1	6	561.3	1,917.4	750

The annual per capita consumption of fish and shellfish for human food is higher in the USVI than in Puerto Rico. During the three-year period from 2003 to 2005, it averaged 29.6 pounds (Figure 5.3.20).

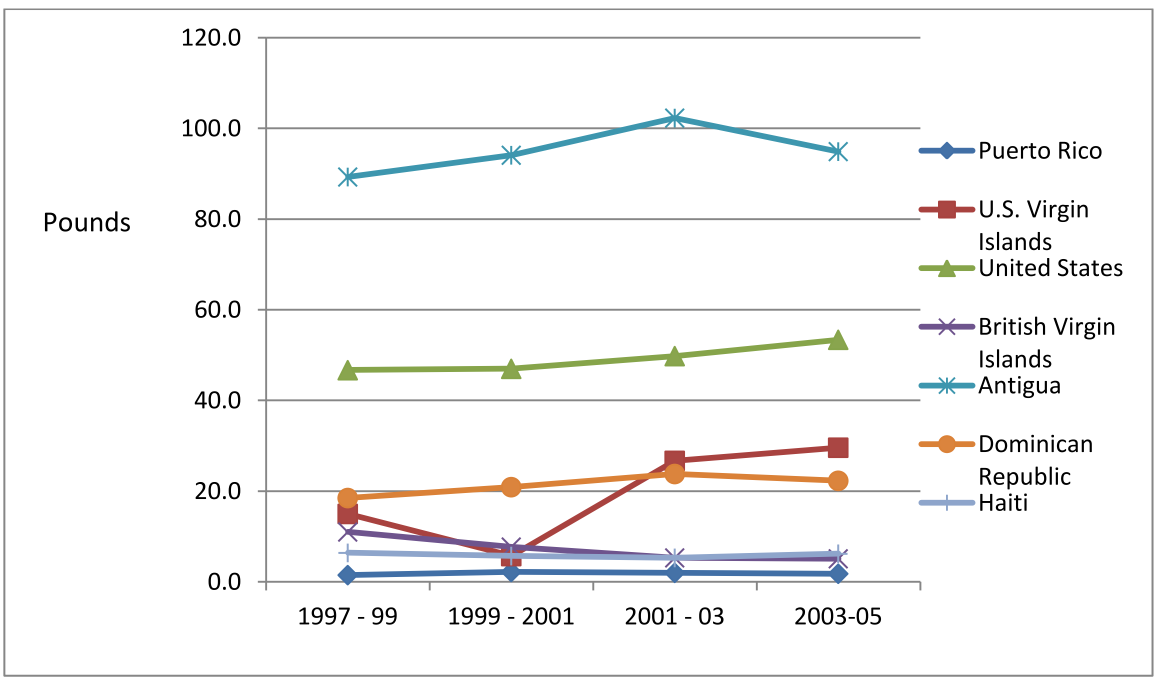

Figure 5.3.20. Average annual per capita consumption of fish and shellfish for human food for four 3-year periods (pounds of estimated live weight equivalent).

5.3.5 Demographics

5.3.5.1 Puerto Rico

The population of Puerto Rico in 2000 was about 3.8 million persons, and as of July 2009, it is estimated to be 3.97 million (CIA-The World Fact Book 2009). In 2000, approximately 24 percent of the population was 14 years and younger, 65 percent from 15 to 64 years of age, and about 11 percent were 65 years and older. The median age was 32 years. Approximately 52 percent of the population is female.

A large majority of Puerto Rico's population identify themselves as white (about 81 percent). Approximately 8 percent are black or African American and less than half a percent are American Indian and Alaska Native. Similarly, less than quarter of a percent are Asian. A dominant majority (almost 99 percent) of the population is Hispanic or Latino (of any race), and 95 percent self-identify as Puerto Rican.

Puerto Rico has one of the highest population densities in the world. As of 2008, there were 1,151 persons per square miles (44 per square kilometer), up from 1,109 persons/ mi^2 in 2000. In 2000, it ranked third in the U.S. behind the District of Columbia (9,378 persons/mi^2) and New Jersey (1,138 persons/mi^2). According to www.siteatlas.com, Puerto Rico ranks 27th in the world in population density: (http://www.sitesatlas.com/Thematic-Maps/Population). According to the CIA-The World Factbook (2009), 98 percent of the population lives in urban areas, and the urbanization rate is 0.8 percent.

High poverty rates have been persistent in Puerto Rico. In 2007, 45.5 percent of the territory's population for whom poverty status could be determined lived in families with income below the poverty level (U.S. Census Bureau, Puerto Rico Community Survey). To place that in comparison to the 50 States, Mississippi's 20.6 percent poverty rate was the highest among the States, followed by Louisiana (18.6 percent), New Mexico (18.1 percent), Arkansas (17.9 percent), and Kentucky (17.3 percent). The top five states with the lowest poverty rates were New Hampshire (7.1 percent), Connecticut (7.9 percent), Hawaii (8.0 percent), Maryland (8.3 percent), and New Jersey (8.6 percent). The territory's high poverty rate in 2007 is not unusual. Its poverty rate was 45.3 percent for 2006-08, 44.9 percent in 2005, 48.2 percent in 2000, percent in 1990, 57 percent in 1980 and 63 percent in 1970.

During the three-year period from 2006-08, an estimated 56.1 percent of children under 18 years of age lived below the poverty level (U.S. Census Bureau, Puerto Rico Community Survey). Also, an estimated 262,175 (21.6 percent) of the 1,213,446 persons that comprised the employed civilian labor force 16 years and older lived below poverty level. During the same time period, 66.2 percent of the unemployed civilian labor force 16 years and over lived below poverty level.

It is well known that most Puerto Ricans move between Puerto Rico and the United States in significant numbers (Aranda 2007, Rodríguez 1989). In 2007, there were 4,120,205

Puerto Ricans living in the United States, while Puerto Rico's population for that year was 3,942,375 (U.S. Census Bureau, American and Puerto Rico Community Surveys).

According to the CIA-The World Factbook (2009), approximately 94 percent of the population 15 years of age or older is literate. An increasing percent of Puerto Rico's 25 years and older population has some college or a college degree.

5.3.5.2 Puerto Rico municipalities

This section divides the territory by coastline and lists the municipalities that have significant landings in one or more of the species or units that are the focus of this amendment. These municipalities are described in Griffith et al. 2007.

5.3.5.2.1 West coast

The west coast accounts for the majority of annual silk and blackfin snapper (SU1) and misty grouper (GU4) commercial landings. During the three-year period from 2004 to 2006, 70 to 75 percent of annual silk snapper landings (in pounds) and 47 to 69 percent of annual blackfin snapper landings were on the west coast. During the same period, 80 to 91.7 percent of annual misty grouper commercial landings (in pounds) occurred on the west coast (Matos-Caraballo 2007). These landings are consistent with the fact that four silk snapper and two blackfin snapper spawning aggregation sites are found on the southwest coast.

On the west coast of Puerto Rico are the coastal municipalities of Cabo Rojo, Mayagüez, Añasco, Rincón, Aguada, and Aguadilla. Silk snapper represents the top species landed in three of these 6 municipalities and the second most landed species in another (Table 5.3.53). In Rincón, queen snapper (SU2) is the most landed species, and it represents 28.6 percent of the municipality's annual landings from 1999 to 2003.

Table 5.3.53. West coast municipalities where snapper, grouper, parrotfish and/or queen conch were the top three species or species groups by pounds, 1999-2003. Source: Griffith et al. 2007. Species in bold/italics are addressed in this amendment.

Municipality	1st Species	2nd Species	3rd Species
Cabo Rojo	Lobster 17.8%	Boxfishes 9.8%	***Lane Snapper 6.7%***
Mayagüez	***Yellowtail Snapper 12.6%***	***Lane Snapper 11.1%***	King Mackerel 7.5%
Añasco	***Silk Snapper 14.1%***	***Lane Snapper 9.6%***	Lobster 6.0%
Rincón	***Queen Snapper 28.6%***	***Silk Snapper 25.1%***	Dolphin 5.1%
Aguada	***Silk Snapper 13.0%***	Skipjack Tuna 8.5%	King Mackerel 7.6%
Aguadilla	***Silk Snapper 12.9%***	Skipjack Tuna 10.0%	King Mackerel 9.9%

The west coast tends to dominate landings of misty and yellowfin grouper, which are part of GU4. Seven yellowfin grouper spawning aggregation sites are along the west coast.

The majority of Puerto Rico's commercial landings of conch are on the west coast where the wide insular shelf provides extensive conch habitat. West coast landings represented an average of 53 percent of annual landings of conch from 1997 to 1999 and about 67 percent from 2004 to 2006, for example. Rivera's survey of commercial fishers found 73 of the territory's 209 conch fishers were from Cabo Rojo (64 fishers), Mayagüez (8) and Añasco (1) (Rivera 1999).

The west coast ranks second among the four coasts in parrotfish landings, with an average of 33.6 percent of annual parrotfish landings from 1997 to 1999 and 29.3 percent from 2004 to 2006.

The west coast has substantially more queen snapper landings than the other coasts combined. West coast landings of queen snapper represented an average of 94 percent of Puerto Rico's annual landings of the species. The west coast also accounts for the largest share of cardinal snapper landings. From 2004 to 2006, from 71 to 83 percent of Puerto Rico's annual cardinal snapper landings were on the west coast.

More detailed socioeconomic information for each municipality can be found in Griffith et al. (2007).

5.3.5.2.2 East coast

The east coast takes a large share of the annual vermilion snapper (SU1) landings, ranking from second to first by coast (Table 5.3.54). From 2004 to 2006, from 27.6 to 50.3 percent of the vermilion snapper landed were on the east coast.

Table 5.3.54. East coast municipalities where snapper, grouper, parrotfish, and/or queen conch were the top three species or species groups by pounds, 1999-2003. Source: Griffith et al. 2007. Species in bold/italics are addressed in this amendment.

Municipality	1st Species	2nd Species	3rd Species
Fajardo	***Yellowtail Snapper 17.9%***	Lobster 7.7%	King Mackerel 5.4%
Vieques	Lobster 15.4%	***Yellowtail Snapper 8.7%***	Triggerfish 6.5%
Culebra	***Nassau Grouper 17.2%***	Lobster 15.4%	Triggerfish 15.1%
Humacao	Lobster 13.7%	***Yellowtail Snapper 9.3%***	White Grunt 7.8%
Yabucoa	***Yellowtail Snapper 12.7%***	***Lane Snapper 10.8%***	White Grunt 10.8%
Maunabo*	***Lane Snapper 12.3%***	White Grunt 11.9%	Lobster 9.3%
Naguabo	Lobster 18.7%	1st class fish 16.1%	3rd class fish 13.7%
Ceiba	***White Grunt 12.5%***	Lobster 7.7%	Boxfishes 5.4%

*Actually on the southeast coast. For purposes here, it is included in the municipalities on the east coast.

In 2005 and 2006, approximately 68 and 62 percent of the territory's landings of yellowfin grouper were on the east coast. Ten yellowfin grouper spawning aggregation sites are along the east coast.

Yellowtail snapper (SU4) is the top species landed in Fajardo and Yabucoa and second most landed species in Vieques and Humacao.

Nassau grouper was the top species landed in Culebra from 1999 to 2003, before the closing of that fishery in 2004. Approximately 26 percent of Puerto Rico's 209 commercial conch fishers in 1999 were from the east coast (Rivera 1999), and 20 were from Naguabo, 13 from Vieques, ten from Fajardo, nine from Ceiba and three from Humacao.

The eight east coast municipalities are: Fajardo, Vieques, Culebra, Humacao, Yabucoa, Maunabo, Naguabo, and Ceiba,

For more detailed information about each of these east coast municipalities, see Griffith et al. (2007).

5.3.5.2.3 South coast

The south coast tends to have the largest parrotfish landings. From 1997 to 1999 and 2004 to 2006, the south coast's average annual share of the territory's commercial parrotfish landings ranged from 48.1 percent (1997 to 1999) to 57.5 percent (2004 to 2006). Parrotfish was the top species landed in Arroyo and third highest species landed in Patillas from 1999 to 2003 (Table 5.3.55). Thirty-two potential spawning aggregation sites are along the southwest coast.

Table 5.3.55. South coast municipalities where snapper, grouper, parrotfish, and/or queen conch were the top three species or species groups by pounds, 1999-2003. Source: Griffith et al. 2007. Species in bold/italics are addressed in this amendment.

Municipality	**1st Species**	**2nd Species**	**3rd Species**
Ponce	***Yellowtail Snapper 18.1%***	***Lane Snapper 13.5%***	***Snapper (generic) 9.1%***
Guayanilla	White Grunt 12.1%	***Mutton Snapper 8.6%***	***Lane Snapper 8.4%***
Guánica	Lobster 14.0%	***Yellowtail Snapper 12.0%***	Hogfish 9.0%
Juana Díaz	Lobster 32.2%	***Lane Snapper 17.5%***	Other fishes 7.5%
Santa Isabel	***Lane Snapper 22.2%***	Lobster 9.3%	***Yellowtail & Mutton Snapper 8.7%***
Salinas	***Lane Snapper 15.7%***	***Yellowtail & Mutton Snapper 9.5%***	White Grunt/Lobster 9.0%
Guayama	Lobster 9.0%	White Grunt 8.4%	***Lane Snapper 8.3%***
Patillas	Lobster 11.8%	***Lane Snapper 6.8%***	***Parrotfish 6.0%***
Arroyo	***Parrotfish 15.1%***	Lobster 10.4%	Ballyhoo 7.0%
Peñuelas	Lobster 26.0%	Hogfish 16.3%	Octopus 11.8%
Lajas	Lobster 8.2%	White Grunt 7.8%	***Lane Snapper 6.5%***

Lane snapper was the top species landed in Santa Isabel and Salinas, the second most frequently landed species in Ponce, Juana Díaz and Patillas, and third most commonly landed species in Guayanilla, Guayama and Lajas. Lane snapper is not one of the species in the fisheries experiencing overfishing; however, if an ACL were established for all snapper, lane snapper fishers could be affected.

Approximately 24 percent (50 fishers) of Puerto Rico's commercial conch fishers in 1999 were from the south coast (Rivera 1999). Sixteen were from Guánica, 15 were from Peñuelas, 12 from Guayanilla, 6 from Lajas, and one from Juana Díaz.

The 11 south coast municipalities are Lajas, Guánica, Juana Díaz, Ponce, Guayama, Salinas, Guayanilla, Peñuelas, Santa Isabel, Arroyo, and Patillas. For more detailed information about each of these south coast municipalities, see Griffith et al. (2007).

Table 5.3.56. North coast municipalities where snapper, grouper, parrotfish, and/or queen conch were the top three species or species groups by pounds, 1999-2003. Source: Griffith et al. 2007. Species in bold/italics are addressed in this amendment.

Municipality	**1st Species**	**2nd Species**	**3rd Species**
San Juan	***Yellowtail Snapper 15.0%***	Jacks 8.0%	***Lane Snapper 6.4%***
Isabela	Lobster 20.7%	***Nassau Grouper 14.1%***	***Silk Snapper 12.1%***
Camuy	***Yellowtail Snapper 18.1%***	***Mutton Snapper 10.5%***	King Mackerel 9.2%
Arecibo	***Silk Snapper 32.9%***	King Mackerel 8.7%	Lobster 8.0%
Barceloneta	***Silk Snapper 14.3%***	Triggerfish 8.8%	***Lane Snapper 7.1%***
Vega Baja	***Silk Snapper 10.2%***	***Red Hind 7.4%***	Bar Jack 5.7%
Vega Alta	***Silk Snapper 10.3%***	Bar Jack 6.4%	***Red Hind 6.2%***
Dorado	***Silk Snapper 10.0%***	Triggerfish 6.8%	***Schoolmaster 6.4%***
Carolina	Jacks 8.0%	White Mullet 7.6%	***Yellowtail Snapper 7.6%***
Loíza	***Silk Snapper 10.5%***	***Vermilion Snapper 8.5%***	***Yellowtail Snapper 6.6%***
Río Grande	***Yellowtail Snapper 11.1%***	***Vermilion Snapper 9.9%***	White Grunt 9.3%
Luquillo	White Grunt 10.3%	***Lane Snapper 7.2%***	King Mackerel 6.2%
Cataño	Jacks 7.9%	Mojarras 6.9%	White Grunt 5.5%
Toa Baja	Jacks 7.9%	Mojarras 6.9%	White Grunt 5.5%
Manatí	Herrings 5.7%	White Mullet 5.6%	Jacks 4.9%
Hatillo*****			

*****: Griffith et al. (2007) suggest there were little to no commercial landings in Hatillo during this period.

5.3.5.2.4 North coast municipalities

From 2004 to 2006, the north coast landed, on average, 42 percent of all vermilion snapper commercially landed annually. Silk snapper was the top most landed species in six north coast municipalities and the third most landed species in another from 1999 to 2003 (Table 5.3.56). Vermilion snapper, which is also part of SU1, was the second most landed species in Loíza and Río Grande. Nassau grouper (GU1) was the second most landed species in Isabela from 1999 to 2003, which was before the fishery closed in 2004. Approximately 15 percent (31 individuals) of Puerto Rico's commercial conch fishers in 1999 were from the north coast (Rivera 1999). Seven of these north coast fishers were from Loíza, seven were from San Juan, six were from Isabela, four were from Manatí, and the others were from Dorado (3), Arecibo (2), Carolina (1), and Río Grande (1).

There are 15 municipalities on the north coast. They are Arecibo, Loíza, Vega Baja, Cataño, Río Grande, Carolina, Barceloneta, Vega Alta, Dorado, Manatí, Isabela, Luquillo, Camuy, Hatillo, and Toa Baja. More detailed descriptions of north coast municipalities can be found in Griffith et al. (2007).

5.3.5.3 U.S. Virgin Islands

The resident population of the USVI has grown from 96,569 in 1980 to an estimated 112,812 persons in 2007. The population of St. Thomas/St. John tends to be slightly larger than that of St. Croix. With a total land area of 82.88 square miles, the population density of the USVI in 2007 was 843.6 persons per square mile (667.1 persons per square mile in St. Croix, 222.3 persons per square mile in St. John and 1,701.7 persons per square mile in St. Thomas). When compared to the population density of states/territories of the mainland U.S., the USVI ranks behind the District of Columbia (9.581.3 persons per square mile), New Jersey (1,171 persons per square mile), and Rhode Island (1,012.3 persons per square mile).

In 2000, the total number of households in the USVI was 40,648. Sixty-six percent of these were family households, and of these, 36 percent were two-person and 25 percent were three-person households. These percentages were generally the same across all counties. About 88 percent of non-family households contained only one person.

There were a total of 50,202 housing units in the territory in 2000. Of the total housing units, 37 percent were owner occupied, 44 percent were renter occupied, and 18 percent were reported as vacant. St. John County contained the fewest units (5 percent of the total), while St. Croix and St. Thomas each accounted for about half of the remaining 95 percent.

Also in 2000, in 68 percent of the households the primary language spoken in the home was English, followed by Spanish or Spanish Creole spoken in 20 percent, French or French Creole spoken in 10 percent, and other languages spoken in two percent of the homes.

Of the total population, 48 percent were born in the USVI, 34 percent were born in a foreign country, 14 percent were born in the United States, and 4 percent were born in Puerto Rico or another U.S. island area. Of the three counties (St. John, St. Thomas, and St. Croix) the county with the highest number of individuals born in the USVI was St. Croix with 23 percent.

In 2000, 26 percent of the adult population (25 years of age and over) had a high school diploma. Approximately 18 percent had some college or an associate's degree and 17 percent held a bachelor's degree or higher. In all education attainment categories, females outnumbered males excluding those that have not received a high school diploma.

The median household income in the territory was approximately $26,925 in 2000 ($21,401 in St. Croix, $32,482 in St. John, and $26,893 in St. Thomas). Like Puerto Rico, the USVI has a significantly higher poverty rate than any of the 50 States. In 1999, 32.5 percent of the territory's population was living below the poverty level (38.7 percent in St. Croix, 18.5 percent in St. John, and 27.2 percent in St. Thomas). Ten years earlier, 27.1 percent of the territory's population had incomes below poverty level.

In the 1990s, the U.S. economy grew substantially and had the lowest child poverty rate in 20 years. In the USVI, however, economic conditions for children and families deteriorated during those years (Annie E. Casey Foundation 2002). In 1989, 23.2 percent of all USVI families had incomes below poverty level (29.5 percent in St. Croix, 11.6 percent in St. John, and 17.7 percent in St. Thomas). By 1999, 28.7 percent of all families had incomes below poverty level (34.8 percent in St. Croix, 14.8 percent in St. John, and 23.2 percent in St. Thomas). In 1999, 42.1 percent of families with children in St. Croix had incomes below poverty level, while 18.4 percent of such families in St. John and 23.2 percent of such families in St. Thomas had incomes below poverty level (U.S. Census Bureau 2000). The highest child poverty rates were in the St. Croix towns of Frederiksted (68 percent) and Christiansted (61 percent) and the lowest in West End, St. Thomas (14 percent) (Annie E. Casey Foundation 2002). From 2000 to 2006, 31 percent to 42 percent of children lived in poverty annually, averaging 35 percent (Annie E. Casey Foundation and the Population Reference Bureau 2002).

The number of persons and households participating in the Supplemental Nutrition Assistance Program (formerly, the Food Stamp Program) has increased significantly in recent years in comparison with previous fiscal years. Household participation increased by 24.8 percent and participation by persons by 20.7 percent from March 2008 to March 2009. Such an increase suggests there could be a significant increase in the number of persons and households engaged in subsistence fishing within the same time period.

Tourism is the primary economic activity, accounting for 80 percent of GDP and employment. The islands normally host 2 million visitors a year. The manufacturing sector consists of petroleum refining, textiles, electronics, pharmaceuticals, and watch assembly. The agricultural sector is small, with most food being imported. International business and financial services are a small but growing component of the economy. One of the world's largest petroleum refineries is at St. Croix. Most workers are employed in the arts, entertainment, recreation, accommodation, and food services sector, which is consistent with the territory's tourism economy.

5.3.5.4 Islands of USVI

5.3.5.4.1 St. Croix

The top ranked species group targeted by St. Croix fishers is reef fish (84.7 percent) followed by deepwater snapper (42.3 percent) and conch (39.1 percent). St. Croix commercial fishers land their catch at 18 different sites on the island. The most popular landing sites in St. Croix are Altona Lagoon (aka Augusta Landing Site), Molasses Dock (aka Krauss Lagoon), and Frederiksted Fishers' Pier. Many St. Croix commercial fishers use multiple landing sites. Approximately 35 percent reported that they use 2 or more sites to land their catch.

Stoffle et al. (2009) argue that the island of St. Croix may be a fishing community because of its dependency on marine resources and the long cultural connection the people and the island of St. Croix have with fishing. However, Valdés-Pizzini et al. (2010) agree with Stoffle et al. only if the definition of a fishing community includes network-based communities. Current federal definitions do not include network-based communities. The MSA specifically limits fishing communities to place-based communities.

According to Valdés-Pizzini et al. (2010: viii), "In St. Croix placed-based fishing communities do not exist. The whole island may be classified as a fishing community based on network relations among fishers. The historical pattern of population dispersal scattered fishers and their families throughout the island. Gallows Bay is in appearance a [place-based] fishing community, but the data state otherwise."

More detailed socioeconomic descriptions of St. Croix and fishing there can be found in Stoffle et al. (2009) and Valdeés-Pizzini et al. (2010) and are incorporated by reference.

5.3.4.2.2 St. John

About 82 percent of St. John commercial fishers land their catches at either Cruz Bay or Coral Bay. No commercial fishers from St. John reported landing their catch outside the island. More St. Thomas/St. John fishers target reef fish (77.7 percent) than any other species group. The fewest target deepwater snapper (4.5 percent).

Impact Assessment Inc. (2007) identified two areas of St. John that may qualify as fishing communities under federal definitions and guidelines. These are the East End and West End districts where Coral Bay and Cruz Bay are located.

More detailed socioeconomic descriptions of St. John and fishing there can be found in Impact Assessment, Inc. (2007).

5.3.4.2.3 St. Thomas

Impact Assessment, Inc. (2007) identified three areas of St. Thomas that may qualify for fishing community status under federal definitions and guidelines. These are the Northside, East End, and Southside districts. Forty-one fishers were located in estates on the East End, 51 were located in estates on the Northside, and 53 were located throughout Southside district.

More detailed socioeconomic descriptions of St. Thomas and fishing there can be found in Impact Assessment, Inc. (2007).

5.4 Administrative Environment

5.4.1 Federal Fishery Management

Federal fishery management is conducted under the authority of the Magnuson-Stevens Act (16 U.S.C. 1801 et seq.), originally enacted in 1976 as the Fishery Conservation and Management Act. The Magnuson-Stevens Act claims sovereign rights and exclusive fishery management authority over most fishery resources within the U.S. EEZ, an area extending from the seaward boundary of each coastal state to 200 nautical miles from shore, and authority over U.S. anadromous species and continental shelf resources that occur beyond the U.S. EEZ.

Responsibility for federal fishery management decision-making is divided between the Secretary of Commerce (Secretary) and eight regional fishery management councils that represent the expertise and interests of constituent states/territories. Regional councils are responsible for preparing, monitoring, and revising management plans for fisheries needing management within their jurisdiction. The Secretary is responsible for promulgating regulations to implement proposed plans and amendments after ensuring management measures are consistent with the Magnuson-Stevens Act and with other applicable laws summarized in Appendix 6. In most cases, the Secretary has delegated this authority to NMFS.

The Caribbean Fishery Management Council is responsible for fishery resources in federal waters of the U.S. Caribbean. These waters extend to 200 nautical miles offshore from the nine-mile seaward boundary of the Commonwealth of Puerto Rico and the three-mile seaward boundary of the territory of the USVI.

The Council consists of seven voting members: four public members appointed by the Secretary, one each from the fishery agencies of Puerto Rico and the USVI, and one from NMFS. Public interests are also involved in the fishery management process through participation on advisory panels and through Council meetings which, with few exceptions for discussing personnel matters, are open to the public. In addition, the regulatory process is in accordance with the Administrative Procedures Act, in the form of “notice and comment” rulemaking, which provides extensive opportunity for public scrutiny and comment, and requires consideration of and response to those comments.

Regulations contained within FMPs are enforced through actions of NOAA's Office of Law Enforcement, the United States Coast Guard, and various territorial authorities. To better coordinate enforcement activities, federal and territory enforcement agencies have developed cooperative agreements to enforce the Magnuson-Stevens Act. But enforcement in the Caribbean region is severely underfunded. Because personnel and equipment are limited, enforcement depends largely on voluntary compliance (The Heinz Center 2000).

5.4.2 Commonwealth/Territory Fishery Management

The governments of the Commonwealth of Puerto Rico and the Territory of the USVI have the authority to manage their respective state fisheries. As a Commonwealth, Puerto Rico has an autonomous government, but is voluntarily associated with the United States. The USVI is an unincorporated territory with a semi-autonomous government and its own constitution (OTA 1987).

Puerto Rico has jurisdiction over fisheries in waters extending nine nautical miles from shore. Those fisheries are managed by the Fisheries Research Laboratory of Puerto Rico's Department of Natural and Environmental Resources. Article VI, Section 19 of the Puerto Rico Constitution provides the foundation for the fishery rules and regulations. PR Law 278 of 1998 establishes public policy regarding fisheries.

The USVI has jurisdiction over fisheries in waters extending three nautical miles from shore, with the exception of about 5,650 acres of submerged lands off St. John, which are owned and managed by the National Park Service (Goenaga and Boulon 1991). The VIDPNR is the USVI's fishery management agency.

Each state fishery management agency has a designated seat on the Council. The purpose of state representation at the council level is to ensure state participation in federal fishery management decision-making and to promote the development of compatible regulations in state and federal waters. The state governments have the authority to manage their respective state fisheries. Each of the states exercises legislative and regulatory authority over their territories' natural resources through discrete administrative units. Although each agency is the primary administrative body with respect to the states' natural resources, all states cooperate with numerous state and federal regulatory agencies when managing marine resources.

Additional information regarding fishery management in territorial or federal waters can be found in Section 2.1 of the Caribbean SFA Amendment (CFMC 2005).

6.0 ENVIRONMENTAL CONSEQUENCES

6.1 ACTION 1: Amend the Stock Complexes in the Reef Fish Fishery Management Unit (FMU)

6.1.1 Direct and Indirect Effects on the Physical, Biological, and Ecological Environment

Action 1(a) Grouper units

Alternative 1 is the no action alternative. As such, it would have no direct or indirect effects on the physical, biological, or ecological environment beyond the baseline. **Preferred Alternative 2** proposes to remove creole-fish from GU3, a change that will have minimal consequences because creole-fish are rarely caught in either the commercial or recreational fisheries. However, **Preferred Alternative 2** also proposes to add black grouper to GU4, and this fish is frequently caught by recreational fishers in Puerto Rico waters. Adding black grouper to the FMU will allow for closer monitoring of the harvest of this constituent reef predator, potentially stabilizing the black grouper population and its role in the reef ecosystem. Black grouper tend to include more pelagic fish in their diet relative to other grouper species that specialize on benthic prey (Jory and Iversen 1989) and thereby occupies a unique niche relative to its congeners. Because black grouper occupy caves and crevices on the reef when not feeding, they also provide an important role in the transfer of materials and energy from the pelagic to the benthic realm. Black grouper are faithful to their home reef, with the result that harvest of individual black grouper may leave a relatively long-term functional void in the reef fish ecosystem from which the individual is harvested. For these reasons, it is important to monitor harvest of black grouper as will be facilitated by actions contained within **Preferred Alternative 2**.

Actions contained within **Preferred Alternative 2** will also move yellowedge and misty grouper from GU4 to a new GU5 populated by only these two species. Both yellowedge and misty grouper occupy deep-water habitats relative to the other, more shallow-dwelling, members of GU4 so this rearrangement of grouper management units is appropriate. Direct physical, biological, and ecological effects will be minimal although indirect effects may be important. Those indirect effects would stem from better tracking of the harvest of these deep-water species, resulting in more careful and responsive management. Because these deep-water species exhibit slow growth, large asymptotic size, and low natural mortality rates (Manickchand-Heileman and Phillip 2000), it is important and necessary to closely monitor harvest to ensure against overexploitation.

Action 1(b) Snapper units

No action **Alternative 1** will result in no direct or indirect effects on the physical, biological, or ecological environment. Anticipated direct and indirect effects resulting from **Preferred Alternative 2**, which proposes to move wenchman from SU2 into SU1 and to add cardinal snapper to SU2, will be minimal. Because wenchman is only being moved from one Unit to another, no direct or indirect effects are anticipated. No direct effects are anticipated as a result of adding cardinal snapper to SU2. Indirect effects may result from better monitoring of the harvest of this species, resulting in more careful and responsive management.

6.1.2 Direct and Indirect Effects on the Economic and Social Environments

Action 1(a) Grouper units

Alternative 1 is the no action alternative and would have no added economic or social impacts. **Preferred Alternative 2** is an administrative action and would not directly affect the economic and social environment. Its indirect effects are dependent upon subsequent regulatory actions.

Action 1(b) Snapper units

Alternative 1 is the no action alternative, which would have no added economic or social impacts. **Preferred Alternative 2** is an administrative action and would not directly affect the economic and social environment. Its indirect effects are dependent upon subsequent regulatory actions.

6.1.3 Direct and Indirect Effects on the Administrative Environment

Action 1(a) Grouper units

Choosing no action **Alternative 1** would cause little immediate effect on the administrative environment because nothing would change. However, long-term negative effects may be realized. In the case of creole-fish, continued monitoring for this species despite its absence from commercial or recreational harvest increases the burden on law enforcement officers, data managers, and data analysts by requiring their attention to the presence of creole-fish, their continued inclusion of a slot for creole-fish in the data framework, and their continued inclusion of creole-fish in analytical models although the likelihood of creole-fish actually appearing in the catch is very small. These concerns potentially could divert attention from those species actually caught in U.S. Caribbean commercial and recreational fisheries. For those same reasons, **Preferred Alternative 2** would tend to reduce the administrative burden by removing creole-fish from consideration as a member of the grouper complex, although a one-time burden resulting from the effort required to remove creole-fish from commercial and recreational catch recording forms would be realized.

The effects of choosing no action **Alternative 1** would be negligible with respect to yellowedge, misty, and black grouper.

Balancing the reduction in administrative burden due to the removal of creole-fish, **Preferred Alternative 2** would increase the administrative burden by adding black grouper to GU4. Law enforcement activities would have to take account of the presence of black grouper particularly in the recreational catch, and the addition of this species to the grouper complex would require modification of data collection, management, and analysis protocols and procedures. While the burden on law enforcement would continue for the long-term, data recording, management, and analysis burdens would be short-term phenomena that would pass as the collection, management, and analysis procedures are adapted. Moreover, effective management and administration of U.S. Caribbean fisheries would be enhanced, thereby reducing confusion, conflict, and challenge.

The administrative effect of moving yellowedge and misty grouper into a newly created GU5, as proposed in **Preferred Alternative 2**, would be minor. Both of these fish already are included in the grouper complex so only minor reprogramming of collection, management, and modeling procedures would be required. As with the black grouper, effective management and administration of U.S. Caribbean fisheries would be enhanced, thereby reducing confusion, conflict, and challenge.

Action 1(b) Snapper units

Alternative 1 maintains the status quo and no change in the administrative environment would be expected. Effects on the administrative environment as a result of **Preferred Alternative 2** would be negligible and would emanate primarily from the addition of cardinal snapper to SU2. Addition of cardinal snapper will require modification of data collection, management, and analysis protocols, but this will be a short-term event. The burden on law enforcement will change only minimally because both of these closely related species (wenchman and cardinal snapper) will be included in the complex so no distinctions will be required. The burden on port samplers will increase because they will be required to distinguish between wenchman and cardinal snapper, two species that have proven to be difficult to properly identify. It is probable that training in procedures to accurately identify the two species will be required, and this effort will continue in response to a constantly changing universe of port samplers.

6.2 ACTION 2: Management Reference Points

Specifying the MSY, overfishing threshold, OY, and ACL of snapper, grouper, parrotfish, and queen conch would not have direct environmental impacts because these parameters (or proxies) simply provide fishery managers with targets and thresholds to use in evaluating fishery status and performance. However, this action would indirectly impact the physical, biological, ecological, social, economic, and administrative environments by influencing the development of fishery management actions to prevent overfishing and optimize yield. Potential indirect impacts are described below.

6.2.1 Direct and Indirect Effects on the Physical, Biological, and Ecological Environment

Most fishery interactions with the physical environment are caused by fishing gear impacts to bottom habitat. Management reference points can influence the extent of these interactions by guiding decisions regarding appropriate catch levels. However, the management measures implemented to manage catches (e.g., bag limits, trip limits, gear restrictions) have a much more substantial impact on the number, nature, and extent of habitat interactions than do the catch levels themselves.

The primary gear types used in federal snapper, grouper, parrotfish, and queen conch fisheries are described in Section 3.0. These include vertical line gear, traps, spear fishing, and hand harvest. Vertical line gear has the potential to snag and entangle bottom structures, which can result in breakage and abrasions (Barnette 2001). Traps can break and damage vulnerable corals, which offer significant benthic structure in the U.S. Caribbean (Barnette 2001). And the cumulative effects of repeated anchoring by fishermen using any harvest method, including spear guns and hand harvest, also can damage (e.g., reduce vertical relief) hard bottom areas where fishing occurs (Barnette 2001).

The management reference point effectively limiting catch levels and, therefore, having the greatest indirect impact on these habitat interactions is the ACL. ACLs effectively limit the total catch of a species, unit or complex that may be taken in any given year without requiring fishery managers to impose additional management controls. As a result, larger ACLs are likely to support less restrictive management controls and increased habitat interactions relative to smaller ACLs.

While the Council did not explicitly specify ACLs for snapper, grouper, parrotfish, and queen conch in the Caribbean SFA Amendment, the ABC estimates derived from the Council's MSY control rule could be considered to represent the ACLs of these species, units or complexes if no additional action were taken through this amendment to revise management reference points (Table 4.2.2). These ABC values are lower than the ACL alternatives considered here for snapper, grouper, and parrotfish and consequently would be expected to best benefit the physical environment by supporting lower catch levels than the action alternatives.[2]

Excluding consideration of sub-alternatives, the range of ACL values specified by **Preferred Alternative 2** and **Alternatives 3** and **4** for snapper, grouper, parrotfish, and queen conch do not differ enough to notably effect habitat interactions to varying degrees (Table 4.2.2). The ACL values specified by **Sub-alternatives (c)** through **(f)**, including **Preferred Alternative 2(d)** become progressively smaller as the precautionary buffers they propose become increasingly larger, whereas the values associated with **Preferred Sub-alternatives (g)** and **(h)** are the same across all alternatives.

Sub-alternatives (f) through **(c)** would progressively increase habitat interactions, with **Sub-alternative (c)** supporting the highest catch levels and, thus, the largest number of interactions. Selecting **Preferred Sub-alternative (h)** for Nassau and goliath grouper would maintain the current benefits to the physical environment provided by the current Nassau grouper and goliath grouper prohibitions and eliminate any negative environmental impacts from queen conch harvest activities. **Preferred Sub-alternative (g)** would benefit the physical environment relative to the no action alternative if selected for queen conch but would increase habitat impacts if selected for parrotfish.

[2] The Comprehensive SFA Amendment did not generate an ABC estimate for queen conch.

Action 2(a) Snapper, grouper, and parrotfish

Management reference points impact the biological and ecological environments by defining fishery management objectives regarding the amount of fish that can or should be removed from a population. MSY represents the largest average catch that can be temporally sustained under average environmental conditions. The overfishing threshold (specified as MFMT or OFL) represents the fishing rate or catch level above which overfishing is occuring, meaning the resource's ability to support MSY is at risk. ACL represents the annual catch level specified by the Council to prevent overfishing and avoid the implementation of AMs. And OY is the catch level that provides the greatest overall benefit to the Nation, taking into account food production, recreational opportunities, and the protection of marine ecosystems.

Together, these parameters provide fishery managers with reference points against which to measure fishery performance. When data are insufficient to specify these parameters, the NS1 guidelines direct regional fishery management councils to estimate them using reasonable proxies, like long-term average catch, and to consider scientific and management uncertainty in determining the appropriateness of alternative proxies.

Uncertainty is inherent in the fishery management process and stems from a variety of sources, including but not necessarily limited to: catch, abundance, and other parameter estimates; development and parameterization of descriptive population models; and prediction of future environmental conditions affecting fish populations, as well as fisheries' response to changing regulations and anticipated economic, political, and social conditions (Hilborn and Peterman 1996). While it is generally difficult to quantify the degree of uncertainty surrounding specific scientific and/or management decisions, accounting for this uncertainty is essential to effective management particularly in U.S. Caribbean fisheries that are considered to be data poor.

The management reference point alternatives considered here incorporate various degrees of precaution to account for the scientific and management uncertainty underlying fishery management decision-making in the U.S. Caribbean. Their potential biological and ecological impacts on snapper, grouper, parrotfish, and queen conch are described below.

Snapper

The parameter estimates defined by the no action **Alternative 1** proxies for snapper are generally the lowest of all those considered under scenarios that incorporate a moderate amount of precaution (Table 4.2.2). Consequently, this alternative would be expected to support relatively low snapper landings relative to the action alternatives.

The primary differences between the reference points (or proxies) defined by the no action **Alternative 1** and those evaluated under the action alternatives are: (1) the no action reference points require estimates of catch, stock biomass, and fishing mortality rates, whereas alternatives require only catch estimates; and (2) the no action alternative estimates reference points at a smaller scale/finer resolution (i.e., for four distinct units within the snapper complex), whereas alternatives estimate aggregate reference points or proxies for the snapper complex as a whole.

Theoretically, the biomass based and fishing-mortality-rate based reference points specified by the no action alternative would be more precise and more effective in preventing overfishing. However, because data are insufficient to estimate biomass and fishing mortality rates in the U.S. Caribbean, these reference points must be calculated based on informed judgment regarding stock status in relation to MSY. As a result, the actual values associated with the present definitions are highly uncertain. In some cases (i.e., MFMT), such values have not even been estimated.

The present practice of defining management reference points at the finest resolution possible could also be considered the ideal approach to monitoring fishery performance. Aggregate reference points would make it more difficult for fishery scientists and managers to monitor the status of individual snapper species. Snapper Unit 1 (silk, black, vermilion and blackfin snapper) is currently classified as subject to overfishing in NMFS' report to Congress on the status of U.S. Fisheries. While NMFS took action to address this overfishing determination through the 2005 Caribbean SFA Amendment, the response of individual snapper species within these units to this regulatory action would be less apparent if reference points were redefined at the aggregate level. However, over 5 percent of snapper landed by Puerto Rico fishers and all snapper landed by USVI fishers in recent years (2006-2007) were not identified to species, making it difficult to effectively monitor fishery performance at the species- or unit-level.

Additionally, the proxies defined by no action **Alternative 1** average landings over the longest time period during which data were considered to be relatively reliable at the time the Council approved the Caribbean SFA Amendment. The NS1 guidelines support using data collected over a long time series to capture the fishery's response to changing conditions. Because fewer years of landings data were available at that time, those proxies incorporated Puerto Rico and USVI landings data prior to 1999. The proxies evaluated in **Alternatives 2-4** do not propose using these data in average landings calculations because the Council no longer considers USVI data collected prior to 1999 to be reliable and favors using a relatively consistent baseline across all islands.

Finally, in contrast to the no action **Alternative 1**, **Preferred Alternative 2** and **Alternatives 3** and **4** do not attempt to incorporate information on recreational snapper catches in the USVI because the MRFSS does not provide this information and no alternative data are available to reliably estimate these landings. As a result, the MSYs specified by these alternative proxies are expected to be underestimated to some degree. According to MRFSS, recreational fisheries landed about 28 percent of the total snapper catch in Puerto Rico, on average, during 2006-2007, the two years for which data are available following implementation of current management controls to end overfishing.

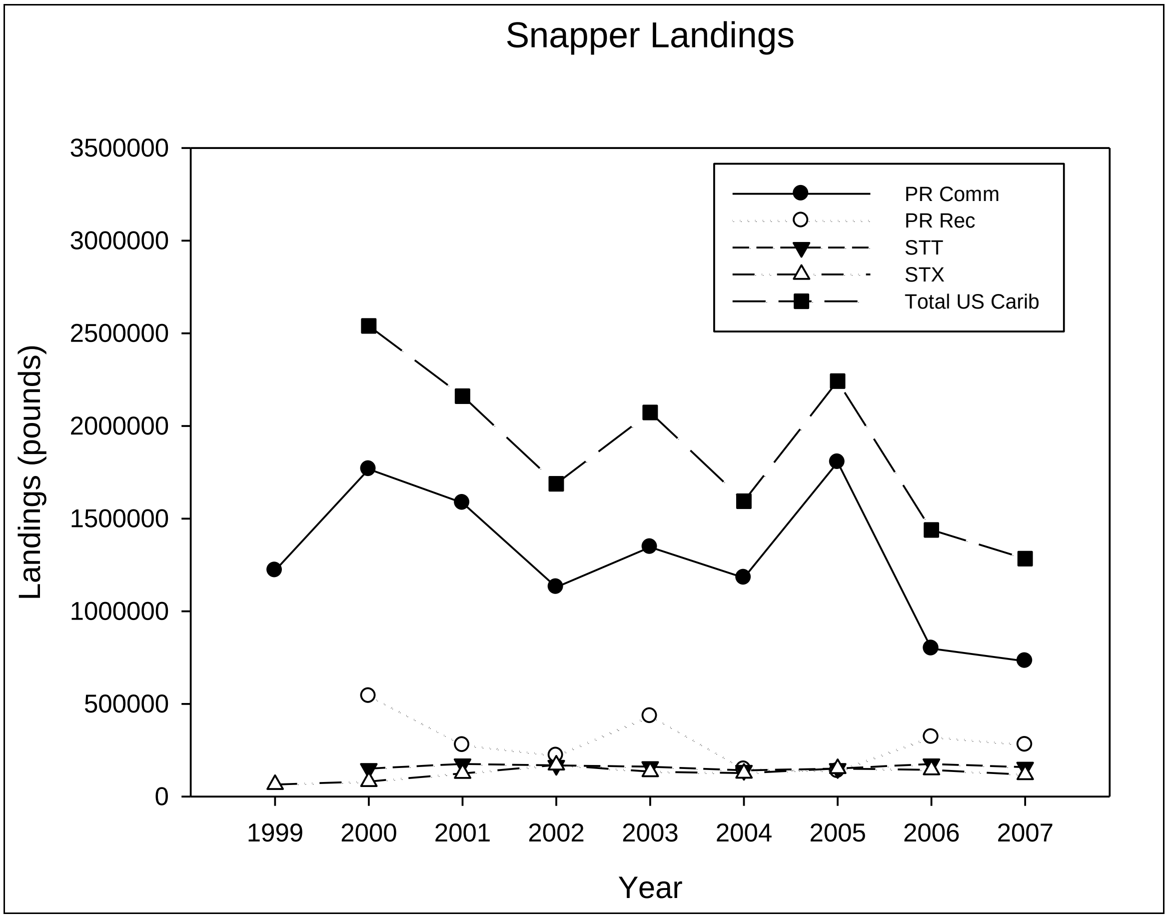

Figure 6.2.1. U.S. Caribbean snapper landings during 1999-2007.

The primary difference between alternative reference point (or proxy) definitions is the time series of landings data on which they are based. **Preferred Alternative 2** would average landings over the longest time period, prior to the 2006 implementation of current management controls, for which the Council considers data to be consistently reliable across all islands. **Alternative 3** would average landings over the longest time period during which landings data are consistently reliable across all islands, including recent years in which harvest was further constrained by management controls. **Alternative 4** would average landings over just the last five years for which data are available (2003-2007), two of which are characterized by the more restrictive management controls in place today.

Preferred Alternative 2 would specify the highest MSY for the snapper complex (1,915,759 pounds), followed by **Alternative 3** (1,784,439 pounds), then **Alternative 4** (1,660,868 pounds) (Table 4.2.2). The MSY values specified by these alternatives differ by no more than 14 percent, indicating the choice of MSY proxy is not likely to have a substantial impact on current management controls or long-term yield. Figure 6.2.1 illustrates annual snapper landings from 1999 through 2007, the last year for which data are available. The landings trend appears relatively stable between 1999 and 2005, averaging 1,915,759 pounds annually, before declining to a lower average level in 2006-2007 (1,321,892 pounds).

The overfishing threshold defined by no action **Alternative 1** is an MFMT equal to the fishing mortality rate at MSY. Because this fishing mortality rate is unknown for U.S. Caribbean species, the Caribbean SFA Amendment adopted natural mortality rate as a proxy for this parameter. However, data are insufficient to evaluate the sustainability of current fishing mortality rates relative to this proxy and make a determination as to whether overfishing is or is not occurring.

Preferred Alternative 2 and **Alternatives 3** and **4** would specify a catch-based overfishing threshold, called the OFL, and annual catches would be evaluated relative to the OFL to determine whether overfishing is or is not occurring. This approach is consistent with the NS1 guidelines, which provide fishery managers the flexibility to determine if overfishing occurs based on either fishing mortality rates or actual annual catch.

Both the ranking and range of the OFL values specified by **Preferred Alternative 2** and **Alternatives 3** and **4** is equal to that described for MSY values as these alternatives would set OFL equal to MSY (Table 4.2.2). Based on recent landings data, the snapper complex would be classified as not subject to overfishing under any of these alternative OFL definitions. Recent landings also are below the current MSY and ABC for the snapper complex in aggregate, indicating actions implemented through the Caribbean SFA Amendment to end overfishing may have successfully reduced snapper catches to sustainable levels. However, as previously noted, monitoring overfishing at the complex level could mask overfishing of individual species or units. Additionally, the recent decline in landings may be attributable to a decline in stock abundance.

While the no action **Alternative 1** does not explicitly define snapper ACLs, the ABC estimates specified by the Council's MSY control rule and detailed in Table 4.2.2 could be considered to represent ACLs if no additional action were taken through this amendment to revise management reference points. However, these ABC values are very uncertain as they were calculated using natural mortality rate as a proxy for the fishing mortality rate that would produce MSY and informed judgment regarding stock biomass. The aggregate value is generally intermediate to those ACL values specified by **Preferred Alternative 2** and **Alternatives 3** and **4**, and would prevent the fishery from achieving OY as currently defined, even though recent data indicates management controls appear to have effectively reduced aggregate catches below the overfishing threshold.

The current OY provides a slight precautionary buffer between catch targets and limits. Restrepo et al. (1998) indicate fishing at that level under equilibrium conditions will reduce the risk of overfishing by 20-30 percent and will result in equilibrium yields at 94 percent of MSY or higher. **Preferred Alternative 2** and **Alternatives 3** and **4** would set the OY and ACL as equal values, requiring the Council to consider the socioeconomic and ecological components of OY when determining how far ACLs should be reduced below the overfishing threshold to account for scientific uncertainty in estimating the OFL and management uncertainty in effectively constraining harvest over time.

The relative ranking of the OY/ACL values specified by **Preferred Alternative 2** and **Alternatives 3** and **4** is equal to that described for the MSY alternatives as most of the OY/ACL values are derived in part from the MSY proxy (Table 4.2.2). Excluding consideration of sub-alternatives, **Preferred Alternative 2** would specify the highest OY/ACL values for the snapper complex, followed by **Alternative 3**, then **Alternative 4**.

Preferred Alternative 2 and **Alternatives 3** and **4** propose essentially the same suite of OY/ACL sub-alternatives for snapper. These sub-alternatives are distinguished from one another by the level of risk (and associated tradeoffs) each would assume. **Sub-alternative (c)** is the most risk prone, proposing to set the OY/ACL equal to the OFL (Table 4.2.2). **Preferred Sub-alternative (d)** and **Sub-alternatives (e)** and **(f)** are progressively more precautionary, incorporating increasingly larger buffers between the OY/ACL and OFL, which are recommended in fisheries characterized by scientific and management uncertainty. **Sub-alternative (f)** would define the OY/ACL to equal 50 percent of OFL, and is the most precautionary definition of those considered. This definition would provide the largest buffer between catch targets and limits and, consequently, the greatest assurance that management measures designed to achieve OY/ACL would be effective in sustaining snapper species over the long term.

The NS1 guidelines suggest that greater precaution is needed for species, like snapper, with life history characteristics (e.g., slow-growing, moderately long-lived) that make them more vulnerable to overfishing (see Section 3.0). Insufficient precaution could lead to overfishing. Overfishing reduces stock biomass and can reduce the size/age distribution of a population, depress the mean size/age at maturity, and decrease genetic diversity, ultimately resulting in growth overfishing and/or in recruitment failure. Overfishing also may alter the community structure and ecological functions of the supporting reef ecosystem. Snapper are part of a complex reef ecosystem, in which co-occurring species compete for resources, such as habitat and food. Consequently, any effects realized by one species or the complex as a whole are likely to impact in some way the ecological community.

Conversely, excessive precaution could lead fishery managers to constrain catches more than needed to prevent overfishing. This would result in higher biomass levels, reducing the potential for overexploitation and maintaining the age and size structure, sex ratio, and genetic integrity of snapper stocks at levels that better approximate natural conditions. Recruitment is generally highly variable due to natural variability in environmental factors that affect the survival of eggs and larvae. A stock maintained at a high biomass level can generally withstand several years of poor recruitment that may occur due to natural factors, but a stock subjected to overfishing for multiple years would find it more difficult to recover from such a situation.

Grouper

The parameter estimates defined by the no action **Alternative 1** proxies for grouper are generally the lowest of all those considered under scenarios that incorporate a moderate amount of precaution (Table 4.2.2). Consequently, this alternative would be expected to support relatively low grouper landings relative to the action alternatives.

The primary differences between the reference points (or proxies) defined by the no action **Alternative 1** and those evaluated under the action alternatives are: (1) the no action reference points require estimates of catch, stock biomass, and fishing mortality rates, whereas alternatives require only catch estimates; and (2) the no action alternative estimates reference points at a smaller scale/finer resolution (i.e., for four distinct units within the grouper complex), whereas alternatives estimate aggregate reference points or proxies for the grouper complex as a whole.

Theoretically, the biomass based and fishing-mortality-rate based reference points specified by the no action alternative would be more precise and more effective in preventing overfishing. However, because data are insufficient to estimate biomass and fishing mortality rates in the U.S. Caribbean, these reference points must be calculated based on informed judgment regarding stock status in relation to MSY. As a result, the actual values associated with current definitions are highly uncertain. In some cases (i.e., MFMT), such values have not even been estimated.

The present practice of defining management reference points at the finest resolution possible could also be considered the ideal approach to monitoring fishery performance. Aggregate reference points would make it more difficult for fishery scientists and managers to monitor the status of individual grouper species. Grouper Units 1 (Nassau grouper) and 4 (red, misty, tiger, yellowedge, and yellowfin grouper) are currently classified as subject to overfishing in NMFS' report to Congress on the status of U.S. Fisheries. And Grouper Units 1, 2 (goliath grouper) and 4 are classified as overfished and managed under rebuilding plans.

While regulations have been implemented to end overfishing and rebuild these stocks, the response of individual grouper species to these regulations would be less apparent if reference points were redefined at the aggregate level. However, over 33 percent of grouper landed by Puerto Rico fishers and all grouper landed by USVI fishers in recent years (2006-2007) were not identified to species, making it difficult to effectively monitor fishery performance at the species- or unit-level. And the Council would still have the option of implementing species-specific regulations, such as the current harvest prohibitions on Nassau and goliath grouper, regardless of whether reference points were defined at the individual or aggregate level.

Additionally, the proxies defined by no action **Alternative 1** average landings over the longest time period during which data were considered to be relatively reliable at the time the Council approved the Caribbean SFA Amendment. The NS1 guidelines support using data collected over a long time series to capture the fishery's response to changing conditions. Because fewer years of landings data were available at that time, those proxies incorporated Puerto Rico and USVI landings data prior to 1999. The proxies evaluated in **Preferred Alternative 2** and **Alternatives 3** and **4** do not propose using these data in average landings calculations because the Council no longer considers USVI data collected prior to 1999 to be reliable and favors using a relatively consistent baseline across all islands.

Finally, in contrast to the no action **Alternative 1**, **Preferred Alternative 2** and **Alternatives 3** and **4** do not attempt to incorporate information on recreational grouper catches in the USVI because the MRFSS does not provide this information and no alternative data are available to reliably estimate these landings. As a result, the MSYs specified by these alternative proxies are expected to be underestimated to some degree. According to MRFSS, recreational fisheries landed about 42 percent of the total grouper catch in Puerto Rico, on average, during 2006-2007, the two years for which data are available following implementation of current management controls to end overfishing.

The primary difference between alternative reference point (or proxy) definitions is the time series of landings data on which they are based. **Preferred Alternative 2** would average landings over the longest time period prior to the 2006 implementation of current management controls for which the Council considers data to be consistently reliable across all islands. **Alternative 3** would average landings over the longest time period during which landings data are consistently reliable across all islands, including recent years in which harvest was further constrained by management controls. **Alternative 4** would average landings over just the last five years for which data are available (2003-2007), two of which are characterized by the more restrictive management controls in place today.

Preferred Alternative 2 would specify the highest MSY for the grouper complex (396,483 pounds), followed by **Alternative 3** (354,853 pounds), then **Alternative 4** (337,178 pounds) (Table 4.2.2). The MSY values specified by these alternatives differ by no more than 15 percent, indicating the choice of MSY proxy is not likely to have a substantial impact on current management controls or long-term yield. Figure 6.2.2 illustrates annual grouper landings from 1999 through 2007, the last year for which data are available. The landings trend appears relatively stable between 1999 and 2005, averaging 396,483 pounds annually, before declining to a lower average level in 2006-2007 (214,118 pounds).

The overfishing threshold defined by no action **Alternative 1** is an MFMT equal to the fishing mortality rate at MSY. Because this fishing mortality rate is unknown for U.S. Caribbean species, the Caribbean SFA Amendment adopted natural mortality rate as a proxy for this parameter. However, data are insufficient to evaluate the sustainability of current fishing mortality rates relative to this proxy and make a determination as to whether overfishing is or is not occurring.

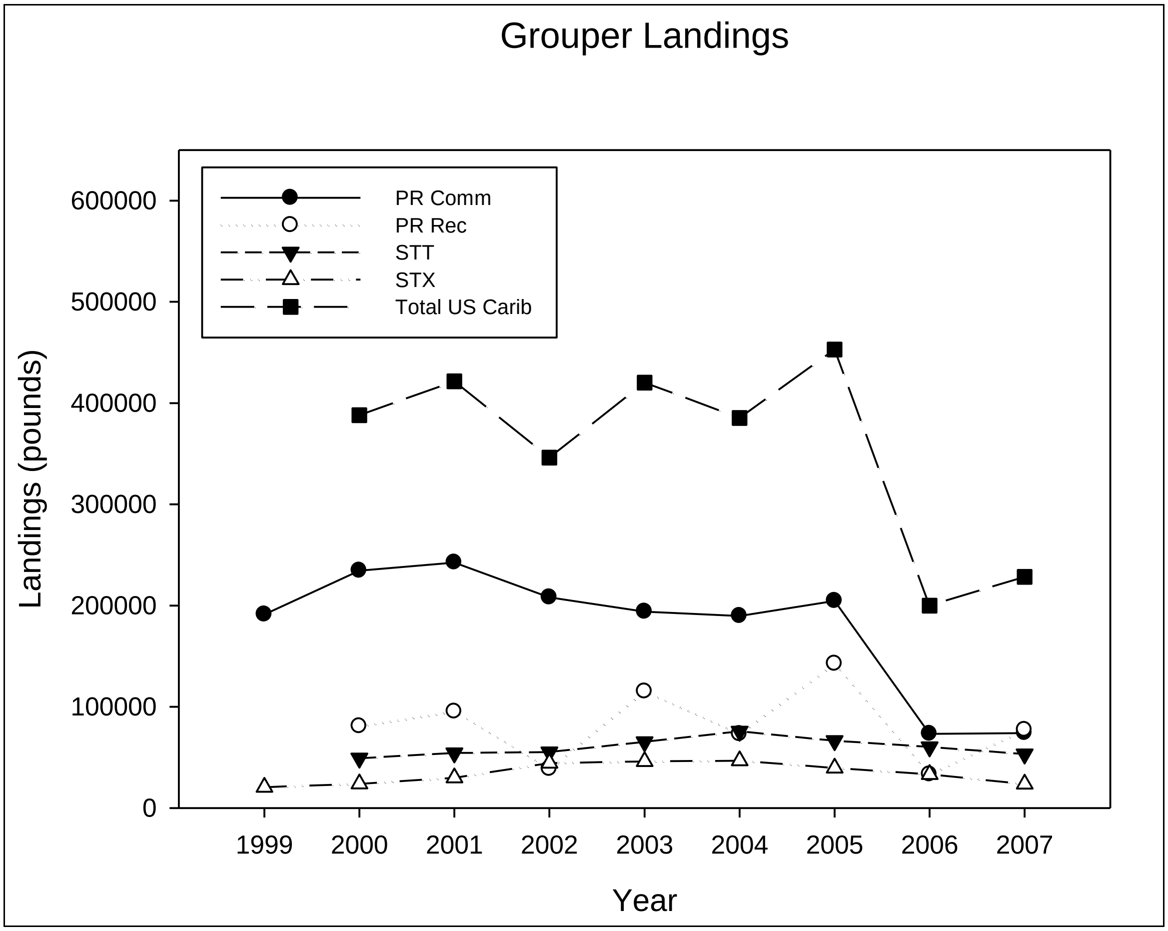

Figure 6.2.2. U.S. Caribbean grouper landings during 1999-2007.

Preferred Alternative 2 and **Alternatives 3** and **4** would specify a catch-based overfishing threshold, called the OFL, and annual catches would be evaluated relative to the OFL to determine whether overfishing is or is not occurring. This approach is consistent with the NS1 guidelines, which provide fishery managers the flexibility to determine if overfishing occurs based on either fishing mortality rates or actual annual catch.

Both the ranking and range of the OFL values specified by **Preferred Alternative 2** and **Alternatives 3** and **4** is equal to that described for MSY values as these alternatives would set OFL equal to MSY (Table 4.2.2). Based on recent landings data, the grouper complex would be classified as not subject to overfishing under any of these alternative OFL definitions. Recent landings also are below the current MSY and ABC for the grouper complex in aggregate, indicating actions implemented through the Caribbean SFA Amendment to end overfishing may have successfully reduced grouper catches to sustainable levels. However, as previously noted, monitoring overfishing at the complex level could mask overfishing of individual species or units. Additionally, the recent decline in landings may be attributed to a decline in stock abundance.

While the no action **Alternative 1** does not explicitly define grouper ACLs, the ABC estimates specified by the Council's MSY control rule and detailed in Table 4.2.2 could be considered to represent ACLs if no additional action were taken through this amendment to revise management reference points. However, these ABC values are very uncertain as they were calculated using natural mortality rate as a proxy for the fishing mortality rate that would produce MSY and informed judgment regarding stock biomass. The aggregate value is relatively low compared to the ACL values specified by **Alternatives 2-4**, and would prevent the fishery from achieving OY as currently defined, even though recent data indicates management controls appear to have effectively reduced aggregate catches below the overfishing threshold.

The current OY provides a slight precautionary buffer between catch targets and limits. Restrepo et al. (1998) indicate fishing at that level under equilibrium conditions will reduce the risk of overfishing by 20-30 percent and will result in equilibrium yields at 94 percent of MSY or higher. **Preferred Alternative 2** and **Alternatives 3** and **4** would set the OY and ACL as equal values, requiring the Council to consider the socioeconomic and ecological components of OY when determining how far ACLs should be reduced below the overfishing threshold to account for scientific uncertainty in estimating the OFL and management uncertainty in effectively constraining harvest over time.

The relative ranking of the OY/ACL values specified by **Preferred Alternative 2** and **Alternatives 3** and **4** is equal to that described for the MSY alternatives as most of the OY/ACL values are derived in part from the MSY proxy (Table 4.2.2). Excluding consideration of sub-alternatives, **Preferred Alternative 2** would specify the highest OY/ACL values for the grouper complex, followed by **Alternative 3**, then **Alternative 4**.

Preferred Alternative 2 and **Alternatives 3** and **4** propose essentially the same suite of OY/ACL sub-alternatives for grouper. These sub-alternatives are distinguished from one another by the level of risk (and associated tradeoffs) each would assume. **Sub-alternative (c)** is the most risk prone, proposing to set the OY/ACL equal to the OFL (Table 4.2.2). **Preferred Sub-alternative (d)** and **Sub-alternatives (e)** and **(f)** are progressively more precautionary, incorporating increasingly larger buffers between the OY/ACL and OFL, which are recommended in fisheries characterized by scientific and management uncertainty. **Preferred Sub-alternative (h)** would set ACL equal to zero for Grouper Units 1and 2 (Nassau and goliath grouper), which are currently managed under a total harvest prohibition. This is the most precautionary definition of those considered and would provide the greatest assurance that these species are rebuilt to more sustainable levels.

The NS1 guidelines suggest that greater precaution is needed for species like grouper, which are considered to be particularly vulnerable to overfishing because of their life history (e.g., hermaphroditism) and behavioral (e.g., aggregation) characteristics. Some species, including the graysby, coney, red hind, and red grouper, are protogynous, functioning first as females, then as males. This reproductive strategy may make them particularly vulnerable to fishing because fisheries that target older, larger individuals may reduce the number of males that enter the population. Reducing the density of a population (Bohnsack 1999) and the proportion of males in a population (Coleman et al. 1999) also reduces the genetic diversity of a population, making it less resilient to environmental change (Bohnsack 1999). Additionally, some species, such as the goliath and Nassau grouper, aggregate in the same locations to spawn, making it easy for fishermen to target and to remove them in large numbers (Coleman et al. 2000).

Insufficient precaution could lead to overfishing. Overfishing reduces stock biomass and can reduce the size/age distribution of a population, depress the mean size/age at maturity, and decrease genetic diversity, ultimately resulting in growth overfishing and/or in recruitment failure. Overfishing also may alter the community structure and ecological functions of the supporting reef ecosystem. Grouper are part of a complex reef ecosystem, in which co-occurring species compete for resources, such as habitat and food. Many large *Epinephelus* species appear to be the resident apex predators of the reef systems they inhabit. Consequently, any effects realized by one species or the complex as a whole are likely to impact in some way the ecological community.

Conversely, excessive precaution could lead fishery managers to constrain catches more than needed to prevent overfishing. This would result in higher biomass levels, reducing the potential for overexploitation and maintaining the age and size structure, sex ratio, and genetic integrity of grouper stocks at levels that better approximate natural conditions. Recruitment is generally highly variable due to natural variability in environmental factors that affect the survival of eggs and larvae. A stock maintained at a high biomass level can generally withstand several years of poor recruitment that may occur due to natural factors, but a stock subjected to overfishing for multiple years would find it more difficult to recover from such a situation.

Parrotfish

The parameter estimates defined by the no action **Alternative 1** proxies for parrotfish are generally the lowest of all those considered under scenarios that incorporate a moderate amount of precaution (Table 4.2.2). Consequently, this alternative would be expected to support relatively low parrotfish landings relative to the action alternatives.

The primary difference between the reference points (or proxies) defined by the no action **Alternative 1** and those evaluated under the action alternatives is that the no action reference points require estimates of catch, stock biomass, and fishing mortality rates, whereas alternatives require only catch estimates. Theoretically, the biomass based and fishing-mortality-rate based reference points specified by the no action alternative would be more precise and more effective in preventing overfishing. However, because data are insufficient to estimate biomass and fishing mortality rates in the U.S. Caribbean, these reference points must be calculated based on informed judgment regarding stock status in relation to MSY. As a result, the actual values associated with current definitions are highly uncertain. In some cases (i.e., MFMT), such values have not even been estimated.

Additionally, the proxies defined by no action **Alternative 1** average landings over the longest time period during which data were considered to be relatively reliable at the time the Council approved the Caribbean SFA Amendment. The NS1 guidelines support using data collected over a long time series to capture the fishery's response to changing conditions. Because fewer years of landings data were available at that time, those proxies incorporated Puerto Rico and USVI landings data prior to 1999. The proxies evaluated in **Preferred Alternative 2** and **Alternatives 3** and **4** do not propose using these data in average landings calculations because the Council no longer considers USVI data collected prior to 1999 to be reliable and favors using a relatively consistent baseline across all islands.

Finally, in contrast to the no action **Alternative 1**, **Preferred Alternative 2** and **Alternatives 3** and **4** do not attempt to incorporate information on recreational parrotfish catches in the USVI because the MRFSS does not provide this information and no alternative data are available to reliably estimate these landings. As a result, the MSYs specified by these alternative proxies are expected to be underestimated to some degree. According to MRFSS, recreational fisheries landed about 11 percent of the total parrotfish catch in Puerto Rico, on average, during 2006-2007, the two years for which data are available following implementation of current management controls to end overfishing.

The primary difference between alternative reference point (or proxy) definitions is the time series of landings data on which they are based. **Preferred Alternative 2** would average landings over the longest time period prior to the 2006 implementation of current management controls for which the Council considers data to be consistently reliable across all islands. **Alternative 3** would average landings over the longest time period during which landings data are consistently reliable across all islands, including recent years in which harvest was further constrained by management controls. **Alternative 4** would average landings over just the last five years for which data are available (2003-2007), two of which are characterized by the more restrictive management controls in place today.

Alternative 4 would specify the highest MSY for the parrotfish unit (512,201 pounds), followed by **Preferred Alternative 2** (507,059 pounds), then **Alternative 3** (496,656 pounds) (Table 4.2.2). The MSY values specified by these alternatives differ by no more than 3 percent indicating the choice of MSY proxy is not likely to have a substantial impact on current management controls or long-term yield. Figure 6.2.3 illustrates annual parrotfish landings, which were relatively stable from 1999 through 2007, the last year for which data are available. The landings trend appears relatively stable between 1999 and 2005, averaging 507,059 pounds annually, before declining to a lower average level in 2006-2007 (464,819 pounds).

The overfishing threshold defined by no action **Alternative 1** is an MFMT equal to the fishing mortality rate at MSY. Because this fishing mortality rate is unknown for U.S. Caribbean species, the Caribbean SFA Amendment adopted natural mortality rate as a proxy for this parameter. However, data are insufficient to evaluate the sustainability of current fishing mortality rates relative to this proxy and make a determination as to whether overfishing is or is not occurring.

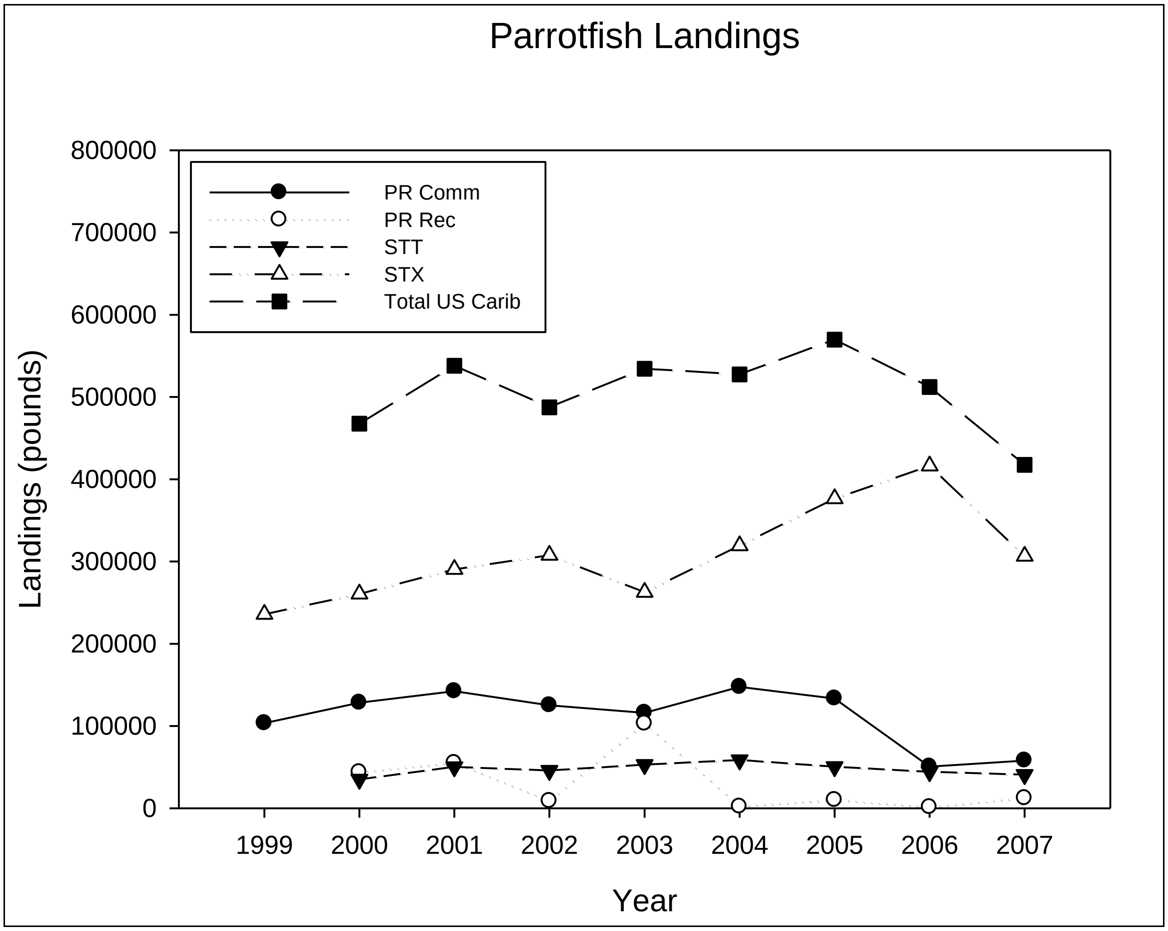

Figure 6.2.3. U.S. Caribbean parrotfish landings during 1999-2007.

Preferred Alternative 2 and **Alternatives 3** and **4** would specify a catch-based overfishing threshold, called the OFL, and annual catches would be evaluated relative to the OFL to determine whether overfishing is or is not occurring. This approach is consistent with the NS1 guidelines, which provide fishery managers the flexibility to determine if overfishing occurs based on either fishing mortality rates or actual annual catch.

Both the ranking and range of the OFL values specified by **Preferred Alternative 2** and **Alternatives 3** and **4** is equal to that described for MSY values as these alternatives would set OFL equal to MSY (Table 4.2.2). Based on recent landings data, the parrotfish unit would be classified as not subject to overfishing under any of these alternative OFL definitions. Recent landings are higher than expected relative to the current MSY and ABC estimates and considering restrictions implemented to end overfishing through the

Caribbean SFA Amendment. The cause of these higher than expected landings is not clear but may be attributed to the delayed implementation of the gillnet prohibition in state waters, increased reporting, or other factors.

While the no action **Alternative 1** does not explicitly define a parrotfish ACL, the ABC estimate specified by the Council's MSY control rule and detailed in Table 4.2.2 could be considered to represent the ACL of this unit if no additional action were taken through this amendment to revise management reference points. However, this ABC value is very uncertain as it was calculated using natural mortality rate as a proxy for the fishing mortality rate that would produce MSY and informed judgment regarding stock biomass. The value is lower than any of the ACL values specified by **Preferred Alternative 2** and **Alternatives 3** and **4**, and would prevent the fishery from achieving OY as currently defined.

The current OY provides a slight precautionary buffer between catch targets and limits. Restrepo et al. (1998) indicate fishing at that level under equilibrium conditions will reduce the risk of overfishing by 20-30 percent and will result in equilibrium yields at 94 percent of MSY or higher. **Preferred Alternative 2** and **Alternatives 3** and **4** would set the OY and ACL as equal values, requiring the Council to consider the socioeconomic and ecological components of OY when determining how far ACLs should be reduced below the overfishing threshold to account for scientific uncertainty in estimating the OFL and management uncertainty in effectively constraining harvest over time.

The relative ranking of the OY/ACL values specified by **Preferred Alternative 2** and **Alternatives 3** and **4** is equal to that described for the MSY alternatives as most of the OY/ACL values are derived in part from the MSY proxy (Table 4.2.2). Excluding consideration of sub-alternatives, **Alternative 4** would specify the highest OY/ACL values for the parrotfish unit, followed by **Preferred Alternative 2**, then **Alternative 3**.

Preferred Alternative 2 and **Alternatives 3** and **4** propose essentially the same suite of OY/ACL sub-alternatives for parrotfish. These sub-alternatives are distinguished from one another by the level of risk (and associated tradeoffs) each would assume. **Sub-alternative (c)** is the most risk prone, proposing to set the OY/ACL equal to the OFL (Table 4.2.2). **Sub-alternative (d)**, **Sub-alternative (e)**, and **Sub-alternative (f)** are progressively more precautionary, incorporating increasingly larger buffers between the OY/ACL and OFL, which are recommended in fisheries characterized by scientific and management uncertainty. **Preferred Sub-alternative (h)** would be expected to best benefit parrotfish, as well as their surrounding ecological environment, because it would set ACL to zero for midnight, blue, and rainbow parrotfish. The ecological benefits of prohibiting directed parrotfish harvest include protecting the essential functions parrotfish perform in coral reef ecosystems. **Preferred Sub-alternative (g)** would set ACL equal to the ABC recommended by the Council's SSC for parrotfish. The environmental impacts of **Preferred Sub-alternative (g)** are generally intermediate to those associated with **Sub-alternatives (c) and (d)**.

The NS1 guidelines suggest that greater precaution is needed for species like parrotfish, which exhibit life history (e.g., sex reversal) or behavioral (e.g., spawning aggregations) characteristics that make them particularly vulnerable to overfishing or are particularly susceptible to harvest (e.g., easily captured) (see Section 3.0).

Insufficient precaution could lead to overfishing. Overfishing reduces stock biomass and can reduce the size/age distribution of a population, depress the mean size/age at maturity, and decrease genetic diversity, ultimately resulting in growth overfishing and/or in recruitment failure. Overfishing also may alter the community structure and ecological functions of the supporting reef ecosystem. Parrotfish are part of a complex reef ecosystem, in which co-occurring species compete for resources, and they perform an essential function as grazers (see Section 3.0). Consequently, any effects realized by one species or the complex as a whole are likely to impact in some way the ecological community.

Conversely, excessive precaution could lead fishery managers to constrain catches more than needed to prevent overfishing. This would result in higher biomass levels, reducing the potential for overexploitation and maintaining the age and size structure, sex ratio, and genetic integrity of parrotfish stocks at levels that better approximate natural conditions. Recruitment is generally highly variable due to natural variability in environmental factors that affect the survival of eggs and larvae. A stock maintained at a high biomass level can generally withstand several years of poor recruitment that may occur due to natural factors, but a stock subjected to overfishing for multiple years would find it more difficult to recover from such a situation.

Action 2(b) Queen conch

The parameter estimates defined by the no action **Alternative 1** proxies for queen conch would support very high landings relative to the action alternatives (Table 4.2.2). The primary difference between the reference points (or proxies) defined by the no action **Alternative 1** and those evaluated under the action alternatives is that the no action reference points require estimates of catch, stock biomass, and fishing mortality rates, whereas alternatives require only catch estimates.

Theoretically, the biomass based and fishing-mortality-rate based reference points specified by the no action alternative would be more precise and more effective in preventing overfishing. However, because data are insufficient to estimate biomass and fishing mortality rates in the U.S. Caribbean, these reference points must be calculated based on informed judgment regarding stock status in relation to MSY. As a result, the actual values associated with current definitions are highly uncertain. In some cases (i.e., MFMT, ABC), such values have not even been estimated.

Additionally, the proxies defined by no action **Alternative 1** average landings over the longest time period during which data were considered to be relatively reliable at the time the Council approved the Caribbean SFA Amendment. The NS1 guidelines support using data collected over a long time series to capture the fishery's response to changing conditions. Because fewer years of landings data were available at that time, those proxies incorporated Puerto Rico and USVI landings data prior to 1999. The proxies evaluated in **Preferred Alternative 2** and **Alternatives 3** and **4** do not propose using these data in average landings calculations because the Council no longer considers USVI data collected prior to 1999 to be reliable and favors using a relatively consistent baseline across all islands.

Finally, in contrast to the no action **Alternative 1**, **Preferred Alternative 2** and **Alternatives 3** and **4** do not attempt to incorporate information on recreational queen conch catches in Puerto Rico and the USVI because the MRFSS does not provide this information and no alternative data are available to reliably estimate these landings. As a result, the MSYs specified by these alternative proxies are expected to be underestimated to some degree.

The primary difference between alternative reference point (or proxy) definitions is the time series of landings data on which they are based. **Preferred Alternative 2** would average landings over the longest time period prior to the 2006 implementation of current management controls for which the Council considers data to be consistently reliable across all islands. **Alternative 3** would average landings over the longest time period during which landings data are consistently reliable across all islands, including recent years in which harvest was further constrained by management controls. **Alternative 4** would average landings over just the last five years for which data are available (2003-2007), two of which are characterized by the more restrictive management controls in place today.

Alternative 4 would specify the highest MSY for queen conch (525,152 pounds), followed by **Preferred Alternative 2** (512,718 pounds), then **Alternative 3** (488,073 pounds) (Table 4.2.2). The MSY values specified by these alternatives differ by no more than 7 percent, indicating the choice of MSY proxy is not likely to have a substantial impact on current management controls or long-term yield. Figure 6.2.4 illustrates annual conch landings from 1999 through 2007, the last year for which data are available. The landings trend appears relatively stable between 1999 and 2004, averaging about 455,000 pounds annually, before sharply peaking at 860,215 in 2005, then declining to a lower average level in 2006-2007 (401,705 pounds).

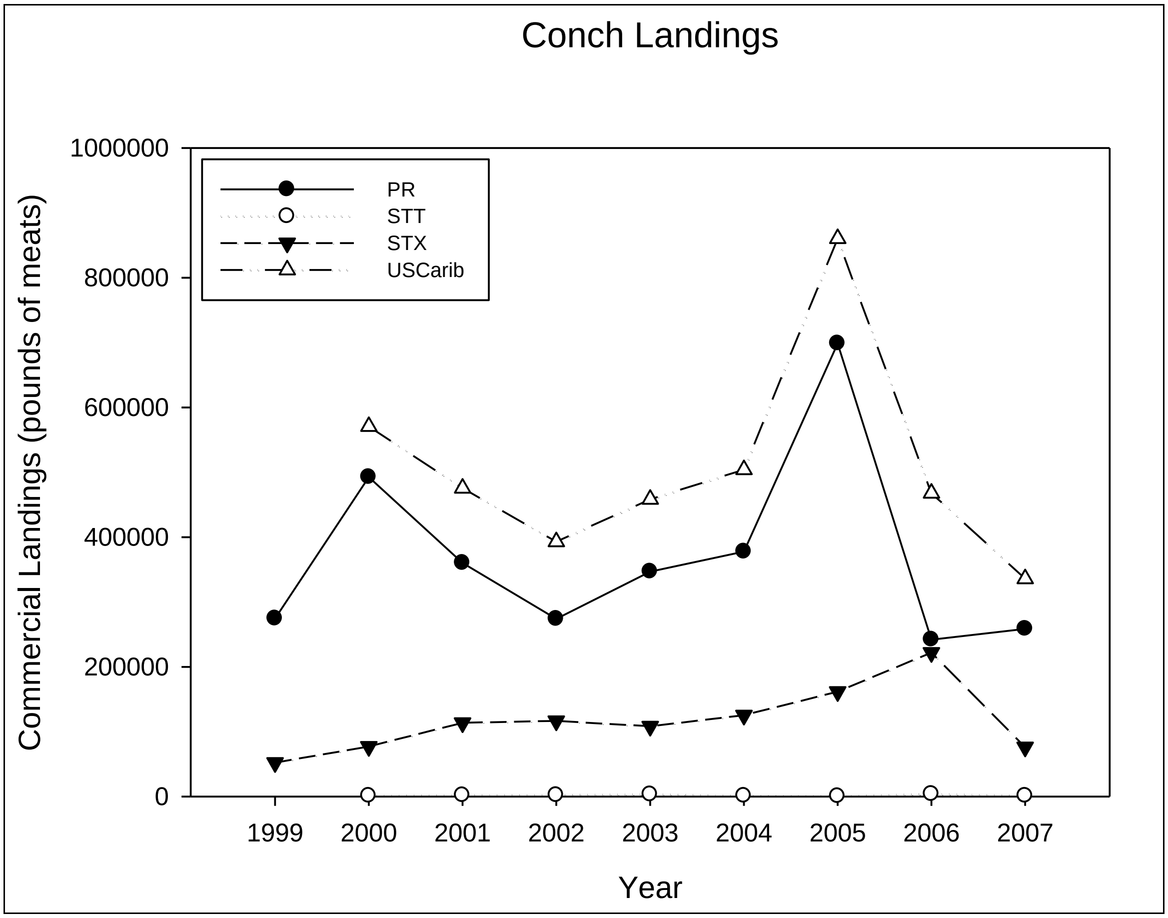

Figure 6.2.4. U.S. Caribbean conch landings during 1999-2007.

The overfishing threshold defined by no action **Alternative 1** is an MFMT equal to the fishing mortality rate at MSY. Because this fishing mortality rate is unknown for U.S. Caribbean species, the Caribbean SFA Amendment adopted natural mortality rate as a proxy for this parameter. However, data are insufficient to evaluate the sustainability of current fishing mortality rates relative to this proxy and make a determination as to whether overfishing is or is not occurring.

Preferred Alternative 2 and **Alternatives 3** and **4** would specify a catch-based overfishing threshold, called the OFL, and annual catches would be evaluated relative to the OFL to determine whether overfishing is or is not occurring. This approach is consistent with the NS1 guidelines, which provide fishery managers the flexibility to determine if overfishing occurs based on either fishing mortality rates or actual annual catch.

Both the ranking and range of the OFL values specified by **Preferred Alternative 2** and **Alternatives 3** and **4** is equal to that described for MSY values as these alternatives would set OFL equal to MSY (Table 4.2.2). Based on recent landings data, queen conch would be classified as not subject to overfishing under any of these alternative OFL definitions. Recent landings also are below the current MSY for queen conch, indicating management action taken to end overfishing successfully reduced queen conch catches to sustainable levels.

The no action **Alternative 1** does not define an ACL for queen conch, or estimate the ABC of the stock due to data limitations (Table 4.2.2). However, the current OY provides a slight precautionary buffer between catch targets and limits. Restrepo et al. (1998) indicate fishing at that level under equilibrium conditions will reduce the risk of overfishing by 20-30 percent and will result in equilibrium yields at 94 percent of MSY or higher.

Preferred Alternative 2 and **Alternatives 3** and **4** would set the OY and ACL as equal values, requiring the Council to consider the socioeconomic and ecological components of OY when determining how far ACLs should be reduced below the overfishing threshold to account for scientific uncertainty in estimating the OFL and management uncertainty in effectively constraining harvest over time. Those values are lower than the OY estimated for queen conch in the Caribbean SFA Amendment, regardless of the OY/ACL alternative selected.

The relative ranking of the OY/ACL values specified by **Preferred Alternative 2** and **Alternatives 3** and **4** is equal to that described for the MSY alternatives as most of the OY/ACL values are derived in part from the MSY proxy (Table 4.2.2). Excluding consideration of sub-alternatives, **Alternative 4** would specify the highest OY/ACL values for queen conch, followed by **Preferred Alternative 2**, then **Alternative 3**.

Preferred Alternative 2 and **Alternatives 3** and **4** propose essentially the same suite of OY/ACL sub-alternatives for queen conch, which are based on average landings in St. Croix over various time periods. These sub-alternatives are distinguished from one another by the level of risk (and associated tradeoffs) each would assume. **Sub-alternative (c)** is the most risk prone, proposing to set the OY/ACL equal to the OFL. **Sub-alternatives (d)** through **(f)** are progressively more precautionary, incorporating increasingly larger buffers between the OY/ACL and OFL, which are recommended in fisheries characterized by scientific and management uncertainty. **Preferred Sub-alternative (g)** would set ACL equal to the ABC recommended by the Council's SSC for queen conch, and **Sub-alternative (h)** would set ACL equal to zero.

OY/ACL **Sub-alternative (h)** would be expected to best benefit queen conch and its surrounding ecological environment because it would require fishery managers prohibit all harvest of that species in federal waters. **Preferred Sub-alternative (g)** would be the next most conservative option for queen conch because it would support the lowest catch level and largest precautionary buffer relative to the remaining sub-alternatives. **Sub-alternatives (f)** through **(c)** would progressively reduce this safety margin and associated environmental benefits, with **Sub-alternative (c)** being the least conservative of those considered.

The NS1 guidelines suggest that greater precaution is needed for species like queen conch, which is particularly vulnerable to overfishing because it is easily harvested by hand (see Section 3.0). Insufficient precaution could lead to overfishing. Overfishing reduces stock biomass and can reduce the size/age distribution of a population, depress the mean size/age at maturity, and decrease genetic diversity, ultimately resulting in growth overfishing and/or in recruitment failure. Overfishing also may alter the community structure and ecological functions of the supporting reef ecosystem. Queen conchs are part of a complex reef ecosystem, in which co-occurring species compete for resources, such as food and habitat. Consequently, any effects realized by one species or the complex as a whole are likely to impact in some way the ecological community.

Conversely, excessive precaution could lead fishery managers to constrain catches more than needed to prevent overfishing. This would result in higher biomass levels, reducing the potential for overexploitation and maintaining the age and size structure, sex ratio, and genetic integrity of grouper stocks at levels that better approximate natural conditions. Recruitment is generally highly variable due to natural variability in environmental factors that affect the survival of eggs and larvae. A stock maintained at a high biomass level can generally withstand several years of poor recruitment that may occur due to natural factors, but a stock subjected to overfishing for multiple years would find it more difficult to recover from such a situation.

6.2.2 Direct and Indirect Effects on the Economic and Social Environments

Action 2(a) Snapper, grouper, and parrotfish

Alternative 1 is the no action alternative and would have no added economic or social impacts; however, it would be incompatible with **Preferred Alternative 2** of Action 1(a) and **Preferred Alternative 2** of Action 1(b). **Preferred Alternative 2** and **Alternatives 3** and **4** are administrative actions and would not directly affect the economic and social environment. Their indirect effects are dependent upon the AMs, regulations that implement the AMs, other regulations, and other environmental factors.

The higher the OY and ACL, the larger the potential indirect economic and social benefits that could derive from exploitation of the resource. For example, **Alternative 1** would set an ACL for each unit less than would be specified by either **Alternative 2c, Preferred Alternative 2d** or **Alternative 2e**; and, hence, the indirect economic and social benefits derived from the exploitation of the snapper and grouper complexes, and the parrotfish unit could be less under **Alternative 1** than **Alternative 2c, Preferred Alternative 2d** or **Alternative 2e** (Table 6.2.1). **Alternative 2c** would specify the highest ACL for each of the snapper and grouper complexes, and **Alternative 4c** would specify the highest ACL for the parrotfish unit. Conversely, **Alternative 4f** would specify the lowest ACL for each of the snapper and grouper complexes and **Alternative 3f** would specify the lowest ACL for the parrotfish unit.

Table 6.2.1. Alternatives 1-4 of Action 2(a): Proposed OYs and ACLs for Snapper, Grouper and Parrotfish.

Alternative	OY = ACL (Pounds)		
	Snapper	Grouper	Parrotfish
1	1,455,000	237,000	285,000
2c	1,915,759	396,483	507,059
2d	1,628,395	337,011	431,000
2e	1,436,819	297,362	380,294
2f	957,880	198,242	253,530
2h			430,000
3c	1,784,439	354,853	496,656
3d	1,516,773	301,625	422,158
3e	1,338,329	266,140	372,492
3f	892,220	177,427	248,328
3g			430,000
4c	1,661,868	337,178	512,201
4d	1,411,738	286,601	435,371
4e	1,245,651	252,884	384,151
4f	830,434	168,589	256,101
4g			430,000
Average 2006 - 07	1,321,892	214,118	464,819

Preferred Alternative 2 and **Alternatives 3** and **4** would directly affect the foundation upon which these reef fish fisheries are managed, and would likely require regulatory changes, such as proposed by Action 5(b). The regulatory changes, in turn, could have direct economic and social impacts on fishers, their families and fishing communities. In the short run, an alternative with a lower ACL, such as **Alternative 4f** for example, could require regulatory change that reduces landings below present levels and reduces economic and social benefits that derive from those landings. In the long run, it is expected that regulatory changes as a consequence of **Preferred Alternative 2** or **Alternatives 3 or 4** would generate greater net economic and social benefits than possible under **Alternative 1** by improving management of the resources. Actual indirect short- and long-term economic and social impacts, however, are dependent upon the AMs, regulations that implement the AMs, other regulations, and other environmental factors.

A neoliberal argument is that overfishing has continued because past governmental regulations have created an incentive to race for the fish, which is said to occur as a result of every fisherman racing to catch as many fish as possible before the government closes the resource to further fishing (Johnson 2008). Hence, neoliberals would contend that if an ACL was established in Puerto Rico's regulated open-access fishery, it would result in adverse incentives that create a race for the fish and overcapacity with fishers being able to catch and land more fish than economically and biologically sustainable. Fishermen with larger vessels and gears capable of catching more of the fish in the same or a shorter period of time would be favored over Puerto Rico's historic artisanal fishermen. Also, the more industrialized gears could negatively impact the economic and social benefits that derive from the use and non-use of the ecosystem of which the fishery is a part. The long-term economic and social benefits of any of the alternative ACLs for the snapper and grouper complexes or parrotfish unit would be dependent upon other regulations that rationalize the fishery for fishing businesses to maintain long-term profits.

Preferred Alternative 2's time series are based on annual landings prior to the 2005 Caribbean SFA Amendment and other relevant regulatory changes. If the present regulatory environment is significantly different than it was prior to 2006 and/or annual landings have changed significantly since 2006, **Alternative 2c's** high degree of certainty, for example, could promote catch levels that are less viable than those levels specified by **Preferred Alternative 2d** or **Alternatives 2e** or **2f**. The larger annual catches of the snapper and grouper complexes that would be supported by **Alternative 2c** may not be possible under current federal and/or state regulations. Also, **Alternative 2c's** higher ACLs could have a greater risk of diminishing the quantity and quality of the snapper and grouper complexes and the economic and social values that derive from their exploitation in the long run.

Alternatives 2g, 3g, and **4g** would set the ACLs for the Parrotfish Unit at the ABCs that would be specified by the SSC. **Alternatives 2g, 3g** and **4g** would set the ACL for the Parrotfish Unit at 430,000 pounds, which is smaller than the ACLs that would be specified by **Alternatives 4c** and **4d, 2c** and **2d**, and **3c**, but larger than the OYs that would be established by **Alternatives 2e, 2f, 3d through 3f, 4e,** and **4f**.

Preferred Alternative 2h and **Alternatives 3h and 4h** would set the ACL and OY for GU1, GU2, and/or three species of parrotfish at zero. **Alternative 1** would keep the OY for GU1 at 1,880 to 23,440 pounds and for GU2 at 1,880 to 10,301 pounds. Therefore, **Alternative 1** would allow for larger annual catches of Grouper Units 1 and 2 and could indirectly generate larger economic and social benefits from these sub-units than **Preferred Alternative 2h** or **Alternatives 3h** or **4h**; however, **Alternative 1** or any ACL greater than zero for Grouper Units 1 and 2 is in contradiction with the present regulatory environment. Grouper Unit 1 is composed of Nassau grouper and GU2 is composed of goliath grouper. Fishing for or possession of either of these two species is prohibited in the U.S. Caribbean EEZ and in Puerto Rico and USVI waters. **Alternative 1** is based on years of landings before the federal and territorial prohibitions, while **Preferred Alternative 2h** and **Alternatives 3h** and **4h** would be consistent with the closures of these fisheries.

In summary, **Alternatives 1** through **4** would have no direct economic or social impact. However, **Preferred Alternative 2** and **Alternatives 3** and **4** would indirectly affect the economic and social environments by fostering regulatory changes that could have short-term adverse economic and social impacts on fishers, their families, and fishing communities, but long- term net benefits. The actual impacts, however, are dependent upon the AMs, regulations that implement the AMs, and other regulations that combine to rationalize the fishery, and other environmental factors.

Action 2(b) Queen conch

Alternative 1 is the no action alternative, which would continue the use of proxies for the targets and thresholds that are used to prevent overfishing and optimize the exploitation of queen conch. These proxies are less reliable in preventing overfishing and optimizing the exploitation of the resource than targets and thresholds based on improved time-series landings data that include more recent years and more accurately reflect the current regulatory environment and other environmental factors. **Alternative 1** would likely result in less economic and social benefits from the Queen Conch FMU than could be realized by using alternative targets and thresholds based on improved time-series data.

Preferred Alternative 2 and **Alternatives 3** and **4** of Action 2(b) would redefine the MSY, OY, overfishing threshold, and ACL for the Queen Conch FMU, which would provide fishery managers with new targets and thresholds against which to evaluate the status and performance of this fishery. The new targets and thresholds would be based on more recent time-series landings data that are considered to be more reliable than the data used to develop the Caribbean SFA Amendment reference points. The targets and thresholds specified by **Preferred Alternative 2** and **Alternatives 3** and **4** would not directly affect the resources, fishers, fishing families or fishing communities. However, **Preferred Alternative 2** and **Alternatives 3** and **4** would directly affect the regulatory foundation upon which the queen conch sector is managed and could indirectly have economic and social impacts on queen conch fishers, their families, and fishing communities as a result of regulatory change warranted by these targets and thresholds.

The higher the OY and ACL, the larger the potential indirect economic and social benefits that could derive from exploitation of the resource. **Preferred Alternative 2** and **Alternatives 3** and **4** would reduce the ACL from the present level of 424,000 pounds and could result in lower indirect economic and social benefits that derive from queen conch fishing (Table 6.2.2). **Alternative 2h, 3h** or **4h** would set the ACL at zero, which would necessitate a regulation that would prohibit fishing for queen conch in the U.S. Caribbean EEZ and could have the largest indirect adverse economic and social impacts on queen conch fishers, their families, and fishing families. **Preferred Alternative 2g** or **Alternative 3g** or **4g** would allow for the next smallest catch of queen conch, which could indirectly result in the second largest adverse economic and social impacts. However, actual outcomes are dependent upon the AMs, regulations that implement those AMs, other regulations that rationalize the fishery, and other environmental factors. For example, the times series used to specify the targets and thresholds of **Alternatives 1, 2c** to **2f, 3c** to **3f,** and **4c** to **4f** are all-to-largely based on annual landings before seasonal and area restrictions were established by Amendment 1 of the Queen Conch FMP in 2005. The ACLs of those alternatives would not be consistent with the USVI's 50,000-pound annual catch limit for St. Croix. **Preferred Alternative 2g** or **Alternative 3g** or **4g** would be consistent with the 50,000-pound limit and Amendment 1 restrictions, and would have no economic and social impacts beyond the baseline, although the ACL of 50,000 pounds is substantially lower than the no action ACL of **Alternative 1**.

Table 6.2.2. Alternatives 1-4 of Action 2(b): Proposed MSY, OFL, OY and ACL for Queen Conch FMU.

Alternative	Pounds		
	MSY	OFL	OY = ACL
1	452,000		424,000
2c	512,718	512,717	107,720
2d			91,562
2e			80,790
2f			53,860
2g			50,000
2h			0
3c	488,073	488,073	116,899
3d			99,364
3e			87,674
3f			58,450
3g			50,000
3h			0
4c	525,152	525,152	138,587
4d			117,799
4e			103,940
4f			69,294
4g			50,000
4h			0
Average 2006 - 07	401,705	401,705	149,026*

* The MSY and OFL for the 2006-07 annual average are based on all U.S. Caribbean landings; the OY and ACL for the 2-year annual average are based on St. Croix landings only.

In summary, **Alternatives 1** through **4** would have no direct economic or social impact. However, **Preferred Alternative 2** and **Alternatives 3** and **4** could indirectly affect the economic and social environments by fostering regulatory changes that could have short-term adverse economic and social impacts on fishers, their families, and fishing communities, but long-term net benefits. The actual impacts, however, are dependent upon the AMs, regulations that implement the AMs, other regulations that combine to rationalize the fishery, and other environmental factors.

6.2.3 Direct and Indirect Effects on the Administrative Environment

Management reference points impact the administrative environment by triggering management review and action. While all the reference points considered here have some influence on fishery management decision-making, the primary parameter guiding management action is the ACL. ACLs effectively limit the total catch of a species, unit, or complex that may be taken in any given year without requiring fishery managers impose additional management controls. As a result, more conservative ACL values would generally be expected to be more administratively burdensome than less conservative values because they would trigger management review and action more frequently.

Excluding consideration of sub-alternatives, the range of ACL values specified by **Preferred Alternative 2** and **Alternatives 3** and **4** for snapper, grouper, parrotfish, and queen conch do not differ enough to notably effect the administrative environment to varying degrees (Table 4.3.1). **Sub-alternative (f)** is expected to be the most administratively burdensome option because it would support the lowest catch levels relative to the other sub-alternatives and, therefore, trigger management review and action most frequently. **Sub-alternatives (e)** through **(c)** would progressively reduce the frequency with which management action was triggered. **Sub-alternative (c)** would trigger management action less frequently, but could have adverse administrative effects if it led to stocks becoming overfished, requiring the development of resource-intensive MSA rebuilding provisions.

An ACL of zero for Nassau and goliath grouper would benefit the administrative environment by supporting the current catch prohibitions. And an ACL of zero for queen conch would reduce the administrative burden of implementing compatible in-season closures each year.

6.3 ACTION 3: Annual Catch Limit Allocation/Management

6.3.1 Direct and Indirect Effects on the Physical, Biological, and Ecological Environment

Action 3(a) Snapper and grouper unit allocation/management

No action **Alternative 1** would require that reference points for management of commercial and recreational snapper and grouper species be established according to the units described in Action 1, the exact construct of those units being determined by the decision whether to maintain the current composition of the units or to modify them as described in Action 1. With respect to Action 3, the details of unit composition are not essential. Rather, Action 3(a) affects whether reference points are established by unit or are aggregated according to the options described in **Alternatives 2** and **3**. Those alternatives determine how aggregate reporting is distributed both within each of the snapper and grouper complexes and within island groups (Puerto Rico and the combined USVI). **Alternative 2** would require aggregation within each of the snapper and grouper complexes. **Sub-alternative A** would allow establishment of aggregate reference points only for Puerto Rico. **Sub-alternative B** would allow establishment of aggregate reference points only for the USVI. **Sub-alternative C** would allow establishment of aggregate reference points for the entire U.S. Caribbean. **Alternative 3** basically reiterates **Alternative 2**, except that **Alternative 3** would allow establishment of aggregate reference points only for grouper. Again, the sub-alternatives allocate according to islands groups, as with **Alternative 2**.

By definition, **Alternative 1** of Action 3(a) would cause no change in the way that fisheries are executed in the U.S. Caribbean. Although **Alternatives 2** and **3** would alter the manner by which fishing activities are pursued in the U.S. Caribbean, those fisheries would remain fully functional. However, some changes in the direct and indirect impacts to the physical environment may occur in response to changes in emphasis on particular units. Aggregating catch quotas, by whatever option may be chosen via **Alternative 2** or **3**, would allow for shifting of effort within each of the snapper and grouper complexes. This is because, instead of a set quota for each unit within each of the snapper and grouper complexes, the quota would be an aggregate within complex depending upon which alternative is selected. Aggregating within either of the snapper or grouper complexes would allow the entire quota for that complex to be fulfilled by harvest of a subset of the members of the complex. For example, the entire snapper quota could be met by harvesting vermilion snapper. As the vermilion snapper population is depleted to the point of collapse, effort could be shifted to one or more other species of snapper. As a result, the overall landings would remain essentially the same and there would be no apparent indication that the vermilion stock is in distress despite the reality of its potential collapse. Changes in fishing effort and methods, in response to quota changes deriving from aggregation of harvest quotas, are difficult to predict. As a result, it is similarly difficult to predict changes in direct and indirect physical effects that may be realized in response to those changes in fishing patterns.

Direct and indirect effects on the biological and ecological environment resulting from Action 3(a) could be substantial. As noted in the paragraph above, allowing aggregation of catch may emphasize harvest of certain species and de-emphasize harvest of other species, thereby allowing the entire quota to be achieved by the harvest of one or a few species. Such an outcome potentially would greatly increase the harvest pressure on those species that are targeted. Because landings would not be managed at the level of individual species, or even at the level of the individual unit, scientists and managers would have no tool with which to restrict catch levels of individual species, so any stress that may be reflected by the catch data would not be easily identified or relieved. Instead, because overall harvest is maintained within the bounds of the quota, the overall harvest numbers would indicate that the management unit is not overfished or undergoing overfishing. In reality, those species that are being harvested may be experiencing substantial overfishing. Resultant direct and indirect effects, both biological and ecological, could be severe. From a biological perspective, overfishing could directly reduce the available spawning stock below a critical threshold, thereby reducing mating opportunities, cohort production, and genetic integrity of the stock. Indirect effects, for example the supply of propagules to other subpopulations of the affected species, also may be substantial. Direct and indirect ecological effects also would be expected, particularly in the delivery of ecosystem services provided by the affected species that include but are not limited to contributions as a predator or prey item within the ecosystem, by increases in other species that benefit by increased access to habitats or prey, and by loss of a food source previously provisioned by the affected species. The latter may be particularly problematic if the affected species is replaced in the ecosystem by a species that is less desirable or suitable for human consumption. In each of these cases, **Alternative 1** appears to provide the least likelihood of negative outcomes because it ensures that all harvest from all island groups is reported to the species level and that those species are managed as a coherent unit. Each of **Alternatives 2** and **3** fall short of this goal, **Alternative 2** to the greatest degree because it allows aggregation of the largest number of management units.

However, from a practical perspective it is not presently possible to effectively manage at the unit level within all of the islands. In the USVI, landings data are presently reported only to the level of the complex (or unit in the case of parrotfish), all landings being grouped within the parrotfish unit or the snapper and grouper complexes. Managing at a level of resolution more refined than that is therefore not possible, at least until a more detailed harvest monitoring program is implemented. Aggregate reference points for the USVI are a necessary outcome of this situation and any sub-alternatives that preclude aggregating catch in the USVI (e.g., **Sub-alternative A** within both **Alternatives 2** and **3**) would not be practicable. However, both **Sub-alternative B** and **Sub-alternative C**, within each of **Alternatives 2** and **3**, are feasible. Those sub-alternatives will result in aggregate reference points for the USVI, thereby circumventing the mismatch between management desires and the reality of historic U.S. Caribbean data reporting. Because landings data from Puerto Rico are reported to species, albeit with varying levels of success as noted in Section 3.3, aggregate reference points for Puerto Rico are not a necessity.

Alternative 4 was added at the request of the Council and adopted as the preferred alternative in Action 3(a). In the USVI, the data are only reported in aggregate for both snapper and grouper, thereby essentially requiring that aggregate reference points be defined for snapper and grouper units in the USVI. This alternative also requires defining aggregate reference points for grouper in Puerto Rico. This reflects a concern by the Council for the large proportion of unclassified landings inherent in the Puerto Rico grouper data. However, based on the availability of species-specific data for snapper in Puerto Rico and on the relatively small proportion of unclassified landings within the snapper category, the Council's preferred option is to define unit-specific reference points for snapper in Puerto Rico. Fewer than 10 percent of the commercial landings of snapper in Puerto Rico are not reported to species. This alternative therefore provides the most highly resolved level of management for Puerto Rico snapper of any of the alternatives, while still addressing the data limitations inherent in the data for grouper in Puerto Rico and for snapper and grouper in the USVI.

Action 3(b) Sector allocation/management (Puerto Rico only)

Decisions regarding sector allocation and management potentially could impact the physical environment particularly of U.S. Caribbean coral reefs. Traps are commonly used in the commercial pursuit of U.S. Caribbean reef fish including parrotfish, snapper, and grouper. In contrast, recreational fishing is oriented more towards hook-and-line or spear fishing. Traps have the potential to be more damaging to the physical environment, through direct contact with reef structure, than are hook-and-line or spear fishing activities. **Alternative 1** would maintain the present situation where commercial harvest is not differentiated from recreational harvest on the island of Puerto Rico (recreational harvest is not monitored in the USVI so Action 3(b) is specific to Puerto Rico). A possible outcome of this situation is an increase in commercial harvesting activity as commercial fishermen maximize harvest until the aggregate (commercial and recreational) quota is achieved. This outcome could result in more traps in the water and therefore more direct impacts to the reef relative to **Preferred Alternative 2**, which would segregate commercial from recreational harvest quotas and monitoring.

Specifying separate commercial and recreational ACLs for Puerto Rico would not be expected to have substantial direct or indirect effects on the biology or ecology of U.S. Caribbean coral reef communities. Although **Preferred Alternative 2** would separate the tracking and management of commercial and recreational harvest, the overall harvest quota for each species, unit, or complex would remain the same. It is possible that indirect effects would occur, as fewer commercial traps result in fewer direct interactions between gear and substrate and thereby fewer impacts on essential habitat for coral reef community members.

Action 3(c) Geographic allocation/management

No substantial change in the direct or indirect effects to the physical environment would be expected as an outcome of changes to geographic allocation and management, beyond those already discussed for Actions 3(a) and 3(b). As noted above, differential harvest of species within each unit or complex, depending upon whether the catch is aggregated or not, may result in changes in usage patterns of fishing gear. But, any other direct or indirect impacts to the physical environment are not anticipated. Establishing sub-regions within the U.S. Caribbean EEZ will require that fishermen land and report catch within more restrictive boundaries than was the previous case assuming that **Preferred Alternative 2** is chosen, but there is no reason to expect that fishing effort will be increased, reduced, or spatially reallocated as a result of that requirement.

Direct and indirect effects to the biological and ecological environment that result from Action 3(c) could be substantial. Arguments here are similar to those presented for Action 3(a) regarding direct and indirect biological and ecological effects. **Alternative 1** will maintain the current situation with the result that no changes to the biological or ecological environment would be detected. **Preferred Alternative 2**, by structuring harvest within each of three U.S. Caribbean island groups, would be expected to better distribute harvest among the island groups according to historic catch patterns. That outcome would result in a substantially reduction in the likelihood that U.S. Caribbean-wide quota opportunities could be focused within one of the subregions (i.e., island groups) causing overharvest in some areas and underharvest in others. Spreading harvest effort would be expected to facilitate sustainable harvest throughout the U.S. Caribbean, thereby minimizing direct and indirect effects due to that harvest.

6.3.2 Direct and Indirect Effects on the Economic and Social Environments

Action 3(a) Snapper and grouper unit allocation/management

Alternative 1 of Action 3(a) would maintain the targets and thresholds for the units within the snapper and grouper complexes; however, this would not be consistent with USVI reporting requirements which do not differentiate species of grouper or snapper.

Because there are no landings by unit in the USVI, the average annual commercial landings of all snapper or all grouper in the USVI would be used as a proxy for each unit's average annual landings for the territory, which, in turn, would be included in the specification of the targets and thresholds for each snapper or grouper unit for the U.S. Caribbean as a whole. The assumption that each and every snapper or grouper unit's average annual commercial landings are equal to the average annual commercial landings of all snapper or grouper would substantially overestimate commercial landings of each sub-unit in the USVI. However, that overestimation would likely offset, although by an unquantified amount, the underestimation of recreational landings of each member of the sub-units in the USVI. **Alternative 1** of Action 3(a) in combination with **Preferred Alternative 2e** of Action 2(a) would allow for overfishing of the units of the snapper and grouper complexes in the USVI and would indirectly result in diminished economic and social benefits that derive from exploitation of these resources over time. However, the actual impacts would be dependent upon the AMs, regulations that implement those AMs, other regulations created to rationalize the fishery, and other environmental factors.

Because **Alternative 2A** of Action 3(a) would define aggregate reference points for the snapper and grouper complexes for Puerto Rico only, it follows that this alternative would, by default, define the targets and thresholds for snapper and grouper units or species for the USVI. That is problematic, however, because the USVI has not required commercial fishers to report landings of snapper or grouper by species. Without the ability to differentiate which snapper or grouper landings are of a particular sub-unit, landings of each sub-unit would be a guess. Hence, when combined with **Preferred Alternative 2** of Action 2(a), **Alternative 2A** of Action 3(a) would specify the same targets and thresholds for each snapper sub-unit and the same targets and thresholds for each grouper sub-unit for the USVI. This combination would allow for overfishing of the units of the snapper and grouper complexes in the USVI and would indirectly result in diminished economic and social benefits that derive from exploitation of these resources over time. However, the actual impacts would be dependent upon the AMs, regulations that implement those AMs, other regulations created to rationalize the fishery, and other environmental factors.

Table 6.3.1. Alternative 2B of Action 3(a) coupled with Preferred Alternative 2(e) of Action 2(a).

Complex	Puerto Rico OY and ACL (pounds)			USVI OY and ACL (pounds)		
	Commercial	Recreational	Total	Commercial	Recreational	Total
Snapper						
Unit 1	284,685	95,526	380,211			
Unit 2	145,916	34,810	180,726			
Unit 3	345,775	83,158	428,933			
Unit 4	373,295	28,509	401,804			
Total	*1,149,671*	*242,003*	*1,391,674*	*236,721*	*Zero*	*236,721*
Grouper						
Unit 1	14,849	5,246	20,095			
Unit 2	625	5,526	6,151			
Unit 3	95,944	61,254	157,198			
Unit 4	4,862	3,894	8,756			
Unit 5	8,055	1,294	9,349			
Unclass.	53,179	0	53,179			
Total	*177,513*	*77,213*	*254,726*	*82,284*	*Zero*	*82,284*

Alternative 2B of Action 3(a) would define aggregate reference points for the snapper and grouper complexes for the USVI only, which is consistent with reporting practices in the USVI. According to **Preferred Alternative 2** of Action 2(a), the MSY for the snapper complex would be 278,495 pounds and the MSY for the grouper complex would be 96,805 pounds. Furthermore, in accordance with **Preferred Alternative 2(d)** of Action 2(a), the ACL for snapper and grouper complexes would be 236,721 pounds and 82,284 pounds respectively (Table 6.3.1). By default, **Alternative 2B** would also define reference points for the snapper and grouper units for Puerto Rico only as shown in Table 6.3.1.

Alternative 2C of Action 3(a) would define aggregate reference points for the snapper and grouper complexes in both Puerto Rico and the USVI, although Puerto Rico reporting requirements differentiate landings of snapper and grouper species. Because it does not differentiate snapper or grouper units, there would be the possibility that Puerto Rico fishermen could intensify fishing effort for any one of the snapper or grouper units and increase landings of that unit despite it experiencing overfishing because an aggregate ACL would be specified for all snapper or grouper. Although **Alternative 2C** could generate short-run benefits for snapper and/or grouper fishermen in Puerto Rico who would be able to increase landings of a unit species, there would be smaller long-term net benefits and potentially long-term net costs associated with such exploitation of a particularly unit. The actual outcomes, however, would be dependent upon the AMs, regulations that implement the measures, other regulations that combine to rationalize the fishery, and other environmental factors.

Alternative 3A of Action 3(a) would define aggregate reference points for grouper only, for Puerto Rico only. Because **Alternative 3A** of Action 3(a) would define aggregate reference points for the Grouper FMU only for Puerto Rico, it would require reference points for snapper and grouper sub-units in the USVI, which is inconsistent with USVI reporting requirements.

Alternative 3B of Action 3(a) would define aggregate reference points for grouper in the USVI only and **Alternative 3C** would define aggregate reference points for grouper in Puerto Rico and the USVI. This would be consistent with reporting practices for grouper in the USVI, but not consistent with reporting practices for snapper in the USVI.

Preferred Alternative 4 is a combination of aspects of **Alternative 2B** and **3A**, which are consistent with USVI reporting requirements**.** The ACLs for each territory are shown in Table 6.3.2. Unlike **Alternative 2B**, it does not define an ACL for the grouper units for Puerto Rico, which could allow Puerto Rico grouper fishermen to increase landings of a particular grouper unit while decreasing landings of another. However, that ability is restricted by present regulations, such as the closure of the Nassau and goliath grouper fisheries (Grouper Units 1 and 2).

Table 6.3.2. Preferred Alternative 4 in combination with Preferred Alternative 2(e) of Action 2(a).

Complex	Puerto Rico OY and ACL (pounds)			USVI OY and ACL (pounds)		
	Commercial	**Recreational**	**Total**	**Commercial**	**Recreational**	**Total**
Snapper						
Unit 1	284,685	95,526	380,211			
Unit 2	145,916	34,810	180,726			
Unit 3	345,775	83,158	428,933			
Unit 4	373,295	28,509	401,804			
Total	*1,149,671*	*242,003*	*1,391,674*	*236,721*	*Zero*	*236,721*
Grouper						
Unit 1						
Unit 2						
Unit 3						
Unit 4						
Unit 5						
Unclass.						
Total	*177,513*	*77,213*	*254,726*	*82,284*	*Zero*	*82,284*

In summary, neither **Preferred Alternative 4** nor **Alternative 1**, **2** or **3** would have a direct economic or social impact on fishermen, their families, or communities. However, they could indirectly affect the economic and social environments by fostering regulatory changes that could have short-term and long-term effects. **Alternatives 1**, **2A**, and **3** are not consistent with USVI reporting requirements and would allow for overfishing of the units of the snapper and/or grouper complexes in the USVI and would indirectly result in diminished economic and social benefits that derive from exploitation of these resources over time. However, the actual impacts would be dependent upon the AMs, regulations that implement those AMs, other regulations created to rationalize the fishery, and other environmental factors.

Preferred Alternative 4 and **Alternatives 2B** and **2C** are consistent with USVI reporting requirements and would base an ACL on known annual landings and average annual landings of snapper and/or grouper. Because of this consistency, any one of these four alternatives could support better management of the fishery(ies) and indirectly yield larger long-term net economic and social benefits than **Alternative 1, 2A** or **3**; however, actual benefits are dependent on the chosen alternatives of the previous proposed actions (Actions 1 and 2), AMs, regulations that implement the AMs, other regulations (including Action 6) that combine to rationalize the fishery, and other environmental factors.

Action 3(b) Sector allocation/management (Puerto Rico only)

Alternative 1, the no action alternative, would not specify sector-specific reference points, which could cause commercial and recreational fishers to compete for the ACL. Commercial fishermen with larger vessels and gears capable of catching more of the fish in the same or a shorter period of time would be favored over Puerto Rico's recreational and subsistence fishermen if there was a race for the catch. **Preferred Alternative 2**, however, would specify separate commercial and recreational annual catch limits in Puerto Rico that are based on the specifications of the MSY, OFL, and OY that are chosen. See Table 6.3.3 for the recreational and commercial ACLs for the Snapper units and Grouper Unit proposed by **Preferred Alternative 2** of Action 3(b) in combination with **Preferred Alternative 4** of Action 3(a), **Preferred Alternative 2(d)** of Action 2(a) and **Preferred Alternative 2(g)** of Action 2(b). A commercial ACL could encourage some fishers to acquire larger vessels and gears that are capable of catching and landing more fish in the same or a shorter period of time than other fishers, which could adversely affect the historical distribution of economic and social benefits that derive from the fishery and the long-term benefits of the fishery and the ecosystem of which it is part.

In summary, **Alternative 1** would not specify sector-specific reference points, which would cause commercial and recreational fishers to compete for a single ACL. Commercial fishers with larger vessels and gears capable of catching more of the fish in the same or a shorter period of time would be favored over Puerto Rico's recreational and subsistence fishers if there was a race for a single ACL and overcapacity was allowed. **Preferred Alternative 2**, however, would specify separate commercial and recreational annual catch limits in Puerto Rico. However, commercial fishers with larger vessels and gears capable of catching more of the fish in the same or a shorter period of time would be favored over Puerto Rico's historic artisanal fishers if there was a race for a commercial ACL and overcapacity was allowed. Such an environment could result in lower long-term benefits that derive from the resource and the ecosystem of which it is part and a transfer of economic and social benefits from artisanal to industrial fishers. The actual economic and social impacts, however, would be dependent on if the regulatory and economic environments support such competition for an ACL.

Table 6.3.3. Preferred Alternative 2 of Action 3(b) coupled with Preferred Alternative 4 of Action 3(a) and Preferred Alternative 2(d) of Action 2(a) and Preferred Alternative 2(g) of Action 2(b).

Puerto Rico ACL (Pounds)		
Complex	**Commercial**	**Recreational**
Snapper Unit 1	284,685	95,526
Snapper Unit 2	145,916	34,810
Snapper Unit 3	345,775	83,158
Snapper Unit 4	373,295	28,509
Grouper	177,513	77,213
Parrotfish	52,737	15,263
Conch	0	N/A

Action 3(c) Geographic allocation/management

Alternative 1, the no action alternative, would maintain Caribbean-wide reference points, and, as such, the U.S. Caribbean EEZ would continue to be an indivisible area. This could allow queen conch, parrotfish, snapper, and grouper that are harvested anywhere within the U.S. Caribbean EEZ to be continued to be harvested in areas of the EEZ off any of the islands of Puerto Rico, St. Croix or St. Thomas/St. John after the ACL has been reached for that island. This could result in overfishing in areas of the EEZ, which could have long-term negative economic and social impacts for fishermen and their families and communities.

Preferred Alternative 2 of Action 3(c) would divide and manage ACLs by island group and divide the associated EEZ into three parts (Table 6.3.4). There would be the Puerto Rico EEZ, the St. Croix EEZ, and the St. Thomas/St. John EEZ. Fish and/or shellfish that are harvested within an island EEZ would not have to be landed on that island. Once an island's landings reach its ACL for a particular complex, unit, or species, the fishery for that complex, unit, or species in the island's EEZ would be subject to appropriate AMs. For example, if the STT/STJ ACL for the snapper complex were reached, **Preferred Alternative 2** could result in closure of snapper harvest in the STT/STJ EEZ depending on the preferred alternatives of Actions 5(a) and 5(b). If the EEZ were not divided (as would be the case under **Alternative 1**), a closure of federal waters to snapper fishing, because the STT/STJ landings reached or surpassed the STT/STJ ACL, would extend to federal waters off Puerto Rico and St. Croix, although PR and/or STX landings may not have reached their respective snapper ACLs. Such a scenario would have adverse economic and social impacts on Puerto Rico and St. Croix snapper fishers, their families, and fishing communities if their access to the resource was reduced.

Table 6.3.4. Preferred Alternative 4 of Action 3(a), Preferred Alternative 2 of Action 3(b), Preferred Alternative 2e of Action 2(a) and Preferred Alternative 2g(i) of Action 2(b).

Complex and Units	Puerto Rico ACL (Pounds)		St. Croix ACL (Pounds)	St. Thomas/St. John ACL (Pounds)
	Commercial	Recreational		
Snapper Unit 1	284,685	95,526		
Snapper Unit 2	145,916	34,810		
Snapper Unit 3	345,775	83,158		
Snapper Unit 4	373,295	28,509		
Snapper			102,946	133,775
Grouper	177,513	77,213	30,435	51,849
Parrotfish	52,737	15,263	255,000	42,500
Conch	0	N/A	50,000	0

Preferred Alternative 2 is similar to the current federal regulation that prohibits fishing for queen conch outside an area of the EEZ off St. Croix.

The Puerto Rican shelf, or fishable habitat 100 fathoms or less, encompasses an approximate 1,837 nm² area. Of that area, only 6.3 percent (116 nm²) occurs in the EEZ, and the vast majority of that area is found off the west coast of Puerto Rico. Conversely, the USVI shelf only encompasses an approximate 630 nm² area. Of that area, 38 percent (240 nm²) occurs in the EEZ. The bulk of the shelf occurs off St. Thomas and St. John, with a 291 nm² total area in territorial waters and a 218 nm² total area in federal waters. St. Croix has 98 nm² of fishable habitat in territorial waters, and only a 21 nm² area off its east coast that resides in the EEZ. This difference in the amount of fishable habitat that occurs in federal waters off each territory is a result of the difference in their jurisdictions. Puerto Rico waters extend offshore nine nm and cover an area of approximately 5,081 square miles, while USVI waters only extend out three nm and cover an area of about 579 square miles. Therefore, the USVI fisheries depend on the EEZ to a much greater extent than those managed off Puerto Rico. Further, St. Thomas and St. John have a greater reliance on the EEZ, with approximately 43 percent of the total shelf occurring in the EEZ, as compared to that of St. Croix, which only has approximately 18 percent of its waters in the EEZ (CFMC 2005: 372). This suggests that the economic and social benefits of **Preferred Alternative 2** could be greater for St. Thomas/St. John fishers, their families, and communities than for fishers, fishing families, and communities in St. Croix and substantially greater for these social entities in St. Thomas/St. John than for their counterparts in Puerto Rico. **Preferred Alternative 2's** adverse economic and social impacts would be experienced by any fishers who presently harvest resources in one or more of the proposed EEZ areas. Adverse impacts could also result if a relocation of fishers increased competition in the EEZ off an island group or in territorial waters. There is insufficient information to assess how many fishers, if any, would be so affected and what would be the adverse economic and social impacts on fishers, their families, and fishing communities.

6.3.3 Direct and Indirect Effects on the Administrative Environment

Action 3(a) Snapper and grouper allocation/management

The no action **Alternative 1** will create the greatest administrative burden of any of the proposed Action 3(a) alternatives. This situation results from the disparity between desired harvest reporting goals and the reality of reporting particularly in the USVI but also in Puerto Rico.

In the USVI, as discussed in Section 3.3, harvest of reef fish is reported only to the level of the complex, so for example the individual grouper species are lumped for reporting purposes into a single category of grouper. The same situation holds for snapper and parrotfish, although for the latter the consequences are minimal with regard to management because there is only a single parrotfish unit. **Alternative 1** as proposed herein would require that reference points for setting harvest levels be established for each individual unit within each of the snapper and grouper complexes. To achieve that goal would be a substantial undertaking and would require substantial modifications to the entire harvest monitoring program in the USVI. New forms would have to be developed, port samplers funded and trained, educational programs implemented to ensure that all landed fish are properly identified to the species level by the samplers and by law enforcement representatives, effective intercept strategies devised, and the fishermen convinced to cooperate with this program. Furthermore, a similar scheme would have to be developed from scratch for the recreational sector as there is presently no monitoring program for recreational harvest in the USVI.

Defining reference points for grouper and snapper units is considerably more tractable in Puerto Rico, with the result that application of **Alternative 1** also would be more tractable from an administrative perspective. In Puerto Rico, landings generally are reported to species although the thoroughness of that reporting varies among species. For parrotfish, only a very small percentage of the total harvest is accurately reported to species; greater than 99 percent of harvested parrotfish are reported to the unclassified (i.e., not reported to species) ‘parrotfishes’ category. Again, this is not a significant problem because parrotfish are managed as a single unit, although it remains a worthwhile goal to record parrotfish harvest to species to facilitate future modifications to the parrotfish Unit. At the opposite end of the spectrum, most snapper that are harvested by commercial fishermen from Puerto Rico waters are reported to species, with only about 1 out of 20 fish being reported to the generic ‘snappers’ category. A worthwhile goal is to obtain 100 percent reporting to species for all harvested resources. Unfortunately, grouper are even more distant from this goal than are snapper, with between 35-53 percent by weight of the classified landings being reported to the unclassified ‘sea basses’ category. To fully achieve the mandate of **Alternative 1** would therefore require a considerable administrative investment, less extensive than that described for the USVI but still substantial.

An initiative is underway to improve commercial fisheries data collection in both Puerto Rico and the USVI, but the proposed program is controversial particularly with the fishermen and is not presently associated with a source of funding. Moreover, the program is specific to the commercial sector so complimentary data for the recreational fisheries would remain unavailable. Although final program design and associated costs presently remain under consideration, an effective program is certain to require considerable investment in personnel, equipment, and the administrative environment. This is not to say that the program is not necessary and needed, only that a substantial increase in the administrative burden is an inherent component of the revised data collection program.

The administrative burden associated with **Alternative 2** of Action 3(a) would be considerably less than that described above for **Alternative 1**, but the full administrative burden is predicated upon the choice of sub-alternatives. In general, **Alternative 2** eliminates the obligation to report, monitor, and manage either the grouper or the snapper complexes according to individual Unit. Instead, all harvest within each of the snapper and grouper complexes will be combined within each complex for reporting and for management. The sub-alternatives will modify the administrative burden considerably. If **Alternative 2, Sub-alternative A** is chosen, aggregate reference points will only be applied to Puerto Rico harvest. This alternative does little to reduce the administrative burden because it does nothing to reduce the requirement to report and manage at the Unit level in the USVI. As explained above, the USVI is the area most lacking in species-level reporting and therefore most distant from an administrative environment supportive of species-level reporting. Some administrative relief would be obtained by aggregating landings in Puerto Rico, but this relief ultimately would be counter-productive because it would require disregarding the administrative effort invested in obtaining species-specific landings information in the first place. Because there is some error associated with species-specific landings in Puerto Rico, some advantage could be gained by pooling within complexes and thereby eliminating effort applied to managing and modeling the unclassified component of catch. But, relief from this administrative burden would be far outweighed by the additional administrative obligations incumbent upon fisheries and data managers in the USVI. In contrast, **Alternative 2, Sub-alternative B** would provide substantial administrative relief for all of the reasons, but opposite logic, associated with **Sub-alternative A**. Catch would be aggregated within both the snapper and grouper complexes in the USVI, where data are only amenable to analysis at this level anyway. Catch would not be aggregated in Puerto Rico, where landings are now reported to species albeit with varying levels of accuracy. The administrative burden would therefore change little in the USVI from the present reality, although administrative obligations as outlined for Puerto Rico in response to **Alternative 1** would still be realized. From an administrative perspective, the least burdensome sub-alternative within **Alternative 2** would be **Sub-alternative C**. That sub-alternative alleviates the requirement to report and manage landings at any level below the complex within either Puerto Rico or the USVI. The result would be no additional administrative requirements in the USVI, where reef fish harvest already is reported and managed at the level of the complex. Fishermen already comply with this program to a greater or lesser degree, there would be no need for additional employment and training of port agents, and the forms and functionalities presently in place would continue to suffice. Administrative obligations would be expected to decrease in Puerto Rico as there would no longer be a need for fisheries managers to provide detailed landings forms and no obligation for the fishermen to complete those detailed forms. **Alternative 2, Sub-alternative C** therefore results in the most benign administrative burden within **Alternative 2**.

By defining aggregate reference points only for grouper, while still requiring management of snapper at the level of the individual Unit, **Alternative 3** of Action 3(a) falls in-between **Alternatives 1** and **2** with respect to changes in the administrative burden. This alternative would demand less administrative attention than **Alternative 1** but more than any option within **Alternative 2**. Reasons for this are discussed in the paragraphs above. In summary, this alternative requires much less information to accomplish than does **Alternative 1** but, because detailed collection and management of species-specific landings data for snapper still would be required, **Alternative 3** with any sub-alternative would be more administratively burdensome than would be the case for any sub-alternative within **Alternative 2**. Within **Alternative 3, Sub-alternative B** is the most realistic and administratively benign because it is most consistent with extant data collection efforts in the U.S. Caribbean. That sub-alternative would require species-specific reporting of grouper in Puerto Rico but not in the USVI. Since harvested grouper already are reported to species in Puerto Rico, albeit with a substantial component of unclassified landings, the increase in the administrative burden would be minimized. However, because species-specific reporting of snapper still would be required in both Puerto Rico and the USVI, the administrative burden associated with snapper reporting and management would be substantially increased relative to any of the sub-alternatives within **Alternative 2** as discussed above. **Sub-alternative A** provides little administrative relief because the obligation remains to report snapper and grouper landings at the species level in the USVI where those data are not presently available. **Sub-alternative C** reduces the administrative burden relative to **Sub-alternative A** but does not achieve the relief implicit within **Sub-alternative B** because it still requires that species-specific landings data for snapper be available from the USVI. Those data are not presently available and will not be for the foreseeable future.

The least burdensome alternative from an administrative standpoint would be **Preferred Alternative 4**. This alternative is consistent with data collection and management efforts as the presently stand in both Puerto Rico and the USVI. For the USVI, each of the snapper and grouper complexes would be managed in aggregate, and that is how the data are presently collected in the USVI. As commercial and recreational data collection efforts are improved in the USVI, management strategies for both grouper and snapper can be modified to accommodate those more highly resolved data, and those modifications will create an additional administrative burden reflecting modifications to port sampling, data streaming, and analytical procedures. Until then, **Preferred Alternative 4** provides the most administratively benign approach to management of grouper and snapper complexes in the USVI. For Puerto Rico, data are available with which to manage both grouper and snapper at the level of the individual unit. However, as discussed above, the data regarding grouper landings in Puerto Rico include a substantial proportion of unclassified landings. In contrast, the landings data regarding snapper are predominately reported to the species level with consistently less than 10 percent of the landings reported to the unclassified category (Figure 4.3.1). **Preferred Alternative 4** appropriately addresses the data situation for both complexes and therefore would create the least administrative burden with respect to port sampling, data streaming, and analytical procedures.

Action 3(b) Sector allocation/management (Puerto Rico only)

Alternative 1 of Action 3(b) would maintain the present situation with regard to managing the commercial and recreational harvest sectors in Puerto Rico. An initial administrative burden would be expected because, at present, there are no harvest quotas or guidelines for the recreational sector in Puerto Rico. Quotas would have to be established, and that effort will require modeling and/or analysis of the presently available data. However, because the establishment of catch quotas for the recreational sector in Puerto Rico is inherent within Action 2(a), and that action calls for a combined commercial and recreational quota, **Alternative 1** adds no additional administrative burden beyond that resulting from implementation of Action 2(a).

Preferred Alternative 2 requires separation of the commercial and recreational catch, establishment of separate quotas for each sector, and implementation of separate monitoring and accountability measures for each sector. Additional administrative burdens would be realized as a result. Because landings data are presently obtained, for the commercial sector via the commercial trip ticket effort and for the recreational sector via the MRFSS program, acquiring and separating the data would require no additional administrative effort. Initial effort would be required to establish landing quotas, but those quotas would be derived anyway as an outcome of Action 2(a). The largest additional burden would be realized from separately monitoring and enforcing the quotas, separately identifying that harvest is approaching the sector-specific quotas, and applying sector-specific AMs as necessary. These administrative burdens would be offset to some degree, and potentially to a considerable degree, by more effective and appropriate management of the individual sectors. In particular, separating management of the two sectors will directly reduce competition for a limited resource between the two sectors and will eliminate the dependence of one sector on the harvest activities of the other. Those outcomes will reduce conflict between sectors and may, as a result, reduce the likelihood of litigation and associated administrative obligations.

Action 3(c) Geographic allocation/management

The no action **Alternative 1** would cause little change to the administrative environment. Although reef fish and conch landings in the U.S. Caribbean are reported by island group, quotas and regulations are applied on a pan-U.S. Caribbean basis rather than by island group. Choosing **Alternative 1** would maintain this situation. Because no geographic division lines would be developed to demarcate sub regions within the U.S. Caribbean EEZ, no additional effort would be required to establish those boundaries or to monitor them.

An increase in the administrative burden would be expected in response to implementation of **Preferred Alternative 2**. With regard to actual harvest, quotas would be established for the EEZ of each island group. To ensure that annual harvest is maintained within those quotas, additional effort will be required to track landings independently for each island group, to identify potential overages in a timely manner, and to efficiently and effectively reduce harvest so as to achieve but not exceed the quota. This additional administrative burden may be offset to some degree by the smaller universe of stakeholders to whom the message must be delivered. For example, if the St. Croix snapper quota is met, only the fishermen on St. Croix will have to be notified. An increase in administrative effort also will be required to establish the formal dividing lines, to distribute that information and to ensure that it is understood by all members of the affected user groups, and to enforce access to those sub regions on the high seas or at the dock. A fully effective monitoring and enforcement program could be a substantial undertaking. However, it is not likely that there would be any noticeable difference among sub-alternatives with regard to the added administrative burden. Those sub-alternatives simply provide slightly different approaches to drawing the lines. Geographic differences among sub-alternatives are not large, so choosing one over the other would be unlikely to increase enforcement efforts and would have no impact on other administrative requirements.

6.4 ACTION 4: Management Measures

6.4.1 Direct and Indirect Effects on the Physical, Biological, and Ecological Environment

Action 4(a) Species-specific parrotfish prohibitions

The **Preferred Alternative 2** prohibition on harvest of midnight, rainbow, and blue parrotfish may have substantial benefits for the reef ecosystems of the U.S. Caribbean. These three species, along with all species of parrotfish, are herbivorous grazers of the reefscape, providing an essential ecological service by controlling the proliferation of algal species that otherwise overgrow the reef surface and interfere with settlement of coral propagules (Brock 1979, Mumby et al. 2006). Midnight, rainbow, and blue parrotfish exhibit the largest maximum size of the parrotfish species that inhabit U.S. Caribbean coral reefs, but they are also of greatest conservation concern because of their relatively long population doubling time, relatively low resilience, and low abundance on Caribbean reefs (Table 4.4.1). Although analyses of the abundance of parrotfish, on coral reefs subject to commercial and recreational harvest relative to pristine reefs, are rare within the U.S. Caribbean, there is concern among scientists and managers that these three large species are depauperate on harvested reefs relative to pristine reefs. While the evidence is not definitive, caution is advised due to the essential ecological services provided by these species. Both direct and indirect effects would be expected from limiting harvest of blue, rainbow, and midnight parrotfish. Direct effects include those resulting from grazing by parrotfish on the reefscape, an activity that ameliorates competition between algae and coral propagules. Indirect effects relate to the provision of habitat by the coral whose abundance may be enhanced by increased recruitment due to that reduced competition with algae. Less substantial indirect effects would include materials transfer between reefs and seagrass beds that also are populated by parrotfish during their life cycle.

Action 4(b) Recreational bag limits

To the extent that bag limits reduce recreational fishing activity, direct and indirect effects on the physical environment may be realized. Those direct and indirect effects would emanate from reduced interaction between fishing gear and the benthic substrate, especially living coral. The primary effects of recreational fishing on the physical environment of the coral reef generally result from fishing gear interactions with the sea floor. Fishing gear can damage or disturb bottom structure, and living coral is particularly sensitive to such damage and disturbance. No action **Alternative 1** would maintain the status quo and therefore would not be expected to elicit change. **Alternatives 2-4** would be expected to progressively enhance the direct and indirect effects of this action, reducing harvest by increasing percentages depending upon the bag limit and the group to which the aggregate bag limit is applied. By establishing a vessel limit that essentially caps the recreational harvest from any one of the groups for each individual vessel, **Alternative 6** provides an upper limit to recreational harvest and maximizes the positive effects, both direct and indirect, to the physical, biological, and ecological environment. **Alternative 5** reiterates the prohibition on take of three species of parrotfish in the U.S. Caribbean EEZ that is proposed in **Alternative 2** of Action 4(a) and therefore reiterates the direct and indirect benefits discussed above. **Alternative 7** was proposed by the Council at their April 2010 meeting. That alternative would provide the greatest flexibility to the individual fisherman but would allow for the continued harvest of ecologically important parrotfish. However, in combination with **Alternative 2** of Action 4(a), harvest of the three largest parrotfish species (midnight, rainbow, blue) would not be allowed. Based upon data from 2006-2007, an allowance of two parrotfish per fisher would be expected to reduce the parrotfish catch by a minimum of 20 percent (Figure 4.4.1) and probably more since parrotfish are rarely reported in the recreational harvest from the U.S. Caribbean EEZ. Moreover, if **Alternative 2** of Action 4(a) is implemented, the three largest (and therefore most appealing to recreational fishers) of those parrotfish species will no longer be available for harvest, in which case the reduction in parrotfish take may be even greater. The physical, biological, and ecological benefits provided by parrotfish would be expected to be enhanced accordingly. **Preferred Alternative 8**, proposed by the Council at their September 2010 meeting, constrains the total take of snapper, grouper, and parrotfish to no more than five per person per day and no more than 15 per vessel per day, with the additional restriction that no more than two parrotfish may be harvested per person per day and no more than six parrotfish may be harvested by fishers aboard a single vessel each day. Thus, **Preferred Alternative 8** combines the parrotfish restrictions included in **Alternative 7** with the individual snapper and grouper bag limits included in **Alternative 3**, and would be expected to reduce both the direct (fishing gear impacts) and the indirect (reduced parrotfish harvest resulting in enhance availability of critical Acropora settlement substrate) impacts to the physical, biological, and ecological environment.

Action 4(c) Additional parrotfish harvest reductions

Action 4(c) proposes to further reduce harvest of parrotfish from EEZ waters surrounding each of St. Croix, St. Thomas/St. John, and Puerto Rico. **Alternative 1** proposes no action and would therefore not be expected to provide any enhancements to the physical, biological, or ecological environment of U.S. Caribbean coastal and EEZ waters. **Alternative 2** provides three sub-alternatives, each of which provides similar but island-specific enhancements to the physical, biological, and ecological environment. **Preferred Sub-alternative 2A** proposes to reduce parrotfish harvest from St. Croix EEZ waters by an additional 5.8822 percent, equivalent to 15,000 pounds, resulting in a proposed ACL of 240,000 pounds for St. Croix. It is likely that such an additional reduction in parrotfish harvest will enhance the physical, biological, and ecological environment by increasing the rate of grazing of parrotfish, thereby reducing macroalgae abundance and indirectly increasing the availability of critical Acropora settlement substrate. **Sub-alternatives 2B** and **2C** similarly restrict parrotfish harvest on St. Thomas/St. John and Puerto Rico, respectively. **Sub-alternatives 2B** and **2C** would be expected to enhance the physical, biological, and ecological environments of St. Thomas/St. John and Puerto Rico, respectively, but to a lesser degree relative to St. Croix because the parrotfish harvest on the latter two islands is considerably smaller. Regardless, overgrazing also is a possibility, resulting in the denuding of Caribbean coral reefs with possible adverse impacts to other coral species (Chaves-Fonnegra and Zea 2011). Overgrazing may mitigate the positive effects of reduced parrotfish harvest and result in degradation of the physical, biological, and ecological environment.

6.4.2 Direct and Indirect Effects on the Economic and Social Environments

Action 4(a) Species-specific parrotfish prohibitions

Alternative 1 is the no action alternative. As such, **Alternative 1** would not affect fishing for or possession of parrotfish in the EEZ or landings of parrotfish from the EEZ. Hence, **Alternative 1** would have no economic or social impact beyond the baseline.

Preferred Alternatives 2A, 2B, and **2C** of Action 4(a) follow logically from **Preferred Alternative 2(h)** of Action 2(a). **Preferred Alternative 2A** would prohibit fishing for or possession of midnight parrotfish in the EEZ. **Preferred Alternative 2B** would apply that prohibition to blue parrotfish, and **Preferred Alternative 2C** would apply the prohibition to rainbow parrotfish. Parrotfish are a shallow-water reef fish. None of Puerto Rico's recreational fishers interviewed for MRFSS in 2006 or 2007 reported catching parrotfish in the EEZ. This suggests **Preferred Alternatives 2A, 2B** and **2C** would have little to no economic or social impact on recreational fishers of Puerto Rico.

Landings of midnight, blue, and rainbow parrotfish represent a very small portion of all commercial parrotfish landings in Puerto Rico from 1983 to 2007, and in most years during this 25-year period, there were no reported landings of these three species. From 1999 to 2007, annual adjusted landings of blue parrotfish averaged 15 pounds, with no landings after 2003. The highest adjusted landings of blue parrotfish (469 pounds) occurred in 1994 (see Table 5.3.17 in Section 5.3.1). Reported landings of midnight parrotfish have been infrequent. From 1983 to 2007, commercial landings of midnight parrotfish were reported in only 4 years, peaking in the first year at 333 pounds (adjusted weight). From 1999 to 2007, an average of 4 pounds (adjusted weight) of midnight parrotfish was landed annually, although landings were reported in only two of those years. Rainbow parrotfish were first reported to be landed in 1995, and an average of 553 pounds (adjusted weight) were landed annually from 1999 to 2007, although none were reported to be landed in 2007. If the adjusted landings account for all commercial landings of these three species in Puerto Rico, combined landings for these species account for approximately half a percent of annual landings of all parrotfish in both pounds and dollars. However, at least 98.6 percent of each year's adjusted commercial landings of parrotfish are in the generic category of "Parrotfish" during the years from 1983 to 2007, and from 1999 to 2007, generic landings represent an average of 99.5 percent of annual landings of all parrotfish. It is reasonable to expect that commercial landings of midnight, blue, and rainbow parrotfish are included among these generic landings. Therefore, the actual percent of all parrotfish landings represented by blue, rainbow, and midnight parrotfish is unknown due to lack of species-specific reporting of parrotfish landings. However, according to a comment made at the April 27, 2009 scoping meeting for this amendment in San Juan, commercial and recreational fishers in Puerto Rico catch the same kind of parrotfish and in the same areas. That comment suggests little to none of the commercial landings of parrotfish result from fishing in the EEZ, and if correct, **Preferred Sub-alternatives 2A, 2B** and/or **2C** would have little to no economic or social impact on commercial fishers, their families, and fishing communities of Puerto Rico.

MRFSS is not conducted in the USVI, so there are no data regarding annual recreational landings of parrotfish or any other species. Hence, the economic and social impacts of **Preferred Alternatives 2A, 2B** and/or **2C** on recreational fishers of the USVI would be unknown. However, as in Puerto Rico, it is expected that the vast majority of parrotfish that are caught by recreational fishers of the USVI are taken in territorial waters because parrotfish generally occupy shallow-water coral reef and seagrass habitats. Thus, Preferred Sub-alternatives 2A, 2B, and/or 2C would have little to no economic or social impact on recreational fishers, their families, and fishing communities in the USVI.

Parrotfish landings represent a substantial portion of St. Croix's annual commercial landings of all species. During the 10-year period from 1998 to 2007, an average of approximately 31 percent of St. Croix's annual commercial landings by weight derived from parrotfish landings. Parrotfish landings are not so substantial in St. Thomas/St. John; from 2000 to 2007, they made up an average of approximately 6 percent of the district's annual commercial landings of all species by weight. The annual average of parrotfish landings in 2006 and 2007 was 361,229 pounds in St. Croix and 42,528 pounds in St. Thomas/St. John.

There was a general increase in commercial landings of parrotfish in both St. Croix and St. Thomas/St. John from 2000 to 2006, followed by a significant decline in both island groups in 2007 (Figure 6.4.1). During these eight years, St. Croix's landings of parrotfish accounted for approximately 87 percent of the USVI's annual commercial landings of parrotfish by weight and 86 percent by dollars, on average. Landings of blue, midnight, and rainbow parrotfish are unknown because any species of parrotfish that are commercially landed in the USVI are reported within the broad category of parrotfish. However, reasonably foreseeable significant adverse impacts on the human environment are not anticipated because any harvest of these species would occur predominately in state rather than EEZ waters, fishers relate that these three large species of parrotfish are not commonly caught using the prevalent harvest gear, and the three species are relatively rare on Caribbean coral reefs (Table 4.4.1).

Major commercial fishing areas include both territorial and federal waters off St. Croix's east coast, where the East End and Lang Bank fishing grounds are popular among netfishers looking to catch parrotfish and other reef species (Valdés-Pizzini et al. 2010). Lang Bank is also popular with divers and trap fishers. Parrotfish are harvested in federal waters off St. Croix; however, it is unknown what percent of commercial parrotfish landings in St. Croix are composed of blue, midnight, and rainbow parrotfish that derive from the EEZ. The economic and social impacts of **Preferred Alternatives 2A, 2B,** and **2C** are unknown, although it is likely that St. Croix fishers, their families, and fishing communities could experience larger adverse impacts than their counterparts in St. Thomas/St. John and possibly significantly larger adverse impacts than their counterparts in Puerto Rico. However, reasonably foreseeable significant adverse impacts on the human environment are not anticipated because St. Croix fishers relate that these three large species of parrotfish are not commonly caught using the prevalent harvest gear and because the three species are relatively rare on Caribbean coral reefs (Table 4.4.1).

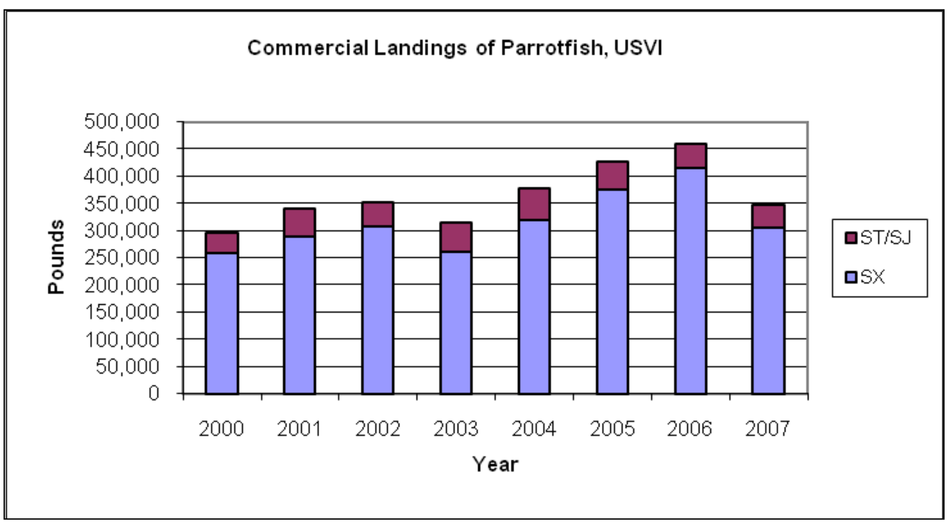

Figure 6.4.1. Commercial landings of parrotfish in St. Croix and St. Thomas/St. John, 2000-2007.

In summary, **Alternative 1** of Action 4(a) is the no action alternative and would not have any added short-term economic or social impacts. **Preferred Alternative 2** of Action 4(a) follows logically from **Preferred Alternative 2h** of Action 2(a) for rainbow, blue and midnight parrotfish and would have direct adverse short-term economic and social impacts on the U.S. Caribbean fishers who take midnight, rainbow, and/or blue parrotfish in the EEZ. It is expected that they could mitigate for loss of harvest of these species from the EEZ, if there is any, by either increasing effort in territorial waters or by targeting other parrotfish or non-parrotfish species in federal waters, subject to any ACL limitations on those species.

Action 4(b) Recreational bag and vessel limits

Alternative 1 is the no action alternative, which would not establish a recreational bag limit on reef fish harvest in the EEZ. It would not have an economic or social impact beyond the baseline.

Alternative 2 of Action 4(b) would allow larger recreational catches per person than **Alternative 3**, and **Alternative 3** would allow larger recreational catches per person than **Alternative 4**. Hence, among these three alternatives, **Alternative 4** would likely have the largest adverse economic and social impacts and **Alternative 2** would likely have the lowest if recreational fishing of snapper, grouper, and parrotfish species occurs in federal waters. However, **Alternative 5** would essentially prohibit recreational fishing of parrotfish in federal waters, and would have the largest adverse economic impact among **Alternatives 2** through **5** for parrotfish. **Alternative 5** could be especially harmful to subsistence fishers of the USVI, especially St. Croix, because ethnographic evidence suggests they are more dependent upon parrotfish than the Puerto Rican counterparts.

The largest adverse economic and social impacts of **Preferred Alternative 8** and **Alternatives 2** through **7** of Action 4(b) could be on recreational fishers of St. Thomas/St. John and St. Croix because more fishable habitat is in the EEZ off St. Thomas/St. John and St. Croix than in the EEZ off Puerto Rico. Boat limits imposed by **Alternative 6, Alternative 7,** and **Preferred Alternative 8** could adversely affect charter vessel operations because their catch of parrotfish and combined catch of snapper, grouper, and parrotfish would be limited, which could discourage anglers from buying their services.

Preferred Alternative 8 of Action 4(b) is a combination of a daily personal limit and daily vessel limit. Specifically, it combines personal daily limits of two parrotfish per person (**Alternative 4C** of two parrotfish per person) and five snapper, grouper and parrotfish combined per person with vessel limits of six parrotfish per boat and 15 snapper, grouper, and parrotfish combined per boat. The vessel limits are three times the personal limits, which is equivalent to **Alternative 6B**, which is smaller than **Alternative 6C**. Consequently, the adverse economic and social impact on charter vessel operations could be larger with **Preferred Alternative 8** than **Alternative 6C**.

None of the recreational bag limits would apply to a person with a commercial fishing license in Puerto Rico or the USVI. Currently, there is a moratorium on commercial fishing licenses in the USVI; however, Puerto Rico does not limit the number of commercial fishing licenses. The cost of a commercial fishing license in Puerto Rico is either $10 for a beginner or $40 for an experienced commercial resident fisher and $250 for a nonresident. The beginner license is typically valid for one year and cannot be renewed (Juan Agar, pers. comm.), and one for an experienced fisher is valid for 4 years, which can be renewed. A resident fisher is required to show from tax returns over a year or more that at least 20 percent of his/her income derives from fishing to obtain an experienced commercial fishing license (Juan Agar, pers. comm.). That income requirement suggests that Puerto Rico's recreational fishers would be able to obtain a one-year beginner commercial license to avoid the recreational bag limit, but would have to show at least 20 percent of his/her annual income derived from fishing to continue to have a commercial license. The same income requirement does not appear to hold for nonresident fishers. Note that the 20 percent minimum income requirement suggests that a Puerto Rican fisher who derives less than 20 percent of his/her annual income from fishing cannot be a commercial fisher although s/he sells all or part of the catch. That may explain the prevalence of recreational fishers in Puerto Rico who sell some of their catch.

The other economic cost of a Puerto Rico commercial license is the time and money spent to report landings caught under that license, if any. If a recreational fisher, who presently catches more individuals in the EEZ than would be allowed by the proposed bag limits, purchases a resident or nonresident commercial fishing license and reports his or her landings caught under that license, such landings could compromise reported commercial landings of snapper, grouper, and/or parrotfish species in Puerto Rico. These landings could be counted against the commercial ACL(s) of grouper, snapper, and/or parrotfish in Puerto Rico. Thus, there would be unintended competition among commercial and recreational fishers for the allowed commercial catch and possibly increased overage and higher overage of commercial catch during a fishing season. That overage could result in a shortened fishing season and diminished commercial landings the next year (see Action 5(b)), which would have negative economic and social impacts on commercial fishers in the snapper, grouper, and/or parrotfish fisheries of Puerto Rico. If the fisher self-identifies as a recreational fisher, who just happens to have a commercial fishing license, s/he may wrongfully not report her or his landings of these species caught under the license because there is no existing requirement to report recreational landings.

If the economic and social cost of either **Preferred Alternative 8** or **Alternatives 2, 3 4, 5, 6, or 7** is greater than the economic and social cost of obtaining a commercial fishing license for a USVI recreational fisher, the lower cost option would be to purchase a nonresident commercial license for $250 that is good for 4 years and can be renewed. The personal and social cost of obtaining a commercial fishing license may be understood as the loss of being officially identified as both a recreational fisher and member of a recreational fishing community, although the person may continue to self-identify and be identified in the Virgin Islands as a recreational fisher. Similarly, if the economic and social cost of either **Preferred Alternative 8** or **Alternatives 2, 3 4, 5, 6, or 7** is greater than the economic and social cost of obtaining a beginner commercial license for a Puerto Rico recreational fisher, the lower cost option would be to purchase a beginner commercial license, although the savings may be good for only one year. After the expiration of the resident's beginner commercial license, the Puerto Rican recreational fisher would experience any adverse economic and social impacts that result from the bag or vessel limits. However, the least cost option may be to substitute fishing in territorial waters for fishing in federal waters to mitigate for any lost landings and associated economic and social benefits because of the bag limits.

Action 4(c) St. Croix parrotfish harvest reductions

Preferred Sub-alternative 2A of Action 4(c) would further reduce the St. Croix parrotfish ACL from 255,000 pounds that would be established by **Preferred Alternative 2(g)i** of Action 2 to 240,000 pounds. **Sub-alternatives 2B** and **2C** would apply similar percent reductions to St. Thomas/St. John and Puerto Rico, respectively. **Alternative 1** would have the least adverse economic and social impact on U.S. Caribbean fishers because it would not further reduce any of the parrotfish ACLs. **Preferred Sub-alternative 2A** would have the largest adverse economic and social impact on parrotfish fishermen of St. Croix, because it would further reduce the St. Croix parrotfish ACL and likely further reduce annual landings. **Sub-alternatives 2B and 2C** would have the largest adverse economic and social impacts on fishermen of St. Thomas/St. John and Puerto Rico, respectively, because each one further reduces the island area's parrotfish ACL and likely further reduces its annual landings. If **Preferred Sub-alternative 2A** and **Sub-alternatives 2B and 2C** were combined, the combination would have the greatest adverse economic and social impact on fishermen of the U.S. Caribbean.

6.4.3 Direct and Indirect Effects on the Administrative Environment

Action 4(a) Species-specific parrotfish prohibitions

No additional direct or indirect effects on the administrative environment are anticipated in response to the **Alternative 1** no action option. It is likely that both direct and indirect effects would be realized in response to the **Preferred Alternative 2** option to prohibit harvest of blue, midnight, and rainbow parrotfish. Direct obligations would befall law enforcement agents to be able to properly identify the three species of prohibited parrotfish within the context of a milieu of parrotfish species in the landed catch. Indirect obligations would incur to track and prosecute these violations.

Action 4(b) Recreational bag limits

Administrative obligations would be increased by the implementation of bag limits, but those obligations would increase only marginally with increasingly restrictive bag limits or with a vessel limit. The initial increase would result from the increased effort required of law enforcement agents to monitor catch and to properly assign that catch to the appropriate species. However, little additional effort would be required to determine if the catch met a 10-fish, 5-fish, or 2-fish limit. Some effort would be required to ensure that the number of fishers on the vessel is adequate to account of the harvest of multiple individual limits. Finally, because the bag limits are restrictive relative to the **Alternative 1** case, it is likely that violations of this regulation would occur. Those violations would be without precedent so would constitute a new source of administrative effort, in the form of ticketing and prosecution, relative to the no action alternative.

Action 4(c) St. Croix parrotfish harvest reductions

This action would further reduce the parrotfish ACL; it would not change existing reporting requirements. Action 4(c) does not have any direct administrative impacts and its indirect impacts are dependent on subsequent actions, such as reducing the parrotfish fishing season in the EEZ. The smaller the ACL, the more likely there could be a reduced parrotfish fishing season, which more likely requires administrative action to implement and enforce a shortened federal fishing season.

6.5 ACTION 5: Accountability Measures

6.5.1 Direct and Indirect Effects on the Physical, Biological, and Ecological Environment

Action 5(a) Triggering accountability measures

The alternatives under this action will not have a direct effect on the physical, biological, and ecological environments. These alternatives simply supply the Council with a mechanism to address overruns of the annual catch limit proxies established and described in this amendment under Action 2. Indirect effects to the biological and ecological environment, however, would vary depending on the alternative selected as preferred, although no effects to the physical environment are expected with any of these alternatives. **Alternative 1**, the no action alternative, would maintain the status quo and no AMs would be triggered. While this alternative would have no direct biological or ecological effect, it also would not satisfy compliance with MSA mandates.

Alternative 2A would trigger AMs to be considered based on landings from a single-year. Such a process is the least precise among **Alternatives 2A-C**, and probably the least accurate, and may result in triggering AMs when, if more data were available, AMs might not need to be triggered at all. On the other hand, because such a one-year process is not very accurate, it may show that AMs should have been triggered earlier. Consequently, using a single-year trigger for AMs will result in a generally higher frequency of triggering AMs and adjusting the ACLs than a multi-year approach (i.e., **Alternatives 2B** and **2C**). **Alternative 2A** would result in a more conservative biological and ecological effect on resources than the no action **Alternative 1**.

Alternative 2B of Action 5(a) is more precise and accurate than **Alternatives 1** and **2A** in that it is based on a 2-year average. The resulting biological and ecological effects from the 2-year trigger approach would be expected to be more precise than a single-year trigger but still marginally acceptable due to the still relatively short 2-year sample period upon which the trigger is based. Potential biological and ecological effects would be similar to that for a single-year trigger in that AMs may be triggered more frequently than needed. The degree of difference between alternatives cannot be determined at this time. However, **Alternative 2B** represents a more statistically reliable method for triggering AMs than **Alternatives 1** and **2A**.

Alternative 2C of Action 5(a) is most precise and accurate when compared to **Alternatives 1, 2A,** and **2B** because it is based on a 3-year time period average. The resulting estimates of biological and ecological effects would be expected to be statistically more precise than a single- or 2-year trigger because it is based on more information (i.e., 3 years rather than 1 or 2 years) with results being more reliable. Indirect effects of **Alternative 2C** are anticipated to be more precise and accurate than other alternatives such that AMs would be triggered more reliably than when using a smaller data base (i.e., shorter time period) for the trigger. The indirect effect of all alternatives is that, when AMs are triggered based on the three-year average, the resource would be managed more conservatively than when AMs are not triggered. The degree of difference between alternatives cannot be determined at this time. However, **Alternative 2C** represents the most statistically reliable method for triggering AMs.

Alternative 3A, **Alternative 3B**, and **Preferred Alternative 3C** of Action 5(a) will have similar direct and indirect biological and ecological effects as **Alternatives 2A-C**, but prior to triggering an AM based on a single-, 2-, or 3-year average of landings, scientific advice (from the SEFSC and the Council SSC) would be needed to determine whether the ACL was exceeded due to increased catch, due to an improved data collection/monitoring effort, or due to a combination of the two. Such a consultation would assist the Council in its determination that catches actually exceeded the ACL. A Commercial Data Collection Improvement Program is under development by the SEFSC and is focused to provide more precise and accurate commercial s sector landings information for the U.S. Caribbean, and there is a real possibility that a greater amount of landings data will be collected for each island mass. For **Alternative 3A**, **Alternative 3B**, and **Preferred Alternative 3C**, a determination will have to be made to examine whether an overrun of the ACL was due to increased catches by fishers or through improved data collection/monitoring efforts. The SEFSC and the SSC will provide an analysis of the information and consult with the Council before any determination is made. A single year of landings beginning in 2010 will be the basis for the initial consultation and subsequent determination whether an ACL was exceeded or not. The addition of such a scientific review would result in a more reliable and defensible decision by the Council to take further management action by triggering an AM to redress ACL overages.

Action 5(b) Applying accountability measures

The alternatives under this action will not have a direct effect on the physical, biological, and ecological environments. These alternatives simply describe alternative measures to address overruns of the annual catch limit proxies established and described in this amendment under Action 2. Indirect effects to the biological and ecological environment, however, would vary depending on the alternative selected as preferred, although no effects to the physical environment are expected with any of these alternatives. **Alternative 1**, the no action alternative, would maintain the status quo and no AMs would be triggered. While this alternative would have no direct biological or ecological effect, it also would not satisfy compliance with MSA mandates.

The indirect biological and ecological effects of **Preferred Alternative 2**, which would shorten the season length to prevent a future overage, would result in reduction of fishing effort for the species undergoing overfishing. When fishing effort on a population is reduced, the general effect is an increase in individual size and abundance of individuals in the population, but the rate and extent of these changes cannot be determined at this time. **Preferred Alternative 2** could result in fishers being restricted to a shorter harvesting season, with the intent of restricting their harvest to levels less than the currently established ACL. Theoretically, the fish population would immediately begin to rebound towards non-fished levels via recruitment and growth. Another short-term effect may be that fishers harvesting non-regulated species or those species with quota remaining may incidentally catch species for which the ACL has been met. In such a case, regulatory discards (i.e., fish discarded due to harvest restrictions) may result in discard mortality. The level of such mortality cannot be determined at this time.

Fish and coral reef habitats would be indirectly affected **Preferred Alternative 2** and **Alternative 3** by a shortened season by not being subjected to the same degree of pre-AM interaction with fishers or gear. Trophic predator-prey interaction should begin to return to a "more natural state", which generally leads to a more species diverse reef community.

The biological and ecological indirect effects of **Alternative 3**, which would shorten the length of the fishing season by the amount needed to pay back the overage in addition to shortening the season length to prevent a future overage, would likely have a greater biological benefit than only reducing the length of fishing season as specified in **Preferred Alternative 2**. However, like **Preferred Alternative 2**, AMs that shorten the fishing season can increase the magnitude of regulatory discards and may not be as effective as AMs that lower the target level but still allow some catch.

A shortened season length as a result of **Alternative 3** (i.e., AM implementation to prevent a future overage) would result in reduction of fishing effort for the species undergoing overfishing. As explained for **Preferred Alternative 2**, reduction of fishing effort generally results in a more natural size distribution of individuals and a larger number of individuals in the population, but the rate and extent of these changes cannot be determined at this time. Also, similar to indirect effects of **Preferred Alternative 2**, fishers would not be allowed to harvest as much fish as before the ACL overrun, so the fish population theoretically would immediately begin to rebound toward a non-fished level via recruitment and growth.

6.5.2 Direct and Indirect Effects on the Economic and Social Environments

Action 5(a) Triggering accountability measures

Alternative 1 of Action 5(a) would not have an economic or social impact beyond the baseline. Without regulations that implement the AMs, **Alternative 2** and **Preferred Alternative 3** would have no added economic or social impacts. However, **Preferred Alternative 3** could have a smaller indirect adverse economic and social impact than **Alternative 2** because it would include considerations for improvements in reported landings that suggest larger landings that are not actually larger. Among the sub-alternatives of **Preferred Alternative 3**, **Preferred Sub-alternative C** could have the smallest indirect adverse economic and social impact because it would require inclusion of a 3-year average of landings as opposed to a two-year average (**Sub-alternative B**) or single year of landings (**Sub-alternative A**).

Preferred Alternative 3 of Action 5(a) would not have an economic or social impact on queen conch fishers in Puerto Rico or St. Thomas/St. John because there is no fishing for queen conch in the EEZ off Puerto Rico or St. Thomas/St. John, nor can fishers take conch from the EEZ off St. Croix and transport it through the EEZ for landing in either Puerto Rico or St. Thomas/St. John. **Preferred Alternative 3C** of Action 5(a)) would also not have an economic or social impact on St. Croix queen conch fishers because **Preferred Alternative 2g** of Action 2(b) would set the ACL for queen conch at 50,000 pounds, which is consistent with the current St. Croix limit set by the USVI.

Action 5(b) Applying accountability measures

Alternative 1 of Action 5(b) would not apply AMs and would have no economic or social impact. **Preferred Alternative 2** or **Alternative 3** of Action 5(b) would have the greatest adverse economic and social impacts if all landings derived from fishing in the EEZ; however, they do not. The vast majority of U.S. Caribbean catches of reef fish are believed to derive from territorial waters, as only about 14 percent of the fishable habitat in the U.S. Caribbean occurs in the EEZ (CFMC 2005: 236). If few of the landings for the species or units result from fishing in the EEZ, a shortened federal fishing season would have little economic or social impact.

Alternative 3 would likely have a larger adverse economic and social impact on fishers, their families, and fishing communities than **Preferred Alternative 2** because it would reduce the fishing season by a longer length of time. However, the actual economic and social impacts of either **Preferred Alternative 2** or **Alternative 3** are greatly dependent upon the percent of landings that derive from fishing in the EEZ and the chosen ACLs relative to current landings. With more fishable habitat in their territorial waters, Puerto Rican fishers would be most able to mitigate for any losses of landings due to a shortened federal fishing season by shifting into territorial waters, if the territorial season were to remain open. With the least amount of fishable habitat in territorial waters off St. Thomas/St. John, it is expected that St. Thomas/St. John fishers would be least able to mitigate for lost landings due to a shortened federal fishing season.

Given the limited amount of fishing for reef fish in the EEZ, it is reasonable to expect that fishers could mitigate most of the adverse economic and social impacts of a shortened federal fishing season, if any, by shifting any fishing from the EEZ to territorial waters, if territorial harvest is allowed. However, the amount of fishable habitat in territorial waters and the EEZ vary substantially. Only 4.7 percent of Puerto Rico's fishable habitat occurs in the EEZ, and the vast majority of that area is found off the west coast of Puerto Rico. Conversely, 38 percent of the USVI' fishable habitat occurs in the EEZ. St. Thomas and St. John have a greater reliance on the EEZ, with approximately 43 percent of the total shelf occurring in the EEZ, as compared to that of St. Croix, which only has approximately 18 percent of its waters in the EEZ (CFMC 2005).

From 2000 to 2007, Puerto Rico's annual commercial snapper landings accounted for, on average, approximately 88 percent of U.S. Caribbean annual commercial snapper landings (pounds), followed by St. Thomas/St. John's landings that accounted for approximately 11 percent and St. Croix's landings that accounted for the remaining nine percent of those U.S. Caribbean commercial landings. Because the majority of commercial snapper are landed in Puerto Rico and because Puerto Rico has significantly less fishable habitat in the EEZ than the USVI, it is reasonable to expect that a shortened snapper fishing season in the EEZ would not substantially reduce U.S. Caribbean landings of snapper. Puerto Rico's fishers could likely mitigate for any losses of snapper landings by increasing effort in territorial waters.

USVI snapper fishers may have significantly less ability to mitigate for lost catch due to a shortened fishing season in the EEZ. For example, approximately 55 percent of the commercial snapper landed in St. Croix from 2000 to 2001 occurred in the EEZ according to trip ticket data (CFMC 2005). The amount and percentage of the catch from the EEZ may have been reduced since then by regulations, such as seasonal/area closures, that have been implemented after 2001.

From 2000 to 2007, Puerto Rico's annual grouper landings represented, on average, approximately 54 percent of U.S. Caribbean grouper landings (pounds) and St. Thomas/St. John's annual grouper landings represented approximately 29 percent and St. Croix's annual grouper landings represented approximately 17 percent of those U.S. Caribbean landings. Trip ticket data from 2000 to 2001 suggests approximately 44 percent of the reported commercial grouper landed in St. Croix occurred in the EEZ (CFMC 2005). The amount and percentage of the catch from the EEZ may have been reduced since then by regulations, such as the seasonal closure of Grammanik Bank, that have been implemented after 2001.

From 2000 to 2007, St. Croix's annual commercial landings of parrotfish accounted for, on average, approximately 66 percent of the U.S. Caribbean's commercial landings of parrotfish, followed by Puerto Rico with approximately 24 percent and St. Thomas/St. John with approximately 10 percent of those annual U.S. Caribbean landings of parrotfish. As stated in Section 6.4.2, there is expected to be no landings of parrotfish in Puerto Rico that are caught in the EEZ.

Current federal regulation prohibits fishing for or possession of queen conch in or from the Caribbean EEZ from June 1 through October 31 each year. Taking queen conch from the EEZ, except for an area off St. Croix, and transporting it outside that area to either St. Thomas/St. John or Puerto Rico is prohibited at all times. Neither **Preferred Alternative 2** or **Alternative 3** would have an economic or social impact on queen conch fishers in Puerto Rico or St. Thomas/St. John because there is no fishing for queen conch in the EEZ off Puerto Rico or St. Thomas/St. John nor can fishers take conch from the EEZ off St. Croix and transport it through the EEZ for landing in either Puerto Rico or St.

Thomas/St. John. Neither **Preferred Alternative 2** nor **Alternative 3** would have an adverse economic or social impact on St. Croix conch fishers because **Preferred Alternative 2(g)** of Action 2(b) equals the ACL to the St. Croix District's 50,000-pound limit.

In summary, **Alternative 1** would not apply the AMs and would have no economic or social impact. **Alternative 3** would likely have a larger adverse economic and social impact on fishers, their families, and fishing communities than **Preferred Alternative 2** because it would reduce the fishing season by a longer length of time. However, the actual economic and social impacts of either **Preferred Alternative 2** or **Alternative 3** are greatly dependent upon the percent of landings that derive from fishing in the EEZ and the chosen ACLs relative to current landings. With more fishable habitat in their territorial waters, Puerto Rican fishers are most able to mitigate for any losses of landings due to a shortened federal fishing season by shifting into territorial waters, assuming the territorial season remains open. With the least amount of fishable habitat in territorial waters off St. Thomas/St. John, it is expected that St. Thomas/St. John fishers would be least able to mitigate for lost landings due to a shortened federal fishing season.

Preferred Alternative 2 of Action 5(b) would not have an economic or social impact on queen conch fishers in Puerto Rico or St. Thomas/St. John because there is no fishing for queen conch in the EEZ off Puerto Rico or St. Thomas/St. John, nor can fishers take conch from the EEZ off St. Croix and transport it through the EEZ for landing in either Puerto Rico or St. Thomas/St. John. **Preferred Alternative 2** of Action 5(b) would also not have an economic or social impact on St. Croix queen conch fishers because **Preferred Alternative 2g** of Action 2(b) would set the ACL for queen conch at 50,000 pounds, which is consistent with the current St. Croix limit set by the USVI.

6.5.3 Direct and Indirect Effects on the Administrative Environment

Action 5(a) Triggering accountability measures

Alternative 1 is the no action alternative, and would not have an administrative effect. **Alternatives 2A-C** and **Alternatives 3A, 3B**, and **Preferred Alternative 3C** would define the trigger to AMs if the ACL is exceeded; however, they do not apply those measures. Without regulation that implements the AMs, **Alternatives 2** and **3** would not change existing fishing practices and would have no impact to enforcement. **Alternatives 3A, 3B**, and **Preferred Alternative 3C** would require the SEFSC to tally yearly landings and provide those numbers to the Council SSC, resulting in some administrative effect, albeit minor.

Action 5(b) Applying accountability measures

Alternative 1, the no action alternative, would not apply AMs. It would not have an administrative impact. **Preferred Alternative 2** and **Alternative 3** would establish the regulation that would reduce the length of the fishing season in the EEZ for a species or unit if the annual or average annual catch exceeded the ACL for the species or unit.

Preferred Alternative 2 would reduce the length of the fishing season in the EEZ for the species or unit by the amount of time needed to prevent overage. For example, if it were found that a single year's commercial landings or an annual average of those landings exceeded the commercial ACL by 10,000 pounds, and commercial fishers landed an average of 10,000 pounds a month, then the next federal fishing year would be shortened by one month under **Preferred Alternative 2**. **Alternative 3** would require a shorter fishing season than **Preferred Alternative 2** in the next fishing year in order to pay-back any overages. Using the previous example for **Alternative 3**, the next federal fishing year would be shortened by two months because the allowed commercial catch would be equal to the commercial ACL less the overage of 10,000 pounds. Both **Preferred Alternative 2** and **Alternative 3** would have similar administrative impacts to management because regulatory actions would have to be developed to implement AMs. Also, **Preferred Alternative 2** and **Alternative 3** would have minimal if any impact on enforcement.

6.6 ACTION 6: Framework Measures

6.6.1 Direct and Indirect Effects on the Physical, Biological, and Ecological Environment

The Council currently has at its disposal, three different regulatory vehicles for addressing fishery management issues. First, a full amendment may be developed to implement or modify management measures as necessary. The amendment process can take anywhere from one to three years dependent upon the level of complexity of the actions being considered. Second, the Council may vote for an interim or emergency rule that could remain effective for 180 days with the option to extend it for an additional 186 days. Interim, and/or emergency rules can be implemented only under limited circumstances and act as short-term management tools while permanent regulations are being developed through the amendment process. Third, the Council may prepare a regulatory amendment based on framework procedures. Typically, framework actions can take about nine months to implement, and are effective until modified.

The no action **Alternative 1** would not establish framework procedures to allow for adjustments to various management measures. This would maintain the current procedure for modifying management regulations, potentially causing delays in important changes. Often, when a modification to management measures is needed, corrective action is required quickly. Not allowing regulations to be adjusted through framework would most likely lead to extended delays in implementation of necessary changes. Such a scenario could be biologically detrimental since overfishing or other threats would persist until the appropriate modifications could be put in place through amendment action. Alternately, if new data shows a stock is doing better than previous assessments indicate and more restrictive management measures are maintained, unnecessary harvest restrictions could prevent the industry from harvesting optimum yield.

Under **Preferred Alternative 2** and **Alternative 3**, adjustments to regulations could be made with relative ease as new information becomes available. Unlike **Alternative 1**, **Preferred Alternative 2** and **Alternative 3** would likely be biologically beneficial for reef fish and queen conch. However, **Preferred Alternative 2** would provide better protection because the framework under **Preferred Alternative 2** is more comprehensive and will provide a larger framework for the Council to work under than **Alternative 3**. **Alternative 3** may inadvertently leave out some management measures which may be needed in the future. If changes to omitted measures are needed, a full plan amendment would be required. During the development of the full plan amendment, the measures that require change will still be in effect, potentially harming the reef fish and queen conch populations for a longer period of time.

Establishing framework procedures allows for periodic adjustments to management measures which could be implemented in a timely manner. Allowing management adjustments to be made through framework actions could eliminate the need to prepare and analyze individual amendments or amendment actions for each adjustment needed.

Framework actions may be implemented by the RA, or the RA and the Council and generally require less public and Council participation when compared to the lengthy amendment process. The majority of public participation and Council weigh-in on framework issues typically takes place when the framework procedures are initially drafted during the amendment process. This reduces the need for long public comment periods and periods of consideration by the Council, as would be the case under **Alternative 1**. Eliminating these time-consuming factors under **Preferred Alternative 2** and **Alternative 3** would enable harvest modifications to be expedited when they are most needed.

6.6.2 Direct and Indirect Effects on the Economic and Social Environments

Alternative 1 is the no action alternative and would have no direct economic and social impacts. It would not establish a framework to authorize setting, adjusting, and implementing of ACLs and AMs that could be deemed necessary to improve management of the resource, and hence, could indirectly result in lower long-term net economic and social benefits that derive from exploitation of the resources. Because **Preferred Alternative 2** and **Alternative 3** would establish such a framework, it is expected that the indirect long-term net economic and social benefits of **Preferred Alternative 2** and **Alternative 3** would be larger than those of **Alternative 1**.

6.6.3 Direct and Indirect Effects on the Administrative Environment

Alternative 1 would be the most administratively burdensome of the three alternatives being considered, because all modifications to the management measures outlined in Section 4.6 would need to be implemented through an FMP amendment, which is a more laborious and time consuming process than a framework action. **Preferred Alternative 2** would incur less of an administrative burden than **Alternatives 1** or **3** since several steps in the lengthy amendment process would be eliminated if the RA were given the latitude to adjust certain management regulations through framework actions. **Alternative 3** could potentially leave out important management measure and if they need to be changed in the future, developing a full plan amendment would be burdensome to managers. **Preferred Alternative 2** provides for a more comprehensive framework and will prevent that type of burden on managers.

6.7 Cumulative Effects Analysis

NEPA requires federal agencies to assess not only the indirect and direct impacts associated with regulatory actions, but also the cumulative impacts associated with those actions. NEPA defines a cumulative impact as the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time, and can either be additive or synergistic. A synergistic impact is when the combined impacts are greater than the sum of the individual impacts.

The following cumulative effects analysis (CEA) is based upon guidance offered in CEQ (1997). The report outlines 11 items for consideration in drafting a CEA for a proposed action. These items are:

1. Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals.
2. Establish the geographic scope of the analysis.
3. Establish the timeframe for the analysis.
4. Identify the other actions affecting the resources, ecosystems, and human communities of concern.
5. Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to change and capacity to withstand stress.
6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.
7. Define a baseline condition for the resources, ecosystems, and human communities.
8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.
9. Determine the magnitude and significance of cumulative effects.
10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.
11. Monitor the cumulative effects of the selected alternative and adapt management.

The CEA for the biophysical environment will follow these 11 steps. Cumulative impacts on the socio-economic environment will be analyzed separately.

1. Identify the significant cumulative impacts issues associated with the proposed action and define the assessment goals.

The CEQ cumulative impacts guidance states this step is accomplished through three activities. The three activities are as follows:

I. Identifying the direct and indirect impacts of the proposed actions.

Direct and indirect impacts of the proposed actions are summarized in Sections 6.1 through 6.6. Establishing ACLs, AMs, and redefining management reference points for snapper, grouper, parrotfish, and queen conch in the U.S. Caribbean will serve to restore and stabilize natural trophic and competitive relationships, rebuild species abundances, re-establish natural sex ratios, and contribute to the long-term health of the ecosystem while reinvigorating sustainable fisheries.

II. Identifying which resources, ecosystems, and human communities are affected.

The resources, ecosystems, and human communities affected by this action are described in Sections 5.0 and 6.0. These include:

1. Managed resources (snapper, grouper, parrotfish, and queen conch);
2. Non-target species (wenchman and creole-fish);
3. Habitat, including essential fish habitat;
4. Protected resources including marine mammals and corals;
5. And, Puerto Rico and USVI fishing communities

III. Identifying impacts that are important from a cumulative impacts perspective.

The effects most important from a cumulative impacts perspective are described in this CEA.

2. Establish the geographic scope of the analysis.

The immediate areas affecting managed resources, non-target species, habitat, and protected resources are federal waters of the U.S. Caribbean. The immediate areas affecting humans would include fishing communities of Puerto Rico and the USVI.

The following is a summary description of the distribution of queen conch and the reef fish species affected by this proposed amendment. More detailed descriptions of these species can be found in section 5.2.

Queen conch

The queen conch occurs in semi-tropical and tropical waters of the Atlantic Ocean, ranging from south Florida and Bermuda to northern South America, including the Caribbean Sea.

The queen conch generally occurs on expanses of shelf to about 250 ft (76 m) depth. It is commonly found on sandy bottoms that support the growth of seagrasses, primarily turtle grass (*Thalassia testudinum*), manatee grass (*Syringodium filiforme*), shoal grass (*Halodule wrightii*), and epiphytic algae upon which it feeds (Randall 1964, Stoner and Waite 1990). This species also occurs on gravel, coral rubble, smooth hard coral or beach rock bottoms, and sandy algal beds (CFMC 1996). Sandt and Stoner (1993) have shown that queen conch actively select among their habitats, with juveniles being more selective than adults, and are dependent on certain habitat requirements. The most productive nurseries occur in shallow (5-6 m deep) seagrass meadows (Stoner 1997). Juveniles exhibit a strong preference for intermediate densities of seagrasses, whereas adults show less habitat specificity (Stoner and Waite 1990).

Both commercial and recreational fishers of Puerto Rico and the USVI harvest queen conch. There is no evidence that there is subsistence queen conch harvest in Puerto Rico, and there is expected to be no subsistence queen conch harvest in the USVI. See Sections 5.3.2.9.5 and 5.3.2.10.6 and 5.3.2.11 for more detailed information about these fisheries in Puerto Rico, and see Section 5.3.3.6.5 for detailed information about the commercial sector in the USVI.

Fishing for and possession of queen conch in federal waters is restricted to an area off St. Croix, and this amendment would not end that restriction. Hence, only queen conch fishers of St. Croix could be affected by this amendment.

Relevant reef fish species

Reef fish species addressed in this amendment include Snapper Units 1 and 2, Grouper Units 1 to 4, and the Parrotfish Unit. In general, these species are found in tropical and subtropical waters of the western Atlantic stretching from the southeastern United States and Bermuda south through the Gulf of Mexico and Caribbean Sea to Brazil. Specific information on the distribution of these species is found in Section 5.2.2.

In general, reef fish are widely distributed in the Caribbean, occupying both pelagic and benthic habitats during their life cycle. Habitat types and life history stages are summarized in the Generic EFH Amendment (CMFC 2002) and in Section 5.2.2, and are incorporated by reference.

Commercial, recreational, and subsistence fishers of Puerto Rico and the USVI harvest species within Snapper Units 1 and 2, Grouper Units 3 and 4, and the Parrotfish Unit. Creole-fish, which is presently included in Grouper Unit 3, would be removed from the unit because it is not targeted by fishers. For more detailed descriptions of Puerto Rico’s commercial harvest activities for these complexes and units, see Sections 5.3.2.9.1 (Snapper Unit 1), 5.3.2.9.2 (Grouper Unit 4), 5.3.2.9.3 (Grouper Unit 1), 5.3.2.9.4 (Parrotfish), 5.3.2.9.6 (Snapper Unit 2), and 5.3.2.9.7 (cardinal snapper). For more detailed descriptions of the USVI’ commercial harvest activities, see Sections 5.3.3.6.1 (Snapper), 5.3.3.6.2 and 5.3.3.6.3 (Grouper), and 5.3.3.6.4 (Parrotfish). Fishing for Nassau grouper (Grouper Unit 1) and goliath grouper (Grouper Unit 2) are prohibited in federal, Puerto Rico, and USVI waters; however, illegal catches of both species have been reported in Puerto Rico.

For more detailed descriptions of Puerto Rico’s recreational fisheries for these complexes and units, see Sections 5.3.2.10.2 (Snapper Unit 1), 5.3.2.10.3 (Grouper Unit 4), 5.3.2.10.4 (Grouper Unit 1), 5.3.2.10.5 (Parrotfish Unit), and 5.3.2.10.7 (Snapper Unit 2). See Section 5.3.2.10.8 for a description of subsistence fishing activities. See Sections

5.3.3.7 and 5.3.3.8 for more information about the recreational and subsistence fisheries of the USVI.

3. Establish the timeframe for the analysis.

Section 3.2 describes the history of management of reef fish and queen conch in the U.S. Caribbean.

The timeframe for the CEA should take into account both historical efforts to manage reef fish and queen conch, as well as future considerations if this Amendment and its subsequent regulations are approved and implemented by NOAA Fisheries. The timeframe for the CEA begins with the implementation of the Reef Fish FMP in September 1985 and extends through 2019, which is seven years after this Amendment would first be approved and implemented.

4. Identify the other actions affecting the resources, ecosystems, and human communities of concern.

The Council recently implemented a regulatory amendment to the Queen Conch FMP to establish compatible closures with USVI. The purpose of the regulatory amendment is to implement federal regulations compatible with the USVI regulations to close queen conch harvest in federal waters once the territorial government has determined the quota in St. Croix has been reached. When harvest is allowed in territorial and not in federal waters or vice versa, there is an added cost to law enforcement to prove that a catch was taken illegally. Compatible closures benefit both federal and territorial law enforcement and fishers because agents could simply inspect the catch at the docks, versus conducting operations in territorial and/or federal waters, and fishers do not incur any added cost of providing proof that conch were legally caught. In combination with this Amendment, there should be little to no added impact to queen conch fishers of St. Croix or their families and communities because less conch fishing occurs in federal waters and the 50,000-pound limit is reached by landing conch harvested from territorial waters.

Table 6.9.1. Federal regulations that affect the reef fish and queen conch fisheries.

FEDERAL REGULATIONS
Permanent Area Closures:
Fishing for any species and anchoring is prohibited year-round in the Hind Bank Marine Conservation District off St. Thomas.
Seasonal Area Closures:
From March 1 through June 30 each year, all fishing is prohibited in the Mutton Snapper Spawning Aggregation Area off St. Croix.
From December 1 through last day of February each year, fishing is prohibited in the Red Hind Spawning Aggregation Areas (Lang Bank east of St. Croix, and in Tourmaline Bank, and Abrir La Sierra Bank off western Puerto Rico).
From October 1 through March 31 each year, no person may fish or possess any Council managed reef fish in the EEZ portion of Bajo de Sico, a Red Hind Spawning Aggregation area off western Puerto Rico. Fishing for spiny lobster, HMS and other non-HMS coastal migratory pelagics is allowed.
From February 1 through April 30 each year, no person may fish for or possess any species of fish, except for highly migratory species, in or from the Grammanik Bank closed area off St. Thomas.
Gear Prohibitions and/or Restrictions:
Fishing with pots, traps, bottom longlines, gillnets, or trammel nets is prohibited year-round in the four Red Hind Spawning Aggregation Areas (Lang Bank, Bajo de Sico, Tourmaline and Abrir la Sierra), Grammanik Bank closed area, Mutton Snapper Spawning Aggregation Area. In Bajo de Sico, anchoring is prohibited year-round, and spearfishing is allowed for commercial fishing.
An explosive may not be used in the U.S. Caribbean EEZ.
A powerhead may not be used in the U.S. Caribbean EEZ to harvest Caribbean reef fish.
A poison, drug, or other chemical may not be used to fish for Caribbean reef fish in the U.S. Caribbean EEZ. These also cannot be used to harvest corals.
A gillnet or trammel net may not be used in the U.S. Caribbean EEZ.
A fish trap used or possessed in the U.S. Caribbean EEZ must have an escape mechanism as defined and must also comply with minimum mesh size regulations.
REEF FISH
Seasonal EEZ Closure:
Snapper Unit 1 (silk, black, vermilion, blackfin)
From October 1 through December 31 each year, no person may fish for or possess vermilion, black, silk, or blackfin snapper in or from the U.S. Caribbean EEZ.
Snapper Unit 3 (gray, lane, dog, mutton, schoolmaster, mahogany)
From April 1 through June 30 each year, no person may fish for or possess mutton or lane snapper in or from the U.S. Caribbean EEZ.
Grouper Unit 4 (red, misty, tiger, yellowedge, and yellowfin) and black grouper
From February 1 through April 30 each year, no person may fish for or possess red, tiger, yellowedge, yellowfin or black grouper in or from the Caribbean EEZ.
Permanent EEZ Species Closure:
Grouper Unit 1 and 2 (Nassau and goliath grouper)
No person may fish for or possess Nassau or goliath grouper in or from the U.S. Caribbean EEZ. Such fish caught must be released immediately with a minimum of harm.
QUEEN CONCH (queen conch)
Seasonal EEZ and/or Area Closures:
Fishing for or possession of queen conch in the EEZ is prohibited, with the exception of Lang Bank, St. Croix, USVI (east of 64º 34'W).
Fishing for queen conch in Lang Bank is prohibited from June 1 through October 31 each year.
Minimum Size Limit:
Min. size limit is 9" (22.9 cm) in length and 3/8" (9.5 mm) in lip thickness at its widest point.
Commercial and Recreational Catch Limits:
A fisherman who has a valid commercial fishing license may not possess in or from the US Caribbean EEZ more than 150 conchs per day when permitted fishing is allowed. Daily recreational bag limit of 3conchs per day, and 12 per vessel per day.
Gear prohibitions:
Hookah gear cannot be used while harvesting queen conch.
Landing Restrictions:
Queen conch in or from the U.S. Caribbean EEZ must be maintained with meat and shell intact.

The Council recently implemented a regulatory amendment to the Reef Fish FMP to extend the seasonal closure of Bajo de Sico, which is off the west coast of Puerto Rico. Bajo de Sico has been identified as an important spawning site, especially for red hind and possibly other resident grouper including Nassau and yellowfin, as well as an important foraging site for these and other Caribbean reef fish. The Bajo de Sico closed area has been described as a well developed and diverse coral and sponge habitat that provides essential fish habitat (EFH) for Caribbean reef fish. The purpose of the regulatory amendment is to protect red hind spawning aggregations and large snapper and grouper from directed fishing mortality. An extended seasonal closure of the Bajo de Sico area in combination with previous actions and this proposed amendment could have significant cumulative adverse economic and social impacts on fishers and fishing communities on Puerto Rico's west coast if there is a geographic allocation (**Alternative 2** of Action 3(c)). Thirty-six percent of the Puerto Rican commercial fishers interviewed by Griffith et al. (2007) in 2005 reported that the Bajo de Sico Marine Protected Area had directly caused adverse socioeconomic impacts on them and their families; and approximately 54 percent reported that the closure indirectly adversely affected their local communities. Some of the adverse socioeconomic effects were increases in transiting time and associated fuel costs associated with avoiding Bajo de Sico while it is closed. However, approximately 21 percent of the interviewed fishers stated that the 3-month seasonal closure created employment and investment opportunities in their communities. Other previous federal actions that have affected these fisheries are summarized in Table 6.9.1. Griffith et al. (2007) estimate that between 250 and 300 fishing families were adversely affected by the combination of the Bajo de Sico and Tourmaline Bank seasonal closures.

Griffith et al. (2007) emphasize that there have been cumulative social and economic effects resulting from the various area closures on the west coast (i.e., Tourmaline Bank, Bajo de Sico, Abrir la Sierra, as well as Desecheo, and Mona/Monito Natural Reserves), as well as the other seasonal closures for numerous commercially important species (e.g., several deepwater snapper species between October and December and several grouper species between February and April). Similar to the Bajo de Sico closure, these latter closures are meant to protect these species during their spawning season.

The seasonal closure of Bajo de Sico avoided the imposition of more restrictive size limits, which the fishermen dislike more than any other regulation because they believe such rules result in the wasteful discarding of fish (Griffith et al. 2007). Some fishermen have avoided the adverse impacts of the closures by not complying with the various area closures (e.g., Bajo de Sico) and other regulations (e.g., licensing and reporting requirements), which reduces the ability to accurately assess harvest activities. With insufficient enforcement on the water, non-compliance was reported to have increased, causing resentment on the part of compliant fishermen. This may in turn further reduce compliance. Compliance with the actions and alternatives proposed in this amendment would allow for improved management of reef fish and queen conch fisheries and larger net long-term economic and social benefits. Griffith et al. (2007) note that, as long as imports of undersized fish continues to be allowed, it is easier for illegally harvested undersized fish to be mixed with fish of the same size that have been legally imported.

Table 6.9.2. Puerto Rico regulations that affect the reef fish and queen conch fisheries.

ALL FISHING
Permanent Area Closures:
No fishing in one mile around Mona and Monito Islands Natural Reserves, except by hook (one) and line in designated areas in Playa Pajaros and Playa Sardinera.
No fishing in the Luis Peña Channel Natural Reserve, in Culebra Island. No fishing in ½ mile around Isla de Desecheo Marine Reserve, and in a specified area in Isla Caja de Muerto Natural Reserve.
No fishing in no-take zone of Tres Palmas Marine Reserve.
Seasonal Area Closures:
From December 1 through last day of February each year, fishing is prohibited in the three Red Hind Spawning Aggregation Areas west of Puerto Rico (Bajo de Sico, Tourmaline Bank, Abrir La Sierra Bank). Fishing for HMS and other non-HMS coastal migratory pelagics is allowed.
Gear Prohibitions and/or Restrictions:
Fishing with pots, traps, bottom longlines, gill nets, and trammel nets and anchoring are prohibited year-round in the Red Hind Spawning Aggregation Areas.
No fishing by means of explosives; traps and nets have specific minimum mesh size requirements (trammel, gill nets); nets have length limits; HOOKAH gear not allowed; no combined use of SCUBA and spearfishing by recreational fishers. Nets cannot be combined with SCUBA by commercial fishers.
Snapper Unit 1 (silk, black, vermilion, blackfin)
Seasonal State Closure:
From October 1 through December 31, no person can commercially or recreationally fish for silk or blackfin snapper in Puerto Rico waters.
Snapper Unit 3 (gray, lane, dog, mutton, schoolmaster, mahogany)
From April 1 through May 31 each year, no person may fish for or possess mutton snapper in or from PR waters. Incidental catch while in closure (daily limit of 5 individuals, no more than 10 per boat) allowed only for personal consumption.
Snapper Unit 4 (yellowtail)
Minimum Size Limit:
Minimum size limit of 10.5” (26.7 cm) fork length (FL).
Grouper Unit 1 (Nassau) and 2 (goliath)
Permanent State Closures:
No person may commercially or recreationally fish for or possess Nassau or goliath grouper in or from waters of Puerto Rico.
Grouper Unit 3 (red hind, coney, rock hind, graysby, creole-fish)
From December 1 through the last day of February each year, no person may commercially or recreationally fish for or possess red hind grouper in or from PR waters.
Grouper Unit 4 (red, misty, tiger, yellowedge, yellowfin)
From February 1 to April 30 no person can commercially or recreationally fish for yellowfin grouper in Puerto Rico waters.
Parrotfish
No regulations specific to these species.
QUEEN CONCH
Seasonal and/or Area Closures:
No person may fish for, or possess on board a fishing vessel, a queen conch in or from Puerto Rico waters from August 1 through October 31 each year.
Minimum Size Limit:
The minimum size limit for queen conch is 9” (22.9 cm) in length and 3/8” (9.5 mm) lip width at its widest point.
Commercial and Recreational Catch Limits:
Daily commercial limit of 150 conch per person and 450 per boat, and daily recreational bag limit of 3 per person and 12 per boat if more than four people on the boat.
Gear Prohibitions and/or Restrictions:
No use of surface supplied (i.e. hookah) gear.
Landing Restrictions:
Conch can be extracted from shell while on boat, but not underwater.

Puerto Rico and the USVI have implemented regulations to manage reef fish and queen conch in their state and territorial waters. For example, fishing for goliath (Grouper Unit 2) or Nassau (Grouper Unit 1) grouper is prohibited in Puerto Rico and USVI waters. See Tables 6.9.2 and 6.9.3 for commonwealth and territorial regulations that affect these fisheries. If Puerto Rico and/or the USVI established landings quotas consistent with the ACLs that would be established by this Amendment, there could be cumulative adverse impacts on fishers, their families, and fishing communities; however, that would be dependent on the ACLs and the levels of annual landings at the time such quotas could be established. If the ACLs are greater than or equal to annual landings, there would be no additional adverse impact.

Regulations that alter the allowable harvest of other managed species in the U.S. Caribbean or alter importation of seafood into the U.S. Caribbean states may alter recreational and commercial queen conch, snapper, grouper, and/or parrotfish fishing. When reduction in harvest of other managed species or in imports of substitute species occurs, a positive economic effect on queen conch, snapper, grouper, and parrotfish fisheries could occur, while conversely, increases in levels of wild and/or imported substitute species would be expected to create a depressed economic value of queen conch and reef fish. However, it is difficult to say with certainty if these trends would hold true for all, some, or even none of the species. Changes in economic value would largely depend on the health and status of the fisheries and the amount of substitute species caught and imported.

Increases in aquaculture, for example, could affect these fisheries and their economic and social value. The National Sustainable Offshore Aquaculture Act of 2009 (H.R. 4363) was introduced on December 16, 2009 by U.S Representative Lois Capps and the bill is in subcommittee as of the time of this writing. If it or a similar bill is passed into law, it could result in offshore aquaculture operations off Puerto Rico and/or the USVI, which could indirectly affect Council managed fisheries, including conch and reef fish, fish habitats, and human communities.

Natural and human induced disasters, as well as socioeconomic changes, can also affect resources, ecosystems, and communities. Such events include hurricanes, earthquakes, tropical storms, flooding, tsunamis, water pollution, coral bleaching, disease outbreaks, invasive species (e.g., lionfish), high fuel prices, economic recessions and depressions, and gentrification of island coasts. These events can negatively affect the revenues and profits of Puerto Rico and USVI fishers. They can also damage existing infrastructure and reduce resource availability.

Table 6.9.3. USVI regulations that affect the reef fish and queen conch fisheries.

ALL FISHING
Permanent Area Closure:
All fishing, except bait fishing and fishing for blue runner, is prohibited in the Virgin Island Coral Reef National Monument.
No fishing in the Buck Island National Monument (U.S. Department of Interior).
No fishing in St. James Reserve or Cay Mangrove Lagoon Reserve, except for bait fry in limited areas.
No fishing permitted in Compass Point Marine Reserve, St. Thomas, Salt River Marine Reserve, St. Croix, and The Small Pond at Frank Bay Wildlife and Marine Sanctuary, St. John.
Seasonal Area Closures:
From December 1 through last day of February each year, fishing is prohibited in the Red Hind Spawning Aggregation Area east of St. Croix (Lang Bank).
No harvest of any species from March 1 through June 30 each year, within the Mutton Snapper Spawning Area.
Area prohibitions and limitations on fishing in the East End Marine Park off St. Croix.
Gear Prohibitions and /or Restrictions:
Fish trap restrictions in St. Croix and St. Thomas/St. John districts. Nets have specific size requirements.
Prohibition on the use of gill and trammel nets in territorial waters.
Fishing with pots, traps, bottom longlines, gillnet, or trammel nets is prohibited year-round in the Red Hind and Mutton Snapper Spawning Aggregation Areas.
Filleting of fish in Territorial/Federal waters is prohibited. Fish captured or possessed in territorial waters must be landed with heads and fins intact.
Snapper Unit 1 (silk, black, blackfin, vermilion)
The possession of silk, black, blackfin, and vermilion snapper is prohibited from October 1 through December 31 in St. Thomas/St. John territorial waters only, not St. Croix.
Snapper Unit 3 (gray, lane, dog, mutton, schoolmaster, mahogany)
From April 1 through June 30, each year, fishing for or possession of mutton and lane snapper is prohibited in USVI territorial waters.
Grouper Unit 1 (Nassau) and 2 (goliath)
Permanent Territorial Closure:
No person may commercially or recreationally fish for, or possess, Nassau and goliath grouper in or from waters of the USVI.
Grouper Unit 4 (red, misty, tiger, yellowedge, yellowfin) and black grouper
The possession of red, tiger, yellowedge, and yellowfin grouper is prohibited from February 1 through April 30 each year in territorial waters. Possession of black grouper is also prohibited during the closure.
QUEEN CONCH (queen conch)
Seasonal and/or Area Closure:
No person may fish for, or possess onboard a fishing vessel, a queen conch in or from USVI waters from June 1 through October 31 each year.
Minimum Size Limit:
Minimum of 9” (22.9 cm) total length or 3/8” (9.5 mm) lip thickness. No possession of conch meats smaller than 2 per pound (un-cleaned) or 3 per pound (cleaned).
Annual Total Catch Limit:
50,000 pounds in the St. Croix district and 50,000 pounds in the St. Thomas/St. John district. Thereafter, the season will be closed until November 1 of that year. All conchs must be landed and reported in the district from which they were harvested.
Commercial and Recreational Catch Limits:
Daily commercial limit of 200 conch per boat (having a licensed commercial fisher on board), and daily recreational bag limit of six conch per person and total of 24 conch per boat.
Landing Restrictions:
All conchs must be landed alive and whole in shell. Transport of conch meat over open water is prohibited.

5. Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to change and capacity to withstand stress.

This step should identify the trends, existing conditions, and the ability to withstand stresses of the environmental components. According to the CEQ guidance, two types of information are needed to describe stress factors. The first are the socioeconomic-driving variables that identify the types, distribution, and intensity of key social and economic activities within the region(s). The second are the indicators of stress on specific resources, ecosystems, and communities.

CEA factor 4 above describes the various stresses affecting the resources, ecosystems, and human communities of concern. Fishermen face numerous economic stresses, such as additional costs to fishing or lower ex-vessel prices for harvested fish. Added costs include higher prices for fuel, insurance, dock fees, ice, replacement gear, and food. Factors reducing ex-vessel prices for fishermen include market gluts, increases in imported fish, or fish health issues. Changes in revenue and increased operating costs are two indicators of socioeconomic stress. In recent years, the additional stresses of overfishing, hurricanes, and fuel prices have resulted in marginal profits and losses in revenue forcing many fishermen to leave fisheries and seek more stable sources of employment. Fishermen targeting healthier and a larger number of stocks and with lower expenses are more resilient to the stresses described above. In contrast those fishermen relying on stocks that are frequently subject to overfishing and stringent management regulations, or that have greater expenses relative to other fishermen, are less resilient to various stresses making them more likely to seek other jobs.

Indicators of stress to the biological environment include reductions in population abundance and habitat degradation. The Council and NOAA Fisheries evaluate the status of wild stocks relative to various pre-defined benchmarks and implement necessary management measures to maintain sustainable resources. This proposed amendment would improve those benchmarks and the management measures that result from them. The susceptibility to stress depends on a species' productivity and life history. In general, longer lived and slower-growing species, such as many reef fishes, are more susceptible to stresses (overfishing, becoming overfished), than shorter-lived and more fecund species. As a result, the time to rebuild these populations is often much longer and reductions in harvest are much greater.

Puerto Rico and USVI commercial fisheries have been characterized as "artisanal" because their commercial fishing vessels tend to be less than 45 feet long, have small crews, participate in multiple fisheries, and yield smaller revenues and/or their seafood processors are small-scale producers. Fishing areas shift with regulatory change, land use and development, land-based pollution, and other factors, such as climate change. For example, water temperature increased in both Guayanilla and Tallaboa Bays of Puerto Rico as a result of hot water discharged by the Central Costa Sur Power Plant, and cloro was discharged by PPG Industries that had a significant adverse impact on marine and coastal resources on the south coast (Pérez 2005: 235). Fishers that operated in the bays had difficulty selling their catches because buyers and consumers feared the fish were tainted with cloro or another contaminant. In response, some fishers went into deeper waters, which was difficult for those with small vessels and modest fishing gear to do.

Access to fisheries also has been challenged in both Puerto Rico and the USVI, and privatization of beach front areas continues to reduce public access to fisheries.

Commercial fishing tends not to be a full-time job in Puerto Rico. Pérez's (2005: 225) survey found that "full-time fishing is not an option for any small-scale fishermen's household in southern Puerto Rico." During economic downturns, fishers are more likely to combine fishing with other occupations in the pursuit of maintaining household incomes. That may require fishers to move to urban areas on the island or to the U.S. mainland. However, that does not mean they abandon or do not return to fishing. Puerto Rican commercial fishers depend more upon fishing when industrial unemployment rises (Pérez 2000: 4). McCaffrey (1999: 112) describes fishing as an "occupational safety net," and according to Griffith et al. (2007), fishing "absorbs the unemployed and poor during difficult economic times and on the other subsidizes individuals working part-time or full-time in the formal economy." Griffith et al. (2007) ethnographic work found that between 40 percent and 45 percent of commercial fishers listed other occupations that were held to supplement fishing incomes. If fishers are more likely to combine fishing with other occupations in the pursuit of maintaining household incomes during an economic downturn, a graphical comparison of the number of active fishers and the unemployment rate do not suggest such a relationship. Nonetheless, during times of recession, depression or other economic downturns, such as experienced from 2007 to 2010 in Puerto Rico, commercial fishing increases in importance for fishing households. Given this economic downturn, former commercial fishers may be returning to fishing, whether they are licensed or not.

USVI commercial fishers tend not to derive all of their income from fishing. The average St. Thomas/St. John commercial fisher derives 74 percent of his/her income from fishing, while 60.2 percent of the average St. Croix fishers' annual income derives from fishing (Kojis 2004). Some of the commercial fishers stated that none of their income derives from fishing. This suggests these fishers may be participants in unreported subsistence fishing. Seventy-five percent of St. Thomas/St. John's commercial fishers obtain more than half of their income from fishing, while 54 percent of St. Croix commercial fishers are similarly reliant on fishing. The recent economic downturn may be increasing the importance of fishing to fishers, their families, and fishing communities.

The ability of these fishers and their communities to withstand any potential adverse impacts caused by the proposed amendment is greatly dependent on their reliance on fishing in federal waters. With more fishable habitat in their state waters, Puerto Rican fishers are most able to mitigate for any losses of landings due to a shortened federal fishing season by shifting into territorial waters, assuming the territorial season remains open. With the least amount of fishable habitat in territorial waters off St. Thomas/St. John, it is expected that St. Thomas/St. John fishers would be least able to mitigate for lost landings due to a shortened federal fishing season because of a Caribbean-wide ACL.

6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.

This section examines whether resources, ecosystems, and human communities are approaching conditions where additional stresses could have an important cumulative effect beyond any current plan, regulatory, or sustainability threshold (CEQ 1997). Sustainability thresholds can be identified for some resources, which are levels of impact beyond which the resources cannot be sustained in a stable state. Other thresholds are established through numerical standards, qualitative standards, or management goals. The CEA should address whether thresholds could be exceeded because of the contribution of the proposed action to other cumulative activities affecting resources.

The MSA requires federal fishery management plans to prevent overfishing and achieve optimum yield on a continuing basis. This proposed amendment is intended to improve federal managers' ability to prevent overfishing and achieve long-term optimal yield. Stresses affecting each of these resources include directed fishing mortality, habitat loss and degradation, increasing demand for food and feed, and environmental changes (e.g., hurricanes, changes in temperature, etc.). For example, how global climate changes will affect Caribbean fisheries is unclear. Climate change can affect marine ecosystems through ocean warming by increased thermal stratification, reduced upwelling, and sea level rise; and through increases in wave height and frequency, loss of sea ice, and increased risk of diseases in marine biota. Decreases in surface ocean pH due to absorption of anthropogenic CO_2 emissions may impact a wide range of organisms and ecosystems, particularly organisms that absorb calcium from surface waters, such as corals and crustaceans (IPCC 2007 and references therein).

The status of many of these species is regularly assessed. When fisheries are determined to be undergoing overfishing or are overfished, NOAA Fisheries and/or the Councils are required by the MSA to implement conservation and management measures to prevent overfishing and rebuild overfished stocks. States and interstate compacts may also impose regulations to control fishing mortality and harvest. For endangered and threatened species, the ESA prohibits take, import or export, shipment, or sale of any endangered species and most threatened species.

Stresses affecting fishing communities include additional regulatory restrictions, competition from foreign seafood imports, coastal development, loss of infrastructure, and rising fuel prices. All of these stresses have placed a greater burden on fishermen and fishing communities that threaten their short- and long-term sustainability. In the past several years, the Council has implemented numerous regulations to end overfishing of reef fish and queen conch. The Council has also approved several rebuilding plans to increase stock biomass and abundance of reef fishes. These regulations have resulted in lower allowable catch levels, gear restrictions, and limited access. Although the net benefit of these regulations is expected to result in more abundant and stable fisheries in the long-term, they have the unavoidable adverse effect of negatively affecting socioeconomic benefits in the short-term. As a result, the cumulative effect of more restrictive regulations, coastal development, higher fuel prices, economic downturns, and natural disasters has led many fishermen to increase non-fishing employment in recent years.

Although the intent of this proposed amendment is to improve the targets and thresholds of queen conch and reef fish units, it may cause additional stresses (e.g., lower landings).

7. Define a baseline condition for the resources, ecosystems, and human communities.

The purpose of defining a baseline condition for the resource and ecosystems in the area of the proposed action is to establish a point of reference for evaluating the extent and significance of expected cumulative effects.

The status of Council managed resources are summarized in the annual status report to Congress on the Status of U.S. Fisheries (NMFS 2011). The baseline status of Council managed species that have been determined to be undergoing overfishing and are addressed in this amendment is also described in Section 5.0. The remainder of Council managed species are either healthy or their status is unknown.

The status and health of EFH has been extensively described (CFMC 1998, 2004) and it is currently under review. The Council, NOAA Fisheries, and other federal agencies have designated numerous areas in the Caribbean to protect and conserve EFH. These areas protect EFH from a wide variety of direct impacts, including: loss of fishing gear, restricted use of certain fishing gears, and damage from anchors.

Section 5.3 describes baseline economic and social conditions for fishing communities in Puerto Rico and the USVI. The Generic Essential Fish Habitat Amendment (CFMC 1998), FEIS (CFMC 2004), Griffith et al. (2007), and Stoffle et al. (2009) provide more extensive characterization of fishing-dependent communities. St. Thomas, St. John, St. Croix, and Puerto Rican fishing communities would be affected as a result of the various actions and alternatives proposed herein; however, until the set of alternatives is chosen, it is impossible to quantify the combined impacts, such as expected net losses of annual landings, ex-vessel revenues, and income, at this time.

8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.

Cause-and-effect relationships for various aspects of queen conch and reef fish fisheries and measures proposed in this Amendment to address these potential effects are described in Sections 5 and 6. Actions considered in this amendment should not have adverse effects on public health or safety since these measures should not alter actual fishing practices, just where or when activities can occur. Depending on the preferred alternatives, fishing may still occur, just limited to the extent allowed by the annual catch limits. Unique characteristics of the geographic area are highlighted in Section 5. Adverse effects of fishing activities on the physical environment are described in detail in Section 6.1-6.6 of the actions.

9. Determine the magnitude and significance of cumulative effects.

Past actions affecting the queen conch and reef fish fisheries are summarized in Tables 6.9.1, 6.9.2, and 6.9.3 and described in Section 3.2. Annual catch limits and AMs are intended to prevent or greatly reduce the risk of overfishing and are expected to have positive biological benefits. However, they may also impose more restrictive catch levels on fisheries resulting in negative social and economic impacts over the short-term. To the extent that catch limits and AMs can prevent overfishing and assist in rebuilding overfished stocks, they should have positive long-term benefits to both the biological and socio-economic environments.

The process of protecting queen conch and reef fish species through the specification of management targets, thresholds, and AMs, and regulations that implement those AMs, is expected to have a short-term adverse impact on the social and economic environment, and will create a burden on the administrative environment. The no action alternatives being considered would avoid these negative effects, but they would not be in compliance with new amendments to the MSA that require each FMP to specify ACLs and AMs for managed fisheries. The range of alternatives has varying degrees of economic and social costs and administrative burdens, starting at zero. For example, if the ACL for queen conch is set at 50,000 pounds or ACL for Grouper Unit 1 is set at zero, neither would have an adverse economic or social impact. See Sections 6.2.2b and 6.2.1a for more detailed information. However, and also for example, if there was a Caribbean-wide ACL for aggregate snapper, the largest adverse economic and social impact could be on St. Thomas/St. John fishers because less fishable habitat occurs in territorial waters off St. Thomas/St. John, followed second by St. Croix fishers who have more fishable habitat in territorial waters than St. Thomas/St. John, but substantially less than their counterparts in Puerto Rico. Recreational and commercial fishers of Puerto Rico, St. Croix, and St. Thomas/St. John would be in competition for the single ACL, which would favor fishers with larger vessels and gears capable of catching more of the fish in the same or a shorter period of time over recreational and historic artisanal fishermen (Section 6.3.2c).

To ensure stocks are not overharvested, periodic monitoring of the fisheries is needed to estimate the condition of the stocks. This monitoring should be designed to incorporate new information and to address unanticipated developments in the respective fisheries and would be used to make appropriate adjustments in the reef fish regulations should harvest practices not achieve needed take reductions. Additionally, NMFS and other government agencies support research on these species by federal, state, academic, and private research entities.

Depending upon the outcome of these monitoring efforts, the Council may determine further management action should be taken, such as adjusting an ACL and promulgating regulations consistent with the revised ACL. What type of rulemaking vehicle NMFS or the Council determines is needed is difficult to predict. Actions would be dictated by the severity of overages and by the time frame needed to implement a regulatory change. The Council has three options for implementing these measures. The first is to amend the Queen Conch or Reef Fish FMPs to include new information and management actions. Recent plan amendments put forth by the Council have taken between two and three years from conception to implementation. NMFS may take other management actions through emergency or interim measures. Emergency actions and interim measures can be implemented only under limited circumstances. They only remain in effect for 180 days after the date of publication of the rule and may be extended by publication in the *Federal Register* for one additional period of not more than 186 days provided the public has had an opportunity to comment on the emergency actions and interim measures. The MSA further states that when a Council requests that an emergency action and interim measure be taken, the Council should also be actively preparing plan amendments or regulations that address the emergency on a permanent basis.

Queen conch and reef fish management measures include a number of area-specific and seasonal regulations where fishing is restricted or prohibited in order to protect habitat or spawning aggregations of fish, or to reduce fishing pressure in areas that are heavily fished. This requires on the water monitoring by law enforcement, which is time consuming and expensive. However, the USCG has been pro-active establishing fisheries officers' trainings which include the local enforcement agencies.

10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.

The process of protecting queen conch and reef fish species through the specification of management targets, thresholds, and AMs, and regulations that implement those AMs is expected to have a short-term adverse impact on the social and economic environment, and will create a burden on the administrative environment. The no action alternatives being considered would avoid these negative effects, but they would not achieve the goal of curbing overfishing and would not be in compliance with new amendments of the MSA that require each FMP to specify ACLs and AMs for managed fisheries. The range of alternatives has varying degrees of economic and social costs and administrative burdens, starting at zero.

To ensure queen conch and reef fish stocks are managed for optimum yield, periodic reviews of stock status are needed. These reviews are designed to incorporate new information and to address unanticipated developments in the respective fisheries and would be used to make appropriate adjustments in the reef fish regulations should harvest not achieve OY objectives. These assessments would be requested as needed by the SEDAR Steering Committee. Reviews of queen conch and reef fish populations should benefit from updated landings information through commonwealth, territorial, and federal fishery monitoring programs to be implemented in the future. Additionally, NMFS and other government agencies support research on these species by federal, state, academic, and private research entities.

Actions that the Council could employ to restrict annual or average annual landings beyond reducing the fishing season, include, but would not be limited to, establishing a permit system to limit the number of fishers in federal waters, trip limits, restrictions on gear use, and/or area closures. The Council has several options for implementing these measures. The first is to amend the Queen Conch or Reef Fish FMP to include new information and management actions. The second method is a regulatory amendment.

The Council can also request NMFS to take other management actions through emergency or interim measures. Emergency actions and interim measures can be implemented only under limited circumstances. They only remain in effect for 180 days after the date of publication of the rule and may be extended by publication in the *Federal Register* for one additional period of not more than 186 days provided the public has had an opportunity to comment on the emergency actions and interim measures. The MSA further states that when a Council requests that an emergency action and interim measure be taken, the Council should also be actively preparing plan amendments or regulations that address the emergency on a permanent basis.

What type of rule making vehicle the NMFS or the Council determines is needed is difficult to predict and would be dictated by the severity of overages in the harvest as well as the time frame needed to implement a regulatory change.

11. Monitor the cumulative effects of the selected alternatives and adapt management.

The effects of the proposed actions are, and will continue to be, monitored through collection of fisheries data by NMFS and the commonwealth and territorial governments, stock assessments and stock assessment updates, life history studies, economic and social analyses, and other scientific observations. Commercial landings data is collected by PRDNER in Puerto Rico and by VIDPNR in the USVI. Recreational data is collected through MRFSS, which has not been conducted in the USVI.

6.8 Unavoidable Adverse Effects

Constraining the harvest of queen conch and reef fish in the U.S. Caribbean, as mandated by the MSRA, is expected to have some negative short-term effects on the social and economic environment, and will create some burdens with respect to the administrative environment. These effects are discussed in detail throughout Section 6 of the document. No alternatives are being considered that would avoid these negative effects because they are a necessary cost associated with setting Annual Catch Limits for the affected fisheries. The range of alternatives has varying degrees of economic costs and administrative burdens. Some alternatives have relatively small short-term economic costs and/or administrative burdens, but would also provide smaller and more delayed long-term benefits. Other alternatives have greater short-term costs, but provide larger long-term benefits. Therefore, it is difficult to mitigate these measures and managers must balance the costs and benefits when choosing management alternatives for the queen conch and reef fish fisheries.

6.9 Relationship Between Short-Term Uses and Long-Term Productivity

The process of protecting queen conch and reef fish species through the specification of management targets, thresholds, and AMs, and regulations that implement those AMs, is expected to adversely affect the economic and social environments related to the uses of the resources in the short-run. However, the process is also expected to provide larger benefits to those environments in the long-run than would be expected with the no action alternative. It is anticipated that more stable and sustainable catches of queen conch and reef fish will be realized as an outcome of the provisions of this amendment, assuming that alternatives other than the “no-action” alternatives are chosen.

6.10 Mitigation, Monitoring, and Enforcement Measures

As mentioned in Section 6.8, the process of establishing ACLs and AMs for the queen conch and reef fish fisheries of the U.S. Caribbean is expected to have some negative short-term effects on the social and economic environment, and will create additional burdens for the administrative environment. This is particularly true when establishing annual catch limits that may fall below the average annual catch of some species that has been previously realized. No alternatives are being considered that would completely avoid these negative effects because they are a necessary cost associated with establishing ACLs and AMs in the U.S. Caribbean. It is therefore difficult to mitigate these measures and managers must balance the costs and benefits when choosing management alternatives for these fisheries.

Harvest of reef fish and conch in the U.S. Caribbean has been monitored for many decades, but as discussed in Section 3.3 of this document the history of that monitoring has been replete with problems. Those problems cannot be singularly attributed but cannot be corrected a posteriori. Instead, initiatives are underway to substantially improve both commercial and recreational fisheries data collection programs. For commercial harvest data, the SEFSC is leading an effort to enhance the data collection program for both Puerto Rico and the USVI. When implemented, the U.S. Caribbean Commercial Data Improvement Program will provide for improved and more comprehensive data reporting forms, species-specific landings data, more timely reporting, data that are referenced by location, depth and gear, better validation of catch and effort, detailed biological information, and enhanced enforcement. For recreational harvest data, the NMFS is advancing and evolving the MRFSS data collection program to the MRIP program, and this evolution should result in more targeted and detailed data on recreational catch. Additionally, it is anticipated that the MRIP will be expanded in the U.S. Caribbean to include the USVI. These advancements in fisheries data collection programs will provide the data required to populate advance fisheries assessment models, thereby allowing for more precise and responsive guidance for the management of these fisheries.

Enforcing queen conch and reef fish harvest regulations is time- and labor-intensive. Cooperation between NMFS Law Enforcement, the U.S. Coast Guard, local enforcement agencies, and other entities such as the Department of Defense is essential, and that cooperation continues to grow via Joint Enforcement Agreements and other instruments. These agreements are typically reconsidered and renewed on a frequent (e.g., annual) basis, which allows for adaptation to changing regulations and conditions.

6.11 Irreversible and Irretrievable Commitments of Resources

There are no irreversible or irretrievable commitments of resources proposed herein. The subject resources are the biological constituents of Caribbean coral reefs, particularly reef fish and queen conch but also the other constituents of the coral reef community that form a highly integrated and interdependent ecosystem. The actions proposed in these amendments will function to ensure that, by ending overfishing of a variety of Caribbean reef resources, those resources are not rendered irretrievable. In the extreme, these actions also function to considerably reduce the likelihood that any of these resources will be irreversibly committed in the sense that they will be driven to functional (become reproductively non-viable) or actual (disappear from the Earth) extinction. Actions act both directly (e.g., reducing harvest of numerous species) and indirectly (e.g., enhancing grazer abundance and thereby increasing the viability of acroporid corals) to ensure that resources are not irreversibly or irretrievably committed. In the event that these proposed actions fail to achieve the goals of ending overfishing and ensuring the long-term health of these resources, the actions to impose minimum conservation standards are readily changeable by the Council or the National Marine Fisheries Service in the future.

6.12 Any Other Disclosures

There are no additional disclosures regarding the proposed actions.

7.0 REGULATORY IMPACT REVIEW

7.1 Introduction

The NMFS requires a Regulatory Impact Review (RIR) for all regulatory actions that are of public interest. The RIR does three things: (1) it provides a comprehensive review of the level and incidence of impacts associated with a regulatory action; (2) it provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives which could be used to solve the problem; and (3) it ensures that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost effective way.

The RIR also serves as the basis for determining whether any proposed regulations are a "significant regulatory action" under certain criteria provided in Executive Order 12866 (E.O. 12866) and whether the approved regulations will have a "significant economic impact on a substantial number of small business entities" in compliance with the Regulatory Flexibility Act of 1980 (RFA).

7.2 Problems and Objectives

The purpose and need, issues, problems, and objectives of the proposed Amendment are presented in Section 1.2 and are incorporated herein by reference.

7.3 Methodology and Framework for Analysis

This RIR assesses management measures from the standpoint of determining the resulting changes in costs and benefits to society.

To the extent practicable, the net effects of the proposed measures for an existing fishery should be stated in terms of changes in production and consumption, changes in profits, and employment in the direct and support industries. However, there is substantial uncertainty regarding the economic impact of the proposed ACLs on existing U.S. Caribbean fisheries. Where figures are available, they are incorporated into the analysis of the economic impacts of the different actions and alternatives.

Fishers who could be affected by these proposed measures are encouraged to comment on the following projections of the economic impacts.

7.4 Description of Relevant Fisheries

The relevant fisheries are described in Section 5.3, and are incorporated herein by reference.

7.5 Economic Impacts of Management Measures

7.5.1 Action 1. Amend Stock Complexes in Reef Fish FMU

Preferred Alternative 2 of Action 1(a) would remove yellowedge and misty grouper from Grouper Unit 4 and combine the two species to create Grouper Unit 5. **Preferred Alternative 2** of Action 1(a) would also add black grouper to Grouper Unit 4 and remove creole-fish from Grouper Unit 4 and place it in a data-collection only category. Creole-fish is not targeted in any fishers and is widespread throughout its range. **Preferred Alternative 2** of Action 1(b) would transfer wenchman from Snapper Unit 2 to Snapper Unit 1 and add cardinal snapper to Snapper Unit 2. The current Snapper Unit 1 is composed of silk, black, vermilion and blackfin snapper. Snapper Unit 2 is presently composed of queen and wenchman (P. *aquilonaris*) snapper. There have been no reported commercial landings of wenchman snapper. Therefore, its inclusion in the Snapper Unit 1 should have no impact on Snapper Unit 1 commercial fishing. Puerto Rican fishers and the DNER do not equate wenchman with P. *aquilonaris.* Instead, wenchman is the common name for cardinal snapper. Hence, landings of wenchman reported by Puerto Rico fishers are landings of cardinal snapper, which are not presently included in landings of Snapper Unit 2 species. **Preferred Alternative 2** of Action 1(b) would result in Snapper Unit 2 landings being comprised of queen and cardinal snapper landings.

Preferred Alternative 2 of Action 1(a) and **Preferred Alternative 2** of Action 1(b) are administrative actions and would not affect existing fishing practices. Hence, they would have no economic impacts.

7.5.2 Action 2. Redefine Management Reference Points or Proxies

7.5.2.1 Action 2(a). Redefine management reference points or proxies for species or units within the snapper, grouper, and parrotfish

Preferred Alternative 2 of Action 2(a) would define aggregate management reference points or proxies for snapper, grouper and parrotfish based on what the Council considers to be the longest time series of landings data prior to the implementation of the Comprehensive SFA Amendment that is consistently reliable across all islands. The MSY proxy specified by **Preferred Alternative 2** would equate to combined average annual commercial and recreational landings in the U.S. Caribbean, calculated using commercial landings data from 1999-2005 for Puerto Rico and St. Croix and from 2000-2005 for St. Thomas/St. John, and recreational landings data from 2000-2005 for Puerto Rico only (Table 7.1). **Preferred Alternative 2(b)** would equate the OFL to the MSY proxy. Snapper landings include commercial and recreational landings of Snapper Units 1 through 4 for Puerto Rico plus commercial landings of all snapper in the USVI. Grouper landings include commercial and recreational landings of Grouper Units 1 through 5 for Puerto Rico and commercial landings of all grouper in the USVI. Some of the snapper and grouper landings in the USVI may include landings of species not in the FMU. Parrotfish landings include all species in the FMU, except two species that could have been mistakenly identified.

Neither **Preferred Alternative 2** nor **Preferred Alternative 2(b)** of Action 2(a) would have a direct economic impact on fishermen, their families or communities because neither would affect existing fishing practices. The indirect impacts of **Preferred Alternative 2** or **Preferred Alternative 2(b)** on snapper, grouper and/or parrotfish commercial and recreational (including subsistence) fishermen, if any, are dependent upon the proposed ACLs in combination with additional actions.

Table 7.1. Proposed MSY proxies and OFLs for snapper, grouper, and parrotfish in the U.S. Caribbean.

Complex and Unit	**MSY Proxy = OFL = Average Pounds Landed Annually**
	U.S. Caribbean
Snapper	1,915,759
Grouper	396,483
Parrotfish	507,059

Preferred Alternative 2(d) would equate the ACL for the Grouper and Snapper complexes to OY, which would be equal to 85 percent of the OFL. **Preferred Alternative 2(g)i** would set the ACL for the Parrotfish Unit to 85 percent of the ABC set by the SSC, which would be 85 percent of 430,000 pounds for the U.S. Caribbean (Table 7.2).

Table 7.2. Proposed ACLs for Snapper, and Grouper Complexes and Parrotfish Unit in the U.S. Caribbean.

Unit	**ACL = [(0.85) x OFL] Pounds Landed Annually**
	U.S. Caribbean
Snapper	1,628,395
Grouper	337,010
Parrotfish	365,500

Neither **Preferred Alternative 2(d)** nor **2(g)i** would have a direct economic impact because they would not change existing fishing practices. However, **Preferred Alternatives 2(d)** and **2(g)i** may have indirect economic impacts if either motivates subsequent regulatory action (Action 5) that reduces average annual harvests by reducing the length of federal fishing seasons. The magnitude of the indirect impact is substantially affected by two factors: the extent that landings derive from federal, as compared to territorial, waters; and second, regulatory changes since 2005. If landings derive entirely or almost entirely from territorial waters, a regulation that reduces the length of federal fishing seasons would have no to minimal impact, especially if fishermen could easily substitute fishing in territorial waters for fishing in federal waters. Conversely, if all or almost all of the landings derive from harvest in federal waters, a regulation that reduces the length of federal fishing seasons could have a substantial adverse economic impact. About 4.7 percent of the fishable area off Puerto Rico is in the U.S. Caribbean EEZ, and the remaining 95.3 percent is in territorial waters (CFMC 2005). The USVI shelf encompasses an area of approximately 630 nm^2 (2,161 km^2). Of that area, 38 percent occurs in the U.S. Caribbean EEZ. The bulk of the shelf occurs off St. Thomas and St. John, with a 291 nm^2 (998 km^2) total area in territorial waters and a 218 nm^2 (748 km^2) total area in federal waters. St. Croix has 98 nm^2 (336 km^2) of fishable habitat in territorial waters and a 21 nm^2 (72 km^2) area off its east coast that resides in the EEZ. This comparison of fishable areas in territorial and federal waters is reflected in Puerto Rico landings, which largely derive from fishing in territorial waters, and Puerto Rico fishermen's ability to substitute fishing in territorial waters for fishing in federal waters. The comparison is also reflected in USVI landings' substantially larger share from fishing in federal waters. It is more difficult for USVI fishermen to substitute fishing in territorial waters for fishing in federal waters.

The years of landings used to specify the ACLs of **Preferred Alternative 2(d)** are prior to the implementation of the Comprehensive SFA Amendment to the reef fish and conch FMPs in 2005. The SFA Amendment substantially changed the management regime by implementing a suite of management measures designed to curb or end overfishing, including for example seasonal and area closures. Table 7.3 compares average annual landings from 2006 and 2007 to the proposed MSY Proxy (**Preferred Alternative 2**) and ACL (**Preferred Alternatives 2(d)** and **2(g)i**). The proposed ACL for each unit is less than the average annual landings from 2006 to 2007 for that unit. Such a difference suggests **Preferred Alternatives 2, 2(b)**, **2(d)** and **2(g)i** would motivate regulatory changes to reduce current average annual harvests of snapper, grouper and parrotfish in the EEZ, which could have adverse economic impacts on snapper, grouper and parrotfish fishermen of Puerto Rico and the USVI, their families and communities. However, actual indirect impacts of **Preferred Alternatives 2**, **2(b), 2(d)** and **2(g)i** are dependent on subsequent actions of this amendment and the extent that fishing for these species occurs in federal waters, as well as more recent territorial actions. These economic impacts are more fully described in the sections that address the subsequent actions.

Preferred Alternative 2(h) would set the ACL for Grouper Units 1 and 2 and rainbow, blue and midnight parrotfish at zero. Since the early to mid 1990s, no person may fish for or possess Grouper Unit 1 (Nassau grouper) or Grouper Unit 2 (goliath grouper) in or from the Caribbean EEZ. Puerto Rico and the USVI also prohibit fishing for and possession of these species. Hence, **Preferred Alternative 2(h)** would be consistent with both federal and territorial prohibitions and would have no indirect economic impact.

Preferred Alternative 2(h) would not have a direct impact on rainbow, midnight and blue parrotfish fishermen; however, it motivates **Preferred Alternative 2** of Action 4(a) that would prohibit harvesting of rainbow, midnight and blue parrotfish in federal waters (Action 4(a)). The direct economic impact of the proposed prohibition, which is the indirect impact of **Preferred Alternative 2(h),** is discussed in section 7.5.4.

Table 7.3. Comparison of proposed MSY proxies and ACLs for Snapper, Grouper and Parrotfish Units to average annual landings from 2006 to 2007 for each unit for U.S. Caribbean.

Unit	Pounds		
	MSY Proxy	2006-07 Avg. Landings	ACL
Snapper	1,915,759	1,321,892	1,628,396
Grouper	396,483	214,118	337,010
Parrotfish	507,059	464,819	365,500

7.5.2.2 Action 2(b). Redefine management reference points or proxies for queen conch

Preferred Alternative 2 of Action 2(b) would define aggregate management reference points or proxies for queen conch based on what the Council considers to be the longest time series of landings data prior to the implementation of the Comprehensive SFA Amendment that is consistently reliable across all islands. The MSY proxy specified by **Preferred Alternative 2** would equate to average annual catch, calculated using commercial landings data from 1999-2005 for Puerto Rico and St. Croix and from 2000-2005 for St. Thomas/St. John, and recreational landings data from 2000-2005 for Puerto Rico only (Table 7.4). **Preferred Alternative 2(b)** would equate the OFL to the MSY proxy. Overfishing would occur when average annual catches exceed the OFL, unless NMFS' Southeast Fisheries Science Center (in consultation with the Caribbean Fishery Management Council and its Scientific and Statistical Committee) determines the overage occurred because data collection/monitoring improved, rather than because catches actually increased.

Table 7.4. Proposed MSY proxy and ACL for queen conch for the U.S. Caribbean.

Unit	Pounds	
	MSY Proxy = OFL	ACL
Queen Conch	917,716	50,000

Preferred Alternative 2(g) would equate the ACL and OY for queen conch to OY at the ABC specified by the SSC. The SSC has recommended a 50,000-pound ABC. Consequently, **Preferred Alternative 2(g)** would establish an ACL of 50,000 pounds.

Present regulation prohibits fishing for or possession of queen conch in federal waters off Puerto Rico, St. Thomas or St. John. The only queen conch harvest in federal waters is off St. Croix, and any landings of queen conch taken from those waters must occur in St. Croix. Since 2008, the USVI government has specified a 50,000-pound annual quota for queen conch in the St. Croix District. Queen conch harvest in the District closes when the 50,000-pound landings limit is met and the season remains closed until November 1, where after the new season begins. **Preferred Alternative 2(g)** is consistent with the St. Croix District's 50,000-pound annual landings quota, and would not motivate regulatory changes that would directly affect existing queen conch fishing practices in federal waters. Therefore, **Preferred Alternatives 2**, **2(b)** and **2(g)** would not have a direct or indirect economic impact on queen conch fishers, their families or communities.

7.5.3 Action 3. Annual Catch Limit Allocation/Management

7.5.3.1 Action 3(a). Snapper and grouper unit allocation/management

Preferred Alternative 4 of Action 3(a) would define aggregate reference points for snapper and grouper in the USVI and define aggregate reference points for grouper but not snapper in Puerto Rico. Therefore, the Snapper Unit would be divided into its Sub-Units and there would be separate ACLs for Snapper Unit 1 (**Preferred Alternative 2** of Action 1(b), Snapper Unit 2 (**Preferred Alternative 2** of Action 1(b)), Snapper Unit 3 and Snapper Unit 4 landed in Puerto Rico (Table 7.5). The ACL would be equal to 85 percent of the MSY proxy as determined by **Preferred Alternative 2(d)** of Action 2(a).

Table 7.5. Proposed MSY proxies and ACLs and average 2006-07 annual landings of Snapper Units 1 – 4 and Grouper Unit for Puerto Rico, and Snapper and Grouper Units for the USVI.

Unit/Sub-Unit		Pounds					
		MSY Proxy		Avg. 2006-07 Landings		ACL	
		Puerto Rico	USVI	Puerto Rico	USVI	Puerto Rico	USVI
Snapper	Unit 1	447,307		356,409		380,211	
	Unit 2	212,619		159,535		180,726	
	Unit 3	504,627		253,084		428,933	
	Unit 4	472,711		256,052		401,804	
	Total		278,495		296,812		236,721
Grouper	Total	299,678	96,805	128,830	85,287	254,726	82,284

The proposed ACLs for Snapper Units 1 through 4 and Grouper in Puerto Rico are larger than average annual landings of the Sub-Units/Units from 2006 to 2007 in the territory. This difference suggests there would not be subsequent regulatory action that reduces future fishing for these species in the EEZ off Puerto Rico. Therefore, Preferred

Alternative 4 would not have a direct or indirect impact on Puerto Rico commercial or recreational fishermen, their families and/or communities.

The proposed ACLs for the Snapper and Grouper Units in the USVI are smaller than average annual landings from 2006 to 2007 for the Units in the territories. **Preferred Alternative 4** would not have a direct economic impact on USVI commercial fishermen, their families and/or communities; however, it would have an indirect impact on them by motivating subsequent regulatory change that is intended to reduce average annual landings of the Snapper and Grouper Units. The magnitude of the adverse economic impacts of the regulatory change is greatly dependent upon the specifics of the regulatory change and the significance of fishing in federal, not territorial, waters. The proposed ACLs and shortened fishing seasons (Action 5) could encourage a shift from USVI's historic small-scale commercial to industrial-scale commercial fishing operations with larger vessels and gears capable of catching more fish in the same or a shorter period of time. Such a competitive environment could result in lower long-term economic benefits that derive from the Units and the ecosystem of which they are part, and a transfer of economic benefits from artisanal fishermen to industrial-scale fishing operations. The actual indirect economic impacts of **Preferred Alternative 4** on USVI commercial fishermen, however, would be dependent on if the regulatory, economic and social environments support industrial-scale operations and such a race. It may be more likely from economic and social standpoints that commercial fishermen maintain historic rates of fishing when the federal season is open then switch to fishing for other species when the federal seasons end and/or move into territorial waters after the federal seasons end to target the Units.

7.5.3.2 Action 3(b). Commercial and recreational sector allocation/management (Puerto Rico only)

Preferred Alternative 2 would divide the commercial and recreational MSY proxies and ACLs for Snapper Units 1 through 4 and the Grouper and Parrotfish Units in Puerto Rico by commercial and recreational (including subsistence) sector, based on annual landings for each sector. This action applies only to Puerto Rico because recreational harvest data are not available for the USVI. No separate sector allocation for queen conch would be specified because there are no commercial or recreational queen conch fisheries in federal waters off Puerto Rico. Fishing for and transportation of queen conch are prohibited in federal waters off Puerto Rico.

Preferred Alternative 2 could benefit recreational and subsistence fishermen who fish in federal waters off Puerto Rico because their landings would not count against an all-sector ACL. If recreational and commercial landings of a Sub-Unit/Unit were to count against the same ACL and average previous years' landings exceeded the ACL, subsequent regulatory action would reduce all fishing for that Sub-Unit/Unit, although most of the previous years' landings and overage may have been from one sector only. If all fishermen are faced with a shortened federal fishing season, there could be a race between commercial and recreational (including subsistence) fishermen to catch as many fish as possible before the federal fishing season is closed. In such a race, commercial fishing operations would be favored because they are typically capable of catching more fish in the same or a shorter period of time than recreational and subsistence fishermen. There would likely be a transfer of economic benefits from recreational and subsistence fishermen who fish in the EEZ to commercial fishermen who fish in federal waters as a result. The actual impacts of a shared ACL, however, would be dependent on the significance that fishing in federal waters has to recreational and subsistence fishermen who fish for Snapper Units 1 through 4 and the Grouper and Parrotfish Units. Parrotfish, for example, tend to be caught exclusively or almost exclusively in state waters, and charter fishing operations that go into federal waters tend to target only pelagic species.

Separation of ACLs by sector does not prevent conflict between fishermen in the same sector. For example, if the federal commercial fishing season for a Sub-Unit/Unit were to be closed early because the average of previous years' landings exceeded the Commercial ACL, commercial fishermen could be in competition with each other to catch as much as possible before the season ends. In that sense, the Commercial ACL and shortened fishing season would encourage a shift from Puerto Rico's historic small-scale commercial to industrial-scale commercial fishing operations with larger vessels and gears capable of catching more fish in the same or a shorter period of time. Such a competitive environment could result in lower long-term economic benefits that derive from the Sub-Unit/Unit and the ecosystem of which it is a part, and a transfer of economic benefits from artisanal fishermen to industrial-scale fishing operations. The actual indirect economic impacts of **Preferred Alternative 2** on commercial fishermen, however, would be dependent on if the regulatory, economic and social environments support industrial-scale operations and such a race. It may be more likely from economic and social standpoints that fishermen continue historic rates of commercial fishing when the federal season is open then switch to fishing for other species when the federal season closes and/or substitute fishing in federal waters for fishing in territorial waters after the federal season ends. In 2008, there were 868 active commercial fishermen with 670 fishing vessels in Puerto Rico.

A comparison of the proposed Commercial ACLs to average annual commercial landings from 2006 to 2007 suggests the proposed Commercial ACLs for Grouper and Snapper Units 1, 3 and 4 would not motivate regulatory change that reduces the length of the federal commercial fishing seasons or otherwise attempts to reduce annual commercial harvests of these Units/Sub-Units in federal waters off Puerto Rico (Table 7.6). The proposed Commercial ACLs for Snapper Unit 2 and the Parrotfish Unit are less than the average annual commercial landings for the respective species from 2006 to 2007, which suggests **Preferred Alternative 2** of Action 3(b) would motivate regulatory change that reduces the lengths of the federal commercial fishing seasons or otherwise attempts to reduce commercial harvest of Snapper Unit 2 or Parrotfish in federal waters off Puerto Rico. The magnitude of the indirect impact would be dependent on the historic level of fishing for Snapper Unit 2 or the Parrotfish Unit in federal waters and the ability of fishermen to continue fishing for the species in territorial waters and/or otherwise mitigate for lost landings after the federal season ends. Parrotfish are almost exclusively or exclusively targeted in territorial waters, and less than 5 percent of the fishable area off Puerto Rico is in the EEZ.

Table 7.6. Comparison of Commercial and Recreational MSY proxies and ACLs for Snapper Sub-Units and Grouper and Parrotfish Units in Puerto Rico to average annual landings of Units from 2006 to 2007 in Puerto Rico.

Unit/Sub-Unit		Pounds					
		MSY Proxy		Avg. 2006-07 Landings		ACL	
		Commercial	Recreational	Commercial	Recreational	Commercial	Recreational
Snapper	Unit 1	334,923	112,384	151,300	205,109	284,685	95,526
	Unit 2	171,666	40,953	151,007	8,528	145,916	34,810
	Unit 3	406,794	97,833	183,987	69,097	345,775	83,158
	Unit 4	439,171	33,540	239,445	16,607	373,295	28,509
Grouper	Total	208,839	90,839	73,625	55,206	177,513	77,213
Parrotfish	Total	127,980	37,042	54,332	6,730	52,737	15,263

The proposed Recreational ACLs for Parrotfish, Grouper and Snapper Units 2, 3 and 4 are greater than the average annual recreational landings from 2006 to 2007 for each respective Unit/Sub-Unit. That suggests **Preferred Alternative 2** would not motivate regulatory change in these fisheries. However, the proposed Recreational Snapper Unit 1 ACL is less than the corresponding average annual recreational landings of the Sub-Unit from 2006 to 2007, which suggests **Preferred Alternative 2** could motivate regulatory change that reduces the length of the federal recreational fishing season or otherwise attempts to reduce recreational harvest of Snapper Unit 1 in federal waters off Puerto Rico. Presently, the federal and territorial seasons for Snapper Unit 1 (excluding wenchman) run from January 1 through September 30 each year. As of March 9, 2010, 582 of Puerto Rico's recreational fishermen were registered with the National Angler Registry and up to 582 recreational fishermen could be indirectly affected by **Preferred Alternative 2**.

The magnitude of the indirect economic impact of **Preferred Alternative 2** is largely dependent upon the significance of recreational fishing in federal, not territorial, waters. If recreational fishers and charter fishing operations do not fish for Snapper Unit 1 in federal waters, any regulatory change that affects Snapper Unit 1 fishing in the EEZ would have no impact on recreational Snapper Unit 1 landings. Also, if Puerto Rico recreational fishermen and charter fishing operations harvest Snapper Unit 1 species from federal waters, it is reasonable to expect they would substitute fishing in federal waters for fishing in territorial waters if they were targeting Snapper Unit 1. Such a substitution would likely have little to no displacement costs and there would be little to no adverse economic impact from regulatory actions designed to reduce Snapper Unit 1 recreational fishing in federal waters off Puerto Rico.

7.5.3.3 Action 3(c). Geographic allocation/management

Preferred Alternative 2 would divide the Caribbean EEZ into three parts and manage ACLs by island group (St. Croix, St. Thomas/St. John, and Puerto Rico,). It would not limit fishermen from any island group to fishing in federal waters of their specific island group. For example, it would not prevent St. Thomas/St. John fishermen from fishing in the Puerto Rico or St. Croix EEZ and vice versa’ however, it would limit landings from one island group to counting against that island group’s ACL. For example, rather than Puerto Rico and USVI commercial fishermen’s landings counting against a U.S. Caribbean Grouper ACL of 259,797, Puerto Rico commercial fishermen’s landings would count against the Puerto Rico Commercial Grouper ACL of 177,513 pounds, St. Croix commercial fishermen’s landings would count against the St. Croix Grouper ACL of 30,435 pounds and St. Thomas/St. John commercial fishermen’s landings would count against the St. Thomas/St. John Grouper ACL of 51,849 pounds (259,797 = 177,513 + 30,435 + 51,849).

Preferred Alternative 2 would limit Puerto Rico, St. Croix and St. Thomas/St. John commercial fishermen’s shares of the U.S. Caribbean commercial ACL. For example, Puerto Rico, St. Croix and St. Thomas/St. John commercial fishermen’s shares of the U.S. Caribbean Commercial Grouper ACL (259,797 pounds) would be approximately 68 percent, 12 percent and 20 percent, respectively. **Preferred Alternative 2** would not allow for a change in an island group’s share of the ACL, although one island group could have a trend of decreasing or increasing commercial Grouper Unit landings. For example, if Puerto Rico’s future annual commercial landings of the Grouper Unit averaged 25,000 pounds less than the Puerto Rico Commercial Grouper ACL, St. Croix and/or St. Thomas/St. John commercial fishermen would not be allowed to increase their combined landings of the Unit up to 25,000 pounds because their Grouper ACLs would be independent of declining landings in Puerto Rico. That inability to increase landings in St. Croix and/or St. Thomas, although there would be no net increase in U.S. Caribbean landings, represents a cost to USVI commercial fishermen.

Preferred Alternative 2 could benefit Puerto Rico, St. Croix and St. Thomas/St. John commercial fishermen who fish in federal waters because their landings would not count against the same ACL. If Puerto Rico, St. Croix and St. Thomas/St. John commercial landings counted against the same ACL and there was an overage of landings because landings exceeded the ACL, subsequent regulatory action would reduce fishing in federal waters off all island groups, although most of the landings and overage may have been attributed to one island group only. Moreover, if all commercial fishermen were faced with a shortened fishing season, there could be a race between Puerto Rico, St. Croix and St. Thomas/St. John fishermen to catch as many fish as possible before the federal fishing season is closed. In such a race, commercial fishing operations with larger vessels and gears capable of catching more fish in the same or a shorter period would be favored over traditional vessels and there would be a transfer of benefits from commercial fishermen with traditional vessels to those with more industrial-scale vessels. However, such an outcome would be dependent on the regulatory, economic and social environments supporting such a race and overcapacity. It may be more likely from economic and social standpoints that Puerto Rico and USVI commercial fishermen would keep to their traditional artisanal fishing practices, maintain historic rates of fishing when the federal fishing season is open, and shift to catching other species and/or move into territorial waters after the season is closed.

Preferred Alternative 2 would not prohibit landings of the Sub-Unit/Unit in an island group after the federal fishing season is closed. Fishermen could continue to fish for the Sub-Unit/Unit in territorial waters and land their catch as long as the territorial season remains open. However, any landings of the Sub-Unit/Unit taken in territorial waters during the time that the federal fishing season is closed would count against the ACL of the island group where the catch is landed.

Fishermen from the island groups tend to restrict their efforts to federal and territorial waters off their particular island group. Because there is substantially more fishable habitat in territorial waters off Puerto Rico than off St. Croix or St. Thomas/St. John, it is expected that Puerto Rico fishermen would have greater ability to mitigate for a shortened federal fishing season than their counterparts in the USVI who would have higher displacement costs, such as higher fuel costs if they travel to more distant areas in the EEZ. The difference in the island groups' abilities to mitigate for lost landings suggest the possibility that **Preferred Alternative 2** could indirectly produce a transfer of benefits from USVI commercial fishermen to Puerto Rico fishermen because an increasing share of U.S. Caribbean landings could occur in Puerto Rico.

A comparison of average annual landings of snapper, grouper and parrotfish from 2006 to 2007 to the proposed ACLs for each of the two USVI island groups suggests **Preferred Alternative 2** of Action 3(c) could motivate regulatory change (Actions 5(a) and 5(b)) that reduces the lengths of the federal fishing seasons for the Snapper and Parrotfish Units in federal waters off St. Croix and in the Snapper and Grouper Units in federal waters off St. Thomas/St. John, which could have a significant adverse impact on St. Croix and St. Thomas/St. John commercial fishermen, their families and communities (Table 7.7). However, average annual landings from 2006 to 2007 may not be representative of current average annual landings. For example, trammel and gill nets have been popular gears to take parrotfish in waters off St. Croix where most parrotfish are landed. According to a public comment by the St. Thomas Fishermen's Association (May 7, 2009), trammel and gill nets have represented 90 percent of the parrotfish landings in St. Croix. One of the SFA implementing regulations of 2005 was a prohibition on the use of gillnet or trammel net in federal waters. In July 2006, their use was banned in USVI waters. Parrotfish landings fell from 460,311 pounds in 2006 to 347,239 pounds in 2007. The net ban was initially met with resistance by parrotfish fishers who used one or both nets and continued to use the nets because the ban was not enforced. Enforcement of the ban did not begin until April 2008. Hence, landings of parrotfish prior to 2008 do not reflect that enforcement, although the 2007 landings represent those after the net ban was implemented in July 2006. Since the ban, it is possible that commercial fishermen have increasingly used other gear(s) and landings have not declined.

A U.S. Caribbean Parrotfish ACL of 365,500 pounds would be divided into four Parrotfish ACLs: Puerto Rico Commercial Parrotfish ACL, Puerto Rico Recreational Parrotfish ACL, St. Croix Parrotfish ACL and St. Thomas/St. John Parrotfish ACL. A U.S. Caribbean Parrotfish ACL of 365,500 pounds would be divided into a Puerto Rico Commercial ACL of 52,737 pounds, Puerto Rico Parrotfish Recreational ACL of 15,263 pounds (Puerto Rico total of 68,000 pounds), St. Croix Parrotfish ACL of 255,000 and St. Thomas/St. John Parrotfish ACL of 42,500 pounds.

Table 7.7. Proposed Action 2 ACLs for the Snapper and Grouper Complexes, and Parrotfish Unit for St. Croix and St. Thomas/St. John.

Unit/Sub-Unit		**Pounds**			
		ACL		**Average Annual Landings 2006-07**	
		St. Croix	**St. Thomas/ St. John**	**St. Croix**	**St. Thomas/ St. John**
Snapper	**Total**	102,946	133,775	130,581	166,231
Grouper	**Total**	30,435	51,849	28,475	56,812
Parrotfish	**Total**	255,000	42,500	361,229	42,528

1. The Council reduced the ABC by 15 percent on each island to account for uncertainty in the scientific and management process.

The 50,000-pound ACL for queen conch in combination with current regulation that limits queen conch fishing in the EEZ to waters off St. Croix essentially establishes a St. Croix ACL of 50,000 pounds, which is equal to the St. Croix District's annual quota set by the VIDPNR. Hence, **Preferred Alternative 2** would not motivate regulatory change that reduces the length of the queen conch fishing season in the EEZ or otherwise attempts to reduce queen conch landings beyond current levels. **Preferred Alternative 2** would not have a direct or an indirect adverse economic impact on queen conch fishermen, their families and communities.

The potential indirect economic impacts of **Preferred Alternative 2** of Action 3(c) on Puerto Rico fishermen are the same as, not additive to, the indirect economic impacts of **Preferred Alternative 2** of Action 3(b) that are described in section 7.5.3.2.

Preferred Alternative 2(a) of Action 3(c) would use a mid-point or equidistant method for dividing the EEZ among the three island groups. It would not have a direct impact on fishermen of the island groups, but would have an indirect impact if subsequent regulatory action (Action 5) closes the EEZ off an island group to fishing for a particular Unit/Sub-Unit if that island group's landings of a Unit/Sub-Unit exceed the proposed ACL for the Unit/Sub-Unit for that island group. For example, if average annual landings of parrotfish in St. Croix exceeded the proposed St. Croix Parrotfish ACL and the federal fishing season in the St. Croix EEZ were shortened, no parrotfish fishing would be allowed in the

St. Croix EEZ after the season closes regardless of where the fishermen live or land their catches.

Because fishermen tend to fish in territorial and federal waters off their respective island groups and land their catch in their home islands, **Preferred Alternatives 2** and **2(a)** of Action 3(c) would align the location of landings and ACL with the location of catch. For example, if St. Croix's landings of the Snapper Unit exceeded the proposed St. Croix Snapper ACL, the length of the Snapper Unit fishing season in the St. Croix EEZ would be shortened (Action 5) and no fisherman, regardless of which island group s/he belonged to, would be allowed to fish for species in the Snapper Unit in the St. Croix EEZ after fishing in the St. Croix EEZ was closed. If fishing for the Snapper Unit were allowed to continue as is in the St. Croix EEZ, overfishing could continue could have a greater relative beneficial indirect economic impact on U.S. Caribbean snapper, grouper and parrotfish fishermen because they would restrict .

7.5.4 Action 4. Management Measures

7.5.4.1 Action 4(a). Species-specific parrotfish prohibition

Preferred Alternative 2 of Action 4(a) follows logically from **Preferred Alternative 2(h)** of Action 2(a) that specifies that the commercial and recreational ACLs for midnight parrotfish, blue parrotfish and rainbow parrotfish would be zero. **Preferred Alternative 2** of Action 4(a) would prohibit fishing for and possession of midnight parrotfish, blue parrotfish and rainbow parrotfish in federal waters.

Preferred Alternative 2 would have direct adverse economic impacts on Puerto Rico, St. Croix and St. Thomas/St. John fishermen who harvest midnight, rainbow, and/or blue parrotfish in the EEZ. From 2000 to 2007 there were no reported recreational landings of midnight parrotfish and only sporadic landings of rainbow and blue parrotfish in Puerto Rico (Table 7.8). From 2004 to 2007, there were no recreational landings of any of the three species. The data suggest **Preferred Alternative 2** would have no to very little adverse economic impact on recreational fishermen of Puerto Rico.

Table 7.8. Recreational landings of rainbow, midnight, and blue parrotfish in Puerto Rico, 2000 to 2007.

Year	Individuals		
	Rainbow	Midnight	Blue
2000	662	0	1,904
2001	0	0	128
2002	0	0	0
2003	550	0	3,326
2004	0	0	0
2005	0	0	0
2006	0	0	0
2007	0	0	0

Commercial landings of blue, midnight and rainbow parrotfish have also been minimal in Puerto Rico. From 1999 to 2007, a total of 32 pounds of midnight parrotfish and 136 pounds of blue parrotfish harvested from territorial and federal waters were landed (Table 7.9). Commercial landings of rainbow parrotfish taken from territorial and federal waters were reported in 1999 and from 2002 to 2006, ranging from 13 to 2,128 pounds. These figures suggest that any adverse economic impact of **Preferred Alternative 2** on Puerto Rico's commercial fishermen would be experienced by those who occasionally harvest rainbow parrotfish. However, it is expected that commercial fishermen could mitigate for any loss of harvest of rainbow, midnight and/or blue species from the EEZ, if there is any, by increasing effort in territorial waters and/or by targeting other parrotfish or non-parrotfish species in federal waters, subject to any ACL limitations on those species, if any. Approximately 95 percent of fishable habitat off Puerto Rico is within territorial waters. None of Puerto Rico's recreational fishers interviewed for MRFSS in 2006 or 2007 reported catching parrotfish in the EEZ. According to a scoping-meeting comment, commercial and recreational fishers in Puerto Rico catch the same kind of parrotfish and in the same areas. That comment suggests **Preferred Alternative 2** of Action 4(a) would have no direct or indirect economic impact on commercial or recreational fishers, their families, and fishing communities of Puerto Rico.

Table 7.9. Commercial landings (adjusted) of rainbow, midnight and blue parrotfish in Puerto Rico, 1999 to 2007, in dollars and pounds.

	Ex-Vessel Revenue (Dollars)			Landings (Pounds)		
Year	**Rainbow**	**Midnight**	**Blue**	**Rainbow**	**Midnight**	**Blue**
1999	24	49	26	13	24	13
2000	0	0	0	0	0	0
2001		0	212	0	0	106
2002	279	0	0	140	0	0
2003	963	6	28	617	8	17
2004	3,275	0	0	2,128	0	0
2005	2,783	0	0	1,855	0	0
2006	331	0	0	220	0	0
2007	0	0	0	0	0	0

MRFSS is not conducted in the USVI, so there are no data regarding annual recreational landings of parrotfish or any other species. Hence, the economic impact of **Preferred Alternative 2** on recreational fishermen of St. Croix and St. Thomas/St. John is unknown. The economic impact of **Preferred Alternative 2** of Action 4(a) on St. Croix and St. Thomas/St. John commercial fishers is also unknown because landings of parrotfish are not reported by species; however, it is likely that St. Croix commercial fishermen and their families could experience a larger adverse economic impact than their counterparts in St. Thomas/St. John, because of the much larger landings of parrotfish in St. Croix relative to St. Thomas/St. John (Table 7.7). It is expected that St. Croix and St.

Thomas/St. John fishermen could mitigate for losses of harvest of midnight, blue, and/or rainbow parrotfish in federal waters, if any, by either increasing effort for other parrotfish or other species in the EEZ and/or relocating to territorial waters when or if they are targeting these species; however, the ability to mitigate is conditional upon the proposed ACLs and corresponding regulations that restrict harvest of other species.

7.5.4.2 Action 4(b). Recreational bag limits

Preferred Alternative 8 would establish an aggregate bag limit for the Snapper, Grouper and Parrotfish Units in federal waters of 10 individual fish per recreational fisher including not more than two parrotfish per fisher or six parrotfish per boat, and 30 aggregate snapper, grouper, and parrotfish per boat on a fishing day.

Preferred Alternative 8 could have an adverse economic impact on recreational fishermen and charter vessel operations of Puerto Rico and the USVI because their catch of parrotfish and combined catch of snapper, grouper and parrotfish in the EEZ would be limited. However, the magnitude of the adverse economic impact on recreational fishermen and charter vessel operations is dependent upon the significance that fishing for these species in federal waters has for these persons and operations and their ability to shift fishing to territorial waters to mitigate for losses of harvest, if any. Charter fishing operations target pelagics in federal waters, not the above species. It is rare for a recreational fisherman in Puerto Rico to harvest more than two parrotfish during a fishing trip, and there are no records of fishermen harvesting five or more parrotfish during a single boat trip during the period from 2000 to 2007, which suggests the parrotfish limitation would have little to no adverse impact on Puerto Rico's recreational fishermen. Approximately 4.7 percent of the fishable area off Puerto Rico is in the U.S. Caribbean EEZ, which suggests Puerto Rico recreational fishermen could substitute fishing in territorial waters for federal waters if they expect to exceed the aggregate bag limit.

There are no data on recreational fishing in the USVI; however, it is expected that St. Croix and St. Thomas/St. John recreational and subsistence fishermen and charter vessel operations would be less able to substitute fishing in territorial waters for federal waters than their counterparts in Puerto Rico. In 2009, there was one charter boat operation in St. Croix and nine in St. Thomas/St. John. As of March 9, 2010, there were 12 USVI recreational fishermen registered with the National Angler Registry. Therefore, up to 10 charter boat operations and up to 12 recreational fishermen in the USVI could be adversely affected by the recreational bag limit. USVI charter fishing operations, however, tend to target pelagic species, which suggests the bag limit would not affect these operations. **Preferred Alternative 8**'s recreational bag limits could affect charter boat operations' abilities to maintain historic numbers of paying passengers per fishing trip into federal waters, which would decrease their revenues per trip. Similarly, recreational and subsistence fishermen could have less fish to bring back home and consume when they fish in the EEZ. In the long run, however, **Preferred Alternative 8** could yield increased populations of these species, which would have higher beneficial economic impacts on these recreational and subsistence fishermen.

If the economic cost of **Preferred Alternative 8** is greater than the economic cost of obtaining a commercial fishing license, the least cost option for a charter vessel operation or recreational (or subsistence) fisherman would be to purchase a Puerto Rico commercial license. USVI fishermen could buy a Puerto Rico commercial fishing license, but Puerto Rico's commercial fishermen could not similarly buy a USVI commercial license to land their catches in the USVI because of a moratorium on commercial fishing licenses in the USVI. The cost of a Puerto Rico commercial license for a nonresident is $250, which is good for four years and can be renewed. The cost for a Puerto Rico resident is $10, which may be good for only one year because it is a beginner license, and the cost for a license for an experienced fisherman is $40, which is renewable every four years. A resident must show sales of catch to get a non-beginner license. The most likely least cost option for the average charter fishing operation or recreational fisherman would be to substitute fishing in territorial waters for federal waters when it is intended that landings of the species would exceed the recreational bag limit(s) or vessel limit.

7.5.4.3 Action 4(c). St. Croix parrotfish harvest reductions

Preferred Sub-alternative 2A would further reduce the St. Croix parrotfish ACL from 255,000 pounds that would be established by **Preferred Alternative 2(g)i** of Action 2 to 240,000 pounds. The former is 85 percent of the SSC's recommended ABC of 300,000 pounds, while the latter is 80 percent of that figure. Similar percent reductions are proposed for the islands of St. Thomas/St. John (**Sub-alternative 2B**) and Puerto Rico (**Sub-alternative 2C**). **Alternative 1** would have the least adverse economic and social impact on U.S. Caribbean fishers because it would not further reduce any of the parrotfish ACLs. **Preferred Sub-alternative 2A** would have the largest adverse economic and social impact on parrotfish fishermen of St. Croix, because it would further reduce the St. Croix parrotfish ACL and likely further reduce annual landings. **Sub-alternatives 2B and 2C** would have the largest adverse economic and social impacts on fishermen of St. Thomas/St. John and Puerto Rico, respectively, because each one further reduces the island area's parrotfish ACL and likely further reduces its annual landings. If **Preferred Sub-alternative 2A** and **Sub-alternatives 2B and 2C** were combined, the combination would have the greatest adverse economic and social impact on fishermen of the U.S. Caribbean.

7.5.5 Action 5. Accountability Measures

7.5.5.1 Action 5(a): Triggering accountability measures

Preferred Alternative 3 would trigger AMs if the ACL is exceeded by landings specified by **Preferred sub-alternative 3C** and NMFS' SEFSC (in consultation with the Caribbean Fishery Management Council and its Scientific and Statistical Committee) determines the overage occurred because catches increased versus data collection/monitoring improved. **Preferred sub-alternative 3C** is equal to a single year of landings effective beginning 2010, a 2-year running average of landings effective 2011, then a 3-year running average of landings effective 2012 and thereafter (i.e., 2010, 2010-2011, 2010-2012, 2011-2013, etc.).

Preferred Alternative 3 and **Preferred Sub-alternative 3C** would not have a direct economic impact on fishermen, their families or communities because they would not directly affect current fishing practices. However, **Preferred Alternative 3** and **Preferred Sub-alternative 3C** motivate Action 5(b) and Action 5(b) could directly affect existing fishing practices in the U.S. Caribbean by reducing the federal fishing season(s) in parts of the EEZ. The economic impacts of Action 5(b) are described in section 7.5.5.2.

7.5.5.2 Action 5(b): Applying accountability measures

Preferred Alternative 2 would reduce the length of the fishing season for the sub-unit or unit the year following the trigger determination by the amount needed to prevent such an overage from occurring again. Shortening the length of the closed season is expected to increase the population size (density) of the species being considered in federal waters. The increased population, in turn, is expected to result in increased profits to fishermen during that portion of the year when harvest is allowed in federal waters in following years, resulting in a potential increase in effort in the EEZ, which, in the long run, would reduce the population and effort until an equilibrium is established.

Ways fishermen could mitigate for a loss of landings of a unit or sub-unit due to a shortened federal fishing season include:

- Relocating to territorial waters to fish for the unit or sub-unit;
- Increasing harvest of other species in territorial and/or federal waters; and/or
- Increasing effort in federal waters in order to catch more fish before harvest in federal waters closes.

These mitigating strategies would not be without costs. **Preferred Alternative 2** may have displacement costs, such as catch-and-landings changes, trip-level search and associated costs, crowding and congestion costs, and personal safety costs that are associated with relocating to territorial or other federal waters. Increasing harvest of other species could adversely affect their stocks and reduce the long-term economic benefits that derive from those stocks. Furthermore, increasing effort to catch the same amount of or more fish in a shortened federal fishing season could produce lower long-term economic benefits that derive from the resource and the ecosystem, and a transfer of economic benefits from small-scale commercial, recreational and subsistence fishermen to industrial fishing operations. In a race to catch the same amount or more fish before closure in federal waters, industrial-scale commercial fishing operations with larger vessels and gears capable of catching more of the fish in the same or a shorter period of time would be favored over historic small-scale commercial, recreational and subsistence fishermen. Furthermore, the ability of charter boat operations to increase effort is limited by demand for their services by paying customers; the ability of recreational fishermen to increase effort is limited by leisure time constraints, and subsistence fishermen are limited by both personal and/or households' rates of consumption of fresh fish and time constraints.

Puerto Rico

Preferred Alternative 2 of Action 5(c) would have no adverse economic impact on Puerto Rico's queen conch fishermen because queen conch fishing and transportation of queen conch is presently prohibited in the EEZ off Puerto Rico and this action would not change that prohibition. All queen conch landings in Puerto Rico are harvested from state waters.

The proposed Commercial Parrotfish ACL in Puerto Rico would be 52,737 pounds. Parrotfish are caught in both federal and territorial waters. The proposed ACL is at most half of annual commercial landings for each year from 1999 to 2005, but larger than annual landings in 2006 and relatively close to, but less than, those in 2007 (Figure 7.1). If the average of 2006 and 2007 landings (54,332 pounds) is more representative of current and future annual parrotfish landings, there would be an overage of commercial parrotfish landings of 1,596 pounds in 2010. However, if the average of 1999 to 2005 landings is more representative of current and future annual landings, there would be an overage of 75,243 pounds. Preliminary estimates indicate annual landings of 88,696 pounds in 2008 and 60,309 pounds in 2009, for an annual average of 74,502 pounds. Regardless of which average is taken to estimate future baseline annual landings, there would be an overage of commercial parrotfish landings. Consequently, an overage would be expected in 2010 and a shortened fishing season for parrotfish in the Puerto Rico EEZ in 2011.

Public comment suggests parrotfish are harvested exclusively or almost exclusively in commonwealth waters. Hence, **Preferred Alternative 2** of Action 5(b) may have little to no direct adverse economic impact and **Preferred Alternative 3** and **Preferred Sub-alternative 3C** of Action 5(a) may have little to no indirect adverse economic impact on Puerto Rico's commercial and recreational parrotfish fishermen if there were a shortened fishing season in the Puerto Rico EEZ. In this situation, a shortened federal parrotfish fishing season in the Puerto Rico EEZ would have little to no positive impact on stock size (if assuming that the density of these species in commonwealth waters is not significantly different than in federal waters), even in the absence of any expansion of commercial effort in federal waters during those months when the Puerto Rico EEZ is not closed to commercial parrotfish fishing. With few to no commercial parrotfish fishermen shifting effort from federal to territorial waters, commercial parrotfish fishermen would not find themselves incurring displacement costs. Also, there would be no costs associated with increased targeting of other species or increased effort to catch parrotfish in a shortened federal fishing season.

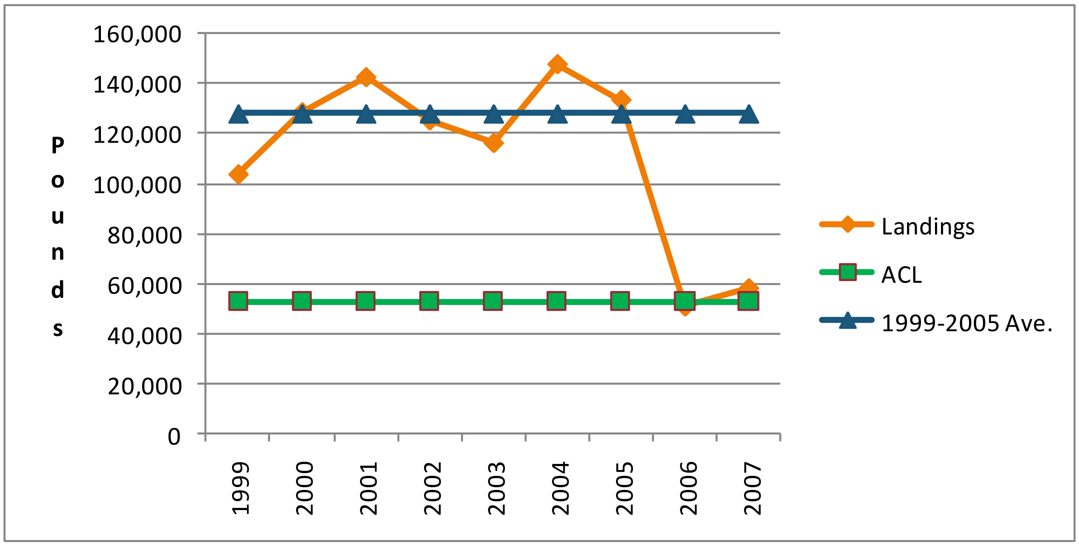

Figure 7.1. Adjusted commercial landings of parrotfish from 1999 to 2007, average annual adjusted commercial landings of parrotfish from 1999 to 2005, and proposed Commercial Parrotfish ACL.

The proposed Recreational Parrotfish ACL for parrotfish in Puerto Rico would be 15,263 pounds or 9,118 individuals, which would apply to both recreational and subsistence fishermen. The proposed ACL is larger than the recreational landings since 2004 (Figure 7.2). If more recent landings, such as in 2006 and 2007, are more representative of current recreational parrotfish landings, there would be no overage of recreational parrotfish landings in 2010 or subsequent years. Nonetheless, if 1999 to 2005 landings are more representative of current landings, then an overage could be expected in 2010, which would motivate Action 5(b)'s reduction of the length of the federal recreational parrotfish fishing season in the Puerto Rico EEZ in 2011 and possibly subsequent years. However, because public comment suggests parrotfish are harvested exclusively or almost exclusively in territorial waters, **Preferred Alternative 2** of Action 5(b) may have little to no direct economic impact and **Preferred Alternative 3** and **Preferred Sub-alternative 3C** of Action 5(a) may have little to no indirect economic impact on Puerto Rico's recreational parrotfish fishermen. In this situation, a shortened federal recreational fishing season would have little to no positive impact on stock size (if assuming that the density of these species in territorial waters is not significantly different than in federal waters), even in the absence of any expansion of recreational effort in federal waters during those months when the Puerto Rico EEZ is not closed to recreational parrotfish fishing. With few to no recreational parrotfish fishermen shifting effort from federal to territorial waters, there would be minimal to no displacement costs. Also, there would be minimal to no costs associated with recreational fishermen increasing either harvest of other species or effort to catch parrotfish in a shortened federal fishing season. The recreational bag limits specified by **Preferred Alternative 8** of Action 4(b) would also discourage an increase in recreational effort to catch parrotfish in federal waters and its associated costs.

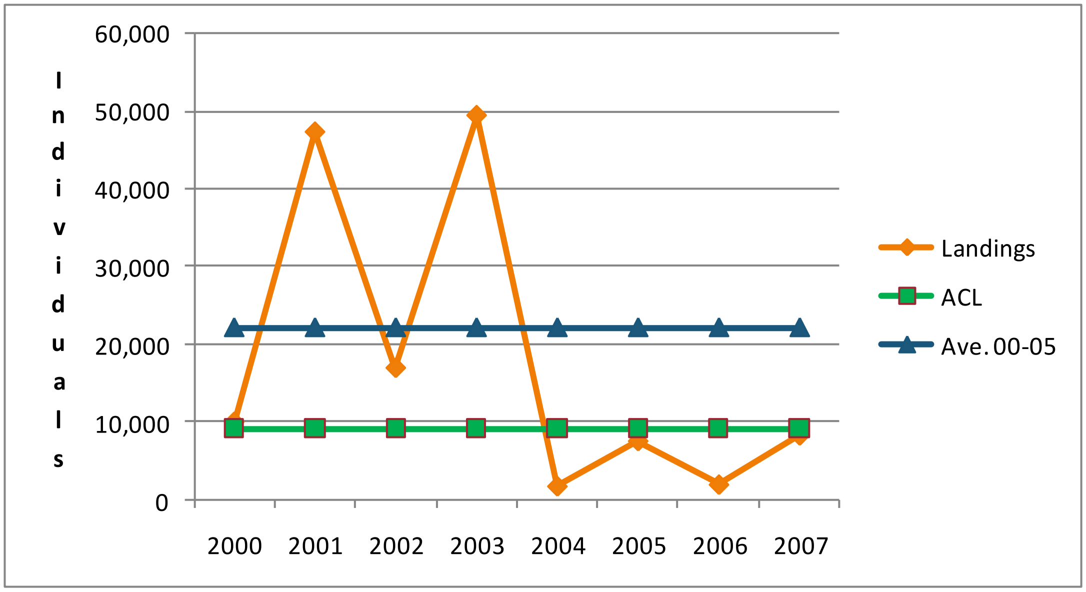

Figure 7.2. Recreational landings of parrotfish from 2000 to 2007, average annual recreational landings of parrotfish from 2000 to 2005, and proposed Recreational Parrotfish ACL in number of individuals.

Commercial landings of current and proposed Snapper Unit 1 harvested from federal and commonwealth waters combined have shown a declining trend since 2003 (Figure 7.3). The proposed Puerto Rico Commercial Snapper 1 ACL is higher than annual landings in 2006 and 2007. Given the SFA implemented a seasonal closure of the EEZ to the possession of all species in Snapper Unit 1 (black, blackfin, vermilion and silk snapper) from October 1 through December 31, which was expected to reduce fishing mortality for all of these species, the decline is not unexpected. However, the magnitude of the decline was expected to be approximately 23 percent, but average annual landings of Snapper Unit 1 species declined by 55 percent from the seven-year period of 1999 to 2005 (334,924 pounds) to the two-year period of 2006 to 2007 (151,300 pounds) (CFMC 2005).

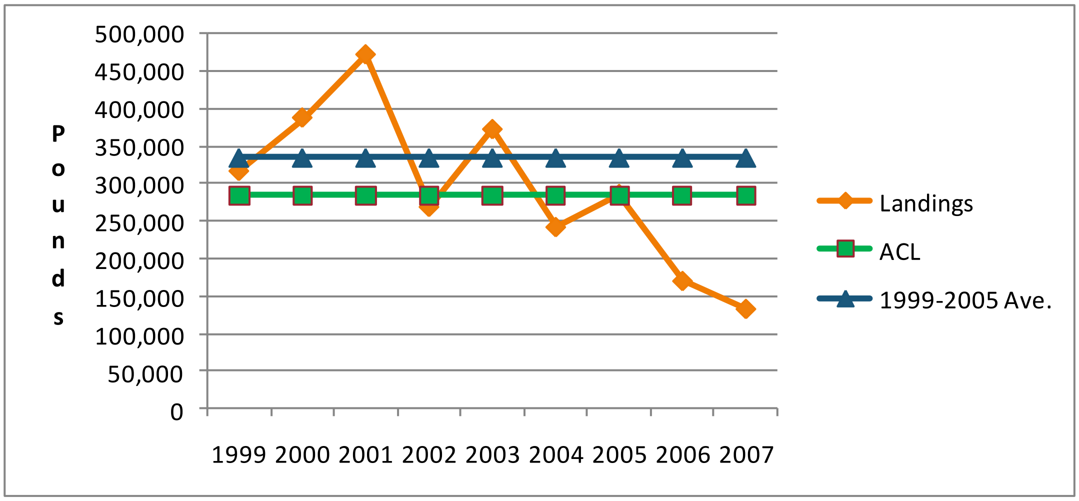

Figure 7.3. Adjusted commercial landings of Snapper Unit 1 from 1999 to 2007, average annual adjusted commercial Snapper Unit 1 landings from 1999 to 2005, and proposed Commercial Snapper Unit 1 ACL.

The declining trend and most recent annual landings suggest there would not be an overage of commercial Snapper Unit 1 landings in 2010 and subsequent years. The increase in the seasonal closure of Bajo de Sico from three to six months is also expected to reduce snapper landings, including Snapper Unit 1. Therefore, **Preferred Alternative 2** should not affect Puerto Rico’s commercial fishermen who harvest Snapper Unit 1 in federal waters and would not have an adverse economic impact on these fishermen. However, if there were an overage, although it is anticipated to be unlikely, it is expected that Puerto Rico’s commercial fishermen would mitigate for possible losses of catch because of a shortened federal commercial fishing season for Snapper Unit 1 in the Puerto Rico EEZ by increasing effort in commonwealth waters. In that situation, a shortened federal fishing season would have little to no positive impact on stock size (if assuming that the density of these species in commonwealth waters is not significantly different than in federal waters), even in the absence of any expansion of effort in federal waters during those months when the Puerto Rico EEZ is not closed to commercial Snapper Unit 1 fishing. However, there could be displacement costs, such as catch-and-landings changes, trip-level search and associated costs, crowding and congestion costs, and personal safety costs, although these may be temporary and minimal. Puerto Rico's commercial fishermen could also mitigate for a shortened federal Snapper Unit 1 fishing season, if there were one, by increasing harvest of other species and/or effort to catch the same number of or more Snapper Unit 1 species in a shortened federal fishing season; however, those behaviors would have associated costs as described in the beginning of this section.

Because recreational landings are reported by the number of individuals and not by weight, the proposed Puerto Rico recreational ACLs are converted from pounds to number of individuals in the following figures used to describe potential impacts on recreational fishers of Puerto Rico.

Puerto Rico's recreational landings of proposed Snapper Unit 1 from catches made in federal and commonwealth waters combined have varied considerably from 2000 to 2007, ranging from a low of 47,108 individuals in 2002 to a high of 182,850 individuals in 2007 (Figure 7.4). An annual average of 97,879 individuals was landed from 2000 to 2005, while that average was 157,768 individuals from 2006 to 2007. This suggests 2010 recreational landings, which may include subsistence landings, of Snapper Unit 1 could greatly exceed the proposed recreational ACL of 95,526 pounds (83,197 individuals). The resulting overage would result in a reduced federal fishing season for Snapper Unit 1 in the EEZ off Puerto Rico in 2010 and likely subsequent years. Therefore, **Preferred Alternative 2** would have an adverse economic impact on Puerto Rico's recreational and subsistence fishermen and charter fishing operations that currently target Snapper Unit 1 species in federal waters.

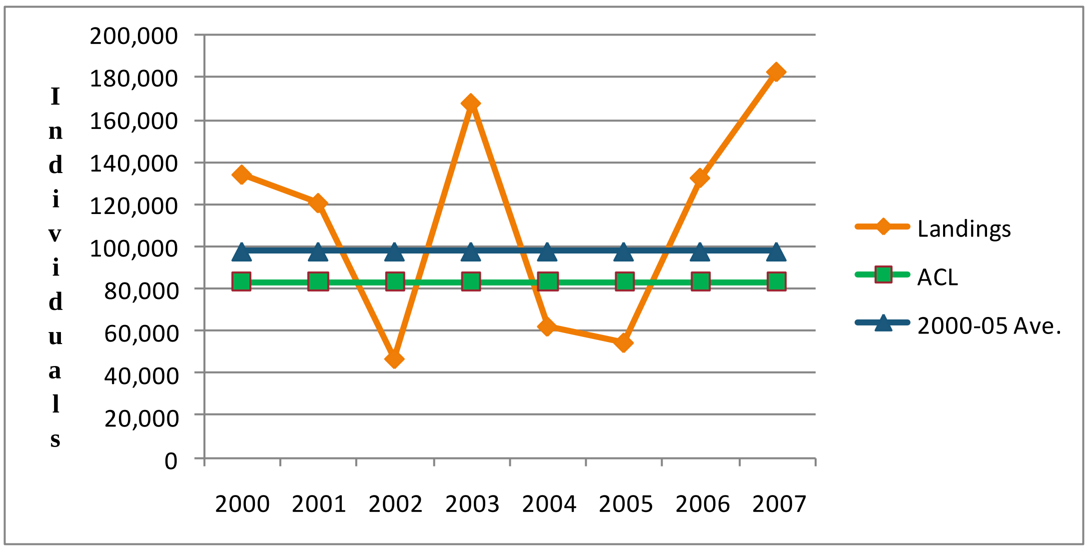

Figure 7.4. Recreational landings of Snapper Unit 1 from 2000-2007, average annual recreational Snapper Unit 1 landings from 2000 to 2005, and proposed Recreational Snapper Unit 1 ACL in number of individuals.

Charter fishing operations and recreational and subsistence fishermen could mitigate for economic losses incurred because of a reduction in the length of the federal recreational Snapper 1 fishing season in the Puerto Rico EEZ by shifting effort from federal waters to commonwealth waters or other parts of the EEZ that remain open to snapper fishing. There could be displacement costs, such as catch-and-landings changes, trip-level search and associated costs, crowding and congestion costs, and personal safety costs, although these may be temporary and minimal. Another way to reduce adverse impacts from a reduced federal recreational fishing season for Snapper Unit 1 would be to increase effort during the open season. However, the ability of charter boat operations to increase effort is limited by demand for their services by paying customers. The ability of recreational fishermen to increase effort is limited by leisure time constraints, and subsistence fishermen may be limited by their personal and/or households' rates of consumption of fresh fish. A third way for charter boat operations and recreational and subsistence fishermen to mitigate for an economic loss would be to target other species in commonwealth and/or federal waters, but that could adversely affect those stocks and reduce long-term economic benefits that derive from those resources. It is anticipated that few to no charter fishing operations, recreational and subsistence fishermen would stop or reduce fishing while the Puerto Rico EEZ is closed.

Puerto Rico's commercial landings of proposed Snapper Unit 2 from commonwealth and federal waters combined show a declining trend from 2003 to 2007 (Figure 7.5). Nonetheless, the proposed ACL is less than annual landings from 2000 to 2005 and in 2007, and less than the average of commercial landings from 2006 and 2007. This suggests there would be an overage of landings in 2010 and possibly subsequent years, and **Preferred Alternative 2** would result in a reduced fishing season for Snapper Unit 2 in the EEZ off Puerto Rico in 2011 and possibly subsequent years.

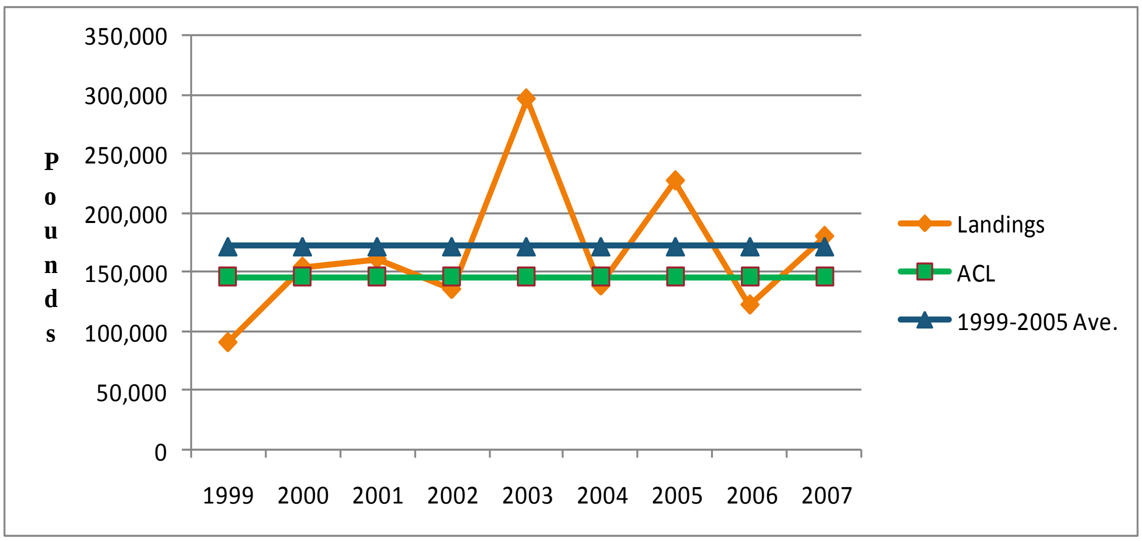

Figure 7.5. Commercial adjusted landings of Snapper Unit 2 from 1999 to 2007, average annual adjusted commercial Snapper Unit 2 landings from 1999 to 2005, and proposed Commercial Snapper Unit 2 ACL.

From 2006 to 2007, 151,007 pounds were landed annually on average. If that average is representative of current and future commercial annual landings of Snapper 2 species, there would be an overage of landings of 509 pounds in 2010 and a shortened federal fishing season in 2011 by approximately 1.2 days, assuming an average of approximately 413.7 pounds are landed daily. It is expected that Puerto Rico commercial fishermen who currently harvest proposed Snapper Unit 2 species in federal waters off Puerto Rico would mitigate for loss of revenues from Snapper Unit 2 landings due to a shortened federal fishing season for Snapper Unit 2 by shifting effort from the Puerto Rico EEZ to territorial waters or other parts of the EEZ if they remain open to Snapper Unit 2 fishing. If a shortened federal fishing season is 10 percent effective in reducing the overage, over the 10-year period from 2011 to 2020, Puerto Rico's commercial fishermen would lose approximately 1.4 million pounds of Snapper 2 species with an ex-vessel value of $104,812 (Table 7.10). There has been a general decrease in landings after 2003. If current and future landings have an average decline of 1 percent each year, 2011 and future baseline landings would be less than the proposed Commercial Snapper Unit 2 ACL and there would be no adverse economic impact.

Table 7.10. Total loss of Snapper Unit 2 landings and ex-vessel revenue to Puerto Rico commercial fishermen, 2011 to 2020, assuming constant baseline annual landings and 10 percent reduction of overage.

Year	Pounds			Dollars			
	Baseline Landings	Landings	Lost Landings	Baseline Revenue	Revenue	Lost Revenue	Present Value Lost Revenue
2010	151,007	151,007	0	1,132,553	1,132,553	0	0
2011	151,007	150,498	509	1,132,553	1,128,734	3,818	3,818
2012	151,007	150,269	738	1,132,553	1,127,016	5,536	5,174
2013	151,007	150,124	883	1,132,553	1,125,928	6,625	5,786
2104	151,007	149,859	1,148	1,132,553	1,123,940	8,612	6,570
2015	151,007	149,667	1,340	1,132,553	1,122,502	10,050	6,697
2016	151,007	149,486	1,521	1,132,553	1,121,148	11,404	6,203
2017	151,007	149,295	1,712	1,132,553	1,119,714	12,838	5,700
2018	151,007	149,126	1,881	1,132,553	1,118,446	14,106	4,778
2019	151,007	148,964	2,043	1,132,553	1,117,230	15,323	3,960
2020	151,007	148,807	2,200	1,132,553	1,116,054	16,498	3,040
Total*	1,510,070	1,496,095	13,975	11,325,525	11,220,713	104,812	51,727

*: Total from 2011 to 2020.

If baseline landings do not decline and commercial fishermen could move into territorial waters to mitigate for losses of Snapper 2 landings; however, there could be associated displacement costs, such as catch-and-landings changes, trip-level search costs, crowding and congestion costs, and personal safety costs, which may be repeated in a number of years, although these added costs may be minimal each year, especially if the federal fishing season is reduced by less than two days. Puerto Rico's commercial fishermen could also mitigate for a shortened federal Snapper Unit 2 fishing season, if there is one, by increasing harvest of other species and/or effort to catch the same number of or more Snapper Unit 2 species in a shortened federal fishing season; however, they could have similar associated costs.

Recreational landings of proposed Snapper Unit 2 in Puerto Rico from territorial and federal waters combined have varied considerably from 2000 to 2007; however, there is a declining trend since 2001. Landings fell from a high of 17,489 individuals in 2001 to a low of 557 in 2006 then rose to 6,824 in 2007 (Figure 7.6).

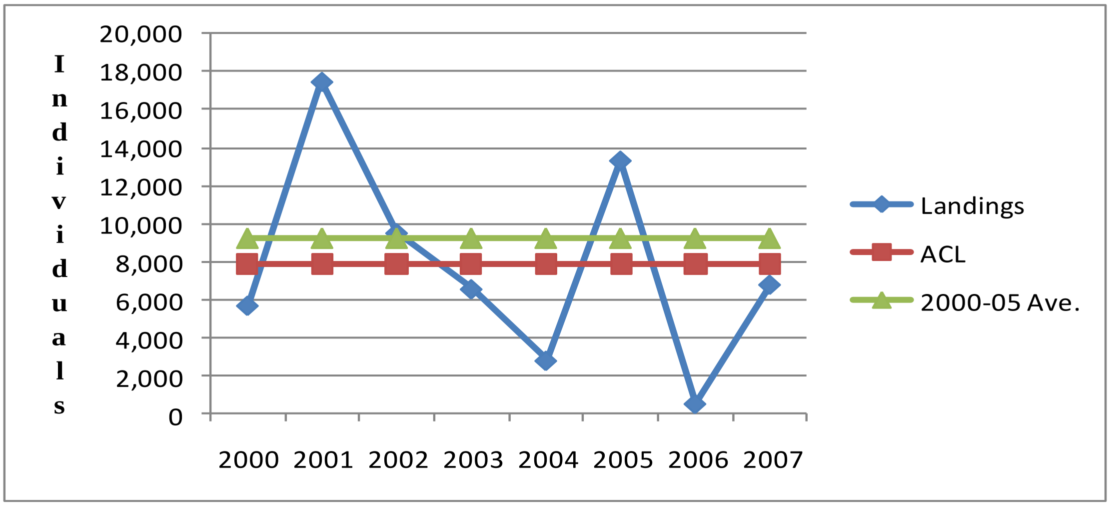

Figure 7.6. Recreational landings of Snapper Unit 2 (number of individuals), average annual recreational Snapper Unit 2 landings from 2000 to 2005, and proposed Recreational Snapper Unit 2 ACL.

The proposed ACL of 34,810 pounds or 7,862 individuals exceeds annual landings in 2000, 2003, 2004, 2006 and 2007. If 2006 and 2007 landings are more representative of current and future landings than 2000 to 2005 landings, there would not be an overage of Snapper Unit 2 recreational landings and a shortened Snapper 2 recreational fishing season in the Puerto Rico EEZ. In that case, **Preferred Alternative 2** would not have an adverse economic impact on charter fishing operations, recreational fishermen or subsistence fishermen of Puerto Rico. However, if there were an overage and a reduction in a recreational Snapper Unit 2 fishing season in federal waters off Puerto Rico, charter fishing operations and recreational and subsistence fishermen, who target Snapper Unit 2 species in these federal waters, could mitigate for economic loss due to a shortened federal fishing season by shifting effort to territorial waters or other parts of the Caribbean EEZ if they remain open to snapper fishing, although there could be temporary and minimal displacement costs. Two others way to reduce adverse economic impacts from a reduced recreational fishing season for Snapper Unit 2, if any, would be to target other species in territorial and/or federal waters and increase effort when recreational harvest of Snapper Unit 2 is allowed in federal waters. The associated costs of these other two mitigating behaviors are discussed at the beginning of this section.

Commercial landings of Snapper Unit 3 (gray, lane, mutton, dog, schoolmaster and mahogany snapper) from territorial and federal waters combined ranged from over 300,000 pounds to almost half a million pounds; from 1999 to 2005 however, in 2006 and 2007 annual landings were less than 200,000 pounds (Figure 7.7).

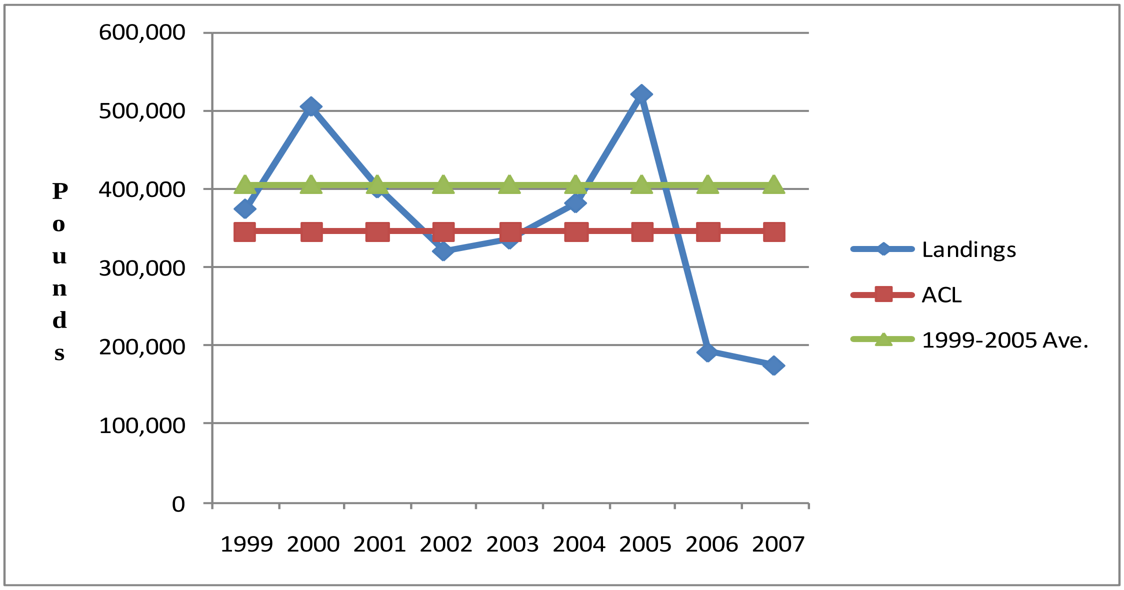

Figure 7.7. Commercial adjusted landings of Snapper Unit 3 from 1999 to 2007, average annual adjusted commercial Snapper Unit 3 landings from 1999 to 2005, and proposed Commercial Snapper Unit 3 ACL.

Table 7.11. Commercial landings of Snapper Unit 3 species in Puerto Rico, 1999 to 2005.

Year	Pounds						
	Mutton	Lane	gray	dog	schoolmaster	mahogany	Total
1999	123,488	251,866	13	100	187	54	375,708
2000	147,721	358,306	149	131	18	72	506,397
2001	130,200	269,479	78	2,260	42	10	402,069
2002	106,792	214,640	27	140	0	0	321,599
2003	131,181	202,682	2,324	27	394	16	336,624
2004	109,363	273,667	31	0	0	0	383,061
2005	121,952	400,121	28	0	0	0	522,101
2006	41,157	151,282	0	0	0	0	192,439
2007	44,422	130,672	0	414	26	0	175,534

Among the regulations that implemented the SFA in 2005 was the seasonal closure of the EEZ to the possession of mutton snapper and land snapper from April 1 through June 30 each year, which was expected to reduce fishing mortality of both species by 29 percent. Annual landings of mutton snapper in 2006 were 66 percent less than they were in 2005, and annual landings of lane snapper were 62 percent less than in 2005 (Table 7.11). Because mutton and lane snapper combined comprise on average 99.8 percent of annual commercial landings of Snapper Unit 3, Table 7.11 suggests the seasonal closure of the mutton and lane snapper fisheries had a significant impact on commercial landings of Snapper Unit 3.

The proposed Commercial Snapper Unit 3 ACL is less than annual landings for every year from 1999 to 2005 and greater than annual landings in 2006 and 2007. If 2006 and 2007 commercial landings are representative of current and future Snapper Unit 3 landings, **Preferred Alternative 2** would not have an adverse economic impact on Snapper Unit 3 commercial fishermen of Puerto Rico. However, if there were an overage of Snapper Unit 3 landings, **Preferred Alternative 2** would result in a reduced commercial fishing season for Snapper Unit 3 in the Puerto Rico EEZ and possibly subsequent years. However, commercial fishermen could mitigate for loss of revenue from Snapper Unit 3 landings due to a shortened federal fishing season by shifting effort from federal waters off Puerto Rico to territorial waters or other parts of the EEZ if they remain open to Snapper Unit 3 fishing. Such a mitigating behavior, however, would have displacement costs, although these may be temporary and minimal. Puerto Rico's commercial fishermen could also mitigate for a shortened federal Snapper Unit 3 fishing season by increasing harvest of other species and/or effort to catch the same number of or more Snapper Unit 3 species in a shortened federal fishing season; however, they would have associated costs as described in the beginning of this section.

Recreational landings of proposed Snapper Unit 3 in Puerto Rico from catches in federal and territorial waters combined have varied considerably from 2000 to 2007, ranging from a high of over 166,000 individuals in 2000 to a low of approximately 40,000 in 2004 (Figure 7.8). The proposed Recreational Snapper Unit 3 ACL of 83,158 pounds or 78,024 individuals is less than the average annual landings of Snapper Unit 3 from 2000 to 2005.

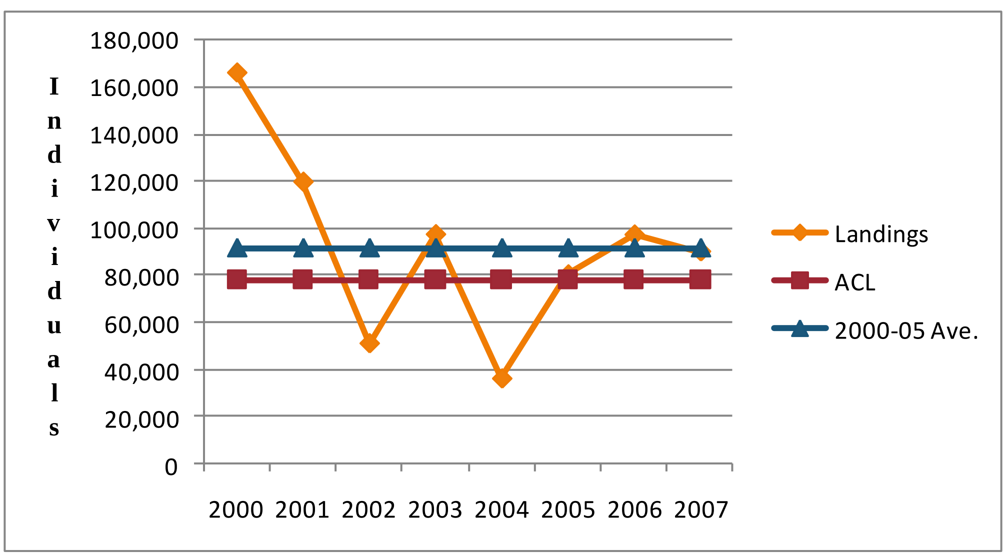

Figure 7.8. Annual recreational landings of Snapper Unit 3 from 2000 to 2007, average annual recreational Snapper Unit 3 landings from 1999 to 2005, and proposed Recreational Snapper Unit 3 ACL.

Whether annual landings from 1999 to 2005 or from 2006 and 2007 are representative of current and future landings, there would be an overage of Snapper Unit 3 recreational landings, and **Preferred Alternative 2** would result in a reduced recreational fishing season for Snapper Unit 3 in the Puerto Rico EEZ in 2010 and likely subsequent years, which could have an adverse economic impact on recreational fishers of Puerto Rico. However, charter fishing operations and recreational and subsistence fishermen, who presently target Snapper Unit 3 species in federal waters, could mitigate for loss of economic benefits because of a reduced federal season for Snapper Unit 3 in the Puerto Rico EEZ by shifting effort to territorial waters or other parts of the EEZ that remain open to Snapper Unit 3 fishing, although there could be associated temporary displacement costs. Another way to reduce adverse economic impacts from a reduced recreational fishing season for Snapper Unit 3, if any, would be to target other species in territorial and/or federal waters or increase effort when recreational harvest of Snapper Unit 3 is allowed in federal waters. The associated costs of these other mitigating behaviors are discussed at the beginning of this section.

Puerto Rico's commercial landings of Snapper Unit 4 (yellowtail snapper) from territorial and federal waters combined ranged from under 282 thousand pounds to over 632 thousand pounds from 1999 to 2005 (Figure 7.9). Landings fell approximately 58 percent from 2005 to 2006 and fell to approximately 208,000 pounds in 2007.

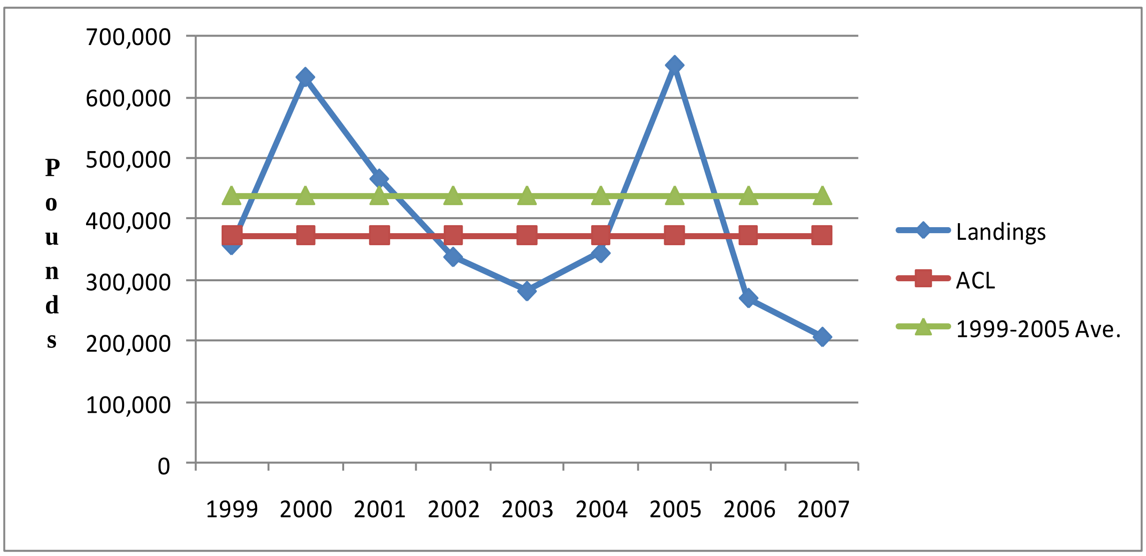

Figure 7.9. Commercial adjusted landings of Snapper Unit 4 from 1999 to 2007, average annual adjusted commercial Snapper Unit 4 landings from 1999 to 2005, and proposed Commercial Snapper Unit 4 ACL.

If 2006 and 2007 landings are representative of current and future commercial landings, **Preferred Alternative 2** would have no economic impact on Puerto Rico's Snapper Unit

4 commercial fishermen because the Commercial Snapper Unit 4 ACL of 373,295 pounds would be greater than annual landings and there would be no reduction of the Snapper Unit 4 fishing season in federal waters off Puerto Rico. However, if there were an overage, **Preferred Alternative 2** would result in a reduced commercial fishing season for Snapper Unit 4 in the Puerto Rico EEZ and possibly subsequent years. However, Puerto Rico's commercial fishermen could mitigate for loss of revenue due to a shortened commercial Snapper 4 fishing season by shifting effort from federal waters off Puerto Rico to territorial waters or to federal waters where the Snapper Unit 4 season remains open, although there could be associated displacement costs. Puerto Rico's commercial fishermen could also mitigate for a shortened federal Snapper Unit 4 fishing season by increasing harvest of other species and/or effort to catch the same number of or more Snapper Unit 4 species in a shortened federal fishing season; however, they would have associated costs as described in the beginning of this section.

Recreational landings of proposed Snapper Unit 4 in Puerto Rico from catches in federal and territorial waters combined have varied considerably from 2000 to 2007, ranging from a high of almost 58,000 individuals in 2003 to a low of approximately 18,000 in 2006 (Figure 7.10). The proposed Recreational Snapper Unit 4 ACL of 28,509 pounds or 27,866 individuals exceeds annual landings in 2002, 2005 and 2006.

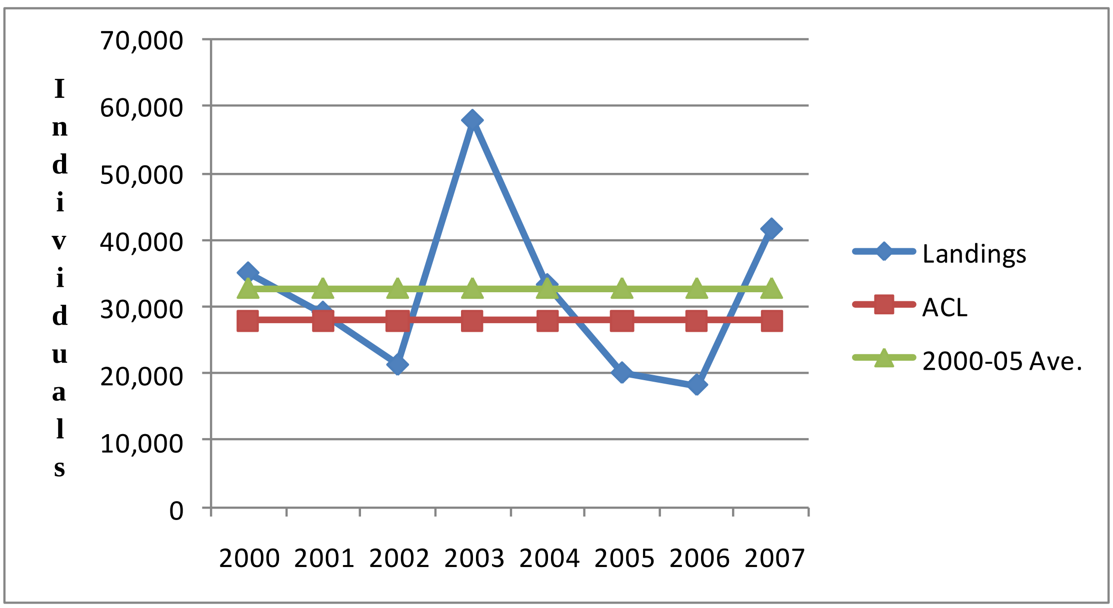

Figure 7.10. Annual recreational landings of Snapper Unit 4 (in number of individuals) from 2000 to 2007, average annual recreational Snapper Unit 4 landings from 2000 to 2005, and proposed Recreational Snapper Unit 4 ACL.

If 2006 and 2007 landings are more representative of current and future landings than 2000 to 2005 landings, there would be an overage of Snapper Unit 4 (yellowtail snapper) recreational landings in 2010 and possibly subsequent years. **Preferred Alternative 2** would result in a reduced recreational fishing season for Snapper Unit 4 in the Puerto Rico EEZ in 2011 and possibly subsequent years, which could have an adverse economic impact on charter fishing operations and recreational and subsistence fishermen of Puerto Rico who fish for Snapper Unit 4 species in federal waters. If 2000 to 2005 landings are more representative of current and future landings, the overage would be greater than that suggested by 2006 and 2007 landings, and the 2011 fishing season would be shorter and subsequent seasons could be shorter. Charter fishing operations and recreational and subsistence fishermen, who presently target yellowtail snapper in federal waters off Puerto Rico, could mitigate for loss of economic benefits due to a reduced federal season by shifting effort to territorial waters or other parts of the EEZ that remain open to yellowtail snapper fishing, although there could be associated displacement costs. Two others way to reduce adverse economic impacts from a reduced recreational fishing season for Snapper Unit 4, if any, would be to target other species in territorial and/or federal waters and increase effort when recreational harvest of Snapper Unit 4 is allowed in federal waters. The associated costs of these other two mitigating behaviors are discussed at the beginning of this section.

Annual commercial aggregate grouper landings in Puerto Rico from 1999 to 2005 ranged from 189,074 pounds to 241,820 pounds, and fell substantially to under 80,000 pounds in both 2006 and 2007 (Figure 7.11). The proposed Commercial Grouper ACL of 177,513 pounds is less than annual landings from 1999 to 2005, but substantially higher than annual commercial landings from 2006 to 2007. The following paragraphs explore possible reasons for such a decline after 2005 in order to assess if there would be an overage of landings in 2010 and subsequent years or not.

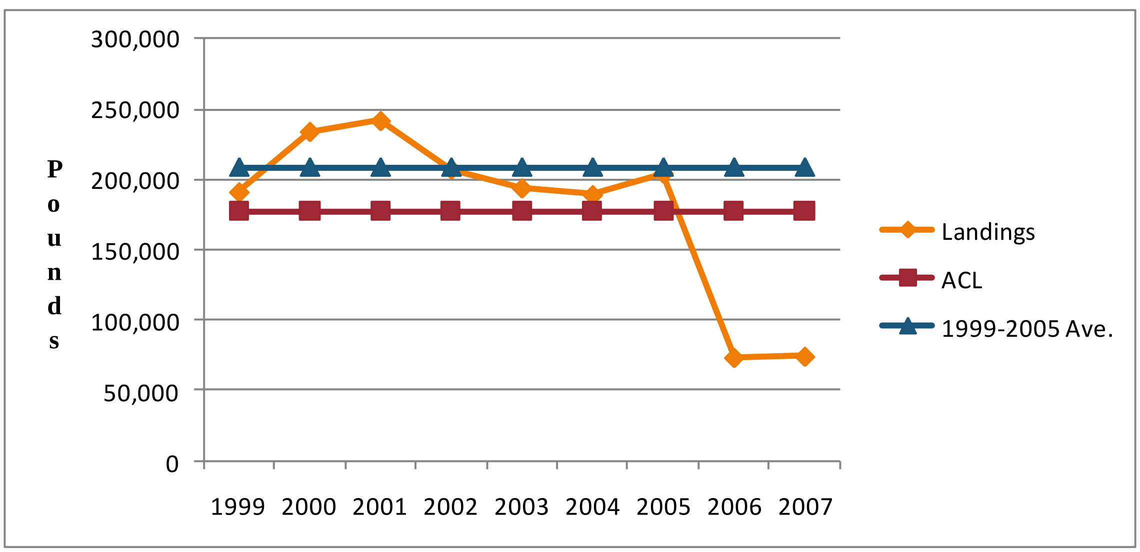

Figure 7.11. Annual aggregate commercial grouper landings from 1999 to 2007, average annual aggregate commercial grouper landings from 1999 to 2005, and proposed Commercial Grouper ACL for Puerto Rico.

Commercial landings of all grouper harvested from territorial and federal waters combined are composed of current Grouper Units 1 and 2, (proposed) Grouper Units 3, 4 and 5, and unclassified landings. Annual landings of Grouper Units 1, 3, 4, and 5 and unclassified species all declined, especially Grouper Unit 3 which has comprised most of the grouper landings (Figure 7.12). Grouper Unit 1 (Nassau grouper) represents 8.36 percent and Grouper Unit 2 (goliath grouper) represents 0.35 percent of average commercial grouper landings from 1999 to 2005, although fishing for and possession of both Nassau and goliath grouper have been prohibited in territorial waters since 2004 and in federal waters since the mid 1990s. Grouper Unit 3 species comprised approximately 54 percent of average annual landings of all grouper from 1999 to 2005.

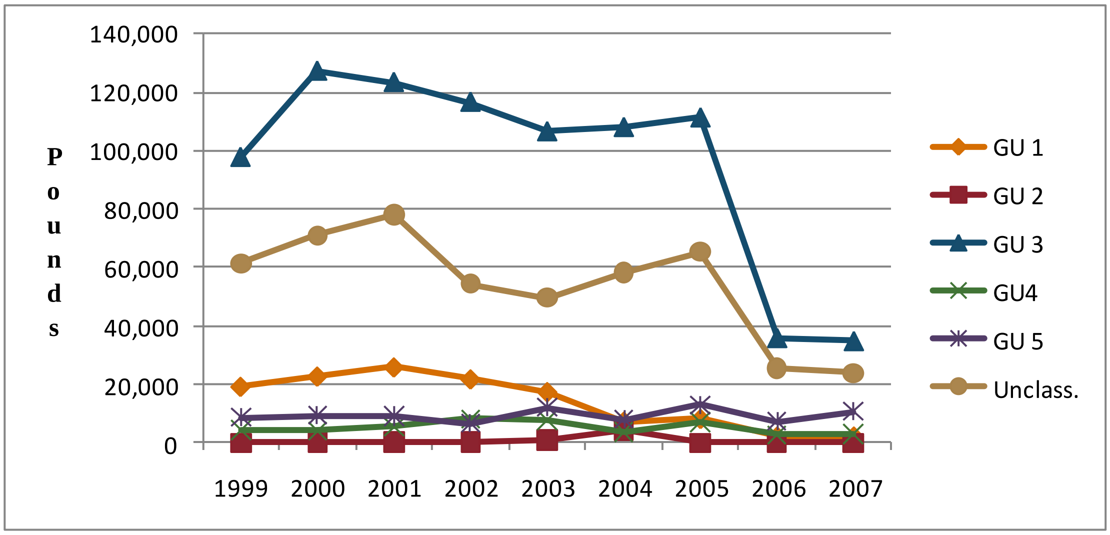

Figure 7.12. Annual commercial landings of Grouper Units 1 and 2, proposed Grouper Units 3, 4 and 5, and unclassified grouper from 1999 to 2007.

Grouper Unit 3 would be composed of red hind, coney, rock hind and graysby grouper. Red hind has dominated commercial landings from1999 to 2007 (Table 7.12). Significant regulatory change has occurred over this time period, which has affected red hind landings. In 2004, Puerto Rico's DNER passed the regulation to prohibit fishing for and possession of red hind from December 1 to last day of February each year in territorial waters. Since implementation of the SFA, possession of red hind has been prohibited from December 1 to last day of February each year in federal waters off the west coast of Puerto Rico (Bajo de Sico, Tourmaline Bank, and Abrir La Sierra Bank). The closed areas cover approximately 24 percent of fishable habitat of the EEZ off Puerto Rico. Annual red hind landings fell 69 percent from 2005 to 2006 and the 2006 to 2007 average annual landings are less than a third of the average annual average from 1999 to 2005. Similarly, there was a substantial decline in average annual landings of coney grouper after 2005. The 2006 and 2007 declines in unclassified grouper landings can also be attributed to these seasonal closures.

Table 7.12. Commercial landings of (proposed) Grouper Unit 3, 1999 to 2007.

Year	Pounds				
	Red hind	Coney	Rock hind	Graysby	GU 3
1999	84,504	13,145	0	32	97,681
2000	106,703	20,239	198	0	127,140
2001	100,282	23,011	0	0	123,293
2002	94,343	22,137	0	34	116,514
2003	87,589	18,840	0	10	106,439
2004	90,386	17,502	4	0	107,892
2005	95,899	15,269	0	0	111,168
2006	29,794	5,985	0	0	35,779
2007	30,731	3,998	0	0	34,729

In light of recent regulatory changes, 2006 and 2007 commercial landings of grouper are expected to be more representative of current and future commercial landings of grouper. Therefore, the proposed Commercial Grouper ACL would be higher than 2010 and future annual landings, and **Preferred Alternative 2** would not have an adverse economic impact on commercial grouper fishermen of Puerto Rico. However, if there were an overage, **Preferred Alternative 2** would result in a reduced fishing season for grouper in the Puerto Rico EEZ and possibly subsequent years. However, Puerto Rico commercial grouper fishermen could mitigate for loss of revenue due to a shortened commercial grouper fishing season by shifting effort from federal waters off Puerto Rico to territorial waters or to federal waters where the grouper season remains open, although there could be associated temporary displacement costs. Puerto Rico's commercial fishermen could also mitigate for a shortened federal Grouper fishing season by increasing harvest of other species and/or effort to catch the same number of or more Grouper species in a shortened federal fishing season; however, they would have associated costs as described in the beginning of this section.

Annual recreational landings of grouper in Puerto Rico from 2000 to 2005 averaged 110,094 individuals, but in 2006 and 2007 that average fell to 44,156 individuals (Figure 7.13). The proposed ACL of 93,580 individuals or 77,213 pounds is higher than annual landings in 2006 and 2007.

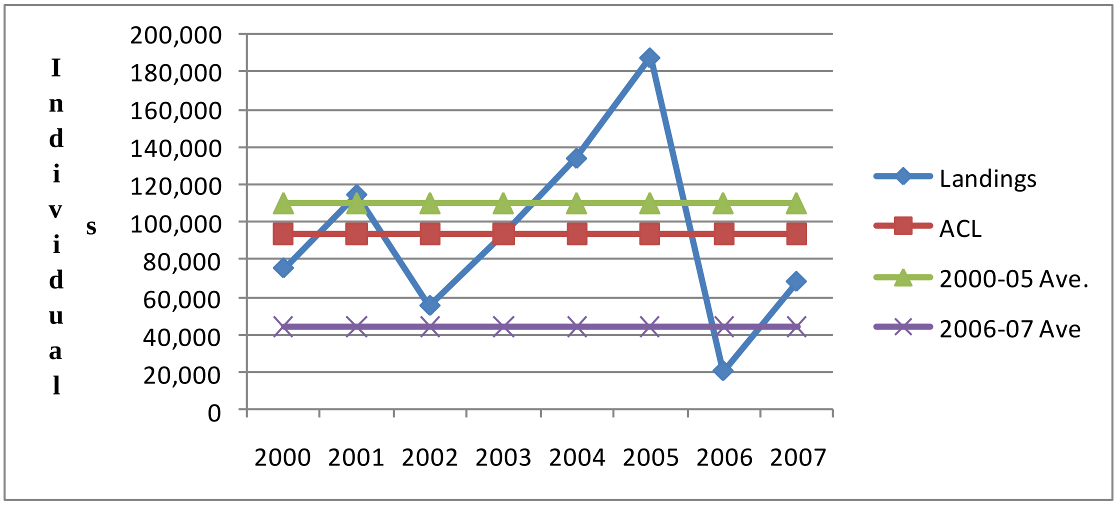

Figure 7.13. Recreational grouper landings, average annual recreational grouper landings (in number of individuals) from 2000 to 2005, and proposed Recreational Grouper ACL.

In light of 2004 and 2005 federal and territorial regulations that affected grouper fishing, especially for red hind, it is expected that 2006 and 2007 landings are more representative of current and future landings than 2000 to 2005 landings. Hence, there would not be an overage of recreational grouper landings and shortened federal recreational season for grouper in the Puerto Rico EEZ, and **Preferred Alternative 2** would not have an adverse economic impact on charter fishing operations or recreational or subsistence fishermen of Puerto Rico. However, if there were an overage of recreational landings of grouper, charter fishing operations or recreational or subsistence fishermen, who presently target grouper in federal waters off Puerto Rico, could mitigate for loss of benefits due to a reduced federal season by shifting recreational effort to territorial waters or other parts of the EEZ that remain open to recreational grouper fishing, although there could be associated temporary displacement costs. Two others way to reduce adverse economic impacts from a reduced recreational fishing season for grouper, if any, would be to target other species in territorial and/or federal waters and increase effort when recreational harvest is allowed in federal waters. The associated costs of these other two mitigating behaviors are discussed at the beginning of this section.

St. Croix

Preferred Alternative 2 in combination with Action 3 that does not separate the recreational from the commercial sectors could have negative economic impacts on St. Croix's charter fishing operations and recreational and subsistence fishermen who fish in federal waters off St. Croix because they could be in competition with commercial fishermen who also fish in the same federal waters and there be a race to catch as many fish as possible before the federal fishing season is closed. In such a race, industrial-scale commercial fishing operations with larger vessels and gears capable of catching more of the sub-unit/units in the same or a shorter period of time would be favored over St. Croix's historic small-scale commercial, charter fishing operations, and recreational and subsistence fishermen. However, such a race would not occur under the status quo because MRFSS is not presently conducted in the USVI and the proposed ACLs are for commercial landings only by default. However, if generation of annual recreational data were to begin, there could be sector conflicts because commercial and recreational landings for a unit would count against the same ACL. As of March 9, 2010, 12 of the USVI's recreational fishermen were registered with the National Angler Registry, and in 2009, there was one charter fishing operation. In 2008, there were 233 licensed commercial fishermen in St. Croix.

Recall that **Preferred Alternative 2g** of Action 2(b) would set the ACL for queen conch equal to the existing landings quota for the St. Croix District limit set by the VIDPNR. With an ACL equal to the District's existing landings quota of 50,000 pounds, there is expected to be little to no overage to trigger the accountability measure for queen conch and, consequently, only slight to no reductions in the length of the federal fishing season for queen conch. Moreover, it is expected that if there were a reduced federal fishing season, it would be irrelevant because St. Croix queen conch fishermen can meet the annual quota by fishing exclusively in territorial waters. It follows that **Preferred Alternative 2** would have no adverse economic impact on St. Croix's queen conch fishermen; however, it would have advantages to territorial and federal law enforcement who would be enforcing seasonal closures in accord with the same 50,000 annual landings quota.

Annual commercial landings of parrotfish that were harvested in either territorial or federal waters and landed in St. Croix from 1999 to 2007 have ranged from a low of 235,861 pounds to a high of 416,074 pounds. From 1999 to 2005, annual commercial landings showed a generally increasing trend and the average was 293,219 pounds (Figure 7.14). The proposed St. Croix parrotfish ACL would be 240,000 pounds.

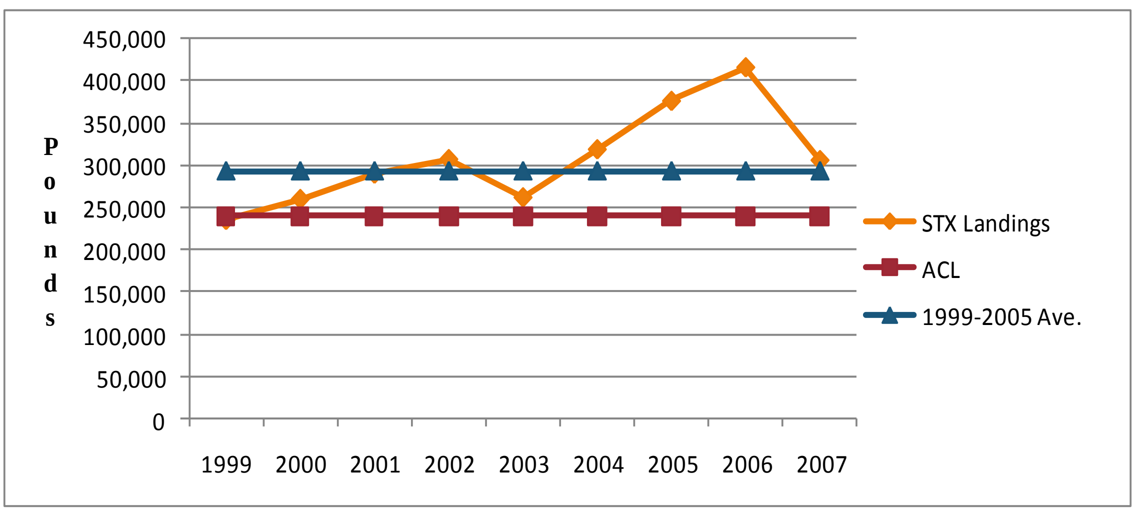

Figure 7.14. Commercial landings of parrotfish in St. Croix from 1999 to 2007 and proposed St. Croix Parrotfish ACL.

Preferred Sub-alternative 2A of Action 4(c) would set the St. Croix parrotfish ACL at 240,000 pounds, which is less than annual commercial landings of parrotfish for each year from 1999 to 2007, which suggests there would be an overage in 2010 and subsequently a shortened federal parrotfish fishing season in the St. Croix EEZ in 2011 and likely in subsequent years. However, average annual commercial landings of parrotfish in St. Croix prior to 2007 may not be representative of current average annual landings.

Since implementation of the SFA, the use of trammel nets and gillnets has been prohibited in the EEZ, and since July 2006, the VIDPNR has prohibited the use of trammel and gill nets in territorial waters. These prohibitions have had a significant impact on St. Croix's parrotfish fishermen. According to the St. Thomas Fishermen's Association (May 7, 2009), gillnets and trammel nets had represented 90 percent of St. Croix's parrotfish landings prior to the bans, although commercial landings reported to VIDPNR suggest a smaller percent. Whether 90 percent or less, commercial parrotfish landings fell dramatically from 2006 to 2007, and since enforcement of the ban did not commence until 2008, commercial landings since 2008 may have continued to show a declining trend. The average annual commercial landings from 1999 to 2005 were 293,219 pounds, while from 2006 to 2007 the annual average was 361,229 pounds. Commercial parrotfish landings in St. Croix in 2008 are reported to be 360,464 pounds, which is greater than the 1999 to 2005 annual average by 67,245 pounds. If 2008 commercial landings are more representative of the current state of harvest, annual landings in 2010 would be greater than the proposed St. Croix Parrotfish ACL of 240,000 pounds by 120,464 pounds.

Gillnet and trammel net accounted for 5.46 percent of landings from January to June 2008 then and 0.5 percent of landings for the rest of 2008. This is not to suggest there was a drop in landings over the last half of 2008. Approximately 58 percent of the landings for that year were from July to December. From 1999 to 2005, diving with no other reported gear accounted for an annual average of 101,434 pounds and from 2006 to 2007 that annual average rose to 204,883 pounds. In the first half of 2008, scuba and free diving with or without other gear accounted for 86,379 pounds, while in the second half of the year, it took in 195,426 pounds. This demonstrates that Cruzan fishermen have shifted from banned nets to increased diving for parrotfish.

Preferred Sub-alternative 2A would have an adverse economic impact on St. Croix's commercial fishermen who harvest parrotfish. To produce a conservative estimate of the potential adverse economic impact on St. Croix's parrotfish fishermen, 2008 commercial landings of 360,464 pounds are assumed to be representative of current and future landings. Hence, an overage of 120,464 pounds is estimated in 2010, which would result in a reduced federal fishing season in 2011. If landings are produced evenly throughout the year at a monthly rate of 30,039 pounds, the 2011 season in the EEZ would be reduced by 4.01 months. However, 2008 landings were not uniform over the calendar year. In the first half of 2008, 25,212 pounds of parrotfish were landed each month on average and in the second half, the monthly average rose to 34,865 pounds. To prevent an overage of 120,464 pounds in the latter half of 2011, harvest would have to be closed approximately 3.5 months, whereas it would be closed approximately 4.8 months in the first half of 2011.

Figure 7.15 shows the percents of St. Croix's parrotfish and other finfish net landings by fishing zone from 2003 to 2006. Note that three of five Fish Aggregating Devices (FADs) are located in federal waters. Two are off the east coast and one is off the north coast. During this time period, parrotfish was the most popular species taken by St. Croix's net fishing commercial fishermen.

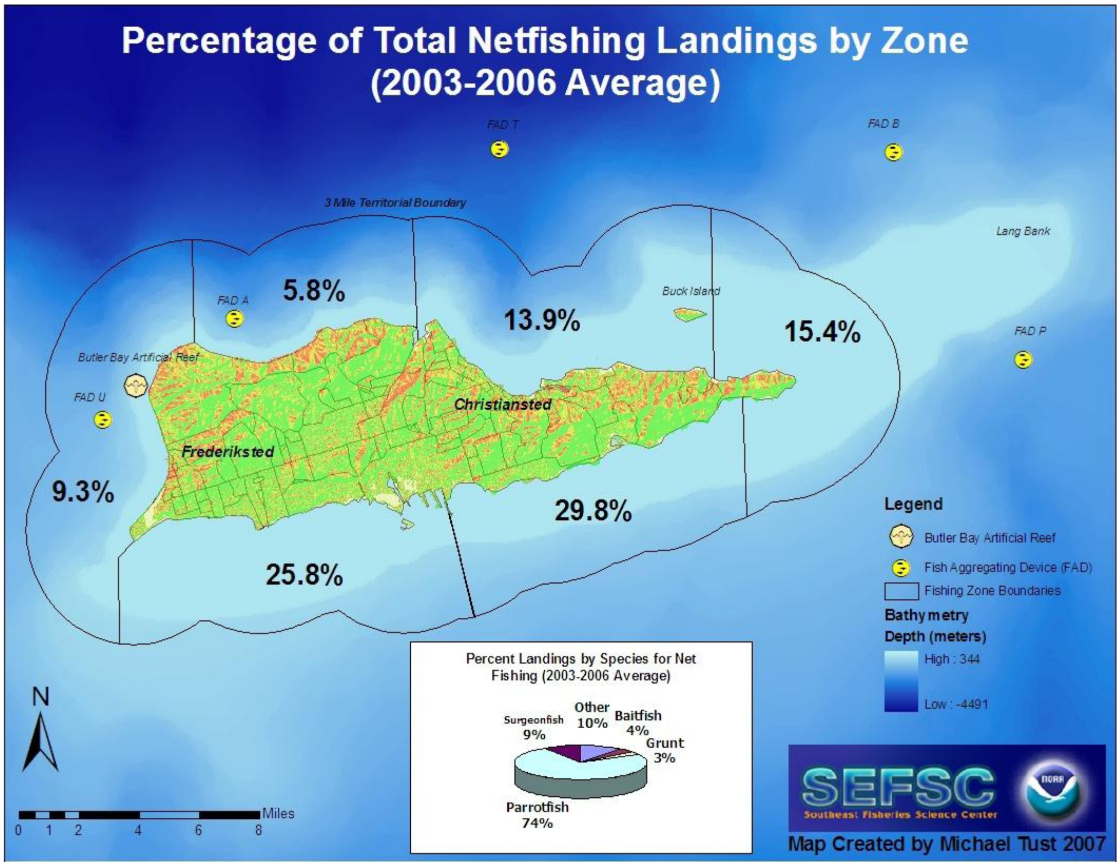

Figure 7.15. Percent of St. Croix finfish landings by zone, 2003 to 2006.

Cruzan commercial fishermen could mitigate for loss of revenues or other benefits by shifting effort to territorial waters and/or other areas of the EEZ where the parrotfish fishing season remains open, although they could experience displacement costs, such as catch-and-landings changes, trip-level search and associated costs, crowding and congestion costs, and personal safety costs. Two others way to reduce adverse economic impacts from a reduced federal fishing season for parrotfish in the St. Croix EEZ would be to target other species in territorial and/or federal waters and increase effort during the time the federal parrotfish sector is open. The associated costs of the first of these other two mitigating behaviors are discussed at the beginning of this section (7.5.5.2).

Assuming a 2011 average ex-vessel price of $5 per pound and the reduction of the federal fishing season is 30 percent effective in reducing an overage, such a loss of landings would represent a loss of $180,696 in 2011 (Table 7.13). Over the 10-year period from 2011 to 2020, there would be a total reduction of parrotfish landings of 754,124 pounds and associated revenue of approximately $3.8 million. Assuming the 223 licensed St. Croix fishermen are 123 small businesses that bear these costs, the average annual loss per small business would vary from $810 in 2011 to $2,287 in 2020. If the shortened fishing season were to reduce catch by 50 percent, the total loss of ex-vessel revenue over the 10-year period would be approximately $4.9 million and the average annual loss per small business would vary from $1,350 to $2,624 (Table 7.14). Furthermore, if the shortened fishing season is 80 percent effective in reducing parrotfish landings, the total loss of ex-vessel revenue over the 10-year period would be approximately $5.7 million and the average annual loss per small business would range from $2,160 to $2,700 (Table 7.15).

Table 7.13. Loss of landings and ex-vessel revenue to St. Croix commercial fishermen due to shortened parrotfish fishing season in St. Croix EEZ, assuming 30 percent reduction of overage.

Year	Pounds			Dollars			
	Baseline Landings	Landings	Lost Landings	Baseline Revenue	Revenue	Lost Revenue	Present Value Lost Revenue
2010	360,464	360,464	0	1,802,320	1,802,320	0	0
2011	360,464	324,325	36,139	1,802,320	1,621,624	180,696	180,696
2012	360,464	311,676	48,788	1,802,320	1,558,380	243,940	227,981
2013	360,464	304,508	55,956	1,802,320	1,522,542	279,778	244,369
2104	360,464	291,452	69,012	1,802,320	1,457,261	345,059	263,244
2015	360,464	283,782	76,682	1,802,320	1,418,910	383,410	255,483
2016	360,464	277,273	83,191	1,802,320	1,386,366	415,954	226,251
2017	360,464	270,918	89,546	1,802,320	1,354,592	447,728	198,797
2018	360,464	266,127	94,337	1,802,320	1,330,636	471,684	159,776
2019	360,464	262,008	98,456	1,802,320	1,310,039	492,281	127,215
2020	360,464	258,446	102,018	1,802,320	1,292,229	510,091	93,984
Total*	3,604,640	2,850,516	754,124	18,023,200	14,252,579	3,770,621	1,977,794

***:** Total from 2011 to 2020.

Table 7.14. Loss of landings and ex-vessel revenues to St. Croix commercial fishermen due to shortened parrotfish fishing season in St. Croix EEZ, assuming 50 percent reduction of overage.

Year	Pounds			Dollars			
	Baseline Landings	Landings	Lost Landings	Baseline Revenue	Revenue	Lost Revenue	Present Value Lost Revenue
2010	360,464	360,464	0	1,802,320	1,802,320	0	0
2011	360,464	300,232	60,232	1,802,320	1,501,160	301,160	301,160
2012	360,464	285,174	75,290	1,802,320	1,425,870	376,450	351,822
2013	360,464	277,645	82,819	1,802,320	1,388,225	414,095	361,687
2104	360,464	263,842	96,622	1,802,320	1,319,209	483,111	368,563
2015	360,464	257,777	102,687	1,802,320	1,288,884	513,436	342,124
2016	360,464	253,211	107,253	1,802,320	1,266,053	536,267	291,694
2017	360,464	249,138	111,326	1,802,320	1,245,691	556,629	247,150
2018	360,464	246,688	113,776	1,802,320	1,233,438	568,882	192,700
2019	360,464	244,839	115,625	1,802,320	1,224,197	578,123	149,398
2020	360,464	243,444	117,020	1,802,320	1,217,221	585,099	107,804
Total*	3,604,640	2,621,990	982,650	18,023,200	13,109,948	4,913,252	2,714,102

*: Total from 2011 to 2020.

Table 7.15. Loss of landings and ex-vessel revenues to St. Croix commercial fishermen due to shortened parrotfish fishing season in St. Croix EEZ, assuming 80 percent reduction of overage.

Year	Pounds			Dollars			
	Baseline Landings	Landings	Lost Landings	Baseline Revenue	Revenue	Lost Revenue	Present Value Lost Revenue
2010	360,464	360,464	0	1,802,320	1,802,320	0	0
2011	360,464	264,093	96,371	1,802,320	1,320,464	481,856	481,856
2012	360,464	254,456	106,008	1,802,320	1,272,278	530,042	495,366
2013	360,464	250,601	109,863	1,802,320	1,253,004	549,316	479,794
2104	360,464	243,277	117,187	1,802,320	1,216,383	585,937	447,008
2015	360,464	241,889	118,575	1,802,320	1,209,444	592,876	395,058
2016	360,464	241,051	119,413	1,802,320	1,205,255	597,065	324,764
2017	360,464	240,414	120,050	1,802,320	1,202,072	600,248	266,517
2018	360,464	240,224	120,240	1,802,320	1,201,118	601,202	203,648
2019	360,464	240,113	120,351	1,802,320	1,200,563	601,757	155,505
2020	360,464	240,050	120,414	1,802,320	1,200,250	602,070	110,931
Total*	3,604,640	2,456,167	1,148,473	18,023,200	12,280,833	5,742,367	3,360,447

*: Total from 2011 to 2020.

Parrotfish is a traditional food source in St. Croix. If market supply decreases because of the proposed ACL and market demand increases as St. Croix's population increases, there could be a substantial increase in the retail price of parrotfish. Given the comparatively high poverty rate and low median household income in St. Croix, such a consequence could be a significant economic strain on Cruzan individuals, households, and communities and a reduction of their food security.

Deepwater snapper and reef fish are popular categories of fish among St. Croix's commercial fishermen. Approximately 42 percent and 85 percent of 215 Cruzan fishermen interviewed in 2004 targeted deepwater snapper and reef fish, respectively (Kojis 2004). The proposed St. Croix Snapper ACL would be 102,946 pounds, which is less than annual commercial snapper landings from territorial and federal waters combined from 2001 to 2007 (Figure 7.16).

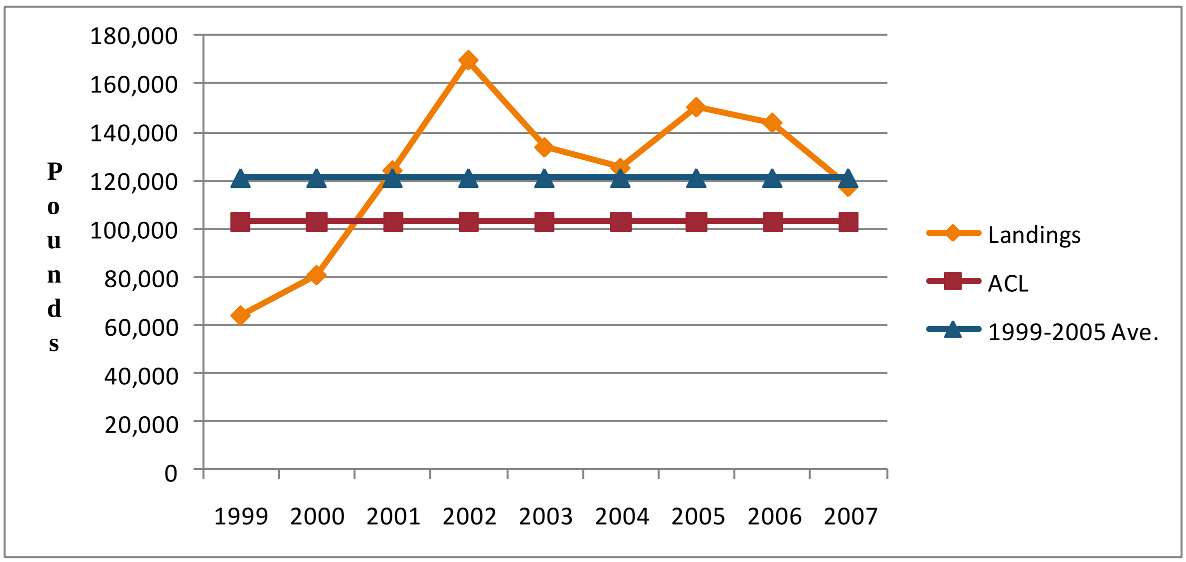

Figure 7.16. Commercial Landings of Snapper in St. Croix from 1999 to 2007 and Proposed St. Croix Snapper ACL.

Since implementation of the SFA in 2005, there have been seasonal closures of various snapper fisheries in the EEZ each year: mutton and lane snapper from April 1 to June 30 and black, blackfin, vermilion and silk snapper from October 1 through December 31. The reduction in snapper landings from 2005 to 2007 likely reflects in part these seasonal closures.

The most popular gear to harvest snapper for Cruzan commercial fishermen has been line fishing. From 1999 to 2007, line gear alone accounted for approximately 60 to 79 percent of snapper landings with known gear, and when combined with other gear, it accounted for 60 to 83 percent of landings with known gear (Table 7.16). Annual commercial landings of snapper taken by line fishing greatly increased from under 40,000 pounds in

1999 to over 169,000 pounds in 2002, and then varied from 117,344 to 150,278 pounds from 2003 to 2007.

Table 7.16. Annual commercial landings of snapper by line fishing and as percent of landings with known gear, 1999 to 2007.

Year	Pounds								Percent Line Fishing	Percent Line Fishing Alone
	Line Fishing With or Without Other Gear							Landings with Known Gear		
	Alone	Diving	Seine Net	Gillnet	Cast Net	Traps	Total			
1999	38,591	533	0	0	0	188	39,312	64,099	61.3%	60.2%
2000	48,397	5	10	0	0	12	48,424	80,817	59.9%	59.9%
2001	74,054	186	108	0	0	6,573	80,921	123,697	65.4%	59.9%
2002	118,793	0	173	0	2,282	748	121,996	169,723	71.9%	70.0%
2003	91,680	0	10	0	0	65	91,755	133,620	68.7%	68.6%
2004	77,232	0	0	15	105	47	77,399	125,080	61.9%	61.7%
2005	104,516	0	0	0	40	87	104,643	150,278	69.6%	69.5%
2006	108,804	0	0	0	215	697	109,716	143,828	76.3%	75.6%
2007	93,051	3,276	260	0	219	151	96,957	117,344	82.6%	79.3%

Major deepwater snapper fishing areas are in both federal and territorial waters off the east coast of St. Croix (Figure 7.17). Deepwater snapper include the species of proposed Snapper Units 1 (silk, black, blackfin, vermilion and wenchman snapper) and 2 (queen and cardinal snapper).

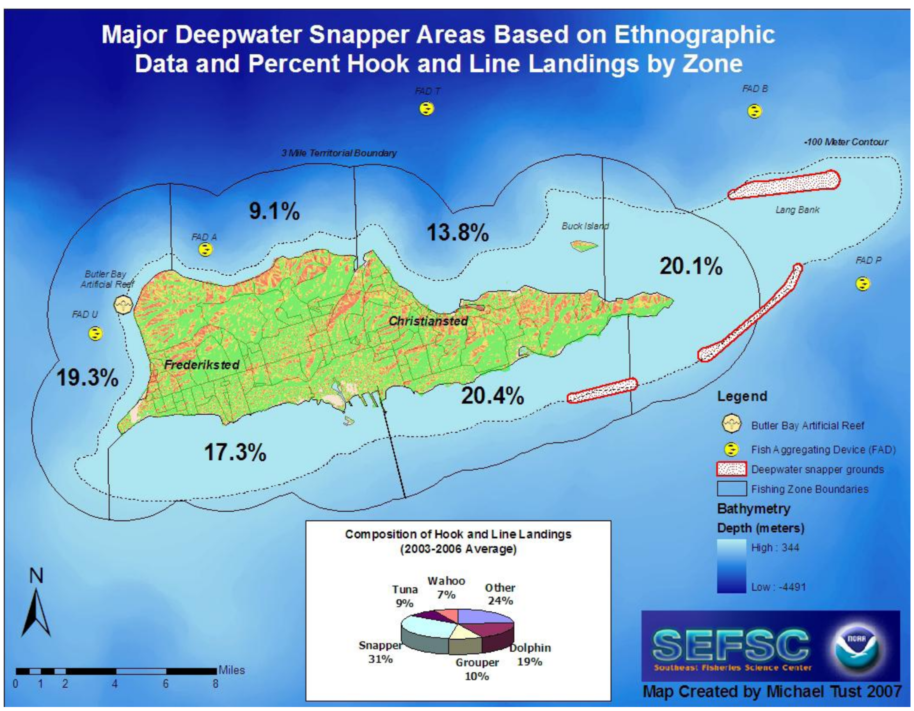

Figure 7.17. Major deepwater snapper fishing areas off St. Croix, 2003 to 2007.

Implementation of the SFA in 2005 and USVI regulations promulgated later prohibit the use of bottom longlines, traps, pots, gillnet and trammel nets year-round in both federal and territorial waters of the Red Hind and Mutton Snapper Spawning Aggregation Areas. The Red Hind Spawning Aggregation Area is located on Lang Bank and covers an area of 11.7 square kilometers, and the Mutton Snapper Spawning Aggregation Area is found off the southwest coast of St. Croix, and covers an area of 8.72 square kilometers. These gear prohibitions are reflected in the decreased use of traps to harvest snapper since 2005 (Table 7.17). At the same time, there has been an increased use of both line fishing and diving (Table 7.18).

Table 7.17. Annual commercial landings of snapper by trap fishing and as percent of landings with known gear, 1999 to 2007.

Year	Pounds								Percent Trap	Percent Trap Alone
	Traps With or Without Other Gear							Landings with Known Gear		
	Alone	Diving	Seine Net	Gillnet	Cast Net	Line F.	Total			
1999	17,512	128	285	180	0	188	18,293	64,099	28.5%	27.3%
2000	16,039	0	20	30	0	12	16,101	80,817	19.9%	19.8%
2001	19,098	86	75	0	0	6,573	25,832	123,697	20.9%	15.4%
2002	22,549	6	0	0	0	748	23,303	169,723	13.7%	13.3%
2003	13,806	0	0	0	0	65	13,871	133,620	10.4%	10.3%
2004	20,832	450	0	410	0	47	21,739	125,080	17.4%	16.7%
2005	18,418	725	0	103	0	87	19,333	150,278	12.9%	12.3%
2006	11,207	71	0	0	0	697	11,975	143,828	8.3%	7.8%
2007	7,861	15	0	0	0	151	8,027	117,344	6.8%	6.7%

Table 7.18. Annual landings of snapper by diving and as percent of landings with known gear, 1999 to 2007.

Year	Pounds									Percent Trap	Percent Trap Alone
	Diving With or Without Other Gear								Landings with Known Gear		
	Alone	Gillnet	Seine Net	Cast Net	Trammel Net	Traps	Line F.	Total			
1999	5,085	23	25	0	0	128	533	5,794	64,099	9.0%	7.9%
2000	12,853	59	1,233	0	0	0	5	14,150	80,817	17.5%	15.9%
2001	17,247	356	1,352	0	0	86	186	19,227	123,697	15.5%	13.9%
2002	20,257	55	115	0	0	6	0	20,433	169,723	12.0%	11.9%
2003	23,801	90	0	0	0	0	0	23,891	133,620	17.9%	17.8%
2004	23,125	0	0	0	15	450	0	23,590	125,080	18.9%	18.5%
2005	22,264	5	0	0	469	725	0	23,463	150,278	15.6%	14.8%
2006	19,558	0	0	45	0	71	0	19,674	143,828	13.7%	13.6%
2007	10,272	0	0	133	30	15	3,276	13,726	117,344	11.7%	8.8%

Figures 7.18 and 7.19 depict major fishing grounds for St. Croix commercial fishermen who dive and/or use traps to harvest snapper and other finfish. Since the implementation of post SFA federal and territorial regulations, the percent of landings and popularity of

these areas may have changed, especially those in federal waters off the east coast of St. Croix.

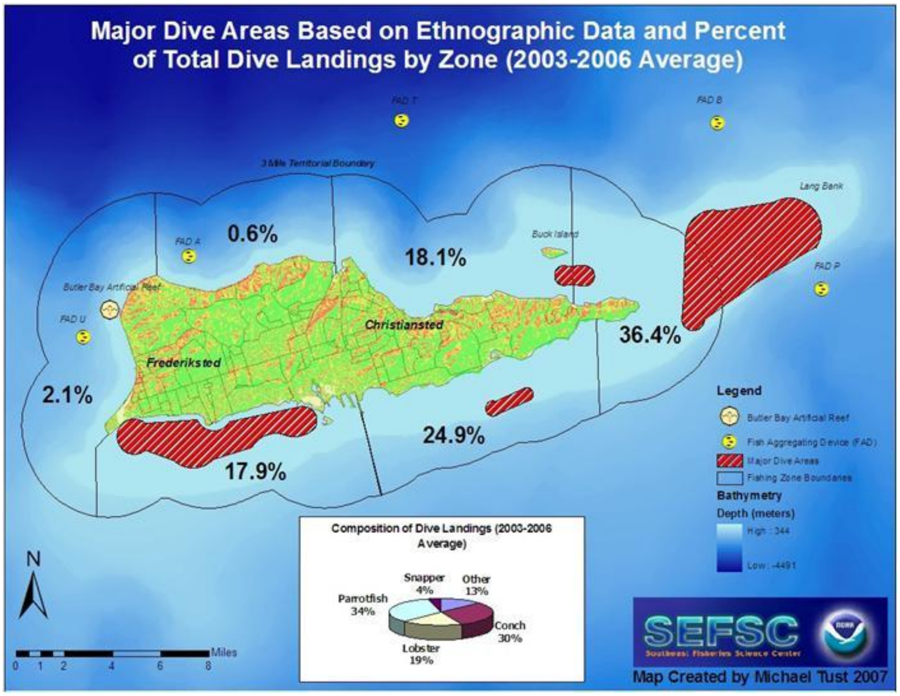

Figure 7.18. Major dive areas off St. Croix in federal and territorial waters, 2003 to 2006.

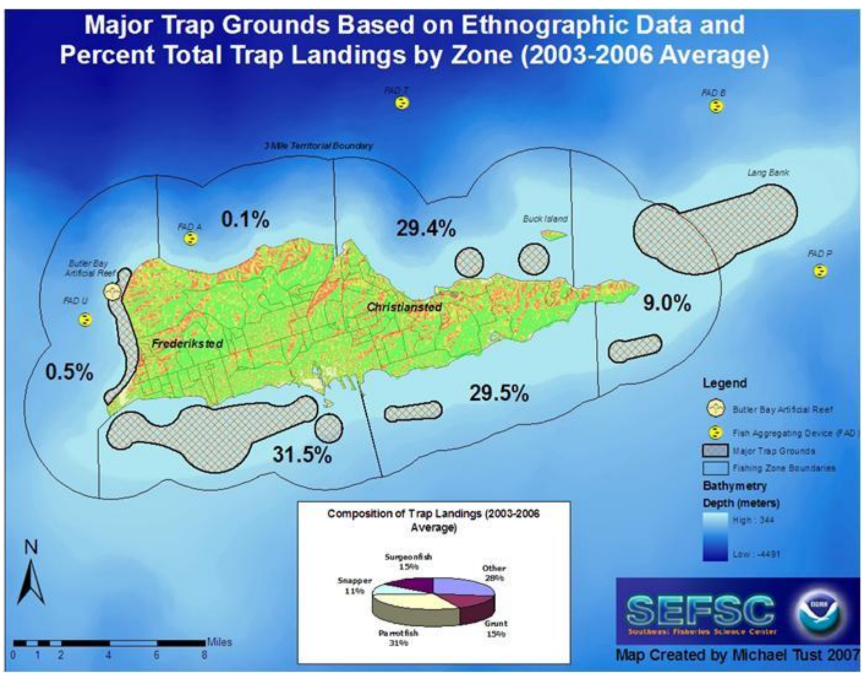

Figure 7.19. Major trap grounds off St. Croix in federal and territorial waters, 2003 to 2006.

Gillnets and trammel nets have never been popular gears to harvest snapper in waters off St. Croix. From 1999 to 2007, gillnet and trammel net combined accounted for less than 3 percent of annual landings with known gear. In 2007, gillnet use accounted for 0.2 percent of annual landings whose gears were known and trammel net accounted for 0.9 percent. Hence, unlike the parrotfish sector, the prohibitions on the use of gillnets and trammel nets in the EEZ and USVI waters did not significantly affect commercial snapper landings in St. Croix.

Preferred Alternative 2 would likely have an adverse economic impact on commercial, fishermen of St. Croix who presently target snapper in the EEZ off St. Croix; however, the magnitude of the impact is dependent on the level of current landings of snapper and the percent of those landings that derive from federal waters. As stated in section 5.3.1, St. Croix has 98-nm^2 of fishable habitat in territorial waters and a 21-nm^2 area off its east coast that resides in the EEZ; hence, approximately 18 percent of fishable habitat is within federal waters and the remaining 82 percent in territorial waters of St. Croix. However, Figure 7.17 suggests significant portions of the deepwater snapper fishing areas lie within federal waters, which is also evidenced by monthly trip ticket reports. For example, in the 2000 to 2001 fishing season, 55 percent of the reported commercial snapper activities in St. Croix occurred in federal waters, according to the monthly trip ticket reports (CFMC 2005). The economic analysis for the regulatory implementation of the SFA estimated the seasonal closure of the EEZ to the possession of black, blackfin, vermilion and silk snapper from October 1 through December 31 would reduce annual landings of these species by 23 percent. The seasonal closure of the EEZ to the possession of mutton snapper and lane snapper from April 1 through June 30 was expected to reduce annual landings of these species by 29 percent. Closure of an area of Grammanik Bank from February 1 through April 30 of each year was also expected to adversely impact St. Croix's fishermen, although no estimate of the impact on snapper landings was generated.

Average annual landings of snapper from 2006 to 2007 are 130,581 pounds, which is 27,635 pounds more than the proposed St. Croix Snapper ACL of 102,946 pounds. If this annual average is representative of current and future annual landings, then there would be an overage of 27,635 pounds in 2010. If an average of 10,882 pounds is landed each month, the snapper fishing season would have to be reduced by approximately 2.8 months. Not all snapper are caught in the EEZ. Prior to the SFA, an estimated 55 percent of snapper landings originated from the EEZ, but it is presumed here that less than 55 percent of current landings of the Snapper Unit derive from fishing in the federal waters. Hence, the effectiveness of a shortened federal fishing season in reducing an overage of snapper landings is assumed to range from 30 percent to 50 percent.

If Cruzan fishermen receive an average price for snapper of $7.50 per pound landed and if a shortened federal fishing season reduces an overage by 30 percent, then the total 10-year loss of snapper landings and associated ex-vessel revenue would be 172,981 pounds and approximately $1.3 million, respectively (Table 7.19). If the reduced federal fishing season reduces the overage by 50 percent, there would be a total loss of approximately $1.9 million over the first ten years (Table 7.20). The average annual loss per Cruzan fisherman, assuming 223 fishermen, would range from approximately $279 to $787 if 30 percent effective and $465 to $929 if 50 percent effective.

Table 7.19 Loss of snapper landings and ex-vessel revenue to St. Croix commercial fishermen due to shortened snapper fishing season in St. Croix EEZ, assuming 30 percent reduction of overage.

Year	Pounds			Dollars			
	Baseline Landings	Landings	Lost Landings	Baseline Revenue	Revenue	Lost Revenue	Present Value Lost Revenue
2010	130,581	130,581	0	979,358	979,358	0	0
2011	130,581	122,294	8,287	979,358	917,205	62,153	58,086
2012	130,581	119,392	11,189	979,358	895,439	83,919	73,298
2013	130,581	117,747	12,834	979,358	883,104	96,253	73,431
2104	130,581	114,752	15,829	979,358	860,636	118,721	79,109
2015	130,581	112,992	17,589	979,358	847,437	131,921	71,756
2016	130,581	111,498	19,083	979,358	836,237	143,121	63,547
2017	130,581	110,040	20,541	979,358	825,301	154,057	52,184
2018	130,581	108,941	21,640	979,358	817,056	162,302	41,942
2019	130,581	107,996	22,585	979,358	809,967	169,391	31,210
2020	130,581	107,178	23,403	979,358	803,837	175,520	23,058
Total*	1,305,810	1,132,829	172,981	9,793,575	8,496,218	1,297,357	567,622

*Total 2011 to 2020

Table 7.20. Loss of snapper landings and ex-vessel revenue to St. Croix commercial fishermen due to shortened snapper fishing season in St. Croix EEZ, assuming 50 percent reduction of overage.

Year	Pounds			Dollars			
	Baseline Landings	Landings	Lost Landings	Baseline Revenue	Revenue	Lost Revenue	Present Value Lost Revenue
2010	130,581	130,581	0	979,358	979,358	0	0
2011	130,581	116,766	13,815	979,358	875,745	103,613	96,834
2012	130,581	109,856	20,725	979,358	823,920	155,438	135,765
2013	130,581	106,401	24,180	979,358	798,008	181,350	138,351
2104	130,581	104,674	25,908	979,358	785,051	194,306	129,474
2015	130,581	103,810	26,771	979,358	778,573	200,784	109,213
2016	130,581	103,378	27,203	979,358	775,334	204,023	90,589
2017	130,581	103,162	27,419	979,358	773,715	205,643	69,658
2018	130,581	103,054	27,527	979,358	772,905	206,453	53,351
2019	130,581	103,000	27,581	979,358	772,500	206,858	38,113
2020	130,581	102,973	27,608	979,358	772,297	207,060	27,201
Total*	1,305,810	1,057,073	248,737	9,793,575	7,928,048	1,865,527	888,551

*Total 2011 to 2020

The reduction in commercial landings of snapper would also affect St. Croix's fish markets and restaurants. According to the 2007 Economic Census, there were 4 establishments with 15 employees in the Specialty Food Store Industry (NAICS 4452) that includes fish markets, and there were 37 establishments in the Full-Service Restaurant Industry (NAICS 7221). Tables 7.19 and 7.20 do not incorporate any losses incurred by fish markets, restaurants or other establishments by the reduction of commercial snapper landings in St. Croix.

St. Croix's commercial landings of grouper have varied considerably from 1999 to 2005, ranging from a low of 20,573 pounds in 1999 to a high of 46,776 pounds in 2004. After 2004 there has been a sharply declining trend (Figure 7.20). More recent landings may reflect the current post-SFA regulatory environment. Regulations that implemented the SFA in 2005 included establishment of the seasonal closure to the possession of all species, except misty grouper, in Grouper Unit 4 (red, tiger, yellowfin and yellowedge grouper) from February 1 through April 30, and was expected to reduce annual landings of the unit, except misty grouper, by 24 percent. Since 2005, the use of bottom longlines, traps, pots, gillnet and trammel net is prohibited year-round in both federal and territorial waters of the Red Hind and Mutton Snapper Spawning Aggregation Areas. Commercial landings of grouper by gillnet declined substantially after 2001, and landings by both gillnet and trammel net declined significantly after the 2006 ban (Table 7.21). Landings by traps also declined significantly after 2005, which may be attributed to the gear prohibition in the Red Hind and Mutton Snapper Spawning Aggregation Areas as well as other restrictions. Trip ticket data from 2000 to 2001 for St. Croix, suggest about 44 percent of reported commercial grouper catch came from the EEZ at that time.

Table 7.21. Commercial Landings of Grouper by Gillnet, Trammel Net and Traps, as Percent of Landings with Known Gear, and All Grouper Landings in St. Croix from 1999 to 2007.

Year	Pounds					% Gillnet, Trammel Net, and Trap Landings	All Landings (Pounds)
	Gillnet	Trammel Net	Traps	Total	All Known Gear		
1999	30	0	6,714	6,744	20,573	32.8%	20,561
2000	483	0	3,488	3,971	23,807	16.7%	23,807
2001	11,009	0	3,648	14,657	29,757	49.3%	29,763
2002	1,219	0	6,569	7,788	44,291	17.6%	44,291
2003	1,697	2	4,644	6,343	45,883	13.8%	45,883
2004	2,400	17	6,627	9,044	46,766	19.3%	46,776
2005	1,106	608	6,695	8,409	39,547	21.3%	39,551
2006	889	548	2,992	4,429	33,188	13.3%	33,188
2007	5	272	1,767	2,044	23,762	8.6%	23,762

The proposed St. Croix Grouper ACL of 30,435 pounds is higher than average annual commercial landings from 2006 to 2007 by 1,960 pounds, but less than 2005 annual landings. If 2006 and 2007 landings are representative of current landings, there would be no overage of grouper landings in St. Croix. However, it is reasonable to expect that Cruzan fishermen would increase landings of grouper in response to likely shortened federal fishing seasons for snapper, which would likely result in overages of grouper landings.

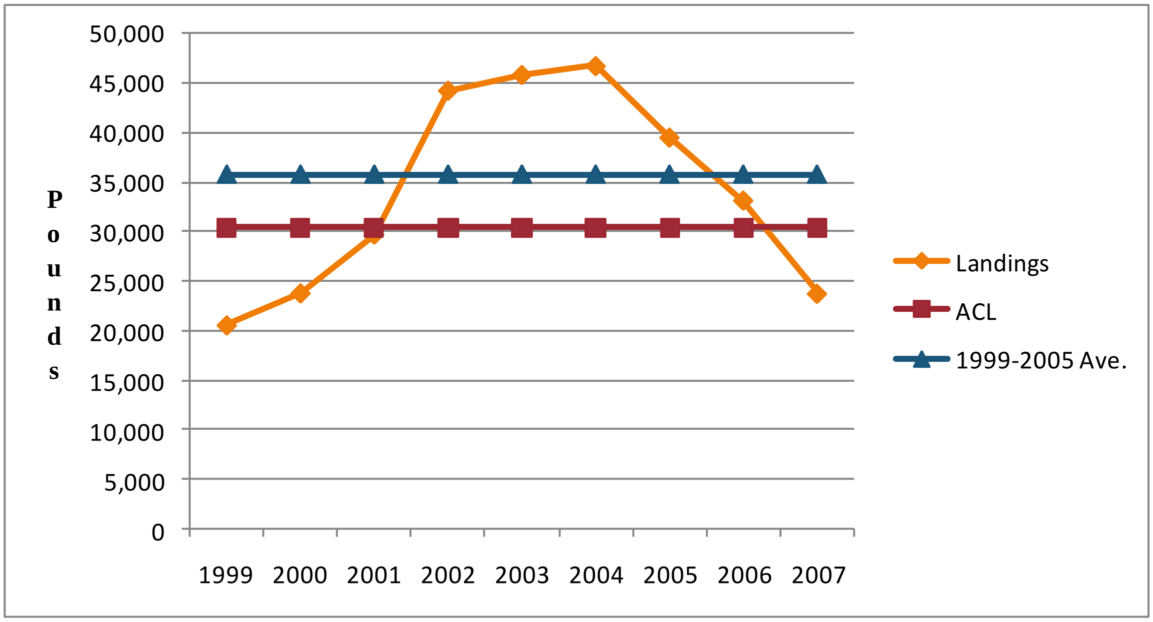

Figure 7.20. Annual Commercial Landings of Grouper, Average Annual Commercial Landings from 1999 to 2005, and Proposed Grouper ACL in St. Croix.

The average of annual landings from 2005 to 2007 is 32,167 pounds. This analysis assumes the average of 2006 and 2007 landings is representative of annual grouper landings before implementation of the Snapper ACL and corresponding accountability measures and the average of 2005 to 2007 is more representative of baseline landings after the implementation of the Snapper ACL and corresponding accountability measures. Therefore, there would be an overage of grouper landings in 2012 which would result in a shortened grouper fishing season in 2013 and in seasons thereafter.

Assuming an average ex-vessel price of $7.5 per pound and an early closure is 30 percent effective in reducing the overage, there would be a total 10-year loss of 6,855 pounds of grouper landings with an ex-vessel value of $51,415 (Table 7.22). If the reduced fishing season is 50 percent effective, there would be a total loss of 9,492 pounds with an ex-vessel value of $71,888 over the 10-year period from 2011 to 2020 (Table 7.23).

Table 7.22. Loss of Ex-Vessel Revenue to St. Croix Commercial Fishermen due to a Shortened Grouper Fishing Season in the St. Croix EEZ, assuming 30 percent reduction of estimated overage.

Year	Pounds			Dollars			
	Baseline Landings	Landings	Lost Landings	Baseline Revenue	Revenue	Lost Revenue	Present Value Lost Revenue
2010	28,475	28,475	0	213,563	213,563	0	0
2011	32,167	32,167	0	241,253	241,253	0	0
2012	32,167	32,167	0	241,253	241,253	0	0
2013	32,167	32,017	150	241,253	240,125	1,128	985
2104	32,167	31,612	555	241,253	237,092	4,160	3,174
2015	32,167	31,483	684	241,253	236,122	5,131	3,419
2016	32,167	31,323	844	241,253	234,924	6,328	3,442
2017	32,167	31,161	1,006	241,253	233,711	7,541	3,349
2018	32,167	31,056	1,111	241,253	232,922	8,330	2,822
2019	32,167	30,957	1,210	241,253	232,175	9,077	2,346
2020	32,167	30,871	1,296	241,253	231,534	9,718	1,791
Total*	321,670	314,815	6,855	2,412,525	2,361,110	51,415	21,327

***:** Total from 2011 to 2020.

Table 7.23. Loss of Ex-Vessel Revenue to St. Croix Commercial Fishermen due to a Shortened Grouper Fishing Season in the St. Croix EEZ, assuming 50 percent reduction of overage.

Year	Pounds			Dollars			
	Baseline Landings	Landings	Lost Landings	Baseline Revenue	Revenue	Lost Revenue	Present Value Lost Revenue
2010	28,475	28,475	0	213,563	213,563	0	0
2011	32,167	32,167	0	241,253	241,253	0	0
2012	32,167	32,167	0	241,253	241,253	0	0
2013	32,167	31,916	251	241,253	239,373	1,880	1,642
2104	32,167	31,259	908	241,253	234,444	6,808	5,194
2015	32,167	31,108	1,059	241,253	233,309	7,943	5,293
2016	32,167	30,931	1,236	241,253	231,986	9,267	5,041
2017	32,167	30,767	1,400	241,253	230,754	10,498	4,661
2018	32,167	30,685	1,482	241,253	230,139	11,113	3,764
2019	32,167	30,615	1,552	241,253	229,611	11,641	3,008
2020	32,167	30,562	1,605	241,253	229,215	12,037	2,218
Total*	321,670	312,178	9,492	2,412,525	2,341,337	71,188	30,821

***:** Total from 2011 to 2020.

Total loss of ex-vessel revenue to Cruzan commercial fishermen over the 10-year period would range from approximately $5.12 to $7.68 million, and present value total loss would range from $2.57 to $4.28 million, depending on the effectiveness of a shortened federal fishing season reducing an overage of landings (Table 7.24). The average loss per Cruzan commercial fisherman over the 10-year period would range from $22,957 to $34,435. These estimates assume 223 licensed commercial fishermen sell all of their catch; however, that may not be true. A fisherman may retain part or all of the catch for their own or household's consumption. Nonetheless, the loss of catch for personal or household consumption represents an income loss equivalent to the cost of purchasing the fish at retail prices. The above losses of landings and ex-vessel revenues include losses incurred by fishermen who are not licensed but serve as crew to these 223 fishermen.

Table 7.24. Total loss of ex-vessel revenue to St. Croix commercial fishermen due to shortened federal fishing seasons for parrotfish, snapper and grouper.

Effective	Parrotfish		Snapper		Grouper		Total			Average per Fisher		
	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars	Present Value	Pounds	Dollars	Present Value
30%	754,124	3,770,621	172,981	1,297,357	6,855	51,415	933,960	5,119,393	2,566,743	4,188	22,957	11,510
50%	982,650	4,913,252	248,737	1,865,527	9,492	71,188	1,240,879	6,849,967	3,633,474	5,564	30,717	16,294
80%	1,148,473	5,742,367	max. 50%		max. 50%		1,406,702	7,679,082	4,279,819	6,308	34,435	19,192

St. Thomas/St. John

Preferred Alternative 2 in combination with Action 3 that does not separate the recreational from the commercial sectors could have negative economic impacts on St. Thomas and St. John's charter fishing operations and recreational and subsistence fishermen who fish in federal waters off St. Thomas/St. John because they could be in competition with commercial fishermen who also fish in the same federal waters and there be a race to catch as many fish as possible before the federal fishing season is closed. In such a race, industrial-scale commercial fishing operations with larger vessels and gears capable of catching more of the sub-unit/units in the same or a shorter period of time would be favored over St. Thomas and St. John's historic small-scale commercial, charter fishing operations, and recreational and subsistence fishermen. However, such a race would not occur under the status quo because MRFSS is not presently conducted in the USVI and the proposed ACLs are for commercial landings only by default. However, if generation of annual recreational data were to begin, there could be sector conflicts because commercial and recreational landings for a unit would count against the same ACL. As of March 9, 2010, 12 of the USVI's recreational fishermen were registered with the National Angler Registry, and in 2009, there was one charter fishing operation. In 2008, there were nine charter fishing operations and 160 licensed commercial fishermen in St. Thomas/St. John.

Preferred Alternative 2 of Action 5(b) would have no economic impact on St. Thomas or St. John queen conch fishermen because queen conch fishing in and transportation of queen conch is presently prohibited in the EEZ off St. Thomas and St. John. All queen conch landings in St. Thomas and St. John are harvested from territorial waters.

Commercial landings of snapper in St. Thomas/St. John have been relatively stable from 1999 to 2007, ranging from 140,863 to 175,338 pounds (Figure 7.21). The proposed Snapper ACL of 133,775 pounds is less than annual landings for each year during this time period. If the average of 2006 and 2007 annual landings is representative of current and future snapper landings, there would be an overage of commercial snapper landings of 32,456 pounds.

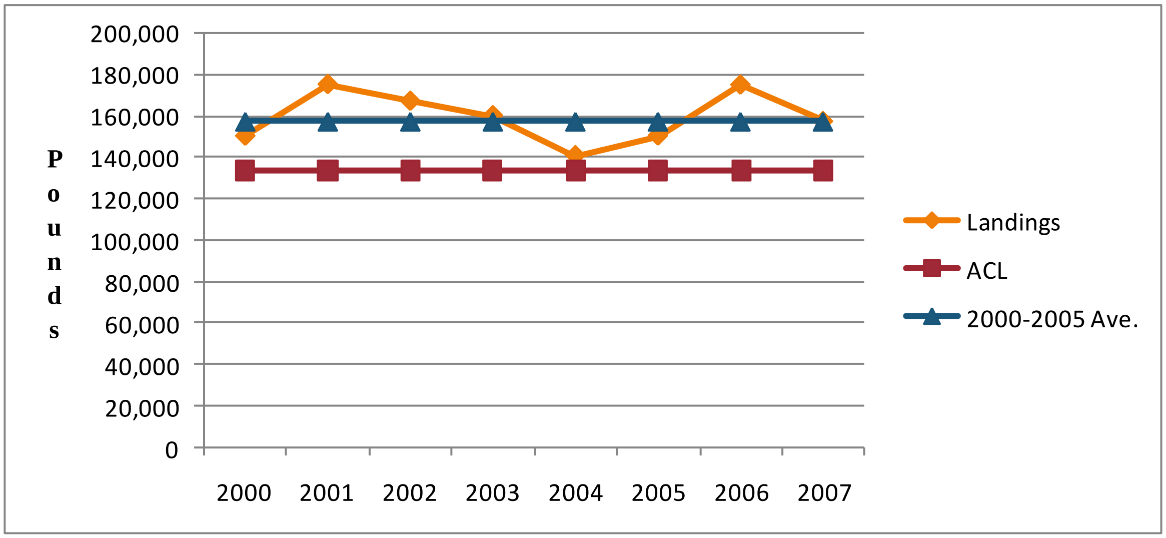

Figure 7.21. Annual commercial landings of snapper from 2000 to 2007, average annual landings from 2000 to 2005, and proposed Snapper ACL for St. Thomas/St. John.

Prior to the SFA, an estimated 50 percent of snapper landings in St. Thomas/St. John were of fish taken from federal waters. Since implementation of the SFA in 2005, there have been seasonal closures of various snapper fisheries in the EEZ each year: mutton and lane snapper from April 1 to June 30 and black, blackfin, vermilion and silk snapper from October 1 through December 31. The VIDPNR prohibits fishing for or possession of silk, black, blackfin, and vermilion snapper from October 1 through December 31 each year in the St. Thomas/St. John district, and fishing for and possession of mutton and lane snapper in all territorial waters from April 1 to June 30 each year.

An overage of snapper landings of 32,456 pounds in 2010 would initiate a reduced federal fishing season in the St. Thomas/St. John EEZ in 2011. **Preferred Alternative 2** would reduce the 2011 snapper fishing season in the St. Thomas/St. John EEZ by 2.4 months, assuming 166,231 pounds of snapper are landed over 12 months, and average monthly landings are 13,853 pounds. Assuming an average ex-vessel price of $7.5 per pound and the reduction in the federal fishing season is 30 percent effective, there would be a loss of landings of 9,737 pounds in 2011 with an ex-vessel value of $73,026 (Table 7.25). Over the 10-year period from 2011 to 2020, there would be total loss of snapper landings of 203,180 pounds with an ex-vessel value of approximately $1.52 million. If the reduced federal fishing season is 50 percent effective in reducing an overage, the total loss of snapper landings would be 247,159 pounds with an ex-vessel value of $1.85 million (Table 7.26).

Table 7.25. Loss of ex-vessel revenue to St. Thomas/St. John Snapper commercial fishermen due to a shortened snapper fishing season in the St. Thomas/St. John EEZ, assuming 30 percent reduction in overage.

Year	Pounds			Dollars			
	Baseline Landings	Landings	Lost Landings	Baseline Revenue	Revenue	Lost Revenue	Present Value Lost Revenue
2010	166,231	166,231	0	1,246,733	1,246,733	0	0
2011	166,231	156,494	9,737	1,246,733	1,173,707	73,026	73,026
2012	166,231	153,086	13,145	1,246,733	1,148,147	98,585	92,136
2013	166,231	151,155	15,076	1,246,733	1,133,664	113,069	98,758
2104	166,231	147,637	18,594	1,246,733	1,107,281	139,451	106,387
2015	166,231	145,571	20,660	1,246,733	1,091,782	154,950	103,250
2016	166,231	143,817	22,414	1,246,733	1,078,630	168,102	91,437
2017	166,231	142,105	24,126	1,246,733	1,065,789	180,944	80,341
2018	166,231	140,814	25,417	1,246,733	1,056,107	190,625	64,571
2019	166,231	139,704	26,527	1,246,733	1,047,783	198,949	51,412
2020	166,231	138,745	27,486	1,246,733	1,040,586	206,147	37,982
Total*	1,662,310	1,459,130	203,180	12,467,325	10,943,476	1,523,849	799,301

***:** Total from 2011 to 2020.

Table 7.26. Loss of ex-vessel revenue to St. Thomas/St. John Snapper commercial fishermen due to a shortened snapper fishing season in the St. Thomas/St. John EEZ, assuming 50 percent reduction in overage.

Year	Pounds			Dollars			
	Baseline Landings	Landings	Lost Landings	Baseline Revenue	Revenue	Lost Revenue	Present Value Lost Revenue
2010	166,231	166,231	0	1,246,733	1,246,733	0	0
2011	166,231	150,003	16,228	1,246,733	1,125,023	121,710	121,710
2012	166,231	145,946	20,285	1,246,733	1,094,595	152,138	142,185
2013	166,231	143,918	22,314	1,246,733	1,079,381	167,351	146,171
2104	166,231	142,768	23,463	1,246,733	1,070,760	175,972	134,248
2015	166,231	141,080	25,151	1,246,733	1,058,099	188,634	125,695
2016	166,231	139,944	26,287	1,246,733	1,049,583	197,149	107,236
2017	166,231	139,017	27,214	1,246,733	1,042,630	204,102	90,624
2018	166,231	138,142	28,089	1,246,733	1,036,067	210,666	71,360
2019	166,231	137,457	28,774	1,246,733	1,030,926	215,807	55,769
2020	166,231	136,876	29,355	1,246,733	1,026,572	220,160	40,564
Total*	1,662,310	1,415,151	247,159	12,467,325	10,613,636	1,853,689	1,035,561

***:** Total from 2011 to 2020.

Annual commercial landings of grouper in St. Thomas/St. John have ranged from under 50,000 pounds to approximately 76,000 pounds from 2000 to 2007. The annual average from 2000 to 2005 is 60,999 pounds and the proposed St. Thomas/St. John Grouper ACL is 51,849 pounds (Figure 7.22). An annual average of 56,812 pounds was landed from 2006 to 2007, which is 4,963 pounds greater than the proposed Grouper ACL. Preliminary estimates of grouper landings in 2008 and 2009 suggest an annual average of 44,264 pounds, which is less than the proposed ACL.

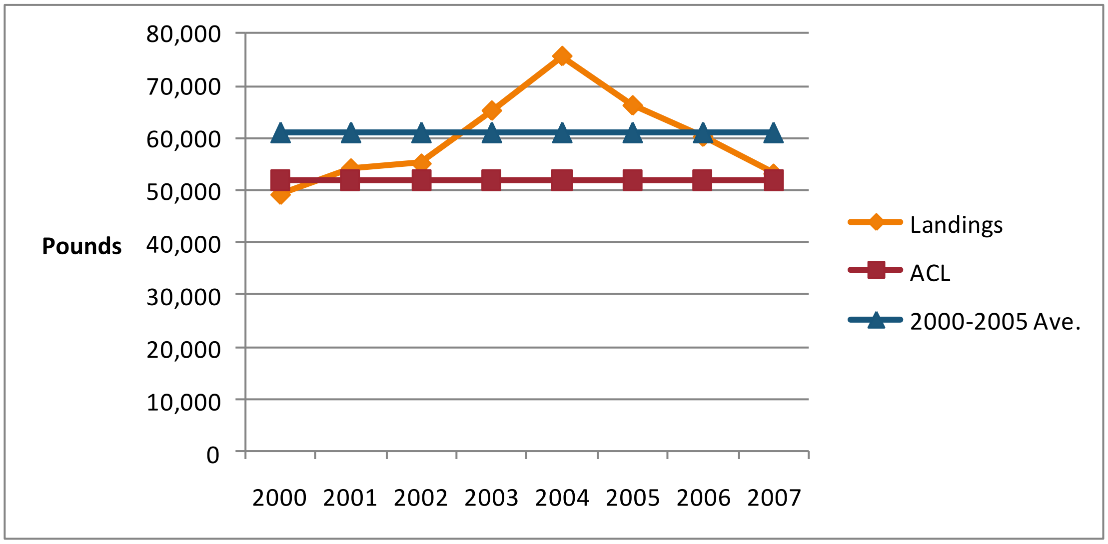

Figure 7.22. Annual commercial landings of grouper from 2000 to 2007, average annual Landings from 2000 to 2005, and proposed Grouper ACL for St. Thomas/St. John.

Prior to the SFA, 85 percent of grouper landings in St. Thomas were believed to originate from the EEZ. Since the SFA, a number of regulations have affected St. Thomas/St. John commercial fishermen who harvest grouper, which include: year-round fishing prohibition in the Hind Bank Marine Conservation District off St. Thomas; closure of an area of Grammanik Bank from February 1 through April 30; establishment of the seasonal closure to the possession of all species, except misty grouper, in Grouper Unit 4 (red, misty, tiger, yellowfin and yellowedge grouper) from February 1 through April 30; and the use of bottom longlines, traps, pots, gillnet and trammel net is prohibited year-round in both federal and territorial waters of the Red Hind and Mutton Snapper Spawning Aggregation Areas.

For purposes here, it is assumed that baseline grouper landings equal the average of 2006 and 2007 landings and there would be an overage of 4,963 pounds in 2010. **Alternative 2** would reduce the 2011 grouper fishing season in the St. Thomas/St. John EEZ by approximately 1.1 months, assuming 56,812 pounds of grouper are landed over 12 months, and average monthly landings are 4,734 pounds. Assuming an average ex-vessel price of $7.50 per pound of grouper, loss of ex-vessel revenue in 2011 would be $11,167, and over the 10-year period there would be total loss of landings of 31,069 pounds with an ex-vessel value of $233,019, assuming a shortened federal fishing season reduces an overage by 30 percent (Table 7.27). The total loss of landings would be 40,484 pounds with an ex-vessel value of $303,632 if the reduced fishing season is 50 percent and 47,316 pounds with an ex-vessel value of $354,870 if 80 percent effective (Tables 7.28 and 7.29).

Table 7.27. Loss of ex-vessel revenue to St. Thomas/St. John Grouper commercial fishermen due to a shortened grouper fishing season in the St. Thomas/St. John EEZ, assuming 30 percent reduction in overage.

Year	Pounds			Dollars			
	Baseline Landings	Landings	Lost Landings	Baseline Revenue	Revenue	Lost Revenue	Present Value Lost Revenue
2010	56,812	56,812	0	426,090	426,090	0	0
2011	56,812	55,323	1,489	426,090	414,923	11,167	11,167
2012	56,812	54,802	2,010	426,090	411,015	15,075	14,089
2013	56,812	54,507	2,305	426,090	408,800	17,290	15,102
2104	56,812	53,969	2,843	426,090	404,766	21,324	16,268
2015	56,812	53,653	3,159	426,090	402,396	23,694	15,788
2016	56,812	53,385	3,427	426,090	400,385	25,705	13,982
2017	56,812	53,123	3,689	426,090	398,421	27,669	12,285
2018	56,812	52,925	3,887	426,090	396,941	29,149	9,874
2019	56,812	52,756	4,056	426,090	395,668	30,422	7,862
2020	56,812	52,609	4,203	426,090	394,567	31,523	5,808
Total*	568,120	537,051	31,069	4,260,900	4,027,881	233,019	122,225

***:** Total from 2011 to 2020.

Table 7.28. Loss of ex-vessel revenue to St. Thomas/St. John Grouper commercial fishermen due to a shortened grouper fishing season in the St. Thomas/St. John EEZ, assuming 50 percent reduction in overage.

Year	Pounds			Dollars			
	Baseline Landings	Landings	Lost Landings	Baseline Revenue	Revenue	Lost Revenue	Present Value Lost Revenue
2010	56,812	56,812	0	426,090	426,090	0	0
2011	56,812	54,331	2,482	426,090	407,479	18,611	18,611
2012	56,812	53,710	3,102	426,090	402,826	23,264	21,742
2013	56,812	53,400	3,412	426,090	400,500	25,590	22,352
2104	56,812	52,831	3,981	426,090	396,234	29,856	22,777
2015	56,812	52,581	4,231	426,090	394,360	31,730	21,143
2016	56,812	52,393	4,419	426,090	392,949	33,141	18,026
2017	56,812	52,225	4,587	426,090	391,691	34,399	15,274
2018	56,812	52,125	4,687	426,090	390,934	35,156	11,909
2019	56,812	52,048	4,764	426,090	390,363	35,727	9,233
2020	56,812	51,991	4,821	426,090	389,932	36,158	6,662
Total*	568,120	527,636	40,484	4,260,900	3,957,268	303,632	167,728

***:** Total from 2011 to 2020.

Table 7.29. Loss of ex-vessel revenue to St. Thomas/St. John Grouper commercial fishermen due to a shortened grouper fishing season in the St. Thomas/St. John EEZ, assuming 80 percent reduction in overage.

Year	Pounds			Dollars			
	Baseline Landings	Landings	Lost Landings	Baseline Revenue	Revenue	Lost Revenue	Present Value Lost Revenue
2010	56,812	56,812	0	426,090	426,090	0	0
2011	56,812	52,842	3,970	426,090	396,312	29,778	29,778
2012	56,812	52,445	4,367	426,090	393,334	32,756	30,613
2013	56,812	52,286	4,526	426,090	392,143	33,947	29,651
2104	56,812	51,984	4,828	426,090	389,880	36,210	27,624
2015	56,812	51,927	4,885	426,090	389,451	36,639	24,414
2016	56,812	51,892	4,920	426,090	389,192	36,898	20,070
2017	56,812	51,866	4,946	426,090	388,996	37,094	16,470
2018	56,812	51,858	4,954	426,090	388,937	37,153	12,585
2019	56,812	51,854	4,958	426,090	388,902	37,188	9,610
2020	56,812	51,851	4,961	426,090	388,883	37,207	6,855
Total*	568,120	520,804	47,316	4,260,900	3,906,030	354,870	207,671

***:** Total from 2011 to 2020.

Annual commercial landings of parrotfish harvested from both territorial and federal waters and landed in St. Thomas/St. John from 2000 to 2007 have ranged from a low of 35,273 pounds to a high of 58,548 pounds. From 2000 to 2005, annual commercial landings showed a generally increasing trend and the average was 48,818 pounds, but after 2005 there has been a declining trend (Figure 7.23). An annual average of 42,528 pounds was landings from 2006 to 2007. The proposed St. Thomas/St. John Parrotfish ACL would be 42,500 pounds, which suggests an overage of 28 pounds. However, preliminary estimates of 2008 and 2009 parrotfish landings suggest landings less than the proposed ACL: 39,411 pounds in 2008 and 17,085 pounds in 2009, for an annual average of 28,248. If there were expected to be no overages of snapper and grouper landings, it is reasonable to expect that parrotfish landings would continue the declining trend and stay below the proposed ACL. However, landings of parrotfish would likely increase if St. Thomas/St. John fishermen attempt to mitigate for lost landings and revenues because of the shortened federal fishing seasons for snapper and grouper. The following estimate of the direct cost of **Alternative 2** on commercial fishermen assumes baseline landings of parrotfish would increase to 45,120 pounds in 2011, which is equal the annual average of landings from 2005 to 2007. Landings in 2011 would exceed the ACL by 2,620 pounds, but would not result in an overage because, the two-year average (2010 and 2011) would be less than the proposed ACL. The three-year average of landings from 2010 to 2012 would result in an overage, which would motivate a reduction of the 2013 federal fishing season by 0.7 months, assuming average monthly landings of 3,760 pounds.

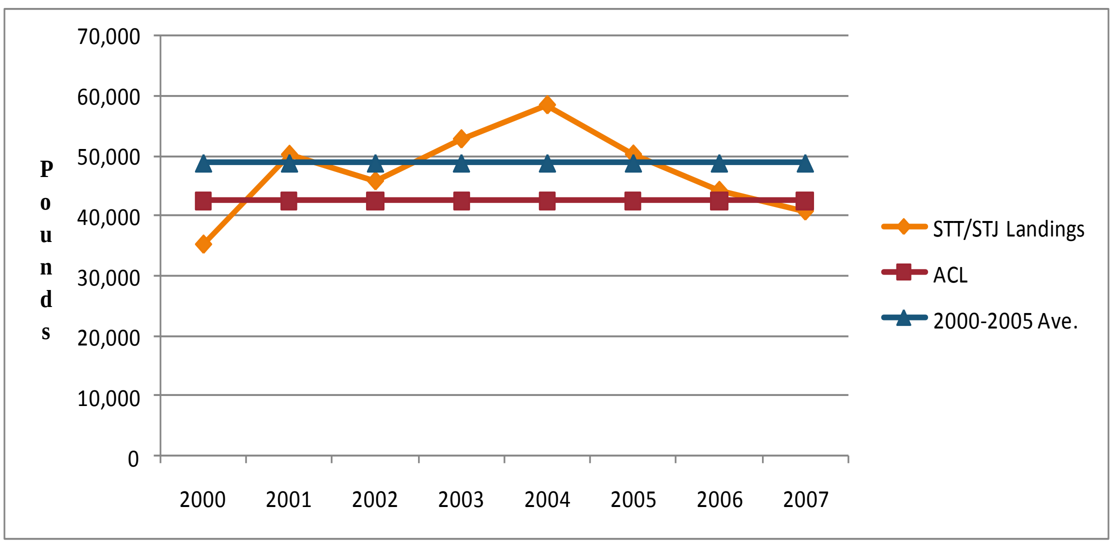

Figure 7.23. Annual commercial parrotfish landings from 2000 to 2007, average annual commercial landings from 2000 to 2005, and proposed Parrotfish ACL for St. Thomas/St. John.

Unlike St. Croix, the use of gillnet or trammel net to take parrotfish has not been popular in St. Thomas/St. John. From 2000 to 2007, traps accounted for an average of 94.3

percent of annual parrotfish landings (pounds), followed by diving which accounted for 4.1 percent and line fishing which accounted for 1.4 percent. Collectively, traps, diving and line fishing accounted for 99.8 percent of annual parrotfish landings. Hence, the prohibitions of the use of gillnet and trammel net in federal and territorial waters had essentially no impact on St. Thomas/St. John commercial parrotfish fishermen. However, post-SFA trap and other gear restrictions may be reflected in the decline of parrotfish landings since 2005.

Few commercial fishermen in St. John use traps. In 2001, for example, only three traps were in use by commercial fishermen of St. Thomas, as compared to 5,812 traps used by St. Thomas commercial fishermen (Impact Assessment, Inc. 2007). This suggests the large majority of parrotfish commercial landings are taken by St. Thomas fishermen. Consequently, the proposed St. Thomas/St. John Parrotfish ACL and any reduced federal parrotfish fishing season would likely have the largest adverse economic impact on commercial fishermen of St. Thomas.

Over the 10-year period from 2011 to 2020, **Alternative 2** would produce a total reduction of parrotfish landings of 10,338 pounds and associated revenue of $51,689, assuming the shortened federal fishing season reduces an overage by 30 percent (Table 7.30). The first overage would not occur until the three-year average of 2010-12 landings exceeds the proposed ACL. If the shortened federal fishing season is 50 percent effective the total loss of parrotfish landings would be 14,319 pounds with an ex-vessel value of $71,596 and 17,756 pounds with an ex-vessel value of $88,779 if 80 percent effective (Tables 7.31 and 7.32).

Table 7.30. Loss of ex-vessel revenue to St. Thomas/St. John parrotfish commercial fishermen due to a shortened parrotfish fishing season in the St. Thomas/St. John EEZ, assuming 30 percent reduction in estimated overage.

Year	Pounds			Dollars			
	Baseline Landings	Landings	Lost Landings	Baseline Revenue	Revenue	Lost Revenue	Present Value Lost
2010	39,411	39,411	0	197,055	197,055	0	0
2011	45,120	45,120	0	225,600	225,600	0	0
2012	45,120	45,120	0	225,600	225,600	0	0
2013	45,120	44,905	215	225,600	224,525	1,075	939
2104	45,120	44,284	836	225,600	221,419	4,181	3,190
2015	45,120	44,089	1,031	225,600	220,443	5,157	3,436
2016	45,120	43,848	1,272	225,600	219,240	6,360	3,459
2017	45,120	43,601	1,519	225,600	218,007	7,593	3,371
2018	45,120	43,442	1,678	225,600	217,211	8,389	2,842
2019	45,120	43,291	1,829	225,600	216,457	9,143	2,363
2020	45,120	43,162	1,958	225,600	215,808	9,792	1,804
Total*	451,200	440,862	10,338	2,256,000	2,204,311	51,689	21,404

***:** Total from 2011 to 2020.

Table 7.31. Loss of ex-vessel revenue to St. Thomas/St. John parrotfish commercial fishermen due to a shortened parrotfish fishing season in the St. Thomas/St. John EEZ, assuming 50 percent reduction in overage.

Year	Pounds			Dollars			
	Baseline Landings	Landings	Lost Landings	Baseline Revenue	Revenue	Lost Revenue	Present Value Lost Revenue
2010	39,411	39,411	0	197,055	197,055	0	0
2011	45,120	45,120	0	225,600	225,600	0	0
2012	45,120	45,120	0	225,600	225,600	0	0
2013	45,120	44,762	359	225,600	223,808	1,793	1,566
2104	45,120	43,750	1,370	225,600	218,751	6,849	5,225
2015	45,120	43,522	1,598	225,600	217,610	7,990	5,324
2016	45,120	43,256	1,864	225,600	216,278	9,322	5,071
2017	45,120	43,005	2,115	225,600	215,023	10,577	4,696
2018	45,120	42,880	2,240	225,600	214,402	11,198	3,793
2019	45,120	42,773	2,347	225,600	213,867	11,733	3,032
2020	45,120	42,693	2,427	225,600	213,465	12,135	2,236
Total*	451,200	436,881	14,319	2,256,000	2,184,404	71,596	30,942

***:** Total from 2011 to 2020.

Table 7.32. Loss of ex-vessel revenue to St. Thomas/St. John parrotfish commercial fishermen due to a shortened parrotfish fishing season in the St. Thomas/St. John EEZ, assuming 80 percent reduction in overage.

Year	Pounds			Dollars			
	Baseline Landings	Landings	Lost Landings	Baseline Revenue	Revenue	Lost Revenue	Present Value Lost Revenue
2010	39,411	39,411	0	197,055	197,055	0	0
2011	45,120	45,120	0	225,600	225,600	0	0
2012	45,120	45,120	0	225,600	225,600	0	0
2013	45,120	44,546	574	225,600	222,732	2,868	2,505
2104	45,120	42,986	2,134	225,600	214,929	10,671	8,141
2015	45,120	42,843	2,277	225,600	214,217	11,383	7,585
2016	45,120	42,692	2,428	225,600	213,459	12,141	6,604
2017	45,120	42,568	2,552	225,600	212,840	12,760	5,665
2018	45,120	42,540	2,580	225,600	212,701	12,899	4,369
2019	45,120	42,520	2,600	225,600	212,600	13,000	3,359
2020	45,120	42,509	2,611	225,600	212,543	13,057	2,406
Total*	451,200	433,444	17,756	2,256,000	2,167,221	88,779	40,635

***:** Total from 2011 to 2020.

The total loss to St. Thomas/St. John commercial fishermen over the 10-year period from 2011 to 2020 would be range from approximately $1.81 million to $2.30 million, assuming shortened federal fishing seasons decrease overages from 30 percent to 80 percent (Table 7.33). The average 10-year loss per fisherman would range from $8,110 to $10,302, assuming there are 160 licensed fishermen. Such ranges assume all of the fishermen sell all of their catch; however, that may not be true. A fisherman may retain part or all of the catch for their own or household's consumption. Nonetheless, the loss of catch for personal or household consumption represents an income loss equivalent to the cost of purchasing the fish at retail prices.

Table 7.33. Total Loss of Ex-Vessel Revenue to St. Thomas/St. John Commercial Fishermen due to a Shortened Parrotfish, Grouper and Snapper Fishing Seasons in the St. Thomas/St. John EEZ.

Effective	Parrotfish		Snapper		Grouper		Total			Average per Fisher		
	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars	Present Value	Pounds	Dollars	Present Value
30%	10,338	51,689	203,180	1,523,849	31,069	233,019	244,587	1,808,557	942,954	1,097	8,110	4,228
50%	14,319	71,596	247,159	1,853,689	40,484	303,632	301,962	2,228,917	1,234,265	1,354	9,995	5,535
80%	17,756	88,779	max. 50%		47,316	354,876	312,230	2,297,344	1,283,909	1,400	10,302	5,757

Total Loss of Ex-Vessel Revenue to All U.S. Caribbean Fishermen

There would be a disproportionate adverse economic impact on USVI fishermen, who would incur losses of landings of parrotfish, snapper and grouper species. Total loss of ex-vessel revenue over the 10-year period from 2011 to 2020 to USVI commercial fishermen would range from approximately $6.93 million to $9.98 million (Table 7.34). Puerto Rico commercial fishermen would incur losses of landings of Snapper Unit 2 species, but likely little to no losses of landings of parrotfish, grouper or other snapper species. Total loss of ex-vessel revenue to Puerto Rico commercial fishermen over the 10-year period would be up to $104,812 (Table 7.35). The combined loss of ex-vessel revenue to U.S. Caribbean commercial fishermen would range from $7.03 million to $10.08 million. Cruzan fishermen would incur approximately 73 percent to 76 percent of the combined loss, St. Thomas/St. John fishermen approximately 26 percent to 23 percent, and Puerto Rico fishermen no more than approximately 1 percent of the combined loss.

Table 7.34. Total and average losses of ex-vessel revenue to USVI commercial fishermen.

Effective	St. Croix			St. Thomas/St. John			USVI		
	Total Revenue Loss	Present Value Revenue Loss	Avg. Loss per Fisherman	Total Revenue Loss	Present Value Revenue Loss	Avg. Loss per Fisherman	Total Revenue Loss	Present Value Revenue Loss	Avg. Loss per Fisherman
30%	$5,119,393	$2,566,743	$22,957	$1,808,557	$942,954	$11,303	$6,927,950	$3,509,697	$18,089
50%	$6,849,967	$3,633,474	$30,717	$2,228,917	$1,234,265	$13,931	$9,078,884	$4,867,739	$23,705
80%	$7,679,082	$4,279,819	$34,435	$2,297,344	$1,283,909	$14,358	$9,976,426	$5,563,728	$26,048

Table 7.35. Total and average loss of ex-vessel revenue to Puerto Rico commercial fishermen.

Effective	Total Revenue Loss	Present Value Revenue Loss	Avg. Loss per Fisher
10%	$104,812	$51,727	$121

7.5.6 Action 6. Framework Measures

Action 6 would reduce risks and associated economic damages caused by absence of an established organizational framework for the Council and NMFS in order to effectively manage fishing and derive the long-term sustainable benefits. It would not directly affect U.S. Caribbean fishermen, their families or communities, and any indirect economic impacts are dependent upon future regulatory actions.

7.6 Public and Private Costs of Regulations

The preparation, implementation, enforcement, and monitoring of this or any Federal action involves the expenditure of public and private resources which can be expressed as costs associated with the regulations. Costs associated with this Amendment include, but are not limited to Council costs of documentation preparation, meeting, public hearings, and information dissemination; NMFS administration costs of document preparation, meetings and review, and annual law enforcement costs.

7.7 Determination of Significant Regulatory Action

Pursuant to E.O. 12866, a regulation is considered a "significant regulatory action" if it is expected to result in: (1) an annual effect of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities; (2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; (3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights or obligations of recipients thereof; or (4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this executive order.

The proposed rule is not expected to have an adverse effect of $100 million or more, create a serious inconsistency or otherwise interfere with an action taken by another agency, materially alter the budgetary impact of programs or rights or obligations of recipients, or raise novel legal or policy issues. Therefore, is not considered to be a significant regulatory action. However, ACLs are a controversial issue in the U.S. Caribbean and this proposed rule would create the first ACLs in a region with populations characterized by large percents of racial/ethnic minorities, high poverty rates and low median household incomes. Moreover, the commercial fishermen of the USVI, especially those of St. Croix, would experience a substantially greater disproportionate adverse impact relative to their counterparts in Puerto Rico.

8.0 REGULATORY FLEXIBILITY ANALYSIS

8.1 Introduction

The purpose of the Regulatory Flexibility Act (RFA) is to establish a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and applicable statutes, to fit regulatory and informational requirements to the scale of businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure that such proposals are given serious consideration. The RFA does not contain any decision criteria; instead, the purpose of the RFA is to inform the agency, as well as the public, of the expected economic impacts of the alternatives contained in the FMP or amendment (including framework management measures and other regulatory actions) and to ensure that the agency considers alternatives that minimize the expected impacts while meeting the goals and objectives of the FMP and applicable statutes.

With certain exceptions, the RFA requires agencies to conduct a regulatory flexibility analysis for each proposed rule. The regulatory flexibility analysis is designed to assess the impacts various regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those impacts. In addition to analyses conducted for the RIR, the initial regulatory flexibility analysis (IRFA) provides: (1) a description of the reasons why action by the agency is being considered; (2) a succinct statement of the objectives of, and legal basis for the proposed rule; (3) an identification, to the extent practicable, of all relevant Federal rules which may duplicate, overlap, or conflict with the proposed rule; (4) a description and, where feasible, an estimate of the number of small entities to which the proposed rule will apply; (5) a description of the projected reporting, record-keeping, and other compliance requirements of the final rule, including an estimate of the classes of small entities which will be subject to the requirements of the report or record; and (6) a description of significant alternatives to the proposed rule which accomplish the stated objectives of applicable statues and which minimize any significant economic impact of the proposed rule on small entities.

8.2 Statement of Need for, Objectives of, and Legal Basis for the Proposed Rule

The purpose and need, issues, problems, and objectives of the proposed Amendment are presented in Section 1.2 and are incorporated herein by reference.

8.3 Identification of Federal Rules which may Duplicate, Overlap or Conflict with the Proposed Rule.

There are no federal rules that duplicate, overlap or conflict with the proposed rule; however, there are federal regulations that presently impose seasonal or year-round prohibitions on fishing for snapper, grouper, parrotfish and queen conch in federal waters of the U.S. Caribbean. First, there is a seasonal prohibition on fishing for or possession of red, tiger, yellowedge, yellowfin and black grouper in the Caribbean EEZ from February

1 through April 30 every year (50 CFR 622.33). Second, from October 1 through December 31, each year, no person may fish for or possess vermilion, black, silk or blackfin snapper in or from the Caribbean EEZ. Third, no person may possess lane and mutton snapper in the EEZ from April 1 through June 30 each year (50 CFR 622.33). Fourth, from March 1 through June 30, each year, all fishing is prohibited in the Mutton Snapper Spawning Aggregation Area, which is located off the coast of St. Croix (Figure 8.1). Fifth, all fishing is prohibited in the Buck Island National Monument off the northeast coast of St. Croix (36 CFR 7.73). Buck Island NM was established in 1961 and expanded more than twenty times in size in 2001, from 880 acres to over 19,000 acres. Its area is mostly underwater and it encompasses seven percent of the shelf around St. Croix. Sixth, from December 1 through February 28, each year, fishing is prohibited in three of the Red Hind Spawning Aggregation Areas, one east of St. Croix and two west of Puerto Rico: Tourmaline Bank and Abrir La Sierra Bank; and from October 1 through March 31 in Bajo de Sico, also in western Puerto Rico (Figure 8.2). Seventh, fishing for any species is prohibited year-round in the Hind Bank Marine Conservation District that is found to the west of Puerto Rico, south of St. Thomas and north of St. Croix. Eighth, from February 1 through April 30, each year, no person may fish for or possess any species of fish, except for highly migratory species, in or from the Grammanik Bank closed area off St. Thomas. Ninth, fishing for any species, except for bait, is prohibited year round in the Virgin Islands Coral Reef National Monument off St. Thomas (36 CFR 7.46). Virgin Islands NM was established in 2001 and its area encompasses 3 percent of the St. John/St. Thomas shelf (Figure 8.3). Tenth, fishing for or transportation of queen conch is prohibited in the EEZ off Puerto Rico and St. Thomas/St. John. Eleventh, fishing for or possession of Grouper Unit 1 (Nassau grouper) or Grouper Unit 2 (goliath grouper) is prohibited in the EEZ. Twelfth, recently the seasonal closure of the Bajo de Sico Red Hind Spawning Aggregation Area was increased from three months to six months and the effects of that regulatory change are still being determined.

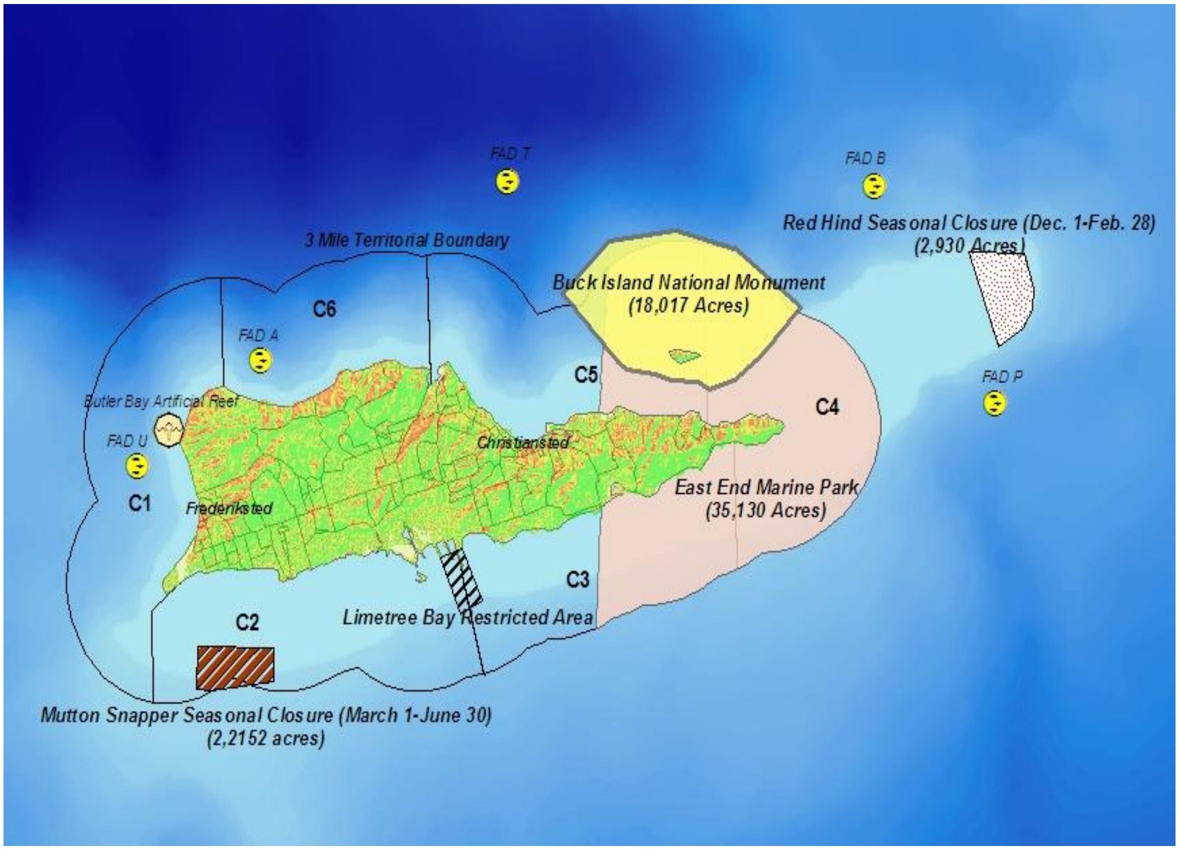

Figure 8.1. Mutton Snapper Spawning Aggregation Area, Red Hind Spawning Aggregation Area, Buck Island National Monument, and Other Restricted Areas off St. Croix.

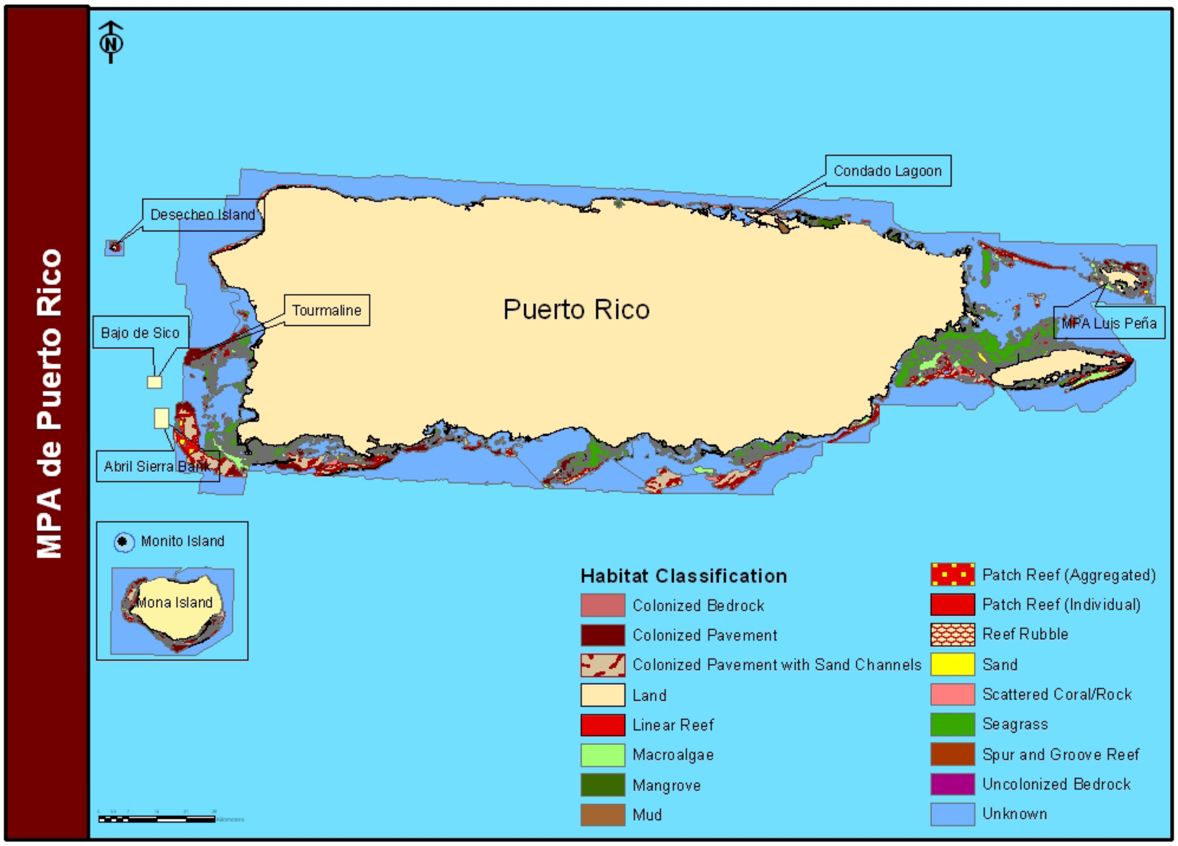

Figure 8.2. Red Hind Spawning Aggregation Areas (Bajo de Sico, Tourmaline Bank, and Abrir la Sierra Bank). Source: Griffith et al. 2007. Federal jurisdiction does not apply to waters surrounding the islands of Desecheo, Monito, Mona and Luis Peña. Puerto Rico's DNER prohibits fishing in waters one mile around Mona and Monito Islands, in the Luis Peña Channel Marine Reserve, half mile around Isla de Desecheo Marine Reserve, and in the no-take zone of Tres Palmas Marine Reserve.

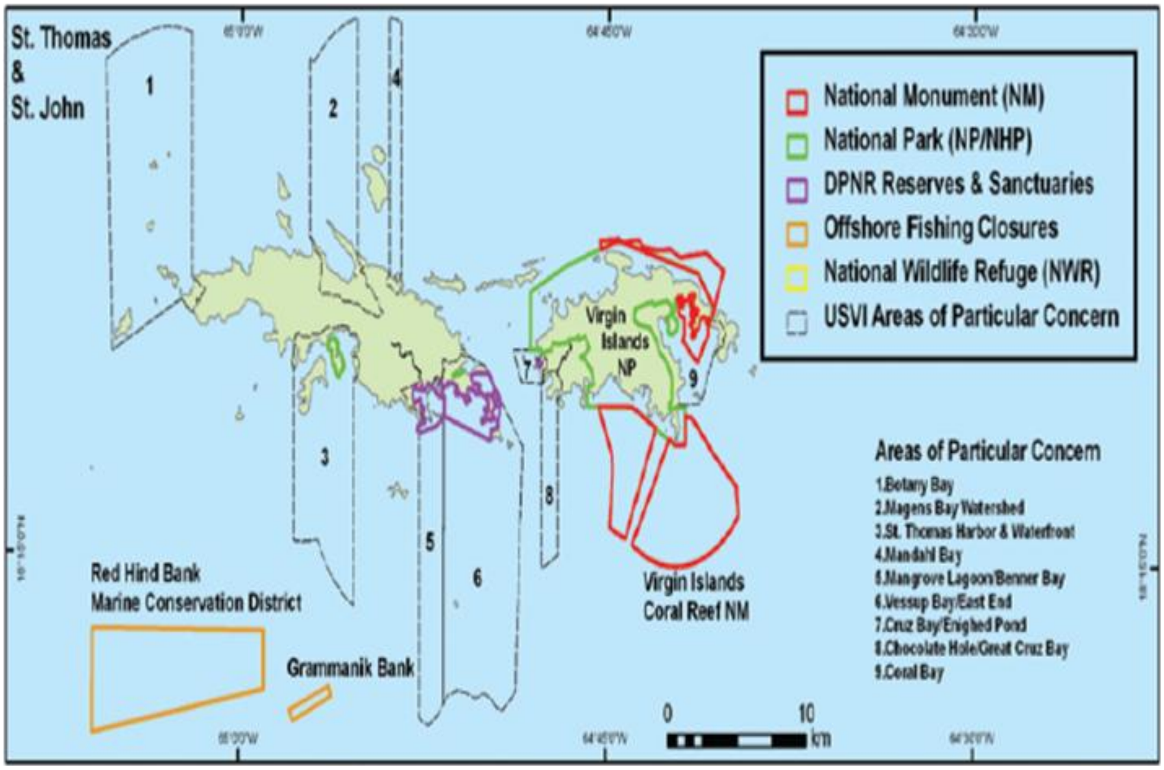

Figure 8.3. Red Hind Bank Marine Conservation District, Grammanik Bank and Other Restricted Areas off St. Thomas/St. John. Source: University of the Virgin Islands Center for Marine and Environmental Studies 2008.

8.4 Description of the Projected Reporting, Record-keeping and Other Compliance Requirements of the Proposed Rule, Including an Estimate of the Classes of Small Entities which will be Subject to the Requirement and the Type of Professional Skills Necessary for the Preparation of the Report or Records.

Actions 1, 2, 3, 4(c) and 6 are administrative actions that do not directly change existing fishing practices. **Preferred Alternative 2** of Action 4a would prohibit fishing for and possession of blue, midnight and rainbow parrotfish in the EEZ, which would directly affect any commercial and charter fishing businesses that currently harvest these species in federal waters. **Preferred Alternative 8** of Action 4b would establish recreational bag limits for snapper, grouper and parrotfish caught in federal waters and would not affect commercial fishermen, but it would indirectly affect any charter fishing operations whose passengers take these species in the EEZ.

Preferred Alternative 3 of Action 5a would trigger a shortened fishing season in federal waters if landings of a parrotfish, snapper or grouper unit/sub-unit exceed the respective ACL. Any commercial or charter fishing entity that currently fishes for parrotfish, snapper and/or grouper in the EEZ could be directly affected by a shortened federal fishing season. For example, there would be a shortened federal fishing season for parrotfish in the St. Croix EEZ if:

1. annual landings of parrotfish in 2010 in St. Croix exceed the St. Croix Parrotfish ACL,
2. the average of 2010 and 2011 annual landings of parrotfish in St. Croix exceed the St. Croix Parrotfish ACL,
3. the average of 2010, 2011 and 2012 annual parrotfish landings in St. Croix exceed the St. Croix Parrotfish ACL; or
4. the 3-year average of annual landings of parrotfish in St. Croix in subsequent years exceeds the St. Croix Parrotfish ACL.

No fisherman, regardless of home or landings port, would be allowed to fish for parrotfish in the St. Croix EEZ when the federal fishing season is closed in that area. However, St. Croix, St. Thomas/St. John and Puerto Rico fishermen would be able to fish for and possess parrotfish in any other part of the EEZ that remained open to parrotfish fishing. **Preferred Alternative 2** of Action 5b would shorten the length of the fishing season in the EEZ by the amount of time necessary to prevent the overage from occurring again.

The proposed rule would establish a St. Croix Queen Conch ACL of 50,000 pounds, which could indirectly result in a shortened federal fishing season. **Preferred Alternative 3** of Action 5a would shorten the federal fishing season for queen conch if landings exceeded the ACL, which could directly affect any Cruzan commercial or charter fishing operations that take queen conch in the EEZ.

The proposed rule would not impose any reporting or record-keeping requirements within the meaning of the Paperwork Reduction Act. Therefore, the proposed rule would not require professional skills for the preparation of reports or records under that Act.

8.5 Description and Estimate of the Number of Small Entities to which the Proposed Rule will Apply.

This proposed rule would apply to small businesses that harvest parrotfish, snapper, grouper and queen conch from federal waters off Puerto Rico and the USVI. These small businesses are in Finfish Fishing (NAICS 114111), Shellfish Fishing (NAICS 114112) and Charter Fishing Industries (NAICS 487210). The small businesses in the Finfish Fishing and Charter Fishing Industries harvest parrotfish, snapper and grouper, and those in the Shellfish Fishing Industry harvest queen conch.

The two Finfish and Shellfish Fishing Industries have an SBA size standard of $4.0 million in annual receipts, and the Charter Fishing Industry’s size standard is $7 million in annual receipts. It is assumed for purposes of this analysis that all commercial (finfish and shellfish) and charter fishing businesses that operate in the U.S. Caribbean have annual receipts less than these size standards and are small businesses.

In 2008, there were 868 active commercial fishermen in Puerto Rico. In 2008, 73.5 percent of these fishermen were captains and the remaining 26.5 percent were helpers. It is assumed for purposes of this analysis that each captain represents a small business in the Finfish Fishing Industry and each helper an employee of one of those businesses. Therefore, it is concluded that there are 638 small businesses in the Finfish Fishing Industry in Puerto Rico and potentially all of these businesses could be directly affected by the proposed rule.

In 2008, there were 223 licensed commercial fishermen in St. Croix and 160 in St.Thomas/St. John. There is a moratorium on the number of licenses, so these numbers are not expected to increase. For purposes of this analysis, it is assumed the 223 commercial fishermen in St. Croix and 160 commercial fishermen in St. Thomas/St. John represent 383 small businesses in the Finfish Fishing Industry in the USVI who could be directly affected by the proposed rule.

Current regulation prohibits fishing for or transportation of queen conch in the EEZ off Puerto Rico and St. Thomas/St. John, and the proposed rule would not end that prohibition. Hence, the proposed rule would not apply to small businesses in the Shellfish Fishing Industry in Puerto Rico and St. Thomas/St. John.

Thirty-nine percent of St. Croix's licensed commercial fishermen in 2003 reported that they targeted conch. Thus, it is assumed that 39 percent (87) of St. Croix's 223 fishermen represent 87 small businesses in the Shellfish Fishing Industry that harvest queen conch and could be directly affected by the proposed rule.

There are an estimated nine small businesses in the Charter Boat Industry in Puerto Rico. Similarly, there are 12 such businesses in St. Thomas/St. John and one in St. Croix. The proposed rule would apply to all 22 of these small businesses.

8.6 Substantial Number of Small Entities Criterion

It is assumed that the proposed rule would apply to all small businesses in Puerto Rico, St. Croix and St. Thomas/St. John within the Finfish Fishing Industry and Charter Fishing Industry. Moreover, it would apply to all of the small businesses in St. Croix in the Shellfish Fishing Industry. Therefore, the proposed rule applies to a substantial number of small entities in the U.S. Caribbean.

8.7 Significant Economic Impact Criterion

The outcome of "significant economic impact" can be ascertained by examining two issues: disproportionality and profitability.

Disproportionality: Does the proposed rule place a substantial number of small entities at a significant competitive disadvantage to large entities?

Profitability: Does the proposed rule significantly reduce profit for a substantial number of small entities?

8.7.1 Impact in Charter Fishing Industry

Charter fishing operations in Puerto Rico and the USVI target pelagic species, such as tuna and marlin, in federal waters. Trips that target non-pelagic species, such as snapper, grouper or parrotfish, are within territorial waters and any landings of these species that are caught in federal waters are likely infrequent and small. Hence, any reductions in the recreational and/or commercial grouper, snapper, and/or parrotfish fishing seasons in the EEZ or recreational bag limits are expected to have little to no adverse economic impact on charter fishing operations of Puerto Rico and/or the USVI.

This proposed rule would prohibit fishing for or possession of rainbow, blue and midnight parrotfish in federal waters. MRFSS is conducted in Puerto Rico. From 2000 to 2007 there were no reported recreational landings of midnight parrotfish and only sporadic landings of rainbow and blue parrotfish in Puerto Rico. From 2004 to 2007, there were no recreational landings of any of the three species, which suggests the prohibition would have little to no adverse economic impact on recreational landings of charter fishing operations of Puerto Rico. According to a scoping-meeting comment, commercial and recreational fishers in Puerto Rico catch the same kind of parrotfish and in the same areas. That comment suggests the prohibition would have no direct or indirect economic impact on charter fishing operations in Puerto Rico.

Recreational and commercial landings of rainbow, blue and midnight parrotfish in the USVI are unknown because MRFSS is not conducted there and commercial reporting forms do not differentiate parrotfish species. Nonetheless, landings of these three species of parrotfish by charter fishing operations, if any, are expected to be rare and small.

It is concluded that there would be little to no adverse economic impact on charter fishing operations of Puerto Rico and the USVI.

8.7.2 Impact in Shellfish Fishing Industry

The proposed St. Croix ACL is consistent with the VI DPNR’s annual quota of 50,000 pounds of queen conch in St. Croix. Once the DPNR has determined that the quota is met, queen conch harvest is closed and no landings of queen conch in St. Croix are permitted for the remainder of the fishing season. The matching of the proposed ACL with the already established annual quota in St. Croix should have no adverse economic impact on small businesses of St. Croix in the Shellfish Fishing Industry that harvest queen conch.

8.7.3 Impact in Finfish Fishing Industry

The proposed ban on fishing for and possession of blue, midnight and rainbow parrotfish in the EEZ is not expected to have an adverse economic impact on commercial fishing operations in Puerto Rico because these species are harvested in territorial, not federal, waters. Commercial landings of the three species in the USVI that are taken from federal waters are unknown, and, consequently, any adverse economic impacts of the prohibition on commercial fishing operations of the USVI are unknown. However, these species are found predominantly in state, not federal, waters. Nonetheless, if any USIV small businesses were adversely affected, they may be able to mitigate for losses of revenues from landings of these three species of parrotfish by increasing landings of other species of parrotfish or non-parrotfish species taken in the EEZ; however, the ability to increase landings of other parrotfish or snapper and grouper would be limited or could be eliminated by the proposed ACLs and shortened fishing seasons in the EEZ.

As described in the RIR (Section 7), this proposed rule is expected to have an adverse economic impact on USVI small businesses that harvest parrotfish, snapper and grouper, and Puerto Rico small businesses that land Snapper Unit 2. Small businesses of Puerto Rico that land parrotfish, grouper and other snapper species are not expected to be adversely affected. The adverse impact would be substantially disproportionate, with USVI small businesses bearing approximately 99 percent of the total cost. Commercial fishing small businesses of Puerto Rico are expected to incur no more than 1 percent of the total cost, while those of St. Croix and St. Thomas/St. John are expected to incur approximately 73 percent to 76 percent and 26 percent to 23 percent of the total cost, respectively.

It is expected that Puerto Rico commercial fishermen who currently harvest proposed Snapper Unit 2 species in federal waters off Puerto Rico would mitigate for loss of revenues from Snapper Unit 2 landings due to a shortened federal fishing season for Snapper Unit 2 by shifting effort from the Puerto Rico EEZ to territorial waters or other parts of the EEZ if they remain open to Snapper Unit 2 fishing. Approximately 95 percent of fishable area off Puerto Rico is in territorial waters. If a shortened federal fishing season is 10 percent effective in reducing the overage, over the 10-year period from 2011 to 2020, Puerto Rico's 638 commercial fishing entities would lose approximately 1.4 million pounds of Snapper 2 species with an ex-vessel value of $104,812. The average loss per small business would be approximately $164 over ten years.

The percent of fishable area in USVI's territorial waters is significantly less than the percent of fishable area in Puerto Rico's territorial waters. Thirty-eight percent of fishable area off the USVI lies within the U.S. Caribbean EEZ, and a larger share of landings in St. Croix and St. Thomas/St. John derive from fishing in the EEZ than in Puerto Rico. Hence, it is more difficult for USVI fishermen to substitute fishing in territorial waters for fishing in federal waters; however, if the Puerto Rico EEZ remains open, while the St. Croix and/or St. Thomas/St. John EEZ is closed for fishing for snapper, grouper and/or parrotfish, St. Croix and/or St. Thomas/St. John commercial fishermen could continue fishing for snapper, grouper and/or parrotfish in the Puerto Rico EEZ of wherever else it is allowed.

A comparison of landings and the proposed ACLs suggest there would be reduced federal fishing seasons for parrotfish, snapper and grouper in the EEZ off St. Croix and St. Thomas/St. John. As described in the RIR, St. Croix and St. Thomas/St. John commercial fishing operations would experience losses of ex-vessel revenues from decreased landings of parrotfish, snapper and grouper because the federal fishing seasons would be reduced.

Total loss of ex-vessel revenue over the 10-year period from 2011 to 2020 to USVI commercial fishermen would range from approximately $6.93 million to $9.98 million (Table 8.1). The average 10-year loss per St. Croix small business would range from $22,957 to $34,435 and the average loss per St. Thomas/St. John small business would range from $11,303 to $14,358. The average 10-year loss per small business in Puerto Rico would be up to $164. Cruzan small businesses would incur 73 percent to 76 percent of the total cost, St. Thomas/St. John small businesses would incur 26 percent to 23 percent, and Puerto Rico's small business would incur approximately 1 percent of the total cost. Thus, there would be a substantially larger adverse economic impact on USVI small businesses, especially St. Croix.

Table 8.1. Total Loss of Ex-Vessel Revenue to Small Businesses in the Finfish Fishing Industry, 2011 to 2020.

Effective	St. Croix			St. Thomas/St. John			USVI		
	Total Revenue Loss	Present Value Revenue Loss	Avg. Loss per Small Business	Total Revenue Loss	Avg. Loss per Small Business	Avg. Loss per Fisherman	Total Revenue Loss	Present Value Revenue Loss	Avg. Loss per Small Business
30%	$5,119,393	$2,566,743	$22,957	$1,808,557	$942,954	$11,303	$6,927,950	$3,509,697	$18,089
50%	$6,849,967	$3,633,474	$30,717	$2,228,917	$1,234,265	$13,931	$9,078,884	$4,867,739	$23,705
80%	$7,679,082	$4,279,819	$34,435	$2,297,344	$1,283,909	$14,358	$9,976,426	$5,563,728	$26,048

Businesses with larger vessels and gears capable of catching more parrotfish, snapper and/or grouper in the same or a shorter period of time would be favored over St. Croix's and St. Thomas/St. John's historic artisanal fishers if overcapacity were allowed and there were a race to catch as many fish as possible before the federal fishing season is closed. The actual long-term adverse economic impacts on historic small businesses, however, would be dependent on if the regulatory and economic environments support such a race and increased market concentration.

8.8 Description of Significant Alternatives

Among the considered but rejected significant alternatives for Action 5a were Alternatives 2a and 3a, which would use a single year's landings to trigger the accountability measures. Also considered but rejected were Alternatives 2b and 3b that would use a single year's landings in 2010 and then use a 2-year annual average starting in 2011 and continue it thereafter to trigger the accountability measures. **Preferred Alternative 3c** and Alternative 2c would use a 3-year average starting in 2012 and continue it thereafter. The adverse economic impact of **Preferred Alternative 3c** is less than the adverse economic impacts of rejected Alternatives 2b, 3b, 2a and 3a and likely equal to Alternative 2c.

Among the considered but rejected significant alternatives for Action 5b was Alternative 3, which would require a larger reduction in the federal fishing season than **Preferred Alternative 2** of that action.

Action 4(c) included two significant but rejected alternatives (Sub-alternatives 2B and 2C). Those rejected alternatives could have a similar adverse economic impact on St. Thomas/St. John and Puerto Rico (respectively) as Sub-alternative 2A has on St. Croix small businesses that harvest parrotfish .

Preferred Alternative 2(d) of Action 2a would have a smaller adverse economic impact than considered but rejected Alternatives 2(e) and 2(f) because the latter would set smaller ACLs, which would motivate actions to further decrease landings. Rejected Alternative 2(c) would have a smaller adverse economic impact than **Preferred Alternative 2(d)**; however, Alternative 2(c) does not allow for uncertainty and could yield lower long run benefits to small entities that make use of these marine resources.

Additional discussion of the expected impacts of the alternatives considered for each of the proposed actions as required by E.O. 12866 is contained in Section 4.

9.0 FISHERY IMPACT STATEMENT / SOCIAL IMPACT ASSESSMENT

9.1 Fishery Impact Statement

Comparisons of the physical, biological, and ecological (i.e. 'biological') effects, and the socioeconomic/administrative effects, of each alternative within the amendment are included in Tables 1.0.1 through 1.0.6 within the Executive Summary. The overall impacts on the fishery are mixed depending upon the specific action considered and the alternative(s) chosen within the action. The preferred alternatives generally benefit the fishery, including the status of the harvested species and the health of the fishing and associated communities.

The preferred alternatives for Action 1 provides for better monitoring and management of harvested snapper and grouper species while having minimal effects on the socioeconomic environment (Table 1.0.1). The preferred alternatives for Action 2 generally benefit the fishery by using the longest time series of data prior to the 2005 implementation of the Sustainable Fisheries Amendment, thereby approximating sustainable yields. The direct socioeconomic impacts are expected to be minimal whereas the indirect impacts will depend upon the AMs and other regulations that are implemented (Table 1.0.2). The preferred alternatives identified within Action 3 are biologically beneficial because they provide more refined management of the species, units, and complexes considered in this amendment, and they allow for more resolved management within the context of sectors and islands (Table 1.0.3). The opportunity for more resolved management provides considerable socioeconomic benefit because it reduces (but does not eliminate) the tendency to "race" for the quota and because it designates ACLs individually for each island group, thereby eliminating the urge for fishers from each island group to "race" against fishers from the other island groups for a single ACL. The preferred alternatives identified in Action 4 would have largely beneficial biological and the socioeconomic effects (Table 1.0.4). Biological benefits include limits on the recreational harvest of snapper, grouper, and parrotfish and elimination of fishing for three large species of parrotfish which contribute disproportionately to the health of coral reefs and their associated communities. Socioeconomic effects are expected to be positive or neutral. The three large parrotfish considered for prohibition are rarely caught by recreational fishers, and the overall bag limits still provide ample recreational fishing opportunities while reducing the likelihood that the recreational fishing sector will contribute to overfishing of these species. Action 5 determines the circumstances under which AMs will be triggered and then defines the specific AMs to be applied. The preferred alternative for triggering AMs ultimately provides for comparing a three-year average of landings with the established ACL. This alternative has positive biological and socioeconomic consequences (Table 1.0.5), the former because it includes a clause to conduct scientific consultations prior to implementing an AM thereby resulting in more reliable and defensible decisions and the latter because triggering AMs will more likely occur in response to actual overharvest rather than to vagaries in data reporting that were discussed in Section 3.3. The preferred alternative for applying AMs has positive biological effects because it results in structuring the length of the fishing season to be consistent with the harvest rate and the ACL for each species, unit, or complex but does not include a payback provision. At present, a payback provision is considered overly burdensome given the limitations of fisheries landings data in the Caribbean. The socioeconomic impacts are considered intermediate because of the constraints on overall harvest reduction. Finally, Action 6 is largely administrative in nature and no preferred alternative has been identified by the Council (Table 1.0.6). Either of the two action alternatives will have generally positive biological and socioeconomic effects because they will increase flexibility and reduce response time for managing these fisheries.

9.2 Social Impact Assessment

9.2.1 Introduction

The social impacts of a proposed rule are its consequences to people that alter the ways in which they live, work, play, relate to one another, organize to meet their needs and generally cope as members of society. Included are cultural impacts involving changes to norms, values and beliefs that guide and rationalize their cognition of themselves and their society.

The U.S. Caribbean islands of Puerto Rico, St. Croix, St. Thomas and St. John comprise the affected area. The people directly affected are commercial fishermen, charter fishing operators and recreational and subsistence fishermen of these islands who harvest and are dependent on parrotfish, snapper, grouper and queen conch from federal waters. The people indirectly affected are fish wholesalers, restaurants, households and others who make use of and are dependent on these fishermen's landings of parrotfish, snapper, grouper and queen conch. If this proposed rule diminishes their use of any of these fishery management units, it would have an adverse social impact on them.

This proposed rule would directly affect all commercial, recreational and subsistence fishermen and charter fishing operators in Puerto Rico, St. Croix, St. Thomas and St. John who operate in federal waters of the U.S. Caribbean by:

1. Prohibiting fishing for and possession of midnight parrotfish, blue parrotfish and rainbow parrotfish.

This proposed rule would directly affect all commercial fishermen in Puerto Rico, St. Croix, St. Thomas and St. John who fish in the Caribbean EEZ by:

2. Possibly reducing the length of commercial fishing seasons for parrotfish, snapper, and grouper.

The proposed rule would directly affect St. Croix's commercial fishermen who take queen conch in federal waters by:

3. Possibly reducing the length of the fishing season for queen conch.

This proposed rule would directly affect charter fishing operations and recreational and subsistence fishermen in Puerto Rico, St. Croix, St. Thomas, and St. John who take snapper, grouper and/or parrotfish in federal waters by:

4. Establishing an aggregate recreational bag limit for snapper, grouper and parrotfish of five individual fish per recreational fisher including not more than

two parrotfish per fisher or six parrotfish per boat, and 15 aggregate snapper, grouper, and parrotfish per boat on a fishing day.

This proposed rule would directly affect Puerto Rico's recreational and subsistence fishermen who fish in the Caribbean EEZ by:

5. Possibly reducing the length of the fishing seasons for parrotfish, snapper, and grouper.

9.2.2 Baseline Conditions

9.2.2.1 Food Insecurity and Poverty

"Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and preferences for an active and healthy life" (World Food Summit, World Food Programme 2009). There are four aspects of food security: availability, access, utilization and stability. Availability is the supply of food in an area and access refers to a household's ability to obtain that food. Hunger and malnutrition are related more to access to food than its availability. Sen (1993, 1989, 1981), for example, demonstrated that during famines in Bengal (1943), Ethiopia (1973) and Bangladesh (1974) food availability did not decline significantly and in some cases it increased. These famines were caused by economic factors, such as declining wages, rising food prices, loss of jobs and declining livestock prices, which reduced access to food through markets. Food was available but many households could not afford the same quality and quantity of food as before because their real incomes fell. Their incomes did not keep pace with rising food prices.

Utilization is defined as a person's ability to select, take in and absorb the nutrients in food and stability refers to sustained availability, access and utilization.

Hunger and poverty can be both causes and effects of each other. A household with income below the poverty threshold may be unable to purchase the required nutrients for fully productive, active and healthy lives of its members. These nutrients are both macro (energy and protein) and micro (vitamins and minerals). Hunger can cause poor health, which diminishes a person's ability to perform wage labor both in the short and long term (World Food Programme 2009).

Hunger is an intergenerational phenomenon passed from mother to child. An undernourished pregnant woman generally passes the condition on to her child as low birth weight, which has an impact on the child's future health and well-being. This hunger-and-poverty process is known as the hunger-poverty trap or hunger trap (World Food Programme 2009: 19). Hunger's impact on health, education and productivity increases the likelihood that one lives in poverty (Behrman et al. 2004, Victora et al. 2008, World Food Programme 2009). Damage done by malnutrition before a child reaches two years of age is irreversible, which substantially decreases the likelihood that the person can escape the hunger-poverty trap (Victora et al. 2008, World Food

Programme 2009). According to the Children's Defense Fund (2010), a child growing up in poverty is almost twice as likely to be poor as an adult.

Puerto Ricans and U.S. Virgin Islanders are dependent on the market for jobs and incomes that allow them to buy food. However, those individuals able to engage in subsistence fishing and farming are able to expand their access to food beyond the market. Subsistence fishing and farming can be a much needed safety net.

Even when a market yields an efficient outcome, it responds to demand, not to need. So, economically optimal outcomes are not necessarily equitable or socially optimal. For example, if a hurricane destroys the region of an island where its crops are gown, the crop farmers in that region also lose their incomes. Without incomes, markets will not supply food to people in the region because the people do not have the money to buy nutritious food. Even with incomes, low wages in combination with high food prices can result in substantial numbers of workers having insufficient access to food. Racial/ethnic and gender groups that are over represented in low-paying occupations, because of institutional racism, ethnocentrism and sexism, have a higher risk of hunger. For example, West Indian immigrants and darker skinned Blacks in St. Croix have been relegated to the lowest paying jobs, including farm and fishing work (Isern 2009), and those of French ancestry have been similarly discriminated against in St. Thomas.

Markets do not guarantee proper nutrition for everyone. They can contribute to hunger and famine (Sen 1993, 1989, 1981).

The U.S. Caribbean tends to have the highest poverty rates in the United States and high costs of living. For example, the U.S. Office of Personnel Management living-cost comparison index in 2006 had the index for Puerto Rico at 103.32 and the USVI at 128.21, as opposed to the index for the Washington, DC, metropolitan area at 100.00 (Federal Register, October 27,2006). In 2006, the Washington Metropolitan area was the wealthiest metropolitan area of the country. Its median household income was $72,800. Median household incomes in Puerto Rico and the USVI are substantially lower. For example, median household income in Puerto Rico was $18,610 in 2008 inflation-adjusted collars and $24,704 in 2000 in the USVI (2006-2008 Puerto Rico Community Survey, Census 2000). A report published by the Planning Board of Puerto Rico in January 2009 stated that the CPI for food and beverages increased by 17.1 percent between November 2007 and November 2008 in Puerto Rico, approximately three times greater than the increase in the U.S (FNS, USDA 2010). An examination of the CPI for the U.S. during an almost identical period (December 2007 to November 2008) showed an increase of just 5.7 percent. Substantial numbers of individuals and families in the USVI have incomes below the poverty level. In 1999, 32.5 percent of all individuals and 28.7 percent of all families lived in poverty. Over fifty percent of families with no husband present and with related children under 5 years lived in poverty. The V.I. Department of Labor's Consumer Price Index indicates that the cost of living in the territory is an average of at least 35 percent higher cumulatively than the U.S. mainland. The annual poverty levels set by the U.S. Census Bureau do not reflect local and regional variations. Consequently, the actual poverty rates in the U.S. Caribbean are higher than reported in the Census Bureau's community and population surveys.

The federal government's Food and Nutrition Program gave $1.4 billion in aid to Puerto Rico and $18.5 million to the USVI in 2003. Puerto Rico's share of the federal program's total budget for that year was 6.12 percent and the USVI's share was 0.08 percent.

9.2.2.2 U.S. Caribbean Population

The population of the U.S. Caribbean was approximately 3.917 million persons in 2000. Almost 10 percent of the population was Black and African American, 78.6 percent was White, and the remaining 11.5 percent was another race or multiple races (Table 9.1). Hispanics and Latinos, of any race, comprised 96 percent of the U.S. Caribbean population. The U.S., by comparison, had a population that was 75 percent White, 12 percent Black or African American and 13 percent of another race or multiple races. Approximately 13 percent of the U.S. population in 2000 was Hispanic or Latino. Thus, Blacks or African Americans were racial minorities in both the U.S. Caribbean and U.S., but Hispanics or Latinos were an ethnic majority in the U.S. Caribbean versus an ethnic minority in the U.S. as a whole. Approximately 48 percent of individuals who live in the U.S. Caribbean had incomes below the poverty threshold in 2000. In 2000, the residents of Puerto Rico made up 97.7 percent of the U.S. Caribbean's population.

In 2008, there were 1,257 commercial fishermen in the U.S. Caribbean, and Puerto Rican commercial fishermen represented 69.5 percent of that figure. The racial and ethnic composition is unknown for the majority of U.S. Caribbean commercial fishermen because Puerto Rico does not differentiate its fishermen by race and/or ethnicity. The number of recreational and subsistence fishermen was and remains unknown. However, as of March 9, 2010, there were 594 U.S. Caribbean recreational fishermen registered with the National Angler Registry: 12 in the USVI and 582 in Puerto Rico. Registration is required of recreational and subsistence fishermen who fish in the EEZ.

Table 9.1. Population of U.S. Caribbean (Puerto Rico and USVI combined), 2000. Source: Census 2000.

Subject	US Caribbean	
	Total	Percent
Total Population	3,917,222	
Race		
One race	3,755,015	95.86%
White	3,079,080	78.60%
Black or African American	385,683	9.85%
Other	290,252	7.41%
Two or more races	162,207	4.14%
Hispanic or Latino		
Hispanic or Latino	3,777,942	96.44%
Mexican	11,854	0.30%
Puerto Rico	3,631,950	92.72%
Cuban	26,162	0.67%
Other	107,976	2.76%
Not Hispanic or Latino	139,279	3.56%

The proposed rule would divide the Caribbean EEZ into three island areas and establish separate ACLs for these three areas: Puerto Rico, St. Thomas/St. John and St. Croix. The descriptions of the baseline social environment and potential social impacts are similarly divided to conform to this logic and compare impacts.

9.2.2.3 Puerto Rico

The population of Puerto Rico grew from approximately 3.5 million persons in 1990 to approximately 3.8 million persons in 2000. As of 2010, the population is estimated to be approximately four million persons.

Puerto Rico has one of the highest population densities in the world. As of 2008, there were 1,151 persons per square miles (44 per square kilometer), up from 1,109 persons/ mi^2 in 2000. According to www.siteatlas.com, Puerto Rico ranks 27th in the world in population density (http://www.sitesatlas.com/Thematic-Maps/Population-density.html). According to the CIA – The World Factbook (2009), 98 percent of the population lives in urban areas, and the urbanization rate is 0.8 percent.

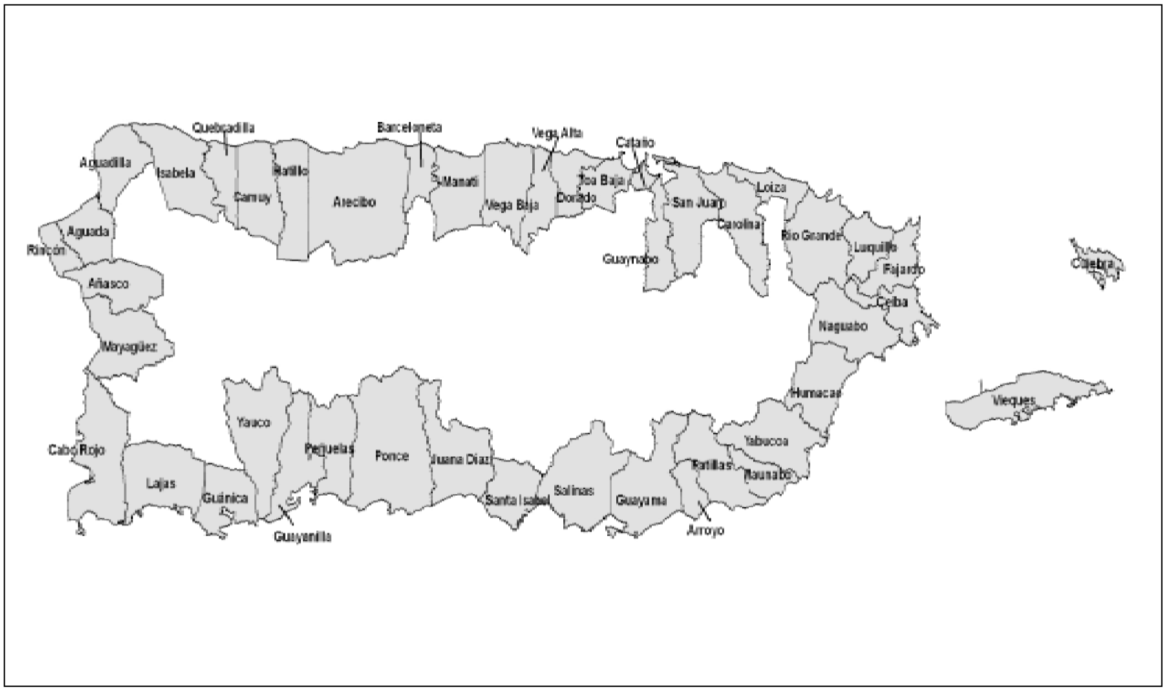

Figure 9.1. Puerto Rico's coastal municipalities. Source: Griffith et al. 2007.

Puerto Rico is divided into 78 municipalities (Figure 9.1). Forty-four of these municipalities are along the coast (18 on the north coast from Isabela to Luquillo, eight on the east coast from Fajardo to Maunabo and including Vieques and Culebra, 12 on the south coast from Lajas to Patillas, and six on the west coast from Cabo Rojo to Aguadilla). In 2008, 868 active commercial fishermen lived in 39 of these coastal municipalities.

The north coast is the most populated coast, with the municipality of San Juan leading with an estimated population of over 400 thousand persons in 2008. It is also the municipality with the highest population density. Approximately 18 percent of the active commercial fishermen interviewed in 2008 lived in north coast municipalities (Table 9.2). None of these commercial fishermen lived in Quebradillas, Manatí, Toa Baja or Guaynabo, although there was a marina in Guaynabo in 2008. The populations of 12 of the 14 north coast municipalities where commercial fishermen lived increased from 2000 to 2008.

Table 9.2. Populations of north coast municipalities where active commercial fishermen lived in 2008. Source: U.S. Census Bureau.

Municipality	1990 Population	2000 Population	2008 Est. Population	2008 Population Density (mi.^{2})
Arecibo	93,385	100,131	102,645	808.2
Barceloneta	20,947	22,322	23,106	962.8
Camuy	28,917	35,244	39,851	847.9
Carolina	177,806	186,076	187,438	4,074.7
Cataño	34,587	30,071	26,074	5,214.8
Dorado	30,759	34,017	36,630	1,592.6
Hatillo	32,703	38,925	43,658	1,039.5
Isabela	39,147	44,444	48,134	859.5
Loíza	29,307	32,537	33,778	1,407.4
Luquillo	18,100	19,817	20,561	790.8
Rio Grande	45,648	52,362	56,695	929.4
San Juan	437,745	434,374	422,665	8,992.9
Vega Alta	34,559	37,910	39,723	1,418.7
Vega Baja	55,997	61,929	64,879	1,380.4
Total	1,079,607	1,130,159	1,145,837	1,900.2

Approximately 27 percent of active commercial fishermen interviewed in 2008 lived in 11 of the 12 south coast municipalities (Table 9.3). Ponce is the largest of these municipalities, both by population and area. In 2008, it had an estimated population of 179,353 persons and population density of 1,546 persons per square mile. The populations of Patillas and Ponce declined from 1990 to 2008.

Table 9.3. Populations of south coast municipalities where active commercial fishermen lived in 2008. Source: U.S. Census.

Municipality	1990 Population	2000 Population	2008 Est. Population	2008 Population Density (mi.^{2})
Arroyo	18,910	19,917	18,954	1,263.6
Guánica	19,984	21,888	22,824	634.0
Guayama	41,588	44,301	45,298	686.3
Guayanilla	21,581	23,072	23,686	564.0
Juana Diaz	45,198	50,531	53,223	872.5
Lajas	23,271	26,261	28,027	459.5
Patillas	19,633	20,152	19,941	424.3
Peñuelas	22,515	26,719	29,575	657.2
Ponce	187,749	186,475	179,353	1,546.1
Salinas	28,335	31,113	32,241	467.3
Santa Isabel	19,318	21,665	22,925	674.3
Total	448,082	472,094	476,047	804.1

Approximately 37 percent of active commercial fishermen in 2008 lived in all six west coast municipalities (Table 9.4). The largest of these municipalities is Mayagüez, both in area and population; however, its population has declined with its demise as Puerto Rico's manufacturing center.

Table 9.4. Populations of west coast municipalities where active commercial fishermen lived in 2008. Source: U.S. Census.

Municipality	1990 Population	2000 Population	2008 Est. Population	2008 Population Density (mi.^{2})
Aguada	35,911	42,042	46,036	1,534.5
Aguadilla	59,335	64,685	67,491	1,874.8
Añasco	25,234	28,348	30,300	757.5
Cabo Rojo	38,521	46,911	53,849	758.4
Mayagüez	100,371	98,434	92,996	1,223.6
Rincón	12,213	14,767	16,615	1,186.8
Total	271,585	295,187	307,287	1,150.9

Approximately 18 percent of active commercial fishermen lived in all of the eight east coast municipalities in 2008 (Table 9.5). The east coast is the least populated coast, and Culebra is the least populated municipality with less than 2,200 persons in 2008. Vieques and Culebra have the smallest population densities: 178 persons per square mile and 194 persons per square mile, respectively.

Census data of the racial composition of Puerto Rico's population has been and continues to be questioned for its reliability (Loveman and Muniz 2007, Duany 2000). Since the early twentieth century, according to Census data, Puerto Rico has become increasingly white. In 1910, 65 percent of Puerto Rico's population was White. By 1920, according to the Census, 74 percent of the population was white, and in 2000, approximately 80 percent of Puerto Rico's population identified themselves as White (Table 9.6).

Table 9.5. Populations of east coast municipalities where active commercial fishermen lived in 2008. Source: U.S. Census.

Municipality	1990 Population	2000 Population	2008 Est. Population	2008 Population Density (mi.^{2})
Ceiba	17,145	18,004	17,802	659.3
Culebra	1,542	1,868	2,138	194.4
Fajardo	36,882	40,712	42,270	1,363.5
Humacao	55,203	59,035	60,809	1,351.3
Maunabo	12,347	12,741	12,668	603.2
Naguabo	22,620	23,753	24,342	459.3
Vieques	8,602	9,106	9,252	177.9
Yabucoa	36,483	39,246	40,559	737.4
Total	190,824	204,465	209,840	711.3

Table 9.6. Puerto Rico population by race, 2000. Source: U.S. Census Bureau, Census 2000.

Subject	Puerto Rico	
	Total	Percent
Total Population	3,808,616	100.00%
Race		
One race	3,654,195	95.95%
White	3,064,862	80.47%
Black or African American	302,933	7.95%
Other	286,400	7.52%
Two or more races	154,421	4.05%

In 1910, respondents were instructed that a negro (black) was one of pure black race, a mulatto was anyone with any trace of black blood, and a white was a person of pure white race. In 1920, the definition of a mulatto changed to be a person who was black, but had any trace of white blood, and by 1930, mulatto was no longer a category, which imposed a black-and-white limitation. These changing racial categories attributed to Puerto Ricans becoming increasingly white. In 2000, less than half a percent of the population was American Indian or Alaska Native. However, a recent island-wide DNA survey found that 61 percent of all Puerto Ricans have Amerindian (Taíno) mitochondrial DNA, 27 percent have African and 12 percent Caucasian mitochondrial DNA (Kearns 2003). This genetic survey has motivated some Puerto Ricans to identify themselves as Taíno in the 2010 Census (mytwocensus.com, May 12, 2010). The survey also supports Puerto Ricans' belief that they are multiracial and do not fit into Census racial categories. The questionable usefulness of racial classifications may explain why the census of Puerto Rico's commercial fishermen does not include questions regarding race.

Table 9.7. Puerto Rico population by gender and age, 2000 and 1990. Source: U.S. Census Bureau.

Subject	1990		2000	
	Number	Percent	Number	Percent
Total population	**3,522,037**	**100**	**3,808,610**	**100**
SEX AND AGE				
Male	1,705,642	48.43	1,833,577	48.10
Female	1,816,395	51.57	1,975,033	51.90
Under 15 years	957,919	27.20	906,368	23.80
15 to 64 years	2,049,082	58.18	2,477,105	65.04
65 years and over	515,036	14.62	425,137	11.16
Median age (years)	28.5		32.1	

The first inclusion of Hispanic occurred in the 1940 Census that separated whites into those with Spanish mother tongue versus those with another mother tongue. Approximately 99 percent of Puerto Rico's population in 2000 was classified as Hispanic or Latino (of any race), and 95 percent identified as Puerto Rican.

The percent of persons in the population from 15 to 64 years of age increased from 58 percent in 1990 to 65 percent in 2000, and the median age increased from 28.5 to 32.1 years during these years (Table 9.7). Approximately 52 percent of the population was female in both years, although there was a slight increase from 1990 to 2000.

The proportion of Puerto Rico's population under 18 years of age declined from 50 percent in 1960 to 29 percent in 2000. The decline in the population under 18 years of age has two primary causes. First, there has been a decline in fertility rates. In 1950, the fertility rate was 5.2 births per woman, and twenty years later it was 3.2 births per woman, and then in 2000, it was 1.9 births per woman. In 2006, the fertility rate was 1.75 births per woman, as opposed to 2.1 births per woman in the U.S. as a whole and 1.88 births per woman in the USVI. Reasons for the declining fertility rate are increasing rates of female sterilization in the 1950s and 1960s and continued sterilization. According to a 2003 Annie E. Casey Foundation Report, 46 percent of married women at that time had been sterilized, which was the highest rate of sterilization of any country for which the Foundation had data. In the 1950s, U.S. pharmaceutical researchers established a base of operations in Puerto Rico to conduct large-scale clinical trials on oral contraceptives. Underlying the establishment of these trials were racist beliefs about Puerto Rican women's sexuality and overpopulation (Fisher 2007). Second, many young Puerto Ricans migrated and continue to migrate to the U.S. mainland, especially when economic opportunities are significantly greater off the island.

There has been considerable movement of Puerto Ricans between the U.S. mainland and the island since 1945-46 when a large number of Puerto Ricans left for the mainland in search of jobs and higher wages (Ayala and Bernabe 2007: 179). Almost one million Puerto Ricans left the island for the agricultural fields and urban areas of the north between 1940 and 1970, which translated to one migrant for every two persons added to Puerto Rico's island population (Marzán et al. 2008). Net outmigration from the island during the 1970s substantially decreased, when almost as many returned to the island as migrated to the mainland. Middle-aged workers and pre-World War II and early post-World War II generations as well as persons who had been laid off because of industrial restructuring returned to resettle on the island. Net outmigration almost doubled during the 1980s as economic conditions on the mainland improved and were better than on the island. More persons left the island and fewer returned during the 1980s and 1990s than in the 1970s; however, substantially fewer migrated to New York City and other areas of the northeast. Increasing numbers were going to Florida and Midwest and Western states. In 2007, there were 4,120,205 Puerto Ricans living in the States, while Puerto Rico's population for that year was 3,942,375 (U.S. Census Bureau, 2007 American and Puerto Rico Community Surveys).

The median annual income in Puerto Rico is substantially less than the median annual income in the United States, which explains in part the movement from the island to the U.S. mainland. In 2000, the median annual income in Puerto Rico was $9,200 as compared to $21,300 in the United States (Table 9.8). The percent of individuals in Puerto Rico with annual incomes less than $10,000 fell from 74.5 percent in 2000 to 62.1 percent in 2007.

Table 9.8. Annual income (from all sources) of Puerto Rico and U.S., 2000 and 2007. Source: FNS, USDA 2010.

Annual Income (from all sources)	Percent of Population			
	Puerto Rico		United States	
	2000	2007	2000	2007
Less than $5,000	61.9	44.6	39.4	21.3
$5,000 to $9,999	12.6	17.5	9.2	10.2
$10,000 to $14,999	9.6	12.0	7.9	9.1
$15,000 to $19,999	5.2	7.2	6.7	7.5
$20,000 to $24,999	3.9	5.2	6.4	7.3
$25,000 to $29,999	1.7	3.5	5.3	6
$30,000 and over	5.2	10.0	25.1	38.6
Median Annual Income	$9,200	$10,200	$21,300	$25,000

Median household income in Puerto Rico in 2008 was $18,610, which was below every median household income for the 50 states and District of Columbia (2006-2008 American Community Survey and Puerto Rico Community Survey). The median household income for the 39 coastal municipalities where active commercial fishermen lived in 2008 ranged from $11,212 to $27,467 in 2008 (Table 9.9). The average median household income per coast was highest along the north coast and lowest along the west coast. Note that the municipalities of Arroyo, Ceiba, Culebra, Maunabo, Vieques and Rincón were not included in the 2006-2008 Community Survey and their median household incomes are identified as NA (not applicable) in the below table.

Poverty is the lack of basic human needs, such as clean water, nutrition, clothing, shelter, health care, and education because of the inability to afford them. High poverty rates have been persistent in Puerto Rico. From 2006 to 2008, 45.3 percent of the population was below the poverty level (Puerto Rico Community Survey). To place that in comparison to the 50 States and the District of Columbia, Mississippi’s 21.0 percent poverty rate was the highest among the States, followed by Louisiana (18.5 percent), New Mexico (17.9 percent), District of Columbia (17.8 percent) and Arkansas (17.6 percent). The top five states with the lowest poverty rates were New Hampshire, Maryland, Connecticut, New Jersey, and Hawaii (Table 9.10). From 2006 to 2008, 13.2 percent of people in the U.S. as a whole lived in poverty. The annual poverty levels set by the U.S. Census Bureau do not reflect local and regional variations. Consequently, the actual poverty rate in Puerto Rico, with its higher cost of living, is higher than reported in the Census Bureau’s community and population surveys.

Table 9.9. Median household income in 2008 dollars. Source: 2006-2008 Puerto Rico Community Survey.

North Coast		South Coast		East Coast		West Coast	
Municipality	**Median HH Income**	**Municipality**	**Median HH Income**	**Municipality**	**Median HH Income**	**Municipality**	**Median HH Income**
Arecibo	16,515	**Arroyo**	NA	**Ceiba**	NA	**Aguada**	13,715
Barceloneta	15,303	**Guánica**	12,561	**Culebra**	NA	**Aguadilla**	13,946
Camuy	13,311	**Guayama**	16,859	**Fajardo**	18,879	**Añasco**	15,311
Carolina	27,467	**Guayanilla**	14,845	**Humacao**	18,215	**Cabo Rojo**	15,432
Cataño	17,661	**Juana Diaz**	16,631	**Maunabo**	NA	**Mayagüez**	14,095
Dorado	22,976	**Lajas**	15,302	**Naguabo**	14,729	**Rincón**	NA
Hatillo	15,148	**Patillas**	13,396	**Vieques**	NA	***Average***	14,500
Isabela	11,212	**Peñuelas**	14,379	**Yabucoa**	13,632		
Loíza	20,220	**Ponce**	16,658	***Average***	16,364		
Luquillo	19,997	**Salinas**	13,335				
Rio Grande	20,257	**Santa Isabel**	11,934				
San Juan	23,916	***Average***	14,590				
Vega Alta	16,996						
Vega Baja	16,981						
Average	18,426						

Table 9.10. Comparison of percent of people below poverty level. Source: 2006-2008 American Community Survey, Puerto Rico Community Survey.

Area	Percent	Area	Percent	Area	Percent
Puerto Rico	45.3	New York	13.8	Nebraska	11.1
Mississippi	21.0	Oregon	13.4	Nevada	10.8
Louisiana	18.5	Missouri	13.3	Wisconsin	10.7
New Mexico	17.9	Ohio	13.2	Vermont	10.5
District of Columbia	17.8	South Dakota	13.2	Delaware	10.4
Arkansas	17.6	California	12.9	Massachusetts	10.0
Kentucky	17.2	Indiana	12.7	Utah	10.0
West Virginia	17.2	Florida	12.6	Virginia	9.9
Alabama	16.3	Maine	12.6	Minnesota	9.7
Texas	16.3	Idaho	12.4	Alaska	9.5
Oklahoma	16.2	Illinois	12.1	Wyoming	8.9
Tennessee	15.7	North Dakota	12.1	Hawaii	8.8
South Carolina	15.5	Colorado	11.9	New Jersey	8.7
North Carolina	14.6	Pennsylvania	11.9	Connecticut	8.5
Georgia	14.5	Kansas	11.7	Maryland	8.0
Arizona	14.3	Rhode Island	11.6	New Hampshire	7.6
Montana	14.3	Washington	11.6		
Michigan	14.0	Iowa	11.2	United States	13.2

The average poverty rates of municipalities where active commercial fishermen lived and those were they did not live have been very similar. The average poverty rate of the 39 municipalities where active commercial lived in 2008 was 52.3 percent as compared with an average poverty rate of 53.5 percent for all other municipalities in 1999. Among the 39 municipalities where active commercial fishermen lived, Culebra had the lowest poverty rate (36.99 percent) and Vieques had the highest with 64.58 percent of its population living below the poverty level (Table 9.11). The highest average poverty rate was on the south coast; however, all were approximately 50 percent or higher.

In 1989, 67 percent of Puerto Rico's children less than 18 years of age lived in families with incomes below the poverty line. That decreased in 1999 to 58 percent of Puerto Rican children. For comparison, 16 percent of children less than 18 years of age lived in families with incomes below the poverty line in the United States in 1999. During the 3-year period from 2006-08, an estimated 56.1 percent of children under 18 years of age lived below the poverty level in Puerto Rico (U.S. Census Bureau, Puerto Rico Community Survey). Also, an estimated 262,175 (21.6 percent) of the 1,213,446 persons that comprised the employed civilian labor force 16 years and older lived in poverty. During the same time period, 66.2 percent of the unemployed civilian labor force 16 years and over in Puerto Rico lived in poverty. Employment reduces the risk of living in poverty; however, it does not eliminate poverty.

Table 9.11. Poverty rate in fishing municipalities, 1999. Source: Census 2000.

North Coast		South Coast		East Coast		West Coast	
Municipality	**Poverty Rate**	**Municipality**	**Poverty Rate**	**Municipality**	**Poverty Rate**	**Municipality**	**Poverty Rate**
Arecibo	50.86%	**Arroyo**	55.10%	**Ceiba**	38.58%	**Aguada**	59.27%
Barceloneta	55.98%	**Guánica**	63.66%	**Culebra**	36.99%	**Aguadilla**	55.04%
Camuy	51.88%	**Guayama**	52.83%	**Fajardo**	42.14%	**Añasco**	51.59%
Carolina	33.71%	**Guayanilla**	57.01%	**Humacao**	47.23%	**Cabo Rojo**	47.12%
Cataño	50.05%	**Juana Diaz**	56.70%	**Maunabo**	59.09%	**Mayagüez**	52.21%
Dorado	41.36%	**Lajas**	56.52%	**Naguabo**	55.97%	**Rincón**	56.34%
Hatillo	55.78%	**Patillas**	54.63%	**Vieques**	64.58%	***Average***	53.59%
Isabela	55.45%	**Peñuelas**	59.75%	**Yabucoa**	54.47%		
Loíza	59.72%	**Ponce**	52.27%	***Average***	49.88%		
Luquillo	51.66%	**Salinas**	58.25%				
Rio Grande	46.64%	**Santa Isabel**	57.36%				
San Juan	40.78%	***Average***	56.73%				
Vega Alta	51.34%						
Vega Baja	50.62%						
Average	49.70%						

Vieques had the highest percent of children below the poverty line in 1999, with 81 percent of children in families with incomes below the poverty line, and Guánica was second with 75 percent (Table 9.12). Ceiba had the smallest, with 43 percent of children living below the poverty line. The average child poverty rate was highest on the south coast and lowest on the north coast. In 2008, 36 percent of children lived in extreme poverty and 50 percent of families with related children lived in poverty (Annie E. Casey Foundation, Kids Count Data Center). The median family (with child) income in 2008 was $18,700. Extreme poverty is defined as having a family income that is equal to or less than 50 percent of the poverty level of income.

Table 9.12. Percent of children in families with incomes below poverty line, 1999, in municipalities where active commercial fishermen live. Source: Annie E. Casey Foundation, 2003.

North Coast		South Coast		East Coast		West Coast	
Municipality	**Percent children**	**Municipality**	**Percent children**	**Municipality**	**Percent children**	**Municipality**	**Percent children**
Arecibo	59	**Arroyo**	66	**Ceiba**	43	**Aguada**	68
Barceloneta	64	**Guánica**	75	**Culebra**	NA	**Aguadilla**	65
Camuy	59	**Guayama**	62	**Fajardo**	53	**Añasco**	59
Carolina	45	**Guayanilla**	64	**Humacao**	57	**Cabo Rojo**	56
Cataño	59	**Juana Diaz**	64	**Maunabo**	70	**Mayagüez**	62
Dorado	49	**Lajas**	68	**Naguabo**	64	**Rincón**	65
Hatillo	64	**Patillas**	60	**Vieques**	81	***Average***	63
Isabela	63	**Peñuelas**	70	**Yabucoa**	63		
Loiza	68	**Ponce**	65	***Average***	62		
Luquillo	63	**Salinas**	68				
Rio Grande	54	**Santa Isabel**	66				
San Juan	56	***Average***	66				
Vega Alta	63						
Vega Baja	59						
Average	59						

Substantial numbers of households received and continue to receive public assistance income. In 1999, 20 percent of Puerto Rico's households had public assistance income. USDA's Nutrition Assistance Block Grants Program provides food assistance to low income families in Puerto Rico, in lieu of food stamps. The Puerto Rico government's Nutrition Assistance Program establishes eligibility and benefit levels. In FY 2005, Puerto Rico's program received $1.495 billion from the USDA program. In FY 2008, federal funding for the Nutrition Assistance Program (NAP) totaled $2.04 billion. Approximately 79 percent of the total went to the NAP Block Grant, followed by the Special Supplemental Nutrition Program for Women, Infants and Children, which received approximately $2.18 million, approximately 10.7 percent of the total (Table 9.13).

In March 2009, Puerto Rico provided nutrition assistance benefits to 1.18 million (30 percent) of the territory's 3.95 million individuals in 1.35 million family units. Almost 19 percent of Nutrition Assistance Program participants were 60 years of age or older and approximately 10 percent were disabled. Approximately 77 percent had a high-school degree or less (State Plan of Operations, 2009). Fifty-seven percent of the NAP participants were females and approximately 36 percent were children between the ages of 0 and 18 (State Plan of Operations, 2009). The percent of households participating in the NAP has varied from 33.7 to 36.8 percent from 2005 to 2008 (Figure 9.2). In FY 2009, NAP participants received an average of $115 per month per person (Food and Nutrition Service (FNS), USDA, 2010). NAP covers 62 percent of the individuals in Puerto Rico under 100 percent of the Federal poverty guideline, leaving 38 percent of individuals uncovered (FNS, USDA, 2010).

Table 9.13. Federal funding for jointly operated social welfare programs in Puerto Rico. Source: FNS, USDA, 2010.

Program Name	Federal Funding FY 2008 (in thousands)	Total Participants FY 2008
Nutrition Assistance		
NAP Block Grant	$1,622,521	1,180,000
Special Supplemental Nutrition Program for Women, Infants and Children	$217,692	199,077
National School Lunch Program	$135,890	370,336
Child and Adult Care Food Program	$24,123	23,523
School Breakfast Program	$31,339	134,729
Summer Food Service Program	$11,029	28,930
Seniors Farmers Market Nutrition Program	$1,000	62,500
Social Insurance		
Unemployment Insurance Program	$334,865	N/A
Public Assistance Programs		
Temporary Assistance for Needy Families	$22,874	31,678
Child Support Enforcement	$50,249	237,233
Health Care for Low-Income Persons and Families		
Medicaid (amount is capped)	$260,400	888,370
State Children's Health Insurance Program	$62,221	100,000
Maternal and Child Health Block Grant (Title V)	$16,276	168,972
Social and Support Services		
Social Services Block Grant	$8,793	10,883
Childcare and Development Block Grant	$26,656	9,100

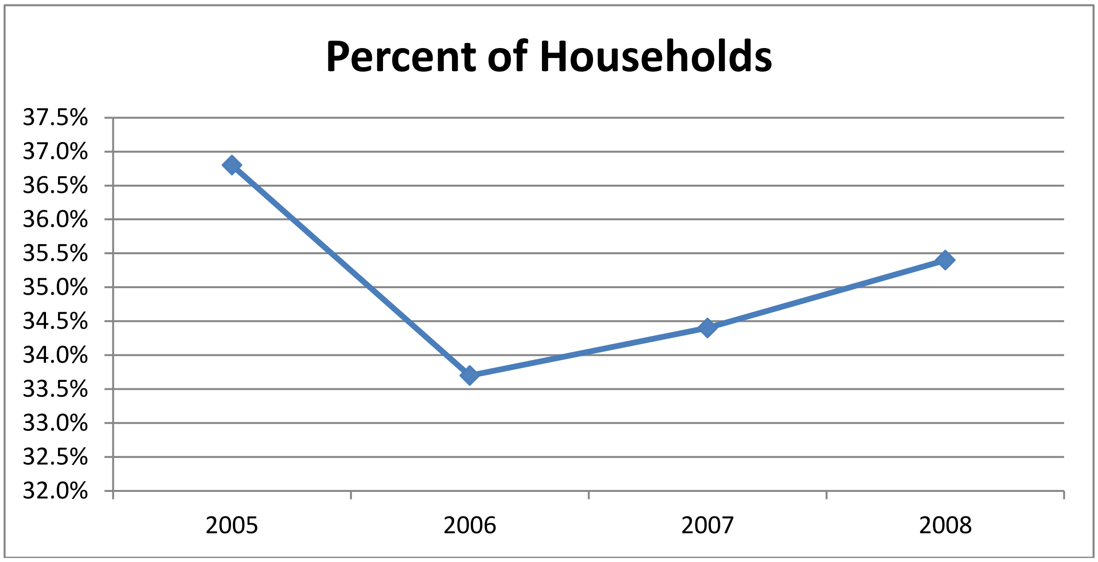

Figure 9.2. Percent of Puerto Rico's households participating in NAP. Source: FNS, USDA, 2010.

Of all households in the 39 municipalities, 19.8 percent of the households received public assistance, as compared to 20.5 percent of households in all other municipalities. Culebra had the smallest percent of households receiving such income, while Arroyo had the largest among the municipalities where active commercial fishermen lived in 2008 (Table 9.14). The south coast had the highest average percent of households receiving public assistance, and the north coast had the lowest.

Table 9.14. Percent of households with public assistance income, 1999. Source: Census 2000.

North Coast		South Coast		East Coast		West Coast	
Municipality	**Percent of Households**	**Municipality**	**Percent of Households**	**Municipality**	**Percent of Households**	**Municipality**	**Percent of Households**
Arecibo	22.25%	**Arroyo**	29.38%	**Ceiba**	17.01%	**Aguada**	21.03%
Barceloneta	25.95%	**Guánica**	27.52%	**Culebra**	6.53%	**Aguadilla**	25.68%
Camuy	19.60%	**Guayama**	24.13%	**Fajardo**	15.44%	**Añasco**	21.94%
Carolina	11.63%	**Guayanilla**	24.54%	**Humacao**	20.30%	**Cabo Rojo**	19.68%
Cataño	20.99%	**Juana Diaz**	25.59%	**Maunabo**	25.21%	**Mayagüez**	19.86%
Dorado	16.18%	**Lajas**	24.40%	**Naguabo**	20.49%	**Rincón**	22.08%
Hatillo	24.72%	**Patillas**	24.69%	**Vieques**	25.47%	***Average***	21.71%
Isabela	22.11%	**Peñuelas**	25.68%	**Yabucoa**	28.45%		
Loiza	22.56%	**Ponce**	24.22%	***Average***	19.86%		
Luquillo	19.77%	**Salinas**	30.12%				
Rio Grande	18.11%	**Santa Isabel**	23.40%				
San Juan	14.69%	***Average***	25.79%				
Vega Alta	24.56%						
Vega Baja	21.32%						
Average	20.32%						

Access to potable water has also been an issue in Puerto Rico. In 1995, the Puerto Rico Aqueduct and Sewer Authority (PRASA) signed a contract with the French conglomerate Vivendi, now called Veolia. PRASA had serious problems with its infrastructure, and it was argued that outsourcing would lead to investment in water services for the island's residents. In August 1999, the Puerto Rican Office of the Comptroller produced a report severely critiquing of Vivendi's services, noting deficiencies in the maintenance, repair, administration and operation of aqueducts and sewers. According to a report by Public Citizen, (http://www.citizen.org/documents/Vivendi-USFilter.pdf)
there were higher incidents of skin allergies, gastroenteritis, and muscle spasms after privatization. Despite the higher water bills, Vivendi put PRASA's operational deficit at $241.1 million, and the Government Development Bank had to contribute emergency funding on multiple occasions. Even the World Trade Organization states that poor communities went without water while U.S. military bases and resorts enjoyed unlimited supplies as a result of the privatization of water (http://www.gatt.org/trastat_e.html).

Puerto Rico ranks last in percent of people who have completed high school among the 50 states, District of Columbia and Puerto Rico. Approximately 66 percent of Puerto Rico's population 25 years and older from 2006-08 completed high school, including equivalency (2006-08 American Community Survey and Puerto Rico Community Survey). Mississippi ranks next to last with approximately 79 percent of its people 25 years and older having completed high school. In the U.S. as a whole, approximately 85 percent of people 25 years and older have completed high school.

Table 9.15. Percent of municipal population 16 to 19 years of age comprised of high school dropouts, 2000. Source: U.S. Census Bureau, Census 2000.

North Coast		South Coast		East Coast		West Coast	
Municipality	**Percent dropouts**	**Municipality**	**Percent dropouts**	**Municipality**	**Percent dropouts**	**Municipality**	**Percent dropouts**
Arecibo	10	**Arroyo**	8	**Ceiba**	11	**Aguada**	13
Barceloneta	17	**Guánica**	20	**Culebra**	NA	**Aguadilla**	22
Camuy	15	**Guayama**	13	**Fajardo**	15	**Añasco**	17
Carolina	10	**Guayanilla**	15	**Humacao**	16	**Cabo Rojo**	14
Cataño	19	**Juana Diaz**	14	**Maunabo**	19	**Mayagüez**	12
Dorado	13	**Lajas**	7	**Naguabo**	19	**Rincón**	12
Hatillo	13	**Patillas**	11	**Vieques**	20		
Isabela	17	**Peñuelas**	13	**Yabucoa**	16		
Loíza	16	**Ponce**	14				
Luquillo	21	**Salinas**	20				
Rio Grande	15	**Santa Isabel**	15				
San Juan	13						
Vega Alta	18						
Vega Baja	17						

The percent of high school dropouts in the 39 municipalities ranged from 7 percent to 22 percent in 2000 (Table 9.15). The highest was in Aguadilla on the west coast where 22 percent of the population 16 to 19 years of age had dropped out of high school.

There has been an increasing demand for workers with at least a high school diploma in Puerto Rico. The increase has motivated fewer Puerto Ricans to drop out. In 1990, 22 percent of Puerto Ricans 16 to 19 years of age were high school dropouts, while in 2000, that figure was 14 percent.

Across all age groups, Puerto Rico has a greater percentage of disabled individuals than the U.S. (26.4 percent versus 15.6 percent). From 2000 to 2007, Puerto Rico witnessed a decline in the disabled population of young and middle-aged adults, while experiencing a corresponding increase in the percentage of disabled children and elderly individuals.

Puerto Rico's unemployment has continued to rise (Figure 9.3). As of July 2010, its unemployment rate was 16.9, compared to 9.5 percent for the U.S. whole.

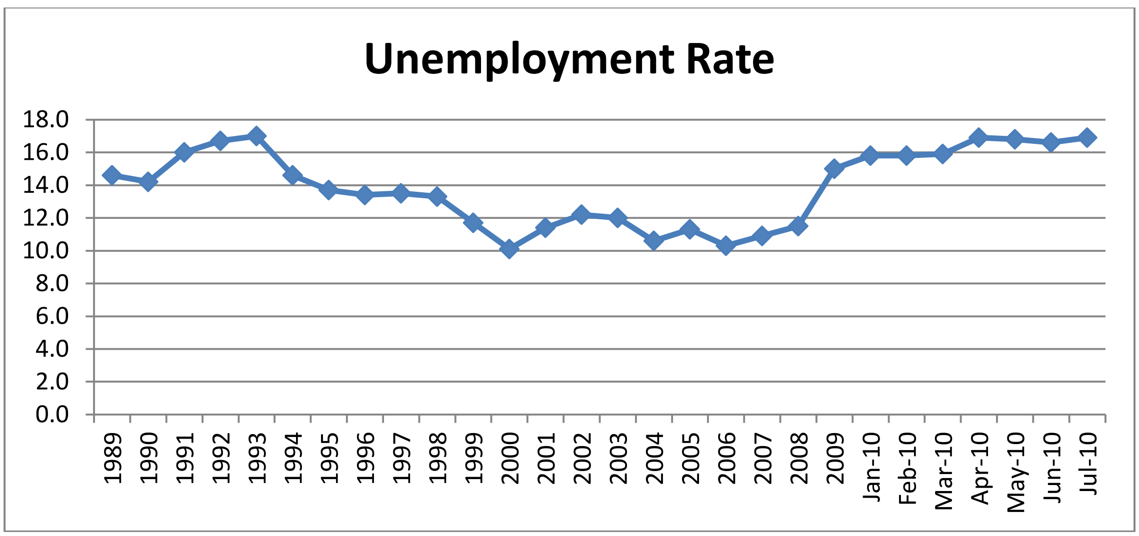

Figure 9.3. Unemployment rate, 1989 to July 2010. Source: Puerto Rico Department of Labor and Human Resources, Labor Force Survey.

The percent of the employed labor force in agriculture, fishing and forestry has consistently declined in Puerto Rico since the 1970s. In 1970, it was almost 10 percent and by 2006 it was less than 1.5 percent. In 1990, approximately 35,000 persons were employed in agriculture, fishing and forestry, and in 2009, that number fell to approximately 17,000 (Figure 9.4).

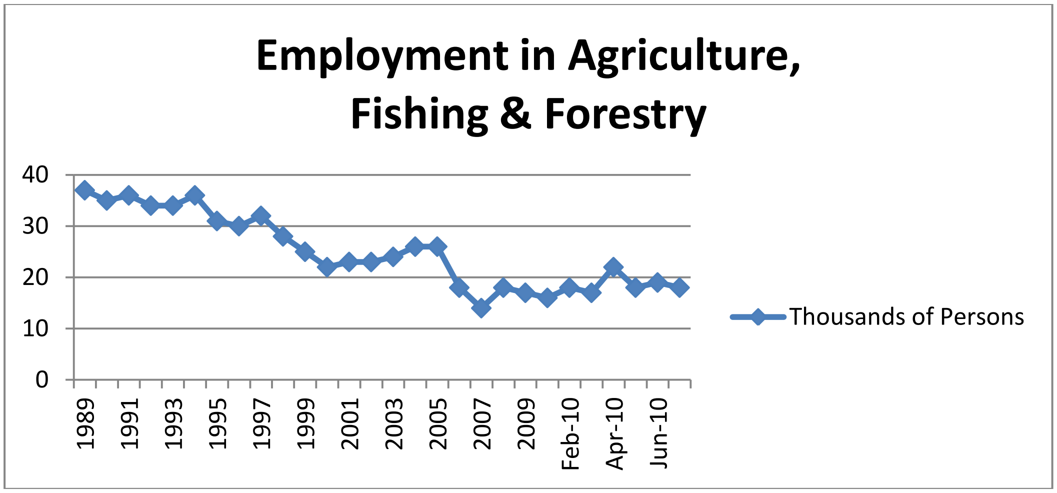

Figure 9.4. Number of persons employed labor force in agriculture, forestry and fishing. Source: Dept of Labor and Human Resources, Puerto Rico.

The percent of persons 16 years and older in farming, fishing and forestry occupations varied from 0.31 to 7.76 in the 39 municipalities in 2000 (Table 9.16). The average percent was highest on the north coast and lowest on the east coast. Santa Isabel had the largest percent of its employed civilian population in farming, fishing and forestry occupations in with 7.76 percent. No one was in that occupational group in Culebra, although active commercial fishermen lived there in 2008. An occupation describes the kind of work that one does on the job. Because Puerto Rico's commercial fishermen tend to have wage-paying jobs, they may identify their occupation as what they do on their wage-paying jobs.

The decline in employment in agriculture, fishing and forestry has been mirrored by a decline in the number of farms. The number of farms steadily declined from 1993 to 2007 (USDA, Census of Agriculture). From 1993 to 2007, there was a 42 percent decline in the number of farms and a 46 percent decline in cuerdas with harvested cropland (Table 9.17). The average size of a farm peaked in 1998, and as of 2007, it was 35.4 cuerdas. A cuerda is approximately 0.9712 acres. Total sales of agricultural products rose from approximately $557 million in 1993 to $593 million in 1998, and then fell to $582 million in 2002 and $516 million in 2007. The market value of production dropped 11 percent from approximately $581.5 million in 2002 to $515.7 million in 2007. The average market value of production per farm fell from $32,932 in 2002 to $32,752 in 2007. The top five crops by cuerdas in 2007 were coffee, grasses or other similar crops, plantains, vegetables and oranges. Among the crops that experienced significantly higher sales in 2007 as compared to 1993 were plantains, bananas, fruits and coconuts, and vegetables and melons.

Table 9.16. Persons 16 years and older in farming, fishing and forestry occupations, 2000. Source: U.S. Census Bureau, Census 2000.

Municipality	Percent Emp. Civ. Pop.	Municipality	Percent Emp. Civ. Pop.	Municipality	Percent Emp. Civ. Pop.	Municipality	Percent Emp. Civ. Pop.
Arecibo	2.09%	**Arroyo**	1.16%	**Ceiba**	0.41%	**Aguada**	1.50%
Barceloneta	1.52%	**Guánica**	2.89%	**Culebra**	0.00%	**Aguadilla**	1.03%
Camuy	4.51%	**Guayama**	1.01%	**Fajardo**	0.59%	**Añasco**	1.89%
Carolina	0.31%	**Guayanilla**	2.81%	**Humacao**	0.77%	**Cabo Rojo**	2.92%
Cataño	1.01%	**Juana Diaz**	5.18%	**Maunabo**	3.63%	**Mayagüez**	1.01%
Dorado	1.28%	**Lajas**	3.94%	**Naguabo**	1.44%	**Rincón**	1.33%
Hatillo	6.34%	**Patillas**	1.80%	**Vieques**	1.69%	***Average***	1.61%
Isabela	2.36%	**Peñuelas**	1.58%	**Yabucoa**	2.18%		
Loiza	0.70%	**Ponce**	0.83%	***Average***	1.34%		
Luquillo	0.64%	**Salinas**	3.77%				
Rio Grande	0.74%	**Santa Isabel**	7.76%				
San Juan	0.27%	***Average***	2.97%				
Vega Alta	1.13%						
Vega Baja	0.86%						
Average	1.70%						

The production of cereals per hectare declined significantly after the mid 1980s; however, the rate of production of roots and tubers increased significantly in the mid 1990s. Total production of roots and tubers declined from 2002 to 2007, from a hundredweight of 213,204 to 180,751, while hundredweight per cuerda increased from 45.97 to 59.50 as the number of farms and cuerdas continued to declined.

Table 9.17. Puerto Rico farms, 1993 – 2007. Source: USDA, Census of Agriculture.

All Farms		1993	1998	2002	2007
Farms	number	22,350	19,951	17,659	15,745
Land in farms	cuerdas	826,893	865,478	690,687	557,530
	average size	37.0	43.4	39.1	35.4
Total cropland	farms	NA	19,030	16,912	14,074
	cuerdas	460,818	533,081	453,433	392,728
Harvested cropland	farms	18,251	16,341	15,284	10,595
	cuerdas	215,093	195,877	199,225	116,198

NA: Data not available.

In August 2009, Puerto Rico Governor Luis Fortuño signed the "Law for the Promotion and Development of Agricultural Biotechnological Businesses in Puerto Rico." The law preempts any local authorities from attempting to regulate agricultural biotechnology. As of that date, there were 11 biotech companies in Puerto Rico. According to Ruiz-Marrero (2004), most genetically engineered corn and soybean seed that is planted in the U.S.

comes from Puerto Rico. Puerto Rico offers biotechnology companies benefits such as, no federal income tax; a low corporate income tax rate from two to seven percent, which can be lower than two percent in some cases; and fast-tracking of government and other permits (PRIDCO 2009). As of January 2005, there were 3,483 field tests of genetically modified (GM) crops on the island. Most GM crops are planted in the southern plains between Juana Diaz and Guayama, and they are concentrated in the area between the towns of Santa Isabel and Salinas (Ruiz-Marrero 2009). GM crops are also found in the northern town of Isabela. There is concern that the recent law may encourage biotech companies to use more fertile lands, which could further decrease domestic food production and increase the island's dependence on imported foods.

Tilapia, shrimp and other aquaculture products are produced in Puerto Rico. Total sales rose substantially from 1992 to 2002, and after declined substantially after peaking in 2002. Tilapia and shrimp sales fell dramatically after 2002. Puerto Rico was the site of an offshore aquaculture operation that grew cobia; however, it relocated to Belize.

Per capita (commodity) food production has declined in Puerto Rico since 1960, while total food production has declined since 1990. The decline in the production of metric tons of cereals has been the most dramatic, falling 84 percent from 1979-81 to 1999-2001 (World Resources Institute 2006). The total and per capita losses of (commodity) food production suggest growing dependence on imported food, which increases Puerto Rico's risk of food insecurity. Historical and continuing subsistence farming and fishing may reduce that risk by increasing availability of and access to food.

Commercial landings of fish and shellfish from 1983 to 2007 suggest a declining linear trend (Figure 9.5), despite the increase from 1990 to 2000. Explanations for a downward trend include declining stocks and increasing federal and state regulations that limit fishing and, consequently, availability of local seafood. For example, there is a seasonal prohibition on fishing for or possession of red, tiger, yellowedge, yellowfin and black grouper in the Caribbean EEZ from February 1 through April 30 every year, and, from December 1 through February 28, each year, fishing is prohibited in the Red Hind Spawning Aggregation Areas, three of which are west of Puerto Rico, although fishing has been recently extended in one of them, Bajo de Sico, and extends from October 1 through March 31, each year. Also, fishing for any species is prohibited year-round in the Hind Bank Marine Conservation District that is found to the southeast of Puerto Rico and fishing for or possession of Grouper Unit 1 (Nassau grouper) or Grouper Unit 2 (goliath grouper) is prohibited in both federal and territorial waters.

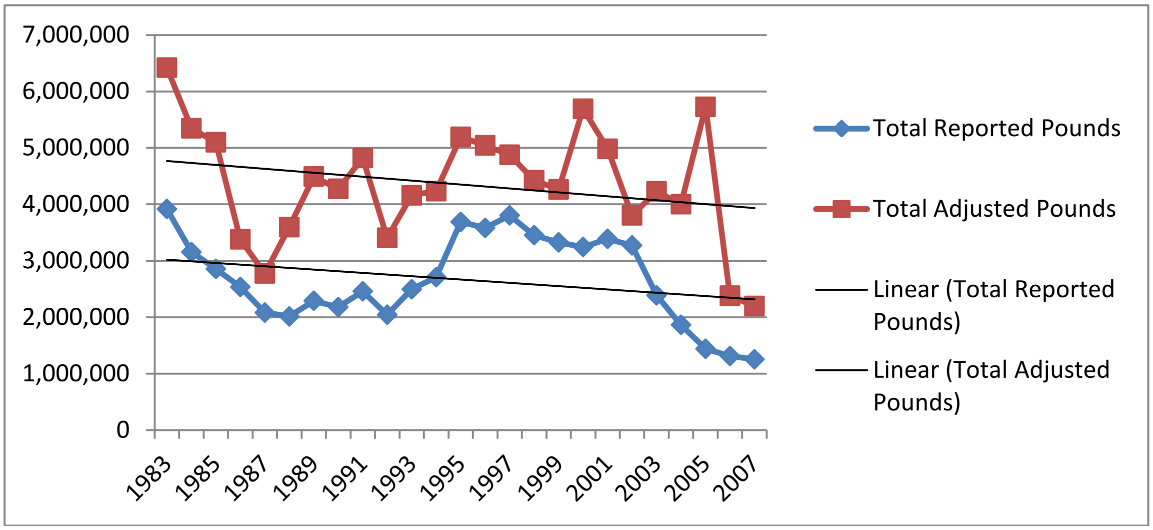

Figure 9.5. Total reported and adjusted commercial landings, 1983 to 2007.

Puerto Rico's commercial landings increased from over 4 million pounds in 1990 to over 5 million pounds in 2000. St. Croix's and St. Thomas/St. John's commercial landings are dwarfed in comparison; however, Puerto Rico's per capita commercial landings are dwarfed by per capita commercial landings in Thomas/St. John and St. Croix (Figures 9.6 and 9.7). Per capita commercial landings in Puerto Rico remained under 2 pounds per person from 1990 to 2000. In 2000, approximately 3.5 million fish were caught by recreational fishermen in Puerto Rico, yielding a per capita recreational harvest of 1.1 fish.

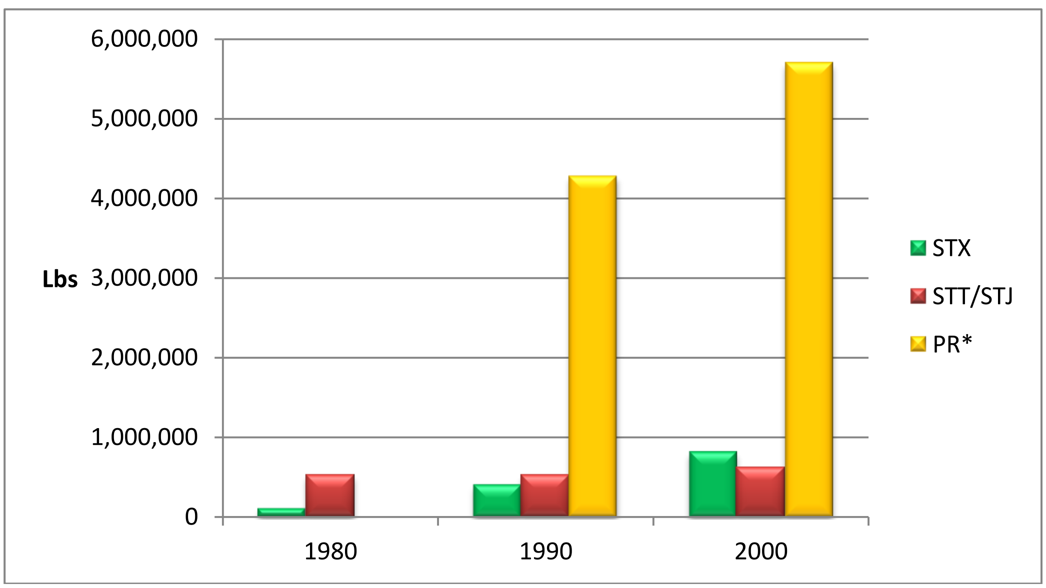

Figure 9.6. Total commercial landings in Puerto Rico, St. Thomas/St. John and St. Croix. *Data is unavailable for Puerto Rico in 1980.

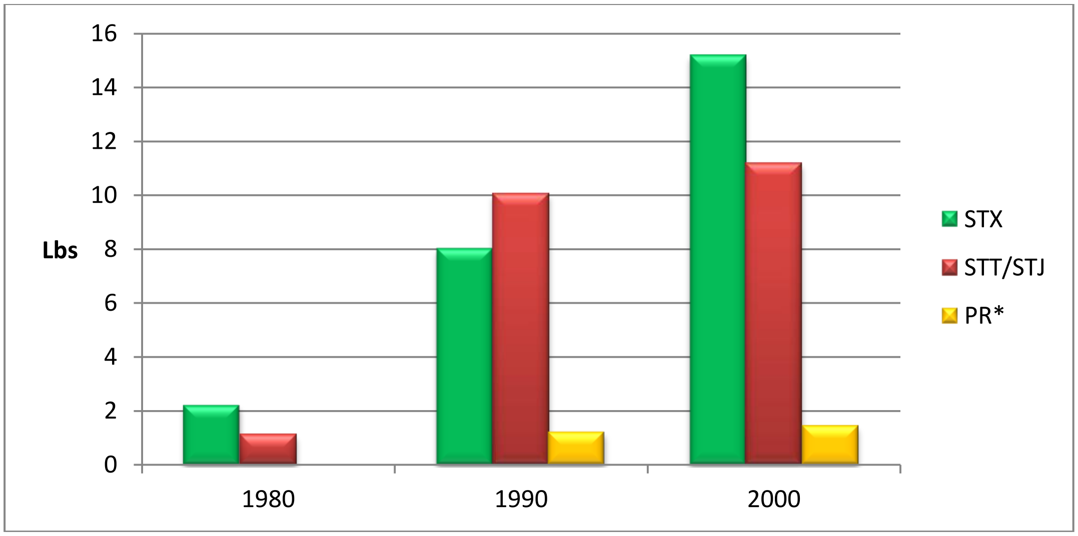

Figure 9.7. Per capita commercial landings in Puerto Rico, St. Thomas/St. John, and St. Croix. *: Data not available for Puerto Rico in 1980.

The annual per capita consumption of commodity fish and shellfish for human food is low in Puerto Rico. During the three-year period from 2003 to 2005, it averaged to be 1.8 pounds (NMFS, Fisheries Statistics of the United States 2008). That contrasts sharply with average annual per capita consumption of 53.4 pounds in the U.S. and 29.6 pounds in the U.S. Virgin Islands. However, these figures do not include consumption of fish and shellfish that are caught by recreational and subsistence fishers. In 2008, for example, approximately 1.911 million pounds of finfish were harvested by recreational fishers and 0.941 million pounds were reported by commercial fishermen in Puerto Rico. The above figures suggest the focus on per capita consumption of commoditized fish under-represents actual per capita consumption of finfish. Subsistence and recreational fishing increases availability, access to, and consumption of finfish and shellfish, and such availability, access and consumption may be of substantial historical significance in Puerto Rico, especially to those living in poverty and extreme poverty.

Fishing businesses are not employers in Puerto Rico. In 2000, only one establishment in the Fishing, Hunting and Trapping Industry had one to four paid employees (Puerto Rico County Business Patterns 2000). More recently in 2004 and 2008, there were no such establishments. Such a conclusion is consistent with artisanal fisheries. Artisanal fishermen are self-employed who may either fish alone or with the assistance of another fisherman. Self-employed individuals and businesses that do not pay federal taxes are not included in the County Business Patterns survey, and many of Puerto Rico's commercial fishermen do not pay federal taxes. In 2008, there were 868 active commercial fishermen in Puerto Rico, and 638 of these fishermen were captains and the remaining 230 were helpers.

One of the primary institutions of Puerto Rico's fishing industry infrastructure is the fishing association, more commonly known as the villa pesquera. Griffith et al. (2007) describe the many villa pesqueras and fishing-related infrastructure and their descriptions are incorporated by reference.

As of 2008, there was only one employer in the Seafood Product Preparation and Packaging Industry (NAICS 31171) and that was a tuna cannery in Mayaguez that employed 250 to 499 persons. Also that year, there were 7 establishments in the Fish and Seafood Merchant Wholesalers Industry with paid employees (NAICS 424460). These establishments had a combined 101 employees and an annual payroll of approximately $2.7 million. All but one of the establishments was located in a coastal municipality where active commercial fishermen lived (Table 9.18). There were five establishments in the Fish and Seafood Markets Industry in 2008 with paid employees. Combined they had no more than 25 paid employees.

Table 9.18. Number of establishments in Fish & Seafood Merchant Wholesalers Industry with paid employees by municipality. Source: 2008 Puerto Rico County Business Patterns.

Municipality	Number of Establishments in Fish and Seafood Merchant Wholesalers (NAICS 424460)				
	1 to 4 employees	5 to 9 employees	10 to 19 employees	20 to 49 employees	Total
Barceloneta		1			1
Florida*	1				1
Humacao	1				1
San Juan		1	1	1	3
Toa Baja				1	1
Total	2	2	1	2	7

* Not a coastal municipality where one or more active commercial fishermen lived in 2008.

In 2008, there were 18 marinas with a combined annual payroll of $4.46 million. These marinas were located in eight municipalities (Table 9.19). Fajardo had the most with seven, followed by San Juan with four and Cabo Rojo with two. The others had one. In 2008, there were nine establishments in the Scenic and Sightseeing Water Transportation Industry (NAICS 487201) that had 100 to 249 employees (Table 9.20). This industry category includes charter boat fishing operations.

Over 40 percent of Puerto Rico's domestic income from the mid-1980s to 2006 was derived from manufacturing. Pharmaceuticals accounted for about 40 percent of total value added in manufacturing in 1987 and that share rose to over 70 percent by 2002 (GAO 2006). However, since the 1990s, there has been an increased shift towards a service economy. Additional information about Puerto Rico's economy can be found in section 5.3.4 of this document.

Table 9.19. Number of marinas with paid employees by municipality. Source: 2008 Puerto Rico County Business Patterns.

Municipality	Number of Marinas				
	1 to 4 employees	5 to 9 employees	10 to 19 employees	20 to 49 employees	Total
Arecibo	1	1			1
Cabo Rojo	1	1			2
Fajardo	2	2	2	1	7
Guaynabo	1				1
Humacao	1	1			1
Lajas	1				1
Ponce	1			1	1
San Juan	1	1	2		4
Total	9	6	4	2	18

Table 9.20. Number of establishments in Scenic and Sightseeing Transportation, Water, Industry with paid employees. Source: 2008 Puerto Rico County Business Patterns.

Muncipality	Number of Establishments in Scenic and Sightseeing Transportation, Water (NAICS 487210)					
	1 to 4 employees	5 to 9 employees	10 to 19 employees	20 to 49 employees	100 to 249 employees	Total
Fajardo	1	0	0	2	0	3
Guaynabo	1	0	0	0	0	1
Mayaguez	0	0	0	0	1	1
Ponce	0	1	0	0	0	1
San Juan	2	0	0	0	0	2
Utuado*	1	0	0	0	0	1
Total	5	1	0	2	1	9

9.2.2.4 Puerto Rico's Fishermen and Fishing Municipalities

Descriptions of Puerto Rico's fishermen, fishing vessels, and the municipalities where they land their catches are contained in the Description of the Fishery and are incorporated by reference. Griffith et al. (2007) describe Puerto Rico's historical fishing communities and that document is also incorporated by reference.

Cabo Rojo and the west coast have tended to rank first in commercial landings year after year. From 1999 to 2003, landings in Cabo Rojo represented approximately 49 percent of west coast landings and approximately 16 percent of all commercial landings in Puerto Rico (Table 9.21). Note that in 2008, there were no active commercial fishermen living in Manatí, Maunabo and Toa Alta, although from 1999 to 2003, the combined landings of these three municipalities represented 1.4 percent of the pounds commercially landed in Puerto Rico.

Table 9.21. Percent of commercial landings (pounds) by coastal municipality, 1993-2003.

North Coast			**South Coast**		
Municipality	**Percent All Pounds on Coast**	**Percent All Pounds All Coasts**	**Municipality**	**Percent All Vessels on Coast**	**Percent All Vessels All Coasts**
Arecibo	11.0%	1.5%	**Arroyo**	4.6%	1.5%
Barceloneta	5.0%	0.7%	**Guánica**	14.5%	4.8%
Camuy	1.2%	0.2%	**Guayama**	9.8%	3.2%
Carolina	6.6%	0.9%	**Guayanilla**	5.8%	1.9%
Cataño	7.9%	1.1%	**Juana Diaz**	11.5%	3.8%
Dorado	4.5%	0.6%	**Lajas**	21.0%	6.9%
Hatillo	0.7%	0.1%	**Maunabo**	2.62%	0.9%
Isabela	2.5%	0.3%	**Patillas**	2.8%	0.9%
Loíza	9.9%	1.3%	**Peñuelas**	5.5%	1.8%
Luquillo	2.3%	0.3%	**Ponce**	10.3%	3.4%
Manati	2.9%	0.4%	**Salinas**	6.8%	2.2%
Río Grande	6.9%	0.9%	**Santa Isabel**	4.7%	1.5%
San Juan	24.2%	3.2%	**Total**	100.0%	33.0%
Toa Alta	0.5%	0.1%			
Vega Alta	4.5%	0.6%			
Vega Baja	9.5%	1.3%			
Total	100.0%	13.3%			
East Coast			**West Coast**		
Municipality	**Percent All Pounds on Coast**	**Percent All Pounds All Coasts**	**Municipality**	**Percent All Pounds on Coast**	**Percent All Pounds All Coasts**
Ceiba	11.3%	2.5%	**Aguada**	8.9%	2.8%
Culebra	3.4%	0.7%	**Aguadilla**	15.8%	5.0%
Fajardo	20.6%	4.5%	**Añasco**	3.8%	1.2%
Humacao	13.1%	2.9%	**Cabo Rojo**	48.9%	15.5%
Maunabo	0.0%	0.0%	**Mayagüez**	9.7%	3.1%
Naguabo	20.3%	4.4%	**Rincón**	12.9%	4.1%
Vieques	25.8%	5.6%	**Total**	100.0%	31.8%
Yabucoa	5.6%	1.2%			
Total	100.0%	21.9%			

The gentrification of the island's coast is an ongoing problem. Privatization of beach front areas continues to reduce public access to fisheries. A recent award-winning documentary, *The Edge of the Sea*, highlights this problem in Rincón along the west coast where fishers have traditionally parked their boats on public land along the shore (http://theedgeofthesea2009.blogspot.com).

The subsistence sector in Puerto Rico is made up mostly of people from working class backgrounds who target snapper-grouper species (40 percent) and pelagic species such as dolphin (7.4 percent) and king mackerel (5.9 percent), but almost no shellfish (Griffith et al. 2007). Their gear varieties are similar to those of recreational fishers, but with fewer who use SCUBA gear.

Snapper Unit 1 Fishermen and Municipalities

The descriptions of the socioeconomic aspects of the commercial and recreational Snapper Unit 1 sectors are described in the Description of the Fishery and are incorporated by reference.

Table 9.22. Percent of active licensed commercial fishermen who target deepwater snapper by municipality of residence, 2008.

North Coast		South Coast		East Coast		West Coast	
Municipality	**Percent Fishermen**	**Municipality**	**Percent Fishermen**	**Municipality**	**Percent Fishermen**	**Municipality**	**Percent Fishermen**
Arecibo	93.3	**Arroyo**	25.0	**Ceiba**	66.7	**Aguada**	54.6
Barceloneta	66.7	**Guanica**	54.3	**Culebra**	33.3	**Aguadilla**	86.8
Camuy	100.0	**Guayama**	53.3	**Fajardo**	84.1	**Añasco**	66.7
Carolina	0.0	**Guayanilla**	55.6	**Humacao**	100.0	**Cabo Rojo**	32.7
Catano	80.0	**Juana Diaz**	0.0	**Maunabo**	90.9	**Mayagüez**	51.1
Dorado	100.0	**Lajas**	44.8	**Naguabo**	55.6	**Rincón**	71.4
Hatillo	50.0	**Patillas**	0.0	**Vieques**	71.7	**Total**	51.4
Isabela	30.8	**Penuelas**	41.2	**Yabucao**	100.0		
Loíza	66.7	**Ponce**	60.8	**Total**	71.8		
Luquillo	27.3	**Salinas**	19.4				
Río Grande	100.0	**Santa Isabel**	0.0				
San Juan	71.4	**Total**	39.7				
Vega Alta	55.6						
Vega Baja	93.3						
Total	73.5						

Approximately 46 percent of the 868 active commercial fishermen in 2008 reported targeting deepwater snapper. Although the north coast accounted for the least landings of Snapper Unit 1, it had the largest percent (73.5 percent) of active commercial fishermen who targeted deepwater snapper in 2008 (Table 9.22). All active commercial fishermen who lived in the north coast municipalities of Camuy, Dorado, and Rio Grande targeted deepwater snapper, as well as all active commercial fishermen who lived in the east coast municipalities of Humacao and Yabucoa. None of the commercial fishermen from Carolina, Juana Diaz and Patillas targeted these species. The top ten municipalities by the percent of commercial fishermen who targeted deepwater snapper species are: Camuy, Dorado, Rio Grande, Humacao, Yabucoa, Arecibo, Vega Baja, Maunabo, Aguadilla, and Fajardo.

Snapper Unit 2 Fishermen and Municipalities

The descriptions of the socioeconomic aspects of the Snapper Unit 2 commercial, recreational and subsistence sectors are described in the Description of the Fishery and are incorporated by reference.

Proposed Snapper Unit 2 would be composed of queen and cardinal snapper. Since 2000, queen snapper landings represent 7.2 percent of reported finfish landings and 5.6 percent of adjusted finfish landings. This increase coincides with declining landings of silk snapper. There were no reports of landings of cardinal snapper prior to 1989, and from 1989 to 1996, there were 4 years with no landings. However, since 1997, there have been landings of the species every year and a general increase in those landings; however, the species remains to represent no more than half a percent of annual finfish, with the exception in 2005 when reported landings represented 0.9 percent of reported finfish landings. Nonetheless, the increase is evidence of fishers seeking alternative species to mitigate for reduced landings of other species, especially silk snapper.

Queen snapper was the top ranked commercial species landed in Rincón from 1999 to 2003, representing 28.6 percent of the west coast municipality's commercial landings during that period (Griffith et al. 2007). The west coast lands substantially more queen snapper than the other coasts combined. West coast landings of queen snapper represented an average of about 94 percent of the territory's annual landings of the species. Griffith et al. (2007) provide additional descriptions of these municipalities and are incorporated by reference.

Snapper Unit 3 Fishermen and Municipalities

Snapper Unit 3 is comprised of gray, lane, mutton, dog, schoolmaster and mahogany snapper. Commercial landings in Puerto Rico from catches in territorial and federal waters combined ranged from over 300,000 pounds to over half a million pounds; from 1999 to 2005 however, in 2006 and 2007 annual landings were less than 200,000 pounds. Lane snapper and mutton snapper comprise almost all to all of the commercial landings from 1990 to 2007. Lane snapper is also a popular catch of recreational fishermen. Present federal regulations prohibit possession of lane and mutton snapper from April 1 to June 30 each year in federal waters. Puerto Rico regulations prohibit fishing for mutton snapper, but not lane snapper, from April 1 to May 31 each year.

Lane snapper is the top ranked species for commercial fishermen in Santa Isabel, Salinas, and Maunabo, where it represents 22.2 percent, 15.7 percent and 12.3 percent of commercial landings in these municipalities, respectively. The species is the second most important species to commercial fishermen in Mayagüez (11.1 percent), Añasco (9.6 percent), Ponce (13.5 percent), Juana Diaz (17.5 percent), Patillas (6.8 percent), Luquillo (7.2 percent), Yabucoa (10.8 percent), Maunabo (12.4 percent) and third most important species in San Juan (6.4 percent), Guayama (8.3 percent), Lajas (6.5 percent), and Cabo Rojo (6.7 percent). Mutton snapper is the second most important species in Salinas (9.5 percent), Guayanilla (8.6 percent), and Camuy (10.5 percent), and third most in Santa

Isabel (8.7 percent). Griffith et al. (2007) provide additional descriptions of these municipalities and are incorporated by reference.

Snapper Unit 4 Fishermen and Municipalities

Snapper Unit 4 is comprised of yellowtail snapper. Yellowtail snapper accounted for the most commercial landings in the municipalities of San Juan (15 percent of all commercial landings), Mayagüez (12.6 percent), Ponce (18.1 percent), Camuy (18.1 percent), Rio Grande (11.1 percent), Fajardo (17.9 percent) and Yabucoa (12.7 percent) from 1999 to 2003 (Griffith et al. 2007). It was the second most species landed in Salinas (9.5 percent), Vieques (8.7 percent), and Humacao (9.3 percent), and third most ranked in Santa Isabel (8.7 percent), Carolina (7.6 percent), and Loíza (6.6 percent). There are size limitations for the yellowtail snapper in federal (max. 12" Fork Length (FL)) and in commonwealth waters (max. 10.5" FL). Griffith et al. (2007) provide descriptions of these municipalities and are incorporated by reference.

Grouper Fishermen and Municipalities

According to Griffith et al. (2007), Nassau grouper was the only species of grouper that was among the top three species commercially landed in any municipality from 1999 to 2003. Approximately 14 percent of the pounds landed in Isabela and 17 percent landed in Culebra came from Nassau grouper landings. However, fishing for this species has been prohibited in both federal and territorial waters since 2004. Additional information about municipalities where grouper are landed can be found in Griffith et al. (2007) and is incorporated by reference.

Parrotfish Fishermen and Municipalities

Parrotfish was the most landed commercial species in Arroyo from 1999 to 2003; it represented 15.1 percent of all commercial landings in that municipality during that period (Griffith et al. 2007). The species was the third most landed species in Patillas and accounted for six percent of its commercial landings from 1999 to 2003. According to Griffith et al. (2007), no other municipality had parrotfish among its top three commercially landed species. Consequently, among commercial fishermen, any action that affected parrotfish fishing would likely have the largest social impact on those of Arroyo and Patillas. Griffith et al. (2007) describe these municipalities and these descriptions are incorporated by reference.

Queen Conch Fishermen and Municipalities

In 1999, 113 of 209 commercial conch fishers were located in and between the southwestern municipality of Cabo Rojo and the southeastern municipality of Peñuelas. Fifty-two conch fishers, the second largest group, were located in the east coast muncipalities of Naguabo, Ceiba, Fajardo and Vieques. A smaller number of conch fishers were located on the north coast. No conch fishers were found in Rincón, Aguada, and Aguadilla along the west coast. The east coast islands of Culebra and Vieques and the west coast islands of Desecheo, Mona, and Monito have been centers of distribution. The description of the fishery can be found in section 5.3.2.9.5.

Current regulation prohibits fishing for or transportation of queen conch in federal waters off Puerto Rico. Consequently, all social benefits that derive from queen conch fishing originate from queen conch taken from territorial waters. There is a recreational bag limit of three conchs per person per day and no more than 12 conchs per boat per day in Puerto Rico waters. The daily commercial limit for queen conch in PR is 150 conchs per person and 450 per boat. Puerto Rico regulations prohibit fishing for queen conch from August 1 through October 31 each year. There is no recreational data for queen conch. None of the subsistence fishers interviewed by Griffith et al. (2007) stated that they harvest conch.

9.2.2.5 U.S. Virgin Islands

The population of the USVI grew from 101,809 persons in 1990 to 108,612 persons in 2000 (Table 9.23). As of 2010, the population is estimated to be 109,775 persons with a median age of 39.8 years. The population density of the USVI has increased since 1990. The 2010 population density is expected to be 820.0 persons per square mile as opposed to 761.3 persons per square mile in 1990. The USVI ranks 42nd in the world in population density (http://www.sitesatlas.com/Thematic-Maps/Population-density.html). Ninety-five percent of the population lives in urban areas, and the annual urbanization rate is 0.2 percent.

Table 9.23. USVI population by gender and age. Source: U.S. Census Bureau, Census 2000 and 1990.

Subject	1990		2000	
	Number	Percent	Number	Percent
Total population	**101,809**	**100**	**108,612**	**100**
SEX AND AGE				
Male	49,210	48.34	51,864	47.75
Female	52,599	51.66	56,748	52.25
Under 15 years	29,444	28.92	28,405	26.15
15 to 64 years	65,886	64.72	71,090	65.45
65 years and over	6,479	6.36	9,117	8.39
Median age (years)	28.2		33.4	

The proportion of the USVI's population under 18 years of age declined from 35 percent in 1960 to 32 percent in 2000. The territory has not experienced the same declining fertility rates as Puerto Rico nor is there considerable movement of U.S. Virgin Islanders between the U.S. mainland and the islands. In 2006, the fertility rate was 1.88 births per woman, as opposed to 2.1 births per woman in the U.S. as a whole and 1.75 births per woman in Puerto Rico. In 2006, the birth rate was 76.1 births per 1,000 women aged 15 to 44 years (Centers for Disease Control and Prevention).

Table 9.24. Populations of islands of USVI. Source: U.S. Census Bureau, Census 2000 and 1990.

Island	1990 Population	2000 Population	2008 Est. Population	2008 Population Density (mi.^{2})
St. Croix	50,139	53,234	56,576	682.6
St. John	3,504	4,197	4,461	227.5
St. Thomas	48,166	51,181	54,394	1,741.2

The most populated island is St. Croix north coast is the most populated island, followed closely by St. Thomas. St. John is dwarfed in comparison (Table 9.24). The populations of the three islands increased from 2000 to 2008.

St. Thomas and St. Croix have the highest percents of people 65 years and older (Table 9.25). St. Croix has a larger percent of persons under 15 years of age.

Table 9.25. Percent of populations of islands in 2000 by sex and age. Source: U.S. Census Bureau, Census 2000.

Sex and Age	Percent of Population		
	St. Croix	St. John	St. Thomas
Male	47.8	48.8	47.6
Female	52.2	51.2	52.4
Under 15	28.5	20.8	24.5
15 to 64	63.4	72.0	67.1
65 and over	8.4	7.2	8.4
18 and over	65.9	75.1	70.5

A large majority of the USVI's population is non-white. In 2000, 76.2 percent of the population was Black or African American, 13.1 percent was White, and 7.2 percent was another race (Table 9.26). Fourteen percent of the population was Hispanic or Latino. Although Blacks and African Americans are a majority racial population in the USVI, they comprise a minority population in the U.S. Caribbean as a whole. Similarly, although Hispanic or Latinos are a minority ethnic population in the USVI, they represent a majority population in the U.S. Caribbean as whole.

Table 9.26. USVI population by race, 2000. Source: U.S. Census Bureau, Census 2000.

Race	Number	Percent
One race	104,820	96.5
White	14,218	13.1
Black or African American	82,750	76.2
Other races	7,852	7.2
Two or more races	3,792	3.5
Hispanic or Latino and Race		
Hispanic or Latino (of any race)	15,196	14.0
Mexican	308	0.3
Puerto Rican	8,558	7.9
Cuban	141	0.1
Other Hispanic or Latino	6,189	5.7
Not Hispanic or Latino	93,416	86.0

Blacks and African Americans represent significantly different proportions of the populations across the islands. In 2000, approximately 81 percent of the population of St. Thomas was Black or African American, followed by 73 percent of the population of St. Croix and 38 percent of the population of St. John (Table 9.27). The percent of the population that is Hispanic or Latino also varies substantially, with 21.2 percent of St. Croix's population versus 4.9 percent of St. John's population.

The population of the USVI has been divided by race and ethnicity. West Indians, who were immigrants from the West Indian Islands such as St. Lucia, Martinique and Guadeloupe, for example, have tended to be subjects of institutional racism. Their distinctive English or French dialects or languages are used to separate them from the rest of the population. According to Isern (2007), West Indians have been scapegoated for school discipline problems, rising crime, power outages and other social ills. They are also overly represented in the lowest paying jobs. For example, a College of the Virgin Islands study in the late 1970s found that West Indians held 89 percent of all jobs in agriculture/fisheries employment in St. Croix (Isern 2007). In St. Croix, West Indian fishermen identify themselves as black. According to Kojis (2004), approximately 42 percent of St. Croix's commercial fishermen were West Indian or Black in 2004.

Table 9.27. St. Croix, St. John and St. Thomas Populations by Race, 2000. Source: U.S. Census Bureau, Census 2000.

Race	St. Croix		St. John		St. Thomas	
	Number	Percent	Number	Percent	Number	Percent
Total Population	**53,234**		**4,197**		**51,181**	
One race	50,901	95.6%	4,115	98.0%	49,804	97.3%
White	6,175	11.6%	1,587	37.8%	6,456	12.6%
Black or African American	39,045	73.3%	2,419	57.6%	41,286	80.7%
Other races	1,420	2.7%	109	2.6%	2,062	4.0%
Two or more races	2,333	4.4%	82	2.0%	1,377	2.7%
Hispanic or Latino (of any race)	11,277	21.2%	207	4.9%	3,712	7.3%

Most persons currently engaged in commercial and subsistence-oriented fishing on St. Thomas and St. John are persons of French descent who arrived from Saint-Barthelemy over the past centuries, or descendants of slaves who also arrived long ago from West Africa, other islands in the Caribbean, or from the continental U.S (Impact Assessment 2007). Like West Indians, the French have also been subjects of discrimination and been relegated to jobs on the lowest rungs of the occupational ladder. The French are an ethnic minority in the USVI. However, they are overrepresented in fishing (Table 9.28). According to Kojis (2004), approximately 55 percent of St. Thomas/St.John's licensed fishermen are of French ethnicity (49.1 percent French and 6.1 percent Black French). Note in Table 9.28 that the USVI survey of commercial fishermen places racial categories into ethnic categories.

Table 9.28. Percent of licensed commercial fishermen by ethnic group. Source: Kojis 2004.

Ethnic Group	Percent of Licensed Fishermen (335 Respondents)		
	St. Thomas/St. John	St. Croix	U.S. Virgin Islands
French	49.1	0.0	16.7
Black French	6.1	0.0	2.1
White	8.8	7.7	8.1
Hispanic	3.5	48.4	33.1
Black	32.5	41.6	38.5
Black Hispanic	0.0	1.8	1.2
East Indian	0.0	0.5	0.3
Total	100.0	100.0	100.0

In 2000, Blacks or African Americans represented 12 percent of the U.S. Caribbean population. If the percent of Puerto Rico's active commercial fishermen in 2008 who are Black or African American is the same as its general population in 2000, then, in 2008, there were 104 Black fishermen in Puerto Rico. Similarly, if 41.8 percent of all licensed USVI fishermen are Black, Black French or Black Hispanic, there were 161 Black fishermen in the USVI. These 265 Black and African American fishermen represent approximately 21 percent of the 1,251 commercial fishermen in the region in 2008 (868 in Puerto Rico plus 383 in the USVI). In that sense, Blacks and African Americans are overrepresented in the fishing industry in the U.S. Caribbean.

The U.S. Census in 2000 asked respondents to identify what language is spoken in their homes and their ability to speak English. A large majority of each island's populations speak English only; however, Spanish, French, French Creole, and other Indo-European languages are spoken (Table 9.29). Almost one-third of St. Croix's population spoke a language other than English in 2000.

Table 9.29. Percent of population 5 years and older by language spoken at home and ability to speak English. Source: Census 2000.

LANGUAGE SPOKEN AT HOME AND ABILITY TO SPEAK ENGLISH	St. Croix		St. John		St. Thomas	
	Number	Percent	Number	Percent	Number	Percent
Population 5 years and over	48,772	100	3,926	100	47,383	100
English only	33,212	68.10%	2,811	71.60%	38,343	80.92%
Language other than English	15,560	31.90%	1,115	28.40%	9,040	19.08%
Speak English less than "very well"	5,207	10.68%	319	8.13%	3,236	6.83%
Spanish	11,823	24.24%	854	21.75%	4,659	9.83%
Speak English less than "very well"	4,246	8.71%	246	6.27%	2,019	4.26%
French (and French Creole)	2,902	5.95%	122	3.11%	3,338	7.04%
Speak English less than "very well"	667	1.37%	23	0.59%	933	1.97%
Other Indo-European language	347	0.71%	63	1.60%	641	1.35%
Speak English less than "very well"	85	0.17%	17	0.43%	125	0.26%
Asian and Pacific Island languages	100	0.21%	30	0.76%	149	0.31%
Speak English less than "very well"	40	0.08%	12	0.31%	39	0.08%

Almost 60 percent of U.S. Virgin Islanders have a high school diploma or have higher educational attainment, while approximately 41 percent of USVI fishermen are similarly educated (Tables 9.30 and 9.31). Approximately 35 percent of the general population has at least some college experience, while approximately 11 percent of licensed fishermen have similar educational attainment. St. Croix had the smallest percent of its population 25 years and older that completed high school in 2000 (57.4 percent). Approximately 71 percent of St. John's and 62 percent of St. Thomas' populations of that age had completed high school. In 2002, 11.1 percent of U.S. Virgin Islanders 16 to 19 years of age had dropped out of high school. The national percent in 2001 was 10 percent. Dropout rates are not available for the three islands.

Table 9.30. Educational attainment of USVI population, 2000. Source: U.S. Census 2000.

Educational Attainment	Number	Percent
Population 25 years and over	65,603	100.0
Less than 9th grade	12,133	18.5
9th to 12th grade, no diploma	13,743	20.9
High school graduate (includes GED)	17,044	26.0
Some college, no degree	9,425	14.4
Associate degree	2,269	3.5
Bachelor's degree	6,841	10.4
Graduate or professional degree	4,148	6.3
High school graduate or higher		60.6
Bachelor's degree or higher		16.8

Table 9.31. Education level of USVI licensed commercial fishermen, 2003. Source: Kojis 2004

Education Level	% Licensed Fishermen (318 Respondents)
Elementary School	0
Junior High School	22.6
Some High School	15.7
High School	30.5
Some College	5.7
College	5
Total	100.0

Median household income in the USVI in 2000 was $24,704 (Census 2000). The median household income for the three islands ranges from $21,401 in St. Croix to $32,482 in St. John.

Median family income varies substantially by race. In St. Croix, the median family income for Whites exceeded the median family income of Blacks and other non-Whites from 2001 to 2007 (Figure 9.8). The same racial income differences among Black and White families are found in St. Thomas (Figure 9.9). In St. John, White families typically have higher median incomes as well (Figure 9.10). In the USVI, poor families are more often black.

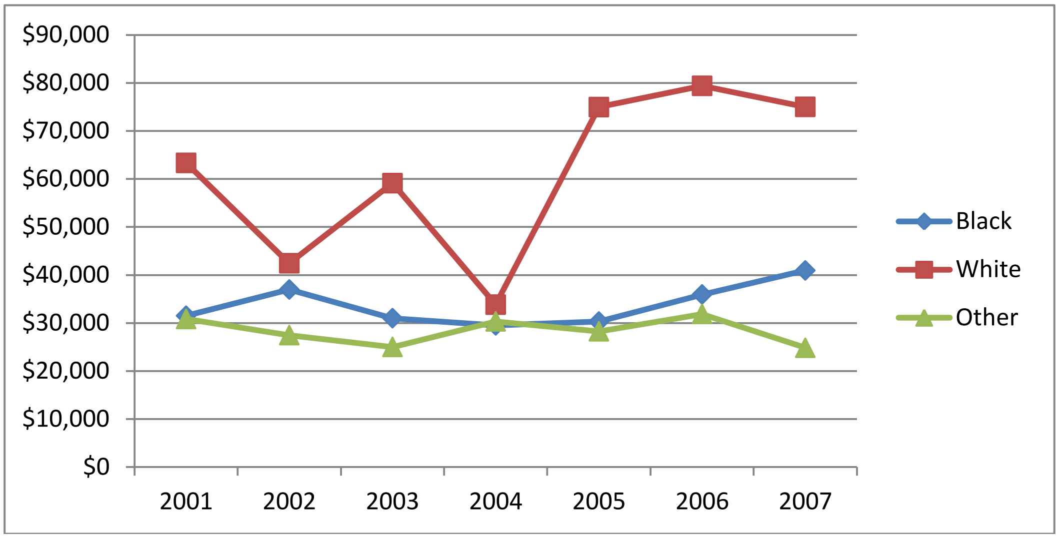

Figure 9.8. Median family income by race in St. Croix, 2001 to 2007. Source: Annie E. Casey Foundation, Kids Count.

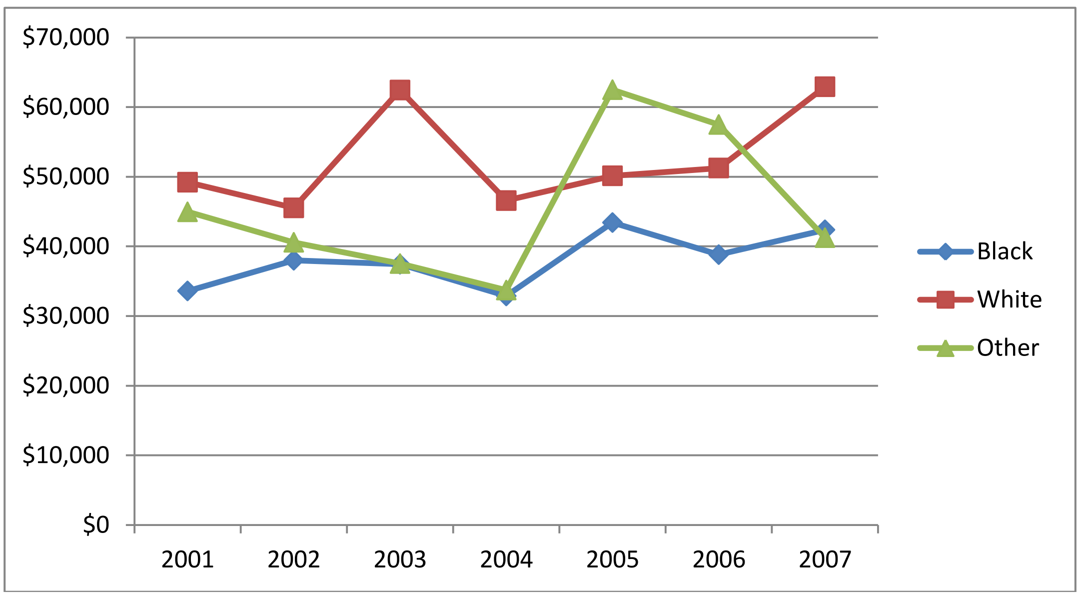

Figure 9.9. Median family income by race in St. Thomas, 2001 to 2007. Source: Annie E. Casey Foundation, Kids Count.

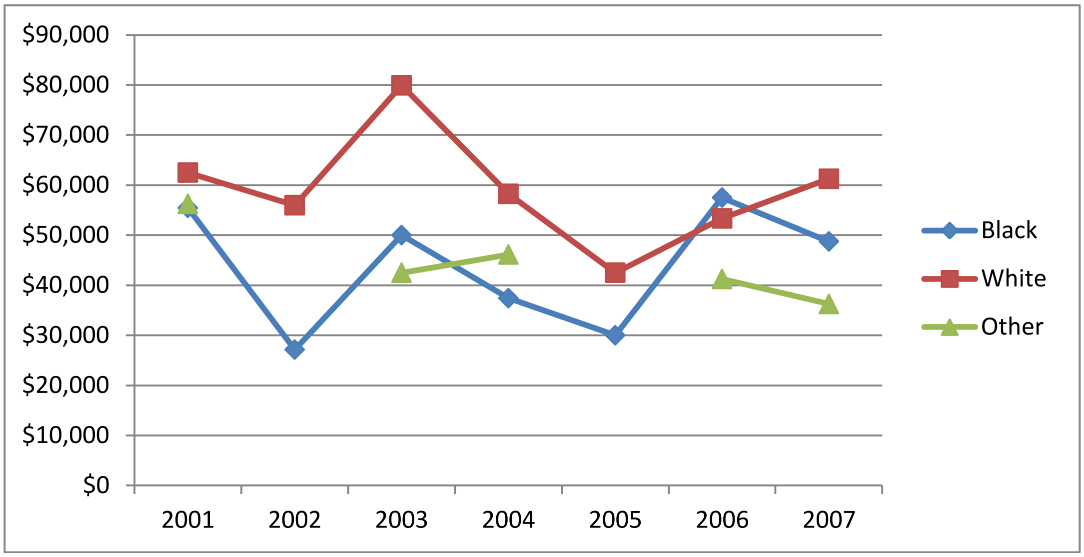

Figure 9.10. Median family income by race in St. John, 2001 to 2007. Source: Annie E. Casey Foundation, Kids Count. Data not available for Other in 2002 and 2005.

Substantial numbers of individuals and families in the USVI have incomes below the poverty level. In 1999, 32.5 percent of all individuals and 28.7 percent of all families lived in poverty. Families with no husband present and with related children were more at risk to live in poverty. Over fifty percent of families with no husband present and with related children under 5 years lived in poverty (Table 9.32). As stated in section 9.2.1, an undernourished pregnant woman generally passes the condition on to her child as low birth weight, which has an impact on the child's future health and well-being. Damage done by malnutrition before a child reaches two years of age is irreversible, which substantially decreases the likelihood that the person can escape the hunger-poverty trap.

Table 9.32. Number and percent of USVI families and individuals with incomes below poverty level, 1999. Source: Census 2000.

Population	Number below Poverty Level	Percent below Poverty Level
Families	7,635	28.7
Families with related children under 18 years	5,862	35.3
Families with related children under 5 years	2,637	41.0
Families, no husband present	4,521	44.6
Families with related children under 18 years	3,863	49.2
Families with related children under 5 years	1,795	56.7
Individuals	34,931	32.5

Higher percents of individuals and families in St. Croix live in poverty than in St. Thomas and St. John. In 1999, 38.7 percent of St. Croix's population and 34.8 percent of its families lived in poverty, as opposed to 27.2 percent of individuals and 23.2 percent of families in St. Thomas and 18.5 percent of individuals and 14.8 percent of families in St. John.

Table 9.33. Percent of children in families with incomes below poverty level. Source: Annie E. Casey Foundation, 2003.

Year	Percent	
	St. Croix	St. Thomas/St. John
2000	49.0	34.0
2001	45.0	31.0
2002	32.0	29.0
2003	39.0	25.0
2004	37.0	35.0
2005	46.0	25.0
2006	32.8	25.9
2007	38.9	28.8

St. Croix had the highest percent of children in families with incomes below the poverty line from 2000 to 2007 than St. Thomas/St. John (Table 9.33). The percent of families in poverty differs by race. In St. Croix, larger percents of Black and other Non-White families lived in poverty from 2001 to 2007. An annual average of 25.6 percent of Black families lived in poverty, as opposed to 11.2 percent of white families and 30.7 percent for other race families (Figure 9.11). Similarly, a larger percent of Black families lived in poverty in St. Thomas than their white counterparts. An annual average of 19.1 percent of Black families in St. Thomas lived in poverty from 2001 to 2007 as opposed to 13 percent of White families (Figure 9.12). The percent of non-Black or non-White families living in poverty averaged 13.7 percent. In St. John, the percents of Black and White families living in poverty are very similar (Figure 9.13). The annual poverty levels set by the U.S. Census Bureau do not reflect local and regional variations. Consequently, the actual poverty rates in the USVI island areas, with the USVI's higher cost of living, are higher than reported here and in the Census Bureau's community and population surveys.

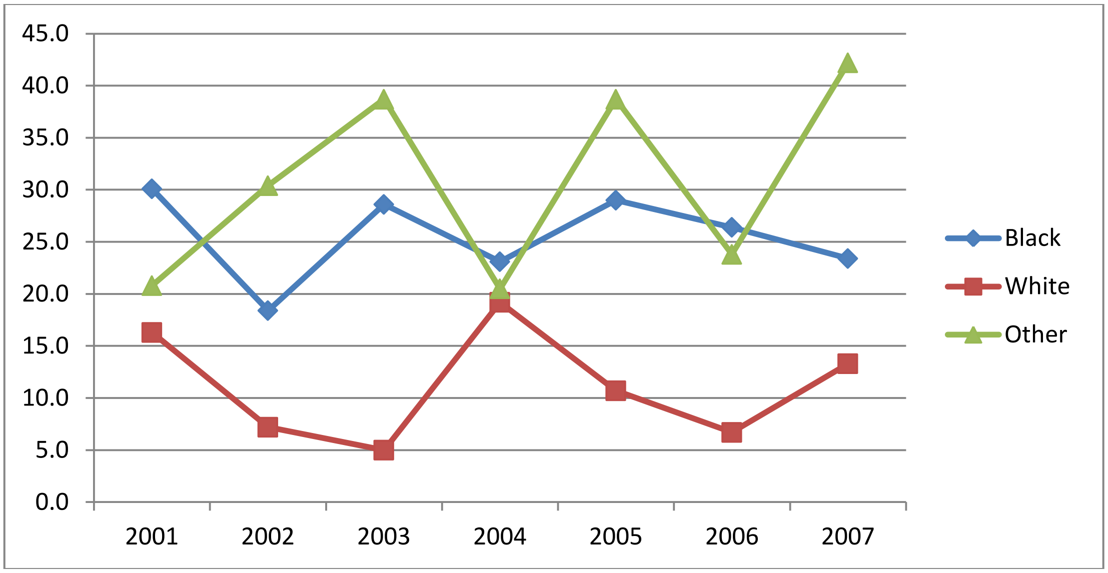

Figure 9.11. Percent of families in poverty by race in St. Croix. Source: Annie E. Casey Foundation, Kids Count.

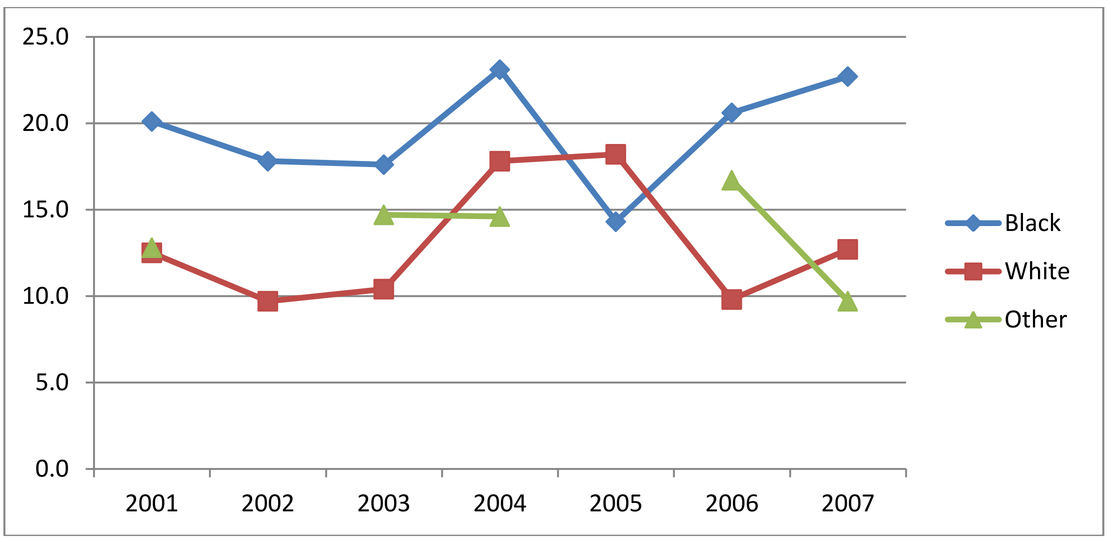

Figure 9.12. Percent of families in poverty by race in St. Thomas. Source: Annie E. Casey Foundation, Kids Count. Data not available for other in 2001, 2002, and 2005.

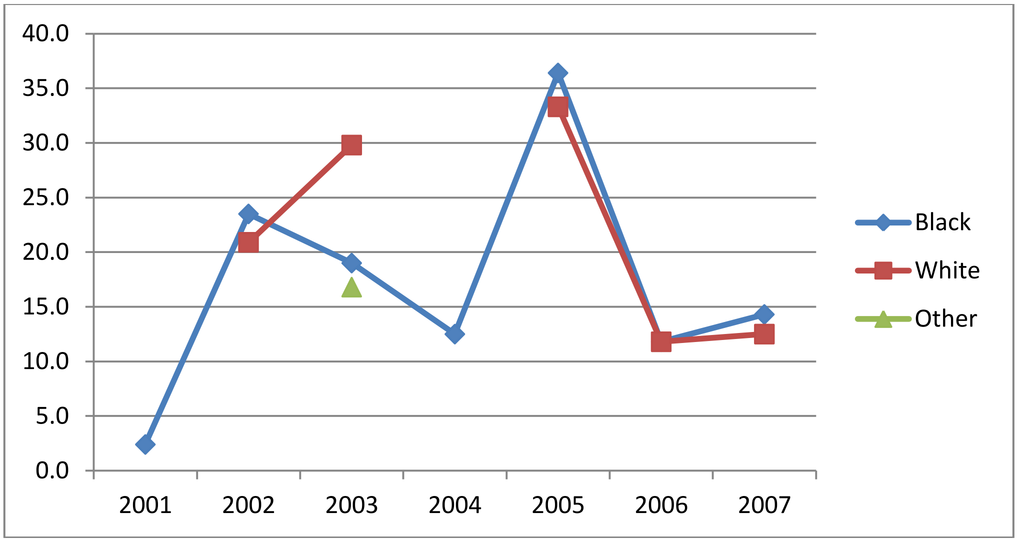

Figure 9.13. Percent of families in poverty by race in St. John. Source: Annie E. Casey Foundation, Kids Count. Data not available for Whites in 2001 and 2004, and Other in all years except 2003.

A larger percent of households in St. Croix received public assistance income in 2000 than households in St. Thomas or St. John. Approximately 9 percent of St. Croix's households, 4 percent of St. Thomas' households, and 2 percent of St. John's households had public assistance income.

The cost of living is significantly higher in the USVI than on the U.S. mainland. In comparative studies conducted during the late 1980's by the Departments of Commerce and Labor, it was estimated that the cost of living in the U. S. Virgin Islands was significantly higher than that of the United States mainland, particularly in the following areas: Food higher by 47 percent; Housing higher by 65 percent; Utilities higher by 36 percent; Transportation higher by 11 percent; Health Services higher by 47 percent. (1997 Department of Human Services Community Assessment). The USVI Department of Labor's Consumer Price Index indicates that the cost of living in the territory is an average of at least 35 percent higher cumulatively.

A small percent of U.S. Virgin Islanders have occupations in farming, fishing and hunting according to the Census. In 2000, St. Croix had 130 persons or 0.7 percent of the employed civilian population 16 years and older in those occupations, St. John had nine persons (0.4 percent) and St. Thomas had 135 persons (0.7 percent) in those occupations. This is not to suggest that these individuals represented the universe of all farmers, fishermen and hunters. For example, in 2002, St. Croix's 139 farms had 317 workers: 189 unpaid workers and 128 paid workers. Similarly, there were 324 persons in the employed labor force in agriculture, fishing and forestry in 2000; however, that figure does not include all workers in that industry group. In 2007, 207 USVI farms had 401 unpaid workers and 56 used hired farm labor.

The number of farms in the USVI increased from 191 in 2002 to 219 in 2007; however, the number of acres declined significantly from 9,168 to 5,881 (USDA, 2007 Census of Agriculture). Similarly, the number of farms increased and acres in farms decreased in both St. Croix and St. Thomas/St. John (Table 9.34). The average size per farm decreased from 62.6 acres to 34.8 acres in St. Croix and from 8.8 to 5.2 acres in St. Thomas/St. John.

Table 9.34. St. Croix and St. Thomas/St. John farms and farm land. Source: USDA, 2007 Census of Agriculture.

Farms		USVI		St. Croix		St. Thomas/St. John	
		2002	2007	2002	2007	2002	2007
Farms	**Number**	191	219	139	160	52	59
Land in Farms	**Acres**	9,168	5,881	8,708	5,574	460	307
Average Size per Farm	**Acres**	48.0	26.9	62.6	34.8	8.8	5.2
Cropland	**Farms**	132	147	94	106	38	41
	Acres	911	493	845	399	66	94
Harvested	**Farms**	129	145	91	105	38	40
	Acres	602	304	558	246	44	58
Other	**Farms**	55	40	39	27	16	13
	Acres	309	188	287	152	22	36
Pasture or Grazing Land	**Farms**	109	103	86	79	23	24
	Acres	7,482	5,209	7,110	5,048	372	161
Woodland	**Farms**	13	19	9	11	4	8
	Acres	541	95	531	71	10	24
Other Land	**Farms**	109	82	84	54	25	28
	Acres	234	83	221	55	12	28

USVI farmers produce field and forage crops, such as cassava, dry beans, dry corn, sorghum, sugarcane, sweet potatoes, taniers, yams and hay. They also produce vegetable crops, such as cabbage, carrots, celery, eggplant, green beans, okra, peppers, spinach, squash, and tomatoes. Fruits and nuts, such as avocadoes, bananas, coconuts, mangoes, papayas, and breadfruits, are also grown. The market value of these sold crops grew from 2002 to 2007 (Table 9.35). During the same period, the market value of most sold livestock increased; however, the market value of cattle and calves sold by Cruzan ranchers dropped substantially. During this 5-year period, there was a substantial decline in the number of cattle and calves and ranches from 2,223 to 776 animals. The primary reason for this fall is the rising price of land, which has motivated ranchers to sell their land. The Buccaneer, a resort in St. Croix for example, is located on a former cattle ranch. Another reason is decreased demand for local beef since the 1990s, especially after Hurricane Hugo. In 2006, the owners of Castle Nugent Farms, where Senepol cattle were developed, gave ownership of their herd to the University of the Virgin Islands. Presently, the National Park Service has proposed Castle Nugent Farms be incorporated into the National Park System as a historical site. The proposed Castle Nugent Farms site would extend off the land into territorial waters up to the three nautical mile limit. The new park is expected to have beneficial impacts to fish habitat and nursery in addition to other beneficial impacts.

Table 9.35. Market value of agricultural products sold, 2002 – 2007. Source: USDA, Census of Agriculture.

Farms		USVI		St. Croix		St. Thomas	
		2002	2007	2002	2007	2002	2007
Field and Forage Crops	**Farms**	28	37	19	23	9	14
	Dollars	45,877	49,104	23,955	35,044	21,922	14,060
Vegetables	**Farms**	77	93	51	64	26	29
	Dollars	340,048	366,195	219,425	311,305	120,623	54,890
Fruits and Nuts	**Farms**	87	117	64	80	23	37
	Dollars	130,784	216,877	101,629	137,188	29,155	79,698
Horticultural Specialities	**Farms**	32	21	24	16	8	5
	Dollars	799,090	946,636	721,363	858,636	77,727	90,000
Cattle and Calves	**Farms**	44	23	38	17	6	6
	Dollars	548,336	165,150	541,136	150,150	7,200	15,000
Hogs and Pigs	**Farms**	25	26	20	17	5	9
	Dollars	92,857	107,200	54,607	66,250	38,250	40,950
Other Livestock and Livestock Products	**Farms**	59	85	42	59	17	26
	Dollars	133,775	190,190	102,675	133,095	31,100	57,095
Poultry	**Farms**	10	7	6	4	4	3
	Dollars	(D)	4,620	(D)	1,550	(D)	3,070
Chicken Eggs	**Farms**	4	3	2	1	2	2
	Dollars	(D)	(D)	(D)	(D)	(D)	(D)
Milk	**Farms**	3	–	3	–	–	–
	Dollars	(D)	–	(D)	–	–	–
Fish and Aquaculture Products	**Farms**	1	1	1	1	–	–
	Dollars	(D)	(D)	(D)	(D)	–	–

(D): Undisclosed.

Pounds harvested of field and forage crops, vegetables and fruits, nuts and horticultural specialties rose from 2002 to 2007 (Table 9.36) in both St. Croix and St.Thomas/St. John. The largest increase in the harvest of field and forestry crops was due to sugarcane, which increased 249 percent in St. Croix. Pounds harvested per capita increased in both St. Croix and St. Thomas/St. John.

Table 9.36. Pounds of harvested crops. Source: 2007 Census of Agriculture.

Farms	Pounds Harvested					
	USVI		St. Croix		St. Thomas/St. John	
	2002	2007	2002	2007	2002	2007
Field and Forage Crops	49,055	65,949	27,680	47,964	10,265	15,150
Vegetable Crops	351,638	421,070	272,795	351,855	79,463	68,595
Fruits, Nuts and Horticulture Specialities	171,793	369,394	122,880	265,391	41,649	104,012
Total	572,486	856,413	423,355	665,210	131,377	187,757
Total Pounds Harvested per Capita	5.20	7.46	3.85	5.80	1.19	1.64

Commercial landings of finfish and shellfish have increased steadily and substantially since 1974 (Figure 9.14). There has also been a dramatic increase in pounds of commercial landings of fish and shellfish per capita since 1980 in the USVI (Figure 9.15). Pounds increased from 1.21 in 1980 to 9.09 in 1990 then to 13.15 in 2000. Since 2002, per capita landings ranged from 13.89 (2007) to 17.80 (2006), and dropped 23 percent in 2007. Per capita landings increased from 2.21 pounds in 1980 to 8.02 pounds in 1990 in St. Croix and from 1.11 to 10.06 pounds in St. Thomas/St. John (Figure 9.7).

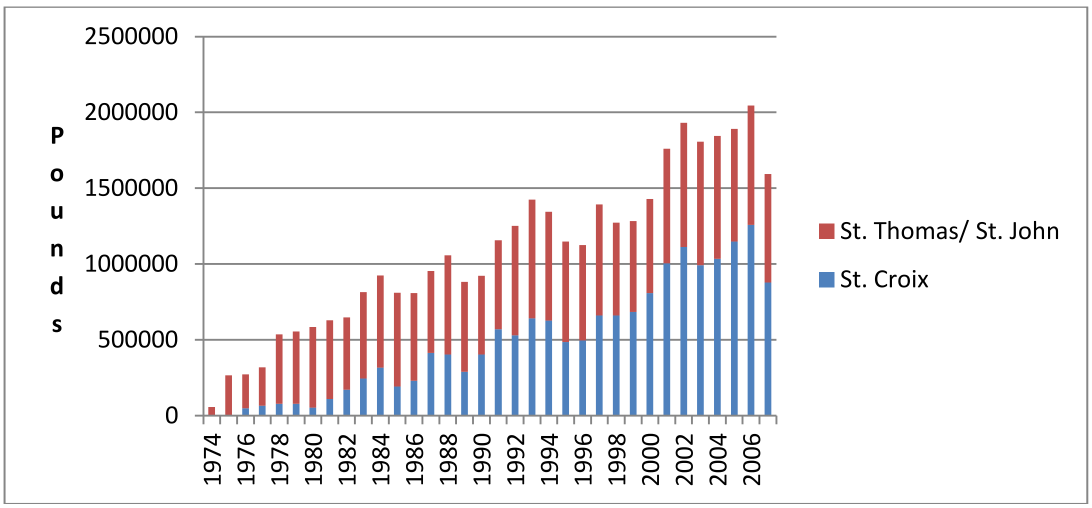

Figure 9.14. Commercial landings in St. Croix and St. Thomas/St. John, 1974 to 2007.

The annual per capita consumption of commodity fish and shellfish for human food is 29.6 pounds and much higher than that of Puerto Rico. The USVI's per capita production of landings represents 40 to 50 percent of its per capita consumption of fish and shellfish, which is evidence of U.S. Virgin Islanders' dependence on fishing. The per capita consumption of commodity seafood does not include consumption of fish and shellfish that are caught by recreational and subsistence fishers. Landings of recreational and subsistence fishermen in the USVI are unknown. Hence, the above figure under-represents actual per capita consumption of finfish and shellfish. Recreational and subsistence fishing increase availability, access to, and consumption of fish and shellfish, and such availability, access and consumption is of substantial cultural significance in the USVI.

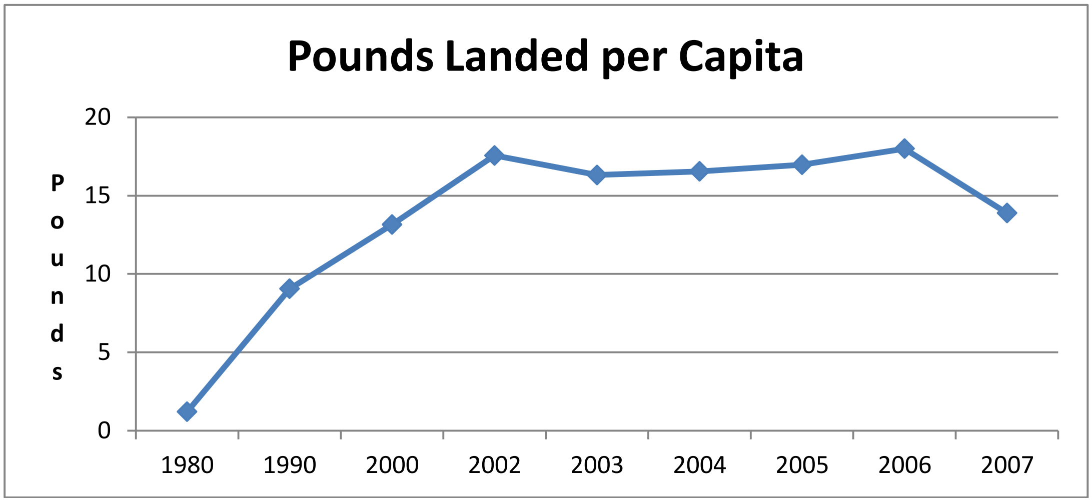

Figure 9.15. Pounds of commercial landings per capita, USVI.

Increases in agricultural production have not been reflected in the agricultural sector's contribution to GDP. The agricultural sector contributes to no more than one percent of USVI's GDP, and the USVI relies heavily on imported food from the U.S. mainland. This relative insignificance of agriculture is reflected in the USVI and U.S. Bureau of Economic Research annual reports, which exclude the agricultural sector. Approximately 80 percent of GDP comes from services, predominantly tourism, and 19 percent from manufacturing.

USVI's nominal and real GDP increased from 2002 to 2007 (Figure 9.16). Per capita real GDP also grew from $36,319 to $40,124 during the 5-year period. This is not to suggest that the USVI avoided the recession that recently affected Puerto Rico. Contraction of major economic indicators in the latter part of 2008 and 2009 indicate the territory has been in a recession. For example, the unemployment rate increased from 2008 to 2009 (Figure 9.17). Economic indicators have improved from the lows posted last year. The unemployment rate declined from 8.5 percent in the first quarter of FY2010 to 8.0 percent in the second quarter. Contributing to the increase in jobs was the hiring of approximately 600 temporary workers for the 2010 Census.

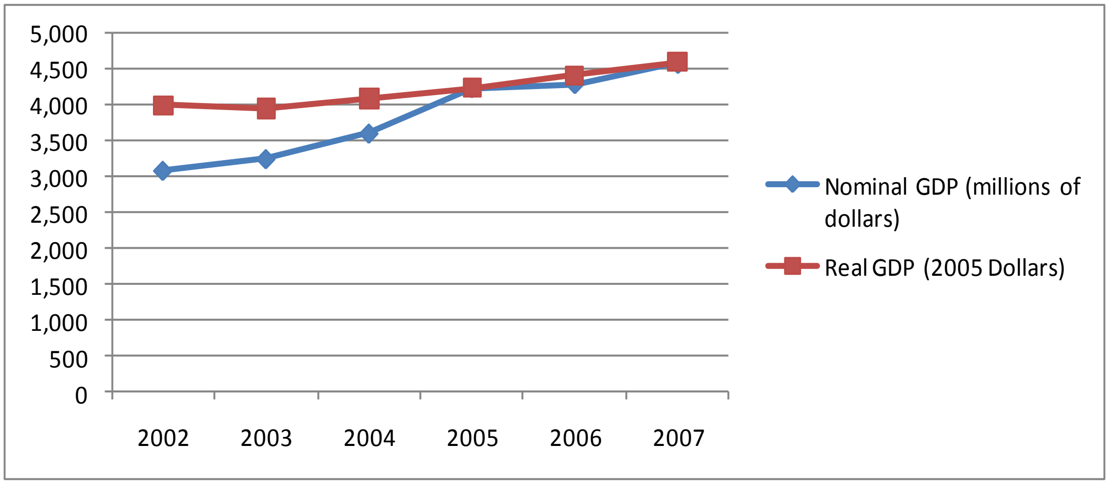

Figure 9.16. Nominal and real GDP, 2002 to 2007. Source: Bureau of Economic Research.

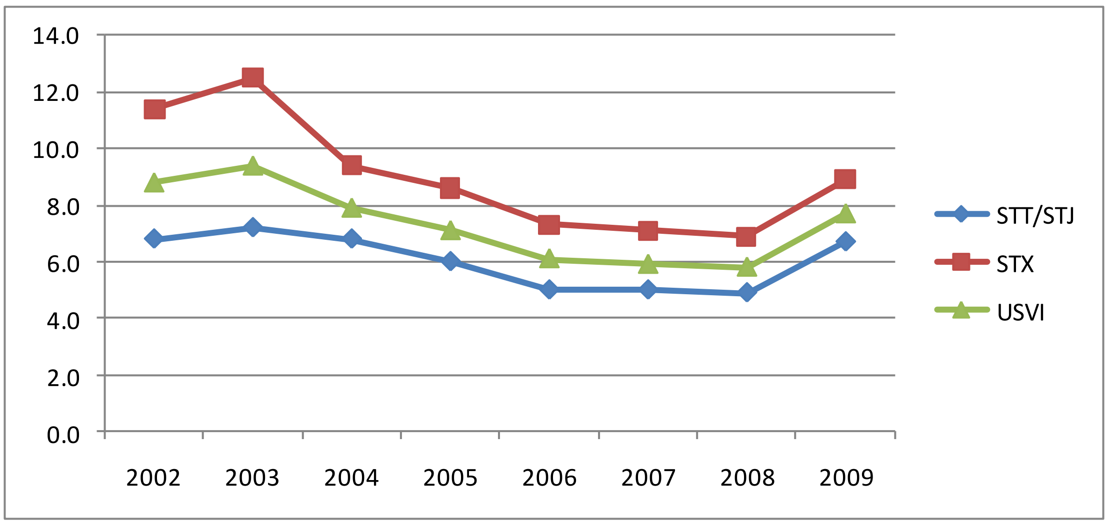

Figure 9.17. Unemployment rate, 2002 to 2009. Source: VI Bureau of Economic Research.

Fishing businesses are not employers in the USVI, although licensed commercial fishermen have helpers who may not be licensed fishermen. About 79 percent said they fish with helpers and about 17 percent with other commercial fishermen. There has been a moratorium on commercial fishing licenses in the USVI since 2003. Presently there are 223 licensed commercial fishermen in St. Croix.

The majority of USVI commercial fishermen fish full time. In 2004, approximately 67 percent of USVI fishermen were involved in fishing more than 36 hours per week. Sixty-one percent of St. Croix's commercial fishermen fish full-time, 31.5 percent fish part-time (36 hours or less per week), and the remaining 7.5 percent were opportunists.

Approximately 77 percent of St. Thomas/St. John's commercial fishermen fish full-time, 19 percent fish part-time, 3 percent are opportunists and one percent are charter fishing operations (Kojis 2004).

According to the 2007 Economic Census there were in St. Croix up to four fish markets with 15 employees, up to six diving equipment stores with 20 employees, 27 limited-services eating places with 363 employees, 37 establishments with 349 employees in Full-service Restaurants Industry, and one establishment in the Charter Boat Industry. Also, according to the same census, in St. Thomas/St. John, there were: up to 15 fish markets with 98 employees, up to12 charter and party fishing operations with 20 to 99 employees, up to seven dive shops with 20 to 99 employees, 37 limited-services eating places with 288 employees, and 76 establishments with 1,307 employees in Full-service Restaurants industry.

In 2007, there were up to 8 marinas in St. Croix with 73 employees and up to 29 marinas in St. Thomas/St. John with 441 employees (2007 Economic Census).

Additional information about St. Croix and St. Thomas/St. John fishing-related infrastructure and fishing communities can be found in Stoffle et al. (2009), Impact Assessment (2007), and Valdés-Pizzini et al. (2010) and is incorporated by reference.

One economic sector that has steadily rebounded is the tourist (visitor) sector, which experienced growth in the first and second quarters of FY2010. Total visitor arrivals for the first two quarters of FY2010 increased 12.2 percent from the previous year. Demand for overnight stays has increased as well. Occupancy rates improved 3.4 percentage points in the first six months of FY2010 and hotel revenues grew 12 percent above last year's level (U.S. Bureau of Economic Research 2010).

Despite the recent improvement, there continue to be job losses in construction, trade, financial services, and tourist accommodation services. However, there are signs of increasing construction activity and jobs primarily from private residential construction, government public works projects and the Diageo and Cruzan Rum distillery and wastewater treatment plant construction. One of the threats to continuing recovery is the government's operating budget deficit of $170 million this current fiscal year.

Manufacturing is the second largest sector of the USVI economy, and its primary industries are refined petroleum products, rum, and jewelry. The watch industry is in a state of collapse, and its survival is doubtful. There is only one company remaining and its output has been declining. The Hovensa oil refinery in St. Croix produces a variety of refined products from crude oil imported from around the world, but primarily from Venezuela. Hovensa is one of the ten largest refineries in the world with a crude oil distillation capacity of 495,000 barrels per day. Approximately 95 percent of its output is exported to the U.S. mainland (U.S. Bureau of Economic Research 2010). Much of the USVI's export performance is dependent on Hovensa, and the value of Hovensa's exports peaked in FY2008 at $14,967 billion and then dropped to $9,353 billion in FY2009. The value of its exports for the first six months of FY2010 was $5,452 billion, suggesting improvement over the previous year.

St. Croix is the site of the fourth largest premium spirits company in the world: Cruzan VIRIL Ltd, which manufactures Cruzan and Old St. Croix brand rum as well as shipments for other labels. The rum tends to be exported in bulk to the U.S. mainland; however, it is also sold to local and regional bottlers for sale under a variety of private labels and regional brand names. Recently Cruzan VIRIL signed a 30-year public-private partnership agreement with the USVI government that includes an expansion of the rum-making facility and the construction of a wastewater plant to deal with historical effluent disposal concerns. Expansion of the facility will increase production capacity by approximately 50 percent (U.S. Bureau of Economic Research 2010). The deal is expected to provide the territorial government with a long-term revenue stream. In the first quarter of FY2010, the USVI government received $30.5 million in rum excise tax revenues. Also, for each proof gallon of rum produced in the USVI and exported to the U.S. mainland, the federal government collects $13.50 in excise taxes, from which $13.25 is returned to the USVI.

Rum exports increased in the second quarter of FY2010 by 23.9 percent to 2,654 proof gallons, compared to 2,143 proof gallons in the second quarter of the previous fiscal year. Rum exports during the first six months of FY2010 improved 20.7 percent over the previous year.

Additional information about the current state of manufacturing and other economic sectors can be found in the U.S. Bureau of Economic Research's report, US Virgin Islands Economic Review March 2010, and is incorporated by reference.

9.2.2.6 USVI Fishermen

A description of St. Croix and St. Thomas/St. John fishermen is included in the Description of the Fishery found in this document and is incorporated by reference.

Snapper, Grouper, Parrotfish and Queen Conch Fishermen

Descriptions of St. Croix and St. Thomas/St. John snapper fishermen are provided in section 5.4 of this document.

9.2.3 Social Impacts

9.2.3.1 Action 1

Puerto Rico, St. Croix and St. Thomas/St. John

Preferred Alternative 2 of Action 1(a) and **Preferred Alternative 2** of Action 1(b) are administrative actions and would not affect existing fishing practices. Hence, they would have no social impacts.

9.2.3.2 Action 2

Puerto Rico, St. Croix and St. Thomas/St. John

Neither **Preferred Alternative 2**, **Preferred Alternative 2(b)** nor **Preferred Alternative 2(d)** of Action 2(a) would have a direct impact on fishermen, their families or communities because neither would affect existing fishing practices. The indirect impacts of **Preferred Alternative 2, Preferred Alternative 2(b)** or **Preferred Alternative 2(d)** on fishermen, if any, are dependent upon the proposed ACLs in combination with AMs (Action 5).

The preferred alternatives may have indirect adverse social impacts if they motivate subsequent action (Action 5) that reduces average annual harvests, associated incomes and other related social benefits by reducing the length of federal fishing seasons. The resulting decrease in market supply of fish could cause retail prices of fish to increase. For people living in or near poverty, rising fish prices could significantly affect their consumption of fish. The magnitude of the indirect impact is substantially affected by two factors: the extent that landings derive from federal, as compared to territorial, waters; and second, regulatory changes. If landings derive entirely or almost entirely from territorial waters, a regulation that reduces the length of federal fishing seasons would have no to minimal impact, especially if fishermen could easily substitute fishing in territorial waters for fishing in federal waters. Conversely, if all or almost all of the landings derive from harvest in federal waters, a regulation that reduces the length of federal fishing seasons could have a substantial adverse social impact if it reduces incomes of fishermen and related incomes and employment that derive from fishing activities, such as fish wholesalers. Those losses of income and jobs, in turn, could cause an increase in the number of households living in or near poverty and decreased access to fish if prices of fish increase as a result of decreased supply. Moreover, those who keep some or all of their catch for their personal or household's consumption may be unable to maintain current levels of consumption if there is a shortened federal fishing season. Some fishermen may have to choose between reduced landings for sale and the income that go with it versus reduced landings for consumption. Without proposed Action 5, there would be no regulatory change and no social impact on fishermen, their families, households or communities. Furthermore, there have been a number of regulatory changes since 2005 that have reduced annual landings and may not be reflected in annual landings from 1999/2000 to 2005 or up to 2007. Consequently, current landings may not call for a shortened federal fishing season.

Preferred Alternative 2(h) of Action 2(a) would be consistent with federal and state bans on fishing for and possession of goliath and Nassau grouper. Consequently, it would not motivate regulatory change and would not have a direct or indirect social impact.

Preferred Alternative 2(h) would not have a direct impact on rainbow, midnight and blue parrotfish fishermen; however, it motivates **Preferred Alternative 2** of Action 4(a) that would prohibit harvesting of rainbow, midnight and blue parrotfish in federal waters

(Action 4(a)). The direct social impact of the proposed prohibition, which is the indirect impact of **Preferred Alternative 2(h)**, is discussed in section 9.2.3.4.

Preferred Alternatives 2 and **2(g)** of Action 2(b) would not have direct social impacts on queen conch fishermen, their families or their communities because it would not affect existing fishing practices. The combination of these preferred alternatives is consistent with the St. Croix District's 50,000-pound annual landings quota, and would not motivate regulatory changes that would directly affect existing queen conch fishing practices in federal waters. Hence, neither **Preferred Alternative 2** nor **Preferred Alternative 2(g)** would have a direct or indirect social impact.

9.2.3.3 Action 3

Puerto Rico, St. Croix and St. Thomas/St. John

Preferred Alternative 4 of Action 3(a) would not have a direct social impact on Puerto Rico, St. Croix or St. Thomas/St. John fishermen, their families, households, and/or communities; however, it may motivate regulatory change that reduces the length of federal fishing seasons or otherwise attempts to reduce average annual harvests of Snapper Units 1 and 2 in the EEZ off Puerto Rico and snapper and grouper in federal waters off the USVI.

Preferred Alternative 2 of Action 3(b) would separate commercial and recreational ACLs in Puerto Rico and have no direct social impact on fishermen of Puerto Rico. However, it could motivate regulatory changes that reduce the federal fishing seasons for Snapper Units 1, 2, 3 and 4, Grouper and Parrotfish. **Preferred Alternative 2** of Action 3(b) could indirectly benefit recreational and subsistence fishermen who fish in federal waters off Puerto Rico because they could not be in competition with commercial fishermen who also fish in the same federal waters should there be a race to harvest as many fish as possible before the federal fishing season is closed. In such a race, commercial fishing operations with larger vessels and gears capable of harvesting more of the sub-unit/units in the same or a shorter period of time would be favored over Puerto Rico's recreational and subsistence fishermen, which could reduce low income households' and families access to food fish.

Commercial fishermen with larger vessels and gears capable of harvesting more of the sub-unit/unit in the same or a shorter period of time would be favored over Puerto Rico's historic artisanal commercial fishermen if there was a race to harvest as many fish as possible before the federal fishing season is closed and overcapacity was allowed. Such an environment could result in lower long-term benefits that derive from the sub-unit/unit and the ecosystem of which it is part, and a transfer of benefits from artisanal fishermen to industrial-scale fishing operations, with potential social and economic losses to artisanal fishermen, their families and households and historic fishing communities. The actual indirect impacts of **Preferred Alternative 2** of Action 3(b) on commercial fishermen and fishing communities, however, would be dependent on if the regulatory, economic and other social environments support such a race. The likely indirect impacts are discussed in section 9.2.3.5.

Preferred Alternative 2 of Action 3(b) would not motivate regulatory change that reduces the length of the queen conch fishing season in the EEZ or otherwise attempts to reduce queen conch landings beyond current levels. Hence, it would not have a direct or an indirect adverse social impact on queen conch fishermen, their families and communities.

Preferred Alternative 2 of Action 3(c) would divide the Caribbean EEZ into three parts and manage the ACLs by island group, and **Preferred Alternative 2(a)** would use a mid-point or equidistant method for dividing the EEZ into the three parts. Neither **Preferred Alternative 2** nor **Preferred Alternative 2(a)** would have a direct social impact on fishermen, their families, households, and communities because it would not change existing fishing practices. However, it could have an indirect adverse social impact if it motivates regulatory changes that have adverse social impacts on Puerto Rico, St. Croix, St. Thomas/St. John fishermen, their families, households, and communities.

9.2.3.4 Action 4

Puerto Rico, St. Croix and St. Thomas/St. John

Preferred Alternative 2 of Action 4(a) would prohibit fishing for and possession of midnight parrotfish, blue parrotfish and rainbow parrotfish in federal waters. **Preferred Alternative 2** would have direct adverse social impacts on Puerto Rico, St. Croix and St. Thomas/St. John recreational, subsistence and commercial fishermen who harvest midnight, rainbow, and/or blue parrotfish in the EEZ.

As of March 9, 2010, there were 594 recreational (including subsistence) fishermen in the U.S. Caribbean registered with the National Angler Registry: 582 in Puerto Rico and 12 in the USVI). Therefore, **Preferred Alternative 8** would directly affect up to 582 recreational fishermen in Puerto Rico and up to 12 in the USVI. However, recreational fishermen in the U.S. Caribbean who fish in the EEZ tend to target pelagic species, not parrotfish.

Preliminary data and public comment suggest Puerto Rican fishermen do not catch parrotfish in the EEZ. It follows there would be no direct or indirect adverse social impact on commercial, recreational, or subsistence fishermen of Puerto Rico.

USVI fishermen catch parrotfish in federal waters, but it is unknown how many of these three species of parrotfish are caught in the EEZ. Parrotfish is a popular food fish among the locals in the USVI, especially St. Croix. It is sold in local fish markets where it is a low priced fish. However, reasonably foreseeable significant adverse impacts on the human environment are not anticipated because any harvest of these species would occur predominately in state rather than EEZ waters, fishers relate that these three large species of parrotfish are not commonly caught using the prevalent harvest gear, and the three species are relatively rare on Caribbean coral reefs (Table 4.4.1).

Up to 12 recreational fishermen in the USVI would have to target other species of parrotfish in federal waters or target these three species in territorial waters if they presently take blue, rainbow and/or midnight parrotfish in the EEZ. However, it is expected that these fishermen target pelagic species, not parrotfish, in federal waters, and **Preferred Alternative 8** would not have a direct or indirect adverse social impacts on recreational and subsistence fishermen, their families, households or communities.

The magnitude of the adverse socioeconomic impact of **Preferred Alternative 2** of Action 4(a) on St. Croix and St. Thomas/St. John commercial fishermen cannot be determined because of the lack of data. Reports of commercial landings in the USVI do not differentiate species of parrotfish. Nonetheless, blue, rainbow and midnight parrotfish are likely harvested in federal waters and landed in the USVI.

Cruzan commercial fishermen catch more parrotfish than their St. Thomas/St. John counterparts, and it is expected they have a greater likelihood of harvesting these species in the EEZ (Figures 9.18 and 9.19). Thus, St. Croix commercial fishermen and their families, households and communities would experience a larger adverse social impact than their counterparts in St. Thomas/St. John. One way for commercial fishermen in St. Croix and St. Thomas/St. John to mitigate for losses of economic and social benefits from landing these three species would be to increase landings of other species of parrotfish taken in the EEZ. However, the ability to increase landings of other parrotfish would be limited or could be eliminated by the proposed Parrotfish ACLs and shortened parrotfish fishing seasons in the EEZ off St. Croix and EEZ off St. Thomas/St. John. Hence, the adverse economic and social impacts of the ban on commercial fishermen in St. Croix and St. Thomas/St. John are inseparable from the economic and social impacts caused by the proposed St. Croix and St. Thomas/St. John Parrotfish ACLs and shortened federal parrotfish fishing seasons that are expected to occur in the St. Croix and EEZ off St. Thomas/St. Johns. For this reason, the RIR and this SIA incorporate the adverse impacts of the ban into the estimates of the adverse impacts of the proposed Parrotfish ACLs and shortened federal fishing seasons on commercial fishermen of St. Croix and St. Thomas/St. John.

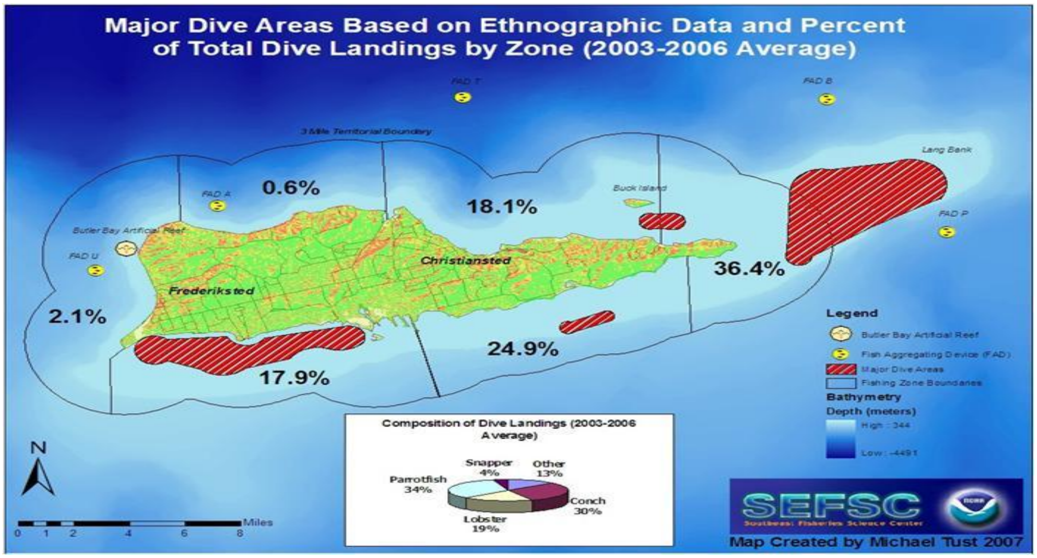

Figure 9.18. Major dive areas off St. Croix.

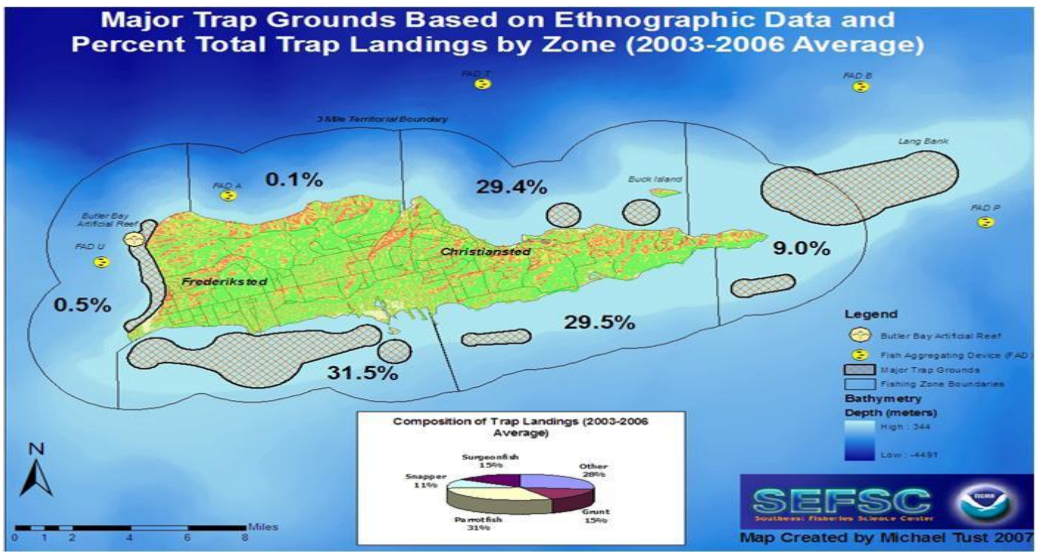

Figure 9.19. Major trap grounds off St. Croix.

Preferred Alternative 8 of Action 4(b) would establish an aggregate recreational bag limit for the Snapper, Grouper and Parrotfish Units in federal waters of five individual fish per recreational fisher including not more than two parrotfish per fisher or six parrotfish per boat, and 15 aggregate snapper, grouper, and parrotfish per boat on a fishing day. Charter fishing operations in the U.S. Caribbean do not target these species in federal waters. Similarly, the 582 recreational fishermen in Puerto Rico and 12 recreational fishermen registered with the National Angler Registry tend to target pelagic species, not snapper, grouper and/or parrotfish. Therefore, **Preferred Alternative 8** it not expected to have an adverse social impact on charter fishing operations or recreational and subsistence fishermen and their families, households or communities. However, if any of

Puerto Rico's recreational and subsistence fishermen expected to exceed the aggregate bag limit, they could substitute fishing in territorial waters for federal waters and there would be no adverse social impact on them, their families, households or communities.

There are no data on recreational fishing in the USVI; however, it is expected that from zero to 12 St. Croix and St. Thomas/St. John recreational and subsistence fishermen would be less able to substitute fishing in territorial waters for federal waters than their counterparts in Puerto Rico if they expected to exceed the aggregate bag limit. The zero to 12 St. Croix and St. Thomas/St. John recreational and subsistence fishermen could have less time fishing in federal waters and less fish to bring back home and consume; however, it is likely they would move into territorial waters if they wished to exceed the bag limit. Another option for these recreational fishermen would be to purchase a nonresident commercial fishing license in Puerto Rico, which would cost $250 and be good for four years and could be renewed. The aggregate bag limit would not apply to anyone with a commercial fishing license. **Preferred Alternative 8** is not expected to have an adverse social impact on St. Croix or St. Thomas/St. John recreational and subsistence fishermen.

Preferred Sub-alternative 2A of Action 4(c) further reduces the St. Croix parrotfish ACL, which indirectly results in longer reductions of the federal parrotfish fishing season in the St. Croix EEZ and smaller landings with associated adverse social impacts. The indirect adverse social impacts on St. Croix fishermen, their families and communities are described in the following paragraphs.

9.2.3.5a Action 5a

Puerto Rico, St. Croix and St. Thomas/St. John Fishing Sectors

Preferred Alternative 3 and **sub-alternative 3C** of Action 5(a) would not have a direct social impact on commercial, recreational and subsistence fishermen and charter fishing operators, their families or communities because they would not directly affect current fishing practices. However, **Preferred Alternative 3** and **sub-alternative 3C** would have indirect impacts because they motivate Action 5(b), which would directly affect existing fishing practices in the U.S. Caribbean by reducing federal fishing seasons in parts of the EEZ.

9.2.3.5b Action 5b

Puerto Rico, St. Croix and St. Thomas/St. John Charter Fishing Sectors

The 22 charter fishing operations in the U.S. Caribbean (nine in Puerto Rico, one in St. Croix and 12 in St. Thomas/St. John) target pelagic species in federal waters, not snapper, grouper or parrotfish, and certainly not queen conch. Therefore, **Preferred Alternative 2** is expected to have no adverse social impact on charter fishing operators of Puerto Rico, St. Croix, and/or St. Thomas/St. John.

The proposed commercial ACLs would apply to the nine charter fishing operators in Puerto Rico because state regulation requires them to have a commercial fishing license. If any charter fishing operator harvests snapper, grouper or parrotfish in federal waters, s/he would be in competition with 868 active commercial fishermen if there were a race to the commercial ACL before the fishing season were closed in the EEZ off Puerto Rico. In such a race, commercial vessels would be at an advantage because they can harvest and land more fish in a specified period of time.

The proposed ACLs that apply to the commercial fishermen in St. Croix would also apply to the charter fishing operators and recreational and subsistence fishermen in St. Croix, and similarly, the proposed ACLs that apply to the commercial fishermen in St. Thomas/St. John would also apply to the charter fishing operations and recreational and subsistence fishermen in St. Thomas/St. John. If MRFSS is extended to the USVI and recreational (including subsistence) landings are recorded, any of the 13 USVI charter fishing operators (one in St. Croix and 12 in St. Thomas/St. John) who harvest snapper, grouper or parrotfish in federal waters would be in competition with 383 commercial fishermen and 12 recreational and subsistence fishermen who fish in federal waters. Such competition may encourage a race to an ACL before the federal fishing season is closed. In such a race, commercial fishermen would have the advantage of being able to harvest more pounds per trip than charter fishing operators and recreational and subsistence fishermen. Charter fishing operators and their families, households and communities would experience a loss of social benefits in such a scenario.

Puerto Rico Recreational and Subsistence Sectors

Preferred Alternative 2 of Action 5(b) would have no social impact on Puerto Rico's recreational and subsistence fishermen who fish for and harvest queen conch, their families, households and communities because queen conch fishing and transportation of queen conch is presently prohibited in the EEZ off Puerto Rico, and this action would not change that prohibition.

Preferred Alternative 2 of Action 5(b) is expected to have no social impact on Puerto Rico's recreational and subsistence fishermen who fish for and land parrotfish, their families, households and communities because preliminary data and public comment suggest parrotfish are caught in territorial, not federal, waters. Moreover, the proposed Recreational Parrotfish ACL is substantially larger than expected future landings, which would not trigger a shortened recreational parrotfish fishing season in the EEZ off Puerto Rico. A shortened federal fishing season, if any, in Puerto Rico's EEZ would not affect current landings of parrotfish unless the territory imposed compatible recreational ACLs and AMs.

The proposed Recreational ACLs for grouper and Snapper Unit 2 are greater than expected future recreational landings. Therefore, there are expected to be no adverse social impacts on recreational and subsistence fishers of Puerto Rico who harvest these species.

As described in Section 7, the proposed Recreational ACLs for Snapper Unit 1, Snapper Unit 3, and Snapper Unit 4 are less than expected future recreational landings of these subunits. Consequently, **Preferred Alternative 2** would reduce the recreational (including subsistence) fishing seasons for these subunits in the EEZ off Puerto Rico in 2011 and subsequent years and could affect to up to 582 recreational (including subsistence) fishermen in Puerto Rico. However, it is anticipated that few to none of the 582 recreational (including subsistence) fishermen would stop or reduce fishing in the EEZ if the recreational fishing seasons for these subunits or other subunits/units in the EEZ off Puerto Rico were closed because recreational fishermen target pelagic species, not snapper, in federal waters. Nonetheless, if there were any recreational fishermen adversely affected by the shortened fishing seasons, they could mitigate for loss of fishing by moving into territorial waters or targeting other species in federal waters during the time any one of these fishing seasons in closed in the EEZ off Puerto Rico or increase effort during the time a federal recreational Snapper Unit fishing season is open. The latter increase in effort, however, is less likely than the other mitigating behaviors.

Puerto Rico commercial sector

Preferred Alternative 2 of Action 5(b) would have no social impact on Puerto Rico's commercial fishermen who fish for and harvest queen conch, their families, households and communities because queen conch fishing and transportation of queen conch is presently prohibited in the EEZ off Puerto Rico, and this action would not change that prohibition.

Preferred Alternative 2 of Action 5(b) is expected to have no social impact on Puerto Rico's commercial fishermen who fish for and land parrotfish, their families, households and communities because preliminary data and public comment suggest parrotfish are caught in territorial, not federal, waters. A shortened federal fishing season, if any, in Puerto Rico's EEZ would not affect current landings of parrotfish unless the territory imposed compatible commercial ACLs and AMs.

As described in Section 7, the proposed Commercial ACLs for Snapper Units 1, 3 and 4 and Grouper are higher than expected future landings of these subunits/units. Thus, there are expected to be no overages of landings of these species, no reduced federal fishing seasons for these species, and no associated adverse social impacts. The recent increase in the Bajo de Sico closure from three to six months has likely decreased future landings of these species, especially Snapper Unit 1, and the likelihood of an overage in the future. However, if there were an overage, it is expected that Puerto Rico's commercial fishermen would mitigate for adverse impacts of shortened federal fishing seasons for Snapper Units 1, 3 and/or 4 by relocating to state waters.

Any adverse social impacts from shortened Snapper Unit 1, 3 or 4 federal fishing seasons, although unlikely, would not be uniform. For example, commercial fishermen who land their Snapper Unit 1 catches on Puerto Rico's west coast could experience the largest adverse economic and social impact because a large majority of Snapper Unit 1 landings occur on the west coast. According to Griffith et al. (2007: 11, 12), silk snapper was the most landed commercial species in the west coast municipalities of Añasco, Aguada, and Aguadilla and north coast municipalities of Arecibo, Barceloneta, Vega Baja, Vega Alta, Dorado, and Loíza from 1999 to 2003. Silk snapper was the second most commercially landed species in the west coast municipalities of Rincón and the third most commercially landed species in the north coast municipality of Isabela. During that 5-year period, landings of silk snapper represented 41 percent of the total pounds of all species landed in Añasco, 13 percent in Aguada, 13 percent in Aguadilla, and 25 percent of total pounds landed in Rincón (Griffith et al. 2007). Vermilion snapper was the second most landed species in Loíza and Rio Grande, representing 8.5 percent and 9.9 percent of each municipality's total landings, respectively.

If there were an overage of Snapper Unit 3 commercial landings, although expected to be unlikely, the most likely fishermen affected by a shortened federal fishing season would be where lane snapper is the top ranked commercial species. It has been the most landed species by commercial fishermen in the south coast municipalities of Santa Isabel, Salinas, and Maunabo (Table 9.37) The species has been the second most important species to commercial fishermen in Mayagüez, Añasco, Ponce, Juana Diaz, Patillas, Luquillo, Yabucoa, Maunabo and third most important species in San Juan, Guayama, Lajas, and Cabo Rojo. Mutton snapper is the second most important species in Salinas, Guayanilla, and Camuy, and third most in Santa Isabel.

Table 9.37. Municipalities where lane and mutton snapper are among top three species landed, 1999 to 2003. Source: Griffith et al. 2007.

Coastal Municipalities			
West	**South**	**North**	**East**
Maunabo	Salinas	Luquillo	Yabucoa
Mayagüez	Santa Isabel	San Juan	Maunabo
Añasco	Ponce	Camuy	
Cabo Rojo	Juana Diaz		
	Patillas		
	Guayama		
	Lajas		
	Guayanilla		

If there were an overage of Snapper Unit 4 commercial landings and a shortened federal fishing season, although not expected, the greatest adverse social impact would be on those commercial fishermen, their families, households and communities where yellowtail snapper represents the top most landed species. Yellowtail snapper accounted for the most commercial landings in the municipalities of San Juan Mayagüez, Ponce, Camuy, Rio Grande, Fajardo, and Yabucoa from 1999 to 2003 (Griffith et al. 2007). It was the second most species landed in Salinas, Vieques, and Humacao, and third most ranked in Santa Isabel, Carolina, and Loíza (Table 9.38).

Table 9.38. Municipalities where yellowtail snapper is among the top three species landed, 1999 to 2003. Source: Griffith et al. 2007.

Coastal Municipalities			
West	**South**	**North**	**East**
Mayagüez	Ponce	San Juan	Fajardo
	Salinas	Camuy	Yabucoa
	Santa Isabel	Rio Grande	Vieques
		Carolina	Humacao
		Loíza	

The magnitude of the adverse economic and social impacts would be dependent on the commercial fishermen's abilities to mitigate for potential losses of Snapper Unit 1, 3 and/or 4 landings, incomes and consumption by increasing effort during the open season, targeting other species and/or moving into territorial waters. Their abilities to increase effort during the open season may be small given the historical fact that fishermen tend to have other jobs and their vessels have limited storage capacity. Because many of Puerto Rico's commercial fishermen retain part of their catch for their personal or household's consumption, they may have to reduce their personal or household's consumption in order to maintain current revenues and income from fishing. Conversely, they may have to forego some revenues and associated incomes in order to maintain current levels of personal and household consumption of these snapper species. Given the high rate of poverty in Puerto Rico, a shortened fishing season could increase the risk of fishing families and households having incomes below the poverty threshold. Also, if there were a decrease in the supply of Snapper Unit 1 species without an increase in the supply of substitute food fish, the retail price of Snapper Unit 1 species would increase and access to these species would be reduced.

The proposed Commercial Snapper Unit 2 ACL is less than expected future landings. Thus, a shortened commercial Snapper Unit 2 fishing season in the Puerto Rico is expected in 2011 and subsequent years. The RIR estimates a total loss of 13,975 pounds of Snapper 2 with an ex-vessel value of $104,812 over the 10-year period from 2011 to 2020. Therefore, **Preferred Alternative 2** of Action 5(b) would have adverse economic and social impacts on Puerto Rico commercial fishermen, their families and communities who currently harvest proposed Snapper Unit 2 species in federal waters off Puerto Rico. The largest adverse impact would likely be experienced by commercial fishermen on the west coast because the west coast lands substantially more queen snapper than the other coasts combined. The west coast municipality of Rincón ranked number one in landings of the species from 1999 to 2003. The estimate of economic costs assumes commercial fishermen mitigate for loss of revenues and associated incomes from Snapper Unit 2 landings due to a shortened federal fishing season by shifting effort from the EEZ off Puerto Rico to territorial waters or other parts of the EEZ if they remain open to Snapper Unit 2 fishing. Such mitigating behavior, however, would have displacement costs, such as catch-and-landings changes, trip-level search and associated costs, crowding and congestion costs, and personal safety costs, which may be repeated in a number of years. Puerto Rico's commercial fishermen could also mitigate for a shortened federal Snapper Unit 2 fishing season by increasing harvest of other species and/or effort to harvest the same number of or more Snapper Unit 2 species in a shortened federal fishing season; however, their ability to increase effort may be small because Puerto Rico’s commercial fishermen tend to hold other jobs and their vessels are relatively small. Personal and household incomes of Snapper Unit 2 fishermen could fall. Puerto Rico’s commercial fishermen may have to reduce the portion of their catches kept for personal or their households’ consumption in order to maintain current revenues and income from fishing, or forego some revenues and associated incomes in order to maintain current levels of personal and household consumption of Snapper Unit 2 species. Given the high rate of poverty in Puerto Rico, a shortened fishing season could increase the risk of fishing families having incomes below the poverty threshold.

St. Croix recreational and subsistence sectors

The proposed ACLs that apply to the 223 commercial fishermen in St. Croix would also apply to the one charter fishing operator and up to 12 recreational and subsistence fishermen in St. Croix. If MRFSS is extended to the USVI and recreational (including subsistence) landings are recorded, the one charter fishing operator and up to 12 recreational and subsistence fishermen in St. Croix who fish in federal waters would be in competition with 223 commercial fishermen. Such competition may encourage a race to an ACL before the fishing season is closed in the EEZ off St. Croix. In such a race, St. Croix’s commercial fishermen would have the advantage of being able to harvest more pounds per trip than the one charter fishing operator and recreational and subsistence fishermen. The up to 12 recreational and subsistence fishermen and their families, households and communities would experience a loss of social benefits in such a scenario.

Recreational and subsistence fishing for parrotfish, snapper and grouper could increase as individuals and families attempt to increase their access to these species, especially during the months that the EEZ off St. Croix is closed to fishing for these species. At present, recreational landings are not reported and counted. A common ACL could likely result in a significant and substantial reduction in recreational landings because commercial fishermen would likely have the advantage of being able to catch more in a shorter or same period of time.

St. Croix queen conch commercial sector

Preferred Alternative 2 of Action 5(b) would have no social impact on St. Croix’s commercial fishermen who fish for and harvest queen conch, their families, households and communities because this action would not change existing queen conch fishing practices.

St. Croix parrotfish commercial sector

Parrotfish is the second most common species that Cruzan commercial fishermen target (Stoffle et al. 2009). In 2004, 85 percent of St. Croix's commercial fishermen reported that they targeted reef fish, which includes parrotfish. Parrotfish have been abundant on the reefs of the U.S. Virgin Islands. It is primarily consumed by locals and served in restaurants that cater to locals rather than tourists. Parrotfish is a much desired "potfish." It is not uncommon for locals to turn away a seven pound mutton snapper and buy seven one pound squirrel fish, blue or red parrotfish, angelfish, or grunts. The seven pounds of potfish feed a larger number of people and are said to be the preferred species of local consumers (Stoffle et al. 2009). Parrotfish are culturally important to Cruzans (Valdés-Pizzini et al. 2010), and their importance during times of rising unemployment, a rising consumer price index and falling household incomes likely increases substantially.

During the 10-year period from 1998 to 2007, an average of approximately 31 percent of St. Croix's annual commercial landings derived from parrotfish landings. However, there was a general increase in commercial landings of parrotfish from 2000 to 2007. During these eight years, St. Croix's landings accounted for approximately 87 percent of the territory's annual landings of the species, on average.

The proposed St. Croix Parrotfish ACL is less than expected future landings, which would shorten parrotfish fishing seasons in the EEZ off St. Croix and reduce commercial landings. Over the 10-year period from 2011 to 2020, fishermen and consumers would lose from 754,124 to 1,148,473pounds of parrotfish with a value of approximately $3.77million to $5.74 million. If all 223 fishermen harvest parrotfish, the average 10-year loss per fisherman would be 3,382 to 5,150 pounds with a value ranging from $16,909 to $25,751. However, if 85 percent of commercial fishermen target parrotfish, or 190 fishermen, the average 10-year loss in 2011 would range from 3,969 to 6,045 pounds and $19,845 to $30,223, and the average annual loss per fisherman would range from $1,985 to $3,022. These losses would result in lower personal and household incomes. As previously noted, the median household and family income in the USVI was $24,704 in 2000.

The decrease in parrotfish landings would most likely drive up the price of parrotfish, especially during the two months when the federal season is closed, which would have an adverse impact on locals who regularly consume parrotfish, The cultural significance of parrotfish as a food source suggests market demand is relatively insensitive to price changes; however, higher prices of parrotfish may reduce low income individuals, families and households' access to parrotfish.

The largest adverse social impact would be on those individuals, families and households in low-income populations who have reduced access to a culturally important food fish. At the same time, reduced landings and sales of parrotfish catch would have an adverse economic and social impact on Cruzan commercial fishermen, their families and households, and that could be substantial. Fishermen tend to be in low-income groups and such a loss would significantly increase their risk of having incomes below the poverty threshold or below the extreme poverty threshold. Fishermen, who typically retain a portion of their catch for their own or household's consumption, may have to substantially reduce such consumption in order to avoid a significant decrease in ex-vessel revenue and the income that derives from that revenue. It is very likely that recreational and subsistence fishing for parrotfish would increase as individuals and families attempt to increase their access to parrotfish, especially during the two months that the EEZ off St. Croix is closed to parrotfish fishing. At present, recreational landings of parrotfish are not reported and counted.

Many St. Croix fishermen do not rely on fishing to provide all of their household income. A possible consequence of this action is that it increases the percent of Cruzan fishermen who take wage-labor jobs to make up for lost incomes.

Recreational and subsistence fishing for parrotfish could increase as individuals and families attempt to increase their access to parrotfish, especially during the months that the EEZ off St. Croix is closed to parrotfish fishing. At present, recreational landings of parrotfish are not reported and counted.

If in the future recreational landings are counted against the St. Croix Parrotfish ACL, commercial fishermen would be in direct competition with recreational and subsistence fishermen. In consequence, commercial fishermen would have larger reductions in landings than estimated here.

The ability of Cruzans to purchase parrotfish is also affected by closures in St. Thomas/St. John. If the closures overlap, there could be a substantial shortage of grouper in the USVI as whole and associated price increases.

St. Croix grouper commercial sector

As described in the RIR, there is expected to be an overage of grouper landings in St. Croix and shortened grouper fishing seasons in the St. Croix EEZ. St. Croix's commercial fishermen are expected to lose from 6,855 to 9,482 pounds of grouper with an ex-vessel value from $51,415 to $71,188 over the 10-year period from 2011 to 2020. These losses are expected to have an adverse impact on fishermen's personal and household incomes and the decreased supply of local grouper is expected to increase the retail price of grouper.

The ability of Cruzans to purchase grouper is also affected by closures in St. Thomas/St. John. If the closures overlap, there could be a substantial shortage of grouper in the USVI as whole and associated price increases.

Recreational and subsistence fishing for grouper could increase as individuals and families attempt to increase their access to grouper, especially during the months that the EEZ off St. Croix is closed to grouper fishing. At present, recreational landings of grouper are not reported and counted.

St. Croix snapper commercial sector

The proposed St. Croix Snapper ACL is expected to cause shortened snapper fishing seasons in the St. Croix EEZ and reduced landings. The Regulatory Impact Assessment estimates a 10-year loss of snapper landings in St. Croix ranging from 172,981 to 248,737 pounds with an ex-vessel value from approximately $1.3 million to $1.9 million. These losses are expected to have an adverse impact on fishermen's personal and household incomes and the decreased supply of local snapper is expected to increase the retail price of snapper.

Recreational and subsistence fishing for snapper could increase as individuals and families attempt to increase their access to snapper, especially during the months that the EEZ off St. Croix is closed to snapper fishing. At present, recreational landings of snapper are not reported and counted.

The ability of Cruzans to purchase snapper is also affected by closures in St. Thomas/St. John. If the closures overlap, there could be a substantial shortage of snapper in the USVI as whole and associated price increases.

Cumulative impact on the St. Croix commercial sector

Neither snapper nor grouper has the cultural significance of parrotfish. Nonetheless, the losses of the snapper and grouper commercial landings combined with the substantially larger losses of parrotfish landings represent significant and substantial losses of local and fresh food production, which significantly decrease St. Croix's food security.
St. Croix commercial fishermen target multiple species, and the top two groups are reef fish and deepwater snapper. In 2004, 85 percent of fishermen targeted reef fish and 42 percent targeted deepwater snapper (Kojis 2004). This proposed rule, however, is assumed to have adverse economic and social impacts on all Cruzan commercial fishermen, their families, and households. The actual impact per fisherman is expected to vary considerably. Approximately 60 percent of St. Croix's commercial fishermen receive all of their incomes from fishing. Fifty-four percent of fishermen derive more than half of their incomes from fishing, 13 percent earn 25 to 50 percent of their incomes from fishing, and 33 percent of fishermen derive less than a quarter of their income from fishing.

Parrotfish is a culturally significant food source in St. Croix, and the largest adverse social impact is expected to result from reduced access to this staple of the Cruzan diet. There is expected to be an overlap in the timing of the closures of the parrotfish and snapper fishing seasons in the EEZ off St. Croix. In 2011, for example, the parrotfish fishing season would be reduced by two months and the snapper season by 2.5 months. The adverse economic and social impact is expected to be its greatest during the months that both federal fishing seasons are closed. During that time, among the fishermen, there would be increased competition for parrotfish and snapper in territorial waters and other areas of the EEZ that remain open to parrotfish and snapper, as well as for other species, especially pot fish. The number of trips and/or lengths of fishing trips may change as individual fishermen attempt to maintain catches sufficient to retain their identities, both economically and socially, as commercial fishermen. In 2004, St. Croix's commercial fishermen averaged 3.3 trips per week with an average duration of 6.7 hours. The range of weekly trips varied from 0.25 to 7 with a ranging duration of one to 13 hours. Fishermen and their helpers who can increase the number of hours that they fish may able to lower their expected losses of landings; however, the social cost may be less time with family members and reduced production of household services, such as child or elderly care. Those who cannot increase their time fishing may experience significant landings and income losses. Similarly, individuals, families and households that traditionally consume parrotfish or both parrotfish and snapper during the time both seasons are close will experience reduced availability of and access to parrotfish and snapper, and reduced access to substitute species, especially other pot fish, because their prices will have increased as well. The higher prices would have a larger adverse economic and social impact on the island's low income families and households who are more likely Black or non-White.

In 2004, 61 percent of St. Croix's commercial fishermen fished full-time, 31.5 percent fish part-time (36 hours or less per week), and the remaining 7.5 percent were opportunists. Eighty-nine percent of them fished with a helper and approximately 10 percent fished with another commercial fisherman. Thus, the actual impact on fishermen may vary considerably. If a competition for the Parrotfish ACL and Snapper ACL were to occur, those fishermen and helpers able to fish more hours during the time the seasons are open in the EEZ off St. Croix would have an advantage of their counterparts. Individuals unable to fish more hours because they hold wage-paying jobs and are responsible for childcare and/or other household production could lose their historic shares of St. Croix's parrotfish and snapper landings. Conversely, families and households could lose valued household services because one or more of their members has to fish more hours in order to keep their historic shares of the landings. Furthermore, losses of income could require fishing or non-fishing family members to take wage-paying jobs or increase hours at such jobs, which could reduce their performance of household services, such as caring labor.

Median family income varies substantially by race in St. Croix (Figure 9.8). In 2007, the median family income for Whites was $75,001 and $40,939 for Blacks. Families of another race had a median family income of $24,845. In 2004, no more than 8 percent of St. Croix's commercial fishermen self-identified themselves as White and 43.4 percent as Black or Black Hispanic. This suggests the cumulative impact of the proposed rule would have a disproportionate impact on lower income and non-White families of St Croix.

Fishermen and their helpers, families and households would likely experience decreases in consumption of parrotfish and snapper as a result of this proposed rule. Twenty percent of St. Croix commercial fishermen reported that they bring their catches home (Kojis 2004). The abilities of these social units to mitigate for losses of income and traditional food fish would be limited by larger economic and other social conditions. For example, Cruzan fishermen tend to be less educated than the general population, which reduces their job opportunities and expected hourly wages. Also, those who have relied on fishing for all of their personal and/or household incomes in the past and have not held a job other than fishing may find it difficult to find a wage-labor job. Cruzan fishermen also tend to be older than the general population and may also be subjects of age discrimination. Non-fishing individuals, families and households would likely be affected by higher prices of parrotfish, snapper and grouper, which could represent a significant decline in individual and household real incomes. The per-capita consumption of seafood has been historically high in the USVI and such consumption could be compromised. Although tourists and high-income residents could afford the higher prices, the large percent of working poor would likely not be able to maintain their historical diets of locally caught seafood.

St. Croix commercial fishermen use multiple landings sites; however, the three most popular are Altona Lagoon, Molasses Pier, and Frederiksted Fishermen's Pier (Table 5.3.39). A consequence of the proposed rule may be the decline of the number of landing sites, especially if the number of fishermen who harvest parrotfish and snapper falls.

Cruzan commercial fishermen distribute their catches to various social units, and smaller catches reduce the availability of fresh fish to these units. Twenty-four percent of St. Croix's fishermen sell their catches at the landing sites (Figure 9.20). Twenty percent bring their catch home to their households and another four percent, included in "Other," do not sell their catches. Thirty-eight percent of the fishermen sell their catches to commercial establishments: restaurants, buyers and retailers. Approximately 17 percent sell their catches to the mid-island Government Fish Market. Unlike in St. Thomas/St. John, few Cruzan commercial fishermen sell their catches alongside the road.

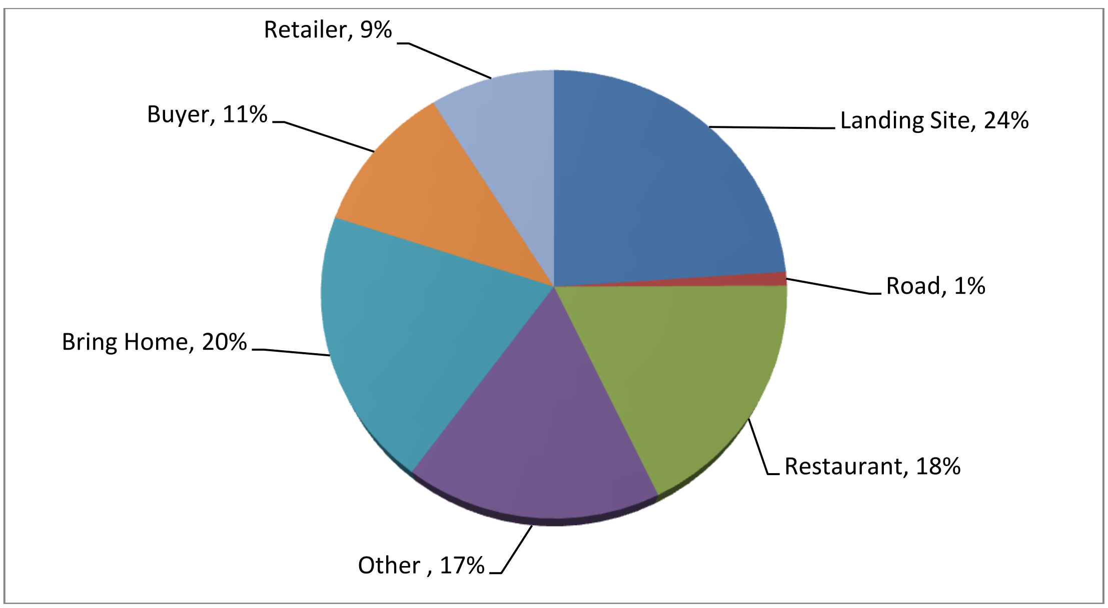

Figure 9.20. Percent of St. Croix commercial fishermen by whom they sell/give their catches to. Source: Kojis 2004.

St. Thomas/St. John recreational and subsistence sectors

The proposed ACLs that apply to the 160 commercial fishermen in St. Thomas/St. John would also apply to the 12 charter fishing operators and up to 12 recreational and subsistence fishermen in St. Thomas/St. John. If MRFSS is extended to the USVI and recreational (including subsistence) landings are recorded, the 12 charter fishing operators and up to 12 recreational and subsistence fishermen in St. Thomas/St. John who fish in federal waters would be in competition with 160 commercial fishermen. Such competition may encourage a race to an ACL before the fishing season is closed in the EEZ off St. Thomas/St. John. In such a race, commercial fishermen would have the advantage of being able to harvest more pounds per trip than the one charter fishing operator and recreational and subsistence fishermen. The up to 12 recreational and subsistence fishermen and their families, households and communities would experience a loss of social benefits in such a scenario.

In reaction to lower commercial landings of parrotfish, snapper and grouper and higher retail prices of these species, recreational and subsistence fishing for parrotfish, especially among lower income groups, may increase as a result of decreased commercial landings. Presently recreational landings are not reported and counted against the ACL; however, if that were to change, the ability to recreationally harvest parrotfish would likely be adversely affected.

St. Thomas/St. John queen conch commercial sector

Preferred Alternative 2 of Action 5(b) would have no social impact on St. Thomas/St. John's commercial fishermen who fish for and harvest queen conch, their families, households and communities because queen conch fishing and transportation of queen conch is presently prohibited in the EEZ off St. Thomas/St. John, and this action would not change that prohibition.

St. Thomas/St. John parrotfish commercial sector

As described in the Regulatory Impact Review, this proposed rule is expected to cause shortened parrotfish fishing seasons in the St. Thomas/St. John EEZ and reduced landings of parrotfish in St. Thomas/St. John. Over the 10-year period from 2011 to 2020, there would be a loss of parrotfish landings ranging from 10,338 to 17,756 pounds and with an ex-vessel value from $51,689 to $88,779. Parrotfish does not have the cultural significance in St. Thomas/St. John that it has in St. Croix, in part, because parrotfish has been considered a poor man's food fish and the median household incomes in St. Thomas and St. John are significantly higher than in St. Croix. However, among those in low income groups in St. Thomas/St. John, parrotfish may represent an important, low-priced food. The reduced landings are expected to cause the retail price of parrotfish to increase.

St. Thomas/St. John snapper commercial sector

The RIR estimates St. Thomas/St. John commercial fishermen would lose from 203,180 to 247,159 pounds of snapper with an ex-vessel value from $1.52 million to $1.85 million over the 10-year period from 2011 to 2020. Not all St. Thomas/St. John licensed commercial fishermen are likely to be directly affected by a snapper reduced fishing season. In 2004, 5 percent of St. Thomas/St. John fishermen reported that they targeted deepwater snapper and 78 percent targeted reef fish.

Fishermen could act to mitigate for losses by targeting other species during the time the federal snapper season is closed in the St. Thomas/St. John EEZ or increasing effort when the season is open. However, individuals unable to fish more hours because they hold wage-paying jobs and/or are responsible for childcare and other household production could lose their historic shares of St. Thomas/St. John's snapper landings. Conversely, families and households could lose valued household services because one or more of their members has to fish more hours in order to keep their historic shares of the landings. Furthermore, losses of income could require fishing or non-fishing family members to take wage-paying jobs or increase hours at such jobs, which could reduce their performance of household services, such as caring labor.

St. Thomas/St. John grouper commercial sector

The RIR estimates St. Thomas/St. John commercial fishermen would lose from 31,069 to 47,316 pounds of grouper with an ex-vessel value ranging from $233,019 to $354,876 over the 10-year period from 2011 to 2020.

Fishermen could act to mitigate for associated social losses by targeting other species during the time the federal snapper season is closed in the St. Thomas/St. John EEZ or increasing effort when the season is open. However, individuals unable to fish more hours because they hold wage-paying jobs and/or are responsible for childcare and other household production could lose their historic shares of St. Thomas/St. John's snapper landings. Conversely, families and households could lose valued household services because one or more of their members has to fish more hours in order to keep their historic shares of the landings. Furthermore, losses of income could require fishing or non-fishing family members to take wage-paying jobs or increase hours at such jobs, which could reduce their performance of household services, such as caring labor.

Cumulative Impact on the St. Thomas/St. John commercial sector

St. Thomas/St. John commercial fishermen tend not to specialize in any one species. Hence, those who lose a portion of their current landings of parrotfish would likely also lose a portion of their current snapper and grouper landings. Over the 10-year period from 2011 to 2020, St. Thomas/St. John commercial fishermen would lose 244,587 to 312,230 pounds of parrotfish, snapper and grouper with an ex-vessel value from $1.81 million to $2.30 million.

Approximately 77 percent of St. Thomas/St. John's commercial fishermen fish full-time, 19 percent fish part-time, 3 percent are opportunists and one percent is a charter fishing operation (Kojis 2004). Fifty-nine percent of the fishermen fish with a helper, 29 percent fish with another commercial fisherman, and 17 percent fish alone. Approximately 60 percent receive all of their income from fishing. Seventy-five percent of St. Thomas/St. John's commercial fishermen obtain more than half of their incomes from fishing, 7 percent of fishermen obtain 25 to 50 percent of their incomes from fishing and 18 percent of fishermen receive less than 25 percent of their incomes from fishing. If a competition for the Parrotfish ACL, Snapper ACL and/or Grouper ACL were to occur, those fishermen and helpers able to fish more hours during the time the seasons are open in the EEZ off St. Thomas/St. John would have an advantage of their counterparts.

Median family income varies substantially by race in St. Thomas and St. John, (Figures 9.8 and 9.9). In 2007 in St. Thomas, the median family income was $62,918 for Whites, $42,476 for Blacks, and $41,251 for families of another race. In St. John, the median family income was $61,251 for Whites, $48,751 for Blacks and $36,251 for others. In 2004, approximately 39 percent of fishermen identified themselves as Black or Black French, nine percent identified themselves as White and 49 percent identified themselves as non-Black French. This suggests a majority of St. Thomas/St. John fishermen may be representatives of non-White and non-Black families, which have the lowest median family incomes.

Fishermen and their helpers, families and households would likely experience decreases in consumption of parrotfish, snapper and grouper as a result of this proposed rule. Five percent of St. Thomas/St. John commercial fishermen reported that they bring their catches home (Kojis 2004). The abilities of these social units to mitigate for losses of income and traditional food fish would be limited by larger economic and other social conditions. For example, fishermen tend to be less educated than the general population, which reduces their job opportunities and expected hourly wages. Also, those who have relied on fishing for all of their personal and/or household incomes in the past and have not held a job other than fishing may find it difficult to find a wage-labor job. Fishermen also tend to be older than the general population and may also be subjects of age discrimination. Non-fishing individuals, families and households would likely be affected by higher prices of parrotfish, snapper and grouper, which could represent a significant decline in individual and household real incomes. The per-capita consumption of seafood has been historically high in the USVI and such consumption could be compromised. Although tourists and high-income residents could afford the higher prices, the large percent of working poor would likely not be able to maintain their historical diets of locally caught seafood.

St. Thomas/St. John commercial fishermen use multiple landings sites. The top six landings sites in St. Thomas are Frenchtown, Hull Bay, Benner Bay, Seaside Inn at Benner Bay, Water Bay, and Krum Bay (Table 5.3.38), and the top two sites in St. John are Cruz Bay and Coral Bay (Table 5.3.37). A consequence of the proposed rule may be the decline of the number of landing sites, especially if the number of fishermen who harvest snapper falls.

St. Thomas and St. John commercial fishermen distribute their catches to various social units, and smaller catches reduce the availability of fresh fish to these units. Twenty-eight percent of St. Thomas/St. John's fishermen sell their catches at the landing sites and 22 percent of fishermen sell their catches alongside the road to individuals, families and households (Figure 9.21). Twenty percent sell to restaurants. Five percent bring their catch homes. Twenty-one percent of commercial fishermen sell or give their catch to "others." These others include special customers, formal and informal fish markets, and giving the catch away to individuals, families and households. Four percent of the fishermen sell their catches to buyers and retailers. The reduction in parrotfish, snapper and grouper landings would reduce availability of these food fish at many to all of these social units, and higher prices would decrease individuals, families and households' access to snapper.

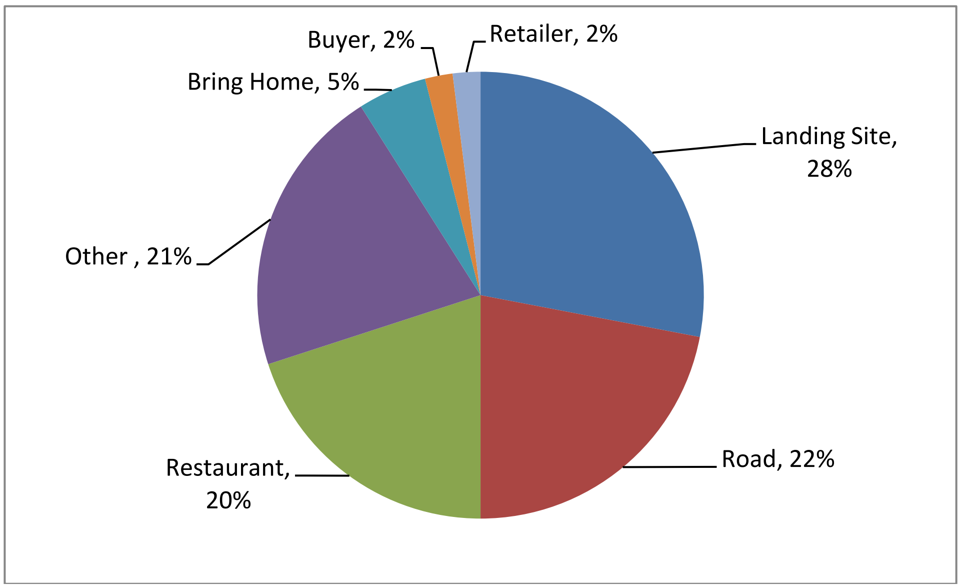

Figure 9.21. Percent of St. Thomas/St. John commercial fishermen by who/where they sell or give away their catch.

The ability of individuals, families and households to mitigate for losses of income and/or traditional food fish would be limited by larger economic and other social conditions. For example, fishermen belonging to a racial or ethnic minority could be subjects of institutionalized racist or ethnocentric discrimination. St. Thomas/St. John fishermen tend to be less educated than the general population, which would reduce their job opportunities and expected hourly wages. Also, those who have relied on fishing for all of their household incomes in the past and have not held a job other than fishing may find it difficult to find a wage-labor job. St. Thomas/St. John fishermen also tend to be older than the general population and may also be subjects of age discrimination. Non-fishing individuals, families and households would likely be affected by higher prices of parrotfish, snapper and grouper, which could represent a significant decline in individual and household real incomes. The per-capita consumption of seafood has been historically high in the USVI and such consumption could be compromised. Although tourists and high-income residents could afford the higher prices, the large percent of working and non-working poor may not be able to maintain their historic diets of locally caught seafood.

If demand for land continues to increase in St. Thomas and St. John, increasing numbers of fishermen may sell their land in partial response to declining fishing opportunities. Whereas St. Croix fishermen who sold their coastal properties were able to move inland, there are little to no such options in St. Thomas and St. John. In that event, these individuals, families and households would likely have to move to another island.

9.2.3.6 Action 6

Action 6 is an administrative action, and, as such, would not directly affect U.S. Caribbean fishermen, their families, households or communities, and any impacts are dependent upon future regulatory actions.

9.2.3.7 Comparison of Cumulative Impacts on All Island Areas

There would be a disproportionate adverse economic impact on St. Croix and St. Thomas/St. John commercial fishermen (Table 7.34). St. Croix commercial fishermen would incur approximately 66 percent of the cost in terms of lost value of landings, and St. Thomas/St. John commercial fishermen would incur the remaining 34 percent.

The largest loss would be of parrotfish landings in St. Croix. St. Croix fishermen would lose $0.49 million to $0.57 million over the 10-year period from 2011 to 2020 (Tables 7.13-7.15). Commercial fishermen tend to be in low-income groups and such a loss would significantly increase their risk of having incomes below the poverty threshold or below the extreme poverty threshold. St. Croix and St. Thomas/St. John fishermen could act to mitigate for losses by targeting other species during the time the federal seasons are closed or increasing effort when the seasons are open. However, fishermen and helpers unable to fish more hours because they hold wage-paying jobs and/or are responsible for childcare and other household production could lose their historic shares of landings. Conversely, fishing families and households could lose valued household services because one or more of their members has to fish more hours in order to keep their historic shares of the landings. Furthermore, losses of fishing income could require fishing or non-fishing family members to take wage-paying jobs or increase hours at such jobs, which could reduce their performance of household services, such as caring labor. Fishermen, who typically retain a portion of their catch for their own or household's consumption, may have to substantially reduce such consumption in order to avoid a significant decrease in ex-vessel revenue and the income that derives from that revenue.

The largest adverse social impact would be on those low income individuals, families and households in St. Croix who would have reduced access to a parrotfish, which is a culturally important food fish, especially for low income families and households. Over the 10-year period from 2011 to 2020, consumers of parrotfish would lose from 97,770 pounds to 113,766 pounds of this pot fish (Tables 7.13-7.15). In 2011, there would be 18,300 to 48,800 fewer pounds of parrotfish, which represents 5 to 14 percent of pounds in 2008; however, that percent would decline over time. Nonetheless, with less availability of and access to this low priced food fish, there may be an increase in food insecurity in the USVI, especially in St. Croix, for low income families. St. Croix's low income families are more likely to be Black or other non-White race.

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11.0 LIST OF PREPARERS

Dr. William Arnold, DOC/NOAA/NMFS/SERO, 263 13th Avenue S, St. Petersburg, FL
Dr. Denise Johnson, DOC/NOAA/NMFS/SERO, 263 13th Avenue S, St. Petersburg, FL
Dr. Joseph Kimmel, DOC/NOAA/NMFS/SERO, 263 13th Avenue S, St. Petersburg, FL
Britni Tokotch, DOC/NOAA/NMFS/SERO, 263 13th Avenue S, St. Petersburg, FL
Maria del Mar Lopez, DOC/NOAA/NMFS/SERO, 263 13th Avenue S, St. Petersburg, FL
Kate Michie, DOC/NOAA/NMFS/SERO, 263 13th Avenue S, St. Petersburg, FL
Graciela García-Moliner, Caribbean Fisheries Management Council, 268 Muñoz Rivera Ave, Suite 1108, San Juan, PR
Heather Blough, DOC/NOAA/NMFS/SERO, 263 13th Avenue S, St. Petersburg, FL
Jennifer Lee, DOC/NOAA/NMFS/SERO, 263 13th Avenue S, St. Petersburg, FL
Jason Rueter, DOC/NOAA/NMFS/SERO, 263 13th Avenue S, St. Petersburg, FL
Dr. Nick Farmer, DOC/NOAA/NMFS/SERO, 263 13th Avenue S, St. Petersburg, FL
Dr. Todd Gedamke, DOC/NOAA/NMFS/SEFSC, 75 Virginia Beach Dr., Miami, FL
Andy Strelcheck, DOC/NOAA/NMFS/SERO, 263 13th Avenue S, St. Petersburg, FL
David Dale, DOC/NOAA/NMFS/SERO, 263 13th Avenue S, St. Petersburg, FL
Shepherd Grimes, USEC/GC, 263 13th Avenue S, St. Petersburg, FL
Mara Levy, USEC/GC, 263 13th Avenue S, St. Petersburg, FL
Carolyn Sramek, DOC/NOAA/NMFS/SERO, 263 13th Avenue S, St. Petersburg, FL
Brent Stoffle, DOC/NOAA/NMFS/SEFSC, 75 Virginia Beach Dr., Miami, FL
Juan Agar, DOC/NOAA/NMFS/SEFSC, 75 Virginia Beach Dr., Miami, FL
Dr. Jim Berkson, Virginia Tech University, Blacksburg, VA
David Keys, DOC/NOAA/NMFS/SERO, 263 13th Avenue S, St. Petersburg, FL
Anik Clemens, DOC/NOAA/NMFS/SERO, 263 13th Avenue S, St. Petersburg, FL
Scott Sandorf, DOC/NOAA/NMFS/SERO, 263 13th Avenue S, St. Petersburg, FL

12.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE STATEMENT ARE SENT

Department of Commerce Office of General Counsel
National Marine Fisheries Service Office of General Counsel
National Marine Fisheries Service Office of General Counsel Southeast Region
National Marine Fisheries Service Southeast Regional Office
National Marine Fisheries Service Southeast Fisheries Science Center
National Marine Fisheries Service Silver Spring Office
National Marine Fisheries Service Office of Law Enforcement
National Marine Fisheries Service Office of Law Enforcement Southeast Division
Angela Somma NOAA/NMFS Endangered Species Division
Galen Tromble NOAA/NMFS Domestic Fisheries Division
United States Coast Guard
United States Fish and Wildlife Service
United States Army Corps of Engineers
United States Department of the Interior
United States Department of Homeland Security
United States Department of State
United States Environmental Protection Agency Headquarters
United States Environmental Protection Agency New York Region
United States Environmental Protection Agency Virgin Islands Field Office
Marine Mammal Commission
Caribbean Environmental Protection Division
Division of Coastal Zone Management
USVI Department of Planning and Natural Resources Division of Fish and Wildlife
USVI Department of Planning and Natural Resources St. Thomas Office
USVI Department of Planning and Natural Resources St. Croix Office
Puerto Rico Department of Natural and Environmental Resources
Puerto Rico Department of Agriculture
Puerto Rico Junta de Calidad Ambiental (Environmental Quality Board)
Puerto Rico Junta de Planificación (Planning Board)
PEW Environmental Foundation
Environmental Defense
Ocean Conservancy
Surfrider Foundation
St. Thomas Fishermen's Association
St. Croix Commercial Fishermen's Association

13.0 INDEX

14.0 APPENDICES

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APPENDIX 1. Scenarios from the Scientific and Statistical Committee

Scenario:	1	2	3	4	5	6	7	8
Life History Demographics	Yes	Yes	Not useful	Yes/No	Yes	Yes	Yes/No	Fishery Determined to be Underutilized
Representative Lengths	Yes	Yes	Yes	No	Yes	Yes	No	
-single time period (recent only)	Yes	Yes	Yes	No	Yes	Yes	No	
-multiple time period	Yes	No	Yes	No	Yes	Yes	No	
Catch	Yes	Yes	Yes	Yes	No	Yes	No	
No recruitment anomaly	Yes	Yes	Yes	NA	Yes	No	NA	
Can trend in stock be determined?	Yes	No	Yes	No	Yes	No	No	
Can stock status be determined?	Yes	Yes (with lag)	No	No	Yes	No	No	
Can OFL be determined?	Yes	No	No	No	No	No	No	
Can ABC be determined?	Yes	No	No	No	No	No	No	
Can ACL be determined?	Yes	No	No	No	No	No	No	
Management Advice	OFL would be >, =, or < recent catch based on ratio of F_{MSY}/F	Catch level should not exceed recent catch. If $F/F_{MSY}>1$ then reduce catch based on this ratio	If trend in F is increasing, catch level should be reduced from recent levels. If not, catch level should not exceed recent catch	Catch level should not exceed average catch in recent years (determined on a case-by-case basis	Can give management advice (e.g., effort), but not catch advice	The result is the same as Scenario 4. If it's possible to correct for the anomaly, it become the same as Scenario 1	Taking into account fishery independent research, control a fishery with the purpose of collecting needed data. Catch and/or effort is limited to what is required to collect sufficient data	Taking into account fishery independent research, control a fishery with the purpose of collecting needed data. Catch and/or effort is limited to control the rate of development of the fishery to avoid overshooting OFL
Notes	Decrease if Council wants to be precautionary. May take into account vulnerability using scalars	Decrease if Council wants to be precautionary. May take into account vulnerability using scalars. Catch would need to be set lower than in Scenario 1 because of single point estimate and possible lag time due to non-equilibrium status.*	Decrease if Council wants to be precautionary. May take into account vulnerability using scalars. Catch should not be increased if overfishing may be taking place	Decrease if Council wants to be precautionary. May take into account vulnerability using scalars	Council may place additional limits if it wants to be precautionary. May take into account vulnerability using scalars		Participation in the fishery is dependent on following all data collection protocols	

* SEDAR recommended treating this situation as having no length data (Scenario 4)

APPENDIX 2. Reef Fish FMU

Lutjanidae--Snapper
<u>Unit 1</u>
Silk snapper, *Lutjanus vivanus*
Blackfin snapper, *Lutjanus buccanella*
Black snapper, *Apsilus dentatus*
Vermilion snapper, *Rhomboplites aurorubens*
<u>Unit 2</u>
Queen snapper, *Etelis oculatus*
Wenchman, *Pristipomoides aquilonaris*
<u>Unit 3</u>
Gray snapper, *Lutjanus griseus*
Lane snapper, *Lutjanus synagris*
Mutton snapper, *Lutjanus analis*
Dog snapper, *Lutjanus jocu*
Schoolmaster, *Lutjanus apodus*
Mahogany snapper, *Lutjanus mahogani*
<u>Unit 4</u>
Yellowtail snapper, *Ocyurus chrysurus*
Serranidae--Sea basses and Grouper
<u>Unit 1</u>
Nassau Grouper, *Epinephelus striatus*
<u>Unit 2</u>
Goliath grouper, *Epinephelus itajara*
<u>Unit 3</u>
Red hind, *Epinephelus guttatus*
Coney, *Epinephelus fulvus*
Rock hind, *Epinephelus adscensionis*
Graysby, *Epinephelus cruentatus*
Creole-fish, *Paranthias furcifer*
<u>Unit 4</u>
Red grouper, *Epinephelus morio*
Yellowedge grouper, *Epinephelus flavolimbatus*
Misty grouper, *Epinephelus mystacinus*
Tiger grouper, *Mycteroperca tigris*
Yellowfin grouper, *Mycteroperca venenosa*
Haemulidae--Grunts
White grunt, *Haemulon plumieri*
Margate, *Haemulon album*
Tomtate, *Haemulon aurolineatum*
Bluestriped grunt, *Haemulon sciurus*
French grunt, *Haemulon flavolineatum*
Porkfish, *Anisotremus virginicus*
Mullidae--Goatfishes
Spotted goatfish, *Pseudupeneus maculatus*

Yellow goatfish, *Mulloidichthys martinicus*
Sparidae--Porgies
Jolthead porgy, *Calamus bajonado*
Sea bream, *Archosargus rhomboidalis*
Sheepshead porgy, *Calamus penna*
Pluma, *Calamus pennatula*
Holocentridae--Squirrelfishes
Blackbar soldierfish, *Myripristis jacobus*
Bigeye, *Priacanthus arenatus*
Longspine squirrelfish, *Holocentrus rufus*
Squirrelfish, *Holocentrus adscensionis*
Malacanthidae--Tilefishes
Blackline tilefish, *Caulolatilus cyanops*
Sand tilefish, *Malacanthus plumieri*
Carangidae--Jacks
Blue runner, *Caranx crysos*
Horse-eye jack, *Caranx latus*
Black jack, *Caranx lugubris*
Almaco jack, *Seriola rivoliana*
Bar jack, *Caranx ruber*
Greater amberjack, *Seriola dumerili*
Yellow jack, *Caranx bartholomaei*
Scaridae--Parrotfish
Blue parrotfish, *Scarus coeruleus*
Midnight parrotfish, *Scarus coelestinus*
Princess parrotfish, *Scarus taeniopterus*
Queen parrotfish, *Scarus vetula*
Rainbow parrotfish, *Scarus guacamaia*
Redfin parrotfish, *Sparisoma rubripinne*
Redtail parrotfish, *Sparisoma chrysopterum*
Stoplight parrotfish, *Sparisoma viride*
Redband parrotfish, *Sparisoma aurofrenatum*
Striped parrotfish, *Scarus croicensis*
Acanthuridae--Surgeonfishes
Blue tang, *Acanthurus coeruleus*
Ocean surgeonfish, *Acanthurus bahianus*
Doctorfish, *Acanthurus chirurgus*
Balistidae–-Triggerfishes
Ocean triggerfish, *Canthidermis sufflamen*
Queen triggerfish, *Balistes vetula*
Sargassum triggerfish, *Xanthichthys rigens*
Monacanthidae-–Filefishes
Scrawled filefish, *Aluterus scriptus*
Whitespotted filefish, *Cantherhines macrocerus*
Black durgon, *Melichthys niger*
Ostraciidae--Boxfishes

Honeycomb cowfish, *Lactophrys polygonia*
Scrawled cowfish, *Lactophrys quadricornis*
Trunkfish, *Lactophrys trigonus*
Spotted trunkfish, *Lactophrys bicaudalis*
Smooth trunkfish, *Lactophrys triqueter*
Labridae--Wrasses
Hogfish, *Lachnolaimus maximus*
Puddingwife, *Halichoeres radiatus*
Spanish hogfish, *Bodianus rufus*
Pomacanthidae--Angelfishes
Queen angelfish, *Holacanthus ciliaris*
Gray angelfish, *Pomacanthus arcuatus*
French angelfish, *Pomacanthus paru*
Aquarium Trade-data collection only
Frogfish, *Antennarius* spp.
Flamefish, *Apogon maculatus*
Conchfish, *Astrapogen stellatus*
Redlip blenny, *Ophioblennius atlanticus*
Peacock flounder, *Bothus lunatus*
Longsnout butterflyfish, *Chaetodon aculeatus*
Foureye butterflyfish, *Chaetodon capistratus*
Spotfin butterflyfish, *Chaetodon ocellatus*
Banded butterflyfish, *Chaetodon striatus*
Redspotted hawkfish, *Amblycirrhitus pinos*
Flying gurnard, *Dactylopterus volitans*
Atlantic spadefish, *Chaetodipterus faber*
Neon goby, *Gobiosoma oceanops*
Rusty goby, *Priolepis hipoliti*
Royal gramma, *Gramma loreto*
Creole wrasse, *Clepticus parrae*
Yellowcheek wrasse, *Halichoeres cyanocephalus*
Yellowhead wrasse, *Halichoeres garnoti*
Clown wrasse, *Halichoeres maculipinna*
Pearly razorfish, *Hemipteronotus novacula*
Green razorfish, *Hemipteronotus splendens*
Bluehead wrasse, *Thalassoma bifasciatum*
Chain moray, *Echidna catenata*
Green moray, *Gymnothorax funebris*
Goldentail moray, *Gymnothorax miliaris*
Trumpetfish, *Aulostomus maculatus*
Cardinal soldierfish, *Plectrypops retrospinus*
Batfish, *Ogcocephalus* spp.
Goldspotted eel, *Myrichthys ocellatus*
Yellowhead jawfish, *Opistognathus aurifrons*
Dusky jawfish, *Opistognathus whitehursti*
Cherubfish, *Centropyge argi*

Rock beauty, *Holacanthus tricolor*
Sargeant major, *Abudefduf saxatilis*
Blue chromis, *Chromis cyanea*
Sunshinefish, *Chromis insolata*
Yellowtail damselfish, *Microspathodon chrysurus*
Dusky damselfish, *Pomacentrus fuscus*
Beaugregory, *Pomacentrus leucostictus*
Bicolor damselfish, *Pomacentrus partitus*
Threespot damselfish, *Pomacentrus planifrons*
Glasseye snapper, *Priacanthus cruentatus*
High-hat, *Equetus acuminatus*
Jackknife-fish, *Equetus lanceolatus*
Spotted drum, *Equetus punctatus*
Scorpaenidae-scorpionfishes
Butter hamlet, *Hypoplectrus unicolor*
Swissguard basslet, *Liopropoma rubre*
Great soapfish, *Rypticus saponaceus*
Orangeback bass, *Serranus annularis*
Lantern bass, *Serranus baldwini*
Tobaccofish, *Serranus tabacarius*
Harlequin bass, *Serranus tigrinus*
Chalk bass, *Serranus tortugarum*
Caribbean tonguefish, *Symphurus arawak*
Seahorses, *Hippocampus* spp.
Pipefishes, *Syngnathus* spp.
Sand diver, *Synodus intermedius*
Sharpnose puffer, *Canthigaster rostrata*
Porcupinefish, *Diodon hystrix*

APPENDIX 3. Bycatch Practicability Analysis

The Caribbean Council is required by MSA §303(a)(11) to establish a standardized bycatch reporting methodology for federal fisheries and to identify and implement conservation and management measures that, to the extent practicable and in the following order, (A) minimize bycatch and (B) minimize the mortality of bycatch that cannot be avoided. The MSA defines bycatch as "fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards. Such term does not include fish released alive under a recreational catch-and-release fishery management program" (MSA §3(2)). Economic discards are fish that are discarded because they are undesirable to the harvester. This category of discards generally includes certain species, sizes, and/or sexes with low or no market value. Regulatory discards are fish that are required by regulation to be discarded, but also include fish that may be retained but not sold. NMFS outlines at 50 CFR §600.350(d)(3)(i) ten factors that should be considered in determining whether a management measure minimizes bycatch or bycatch mortality to the extent practicable. These are:

A) Population effects for the bycatch species;
B) Ecological effects due to changes in the bycatch of that species (effects on other species in the ecosystem);
C) Changes in the bycatch of other species of fish and the resulting population and ecosystem effects;
D) Effects on marine mammals and birds;
E) Changes in fishing, processing, disposal, and marketing costs;
F) Changes in fishing practices and behavior of fishermen;
G) Changes in research, administration, and enforcement costs and management effectiveness;
H) Changes in the economic, social, or cultural value of fishing activities and nonconsumptive uses of fishery resources;
I) Changes in the distribution of benefits and costs; and,
J) Social effects.

Agency guidance provided at 50 CFR §600.350(d)(3)(ii) suggests the Councils adhere to the precautionary approach found in the Food and Agriculture Organization of the United Nations (FAO) Code of Conduct for Responsible Fisheries (Article 6.5) when faced with uncertainty concerning these ten practicability factors. According to Article 6.5 of the FAO Code of Conduct for Responsible Fisheries, using the absence of adequate scientific information as a reason for postponing or failing to take measures to conserve target species, associated or dependent species, and non-target species and their environment, would not be consistent with a precautionary approach.

Background

Bycatch practicability was first addressed in the Caribbean SFA Amendment/Final EIS, which was approved by the agency on September 13, 2005 and the final rule published in the *Federal Register* on October 28, 2005, effective November 28, 2005 (70 FR 62073). The Caribbean SFA Amendment contained a bycatch practicability analysis and evaluated the biological, ecological, social, economic, and administrative impacts associated with a wide range of alternatives including those required for achieving the bycatch mandates of the Magnuson-Stevens Fishery Conservation and Management Act. In summary, 4 alternatives including a "No Action" alternative were presented and impacts were described regarding bycatch reporting and are included herein by reference. Those alternatives in addition to no action proposed to: Develop a federal permit system for commercial and charter boat fishermen participating in Council-managed fisheries, with an associated mandatory monthly reporting requirement; utilize the MRFSS database to provide additional bycatch information on the recreational and subsistence sectors; and consult with Puerto Rico and the USVI in an effort to modify the trip ticket system currently in place in the U.S. Caribbean to require standardized collection of bycatch data.

Also, measures were included in the Caribbean SFA Amendment to minimizing bycatch and bycatch mortality to the extent practicable. The analysis of the practicability of these measures is provided in Section 6.6.2 of that amendment and is herein included by reference.

To summarize, 4 alternatives including a "No Action" alternative were presented and impacts were described regarding minimizing bycatch and bycatch mortality and are included herein by reference. Those alternatives in addition to no action proposed to: Increase the minimum allowable mesh size for fish traps; establish a minimum mesh size of two inches and a maximum mesh size of six inches, stretched mesh, for gill and trammel nets. Additionally, gill and trammel nets must be tended at all times; and amend current requirements for trap construction such that only one escape panel be required, which could be the door.

Puerto Rico

There are scant data on commercial and recreational bycatch in the U.S. Caribbean region. Rosario (1993) estimated, based on fishery-independent data from the SEAMAP-Caribbean program collected off the west coast of Puerto Rico, that about 14 percent by number and 17 percent by weight of the fish caught in the commercial hook and line fishery are species with low market value, including squirrel fishes, butterfly fishes, doctorfishes, puffers, filefish, and scorpion fish. Matos-Caraballo (2007) surveyed a limited number of fishers from the west coast of Puerto Rico in 2004-2005 and a limited number of gears (traps, beach seine and trammel nets). Beach seines, the gear with the highest rate of discard mortality, are not used in the EEZ. Trammel nets were banned from the EEZ in 2005 (CFMC 2005) but were reported to produce little by-catch. Unfortunately, the information provided is very limited. However, anecdotal information suggests that the vast majority of fish harvested in the U.S. Caribbean are retained for the market or for personal use – including species with low market value. With the exception of species that are commonly believed to be ciguatoxic, economic discards in this region appear to be minimal. Regulatory discards may potentially include the following species:

- Nassau grouper. Federal, state, and territorial laws require that Nassau grouper landed in the U.S. Caribbean be returned to the water;
- Goliath grouper. Federal, state, and territorial laws require that Goliath grouper landed in the U.S. Caribbean be returned to the water;
- Butterfly fish. The harvest of some species of butterfly fish (*Chaetodon spp.*) is not prohibited in federal waters (CFMC 2005) but it is prohibited in the state waters of Puerto Rico. The USVI has permitted the catch of a small number of these species for scientific research/educational purposes;
- Sub-adult yellowtail snapper. Federal law requires that catches of yellowtail snapper under 12 inches in fork length be returned to the water (yellowtail snapper are not regulated in the state waters of the USVI, and the minimum size in Puerto Rico waters is 10.5 inches) SL, about the same as in federal waters;
- Sub-adult and berried spiny lobster. Federal, Commonwealth, and territorial laws prohibit the harvest of spiny lobster under 3.5 inches in carapace length and berried spiny lobsters (this size limit also applies to *Panulirus argus* imports into the U.S. Caribbean (CFMC 2008); and,
- GU3, GU4, SU1. Federal law prohibits fishing for and possession of fish within these Units during the closed seasons. Commonwealth and territorial laws also prohibit fishing for and possession of species within these Units during the closed seasons to varying degrees. Depending on the species and depth of the fishing activity, there might be high mortality.

USVI

In 2006, a pilot research study to deploy observers in St. Thomas (USVI) fisheries was conducted and also examined bycatch composition of several fishing gears (Trumble et al. 2006). The primary purpose of this project was to assess the potential for obtaining information on bycatch, discards, and biological data from commercial fisheries in the USVI. The project focused on gears typically used on the continental shelf platform of St. Thomas: fish traps, lobster traps, seine nets, and hook and line. One of the findings of this study was problems of data bias occur when placement of observers on vessels is voluntary because fishers may operate differently when observers are on board.

Summary results of the bycatch portion of the study, all gears combined, indicated 78 percent of the fish discarded as bycatch were smaller than the marketable size. Of these discards 56 percent were either small box fish (Ostraciidae) or surgeon fish (Acanthuridae). These discards have been reported as being due to market preferences and are released alive. Also, fishers affirm that the risk of ciguatera fish poisoning negates the marketability for some species, accounting for nearly 14 percent of the discarded finfish. Virgin Islands consumers eat a wide variety of species so that species discarded in other regions are often marketed and consumed in this area. A total of 89 species were found in the landed catch. Thus, it not unexpected that only nine percent of the by catch was made up of unacceptable species. Finally, fishermen had said that when the market was filled with a particular species, they discarded those fish at sea. Use of bycatch for bait is an insignificant element of the by catch.

Summary

The extent of these regulatory discards has not been quantified. In the past, the regulatory requirements forcing fishermen to discard these species were difficult to enforce because regulations were generally less restrictive in state waters. So, for example, the captain/crew of a boat boarded in the U.S. EEZ could claim that any prohibited and/or undersized species onboard were captured in state waters. The mortality rates associated with commercial and recreational bycatch also have not been quantified, but generally increase with depth (e.g., finfish taken from deeper water generally have a lower survival rate when returned to the water).

Due to the nature of Caribbean fisheries, it is unlikely that any of the alternatives in the Caribbean SFA Amendment would significantly reduce bycatch. Most Caribbean fishermen utilize all they catch, and those fisheries that are noted for producing large amounts of bycatch (e.g., trawling) are essentially absent from the U.S. Caribbean. Thus, bycatch is not as significant an issue in the U.S. Caribbean compared to other regions. What little bycatch occurs is generally confined to regulatory discards, which would be minimally affected by the gear restriction alternatives evaluated here. Such discards will likely be further reduced if preferred alternatives identified in other sections of this amendment are retained and implemented (e.g., prohibition on filleting fish at sea). In summary, the direct effects to the biological environment from any of these alternatives would be minimal. The effects of the management regime implemented in 2005 have not been fully assessed to determine the impact of bycatch.

One or more alternatives may result in a direct, but relatively minor, effect to the socioeconomic and administrative environment, due to the required modifications of fishing gear. In contrast, anecdotal information suggests that the only reason for large-mesh net fisheries is to illegally fish for turtles. Similarly, most trap fishermen already only employ one escape panel door. Regardless, the Council also opted to prohibit the use of gill and trammel nets in the EEZ (excluding some bait and species not managed by the FMP), primarily to reduce fishing mortality, though it will also have ancillary benefits in the reduction of bycatch.

The alternatives implemented for the EEZ in 2005 were to varying degrees also implemented in state and territorial waters in the U.S. Caribbean. Additionally, Puerto Rico has implemented additional regulations for the commercial and recreational harvest. Both Puerto Rico and the USVI governments, in cooperation with the fishers, SEFSC, SERO, and the CFMC, are actively involved in the development of new data gathering forms and improving the quality of the catch reports and trip interview programs.

In the current amendment bycatch in commercial and/or recreational fisheries may be affected through alternatives presented and described to revise/establish management reference points (MSY, OY, OFL, and ACL), allocate resources (based on species or unit, recreational and commercial sectors, and geographic criteria), and establish parrotfish management measures and establish recreational bag limits. The 10 factors, listed below

(A-J) should be considered in determining whether a management measure minimizes bycatch or bycatch mortality to the extent practicable.

A) Population effects for the bycatch species: Management measures presented in this amendment may have an indirect but slight impact on minimizing bycatch. If measures redefining management reference points result in more conservative estimates of MSY and OY, conservative establishment of OFLs and ACLs, and with these measures there is a high compliance to regulations, fishing effort would be expected to be reduced in proportion to the more conservative catch allowances resulting in a reduction in bycatch and bycatch mortality.

B) Ecological effects due to changes in the bycatch of that species (effects on other species in the ecosystem): If management develops conservative measures as cited in (A) above, slightly less bycatch and bycatch mortality would be expected, although natural variation may mask such a result. Theoretically, in response to such conservative management, the coral reef ecosystem would become better balanced as a result of more intact trophic and predatory interactions due fewer non-target individuals being extracted or dying from the impacts of capture and release to the natural system.

C) Changes in the bycatch of other species of fish and the resulting population and ecosystem effects: Same as (C) above.

D) Effects on marine mammals and birds: Because fishers in this area traditionally utilize most resources harvested, the amounts of bycatch resulting from proposals in this amendment are not expected to change, so little to no affect to mammals or birds is expected.

E) Changes in fishing, processing, disposal, and marketing costs: If management chooses the most conservative and restrictive proposals in this amendment one might expect changes to fishing in that more fishing effort might take place after implementation of the amendment to hedge against closure once limits are reached. Such a change may result in a proportionate change in bycatch or bycatch mortaility. If this occurs, AMs would be triggered to reduce the length of the fishing season in subsequent fishing yeatrs, thereby minimizing bycatch.

F) Changes in fishing practices and behavior of fishermen: Regardless of the conservative degree management takes in responding to the proposals of this amendment, changes to fishing practices are not expected to result in higher or lesser degrees of bycatch. Fish traps, hook-and-line, and spearfishing have been the most successful fishing practices and these practices are not expected to change without further regulations. Bycatch is not expected to change from its current level.

G) Changes in research, administration, and enforcement costs and management effectiveness: Research and monitoring is needed to understand the effectiveness of proposed management measure in reducing bycatch. Additional work is needed to determine the effectiveness of measures being developed in this amendment and by future actions being considered by the Council to reduce bycatch. A Data Collection Improvement Program is being developed in the region in cooperation with local governments and NMFS, which if funded should begin accumulation of information needed to assess bycatch questions. Additional administrative and enforcement efforts will be needed to implement and enforce these regulations.

H) Changes in the economic, social, or cultural value of fishing activities and nonconsumptive uses of fishery resources: Proposed management measures, including those that are likely to increase or decrease discards could result in social and/or economic impacts as discussed in Section 4.

I) Changes in the distribution of benefits and costs: Attempts were made to ensure reductions provided by proposed management measures are equal in the commercial and recreational sectors. The extent to which these management measures will increase or decrease the magnitudes of discards is not clear. Potential increases in dead discards are taken into consideration in bag and size limits, setting commercial quotas, and determining the effectiveness of a seasonal closure. It is unlikely that the magnitude of discards will be the same in the commercial and recreational sectors. Commercial fishermen generally catch fewer small fish than recreational fishermen with the possible exception of spear gear where the size distribution of the catch is similar.

J) Social effects: The social effects of all the management measure, including those most likely to reduce bycatch, are described in Section 4.

Conclusion

This section evaluates the practicability of taking additional action to minimize bycatch and bycatch mortality in the Caribbean reef fish and queen conch fisheries using the ten factors provided at 50 CFR 600.350(d)(3)(i). In summary, the proposal of closing a fishery when an ACL is met could help to reduce bycatch. It is likely that some management measures such as reduced or new quotas, bag limits, and increased size limits could increase the number of discards. However, this depends on if fishermen shift effort to other species, seasons, or fisheries and if effort decreases in response to more restrictive management measures as well as changes in community structure and age/size structures that could result from ending overfishing. Potential increases in dead discards are taken into consideration in bag and size limits, setting commercial quotas, and determining the effectiveness of a seasonal closure. Furthermore, overall fishing effort could decrease in the commercial and recreational sectors in response to more restrictive management measures, thereby reducing the potential for bycatch.

Overlapping seasonal closures could be expected to reduce bycatch and fishing mortality of many co-occurring species. The relative abundance, size structure, and age structure of other species in reef communities could be expected to change in response to reduced fishing pressure on species as a result of this amendment as well as potential shifts in effort. Thus, ecological changes could occur in the community structure of reef ecosystems through actions that would end overfishing. These ecological changes could affect the nature and magnitude of bycatch over time. Additional measures to reduce bycatch are being developed. The Comprehensive 2011 ACL Amendment could propose additional measures to reduce bycatch in the reef fish fishery. For example, species groupings based on biological, geographic, economic, taxonomic, technical, social, and ecological factors will be proposed in that amendment.

APPENDIX 4. Alternatives Considered by Council but Eliminated

This section describes alternatives to the proposed actions that the Council considered in developing this document, but decided not to pursue. The description of each alternative is followed by a summary statement of why it was eliminated from more detailed summary. Alternatives are numbered as they were in the December 2, 2009 version of the options paper titles 'Options paper for Amendment 2 to the fishery management plan for the queen conch fishery of Puerto Rico and the USVI and Amendment 5 to the reef fish fishery management plan of Puerto Rico and the USVI.'

4.0 MANAGEMENT ALTERNATIVES

4.1 Action 1: Amending the Stock Complexes in the Reef Fish Fishery Management Unit

Action 1a. Amend the stocks that comprise the parrotfish FMU.
Alternative 1. No action. Do not change the stocks that comprise the parrotfish FMU.
Alternative 2. Separate the parrotfish FMU into 2 complexes. Parrotfish Unit 1 would include princess, queen, redfin, redtail, stoplight, redband, and striped parrotfish and Parrotfish Unit 2 would include blue, midnight, and rainbow parrotfish.

Landings data are not available with which to address the allocation of parrotfish among FMUs. In the USVI, parrotfish landings data are only available at the family level, inadequate for addressing species-level issues. Puerto Rico does capture parrotfish landings data at the species level, but >99 percent of all parrotfish landings from Puerto Rico waters are reported to the generic category 'parrotfishes'.

Action 1d. Create a 'data collection only' category for various species of Caribbean reef fish.
Alternative 1. No action. Do not create a 'data collection only' category for various species of Caribbean reef fish.
Alternative 2. Create a 'data collection only' category for various species of Caribbean reef fish and move creole fish from the grouper FMU into the 'data collection only' category.

It was determined by the Caribbean Fisheries Management Council at their 133rd meeting in December 2009 to focus the present amendment on setting ACLs for species undergoing overfishing. Other actions were removed from this amendment and will be considered for inclusion in a future amendment that focuses on those Caribbean species that are not undergoing overfishing. This will include species relegated to the 'data collection only' category.

Action 2c: Annual Catch Limits for commercial harvest of queen conch off Puerto Rico
Alternative 2. Set an ACL for queen conch off Puerto Rico equal to:
Sub alternative B. The pounds of meats from combined commonwealth and Puerto Rico EEZ landings, based on the average commonwealth and federal landings from 1999-2007.

Sub sub alternative i. 205,812 pounds of meats, the average reported commonwealth and Puerto Rico EEZ landings during 1999-2007.
Sub alternative C. The pounds of meats from combined commonwealth and Puerto Rico EEZ landings, based on the average commonwealth and federal landings reported for the most recent five years (2003-2007).
Sub sub alternative i. 175,438 pounds of meats, the average reported commonwealth and Puerto Rico EEZ landings during 2003-2007.

The sub alternatives that considered reported rather than adjusted landings from Puerto Rico were rejected. Puerto Rico adjusts reported commercial catch data to account for failure of fishermen to report and for underreporting and misreporting. Expansion factors developed cooperatively between Puerto Rico DNER and NOAA's SEFSC are applied to the reported landings to adjust for such reporting discrepancies. It was decided by the Council at their 133rd meeting to only use the adjusted landings.

Action 3c: Annual Catch Limits for commercial harvest of parrotfish off Puerto Rico
Alternative 2. Set the ACL for parrotfish off Puerto Rico equal to**:**
Sub alternative B. The pounds of combined commonwealth and Puerto Rico EEZ landings, based on the average commonwealth and EEZ landings during 1999-2007.
Sub sub alternative i. 213 pounds, the average reported commonwealth and Puerto Rico EEZ landings during 1999-2007.
Sub sub alternative iii. 63,780 pounds, the average reported (with redistribution) commonwealth and Puerto Rico EEZ landings during 1999-2007.
Sub alternative C. The pounds of combined commonwealth and Puerto Rico EEZ landings, based on the average commonwealth and EEZ landings reported for the most recent five years (2003-2007).
Sub sub alternative i. 303 pounds, the average reported commonwealth and Puerto Rico EEZ landings during 2003-2007.
Sub sub alternative iii. 43,176 pounds, the average reported (with redistribution) commonwealth and Puerto Rico EEZ landings during 2003-2007.

As explained above, the CFMC at their 133rd meeting chose to not include reference to reported landings but to instead focus on adjusted landings.

Action 3d: Annual Catch Limits for commercial harvest of parrotfish unit 1 off Puerto Rico
Alternative 1. No action. Do not set an ACL for parrotfish unit 1 in the EEZ off Puerto Rico.
Alternative 2. Set the ACL for parrotfish unit 1 off Puerto Rico equal to**:**
Sub alternative A. Zero in the EEZ.
Sub alternative B. The pounds of combined commonwealth and Puerto Rico EEZ landings, based on the average commonwealth and EEZ landings during 1999-2007.
Sub sub alternative i. 19 pounds, the average reported commonwealth and Puerto Rico EEZ landings during 1999-2007.
Sub sub alternative ii. 25 pounds, the average adjusted commonwealth and Puerto Rico EEZ landings during 1999-2007.

Sub sub alternative iii. 5,783 pounds, the average reported (with redistribution) commonwealth and Puerto Rico EEZ landings during 1999-2007.
Sub sub alternative iv. 4,760 pounds, the average adjusted (with redistribution) commonwealth and Puerto Rico EEZ landings during 1999-2007.
Sub alternative C. The pounds of combined commonwealth and Puerto Rico EEZ landings, based on the average commonwealth and EEZ landings reported for the most recent five years (2003-2007).
Sub sub alternative i. 0 pounds, the average reported commonwealth and Puerto Rico EEZ landings during 2003-2007.
Sub sub alternative ii. 0 pounds, the average adjusted commonwealth and Puerto Rico EEZ landings during 2003-2007.
Sub sub alternative iii. 0 pounds, the average reported (with redistribution) commonwealth and Puerto Rico EEZ landings during 2003-2007.
Sub sub alternative iv. 0 pounds, the average adjusted (with redistribution) commonwealth and Puerto Rico EEZ landings during 2003-2007.

Action 3e: Annual Catch Limits for commercial harvest of parrotfish unit 2 in the U.S. Caribbean EEZ
Alternative 1. No action. Do not set an ACL for parrotfish unit 2 in the U.S. Caribbean EEZ.
Alternative 2. Set the ACL for parrotfish unit 2 in the U.S. Caribbean EEZ equal to**:**
Sub alternative A. Zero.
Sub alternative B. The pounds of combined state and U.S. Caribbean EEZ landings, based on the average state and EEZ landings reported during 2000-2007.
Sub sub alternative i. 365,030 pounds, the average reported state and U.S. Caribbean EEZ landings during 2000-2007.
Sub sub alternative ii. 365,453 pounds, the average adjusted state and U.S. Caribbean EEZ landings during 2000-2007.
Sub sub alternative iii. 425,483 pounds, the average reported (with redistribution) state and U.S. Caribbean EEZ landings during 2000-2007.
Sub sub alternative iv. 476,525 pounds, the average adjusted (with redistribution) state and U.S. Caribbean EEZ landings during 2000-2007.
Sub alternative C. The pounds of combined state and U.S. Caribbean EEZ landings, based on the average state and EEZ landings reported for the most recent five years (2003-2007).
Sub sub alternative i. 385,770 pounds, the average reported state and U.S. Caribbean EEZ landings during 2003-2007.
Sub sub alternative ii. 386,436 pounds, the average adjusted state and U.S. Caribbean EEZ landings during 2003-2007.
Sub sub alternative iii. 428,643 pounds, the average reported (with redistribution) state and U.S. Caribbean EEZ landings during 2003-2007.
Sub sub alternative iv. 486,551 pounds, the average adjusted (with redistribution) state and U.S. Caribbean EEZ landings during 2003-2007.

All unit-specific references to parrotfish have been rejected because the distribution of parrotfish species between two FMUs has been rejected, thus any alternatives that reference the parrotfish units are similarly rejected.

Action 4: Annual Catch Limits for commercial harvest of grouper
Action 4b: Annual Catch Limits for commercial harvest of goliath grouper
Alternative 1. No action. Do not set an ACL for goliath grouper in the EEZ off St. Croix.
Alternative 2. Set the ACL for goliath grouper in the EEZ off St. Croix equal to zero.
Alternative 3. No action. Do not set an ACL for goliath grouper in the EEZ off St. Thomas/St. John.
Alternative 4. Set the ACL for goliath grouper in the EEZ off St. Thomas/St. John equal to zero.
Alternative 5. No action. Do not set an ACL for grouper unit 2 (goliath grouper) in the EEZ off Puerto Rico.
Alternative 6. Set the ACL for grouper unit 2 (goliath grouper) in the EEZ off Puerto Rico equal to zero.

Goliath grouper are considered to be overfished but are not presently undergoing overfishing due to a complete prohibition on harvest. Thus, they are no longer included in the present amendment that is focused on species undergoing overfishing.

Action 4e: Annual Catch Limits for commercial harvest of "current" grouper unit 4 off Puerto Rico
Alternative 2. Set the ACL for "current" grouper unit 4 off Puerto Rico equal to:
Sub alternative B. The pounds of combined commonwealth and Puerto Rico EEZ landings, based on the average commonwealth and Puerto Rico EEZ landings from 1999-2007.
Sub sub alternative i. 8,776 pounds, the average reported commonwealth and Puerto Rico EEZ landings during 1999-2007.
Sub sub alternative iii. 12,438 pounds, the average reported (with redistribution) commonwealth and Puerto Rico EEZ landings during 1999-2007.
Sub alternative C. The pounds of combined commonwealth and Puerto Rico EEZ landings, based on the average commonwealth and Puerto Rico EEZ landings reported for the most recent five years (2003-2007).
Sub sub alternative i. 7,785 pounds, the average reported commonwealth and Puerto Rico EEZ landings during 2003-2007.
Sub sub alternative iii. 10,866 pounds, the average reported (with redistribution) commonwealth and Puerto Rico EEZ landings during 2003-2007.

As discussed above, all alternatives that include reported rather than adjusted landings have been rejected.

Action 4f: Annual Catch Limits for commercial harvest of "proposed" grouper unit 4 off Puerto Rico
Alternative 2. Set the ACL for "proposed" grouper unit 4 off Puerto Rico equal to:

Sub alternative B. The pounds of combined commonwealth and Puerto Rico EEZ landings, based on the average commonwealth and Puerto Rico EEZ landings from 1999-2007.
Sub sub alternative i. 2,906 pounds, the average reported commonwealth and Puerto Rico EEZ landings during 1999-2007.
Sub sub alternative iii. 4,118 pounds, the average reported (with redistribution) commonwealth and Puerto Rico EEZ landings during 1999-2007.
Sub alternative C. The pounds of combined commonwealth and Puerto Rico EEZ landings, based on the average commonwealth and Puerto Rico EEZ landings reported for the most recent five years (2003-2007).
Sub sub alternative i. 1,983 pounds, the average reported commonwealth and Puerto Rico EEZ landings during 2003-2007.
Sub sub alternative iii. 2,768 pounds, the average reported (with redistribution) commonwealth and Puerto Rico EEZ landings during 2003-2007.

As discussed above, all alternatives that include reported rather than adjusted landings have been rejected.

Action 5: Annual Catch Limits for commercial harvest of snapper
Action 5c: Annual Catch Limit for commercial harvest of snapper unit 1 off Puerto Rico
Alternative 2. Set the ACL for snapper unit 1 off Puerto Rico equal to:
Sub alternative B. The pounds of combined commonwealth and Puerto Rico EEZ landings, based on the average commonwealth and EEZ landings during 1999-2007.
Sub sub alternative i. 179,492 pounds, the average reported commonwealth and Puerto Rico EEZ landings during 1999-2007.
Sub sub alternative iii. 189,518 pounds, the average reported (with redistribution) commonwealth and Puerto Rico EEZ landings during 1999-2007.
Sub alternative C. The pounds of combined commonwealth and Puerto Rico EEZ landings, based on the average commonwealth and EEZ landings reported for the most recent five years (2003-2007).
Sub sub alternative i. 119,124 pounds, the average reported commonwealth and Puerto Rico EEZ landings during 2003-2007.
Sub sub alternative iii. 125,162 pounds, the average reported (with redistribution) commonwealth and Puerto Rico EEZ landings during 2003-2007.

As discussed above, all alternatives that include reported rather than adjusted landings have been rejected.

Action 6: Annual Catch Limits for the Recreational Sector
Sub action 6c. Annual Catch Limits for recreational harvest of conch off Puerto Rico
Alternative 2. Set the recreational ACL for conch off Puerto Rico:
Sub alternative B. equal to the average conch landings from MRFSS during 2000.
Sub action 6d. Annual Catch Limits for recreational harvest of parrotfish unit 1 off Puerto Rico

Alternative 1. No Action. Do not set a recreational ACL for parrotfish unit 1 in the EEZ off Puerto Rico.
Alternative 2. Set the recreational ACL for parrotfish unit 1 off Puerto Rico:
Sub alternative A. equal to zero in the EEZ.
Sub alternative B. equal to the average parrotfish unit 1 landings (17,785 fish A + B1) from MRFSS during 2000-2007.
Sub alternative C. equal to the average parrotfish unit 1 landings (13,729 fish A + B1) from MRFSS during the most recent five years (2003-2007).
Sub alternative D. Do not set recreational ACLs for parrotfish unit 1 in the EEZ off Puerto Rico, but use commercial ACL monitoring as a mechanism for recreational accountability measures.

Subalternative B uses Puerto Rico MRFSS data from only 2000. MRFSS data have been collected for Puerto Rico from 2000-2007 (and later years as well) so those data are used in the present amendment in lieu of using only the year 2000 data.

4.8 Action 8: Permits and tags

Action 8a: Establish a commercial fishing permit system for St. Croix EEZ waters.
Alternative 1. No Action. Do not establish a permit system for commercial fishing in the EEZ around St. Croix.
Alternative 2. Require a federal permit for commercial fishing in the EEZ around St. Croix.
Sub alternative A. Require that each fisherman submit an application for a federal fishing permit.
Sub alternative B. Award a federal fishing permit to all extant St. Croix territorial fishing permit holders.
Action 8b: Establish a commercial fishing permit system for St. Thomas/St. John EEZ waters.
Alternative 1. No Action. Do not establish a permit system for commercial fishing in the EEZ around St. Thomas/St. John.
Alternative 2. Require a federal permit for commercial fishing in the EEZ around St. Thomas/St. John.
Sub alternative A. Require that each fisherman submit an application for a federal fishing permit.
Sub alternative B. Award a federal fishing permit to all extant St. Thomas/St. John territorial fishing permit holders.
Action 8c: Establish a commercial fishing permit system for Puerto Rico EEZ waters.
Alternative 1. No Action. Do not establish a permit system for commercial fishing in the EEZ around Puerto Rico.
Alternative 2. Require a federal permit for commercial fishing in the EEZ around Puerto Rico.
Sub alternative A. Require that each fisherman submit an application for a federal fishing permit.
Sub alternative B. Award a federal fishing permit to all extant Puerto Rico territorial fishing permit holders.

Action 8d: Establish a commercial sales permit system for St. Croix EEZ waters.
Alternative 1. No Action. Do not establish a permit system for selling catch harvested from EEZ waters around St. Croix.
Alternative 2. Require a federal permit for selling catch harvested from EEZ waters around St. Croix.
Sub alternative A. Require that each fisherman submit an application for a federal catch sell permit.
Sub alternative B. Award a federal catch sell permit to all extant St. Croix territorial commercial fishing permit holders.
Action 8e: Establish a commercial sales permit system for St. Thomas/St. John EEZ waters.
Alternative 1. No Action. Do not establish a permit system for selling catch harvested from EEZ waters around St. Thomas/St. John.
Alternative 2. Require a federal permit for selling catch harvested from EEZ waters around St. Thomas/St. John.
Sub alternative A. Require that each fisherman submit an application for a federal catch sell permit.
Sub alternative B. Award a federal catch sell permit to all extant St. Thomas/St. John territorial commercial fishing permit holders.
Action 8f: Establish a commercial sales permit system for Puerto Rico EEZ waters.
Alternative 1. No Action. Do not establish a permit system for selling catch harvested from EEZ waters around Puerto Rico.
Alternative 2. Require a federal permit for selling catch harvested from EEZ waters around Puerto Rico.
Sub alternative A. Require that each fisherman submit an application for a federal catch sell permit.
Sub alternative B. Award a federal catch sell permit to all extant Puerto Rico territorial commercial fishing permit holders.
Action 8g: Establish a permit system for purchasing catch harvested from St. Croix EEZ waters for subsequent resale.
Alternative 1. No Action. Do not establish a permit system for purchasing catch harvested from EEZ waters around St. Croix for subsequent resale.
Alternative 2. Require a federal permit for purchasing catch harvested from EEZ waters around St. Croix for subsequent resale.
Action 8h: Establish a permit system for purchasing catch harvested from St. Thomas/St. John EEZ waters for subsequent resale.
Alternative 1. No Action. Do not establish a permit system for purchasing catch harvested from EEZ waters around St. Thomas/St. John for subsequent resale.
Alternative 2. Require a federal permit for purchasing catch harvested from EEZ waters around St. Thomas/St. John for subsequent resale.
Action 8i: Establish a permit system for purchasing catch harvested from St. Croix EEZ waters for subsequent resale.
Alternative 1. No Action. Do not establish a permit system for purchasing catch harvested from EEZ waters around St. Croix for subsequent resale.
Alternative 2. Require a federal permit for purchasing catch harvested from EEZ waters around St. Croix for subsequent resale.

The permit action has been removed from the present amendment and will instead be included in a future amendment.

4.9 Action 9: Monitoring of Annual Catch Limits

Alternative 1. No Action. Maintain existing catch reporting protocols.

Alternative 2. Require any person landing Council managed species to complete and submit an appropriate data collection form, as developed by the SEFSC or the Council's SSC, after every trip.

Alternative 3. Require any federal permit holder to complete and submit an appropriate data collection form, as developed by the SEFSC or the Council's SSC, after every trip.

Alternative 4. Require any federal permit holder to complete and submit an appropriate updated catch report form as developed in coordination with the SEFSC, local and territorial governments, fishermen, and the Council's SSC with enough detail such that CPUE per species can be calculated for each gear.

The monitoring action has been removed from the present amendment and will instead be included in a future amendment. A modified commercial data collection program for the U.S. Caribbean is being developed.

4.11 Action 11: Allowable Gear for Reef Fish

Alternative 1. No Action. Do not alter allowable gear in the U.S. Caribbean.

Alternative 2. Review the list of allowable gear under 50 CFR 600.725 and revise as appropriate.

Sub alternative A. Remove trawl from the list of allowable gears. (Prohibit the use of trawls in the EEZ (both recreational and commercial use) for reef fish, spiny lobster, queen conch and coral and reef resources.

Sub alternative B. Remove gillnet and trammel net from the list of allowable gears.

Sub alternative C. Remove powerheads from the list of allowable gears (Prohibit the use of powerheads in the Reef Fish, Coral and Queen Conch fisheries.)

Sub alternative D. Allow the harvest of reef fish with spearguns in the commercial fishery for reef fish.

Sub alternative E. Allow the commercial harvest of reef fish with the following gears: handline, bandit gear.

The allowable gear action has been removed from the present amendment and will instead be included in a future amendment.

Action 6: ACL for Recreational Sector

Alternative 4. Do not establish a recreational ACL in the USVI EEZ and state waters, but use the Commercial ACL for each unit or family as a proxy for the ACL for all sectors in the fishery.

Alternative 5. Set the recreational ACL in the USVI equal to 10% of each islands commercial ACL.

The Council (132nd meeting) discussed the lack of data from recreational fishing in the USVI and decided to “not specify recreational ACLs for the USVI, until a recreational survey is implemented”.

Alternative 6. Establish a separate charter boat sector ACL based on MRFSS data for Puerto Rico.

The Council (132nd) decided that the charter ACL would not be set because (1) the proportion of the recreational landings from the charter sector is minimal, (2) there are efforts underway to establish log reporting by charter operators, (3) charters in Puerto Rico have a commercial fishing licenses and are prohibited from selling the catch, (4) the charter operators are more catch and release.

APPENDIX 5. Research Needs

An overarching consideration with regard to the following research needs is that they be well-designed and include statistically valid sample sizes and distribution and that they be conducted with a commitment to long-term data collection as appropriate (SEDAR 2009).

- Conduct age, growth, and reproduction studies for important fish groups in the U.S. Caribbean (those species or groups overfished or undergoing overfishing).
- Determine a more complete picture of the locations of spawning aggregation sites for snapper/grouper (idea is to determine the location of a greater number of spawning aggregation sites).
- Assess the temporal and spatial stability of spawning aggregations.
- Elucidate source-sink dynamics and larval transport pathways, including stability of those pathways, for reef fish and queen conch metapopulations in the U.S. Caribbean.
- Determine fishery-independent CPUEs for principle gears in the U.S. Caribbean.
- Determine the adult standing crop of queen conch in Lang Bank USVI and compare to overall populations of the rest of STX.
- Develop techniques for aging queen conch.
- Determine the biological and economic effects of various escape vents on fish and lobster traps.
- Determine the effects of harvesting herbivorous fishes and invertebrates (queen conch) on the settlement of coral propagules.
- Quantify the size distribution and abundance of fishes in MPAs and compare to similar habitats outside of MPAs.
- Compare four treatments for macroalgal vs. coral cover, including:
    1. unfished/no point source pollution;
    2. fished/no point source pollution;
    3. unfished/point source pollution; and,
    4. fished/point source pollution.
- Continue the trap studies by Sheridan et al. from NMFS' SEFSC.
- Conduct reef fish surveys (focused on targeted species (grouper, snapper, triggerfish, parrotfish)) that can be used for density and abundance estimates.
- Conduct benthic habitat surveys that can be used for abundance and density estimates of benthic species (corals, algae, and sponges), rugosity, and temporal variation (i.e., long term studies).
- Conduct hydrographic studies to aid in determining larval flow/marine reserve areas.
- Obtain effort analysis for both the commercial and recreational fisheries.
- Effect comparative studies between reserve areas (that we think are actually enforced) and fished areas, focusing on assemblage density and for both fish and benthic communities.
- Evaluate and verify expansion factors used to estimate total catch from trip intercepts.

- Develop and implement effective sampling programs for recreational and commercial fisheries.
- Collate, computerize, and evaluate the quality of early biological and biostatistical data collected from U.S. Caribbean waters.

APPENDIX 6. Other Applicable Laws

The MSFCMA (16 U.S.C. 1801 et seq.) provides the authority for U.S. fishery management. But fishery management decision-making is also affected by a number of other federal statutes designed to protect the biological and human components of U.S. fisheries, as well as the ecosystems within which those fisheries are conducted. Major laws affecting federal fishery management decision making are summarized below.

Administrative Procedures Act

All federal rulemaking is governed under the provisions of the Administrative Procedure Act (APA) (5 U.S.C. Subchapter II), which establishes a "notice and comment" procedure to enable public participation in the rulemaking process. Under the APA, NOAA Fisheries is required to publish notification of proposed rules in the *Federal Register* and to solicit, consider and respond to public comment on those rules before they are finalized. The APA also establishes a 30-day wait period from the time a final rule is published until it takes effect.

Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) of 1972 (16 U.S.C. 1451 et seq.) encourages state and federal cooperation in the development of plans that manage the use of natural coastal habitats, as well as the fish and wildlife those habitats support. When proposing an action determined to directly affect coastal resources managed under an approved coastal zone management program, NOAA Fisheries is required to provide the relevant state agency with a determination that the proposed action is consistent with the enforceable policies of the approved program to the maximum extent practicable at least 90 days before taking final action. The Council and NOAA Fisheries determined that this action is consistent to the maximum extent practicable with the enforcement policies of the approved coastal management programs of Puerto Rico and the USVI.

Data Quality Act

The Data Quality Act (DQA) (Public Law 106-443), which took effect October 1, 2002, requires the government for the first time to set standards for the quality of scientific information and statistics used and disseminated by federal agencies. Information includes any communication or representation of knowledge such as facts or data, in any medium or form, including textual, numerical, cartographic, narrative, or audiovisual forms (includes web dissemination, but not hyperlinks to information that others disseminate; does not include clearly stated opinions). Specifically, the Act directs the Office of Management and Budget (OMB) to issue government wide guidelines that "provide policy and procedural guidance to federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information disseminated by federal agencies." Such guidelines have been issued, directing all federal agencies to create and issue agency-specific standards to 1) ensure Information Quality and develop a pre-dissemination review process; 2) establish administrative mechanisms allowing affected persons to seek and obtain correction of information; and 3) report periodically to OMB on the number and nature of complaints received.

Scientific information and data are key components of FMPs and amendments and the use of best available information is the second national standard under the MSFCMA. To be consistent with the Act, FMPs and amendments must be based on the best information available, properly reference all supporting materials and data, and should be reviewed by technically competent individuals. With respect to original data generated for FMPs and amendments, it is important to ensure that the data are collected according to documented procedures or in a manner that reflects standard practices accepted by the relevant scientific and technical communities. Data must also undergo quality control prior to being used by the agency.

Endangered Species Act

The Endangered Species Act (ESA) of 1973 (16 U.S.C. Section 1531 et seq.) requires that federal agencies use their authorities to conserve endangered and threatened species, and that they ensure actions they authorize, fund, or carry out are not likely to harm the continued existence of those species or the habitat designated to be critical to their survival and recovery. The ESA requires NOAA Fisheries, when proposing a fishery action that “may affect” critical habitat or endangered or threatened species, to consult with the appropriate administrative agency (itself for most marine species, the U.S. Fish and Wildlife Service for all remaining species) to determine the potential impacts of the proposed action. Consultations are concluded informally when proposed actions “may affect but are not likely to adversely affect” endangered or threatened species or designated critical habitat. Formal consultations, resulting in a biological opinion, are required when proposed actions may affect and are “likely to adversely affect” endangered or threatened species or designated critical habitat. If jeopardy or adverse modification is found, the consulting agency is required to suggest reasonable and prudent alternatives.

As provided in 50 CFR 402.16, reinitiation of formal consultation is required when discretionary involvement or control over the action has been retained (or is authorized by law) and: (1) the amount or extent of the incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not previously considered; or (4) if a new species is listed or critical habitat designated that may be affected by the identified action.

A formal consultation was requested with regard to the establishment of ACLs for reef fish species in the U.S. Caribbean. With respect to the present amendment to the Reef Fish FMP, the focus of this consultation was the interaction between parrotfish, macroalgae, and listed species of acroporid corals including *Acropora palmata* and *A. cervicornis*. As described in Sections 4.4.1, 4.4.3, 5.2.3.3, and 6.4.1, parrotfish graze coral reefs, reducing overgrowth of a variety of macroalgal species. Because macroalgal overgrowth interferes with successful settlement of acroporid propagules, parrotfish provide an essential service to the continued existence of these threatened coral species by cleansing substrate and ensuring adequate availability of critical Acropora settlement substrate. The results of that consultation will be complete before the Secretary of Commerce makes a final decision on the approvability of the amendment.

To ensure that the essential role of parrotfish on coral reefs is maintained, and enhanced, on Caribbean coral reefs, the present amendment proposes several actions. First, as described in Action 2(a), **Preferred Alternative 2(h)**, the OY and ACL for three large species of parrotfish (midnight, rainbow, blue) is set at zero. Additionally, **Preferred Alternative 2** within Action 4(a) prohibits the harvest of each of these three species from the U.S. Caribbean EEZ. These three large parrotfish species are of substantial conservation concern because of their hermaphroditism, relatively long population doubling time, low resilience relative to other parrotfish species, susceptibility to spear gear, and low abundance on Caribbean reefs (Table 4.4.1). Moreover, midnight, rainbow, and blue parrotfish are territorial and haremic (Robertson and Warner 1978), resulting in bias towards terminal phase males and a female-oriented sex ratio (Streelman et al. 2002). Those traits tend to reduce effective population size (the number of males that successfully contribute gametes to the next generation), further exacerbating reductions in overall population size. Finally, the allowable harvest of all parrotfish species from U.S. Caribbean EEZ waters is reduced relative to recent average landings (Table 4.3.2) and capped, both by reducing the allowable harvest by 15 percent from the annual average recorded during 1999-2005 for each of the Puerto Rico, St. Thomas/St. John, and St. Croix island groups (Action 2(a), **Preferred Alternative 2(g)i)** and by reducing the allowable harvest on St. Croix by an additional 5.8822 percent (Action 4(c), **Preferred Sub-alternative 2A**).

National Marine Sanctuaries Act

Under the National Marine Sanctuaries Act (NMSA) (also known as Title III of the Marine Protection, Research and Sanctuaries Act of 1972), as amended, the Secretary of Commerce is authorized to designate National Marine Sanctuaries to protect distinctive natural and cultural resources whose protection and beneficial use requires comprehensive planning and management. The National Marine Sanctuaries are administered by NOAA's National Ocean Service. NMSA provides authority for comprehensive and coordinated conservation and management of these marine areas. The National Marine Sanctuary System currently comprises 13 sanctuaries around the country, including sites in American Samoa and Hawaii. These sites include significant coral reef and kelp forest habitats, and breeding and feeding grounds of whales, sea lions, sharks, and sea turtles. A complete listing of the current sanctuaries and information about their location, size, characteristics, and affected fisheries can be found at:
http://www.sanctuaries.nos.noaa.gov/oms/oms.html.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act protects the quality of the aquatic environment needed for fish and wildlife resources. The Act requires consultation with the Fish and Wildlife Service and the fish and wildlife agencies of States where the "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified" by any agency (except TVA) under a federal permit or license. NOAA Fisheries was brought into the process later, as these responsibilities were carried over, during the reorganization process that created NOAA. Consultation is to be undertaken for the purpose of "preventing loss of and damage to wildlife resources", and to ensure that the environmental value of a body of water or wetland is taken into account in the decision-making process during permit application reviews. Consultation is most often (but not exclusively) initiated when water resource agencies send the FWS or NOAA Fisheries a public notice of a Section 404 permit. FWS or NOAA Fisheries may file comments on the permit stating concerns about the negative impact the activity will have on the environment, and suggest measures to reduce the impact.

Executive Orders

E.O. 12114: Environmental Effects Abroad of Major Federal Actions

The purpose of this Executive Order is to enable responsible officials of federal agencies having ultimate responsibility for authorizing and approving actions encompassed by this Order to be informed of pertinent environmental considerations and to take such considerations into account, with other pertinent considerations of national policy, in making decisions regarding such actions. While based on independent authority, this Order furthers the purpose of the National Environmental Policy Act (NEPA) and the Marine Protection Research and Sanctuaries Act and the Deepwater Port Act consistent with the foreign policy and national security policy of the United States, and represents the United States government's exclusive and complete determination of the procedural and other actions to be taken by federal agencies to further the purpose of the NEPA, with respect to the environment outside the United States, its territories and possessions.

Agencies in their procedures shall establish procedures by which their officers having ultimate responsibility for authority and approving actions in one of the following categories encompassed by this Order, take into consideration in making decisions concerning such actions, a document described in Section 2-4(a):

(1) major federal actions significantly affecting the environment of the global commons outside the jurisdiction of any nation (e.g., the oceans or Antarctica);
(2) major federal actions significantly affecting the environment of a foreign nation not participating with the United States and not otherwise involved in the action;
(3) major federal actions significantly affecting the environment of a foreign nation which provide to that nation:
    (a) a product, or physical project producing a principal product or an emission or effluent, which is prohibited or strictly regulated by federal law in the United

States because its toxic effects on the environment create a serious public health risk; or

(b) a physical project which in the United States is prohibited or strictly regulated by federal law to protect the environment against radioactive substances.

(4) major federal actions outside the United States, its territories and possessions which significantly affect natural or ecological resources of global importance designated for protection under this subsection by the President, or, in the case of such a resource protected by international agreement binding on the United States, by the Secretary of State. Recommendations to the President under this subsection shall be accompanied by the views of the Council on Environmental Quality and the Secretary of State.

E.O. 12866: Regulatory Planning and Review

Executive Order 12866: Regulatory Planning and Review, signed in 1993, requires federal agencies to assess the costs and benefits of their proposed regulations, including distributional impacts, and to select alternatives that maximize net benefits to society. To comply with E.O. 12866, NOAA Fisheries prepares a Regulatory Impact Review (RIR) for all fishery regulatory actions that either implement a new fishery management plan or significantly amend an existing plan. RIRs provide a comprehensive analysis of the costs and benefits to society associated with proposed regulatory actions, the problems and policy objectives prompting the regulatory proposals, and the major alternatives that could be used to solve the problems. The reviews also serve as the basis for the agency's determinations as to whether proposed regulations are a "significant regulatory action" under the criteria provided in E.O. 12866 and whether proposed regulations will have a significant economic impact on a substantial number of small entities in compliance with the Regulatory Flexibility Act (RFA). A regulation is significant if it is likely to result in an annual effect on the economy of at least $100,000,000 or has other major economic effects.

E.O. 12630: Takings

The Executive Order on Government Actions and Interference with Constitutionally Protected Property Rights, which became effective March 18, 1988, requires that each federal agency prepare a Takings Implication Assessment for any of its administrative, regulatory, and legislative policies and actions that affect, or may affect, the use of any real or personal property. Clearance of a regulatory action must include a takings statement and, if appropriate, a Takings Implication Assessment.

E.O. 13089: Coral Reef Protection

The Executive Order on Coral Reef Protection (June 11, 1998) requires federal agencies whose actions may affect U.S. coral reef ecosystems to identify those actions, utilize their programs and authorities to protect and enhance the conditions of such ecosystems; and, to the extent permitted by law, ensure that actions they authorize, fund or carry out not degrade the condition of that ecosystem. By definition, a U.S. coral reef ecosystem means those species, habitats, and other national resources associated with coral reefs in all maritime areas and zones subject to the jurisdiction or control of the United States (e.g., federal, state, territorial, or commonwealth waters).

The actions contained in the present amendments will benefit coral reef resources of the U.S. Caribbean in important ways. Establishment of ACLs will end overfishing of several reef fish complexes and units including snapper, grouper, parrotfish, and queen conch. Species comprising these complexes or units play important roles on Caribbean coral reefs either as top-level predators (snapper, grouper), grazers that function to prevent overgrowth of macroalgae on coral reefs and thereby assist in the provision of critical settlement habitat for Acroporid corals (parrotfish), or serve to transfer nutrients and other materials among coral reefs and surrounding habitats (queen conch, parrotfish). It is anticipated that the abundance of the species comprising these complexes and units will increase in response to the catch limits, catch prohibitions, accountability measures, and other provisions of these amendments. Overall, the provisions of Amendment 2 to the Queen Conch FMP and Amendment 5 to the Reef Fish FMP are expected to move coral reef ecosystems in the U.S. Caribbean towards a healthier and more natural state. However, it must be kept in mind that factors other than fishing, including global climate change and associated acidification of marine waters, along with land-based sources of nutrification and sedimentation, contribute substantially to the degradation of U.S. Caribbean coral reefs and those reefs will not return to a healthy state until all the factors that contribute to their degradation are addressed.

E.O. 13112: Invasive Species

The Executive Order requires agencies to use authorities to prevent introduction of invasive species, respond to and control invasions in a cost effective and environmentally sound manner, and to provide for restoration of native species and habitat conditions in ecosystems that have been invaded. Further, agencies shall not authorize, fund, or carry out actions that are likely to cause or promote the introduction or spread of invasive species in the U.S. or elsewhere unless a determination is made that the benefits of such actions clearly outweigh the potential harm; and that all feasible and prudent measures to minimize the risk of harm will be taken in conjunction with the actions. The actions undertaken in this amendment will not introduce, authorize, fund, or carry out actions that are likely to cause or promote the introduction or spread of invasive species in the U.S. or elsewhere.

E.O. 13132: Federalism

The Executive Order on federalism requires agencies in formulating and implementing policies that have federalism implications, to be guided by the fundamental federalism principles. The Order serves to guarantee the division of governmental responsibilities between the national government and the states that was intended by the framers of the Constitution. Federalism is rooted in the belief that issues that are not national in scope or significance are most appropriately addressed by the level of government closest to the people. This Order is relevant to FMPs and amendment given the overlapping authorities of NOAA Fisheries, the states, and local authorities in managing coastal resources, including fisheries, and the need for a clear definition of responsibilities. It is important to recognize those components of the ecosystem over which fishery managers have no direct control and to develop strategies to address them in conjunction with appropriate state, tribes and local entities.

E.O. 13158: Marine Protected Areas

Executive Order 13158 (May 26, 2000) requires federal agencies to consider whether their proposed action(s) will affect any area of the marine environment that has been reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural or cultural resource within the protected area.

E.O. 12898: Environmental Justice

This Executive Order mandates that each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions. Federal agency responsibilities under this Executive Order include conducting their programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons from participation in, denying persons the benefit of, or subjecting persons to discrimination under, such, programs policies, and activities, because of their race, color, or national origin. Furthermore, each federal agency responsibility set forth under this Executive Order shall apply equally to Native American programs.

Specifically, federal agencies shall, to the maximum extent practicable; conduct human health and environmental research and analysis; collect human health and environmental data; collect, maintain and analyze information on the consumption patterns of those who principally rely on fish and/or wildlife for subsistence; allow for public participation and access to information relating to the incorporation of environmental justice principals in federal agency programs or policies; and share information and eliminate unnecessary duplication of efforts through the use of existing data systems and cooperative agreements among federal agencies and with State, local, and tribal governments.

Marine Mammal Protection Act (MMPA

The MMPA established a moratorium, with certain exceptions, on the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas. It also prohibits the importing of marine mammals and marine mammal products into the United States. Under the MMPA, the Secretary of Commerce (authority delegated to NOAA Fisheries) is responsible for the conservation and management of cetaceans and pinnipeds (other than walruses). The Secretary of the Interior is responsible for walruses, sea otters, polar bears, manatees, and dugongs.

In 1994, Congress amended the MMPA, to govern the taking of marine mammals incidental to commercial fishing operations. The MMPA requires a commercial fishery to be placed in one of three categories, based on the relative frequency of incidental serious injuries and mortalities of marine mammals. Category I designates fisheries with frequent serious injuries and mortalities incidental to commercial fishing; Category II designates fisheries with occasional serious injuries and mortalities; Category III designates fisheries with a remote likelihood or no known serious injuries or mortalities. To legally fish in a Category I and/or II fishery, a fisherman must obtain a marine mammal authorization certificate by registering with the Marine Mammal Authorization Program (50 CFR 229.4) and accommodate an observer if requested (50 CFR 229.7(c)) and they must comply with any applicable take reduction plans. According to the List of Fisheries for 2010 published by the National Marine Fisheries Service, the both the Reef Fish (all gear) and Caribbean conch fisheries are considered Category III (74 FR 58859).

Paperwork Reduction Act

The Paperwork Reduction Act (PRA) of 1995 (44 U.S.C. 3501 et seq.) regulates the collection of public information by federal agencies to ensure that the public is not overburdened with information requests, that the federal government's information collection procedures are efficient, and that federal agencies adhere to appropriate rules governing the confidentiality of such information. The PRA requires NOAA Fisheries to obtain approval from the Office of Management and Budget before requesting most types of fishery information from the public. This action contains no new collections of information.

Small Business Act

The Small Business Act of 1953, as amended, Section 8(a), 15 U.S.C. 634(b)(6), 636(j), 637(a) and (d); Public Laws 95-507 and 99-661, Section 1207; and Public Laws 100-656 and 101-37 are administered by the Small Business Administration (SBA). The objectives of the act are to foster business ownership by individuals who are both socially and economically disadvantaged; and to promote the competitive viability of such firms by providing business development assistance including, but not limited to, management and technical assistance, access to capital and other forms of financial assistance, business training and counseling, and access to sole source and limited competition federal contract opportunities, to help the firms to achieve competitive viability. Because most businesses associated with fishing are considered small businesses, NMFS, in implementing regulations, must make an assessment of how those regulations will affect small businesses.

Magnuson-Stevens Act Essential Fish Habitat (EFH) Provisions

The Magnuson-Stevens Act includes EFH requirements, and as such, each existing, and any new, FMPs must describe and identify EFH for the fishery, minimize to the extent practicable adverse effects on that EFH caused by fishing, and identify other actions to encourage the conservation and enhancement of that EFH. The Council and NMFS have determined there are no adverse effects to EFH in this amendment as discussed in the Environmental Consequences section (Section 5.0).

National Environmental Policy Act

The National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 et seq.) requires federal agencies to consider the environmental and social consequences of proposed major actions, as well as alternatives to those actions, and to provide this information for public consideration and comment before selecting a final course of action. This document contains an Environmental Impact Statement to satisfy the NEPA requirements. The statement of need can be found in Section 2, Alternatives are found in Section 4, the environmental impacts are found in Section 5, and a list of agencies/people consulted is found in Section 10.

Regulatory Flexibility Act

The purpose of the RFA (1980, 5 U.S.C. 601 et seq.) is to ensure that federal agencies consider the economic impact of their regulatory proposals on small entities, analyze effective alternatives that minimize the economic impacts on small entities, and make their analyses available for public comment. The RFA does not seek preferential treatment for small entities, require agencies to adopt regulations that impose the least burden on small entities, or mandate exemptions for small entities. Rather, it requires agencies to examine public policy issues using an analytical process that identifies, among other things, barriers to small business competitiveness and seeks a level playing field for small entities, not an unfair advantage.

After an agency determines that the RFA applies, it must decide whether to conduct a full regulatory flexibility analysis (IRFA or Final Regulatory Flexibility Analysis) or to certify that the proposed rule will not "have a significant economic impact on a substantial number of small entities. In order to make this determination, the agency conducts a threshold analysis, which has the following 5 parts: 1) Description of small entities regulated by proposed action, which includes the SBA size standard(s), or those approved by the Office of Advocacy, for purposes of the analysis and size variations among these small entities; 2) Descriptions and estimates of the economic impacts of compliance requirements on the small entities, which include reporting and recordkeeping burdens and variations of impacts among size groupings of small entities; 3) Criteria used to determine if the economic impact is significant or not; 4) Criteria used to determine if the number of small entities that experience a significant economic impact is substantial or not; and 5) Descriptions of assumptions and uncertainties, including data used in the analysis. If the threshold analysis indicates that there will not be a significant economic impact on a substantial number of small entities, the agency can so certify. The IRFA for this action can be found in Section 7.0.

APPENDIX 7. Scoping Locations and Outcomes

Summary Scoping Meetings

This section summarizes testimony on earlier drafts of the scoping and options documents presented at ten public meetings or submitted in writing to the Caribbean Fishery Management Council and/or the NOAA-Fisheries during the public scoping period. The scoping documents are included in Appendices S-1 and S-2 as well as the summary minutes of the oral testimony received. Written comments received during each of the meetings are available from the Caribbean Fishery Management Council.

The first draft of the scoping document for Amendments to the Queen Conch and Reef Fish FMPs included 13 Actions, 51 Alternatives, and 69 sub-alternatives (See Appendix S-1). These draft scoping documents are prepared in both English and Spanish and mailed to individual fishers (both commercial and recreational), divers, charters, interested parties (scientists, academics, news media, general public), fishing associations, clubs, and marinas. Announcements for the meetings are published in the CFMC web site (http://www.caribbeanfmc.com), in the local newspapers, both in English and Spanish and in the Federal Register (FR Volume 74, No. 69: 16846-16850, Monday, April 13, 2009; FR Volume 74, No. 145: 37981-37986, Thursday, July 30 2009). The second draft scoping document contained 13 actions, 52 Alternatives, and 78 sub-alternatives responding to the comments received at the public meetings (See Appendix S-2). The comments from the public meetings were presented at the CFMC Regular Meetings number 131 (June 2009) and 132 (September 2009).

The Draft Scoping Document on Annual Catch Limits and Accountability Measures to amend the Queen Conch and Reef Fish FMPs (dated March 25, 2009) was taken to public meetings first during the period April 27 to May 7, 2009 and then (Scoping Document dated July 14 2009) in August 18-19, 2009. The following table summarizes the locations, dates, and public attendance as well as number of comments received at these meetings. Each scoping document included alternatives suggested at the public meeting and approved by the CFMC. The CFMC discussed the results of the scoping meetings during its 131st and 132nd meetings.

All comments received were addressed by the CFMC at the 131st and 132nd meetings. Although well attended, the results from the public meetings in the U.S. Virgin Islands yielded a No Action for every one of the alternatives presented in the scoping documents. However, the written comments received from the St. Thomas Fishermen's Association included additional alternatives to determine ACLs. These were reviewed by the SEFSC and the SSC and addressed during the 132nd CFMC meeting.

Scoping Meetings ACLs and AMs

Place	Date	Attendance	Deponents
San Juan	April 27 2009	22	1** (representing 21)
San Juan	August 19 2009	0	0
Ponce	April 28 2009	2	0
Fajardo	April 29 2009	0	0
Mayaguez	May 4 2009	10	2
Mayaguez	August 18 2009	7	6
St. Thomas	May 6 2009	47	5
St. Thomas	August 18 2009	40*	10
St. Croix	May 7 2009	48	4
St. Croix	August 19 2009	17	7

*St. Thomas Fisherman Association presented 33 signatures
** Representing the Free Divers Association

The most relevant issues discussed during the scoping meetings were the need to (1) consider the landings by area for each separate Island and not in combined form, (2) account for the changes in the fishery after the Caribbean SFA Amendment management measure went into effect in 2005, (3) account for the lack of enforcement, (4) account for the lack of information on the recreational sector, and (5) account for the lack of monitoring and data.

The Options Paper was presented at the CFMC 133rd meeting and additional alternatives were discussed and approved by the CFMC to be included in the public hearing draft. The Options paper was dated December 2, 2009. The CFMC reviewed the first draft of the public hearing document at its 134th meeting (April 2010) and approved the document to be taken to public hearings.

The public hearing draft included many changes and a reorganization of the scoping and options paper. The original actions are discussed below and are referenced to the decisions of the CFMC and the new sections of the public hearing draft. The two scoping documents included the following actions differing in the alternatives and sub-alternatives as modified by the ACLG and SSC recommendations, CFMC and public comment (See Appendices S-1 and S-2). The comments received are summarized under each Action. (Refer to Appendix 4 for the alternatives presented under each Action).

Action 1: Amending the Stock Complexes in the Reef Fish Fishery Management Unit

Parrotfish: Most comments agreed with separating the blue, rainbow, and midnight parrotfish and limiting their harvest; SSC and ACLG also recommended separating these species.

Grouper Unit 4: Misty and yellowedge grouper are harvested from deeper waters than the other species in the unit. There was one comment on the need to evaluate red grouper since it has disappeared from shallow waters.

Snapper: concurrence with the changes proposed.

This Action remains the same in the public hearing draft, as Action 1, except for the parrotfish being considered one unit (rather than 2) due to the lack of species specific data.

Action 2: Annual Catch Limits for Queen Conch (*Strombus gigas*) off St. Croix

Comments on determining ACLs for the USVI included (1) a need for enforcement of the regulations that are put in place (quota and bag limits), and (2) the need to monitor the resource and re-evaluate the overfished designation.

Comments received in Puerto Rico included the need to assess the conch population in the EEZ (now closed).

Action 3: Annual Catch Limits for Parrotfish Unit 1 and Parrotfish Unit 2

Some suggested that parrotfish be allocated to the recreational fishers and managed by bag limits.

Divers seek to harvest the largest individuals to set a record (as trophy fish).

Action 4: Annual Catch Limits for Grouper Unit 4

Commercial fishers suggested that the grouper in this unit be monitored before establishing an ACL.

St. Thomas fishers argued that with the establishment of the seasonal closure for GU4 and the seasonal area closure established in Grammanik Bank, there was no need to establish an ACL or to regulate these species further. USVI fishers also argued that some species within this unit are ciguatoxic and not harvested and therefore there is no need to establish an ACL or regulate these species further.

Action 5: Annual Catch Limits for Snapper Unit 1

USVI fishers argued that the species within the SU1 are not fished in St. Thomas and are not overfished but is a fishery that can expand. Puerto Rico fishers argue that based on information from the SEFSC there was room for expansion of this fishery.

All these Actions (2, 3, 4, and 5) from the scoping documents have been combined into Actions 2 and 3 of the public hearing draft. These are discussed under the re-definition of the management references points in pre- and post-Caribbean SFA Amendment and the re-determination of these reference points in relation to ACLs for queen conch, SU1, GU4, and parrotfish.

Action 6: Annual Catch Limits for the Recreational Sector

Most recreational fishers supported an equal ACL for the recreational and commercial sectors based on the higher number of recreational fishers and the fact that both target the same species.

Most commercial fishers supported limits to the recreational harvest (10%, 25% of the commercial catch). Others suggested a 50:50 distribution between the commercial and recreational sectors for the ACL for all species.

Most comments received discussed the need for recreational fishing licenses and permits as well as the requirement to submit landings data after every trip as the commercial fishers are required to do. Comments also included the need to limit the recreational catch through quotas and bag limits.

Action 3 of the public hearing draft includes the determination of ACLs allocation and management.

Action 7: Accounting for Uncertainty

Most comments received supported no scalar or the less restrictive reduction in harvest.

Action 2 of the public hearing draft addresses uncertainty. All recommendations for scalars have been included.

Action 8: Alternative Methods for Reducing Fishing Mortality and Establishing ACL Proxies

This alternative originally included additional closures in the U.S. Caribbean EEZ and was rejected by the public and the CFMC. Among the issues raised by the public was (1) the lack of monitoring of the closed areas already in place, (2) the restrictive nature of the closures, (3) the use of other management alternative such as bag limits, quotas, seasonal closures, and (4) the lack of information on the economic impact of the closures. Action 8 included, among the alternatives to reduce fishing mortality, a number of proposed area closures for the U.S. Caribbean EEZ. These alternatives were the most contentious and least accepted by the public and the Council. These alternatives were not considered in the July 15, 2009 draft of the scoping document and subsequent discussion at the Council.

Action 4 of the public hearing draft addresses management measures including the recommendations of the public (bag limits for the recreational sector), among others, but no closed areas.

Action 9: Permits

The local governments have established or are establishing licenses and permits for the commercial and recreational fishers. Most commenters support the issuing of federal permits but reducing duplication.

This Action is not included in the public hearing draft since the CFMC will develop a separate amendment for permits in the EEZ.

Action 10: Monitoring and Enforcement of Annual Catch Limits

This action received the most comments including: (1) the need to enforce the regulations in place (selling of the recreational catch, poaching of traps and during the seasonal closures, poaching in the closed areas) (2) monitor the closed areas specifically with the help of the commercial fishers, (3) the need to carry outreach and educate fishers on the regulations and data collection.

The CFMC discussed the need for monitoring and enforcement not only of the ACLs but of the management measures in place. The necessary steps to monitor the ACLs are already underway including improvements to the data collection programs and additional efforts to collect fisheries data, among others.

Action 11: Accountability Measures

The triggering of the accountability measures was of great concern to the fishers because of the time it takes to analyze the data and the lack of data from the recreational sector.

Action 5 in the public hearing draft was expanded to accommodate the changes suggested to the now Action 2 in the public hearing draft regarding management reference points and ACLs. All recommendations on the use of scalars to deal with uncertainty have been included.

Action 12: Allowable Gear for Reef Fish

The comments received included (1) allow use of spear by commercial fishers, (2) do not allow the use of powerheads by either commercial or recreational fishers, (3) nets are already prohibited in the EEZ and (4) do not allow trawling in the area.

This action was removed from the options paper and public hearing draft because the necessary changes to the allowable gears in the US Caribbean EEZ can be achieved through technical amendments.

Action 13: Establish Framework Measures for ACLs and AMs in the Reef Fish FMP

This is Action 6 in the public hearing draft.

All the issues addressed by the public have been discussed at each CFMC meeting following public meetings, subsequently revised, and the new public hearing document is much less complex than the scoping documents. However, the determination of ACLs and AMs is the core of the document to be considered by the Council. The CFMC meeting at which results from the scoping meetings were discussed included meeting numbers 130th, 131st, 132nd and 133rd. Verbatim transcriptions of the Council meetings are all available at the Council Office.

Appendix S-1

CARIBBEAN FISHERY MANAGEMENT COUNCIL
268 MUNOZ RIVERA AVE. SUITE 1108
SAN JUAN, P. R. 00918-1920
ACLs SCOPING MEETINGS
SAN JUAN, PR
APRIL 27, 2009
SUMMARY MINUTES

The meeting was called to order at 7:25 pm. Mr. Eugenio Piñeiro welcomed the attendees. A brief explanation of the ACLs and alternatives was presented by Graciela García-Moliner.

A total of 22 participants were present. Council and staff members present were Graciela García-Moliner, Iris Oliveras, and Eugenio Piñeiro.

Comments:

1. Roberto Reyes - Puerto Rico Freedivers, and member of the Council's AP. (Mr. Reyes a viva vocce requested and was granted support for his comments on the ACL alternatives as presented below. Free divers or apnea divers are recreational fishers harvesting fish with spears.)

Action 1 - Amend the Stock Complexes in the Reef Fish Fishery Management Unit

• Suggests that the midnight and rainbow parrotfish species be separated from the rest of the parrotfishes.

• Requested that a quota be established for recreational fishers (free divers). Free divers are interested in record fish by spear fishing and he stated that the divers can select the largest fish.

• Limit of 1 of the 3 parrotfish per person per day; the records are from Puerto Rico (largest individuals) for midnight and rainbow.

• They had no comments in the SUI (too deep for apnea or free diving).

Action 2 - ACLs for Queen Conch in St. Croix (Does not apply to PR).

Action 3 - ACLs for Parrotfish Unit 1 and Parrotfish Unit 2

• Proposes to establish an ACL for parrotfish units and divide it on a 50/50 between the commercial and recreational fishers. For example, multiply the average amounts calculated from the commercial catch by 2 and then divide it by 2 (e.g., 80,000 x 2 = 160 / 2= 80,000 pounds for each sector).

• The commercial and recreational fishers fish the same kind of fish and in the same areas.

• There are many more recreational fishers than commercial fishers.

• Need data from the recreational fishing activity.

Action 4 - Annual Catch Limits for Grouper Unit 4

• Red grouper is rarely seen in the free diving depth range, suggested it be treated as the Nassau grouper, as threaten.

Action 5 -ACLs for Snapper Unit 1

• Suggests that equal amounts be established for commercial and recreational fishers of 374,000 pounds for each sector.

Action 6 - Annual Catch Limits for Recreational Fishing
• As in Alternative 3, use recreational fishing average landings in Puerto Rico, and if no data is available, establish a 50% for recreational and 50% commercial. (The ACL calculated for the commercial sector is used to establish the ACL for the recreational sector. See Action 5 above).
• Suggest that Charters be included in the commercial sector. Numbers reported to MRFSS, be reported as commercial.
Action 7 - Accounting for Uncertainty
• No comments.
Action 8 - Alternative Methods for Reducing Fishing Mortality and Establishing ACL Proxies
• No closed areas (No to Alternatives 2, 3, and 4) because these are too restrictive.
• Alternative 5 - Instead of closing areas (a) establish daily quotas for charters and recreational fishers, (b) catch and release for charters, (c) establish bag limits of 1 fish per day for recreational fishers, (d) use the recreational limits and regulations established by the PR-DNER (e.g. no SCUBA and spear for harvesting fish), (e) selectivity by gear (e.g., spears) also reduce by catch.
Action 9 - Permits
• Need to establish a recreational license, once established by the local government do not duplicate in the federal government. If there is a fee for the license/permit the money should go to the government of Puerto Rico. Only if moneys go to PR would they agree with the federal permits, otherwise, No Action.
Action 10 - Monitoring and Enforcement
• Alternative 4 is the preferred.
Action 11 - Accountability Measures
• Alternative 2, Sub-alternative A (one year) and Alternative 6.
Action 12 - Allowable Gear for Reef Fish
• Spear fishing is allowed.
• Do not allow powerheads in either the commercial and recreational sectors.
Action 13
• Alternative 2.

2. Rodolfo Abrams Palomares - Commercial Fisher - Toa Baja, PR
Action 1 - Amend the Stock Complexes in the Reef Fish Fishery Management Unit
• Suggests that the midnight and rainbow parrotfish species be separated from the rest of the parrotfishes; these are deep water species.
• Allow only recreational harvest.
• No changes suggested for the other fish units.
Action 2 - ACLs for Queen Conch in St. Croix (Does not apply to PR)
Action 3 - ACLs for Parrotfish Unit 1 and Parrotfish Unit 2
• Many commercial fishers do not have a commercial fishing license, many pass as recreational fishers.
• No changes noticed in the amount of fish being harvested.
Action 4 - Annual Catch Limits for Grouper Unit 4
• Red grouper is a small grouper that has been fished and there is a need to evaluate the species and treat it as a separate unit.

Action 5 -ACLs for Snapper Unit 1
• Keep the ACLs separate for Puerto Rico.
Action 6 - Annual Catch Limits for Recreational Fishing
• As in Alternative 3, use recreational fishing average landings in Puerto Rico, and if no data is available, establish a 50% for recreational and 50% commercial. [The ACL calculated for the commercial sector is used to establish the ACL for the recreational sector. See Action 5 above.]
• There are no real data from the recreational sector.
Action 7 - Accounting for Uncertainty
• No Action
Action 8 - Alternative Methods for Reducing Fishing Mortality and Establishing ACL Proxies
• No closed areas (No to Alternatives 2, 3, and 4.
• PR-DNER needs to focus more on outreach and education rather than enforcement. Need to work more with the commercial and recreational fishers.
Action 9 - Permits
• Need to establish permits as long as the moneys collected from these stays in Puerto Rico, otherwise, No Action.
Action 10 - Monitoring and Enforcement
• Alternative 4 is the preferred.
Action 11 - Accountability Measures
• Alternative 2, Sub-alternative A (one year) and Alternative 6.
Action 12 - Allowable Gear for Reef Fish
• Spear fishing is allowed for commercial and recreational fishing.
Action 13
• Alternative 2.

General Comments:
• Concerns about the reporting by recreational fishers, how the reporting is done and what is reported.
• Request from the PR DNER educate recreational fishers.
• PR-DNER should assign additional funds for education.
• Assign funds for outreach on the use of anchoring buoys.
• There is an urgent need for timeliness on the use of data.
• Enforcement Agents should be more courteous.

The meeting was adjourned at 10: I0 pm.

CARIBBEAN FISHERY MANAGEMENT COUNCIL
268 MUNOZ RIVERA AVENUE, SUITE 1108
SAN JUAN, PUERTO RICO 00918
SCOPING MEETING
ANNUAL CATCH LIMITS (ACLs) AND
ACCOUNTABILITY MEASURES (AMs)
PONCE, PR
APRIL 28, 2009
SUMMARY MINUTES

Council's Chairman, Mr. Eugenio Piñeiro opened the meeting at 7:55pm. A brief description of the ACLs background and the different alternatives for the ACLs were presented by Graciela García-Moliner.

A total of 2 participants were present. Council staff members attending this meeting were Graciela García-Moliner, Iris Oliveras, and Eugenio Piñeiro, Council Chair, Mr. Miguel A. Rolón, Executive Director.

General Comments:

1. María Román - Pescadería City Island - Juana Díaz, and Julio Reyes, President of the "Asociación de Pescadores Paseo Costero del Sur de Juana Díaz (previously Pastillo).
• They are worried about not having recreational statistics.
• There are no fishing regulations for recreational fishers and there are many of them.
• Recreational fishing could be controlled using catch and release and bag limits.
• Regarding the charters, if customers are paying $500 for the trip, they should be allowed to keep the fish. There should also be catch and release for fish that the customer is not keeping.
• Have noticed a large decrease in the use of traps because of poaching and theft. This problem requires the presence of DNER Rangers or police. The trap fishers in the area use no GPS, no winch but still the cost of trap construction has increased significantly.
• There are lots of restrictions on commercial fishing, but no effort to attract new, young fishers.
• Is very hard these days to make a living from fishing due to increased costs of materials.

Meeting adjourned at 9:00 pm.

CARIBBEAN FISHERY MANAGEMENT COUNCIL
268 MUÑOZ RIVERA AVE. SUITE 1108
SAN JUAN, P. R. 00918-1920
ACLs SCOPING MEETINGS
APRIL 29, 2009
FAJARDO, PR
SUMMARY MINUTES

There were no participants at this meeting. Council staff members present were Graciela García-Moliner and Iris Oliveras. Marcos Hanke acted as chairman.

Meeting adjourned at 9:30pm.

CARIBBEAN FISHERY MANAGEMENT COUNCIL
268 MUNOZ RIVERA AVENUE, SUITE 1108
SAN JUAN, PUERTO RICO 00918
SCOPING MEETING
ANNUAL CATCH LIMITS (ACLs) AND
ACCOUNTABILITY MEASURES (AMs)
MAYAGUEZ, PUERTO RICO
MAY 4, 2009
SUMMARY MINUTES

The scoping meeting was held at the Mayagüez Resort and Casino, in Mayagüez, Puerto Rico, and was chaired by Mr. Marcos Hanke, CFMC Member.

Mr. Miguel Rolón gave a PowerPoint presentation (attached) on the proposed management measures for *ACLs/AMs*, and explaining the new requirements of the Magnuson Stevens Act.

A total of 10 people attended the meeting:
Following are the comments offered by the attendees:

1. Nelson Crespo - Commercial Fisherman
   - A written statement was provided and read for the record. (Attached as part of the minutes.)

2. Fred Lentz - Commercial Fisherman
   - A written statement was provided and read for the record. (Attached as part of the minutes.)

3. Jasmín Seda - Commercial Fisher
   - Recommends to divide ACLs by Islands (Puerto Rico, St. Thomas, St. Croix, St. John).
   - Monitoring is very important. How will it be done?
   - The port agents should be the ones collecting the statistics from the fishermen as they used to do before. It is more effective if it is done this way.

4. Alexander Hermindez Rodriguez - Commercial Fisherman
   - The problem is that there is not good enforcement of the existing regulations.
   - The recreational fishers are selling their catch to the local restaurants, and this is an illegal practice since recreationals cannot sell their catches. This hurts the commercial fishermen who depend on selling the catch to support their families.
   - The recreational fishermen should also report their catches.

The meeting was adjourned at 9:30 p.m.

Appendix S-2

CARIBBEAN FISHERY MANAGEMENT COUNCIL 268 MUÑOZ RIVERA AVE.
SUITE 1108 SAN JUAN, P. R. 00918-1920
ACLs SECOND SCOPING MEETING MAYAGÜEZ RESORT & CASINO HOTEL
AUGUST 18, 2009
SUMMARY MINUTES

The meeting was opened at 8:05 pm. The Council's Chairman, Mr. Eugenio Piñeiro read the Protocol for this meeting. The different alternatives for the ACL's were presented by Graciela García-Moliner.

A total of 7 people present, 6 were commercial fishers. Council and staff members present were Graciela García-Moliner, Iris Oliveras, and Eugenio Piñeiro.

Comments:

4.1 Action 1: Amending the Stock Complexes in the Reef Fish Fishery Management Unit.

Alternative 2. Modify the FMU by:

Sub alternative A. Separating the Parrotfish Unit into 2 complexes. Parrotfish Unit 1 would include princess, queen, redfin, redtail, stoplight, redband, and striped parrotfishes and Parrotfish Unit 2 would include blue, midnight, and rainbow parrotfishes.

1. Victor Padilla – Commercial Fisher - El Seco, Mayagüez

Separate parrotfishes in two groups; the large ones and small ones.

2. General comment

Not much of a parrotfish fishery in the west coast of Puerto Rico; those present were mostly deep water snapper fishers and divers; one trap fisherman.

Sub alternative B. Separate Grouper Unit 4 into Grouper Unit 4 (yellowfin, red, tiger, and black grouper) and Grouper Unit 5 (yellowedge and misty grouper). Add black grouper to Grouper Unit 4.

1. Victor Padilla – Commercial Fisher - El Seco, Mayagüez

Separate them in two units, deep water groupers and shallow water groupers. Concurred that the yellowedge and misty should be a separate unit.

Sub alternative C. Add cardinal snapper (*Pristipomoides macrophthalmus*) to Snapper Unit 2 and move wenchman (*Pristopomoides aquilonaris*) into Snapper Unit 1.

1. General comment

Concurred that the cardinal snapper should be with the queen snapper. The wenchman is caught with the silk snapper and not much of a fishery. Whatever is reported in Puerto Rico as wenchman is really cardinal snapper.

4.2 Action 2: Annual Catch Limits for queen conch (*Strombus gigas*) off St. Croix

1. General comments

There were questions about the re-opening of the queen conch fishery in the EEZ off the west coast of Puerto Rico. Also, the fishers present voiced complaints about those fishers not abiding by the law (size and seasonal closure) and the indiscriminate harvest by recreational fishers of juvenile conch.

The fishers voiced a general concern about the lack of enforcement of the fishing regulations on the recreational sector.

The fishers voiced a general concern about the lack of recreational fishing license, fishing regulations, fishery statistics and interventions by the rangers and the USCG. Also, there are concerns about the recreational or non-licensed fishers selling the catch to restaurants and other dealers.

There is a need to reach out to the restaurants and fish buyers regarding the need to buy their fish from licensed commercial fishers.

4.3 Action 3: Annual Catch Limits for Parrotfish Unit 1 and Parrotfish Unit 2

Alternative 3. Set the ACL for Parrotfish Unit 1 off Puerto Rico equal to:

Sub alternative B. Establish an ACL of 80,000 pounds based on the average landings during 1999-2006. (ACLG February 2009 recommendation)

1. General comment

Although the fishers present are not harvesters of parrotfish, their main concerns were with the recreational harvest: (1) there should be a limit to the recreational landings of 25% or less of the total commercial catch; (2) there should be no selling of the catch by recreational fishers or non-licensed commercial fishers; (3) need the landings statistics from the recreational fishing sector.

2. Pedro Silva – Commercial Fisher - Mayagüez

Establish a limit for recreational of only 25% of the 80,000 pounds= 20,000 pounds or less.

Alternative 6. Set the ACL for Parrotfish Unit 1 in the U.S. Caribbean equal to:

Sub alternative A. Zero for the EEZ and do not establish an ACL for state waters, but rely on the data collection program (described in Action 10) and revisit ACL for parrotfish five years after implementation of data collection program.

Sub alternative B. 380,000 pounds based on the average landings during 1999-2006.

Sub alternative C. The average landings during 1994-2006 multiplied by an uncertainty scalar (see Action 7 for uncertainty scalar).

1. General comment

The general consensus was that there should be ACLs separate for each Island; not to go back to having one fishery for the US Caribbean.

4.4 Action 4: Annual Catch Limits for Grouper Unit 4

Sub alternative C. 15,000 pounds, based on the average corrected landings for identified Grouper Unit 4 species during 1994-2006 plus the average proportional corrected landings estimate for Grouper Unit 4 species landed in the generic "Sea Basses" category during 1994-2006.

1. Victor Padilla - Commercial Fisher - El Seco, Mayagüez

Stated that groupers are harvested by commercial and recreational fishers and suggests first that recreational fishers be allowed to harvest 25 percent of the commercial catch. The rationale he offered was that of the total number of fishers in Puerto Rico, 95 percent are recreational and 5 percent are commercial. He asked if the ACLs in these alternatives included the recreational harvest and stated that the implementation of these should consider both the commercial and recreational harvest. He expressed concern about the lack of enforcement of fishing regulations on the recreational sector, including the lack enforcement on the selling of the catch by the recreational fishers.

2. Pedro Silva - Commercial Fisher - Mayagüez

Suggested that the level should be higher than 15,000 pounds to account for those years when fishing is better that correspond to years of good reproduction. Recreational fishers should be allowed to harvest less than the commercial fishers, about 10 percent of the commercial catch. The recreational fishers have other jobs and do not make a living from fishing and the amount allowed for harvest should be less than that of the commercial fishers.

Alternative 5. Set the ACL for Grouper in the U.S. Caribbean equal to:

1. General comment

Fishers consensus not to consider this alternative.

4.5 Action 5: Annual Catch Limits for Snapper Unit 1

Alternative 2. Set the ACL for Snapper Unit 1 off Puerto Rico equal to:

Sub alternative H. 500,000 pounds ACL in the EEZ and do not establish an ACL for state waters, but rely on the data collection program (described in Action 10) and revisit ACL for Snapper Unit 1 five years after implementation of the data collection program.

1. Gerardo Colón -Commercial Fisher - Mayagüez

Suggests DNER give a brochure to recreationals with species they can fish and quotas allowed when renewing their boats registration.

2. Carlos Nieves: Commercial Fisher –El Seco, Mayagüez

Recreationals be allowed only 10% of the commercial quota. Sub alternative J. 374,000 pounds each for both the commercial and recreational sectors.

1. Carlos Nieves - Commercial Fisher – El Seco, Mayagüez

Recreational fishers take 80 percent more snappers than commercials. He does not agree with the 374,000 pounds for recreational fishers considered in this alternative. Snappers should not be fished recreationally with cala (bottom line, deep water snapper reel: the way commercial fishers harvest deep water snappers). Recreational fishers should be allowed 10 percent of the commercial harvest.

2. Pedro Silva - Commercial Fisher - Mayagüez

Recreational fishers should only be allowed 10 percent of the harvest for snappers. Snappers are caught in federal waters – if closing fishing they won't fish

3. Julio Morales - Commercial Fisher – El Seco, Mayagüez

Recreational fishers should be sport fishers and have harvest limits. He was concerned about the managers taking into consideration the comments from the commercial fishers.

4. Victor Padilla - Commercial Fisher - El Seco, Mayagüez

Limit the recreational harvest of chillo (snappers).

5. Gerardo Colón - Commercial Fisher -Mayagüez

Suggested that the DNER educate the recreational fishers about the fishing regulations and that there should be a quota (by pounds) for the recreational fishers.

Alternative 5. Set the ACL for Snapper in the U.S. Caribbean equal to:
Sub alternative A. Zero for the EEZ off the U.S. Caribbean and do not establish an ACL for state waters, but rely on the data collection program (described in Action 10) and

revisit ACL for Snapper Unit 1 five years after implementation of the data collection program.

Sub alternative B. 1,529,000 pounds, based on the average landings during 1994 - 2006 for all Snapper species.

Sub alternative C. The average landings during 1994 - 2006 for all Snapper species multiplied by an uncertainty scalar (see Action 7 for uncertainty scalar).

1. Pedro Silva - Commercial Fisher - Mayagüez

Separate each island because of the kind of fish harvested and the way fishing is done is different among the Islands. Also, the preference for fish is different among the Islands.

2. Daniel Matos – Director, Fishery Statistics Program, Fisheries Research Lab. -DNER

The islands should be separated because each has different fisheries and the types of statistics that are collected are different and collected in a different manner. Puerto Rico has more species specific data.

4.6 Action 6: Annual Catch Limits for the Recreational Sector

Alternative 5. Set the recreational ACL in the USVI equal to 10 percent of each islands' commercial ACL.

1. Pedro Silva - Commercial Fisher - Mayagüez

This should also be the alternative for Puerto Rico. (Concerns with the recreational fishing activity were raised by the commercial fishers on most of the alternatives for setting ACLs. The rational includes: (1) the high number of recreational fishers; (2) the lack of regulations, licenses and enforcement; (3) fishing gear used by the recreational fishers that should only be used by commercial fishers; (4) selling of the recreationally caught fish.)

Alternative 6. Establish a separate charter boat sector ACL based on MRFSS data for Puerto Rico.

1. General comment

Consensus on the separate ACL for charters.

Alternative 7. Establish recreational ACL equal to half of the commercial ACL in Puerto Rico.

Sub alternative A. Allow recreational fishers to harvest all species managed by the Council in the EEZ and state waters.

Sub alternative B. Allow recreational fishers to harvest only fish species managed by the

Council that are not listed as overfished or undergoing overfishing in the EEZ and state waters.

1. Victor Padilla - Commercial Fisher - El Seco, Mayagüez

The recreational harvest allowed should be lower than the commercial catch. Recreational fishers go out on the weekends and catch more than commercials that go out every day. Recreational fishers sell the catch at a lower price per pound (lower than the market value) than the commercial fishers and flood the market; commercial fishers then cannot sell the catch. Commercials have a lot more expenses than the recreationals. The cost of gas, gear, boat maintenance, etc. has increased greatly and these expenses cannot be overcome when the recreational fishers sell fish below market price.

2. Carlos Nieves - Commercial Fisher - El Seco, Mayagüez

The quotas for the recreational fishers should be set like they are in the fishing regulations on Puerto Rico for dorado (mahi), wahoo and mackerels. There are restrictions on the fishing gear; recreational fishers should not use malacate (hauler reel). This gear should only be used by licensed commercial fishers. There have to be fines for breaking the law.

3. Pedro Silva - Commercial Fisher - Mayagüez

Suggested that recreational fishers be allowed only 10 percent of the harvest (like in the USVI). There should be restrictions in the number of fish harvested during recreational fishing tournaments, large boats take much more than the quotas for fish such as dorado. These fish caught at tournaments are being sold. There should be no selling of the catch by recreational fishers.

4. Julio Morales - Commercial Fisher - El Seco, Mayagüez

Agreed with the 10 percent of the commercial catch for the recreational sector.
(Note: They referred to 10 percent of the commercial catch such that the total ACL would be the sum of the commercial plus this 10 percent of the recreational.)

5. Victor Padilla - Commercial Fisher - El Seco, Mayagüez

Requested clarification on the seasonal closures in the federal waters and on the seasonally closed areas; these seasonally closed areas are pushing fishers to smaller and smaller fishing grounds. He suggested outreach and education to inform the fishers about the seasonal closures and other regulations. Fishers agreed that the seasonal closures are working and cited as examples the red hind and the mutton snapper with increased landings over the years.

6. Pedro Silva - Commercial Fisher - Mayagüez

Agreed with Victor Padilla and explained that the West coast was the most impacted by the closed areas in the EEZ.

4.7 Action 7: Accounting for Uncertainty

Alternative 2. In setting ACLs based on average catch, use:

Sub alternative A. 75 percent of the specified level in the previous actions to adjust for uncertainty

Sub alternative B. 50 percent of the specified level in the previous actions to adjust for uncertainty

Sub alternative C. 25 percent of the specified level in the previous actions to adjust for uncertainty.

1. Victor Padilla - Commercial Fisher - El Seco, Mayagüez

The problem is that they don't have real numbers from fishers; they don't know for sure how much has been reported or caught. It affects everybody. Work more with "bonafide" fishers.

2. Daniel Matos – Director, Fishery Statistics Program, Fisheries Research Lab - DNER

There is a study done every year to determine the correction factor. It will be done more frequently and in depth to have a better idea of the correction factor. There are many commercial fishers without commercial fishing license.

3. Victor Padilla - Commercial Fisher - El Seco, Mayagüez

Fishers do not report their real catches because then they will have to report a higher income (and will lose marginal benefits like food stamps, incentives for houses (Plan 8), etc.)

4. Daniel Matos – Director, Fishery Statistics Program, Fisheries Research Lab - DNER

Daniel explained to the fishers that because of the improvements on data reporting and the information collected by the Fisheries Research Lab., it is being shown that fish stocks are increasing, the size of the fish is increasing, and also landings are improving because of the closed seasons.

4.8 Action 8: Alternative Methods for Reducing Fishing Mortality and Establishing ACL Proxies

Alternative 2. Work with fishermen to develop measures to reduce fishing effort (i.e., permits, data collection).

Alternative 3. Establish ACL by sector for St. Thomas/St. John.

Sub-alternative A. Establish ACL by net sector Sub-alternative B. Establish ACL by trap/pot sector Sub-alternative C. Establish ACL by hook-and-line sector.

Alternative 4. Establish ACL by sector for St. Croix Sub-alternative A. Establish ACL by net sector Sub-alternative B. Establish ACL by trap/pot sector Sub-alternative C. Establish ACL by hook-and-line sector.

Alternative 5. Establish ACL by sector for Puerto Rico Sub-alternative A. Establish ACL by net sector Sub-alternative B. Establish ACL by trap/pot sector Sub-alternative C. Establish ACL by hook-and-line sector.

1. Pedro Silva - Commercial Fisher - Mayagüez

Keep the Islands separate and separated by fish stock not by gear.

4.9 Action 9: Permits

Alternative 2. Require a federal permit for fishing in the EEZ. Sub-alternative A. Require a federal permit for recreational fishing in the EEZ.

1. Carlos Nieves - Commercial Fisher - El Seco, Mayagüez

Consensus that there should be federal permits for recreational fishers. There should be quotas for the recreational fishers associated with these permits, quotas by species. Recreational fishers should be allowed 10 to 12 fish per fishing trip.

Sub-alternative B. Require a federal permit for commercial fishing in the EEZ.

1. General comment

Consensus among fishers present that there should be a federal permit for commercial fishers but the cost of the permit should be zero or very limited.

2. Carlos Nieves - Commercial Fisher - El Seco, Mayagüez

Establish a limited access to the fisheries and a permit which should be free or about $100 dollars.

Sub-alternative C. Require the use of trap tags for all (lobster and fish) trap fisheries in the EEZ.

1. Victor Padilla - Commercial Fisher - El Seco, Mayagüez

The trap fishers already have a color code in Puerto Rico assigned to the fisher. These color codes are supposed to be on the boat and the buoys. He did not think there was a registration number associated with the color codes. There should be no limit on the number of traps.

Sub-alternative D. Require a federal permit for charter boats fishing in the EEZ.

Alternative 3. Require a federal permit to sell Council managed species.

Alternative 4. Require a federal permit to purchase Council managed species.

1. Pedro Silva - Commercial Fisher - Mayagüez

Suggested a generic commercial license; that the Puerto Rico commercial fishing license be valid for federal waters too. There should be fee for the federal permit.

2. Gerardo Colón - Commercial Fisher -Mayagüez

Fishing licenses should not limit the type of fishing done by commercial fishers or the gears used by the commercial fishers. The commercial permit should be a general one that allows for all types of fishing and to harvest all species.

3. General comment

Fishers agreed that the federal permit would be better for enforcement.

4.10 Action 10: Monitoring and Enforcement of Annual Catch Limits

Alternative 1. No Action. Set the ACL at the level specified in the previous actions.

Alternative 2. Require any person landing Council managed species to submit an appropriate data collection form, as developed by the SEFSC or the Council's SSC, after every trip with enough detail such that CPUE per species can be calculated for each gear.

Alternative 3. Require any federal permit holder to submit an appropriate data collection form, as developed by the SEFSC or the Council's SSC, after every trip with enough detail such that CPUE per species can be calculated for each gear.

Alternative 4. Develop an updated catch report form in coordination with the SEFSC, local and territorial governments, fishermen, and the Council's SSC with enough detail such that CPUE per species can be calculated for each gear.

1. Daniel Matos – Director, Fishery Statistics Program, Fisheries Research Lab - DNER

Explained the development of the new data form and invited the fishers to the upcoming meetings in Rincón, Ponce and Cabo Rojo to discuss the form and to test it among the fishers. The more specific the data are and the more detail and real information, the better for everyone.

4.11 Action 11: Accountability Measures Alternative 1. No Action. Do not establish Accountability Measures.
Alternative 2. Implement accountability measures for exceeding an ACL based on:

Sub alternative A. A single year of landings/catch. Sub alternative B. A 2-year average of landings/catch. Sub alternative C. A 3-year average of landings/catch.

Alternative 3. Reduce the fishing season in the following year by a length determined to be appropriate to account for exceeding the ACL.

Alternative 4. For queen conch exceedences in St Croix, close the EEZ to queen conch harvest.

Alternative 5. Reduce the ACL in the subsequent fishing year by an amount equal to an overage in the previous year.

1. Victor Padilla - Commercial Fisher - El Seco, Mayagüez

Expressed concern about the future of fishing and the lack of young people entering the commercial fishing. Commented on the numerous laws regulating commercial fishing and the need to monitor what is in place already.

2. Pedro Silva - Commercial Fisher - Mayagüez

There is great need to monitor all species and the regulations that are in place. The fishers agreed that the seasonal closures are working and that mutton snapper are more abundant now and larger.

4.12 Action 12: Allowable Gear for Reef Fish

Alternative 2. Review the list of allowable gear under 50 CFR 600.725

1. General Comment

Agreed that commercial fishers using SCUBA should be allowed to use spear. Also, that the recreational fishers should not be allowed to use SCUBA and spear fish (this would be compatible with the Puerto Rico regulations). Recreational divers should not be allowed to use powerheads.

In the discussion on ACLs for snappers, the fishers suggested that the recreational fishers not be allowed the use of the bottom line (deepwater snapper reel) and hauler that the commercial fishers use.

4.13 Action 13: Establish Framework Measures for ACLs and AMs in the Reef Fish FMP.

Alternative 1. No Action. Do not establish a framework for ACLs and AMs

Alternative 2. Establish a framework procedure for setting and adjusting ACLs and AMs

1. Other General Comments:
Enforcement: There should be more enforcement interventions with the recreational fishers.

Recreational Fishing: There should be a recreational fishing license and quotas on recreational fishing. There should be data collection from the recreational fishers, same as it is done with the commercial fishers.

Studies should be carried out before implementing laws and regulations not the other way around.
Outreach and education: the DNER should inform the recreational fishers of the fishing regulations in place.

The meeting was adjourned at 10:10 pm.

CARIBBEAN FISHERY MANAGEMENT COUNCIL 268 MUÑOZ RIVERA AVENUE, SUITE 1108 SAN JUAN, PUERTO RICO 00918

SCOPING MEETING ANNUAL CATCH LIMITS (ACLs) AND ACCOUNTABILITY MEASURES (AMs)
ST. THOMAS, USVI AUGUST 18, 2009
SUMMARY MINUTES

The scoping meeting was held at Holiday Inn Windward Passage Hotel, in St. Thomas U.S.V.I., and was chaired by Mr. Winston Ledee, CFMC Member.

Mr. Miguel Rolón gave a PowerPoint presentation (attached) on the proposed management measures for ACLs/AMs, and explained the new requirements of the Magnuson Stevens Act.

Following are the comments offered by the attendees:

1. Julian Magras – Chairman of the Board, St. Thomas Fishermen's Association

A written statement was provided and is included with the minutes.

2. Makeda M. Okolo – Office of the VI Delegate to Congress Donna Christiansen

Ms. Makeda represented Congresswoman Donna Christensen who said she was behind the fishermen to back them up, and that fishermen alone should not be held accountable, she also invited everyone to "think outside the box" to make the best for the resources as well as for the fishermen.
A written statement will be provided by mail.

3. David Berry – Commercial Fisherman

Disagrees with the ACLs document. No action to all alternatives.

4. Jason Budsan – East Environmental Association St. Thomas/St. John

Support some limits to overfishing to a degree, but data collection is vital.
See the need for better land use planning and erosion control methods. The VI needs a waste and land use plan to protect the reefs and mangroves. Without a plan we will see a continuing decline in our fishery stocks.

5. Alberto Tapia – St. Thomas resident

There is a need to use the data that is collected in the USVI.

6. Kevin Campbell – Commercial fisherman

Has a study been done on the hind bank to see how the closure is doing?
There is a need for more education on both sides.

The meeting was adjourned at 9:30 p.m.

CARIBBEAN FISHERY MANAGEMENT COUNCIL
268 MUÑOZ RIVERA AVE. SUITE 1108
SAN JUAN, P. R. 00918-1920
ACLs SECOND SCOPING MEETING
DOUBLE TREE BY HILTON HOTEL
SAN JUAN, PUERTO RICO
AUGUST 19, 2009

Summary Minutes

The meeting was opened at 7:30 pm. There were no participants at this meeting. Council staff Graciela García-Moliner and Iris Oliveras were present, and the Chairman, Eugenio Piñeiro.

The staff and Mr. Piñeiro officially closed the meeting at 8:40 pm.

CARIBBEAN FISHERY MANAGEMENT COUNCIL
268 MUÑOZ RIVERA AVENUE, SUITE 1108
SAN JUAN, PUERTO RICO 00918
SCOPING MEETING
ANNUAL CATCH LIMITS (ACLs) AND
ACCOUNTABILITY MEASURES (AMs)
ST. CROIX, USVI
AUGUST 19, 2009

SUMMARY MINUTES

The scoping meeting was held at The Buccaneer Hotel, in St. Croix, U.S.V.I., and was chaired by Mr. Joseph Kimmel, CFMC Member.
Mr. Miguel Rolón gave a Power Point presentation on the proposed management measures for ACLs/AMs, and explained the new requirements of the Magnuson Stevens Act.

Following are the comments offered by the attendees:

1. Makeda M. Okolo – Office of the VI Delegate to Congress Donna Christiansen

Ms. Makeda represented Congresswoman Donna Christensen who said she was behind the fishermen to back them up, and that fishermen alone should not be held accountable, she also invited everyone to "think outside the box" to make the best for the resources as well as for the fishermen.

A written statement will be provided by mail.

2. Gerson Martinez – Commercial Fisherman

Disagrees with the ACLs document.
The only thing that the Council has to do is to work with the fishermen. Feels that the Council is forcing something against the fishermen of St. Croix. It is not fair.
"The Fishermen are going to be hurt about these regulations. We are single individuals with twenty five foot boats that go every day out and come back with a hundred or a hundred of fifty pounds of fish, ten to fifteen pounds of lobster. We sell our catch, and tomorrow we go out and do the same thing. We are not exporting. We are just trying to catch enough to survive day by day."
"Regarding action 3, sub alternative F; the way that we intended that alternative was for you guys to set an ACL for federal waters and leave the state waters open. I don't know when the Council got a restriction over state waters, but from since the snapper extension from shoreline to two hundred miles, you guys have been doing damage to the fishing industry here in St. Croix."
"I don't know how more we can reduce fishing effort. We have banned gillnets, we have 50 thousand pounds quota on conch…"

3. Edward Schuster – Commercial Fisherman – President St. Croix Commercial Fishermen Association.

"Numerous sub alternatives of actions have been added, and a lot of it has been twisted from what had been recommended from its original state."
"Alternative 5, sub alternative G, in action 3, you are going back to a timeframe where the fishing effort wasn't as mandatory as it is right now. There is more of a demand on seafood, there is conservation to bear in mind, but there is people that are tending more to eat a fresh produce."
"Alternative 2, what I understood it to be was that you would allow us to fish for the five years, collecting the data. Since the data which has been collected for about 40 years could not be used into any of the models that have been created by the Council, and rely on the data collected in those five years from port sampling. Now is turned around that is as long as the ACLs are set to 0 you cannot fish for the species that you are trying to obtain the information for to set an ACL. For this is action 3, alternative 2, sub alternative A.
Regarding the conch, there needs to be a fair playing field here, because we came up with our own regulatory in our state waters on an action taken, which there was an issue where no matter how many commercial fishermen you had on board, it did not limit you to the amount of conch. We sat down in a group, we reduced that by having our catch to reduce from 150 per license, to 200 per boat. Now, when we did this it was not compatible in the EEZ, and we brought it up to your attention at the Carambola meeting. Now, on behalf of this conch issue, you are going back and setting an ACL where in a sense you are creating overfishing. Those resources are going to be impacted so hard in the timeframe where it is open, that I can almost tell you that the people who are not given or not had their fair share last year, you are going to actually get under reporting. So this thing about going back to the original state of setting an ACL, I think it should be higher to that 90 thousand pounds, which is more of a fair share of the pie, meaning that to this day a conch study has not been done to do a total analysis of the shelf, of what you have on St. Croix; meaning adults and juveniles."
"A final comment, I think the ACL should be set in the jurisdiction where the federal government has authorization to do so, or jurisdiction, and not be set in the state waters."

4. Michelle Pugh – St. Croix Resident – Diver

Written comment provided is attached with the minutes.

5. Tomas Daley – Commercial Fisherman – Vice chair of St. Croix Fishermen's Advisory Committee

What is now here is not what was promised.
There are already enough measures in place.
If the fishery collapses in St. Croix the CFMC will be held responsible.
There is a need to map the hind area and open the fishery.

The meeting was adjourned at 9:30 p.m.

APPENDIX 8. Response to Public Comments on DEIS

RESPONSES TO COMMENTS

The following section satisfies NEPA's requirement for responding to comments on the DEIS version of Amendment 2 to the Fishery Management Plan for the Queen Conch Fishery of Puerto Rico and the U.S. Virgin Islands and Amendment 5 to the Reef Fish Fishery Management Plan of Puerto Rico and the U.S. Virgin Islands (2010 Caribbean ACL Amendment). NEPA requires that a federal agency shall respond to comments on the DEIS by one or more of the following means: (1) Modify an existing alternative; (2) develop and analyze a new alternative; (3) supplement, improve, or modify the analyses; (4) make factual corrections; or (5) explain why the comments do not warrant further agency response, citing the sources, authorities, or reasons which support the agency's position.

The following section responds to written comments generated during the comment period for the Fishery Management Plan (FMP) and DEIS, in addition to those received as verbal testimony during the public hearings. The public comment period for the 2010 Caribbean ACL Amendment, including public hearings, ran from July 23, 2010, through September 7, 2010. In addition to the written comments received during that period and included above, comments were received during public hearings conducted at four sites in Puerto Rico (11 total attendees) and two sites in the U.S. Virgin Islands (60 total attendees). The following provides a response to each of the comments received during the public comment period.

I. Environmental Protection Agency (EPA)

Comment 1**:** The United States Environmental Protection Agency (EPA) classified the DEIS and proposed actions as "LO" (Lack of Objections) although they did express a preference for two alternatives as discussed below:

For Action 2 (Management Reference Points): EPA preferred an uncertainty factor of 0.50.

For Action 4 (Management Measures): EPA preferred a 0-fish aggregate bag limit for parrotfish.

<u>Response:</u> Regarding Action 2, the Council chose as their preferred alternative an uncertainty factor of 0.85 applied to the OFL for snapper and grouper (Alternative 2(d)) and applied to the SSC recommendations for parrotfish (Alternative 2(g)i). The choice of the 0.85 uncertainty factor was based upon input from all user groups and was felt by the Council to best reflect the appropriate level of scientific and management uncertainty in these fisheries but also considering the many management changes included in the Comprehensive Sustainable Fisheries Act Amendment of 2005 (SFA Amendment) and the harvest reductions that occurred as a result of those changes in management.

Regarding Action 4, parrotfish remain a culturally valued food item throughout the U.S. Caribbean and especially on St. Croix. It is reasonable to allow some level of continued recreational harvest of parrotfish species (all but midnight, blue, and rainbow, for which it is proposed that all harvest be prohibited) both to address cultural sensibilities and also to address issues of fairness between the commercial and recreational fisheries.

II. Department of the Interior (DOI)
Comment 2: The United States Department of Interior had "no comment at this time."

III. U.S. Virgin Islands Senator, Patrick Simeon
Comment 3: Concern was expressed by staff of Virgin Islands Senator Patrick Simeon Sprauve that Puerto Rico landings data were being used to establish catch limits for Virgin Islands fisheries. That approach was considered unacceptable by Senator Sprauve's staff.

Response: The Council has taken an island-specific approach to management of U.S. Caribbean fisheries. As a result, landings data from St. Thomas and St. John have been used to set annual catch limits (ACLs) for St. Thomas and St. John, and landings data from St. Croix have been used to set ACLs for St. Croix. The island-specific determination of ACLs is best described in Table 4.3.2 of the 2010 Caribbean ACL Amendment. Additionally, Action 3(c) provides for the establishment of exclusive economic zone (EEZ) sub-boundaries that will be used for applying island-specific accountability measures (AMs) as appropriate and necessary.

IV. U.S. House of Representatives, Delegate Donna Christensen
***Comment 4*:** The office of House-Delegate Donna Christensen also expressed concern regarding the use of island-specific data for establishing ACLs. It was additionally stated that they "cannot support the preferred alternative that reflects a scalar of 0.75". Finally, it was requested by that office that a "more collaborative approach" be taken when working to protect U.S. Caribbean resources.

Response: As noted above, an island-specific approach is being taken by the Council. Additionally, the 0.75 scalar is no longer the preferred alternative so this concern has been positively addressed. Finally, NMFS and the Council are working hard to be inclusive of all user-groups when formulating resource management plans for U.S. Caribbean EEZ waters.

V. Other Comments

Comment 5: Thirty-seven students in an undergraduate science class at the University of the Virgin Islands were queried concerning their opinion regarding sustainable fisheries. Of those, 32 expressed general support for the concept; the opinions of the remaining five were not included. Additionally, St. Croix elementary school students were given an opportunity to draw their version of 'A Healthy St. Croix Sea and Me' and 139 of those drawings reflected indicators of a healthy marine environment.

Response: The National Marine Fisheries Service is committed to the concept of healthy and vibrant marine ecosystems that support active but sustainable fisheries. This commitment is reflected in the revised Magnuson-Stevens Act and NMFS's role in implementing that Act.

Comment 6: One St. Croix resident recommended a five-year complete moratorium of all reef fishing on the island.

Response: A moratorium on fishing was not considered by the Council for St. Croix or any area of the U.S. Caribbean. Such an approach would not be consistent with National Standard 1 of the MSA, which requires that management prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery.

Comment 7: One Virgin Islander requested that the procedures for establishing ACLs in the U.S. Caribbean be "readdressed" and that collection of good extensive data be a first priority.

Response: The Council agrees that improved data collection and management mechanisms are desired, and both Council and NMFS staff are working to accomplish those goals. The Council does not agree that the process of establishing ACLs be reconsidered, both because this effort is mandated by Congress but also because the best available data are being used to set ACLs. Data will improve in the future, but it may never be perfect so such arguments for reconsideration could always be made. Setting ACLs, and fisheries management in general, are dynamic processes. Reference points and other aspects of the management process will be reconsidered as additional data become available.

Comment 8: An environmental group provided numerous detailed comments on the proposed actions. Those comments are addressed in turn below:

Concern was expressed regarding the choice of uncertainty factors as well as the relative contribution of management versus scientific uncertainty to the chosen uncertainty factor. The commenter supported the choice of Alternative 2(e) applying a 0.75 uncertainty factor and considered that this would be "the minimum acceptable to account for both scientific and management uncertainty." However, they further stated that "setting the ACL at 75 percent of the OFL may be insufficient" and that "such a risky strategy be accompanied by efforts to collect data with which the Council can closely monitor the fishery and evaluate this approach". They also requested that the document "clearly describe whether the 25 percent reduction from the overfishing limit (OFL) to the Acceptable Biological Catch (ABC) and the Annual Catch Limit (ACL) is intended to account for both scientific and management uncertainty".

Response: At the September 2010 meeting of the Council, it was proposed via motion to identify Alternative 2(d) rather than Alternative 2(e) as the preferred alternative within Action 2. The rationales for this change from a 0.75 uncertainty factor to a 0.85 uncertainty factor were several. First, the Council's Reef Fish Advisory Panel recommended that the 0.85 uncertainty factor be applied. This panel functions as the interface between user groups and the Council and provides insight from in-the-field observations. Second, the Council entertained a lengthy discussion among members regarding the issue of uncertainty and the value of choosing an uncertainty factor that would be most palatable to the territorial and commonwealth governments and therefore would be most likely to induce the application of compatible uncertainty factors within local waters. It was therefore felt that such an approach, applying 0.85 rather than 0.75 as the uncertainty factor, "would help bring more stability to the management regime." Moreover, the statement was made that "We've heard from the local governments that they think the likelihoods of compatible regulations down the road are enhanced by this change and that would bring less uncertainty to the overall management regime and presumably increase the likelihood of improving these data collection programs in the near term, reducing the uncertainty there. That's basically your rationale for not going with 0.75 and switching to the 0.85." Therefore, "Our ability to detect the benefits and actually measure those benefits of those management actions lags behind in our desire, again, to reduce the buffer accordingly, but all of that said, the notion of compatible regulations, that would -- The benefit for that would be instantaneous and I think would be measureable and that is a very progressive offset in terms of scientific uncertainty in those management measures and I think that's a good thing to have on the table."

Regarding the request that the document clearly state whether the uncertainty reduction accounts for both scientific and management uncertainty, it is stated in Section 4.2.3 and elsewhere in the document that the uncertainty factor is designed "to account for scientific uncertainty in estimating the OFL and management uncertainty in effectively constraining harvest over time."

Support was expressed for preferred sub-alternatives A, B, and C of Action 4(a), Alternative 2. Those sub-alternatives prohibit fishing for or possessing, in the EEZ, midnight, blue, and rainbow parrotfish, respectively. In that same comment, it was noted that "all parrotfish deserve special consideration."

<u>Response:</u> The Council agrees that midnight, blue, and rainbow parrotfish play an essential role in the maintenance of critical *Acropora* habitat in the U.S. Caribbean. The Council further agrees with the statement that all parrotfish deserve special consideration and has applied that special consideration in setting ACLs for these species. In addition to prohibiting harvest of midnight, blue, and rainbow parrotfish, the amendment proposes additional restrictions on the harvest of seven other parrotfish for which catch has been recorded from U.S. Caribbean waters. Preferred Alternative 2(g)i reduces the parrotfish ACL below the SSC's ABC recommendation by applying an uncertainty reduction factor of 0.85. Further, Action 4(c), preferred Sub-alternative 2A, adds a further reduction to St. Croix parrotfish harvest of 5.8822 percent in an effort to further constrain the directed fishery for parrotfish on that island.

Concern was expressed regarding AMs with specific emphasis on three topics. First, regarding Action 5(a) Alternative 3C, a clear explanation is requested regarding how the three-year running average will be applied, and the commenter was particularly concerned "about the annual nature of the comparison between catch and ACL." The commenter urged "the Council to include an explicit description of the timing and process for reviewing and adjusting ACLs and AMs in the document." Second, there was concern "that the alternative as written gives the Council authority to dismiss any and all overfishing findings with no clear criteria or explanation. If this kind of qualitative judgment is to be made, it must be made by the Council's scientific advisors, and the control rule or criteria for such a decision needs to be spelled out in the document to prevent abuse." Third, the commenter questioned the selection of preferred Alternative 2 of Action 5(b). The concern regards the lack of a payback provision for those species that have been determined to be overfished. "Species groups considered to be overfished (queen conch, grouper units 1, 2, and 4) require overage deductions in the next fishing year to maintain the rebuilding plan for the populations. Parrotfish and snapper groups which are not overfished do not require these types of AMs".

Response: Regarding the first concern, landings data will be evaluated on an annual basis as those data are provided by the Southeast Fisheries Science Center (Center). As mentioned in Section 4.5.1, delays of as much as two years may occur between the time a fish is landed and the time when the data describing the landing of that fish are available for use by the Council. Efforts are underway to streamline that process, and it is reasonable to expect that such delays will be considerably reduced as streamlining efforts achieve their desired goals. Thus, although an "explicit description" of the timing of data evaluation is not presently feasible given the changing nature of data collection and reporting in the U.S. Caribbean, challenging the established ACL against the appropriate index of landings will occur as quickly as possible following provision of the appropriate data. The second item follows from the first. As stated in the document, the Council's preferred alternative for triggering accountability measures is Alternative 3 of Action 5(a), requiring that the Center work in consultation with the Council and its SSC to determine why an ACL overrun (if any) has occurred. The SSC and the Center are the scientific advisors to the Council, so this preferred alternative addresses the respondent's concerns. Because the range of potential causes of an overage is considerable, a specific control rule or criterion is not appropriate at this time. The third item within this comment refers to the inclusion (or not) of an overage payback as part of the application of accountability measures. Such a payback provision is included as a component of Action 5(b), Alternative 3, but this is not the Council's preferred alternative. This comment is pertinent to four groups that are considered to be overfished, including queen conch and grouper units 1, 2, and 4. Specific payback provisions are not feasible for the groupers because data with which to determine appropriate payback levels are not available on a species or unit basis. With respect to grouper units 1 (Nassau) and 2 (goliath), the ACL for each is set at zero so paybacks are not appropriate. Queen conch are monitored and managed within the season, and harvest is closed in both territorial and EEZ waters as the established harvest quota is approached.

Comment 9: Written comments from two Puerto Rico commercial fishermen and from a Puerto Rico commercial fisherman's organization supported most of the preferred alternatives included in the DEIS. However, one individual fisher supported Alternative 2 for each of Actions 6(a) and Action 6(b) whereas the fishing organization supported Alternative 3 for Action 6, apparently for both sub-actions of Action 6. One of the individual fishermen and the fisherman's organization were strongly opposed to the preferred alternative for Action 4(b). The individual fisher requested that the alternatives within Action 4(b) include a statement requiring that recreational fishers who desire to land fish must be in possession of a recreational fishing license issued by Puerto Rico or the USVI. The fisherman's organization requested that the recreational bag limit be set at zero for those species identified as undergoing overfishing (i.e., snapper, grouper, parrotfish) and then increased to no more than five fish per boat during a five-year period when corresponding abundance studies are being conducted. All constituents commented that the combination of such large bag limits as are proposed in the amendment, coupled with the large number of recreational fishers in Puerto Rico waters, would result in an unsustainable harvest of the target species. One of the individual commercial fishermen commented regarding Action 4(b), indicating that the original preferred alternative (Alternative 7) was a "big mistake" because, with so many recreational fishers, allowing the take of 30 fish per day would "not only affect the commercial fisherman but also will affect the managed fishery." The commenter further suggested that recreational harvest of any "species at risk" or any managed species should be prohibited.

One of the individual commercial fishermen commented in support of Action 3(c), noting that Puerto Rico "has its own fishing culture and tradition" and should therefore "be treated on an individual basis."

<u>Response</u>: At its September 2010 meeting, the Council added Alternative 8 to Action 4(b) and identified it as the preferred alternative. That alternative establishes an aggregate bag limit for snapper, grouper, and parrotfish of five fish per person, of which no more than two could be parrotfish, and a vessel limit of 15 fish of which no more than six could be parrotfish. The recreational bag limit action is presented in Section 4.4.2 of the document. This represents a 50 percent reduction from the original preferred alternative (Alternative 7).

Regarding separate island-specific fishery management, it is proposed in the amendment to establish separate ACLs and other management actions for each of the St. Thomas/St. John, St. Croix, and Puerto Rico island groups, thereby addressing the request that Puerto Rico "be treated on an individual basis."

Comment 10: A St. Croix commercial fisherman's association provided specific responses to each of the actions included in the amendment. Their letter included an initial comment that commercial and recreational sectors should be governed by a single ACL. Otherwise, they supported the Council's preferred alternatives with a few exceptions. The first exception was a request that, rather than implementing the preferred Alternative 2(a) and 2(b) actions to use the longest pre-Caribbean SFA Amendment time series (through the 2005 calendar year), use the most recent five calendar years of landings data (2003-2007). Second, the commenter supported Action 4(b) Alternative 7 regarding bag limits, and that alternative was identified as the preferred alternative at the time of the public hearings. Finally, the commenter included a suggestion to add a new alternative to Action 5(a) to use a single year of landings for comparison with the ACL, shifting to a 2-year running average only after implementation of the new Commercial Catch Report forms.

Response: Regarding the establishment of a combined ACL for the commercial and recreational sectors, this will be the initial approach in the USVI because suitable recreational landings data are presently not available for those islands. However, it should be noted that the Council's goal is to establish separate ACLs for each of the recreational and commercial sectors and to manage those sectors independently. That approach is being used in Puerto Rico where suitable recreational data are available. A discussion of the reasoning behind sector separation is included in the Discussion section of Action 3(b).

With respect to the use of the most recent five years of data, the Council chose to include data only through 2005 when establishing average annual catch from which the ACL is derived. The Caribbean SFA Amendment was approved in 2005 and the many regulatory outcomes of that amendment were implemented beginning in 2006. However, full implementation of some of those regulations was delayed due to a variety of factors. Thus, it is not clear when and to what extent landings were affected by those new regulations relative to landings collected in 2005 and earlier. In any case, crossing that implementation boundary would result in inconsistency in harvest among the included years. It was therefore determined by the Council that for the purpose of establishing ACLs, the most consistently reliable landings data would be derived from the time period 1999-2005 for Puerto Rico commercial landings, 2000-2005 for Puerto Rico recreational landings (recreational data were not collected during 1999), 1999-2005 for St. Croix commercial data, and 2000-2005 for St. Thomas/St. John commercial data (suitable commercial data are not available for St. Thomas/St. John during 1999).

Finally, regarding recreational bag limits, at the September 2010 Council meeting following the public hearings, a new alternative (Alternative 8) was added to the list and identified as the preferred alternative. Thus, the preference identified in this comment is no longer the preferred alternative. It is not clear from the comment whether the Alternative 8 bag limits would be more or less preferable to the commenter than would be the Alternative 7 bag limits. This would depend upon whether the commenter preferred more or less stringent recreational bag limits, and that opinion cannot be discerned from the comment. As noted in the Discussion section of Action 4(b), a primary goal of these bag limits is to ensure to the greatest extent that the recreational ACL is not met until as late in the year as possible, thereby enhancing the likelihood that recreational anglers will be able to access their fisheries throughout the year. A lower bag limit further increases that likelihood.

Comment 11: Separate comment letters were submitted by two members of a St. Thomas fisherman's association, but the comments were identical and will be treated together. A primary concern expressed by these constituents was the need to use Virgin Island's data to manage Virgin Island's fisheries. A second concern was that the preferred uncertainty reduction of 25 percent was excessive. A third concern was that the Council changed their approach without adequate discussion, moving from an island-specific approach encompassing only a subset of species to a comprehensive U.S. Caribbean approach that included more than just those species designated as undergoing overfishing. A corollary of this concern was that the method used to identify species undergoing overfishing was flawed. A fourth concern was that AMs only be applied if management of landings data was improved to the point that in-season monitoring would be possible, thereby allowing the fishermen some warning that the ACL was being approached.

Response: Regarding the first comment, the Council is using island-specific landings data for the establishment of island-specific ACLs. Commercial landings data collected during 1999-2005 (St. Croix) or 2000-2005 (St. Thomas and St. John) were used to determine the average landings upon which the overfishing level (OFL) was established. Data collected prior to those years was not applicable to the present process because it was gear-specific rather than FMU-specific, so the data could not be allocated among the management units. Data acquired subsequent to 2005 was biased to an unknown degree by the impacts of the SFA Amendment. To set the ACL for each group, a reduction scalar was applied to the OFL to account for scientific and management uncertainty resulting from a variety of factors. The original preferred alternative for that reduction scalar was 0.75, but the Council has reconsidered and established a new preferred reduction scalar of 0.85. This directly addresses the second concern of this comment. The third concern expressed in this comment stems from poor communication rather than a fundamental change in process. U.S. Caribbean-wide reference points were set in the SFA Amendment, and a discussion of the transition from those U.S. Caribbean reference points to the island-specific approach was included in the present document. This transition is a complex process and some level of confusion is understandable, but the operative ACLs and AMs that will derive from these amendments to the queen conch and reef fish FMPs will reflect island-specific data and will be applied on an island-specific level. It is true that some species not designated as undergoing overfishing are included in the 2010 Caribbean ACL Amendment along with those species so designated. The primary factor influencing that decision was the fact that reporting of landings data in the U.S. Caribbean is not species-specific, so separately addressing the constituent members of each FMU with regard to ACLs and AMs was not possible. Further supporting this decision is the requirement that all managed species, and not just those designated as undergoing overfishing, must have ACLs and AMs in place in time to apply management measures responsive to the outcome of the 2011 calendar fishing year. Thus, setting ACLs and AMs for those species not identified as undergoing overfishing is, in the worst case scenario, only slightly premature. Moreover, the Council does not agree that the designation of species undergoing overfishing is flawed. Those determinations were made by a cross-section of involved and knowledgeable parties including fishers, resource managers, scientists, representatives from non-Governmental organizations, and others. Although, as always, the knowledge base upon which those decisions were made was not perfect, it was and remains the best available information. As better information becomes available, those determinations will be reconsidered. The Council agrees in principal with the fourth concern, that landings data be reported in a timely fashion so that notice can be provided as an ACL is approached, thereby providing the fishers with sufficient time to modify fishing practices in an effort to avoid exceeding the ACL and suffering the application of AMs. However, data management is a community process, and achieving the consensus goal of timely data reporting will require cooperation and commitment from the fishers who supply the data, the local government staff who receive and input the data, and the

Center staff who process, validate, and distribute the data. In the meantime, landings will be tracked against mandated ACLs using the best available data, and AMs will be applied as necessary based upon the relationship between landings and ACLs.

Comment 1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

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Dr. Roy E. Crabtree
Regional Administrator
Southeast Regional Office
National Marine Fisheries Service
263 13th Avenue South
St. Petersburg, FL 33701

Subject: EPA NEPA Review of NOAA Public Hearing Draft Amendment 2 to the Fishery Management Plan for the Queen Conch Fishery of Puerto Rico and the U.S. Virgin Islands and Amendment 5 to the Reef Fish Fishery Management Plan of Puerto Rico and the U.S. Virgin Islands (with DEIS and Regulatory Impact Review) (July 9, 2010); CEQ# 20100265; ERP# NOA-C39018-00

Dear Dr. Crabtree:

Consistent with our responsibilities under Section 102(2)(C) of the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, the U.S. Environmental Protection Agency (EPA) has reviewed the National Oceanic and Atmospheric Administration/National Marine Fisheries Service (NOAA/NMFS) Public Hearing Draft Amendment 2 to the Fishery Management Plan for the Queen Conch Fishery of Puerto Rico and the U.S. Virgin Islands and Amendment 5 to the Reef Fish Fishery Management Plan of Puerto Rico and the U.S. Virgin Islands. The purpose of the joint amendment is "...to bring those fisheries into compliance with the 2007 revisions to the Magnuson-Stevens Fishery Conservation and Management Act" and to "revise management reference points and status determination criteria for the Caribbean queen conch, snapper, grouper and parrotfish" so as to address species previously defined as undergoing overfishing while minimizing, to the extent practicable, negative socioeconomic impacts that may result from the amendment actions. Six actions are proposed to achieve these goals.

EPA defers to NMFS in technical matters pertaining to fishery management, and supports NMFS preferred alternatives, where one has been selected, for actions 1, 3, 5 and 6. We offer the following comments on actions 2 and 4:

Action 2 – EPA prefers an uncertainty factor of 0.50 for the adjustment of the average annual catch when deriving the annual catch limit (ACL). EPA feels a conservative approach to protecting reef resources is the best way to ensure the long-term sustainability of the fisheries and minimize habitat interactions.

Action 4 – EPA favors Alternative 5 (a 0-fish aggregate bag limit for parrotfish) over the preferred Alternative 7 (an overall aggregate bag limit that allows a fisher a total of 10 fish per day including not more than two parrotfish (excepting midnight, blue, and rainbow parrotfish)). EPA supports the elimination of harvesting of midnight, blue and rainbow parrotfish, but given the ecological importance of all parrot fish, EPA prefers an alternative that prohibits the harvest of these three species as well as a 0-bag limit for all parrotfish. As was mentioned in the amendment, essential ecological services are provided by parrot fish by way of grazing on the reefs cape and controlling the proliferation of algal species that would otherwise overgrow the reef and could impact the settlement of coral propaguels.

EPA rates this action as "LO" that is, lack of objections. EPA supports the overall Queen Conch Fishery and Reef Fish Fishery Management Plan of Puerto Rico and the U.S. Virgin Islands. We appreciate NOAA's continued coordination with us and look forward to receipt of the Final EIS (FEIS). At that time, we will review NOAA's response to our comments on the DIES. Should you have questions regarding these comments, feel free to contact Stephanie Lamster at (212)-637-3465.

Sincerely,

Judy-Ann Mitchell (for)

John Filippelli, Chief
Strategic Multi-Media Programs Branch

Comment 2

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Richard B. Russell Federal Building
75 Spring Street, S.W.
Atlanta, Georgia 30303

TAKE PRIDE IN AMERICA

10/619
9043.1

September 7, 2010

Miguel A. Rolón
US Department of Commerce
Caribbean Fishery Management Council
268 Muñoz Rivera Ave., Suite 1108
San Juan, Puerto Rico 00918-1920

Subject: Comments on the Review of Draft Environmental Impact Statement (DEIS) for Amendment 2 to FMP for the Queen Conch Fishery of Puerto Rico and the U.S. Virgin Islands

Dear Mr. Rolón:

The United States Department of the Interior (Department) has reviewed the Draft Environmental Impact Statement (DEIS) for Amendment 2 to FMP for the Queen Conch Fishery of Puerto Rico and the U.S. Virgin Islands. We have not comment at this time.

If you have questions or concerns, I can be reached on (404) 331-4524 or via email at gregory_hogue@ios.doi.dov.

Sincerely,

Gregory Hogue
Regional Environmental Officer

cc:
Jerry Ziewitz - FWS
Brenda Johnson – USGS
OEPC - WASH

Comment 3

28th Legislature of the Virgin Islands

Capitol Building, Charlotte Amalie, St. Thomas, U.S. Virgin Islands 00802

PATRICK SIMEON SPRAUVE
Senator
Committee on Health, Hospitals & Human Services
Chairman

P.O. Box 1690 • Tel.(340) 693-3513 • FAX: (340) 693-3631
e-mail: psprauve@legvi.org

Remarks to the Caribbean Fishery Management Council Hearing
Windward Passage Hotel, St. Thomas
July 21, 2010, 7pm

Good evening to those present, fishermen and members of the Caribbean Fishery Management Council. My name is Catherine Bryan, Chief of Staff for Senator Patrick Simeon who is a representative for the St. Thomas/St. John District. The Senator asked that I represent him here tonight, at this important meeting. In addition to my responsibilities as Chief of Staff, I am also a member of the Fisheries Advisory Council. Ladies & gentlemen, it would appear that the members here tonight have not fully recognized the concerns of Virgin Islanders as the information that I am going to outline in the next few minutes have been drafted & discussed on numerous occasions over the last five years. It is through the previous statement that Senator Sprauve requests I convey to you, the Caribbean Fishery Management Council, the need for responsible resource management here in the Territory.

It is safe to say that we all want the same thing, a healthy and productive fishery. In fact, the existence of our islands depends on our fishery for our tourism product and food production. The best methods for ensuring the protection and sustainability of our fishery are not as clearly defined. However, I implore the CFMC to fulfill their mandates cautiously. I appreciate the magnitude of the task at hand and I strongly believe there must be discussions with all stakeholders present. However, poorly advertised and facilitated meetings are unacceptable and appear to provide a level of impropriety in relation to transparency. All stakeholders must have an opportunity to be heard and more importantly taken into consideration. The people of the Virgin Islands must be included in decision making which will affect the economics of our Territory.

I must express my concern for the method for which data is being collected. Virgin Island fishermen have submitted catch reports for years to recently learn that their data is not acceptable. Whatever the shortcomings of their figures, have we corrected it so that we do not exacerbate the problem for the future? It is troubling, that the solution for acquiring data was to simply dismiss 30 years of Virgin Islands data and instead use Puerto Rico's fishing data; an island with four million people, and an abundance of conflicting variables that would affect this fishery over ours. Using one islands fishery data to determine the livelihood of its neighbor is irresponsible, disingenuous and borderline criminal. The CFMC and other regulatory agencies may regard the Virgin Islands as a small foreign country that can be easily dismissed. But let me assure you, we will not. I implore you to reconsider the concept being presented.

Again, I realize you are mandated to set annual catch limits this year. Thus, I strongly urge you to use the Virgin Islands figures that are available to set the ACL's for the Territory. Puerto Rico's statistics should only be used to set Puerto Rican data.

Senator Sprauve remains committed to seeing fair and reasonable administration of our fishery. He is willing to assist in facilitating this process so that we can move forward in setting regulations to protect both our marine environment and our local fishermen. Thank you for your time and please feel free to contact me with any concerns at 340-693-3513.

Comment 4

JUL 27 2010

DONNA M. CHRISTENSEN
DELEGATE, VIRGIN ISLANDS

COMMITTEE ON
ENERGY AND COMMERCE
MEMBER, SUBCOMMITTEE ON HEALTH
MEMBER, SUBCOMMITTEE ON
TECHNOLOGY AND THE INTERNET
MEMBER, SUBCOMMITTEE ON
OVERSIGHT AND INVESTIGATIONS

COMMITTEE ON
NATURAL RESOURCES
MEMBER, SUBCOMMITTEE ON
INSULAR AFFAIRS, OCEANS AND WILDLIFE
MEMBER, SUBCOMMITTEE ON
NATIONAL PARKS, FORESTS,
AND PUBLIC LANDS

MEMBER,
CONGRESSIONAL BLACK CAUCUS
MEMBER, CONGRESSIONAL CAUCUS FOR
WOMEN'S ISSUES

Congress of the United States
House of Representatives
Washington, DC 20515–5501

PLEASE RESPOND TO:

WASHINGTON OFFICE
☐ 1510 LONGWORTH HOUSE OFFICE BUILDING
WASHINGTON, DC 20515
(202) 225-1790
FAX (202) 225-5517

DISTRICT OFFICES
☐ SUNSHINE MALL SPACE #204 205
#1 ESTATE CANE
FREDERIKSTED, VI 00840
P.O. BOX 5980
C'STED, ST. CROIX, VI 00823
(340) 778-5900
FAX (340) 778-5111

☐ 8000 NISKY CENTER, SUITE NO. 207
ST. THOMAS, VIRGIN ISLANDS 00802
(340) 774-4408
FAX (340) 774-8033

☐ #100 CONTANT ENIGHED
CRUZ BAY, ST. JOHN
U.S. VIRGIN ISLANDS 00831
(340) 776-1212

July 20, 2010

Mr. Miguel A. Rolón, Executive Director
Caribbean Fishery Management Council
268 Muñoz Rivera Ave., Suite 1108
San Juan Puerto Rico 00918-1920

Dear Mr. Rolón:

Thank you for the opportunity to contribute my perspectives on the proposed management alternatives before the Caribbean Fishery Management Council as it relates to setting annual catch limits for the U.S. Caribbean fishery.

For generations, fishing has played a tremendous role in the economy and culture of the Virgin Islands. To successfully preserve this important resource however, it is important that there is increased collaboration between the Council, local and federal regulators and relevant stakeholders. Of particular concerned to me is the "one size fits all" approach that appears to be guiding the decision making process. I would also like to reiterate the importance of setting individual annual catch limits for each island district and not a single one for the "U.S. Caribbean". There is valid concern that categorizing St. Croix, St. Thomas-St. John and Puerto Rico into a single collective would only commit a greater disservice to the goal of sustainably managing our fisheries as it blatantly ignores the differences inherent to each island community. To that end, I want to make clear that I cannot support the preferred alternative that reflects a scalar of .75 without further investigation of its applicability and relevance specific to St. Croix and St. Thomas-St. John catch effort. I hope you take this into consideration as you proceed with your deliberations.

On Monday, July 21st, President Obama issued an executive order that emphasizes the need for comprehensive and collaborative efforts for determining management strategies, and calls for the need to preserve the social, cultural and historic value of our fisheries and fishing communities. In the spirit of this announcement, I encourage you to consider a more collaborative approach to protecting the U.S. Caribbean's marine resources. While I do recognize that there has been a greater attempt to collaborate with Virgin Islands' stakeholders, rarely do final management actions reflect such. It is my hope that future efforts demonstrate a stronger commitment to balancing stakeholder input with Council priorities.

Letter to Mr. Miguel A. Rolón
Re: U.S. Caribbean Fishery Management
July 21, 2010

Lastly, I submit that we use existing USVI-specific data to set ACLs and take time to implement the new data collection program for a period of 1-5 years while we address the uncertainty that has plagued the process for some time.

I appreciate your attention to this matter and look forward to working together to seek resolution to the issues before us.

Sincerely,

Donna M. Christensen
Member of Congress

Comment 5

VICS The Virgin Islands Conservation Society
5032 Anchor Way
Suite 5
Christiansted VI 00820
(340) 773-1989
fax: (340) 773-7545

University of the Virgin Islands' Student Letters Supporting Sustainable Fisheries Management

July 20, 2010

For many years, the Virgin Islands Conservation Society (VICS) has worked with local chapter organizations to help protect our coastal waters and marine resources including fisheries. VICS supports the Caribbean Fisheries Management Council actions to establish regulations to support sustainable fisheries management practices in federal waters surrounding the US Virgin Islands and Puerto Rico.

Anyone who lives in or visits the USVI or Puerto Rico -- whether fisherman, snorkeler, SCUBA diver, person who enjoys a seafood dinner, or anyone who lives in or does business in buildings in coastal areas protected by coral reefs – is a stakeholder in our marine and fisheries resources. As such VICS has been working with local groups, businesses and individuals to encourage them to take a part of the process of protecting our fishery resource and have their opinions and voices heard.

One group of stakeholders with whom VICS has met recently consisted of students of the University of the Virgin Islands (UVI) St. Thomas campus. Students in an undergraduate science class were given information about Caribbean Fisheries Management Council efforts to implement regulations to sustain fisheries in US Caribbean federal waters. Students were asked to write their opinion about whether or not they support such efforts.

Eighty six percent (32 of 37) students who participated expressed support of sustainable fisheries. There were a number of overlapping themes in the student letters, including:

- Agreement that there has been an observable decrease in fish size, numbers and diversity in recent decades
- A wish for future generations to be able to enjoy the healthy reef systems and fish numbers and diversity that they experienced as children
- A desire to maintain reliable and continual income generated by marine resources via tourism
- A desire to prevent extinction of fish species
- Concern about parrot fish, noting the role they play in maintaining reefs, building beaches and protecting shorelines
- Concern about fish population health and fish importance in the food chain, diet and food source availability over the long term
- Importance in local recreational activities, including beach days, diving and snorkeling, sea trekking and recreational fishing
- Concern about long term preservation of job sustainability and income for local fishermen

Many of the letters stressed the importance of the long view, while acknowledging the complexity of the issues surrounding the changes needed in implementing sustainable fisheries management. Attached are a small sample of letters in their entirety that best represent the concerns and views expressed. Following are excerpts from UVI student letters supporting regulations for sustainable fisheries management:

"Having personally grown up in the Mandahl Bay Area I can personally attest to the beauty of our natural environment. I am in complete agreement with the CFMC plan's to halt overfishing in our waters. Not only is there economic involvement at stake but a health one. The attraction that our waters hold to tourists will be taken away if overfishing is allowed to continue…I therefore urge that this committee continue to move forward with the plan that will protect our Caribbean lifestyle for generations to come.

"First of all, I would like to tell you that I do not like this idea. I love to fish and I also enjoy eat fish. Fishing is the only way to may income for some fishermen and many people fish for fun also. However, it would be selfish and thoughtless to tell you not to go through with this plan. If overfishing is not ceased, many species of fish may start to become extinct. If that happens, then there will be no more fish to be caught. This plan will only be for the best, as far as I see it. As I said before, I don't like this idea but that is only for personal purpose. I support your plan one hundred percent."

"I would like you to move forward with your plan to limit catches of many species of snappers, groupers, parrotfish and conch in federal waters. The region's world-class coral reefs provide essential habitat for hundreds of species and support the highest biological diversity of any type of marine habitat and provides financial support for many families…I would love to go diving and see these species live in their natural habitat. I want to be able to see my children, grandchildren, and even my great grandchildren enjoy the treasure trove that is the Caribbean Sea."

"Sea food in the Caribbean is of great importance…The risk of possible total depletion is not impossible, if this rate continues, and the long term effects will be greater and much more negative; than short term losses….This initiative to halt over fishing will in no doubt benefit the fishermen in the future….Fishermen should consider that this short-term loss in sales; will result in the preservation of their livelihood and furthermore the saving of not one but many species."

"We are aware that our region is suffering from overfishing….This issue is important to me not only because of my love for fresh high quality seafood, but my love for my Caribbean. I feel proud when I read articles about my region and hear the comments from our visitors about our fresh delicious seafood and beaches. I feel these things are what make the Caribbean different and better than the rest…..It is my hope that Governments of the wider Caribbean will also make use your proposal to sustain fishing in their waters."

"If we destroy our coral reefs by catching all the fish that cleans the reef then we will be making the environment more prone to destruction."

"…Before you finalize your plans there are a few things that should be taken into consideration. They include but not limited to: 1. the destruction of the Reefs due to million dollar constructions along the shore which will inhibit the reproduction of these marine life. 2. The lack of knowledge by some fishermen that catches of these species in their early stages before have a chance to reproduce. Finally, the impact that limited catches would face on the fishermen due to the already threatened economy….Once we have established that our reefs are being taken care of and the species that once called them their homes come back to reproduce, there will be enough of these species to go around for sale and consumption."

"As a diver I feel very strongly about this issue, because viewing these animals brings me great joy….I hope that this proposal is approved so we can keep our beautiful waters and the animals in it."

"I used to think that there were a lot of species to go around, but now I think that we are running out of sea life and soon there won't be any at all if we don't stop overfishing. Most people don't know that if you catch a fish before it mature enough to make to reproduce more fishes our waters would run out….."

"I have enjoyed the beaches, diving around the coral reefs, and choosing the best catch of the day from the local fishermen. The beaches and the local food markets are a big part of our Tourism Department. I agree with your decision on trying to stop overfishing....Tourists from all over the world will still find our Virgin Islands as a top ten destinations port."

"... **If you want your children and their children to enjoy** our clear waters, sandy beaches, the beautiful aquatic life of coral reefs and the beautiful fish I think you should move forward with your plan to prevent overfishing."

"**I think the plan is an excellent idea and it needs to be implemented as soon as possible.** Fish are a very important contributor to the existence of mankind in our on society. For example, people pay thousands of dollars and travel for thousands of miles and fly for hours and hours just to be able to enjoy our paradise. **The main attraction is the beaches and believe it or not people will come down to our island just to go snorkeling to see our beautiful corals and the fish that live in that unique habitat.** Tourism is a major source of income in our society....Me personally, I love marine life. I am so fascinated with it and I would do anything in my power **to help preserve it so that people beyond my generation can be able to enjoy it** the way I am enjoying it now."

"...**I was raised around the water and use it as a way of life....**Now at the age of 19 I have noticed a dramatic change of these waters. Diving these waters now has been very hard to see even one grouper, especially a Nassau Grouper....**Parrotfish are some of the most commonly seen fish in the ocean...These fish help make our beaches have that bright white sand that attract tourists. Without these fishes we wouldn't have beaches that are in the top ten in the world....**This is why we should come together to make decisions and enforce rules that would help save our ocean wildlife."

"On behalf of my family and me, we are in favor and support The Caribbean Fishery Management Council (CFMC) decision to limit fishing catch, in federal waters off the coast of Puerto Rico and the U.S. Virgin Islands...**One of our natural major resources in the Virgin Islands is the fishing and the rich diversity of sea lives in our waters.**"

"The reefs are important because they help provide protection to shorelines and inhabitants living near costal waters."

"Over fishing naturally has serious harmful effects on our coral reefs and will eventually lead to the extinction of several essential marine-lives in our region...I know that our economy is one of tourism and the tourists too enjoy these past times... Over fishing will naturally bring all these to a sudden end...**It is important for me, for you and for our children that we protect our coral reefs and our ocean life** and that we manage them rather than succumb to the pressure of those how have an immediate economic interest by encouraging overfishing....**I am urging you to vote to pass a limit on the volume of fishing so that through managed growth we can enjoy the bounties and the beauties of these islands for generations to come.**"

"...The U.S. Virgin Islands regards tourism as one of its main export due to the beautiful coral reefs found on the lovely white sand beaches...**A decline in species of fish means a decline in coral reefs and a decline in the number of tourists coming to our shores.** What then will we sell to our tourists? We need to protect our species of fish by halting overfishing!"

V Carmen L. Figueroa

Estate Tutu #13-235

St. Thomas, USVI 00802

April 16, 2010

The Caribbean Fishery Management Counsel (CFMC)

And The National Marine Fisheries Services. (NMFS)

Dear Sir or Madam:

I have lived in the Virgin Islands for many years. I have enjoyed the beaches, diving around the coral reefs, and choosing the best catch of the day from the local fishermen. The beaches and the local foods are a big part of our Tourism Department. I agree with your decision on trying to stop overfishing. This way, the habitat and species would be able to catch themselves abundantly. The Fishermen would be able to always bring a good hand of fresh sea-foods. Finally, we the local population would be able to enjoy the delicacies from our surrounding waters. Tourists from all over the world will still find our Virgin Islands as a top ten destination port.

I agree that this letter may b submitted as official public comment.

Thank you for considering my concerns.

CLFigueroa 4/16/2010

Carmen L. Figueroa

Name: Leechang Defreitas

Science 100

4/21/10

To Whom It May Concern:

It is to my understanding that you all (The Caribbean Fisheries Council) are trying to put into effect a new law, whereas to help protect the fish species such as the grouper, parrotfish, snappers and conch, in federal waters which is considered to be off the coast of Puerto Rico and the U. S Virgin Islands. Personally, I share the opinion that as this may be a great idea, it may also be considered a lost to some within our society.

I enjoy going to the beach on Sunday afternoons just to relax and scuba dive, to see the beautiful corals and fishes. If this law is put into effect then we must remember that the Brown and Red Algae and these corals that the tourists as well as the locals enjoy, are "fighting" for space on the sea floors and the coastal edges. These fishes eat the algae and thus the corals could "spread their wings." This is one of the many advantages of implementing the law. On the other hand, there are the fishermen who have a living from fishing. If they were to be restricted then what will they do? How will they survive? How will they feed their families?

I personally think that the law should be constructed in such a way that everyone could benefit from it. For example, the law should entail that the fishermen could fish, but not during the reproduction season and in that way there will be more than enough fishes to eat the algae and create space for the corals.

I agree that this letter may be submitted as an official public comment.

4/21/10 Defreitas

Jaime Donastorg
Science 100
04/28/2010
Dr. Donald Drost

Letter to the CMFC

To whom this may concern,

Hi, my name is Jaime Donastorg and I am an 18 year old attending the University of the Virgin Islands. It has been brought to my attention that this plan that you are commencing to half overfishing is slowly coming into fruition. I think the plan is an excellent idea and it needs to be implemented as soon as possible, Fish are a very important contributor to the existence of mankind in our on society. For example, people pay thousands of dollars and travel for thousands of miles and fly for hours and hours just to be able to enjoy our paradise. The main attraction of course is the beaches and believe it or not people will come down to our island paradise just to go snorkeling to see out beautiful corals and the fish that live in this unique habitat. While overfishing is continuing to rise at an alarming rate, many of the fishes that live around the coral reefs won't exist anymore. This makes the attraction for people to come and see it decrease.

Tourism is our main source of income in the U.S Virgin Islands, without that this society as we know it would crumble and all hell will break loose. Me personally, I love marine life. I am so fascinated with it and I would do anything in my power to help preserve it so that people beyond my generation can be able to enjoy it the way that I am enjoying it now. Some of the same species of fish that are in your catch limit proposal are the most precious ones. The parrotfish, I know for sure is one of the most beautiful fishes in the Virgin Islands All the species of the parrot fish are so fascinating in their own way. If overfishing can come to screeching halt, we can preserve these fishes which will allow them to showcase their beauty in our waters to tourist who fly from up yonder to see the beauty beyond the land. I wish you luck as far as this plan being voted upon in your favor and it can be implemented by law that overfishing must come to a limit.

I agree that this letter may be submitted as an official public comment. 04/28/10 J. D.

Sincerely,

J. D.

The Caribbean Fishing management Council

April 14, 2010

Dear Council Members,

Re: CFMC's proposal to limit the fishing of various species of sea foods

It is with great pleasure that I read your proposal to limit the fishing of some of our species of fish and other sea life. We are aware that our region is suffering from overfishing. The result of this may be seen in the scarcity of some fish such as the goat fish and doctor fish, which were found in great abundance at one time. The economy of the entire region relies heavily on fishing not only as an industry, but also as recreation .Your proposal affords the Caribbean an opportunity to give these species an opportunity to spawn, so that the quantity and quality of fish produced in our waters can be maintained. The implementation of such a proposal will greatly benefit the region.

This issue is important to me not only because of my love for fresh high quality seafood, but my love for my Caribbean. I feel proud when I read articles about my region and hear the comments from our visitors about our fresh delicious seafood and beaches. I feel that these are the things that make the Caribbean different and better than the rest. Again, I thank you for this proposal and wish you every success. It is my hope that Governments of the wider Caribbean will also make use your proposal to sustain fishing in their waters.

Respectfully

Tricia Beard

I agree that this letter can be used for public comment. T Beard

KEROMA POLLOCK
BOX 92, UVI- Student Housing
#2 John Brewers Bay
St. Thomas, USVI 00802
Tel#: 908-644-4679
Email: Keromapollock@hotmail.com

Miguel A. Rolón
Executive Director
US Department of Commerce
Caribbean Fishery Management Council
268 Munoz Rivera Ave., Suite 1108
San Juan, Puerto Rico 009918-1920

Dear Mr. Rolón:

Sea food in the Caribbean is of great importance. Their capture fosters economic activity weather on a small scale; (that is to sell to local markets, shop and store); or on a larger scales; (to restaurants hotels and even to ship overseas). However over the years, this activity which is the livelihood of many, has caused and is still causing a dramatic decline in certain species as indicated by the council. The risk of possible total depletion is not impossible, if this rate continues, and the long term effects will be greater and much more negative; than short term losses. That is why I must agree with the council's proposal to limit the catching of the species that are most at risk.

These species that include many species of snappers, groupers, parrotfish and conch are all found in federal waters. This initiative to halt over fishing in will in no doubt benefit the fishermen in the future. I am a lover of conch other shellfish. It is understandable that fishing provides financial support for many families. However, if controllable measures are not put in place now, in 4 -5 years there may not be anything to fish for and the effects would be far more devastating. Fishermen should consider that this short-term loss in sales; will result in the preservation of their livelihood and furthermore the saving of not one but many species.

Sometimes for the benefit of others comes at a price and even so sometimes in our best interest authorities must take whatever action is necessary for our own good. Therefore I stand in support of the council's proposition and though I too will be affected the future benefit are more than appealing.

Save the species.... save our livelihood....save our economy!!!!!

Sincerely,

I agree that this letter may be submitted as an official public comment.

KPollock

Keroma Pollock 04/19/2010

Dear Caribbean Fishery Management Council,

Limiting catches of many species in federal waters is phenomenal idea. Too many people catch these beautiful animals in an over abundance, taking away from our ocean's beauty. As a diver I feel very strongly about this issue, because viewing these animals brings me great joy. People are wasting our resources and affecting the biological diversity among species and the balance of things by overfishing. Only the needed amount is what should be taken from the sea and not everybody vies this the same way, but they should be considerate of these beautiful creatures and those who find them to be fascinating. I hope that this proposal is approved so we can keep out beautiful waters and the animals in it.

I agree that this letter may be submitted as an official public comment. 4/18/10

Sincerely,

Julianna L. Gardner

Comment 6

Caribbean Fisheries Management Council

I have been a full time resident of St. Croix since October 1977. I have been working daily as a dive instructor for the pass 32 years. I have made thousands of dives off the north shore of St. Croix. In 1989, I was responsible for the mooring system for dive operators and later on more moorings for recreational fishers. I am on and the board for the St. Croix Fisheries Advisory Committee, since 1989.
Diving daily, weekly monthly and yearly to the same dive sites I have noticed the decline of the fish population to the point of many species of fish totally gone from these areas. Such fish as the majority of groupers, snappers and the larger species of parrotfish.

In the early 70's scuba, diving was introduced to the USVI and since then it became the decline of the fishers. To add insult to injury the introduction of the gill and trammel net and the use of scuba has caused a near collapse of the fisheries on St. Croix.

We have limited reef area surrounding the island of St. Croix. We are a plate pushed up from the sea and are not connected underwater to other islands. With this finite shelf, the fishers that use scuba are finding their catch at much deeper depth, which is causing a high incident of decompression sickness. Conch that use to be in the shallow waters are now found only in excess of 90 feet,

With the increase, number of fishers and extremely effective methods of fishing has caused over fishing for more than 20 years. Records from Dr. Olsen, former director of Fish and Wildlife has shown that the majority of fish caught on St. Croix are too small to breed, which is another reason for the disappearing act of our reef fish. Lack of enforcement on St. Croix has and always will be a problem to protect or preserve what little we have left.

I can not speak for St. Thomas or St. John, but having an annual catch limit on St. Croix will not work. First of all the fishers will not accurately give fish reports, the gill net is still widely used and the most important reason is that we do not have enforcement here. Presently we have excellent rules and regulations for the fisheries, but they are not enforced. When there is enforcement and a fisher goes to court it would be dismissed or a small fine, which will not be a deterrent to continue breaking the law.

My recommendation to the council is a five year complete moratorium of all reef fishing on the island of St. Croix. This will be easy to enforce and allow the fish to recover. During this five year the 100 or so full time fishers can work with fish and wildlife to do studies and help restore the reefs, which the majority is covered in algae due to lack of parrotfish and sea urchins. There are many Federal funds available to eradicate lionfish; this is something the fishers would be excellent at. Also more FADs need to be put in place so the fishers could continue to fish in the deep waters.

St Croix can not support reef fish fisheries. Having an annual catch limit will not help the fishery only put the last nail in the coffin.

Sincerely,

Michelle Pugh
Dive Experience
divexp@gmail.com

Comment 7

Good Evening:

My name is Ruth Gomez. I would like to make it clear that the following statement is a reflection of my personal views. The following series of statements do not affect my duties and responsibilities at The Division of Fish & Wildlife. They in no way represent the views of my employer.

I am here as a 4th generation Virgin Islander. I can no longer sit quietly and watch as you (federal government) attempt to regulate my fishery, possibly starve and instill economic hardship on the people of the Virgin Islands. What brings me the most sadness is what is regarded as attempts to manage, now show signs of border line manhandling.

I understand that there are mandates, but I am sure I can comfortably state that when Congress issued those mandates, destroying a way of life, destroying a culture was not what they had in mind.

In the recent Daily News article on Tuesday, July 20th it stated, "regulators, on the other hand, say that the data reported is faulty, because it lacks details that help them determine fishery health". If you the regulators are the messenger and executioner of these congressional mandates... then how can you in good conscience continue to travel the route you are on.

The entire foundation of the alleged over fishing was seeded from the Sustainable Fisheries Act. What you have since admitted to, is that there was no sound scientific basis to compile the list of overfished species. Thus, in the absence of good Virgin Islands data, you used Puerto Rico data. Basically, the people of the Virgin Islands must do penance for you massaging data. So... help clarify my confusion. If you admit, you have no scientific basis, than how and why are we where we are at today?

I believe that no one benefactor of the resource should have a controlling say. I do passionately believe that all should have a say. No one group whether the scale is tipped financially in their favor should outweigh the other. In our case, the value of the stakeholders is severely under estimated. The tourist sectors needs are of equal importance as the daily existence of the people. Should these Virgin Islands suffer any sort of natural disaster, they as well as the farmers will feed the people of the Virgin Islands, regardless of where they were born or skin color. YOU can't truck it from the neighboring state.

Should you implement Annual Catch Limits (ACL's), are you addressing or even taking in to consideration the other environmental factors that will continue to take place and adversely affect the fishery? Or further down the road will you admit you negated to consider and dispense more hardship on us? This is not about squeezing the immediate. Good effective management of this fishery with the least socio-economic effect on the people of the Virgin Islands is a complicated equation. Simplicity isn't the best option here.

We are not adverse to management, just management without bias. Setting ACL's based on your admission of faulty data would be a travesty and questions your integrity as fishery scientists. Let's not mention the issue of good conscience as individuals. This master plan you have authored is a plan designed only to end in failure-failure only to be felt by the people of the Virgin Islands. Quotas will surely be met before the 12 month period ultimately closing our fishery.

In my heart I believe you stopped listening and you are moving forward like a Roman Army with blinders on. How we as a people fend, makes no difference to you. You can bring all the user groups together, but if you have no desire to listen then what is the purpose.

This entire scenario resembles some sort of misguided battle, and the people of the Virgin Islands are nothing more than collateral damage. My mother, my grandmother, and I are not to be collateral damage.

"One of the hardest things in this world is to admit you are wrong. And nothing is more helpful in resolving a situation than its frank admission."

Correcting the fact that you fell asleep at the wheel for over 30 years has to start somewhere. That somewhere is not on the tables, in the mouths, in the pockets or hearts of the people of the Virgin Islands. Gathering more species specific data is a work in progress and can be slow. Am I to understand that slow progression is exclusive to you, but steady regression is dictated to us?

In closing, I simply ask that you put the brakes on and readdress your plan of attack. Collect good extensive data and set ACL's that are true representations of the fishery of the Virgin Islands.

I thank you for your time.

Comment 8

Eugeno Pinero-Soler
Chairman
Caribbean Fishery Management Council
268 Muñoz Rivera Avenue, Suite 1108
San Juan, Puerto Rico 00918-1920

Recommendations re: US Caribbean Fishery Management Council's Annual Catch Limit and Accountability Measures Amendment

Dear Chairman Pinero,

We appreciate this opportunity to comment on key issues in the Annual Catch Limit and Accountability Measures Amendment (Amendment). We commend the Caribbean Council, staff and all involved for their hard work in putting together this Amendment. As you move forward with this important process, we offer the following recommendations regarding sound conservation and management of our fishery resources and compliance with the new requirements in the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the National Standard 1 (NS1) Guidelines.

We do so in recognition that data on catch and effort in the region is less than ideal and that improving data collection is now, and will continue to be, a major focus for NOAA Fisheries and the Caribbean Council for many years in the future. However, there is clear evidence from a number of peer-reviewed studies indicating that the marine ecosystem in the U.S. Caribbean has suffered severe losses, and that overfishing is likely a major factor in this decline.[1] This underscores the need to secure the long-term health of our fish populations by moving swiftly to enact measures that will end and prevent overfishing. A thoughtful ACL/AM Amendment for the Caribbean that complies with the MSA and NS1 guidelines should be a foundation on which to secure that future of healthy fish populations and vibrant fisheries.

[1] Roberts, Callum. 1995. Effects of Overfishing on the Ecosystem Structure of Coral Reefs. Journal of Conservation Biology 9:5 988-995.

The Pew Environment Group's comments and recommendations focus on the following key issues:

- The Amendment should clearly describe whether the 25% reduction from the overfishing limit (OFL) to the Acceptable Biological Catch (ABC) and the Annual Catch Limit (ACL) is intended to account for both scientific and management uncertainty, and provide a rationale for the use of this estimate.
- All parrotfish deserve special protections due their ecological importance and unique biology.
- Accountability measures (AMs) and the circumstances that would trigger the implementation of accountability measures need to be more detailed.

Overall, we find that the Amendment represents a positive step towards sustainable fisheries, and we support passage of the Amendment with the current preferred alternatives. In Actions 2 and 3, the preferred alternatives are reasonable and well supported. However, we are concerned that Actions 1, 4 and 5 may not be sufficient to end and prevent overfishing, and thus ensure the maximum ecological and economic benefit from fisheries in the region. As additional data is available, it may be necessary to adjust the catch limits and other management measures via a future amendment. However, it is imperative that the Council not delay action, both because the legal deadline to establish these measures is fast approaching and because the sooner you act, the more quickly overfishing will end and fisheries will begin to rebound. The MSA is designed to address situations like the one we face in Puerto Rico and the Virgin Islands where catch data is limited. The series of limits, buffers and accountability measures spelled out by the MSA and NS1 guidelines has proven to be successful in restoring and maintaining healthy fisheries over the long-term, and should be clearly incorporated into this Amendment.[2]

<u>**Action 1: ACL = OFL x 0.75**</u>

We support approval of the Amendment with the preferred alternatives in Action 1, but we have some concerns about the ACL designation. NS1 requires that the Council's system of ACLs and AMs account sufficiently for both scientific and management uncertainty.

> *... In general, when specifying limits and accountability measures intended to avoid overfishing and achieve sustainable fisheries, Councils must take an approach that considers uncertainty in scientific information and management control of the fishery... [50 C.F.R. §600.310(a)(3)]*
>
> *...rules should be designed so that management actions become more conservative as biomass estimates, or other proxies, for a stock or stock complex decline and as science*

[2] Shertzer, K. W., and M. H. Prager. 2007. Delay in fishery management: diminished yield, longer rebuilding, and increased probability of stock collapse. ICES Journal of Marine Science 64: 149–159.

and management uncertainty increases. Examples of scientific uncertainty include uncertainty in the estimates of MFMT and biomass. Management uncertainty may include late catch reporting, misreporting, and underreporting of catches and is affected by a fishery's ability to control actual catch. For example, a fishery that has inseason catch data available and inseason closure authority has better management control and precision than a fishery that does not have these features... [50 C.F.R. §600.310(f)(4)]

Ideally these two sources of uncertainty should be quantified separately in order to determine the appropriate buffer to prevent overfishing. In a presentation to the Council early this year, NOAA's Southeast Science Center suggested that a 25% reduction from the OFL to the ABC and the ACL would be the minimum acceptable to account for both scientific and management uncertainty. This buffer has been used by other regional councils for data poor stocks, but many of the "data poor" stocks in the north Pacific region, for example, have more data available than any fish stock in the Caribbean. Thus, we are concerned that setting the ACL at 75% of the OFL may be insufficient to account for the high level of both scientific and management uncertainty for nearly every species in this region. The precautionary approach requires using greater caution in the face of greater uncertainty. We recommend that such a risky strategy be accompanied by efforts to collect data with which the Council can closely monitor the fishery and evaluate this approach annually to determine whether the 25% buffer is sufficient to prevent overfishing. If it is not, this must be remedied immediately by implementing more conservative management strategies to avoid irreparable harm to fisheries.

Action 4: Parrotfish prohibitions

We strongly agree with the selection of alternatives 2a, 2b, and 2c to prohibit the harvest of midnight, blue and rainbow parrotfish. The Council's Science and Statistical Committee (SSC) recommended a catch level of 0, and the Council is legally bound to not exceed the catch level recommendations of its SSC.

Each Council shall, in accordance with the provisions of this Act- develop annual catch limits for each of its managed fisheries that may not exceed the fishing level recommendations of its scientific and statistical committee or the peer review process established under section (g); [16 U.S.C. 1852 MSA. §302(h)(6)]

NOAA's Office of Protected Resources also gave a presentation to the Council in June expressing concern for the delicate relationship between endangered corals and parrotfish. The midnight, rainbow and blue parrotfish are particularly vulnerable to overfishing due to their unusual biology. They form territorial harems where large individuals change sex to become the single male in the group. This social structure necessitates a larger overall population in order to sustain the parrotfish presence on the coral reef. Although these three species are particularly susceptible to overfishing, all parrotfish deserve special consideration. As dramatic declines in coral cover spread through the Caribbean, the parrotfish's role in coral reef development must be balanced with interests in a fishery. Endangered species of coral like elkhorn (*Acropora cervicornis*) may depend upon parrotfish for their survival and the islands themselves depend upon the existence of the coral reef.[3]

Action 5: Accountability Measures

There are three considerations involved in Action 5. The first is the use of a three-year rolling average to trigger AMs. While the use of running averages is allowable under the fisheries management guidelines, we are concerned that as written, it could allow overfishing to occur with no consequences.

> *Some fisheries have highly variable annual catches and lack reliable inseason or annual data on which to base AMs. If there are insufficient data upon which to compare catch to ACL, either inseason or on an annual basis, AMs could be based on comparisons of average catch to ACL, either inseason or on an annual basis, AMs could be based on comparisons of average catch to average ACL over a three-year moving average period or, if supported by analysis, some other appropriate multi-year period. Councils should explain why basing AMs on a multi-year period is appropriate. Evaluation of the moving average catch to the average ACL must be conducted annually and AMs should be implemented if the average catch exceeds the average ACL. [50 C.F.R. §600.310 (g)(4)]*

Guidelines require that the Council justify its use of the running average, and a detailed justification should be included in the document. In addition, this section of the guidelines is specific about the annual nature of the comparison between catch and the ACL. The Council may intend to conduct such evaluations annually but it is not clear as currently written. We urge the Council to include an explicit description of the timing and process for reviewing and adjusting ACLs and AMs in the document.

The second question posed in Action 5 is whether the overfishing determination is based solely on landings exceeding the ACL or, alternatively, if the Council and SSC should determine the cause of the apparent overage and determine whether the ACL was exceeded due to overfishing or other causes. We acknowledge the real possibility that landings could rise due to factors other than increasing effort (including increased data collection), and agree that there may be situations where it may not be appropriate to trigger accountability measures. We are concerned however, that the alternative as written gives the Council authority to dismiss any and all overfishing findings with no clear criteria or explanation. If this kind of qualitative judgment is to be made,

[3] Coral Reef Alliance, 2010. http://www.coral.org/resources/about_coral_reefs/why_care

it must be made by the Council's scientific advisors, and the control rule or criteria for such a decision needs to be spelled out in the document to prevent abuse.

The third issue is whether or not to deduct overages from the next year's ACL in addition to adjusting the ACL to prevent the overage from occurring again. NS1 guidelines require that:

> *For stocks and stock complexes in rebuilding plans, the AMs should include overage adjustments that reduce the ACLs in the next fishing year by the full amount of the overages, unless the best scientific information available shows that a reduced overage adjustment, or no adjustment, is needed to mitigate the effects of the overages. If catch exceeds the ACL for a given stock or stock complex more than once in the last four years, the system of ACLs and AMs should be re-evaluated and modified if necessary to improve its performance and effectiveness.* [50 C.F.R. §600.310 *(g)(3)]*

Species groups considered to be overfished (queen conch, grouper units 1, 2, and 4) require overage deductions in the next fishing year to maintain the rebuilding plan for the population.[4] Parrotfish and snapper groups which are not overfished, do not require these types of AMs according to the section quoted above. It is not clear whether the preferred alternative in the amendment sets up overage adjustments for species that are designated as overfished. The system represented by the preferred alternative needs to be explained more fully, and overfished species need AMs that reduce the ACL in the next fishing year by the full amount of the overage.

Conclusion

The precautionary approach to fisheries management is proven to work, and it is also well suited to application in the Caribbean.[5] The basic principal is akin to walking near the edge of a cliff. If you are blindfolded, you would be well advised to walk far from the cliff's edge. In contrast, someone with 20/20 vision might choose to walk much closer to the edge of the cliff. In the Caribbean region, the limited data on catch and effort means that the Council is in some ways essentially blindfolded, and thus should use great caution in managing our priceless ocean resources. Parrotfish fill a critical role in the overall health of our ocean and islands, and should be afforded particular protections. Accountability measures and buffers to account for the high level of uncertainty in fisheries dependent data and the effectiveness of management measures in constraining catch make up the backbone of science-based fisheries management, and we feel that these are the most important elements for the Council to get right in this Amendment.

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[4] 50 C.F.R. §600.310 *(g)(3*

[5] Rosenberg, A. et al. Setting Annual Catch Limits for U.S. Fisheries: An Expert Working Group Report, 2007

We are encouraged by the timely action of the Council and we look forward to continuing to work with the council to manage our ocean resources carefully so that they will continue to provide the islands with beauty, economies and jobs into the future.

Sincerely,

Sera Harold Drevenak
Science and Policy
Ending Overfishing in the Southeast
Pew Environment Group

Holly Binns
Manager
Ending Overfishing in the Southeast
Pew Environment Group

Comment 9

RINCON COMERCIAL FISHERMAN'S UNION

P.O. BOX 533
RINCON, P.R. 00677
TEL. 787-539-6790
e-mail: rcfunion@yahoo.com

RINCON COMERCIAL FISHERMAN'S UNION

P.O. BOX 533
RINCON, P.R. 00677
TEL. 787-539-6790
email: rfcunion@yahoo.com

Muy buenas noches tengan todos . Mi nombre es Nelson Crespo y soy presidente de la Union de Pescadores Comerciales del Noroeste.

Para nosotros es un placer y un privilegio tenerlos en Rincon durante esta noche para esta importante vista publica formal que sera determinante para la pesca, tanto comercial como recreacional en los años por venir.

Durante los pasados dos años este servidor junto con otros compañeros, hemos trabajado conjuntamente con la NOAA y el Departamento de Recursos Naturales para obtener la major data posible para el manejo correcto de nuestras pesquerias.

RINCON COMERCIAL FISHERMAN'S UNION

P.O. BOX 533
RINCON, P.R. 00677
TEL. 787-539-6790
email: rfcunion@yahoo.com

Ha sido un proceso largo y complicado que ha incluido representacion de todas las islas y todos los sectores y le queremos expresar nuestro agradecimiento al Dr. Joe Kimmel, al Dr. Bill Arnold, al Director Sr. Rolon y al Presidente del Caribbean Fishery Management Council de la NOAA, Sr. Geño Piñeiro por todo su apoyo y compromiso con los pescadores del Caribe.

Nuestros comentarios son los siguientes:

ACCION 1

En cuanto a la Accion 1(a):

Estamos de acuerdo con la opcion preferida. Los meros de profundidad como lo son la Guasa y el Guajil del Hondo merecen ser clasificados en un grupo aparte al de los meros del llano de la Unidad 4 que estan sobrepescados.

RINCON COMERCIAL FISHERMAN'S UNION

P.O. BOX 533
RINCON, P.R. 00677
TEL. 787-539-6790
email: rfcunion@yahoo.com

En cuanto la Accion 1(b):

Tambien respaldamos la re-clasificacion. El Cartucho y la Moniama de Afuera merecen una clasificacion separada ya que su habitat es mas profundo que las especies de la unidad uno (1).

ACCION 2

En cuanto la Accion 2(a):

Favorecemos la alternativa preferida basada en la data mas consistente para los pargos, meros y loros.

En cuanto la Accion 2(b):

Favorecemos la alternativa preferida para el manejo del carrucho.

RINCON COMERCIAL FISHERMAN'S UNION

P.O. BOX 533
RINCON, P.R. 00677
TEL. 787-539-6790
email: rfcunion@yahoo.com

ACCION 3

En cuanto a la Accion 3(a):

Favorecemos la alternativa preferida para que en Puerto Rico, contrario resto de las Islas no se agreguen los pargos.

En cuanto la Accion 3(b):

Definitivamente favorecemos que se maneje de manera separada las capturas de los pescadores recreacionales y los pescadores comerciales.

En Puerto Rico solamente existen 200,000 pescadores recreacionales vs. alrededor de 2,000 pescadores comerciales.

La sobrepesca es una consecuencia de la falta de control por parte de las autoridades Estatales y Federales y de los pescadores recreacionales.

RINCON COMERCIAL FISHERMAN'S UNION

P.O. BOX 533
RINCON, P.R. 00677
TEL. 787-539-6790
email: rfcunion@yahoo.com

Hay que manejar las dos pesquerias por separado. Los pescadores recreacionales son el sector con mayor posibilidad de crecimiento y hay que tenerlos bajo estricto control.

En cuanto la Accion 3(c):

Estamos de acuerdo con el Consejo. El Caribe se debe dividir usando un metodo equidistante entre las Islas. De esa manera es mas justo y si otra juridiccion incurre en violaciones o sobrepesca nosotros no nos veremos afectados.

ACCION 4

En cuanto la Accion 4(a):

Aunque nosotros no capturamos estas especies estamos a favor de que se protejan las especies vulnerables sujetas a sobrepesca.

P.O. BOX 533
RINCON, P.R. 00677
TEL. 787-539-6790
email: rfcunion@yahoo.com

Por lo tanto estamos de acuerdo por la accion preferida por el Consejo.

En cuanto la Accion 4(b):

Diferimos totalmente de la opcion favorecida por el Consejo.

Nosotros no estamos en contra de la pesca recreacional ni del pescador recreacional. Entendemos que la pesca es una actividad legitima que une a la familia y fomenta la sana competencia.

Ahora bien, una cosa es pescar "catch and release" como es el caso de los peces de pico o la pesca de especies que no tienen problemas y otra cosa es permitirle a los pescadores recreacionales la captura de 30 peces por dia de especies sobrepescadas.

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P.O. BOX 533
RINCON, P.R. 00677
TEL. 787-539-6790
email: rfcunion@yahoo.com

Es un insulto y una falta de respeto por un lado pedirle, exigirle u ordenarle so pena de multa o carcel a un pescador comercial que reduzca sus capturas de chillo en un 25 % y por otro lado permitirle a los pescadores recreacionales capturar 30 peces por embarcacion por dia.

Si de las 60,000 embarcaciones recreacionales registradas en Puerto Rico en un dia salen a pescar 20,000 de ellas y cada una captura 30 chillos, estariamos hablando de 2 MILLONES de libras al dia. Eso es mas que todo lo que se captura en un año en el Caribe.

Nosotros no pretendemos que se prohiba la pesca a los recreacionales. Pero tiene que haber respeto hacia el pescador comercial y tiene que existir una <u>COHESION MORAL</u> en las medias de manejo que se aplican.

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P.O. BOX 533
RINCON, P.R. 00677
TEL. 787-539-6790
email: rfcunion@yahoo.com

Como con criticar no se logran cambios ni progreso alguno, queremos presentar una octava alternativa para esta accion:

Establecer un Bag Limit (ACL) de cero (0) para los pescadores recreacionales para los pargos, meros y loros en aguas federales del Caribe y para todas las ESPECIES SUJETAS A SOBREPESCA (over fished and over fishing) en lo que dichas especies son removidas de la lista de SOBREPESCADAS y una vez re-establecida la especie no mas de cinco (5) ejemplares por embarcacion por un periodo de cinco (5) años o en lo que se hacen los estudios de abundancia correspondiente.

RINCON COMERCIAL FISHERMAN'S UNION

P.O. BOX 533
RINCON, P.R. 00677
TEL. 787-539-6790
email: rfcunion@yahoo.com

El permitir que los pescadores recreacionales capturen 30 chillos por viaje es legalizar la venta, es trastocar el orden socio-economico en la ecuacion pesquera.

Por este medio le solicitamos a los miembros del Consejo de Pesca que recapaciten y sean valientes en sus deliberaciones finales y protejan al pescador comercial de el daño potencial que significa respaldar la alternativa preferida (7).

Nosotros pescamos para mantener a nuestras familias, no pescamos por diversion y siempre apoyamos a la NOAA. Es hora que la NOAA nos apoye.

RINCON COMERCIAL FISHERMAN'S UNION

P.O. BOX 533
RINCON, P.R. 00677
TEL. 787-539-6790
email: rfcunion@yahoo.com

ACCION 5

En cuanto a la accion 5(a):

Favorecemos la alternativa preferida (3)

En cuanto a la accion 5(b):

Respaldamos la alternativa preferida (2)

ACCION 6

Aunque el Consejo no escogio alternativa preferida recomendamos la alternativa numero 3.

RINCON COMERCIAL FISHERMAN'S UNION

P.O. BOX 533
RINCON, P.R. 00677
TEL. 787-539-6790
email: rfcunion@yahoo.com

Muchas gracias por su atencion y esperamos tomen en cuenta nuestras recomendaciones.

Buenas noches.

Comment 10

St. Croix Commercial
Fishermen's Association
P.O. Box 1129
Kingshill, VI 00851

Edward Schuster, Sr.
President

Gerson Martinez
Vice-President

Mr. Miguel A. Rolon
Executive Director
Caribbean Fisheries Management Agency
268 Munoz Rivera Ave., Suite 1108
San Juan, Puerto Rico 00918-1920

July 28, 2010

Dear Mr. Rolon:

The St. Croix Commercial Fisherman's Association (SCCFA) would like to take this opportunity to offer the following preferred Alternatives as it relates to the implementation of Annual Catch Limits for the island of St. Croix, USVI.

Set ACL's for both Commercial and Recreational fisheries in the proposed actions in Amendment 2 and Amendment 5 to the Reef Fish Fishery Management Plan for St. Croix, USVI.

Discussion: The SCCFA members believe that having one ACL would enable the Division of Fish and Wildlife better management of the harvested resource and would reduce the confusion between both fishing sectors and enforcement.

Action 1(a): Grouper Complex
Alternative 2
Action 1(b): Snapper complex
Alternative 2
Action 2(a) Snapper, Grouper and Parrotfish Complexes
Alternative 4: Redefine management reference points or proxies for the snapper, grouper and/or parrotfish complexes based on the most recent five years of available catch data.

Discussion: The SCCFA members believe that with the existing closures, expanded Buck Island Monument, and the prohibition of certain fishing gears post SFA has added more protection to the resource and less area for harvest by fishers, making the catch data more reliable.

Action 2(b) Queen Conch Complex
Alternative 4: Redefine management reference points or proxies for queen conch based on the most recent five years of available catch data.

Discussion: The SCCFA members believe that the emergency closure and quota implemented by the Department of Planning and Natural Resources was not scientifically verified nor was a study conducted for accuracy. Other than the spike which occurred in 2006 when conch was being exported to Puerto Rico, the St. Croix conch fishery is stable at around 120,000 lbs. In addition, the expansion of the Buck Island Reef National Monument a known habitat for conch is also *protected and the fact that conch is found in waters in depths beyond where divers can go, affording self protection. Also, the St. Croix Fisheries Advisory Committee recommended and was approved by the Commissioner of DPNR, to expand the closed season for harvest from 3 months to 6 months. The SCCFA recommends that the recent SEAMAP study conducted by DPNR's Fish and Wildlife be reviewed by the SSC and further consideration be given to the SSC's recommendation.*

Action 3(a) Snapper and Grouper Unit Allocation/Management

New Alternative – Define aggregate reference points for the Snapper and Grouper Units for island specific.

Discussion: Due to Ciguatoxin, the harvestable Snapper and Grouper between St. Thomas/St. John District and the St. Croix district vary greatly; therefore, aggregate reference points should be specific to each island.

Action 3(c) Geographic Allocation/Management

Alternative 2 (PREFERRED): Divide and manage annual catch limits by island group (i.e., Puerto Rico, St. Thomas/St. John, and St. Croix) based on the preferred management reference point time series (Table 4.3.1 and Action 2). A. (PREFERRED) Use a mid-point or equidistant method for dividing the EEZ among islands.

Action 4(a) Species-Specific Parrotfish

Prohibitions

Alternative 2 (PREFERRED): Prohibit fishing for or possessing in the EEZ:

A. Midnight parrotfish

B. Blue parrotfish

C. Rainbow parrotfish

Discussion: The SCCFA agrees with the motion made and forwarded by the FAC to protect these species of parrotfish in territorial waters, making it compatible with what is being proposed for the EEZ.

Action 4(b) Recreational bag limits

Alternative 7 (PREFERRED): Establish an aggregate bag limit for snapper, grouper and parrotfish FMUs ~~of 10 per~~ fisher including not more than two parrotfish per fisher or six parrotfish per boat, and 30 aggregate snapper, grouper, and parrotfish per boat on a fishing day.

Action 5(a) Triggering Accountability Measures

Alternative 3 (PREFERRED): Trigger AMs if the annual catch limit is exceeded as defined below and NMFS' SEFSC (in consultation with the Caribbean Fishery Management Council and its Scientific and Statistical Committee) determines the overage occurred because catches increased versus data collection/monitoring improved:

(NEW) subpart (D) a single year of landings effective beginning a 2 year running average after implementation of the new Commercial Catch Reports.

Discussion: The SCCFA believes that the new CCR's should be given time to see a truer picture of species specific data and the amount being harvested.

Action 5(b) Applying Accountability Measures

Alternative 2 (PREFERRED): If AMs are triggered, then reduce the length of the fishing season for that species or species group the year following the trigger determination by the amount needed to prevent such an overage from occurring again. The needed changes will remain in effect until modified.

Action 6(a): Establish Framework Measures for Reef Fish FMP

Alternative 2: Amend the framework procedures for the Reef Fish FMP to provide a mechanism to expeditiously adjust the following reference points and management measures through framework action:

a) Quota Requirements
b) Seasonal Closures
c) Area Closures
d) Fishing Year
e) Trip/Bag Limit
f) Size Limits
g) Gear Restrictions or Prohibitions
h) Fishery Management Units (FMUs)
i) Total Allowable Catch (TAC)
j) Annual Catch Limits (ACLs)
k) Accountability Measures (AMs)
l) Annual Catch Targets (ACTs)
m) Maximum Sustainable Yield (MSY)
n) Optimum Yield (OY)
o) Minimum Stock Size Threshold (MSST)
p) Maximum Fishing Mortality Threshold (MFMT)
q) Overfishing Limit (OFL)
r) Acceptable Biological Catch (ABC) control rules
s) Actions to Minimize the Interaction of Fishing Gear with Endangered Species or Marine Mammals

Action 6(b): Establish Framework Measures for Queen Conch FMP

Alternative 2: Amend the framework procedures for the Queen Conch FMP to provide a mechanism to expeditiously adjust the following reference points and management measures through framework action:

a) Quota Requirements
b) Seasonal Closures
c) Area Closures
d) Fishing Year
e) Trip/Bag Limit
f) Size Limits
g) Gear Restrictions or Prohibitions
h) Total Allowable Catch (TAC)

i) Annual Catch Limits (ACLs)
j) Accountability Measures (AMs)
k) Annual Catch Targets (ACTs)
l) Maximum Sustainable Yield (MSY)
m) Optimum Yield (OY)
n) Minimum Stock Size Threshold (MSST)
o) Maximum Fishing Mortality Threshold (MFMT)
p) Overfishing Limit (OFL)
q) Acceptable Biological Catch (ABC) control rules
r) Actions to Minimize the Interaction of Fishing Gear with Endangered Species or Marine Mammals

Respectfully,

Edward Schuster. Sr.

Edward Schuster, Sr.
President

Gerson Martinez

Gerson Martinez
Vice President

St. Thomas Fishermen's Association

Protecting our Natural Heritage and Culture

July 21, 2010

Good evening, my name is David Olsen. I am Chief Scientist for the St. Thomas Fishermen's Association, a former Director of the Division of Fish and Wildlife and a published fishery researcher and consultant for the Caribbean, West Africa and the Middle East.

Infroduction

For the past three years, the Council has been developing an approach to managing resources in its area of responsibility which were intended to improve on the approach taken in the Sustainable Fisheries Act Amendment (SFA) passed in 2005. That approach consisted of an SFA working group which came up with a series of proposed area and seasonal closures. "The determinations of the SFA Working Group were based on available scientific and <u>anecdotal</u> information (including <u>anecdotal</u> observations of fishermen as reported by fishery managers), life history information, and the status of individual species as evaluated in other regions.[1]" No Virgin Islands data were used in this determination, just a bunch of people, committed to shutting down fisheries, sitting around and fabricating justification for their actions. These actions were based upon little more than opinion and a near complete lack of understanding of Virgin Islands fisheries.

Despite this, the Council and the Territory implemented seasonal closures and total fishery closures for the St. Croix net fishery and the St. Thomas Grammanik Bank fishery and an area closure of the Grammanik Bank.

These 2005 management actions had resource affects as surely as gravity affects a falling stone and were certainly sufficient to end overfishing of these species groups.

- Snapper Unit 1. Puerto Rico instituted size restrictions and seasonal closures which even NMFS admits had a positive effect.
- Grouper Unit 4. Closure of the Grammanik Bank and a 3 month seasonal closure surely reduced landings by a minimum of 25%. In fact, my research on the Nassau grouper spawning aggregation in the 1970s indicated that 85% of the annual catch came from that period so the impact of the Grammanik closure must certainly be <u>much</u> higher than 25%. The remaining species in Grouper Unit 4 pose a high risk for Ciguatera and were never fished here in St. Thomas.

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[1] CFMC Hearing Document, page 9.

- Parrotfish. In 2006 61% of the parrot fish in St. Croix were caught using gill and trammel nets. That fishery has been closed since 2007.
- Conch. The Virgin Islands instituted a 50,000 lb quota for conch (in each district) in 2007. The Council has failed to act at all so that any need for expanded management is their own responsibility.

The current proposal contains no consideration or discussion of whether or not these 2005 management measures addressed the imagined "overfishing". Instead, species which were not considered as "overfished" have now been lumped in with them to maximize the impact of the new rules upon fishermen under a "one size fits all" approach to management. We will discuss whether or not one size does indeed fit all later.

Until the last Council meeting, the management proposal actions were limited to those species groups with the one change that ACL quotas were going to be specific to the various island groups (St. Croix, St. Thomas/St. John and Puerto Rico).

For the last 3 Years

- Separate Quotas for each Island Group
- ACLs for:
  - Nassau Grouper and Jewfish
  - Snapper Unit 1 (deep water snappers)
  - Grouper Unit 4 (yellowfin groupers)
  - Parrotfish
  - Conch

Sudden shift in approach

At the last meeting, the NMFS Regional Director Roy Crabtree suddenly introduced a radically different approach to management in the Caribbean. Suddenly, under the new plan we are looking at a single quota for the region and ACLs for all of the species related to the above groups.

It seems clear that the Regional Director has become impatient with the Council and is not content to simply deal with the "overfished" species that were on the table and has now moved from species groups to entire combined families. This flies in the face of NMFS own efforts to develop species-specific data collection. It is simply an attempt to insure that he will be able to introduce Draconian "Accountability Measures" as soon as possible and shut down Virgin Islands fishing. We read the accountability measure options as indicating that Virgin Islands fisheries could be closed as soon as 2012.

March 2010 Meeting

- Single Quota for Caribbean Area
- ACLs for:
  - Nassau Grouper and Jewfish
  - All Snappers
  - All Groupers
  - Parrotfish
  - Conch

Despite the radical change, the Council listened to and rubber stamped the proposal in a single day.

In 2005 at the CFMC meeting for the Sustainable Fisheries Act Amendment, the St. Thomas Fishermen's Association characterized the Council as little more than a puppet show with NMFS Regional Director Roy Crabtree pulling the strings. We are here tonight with yet another example of how the Regional Director simply dictates fishery management terms to the Caribbean.

We maintain that the current proposal where by the Regional Director has moved from specific ACL values for each geographic area to a single Caribbean wide ACL and combining the various species groups into species complexes had not had adequate discussion in the Council. It was only presented at the 134th meeting with no advance availability. Therefore, tonight's hearing is premature.

In addition, despite the availability of Virgin Islands data, NMFS has found a way to return to 2005 when a bunch of like-minded bureaucrats sat around in closed rooms closing fisheries.

Ignoring facts and data

Virgin Islands data became available (again) in 2006 and the first thing NMFS did was announce that "zero percent" of it could be used. That is nearly 500,000 Virgin Islands daily trip reports and almost 12,000 port sampled catches could contribute nothing towards informing management of Virgin Islands resources. These are data funded by NMFS, with annual reports approved by NMFS and with no complaints by them for over three decades.

We are back again to a bunch of people, committed to shutting down fisheries, sitting around and fabricating justification for their actions. This is nothing less than a conspiracy of <u>deliberate</u> ignorance being perpetrated by NMFS Regional Office. We disagree and will not agree to any management measure which does not include a full consideration of Virgin Islands data. We also do not understand why Puerto Rican data can be used when 50% of Puerto Rican fishermen fail to report and Virgin Islands data cannot be used when they all report.

Additionally, in the St. Thomas/St. John district, there is ample evidence that resources are not being overfished and never were. For example recent studies have shown that:

- Large fish of all species are abundant.
- Recent NOAA funded studies have shown that small pre-reproductive fish are released as by catch.
- Establishment of the Virgin Islands National Coral Reef Monument has removed large areas from fishing pressure.
- The hind bank closure has been a major success with UVI censuses indicating that populations on the bank have risen from less than 10,000 in 1997 to over 95,000 in 2009[2]. Average size has increased from 27 cm TL in 1978 to over 40 cm TL in 2008[3]. This creates the spectre that more and more larger and larger hind will be caught because of this success but that the Council will consider this as overfishing.
- Average lobster carapace length has only decreased from 121mm in 1971 to 111mm in 2006. All this while landings have increased from 7,000 lbs in 1978 to 134,000 lbs in 2006. Large lobsters are regularly caught. We attribute this to the 3.5in minimum CL requirement which will not be addressed through setting quotas.
- In addition the STFA has become active in developing important fishery management information on by catch and is engineering escape vents to reduce bycatch.
- Current collaboration between UVI and STFA are proving valuable information that Nassau groupers are relatively abundant and are well on the way to recovery.

All of these information sources are being ignored by NMFS who seem dedicated to causing the maximum amount of damage to the fishing community by using the minimum amount of information in their decision making process.

Failure to address requirements

It is in this area where the "one size fits all" approach totally breaks down. Puerto Rico reef fisheries, particularly parrot fish are in decline. St. Croix has been undergoing massive (and possibly unsustainable) expansion for the past two decades while St. Thomas/St. John landings have been virtually constant for the past three decades only fluctuating 8-15%. The Council is proposing a 25% reduction in landings (based on average catches for the recent past) for ACLs for the entire area.

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[2] Kadison, Pers. Com.

[3] Op. Cit.

- Puerto Rico's declining parrot fish landings will have to significantly increase before even approaching the ACL value. Indeed all of Puerto Rico's reef fish species complexes are showing a decline over the past decade. Is this a result of changing fishing practices or overfishing? The Council is ignoring this fact because it strikes too close to its Puerto Rican home.
- St. Croix's probable overfishing will likely be rewarded because of the high average annual values from expanded landings over the past decade. The Council is simply not going to address overfishing by this approach.
- St. Thomas/St. John's constant and equilibrium landings values will lead to overruns of the ACL values and so instead of being rewarded for good fishing practices, they will be punished. In fact all of the snapper, grouper, parrot fish landings have exceeded the proposed ACL values for almost the entire decade. The same will hold true for the remaining species groups.

In fact there are additional issues for example:

- What will happen if the Hind Bank production continues to increase? What adjustment is going to be taken for that? It can't be overfishing if the resource is expanding.
- Recently a St. Thomas fisherman has begun to fish for deep water snappers. There will now be a contribution to snapper landings from a previously unfished source. Is this snapper overfishing?

See-one size does not fit all and the Council which is charged with eliminating overfishing will not even come close to achieving its legislatively mandated requirements by taking this approach. Instead, they will ignore management successes, reward overfishing, punish careful fishing practices and further alienate the primary group whose cooperation they need.

Hundreds of thousands of dollars have been spent on a supposed "new and improved" data collection program. Fishermen have been excluded from all of the discussion and the end product has done nothing but magnify the problems of the prior program. This is, quite simply, because they do not care to find out how to obtain the most accurate data from the people that they are asking to supply information.

Council Performance

It is our belief that this entire effort is nothing less than a conspiracy to close local fisheries in order to import Central American seafood. In the past 4 years, one of the Council members, the STFA President, Chairman of the Board and Chief Scientist as well as the President of the St. Croix Commercial Fishermen's

Association have all been approached by a close associate of the Regional Director about entering in to this business here.

This is just one aspect of the corruption that exists within the Council. The prior Director of the Division of Fish and Wildlife received over $35,000 in illegal payments from 2000 to 2006 for her support of NMFS proposals. Following her retirement she received a "golden parachute" as chairperson of the Scientific and Statistical Committee which she has used to solicit for grants to study the very fishermen that she is regulating. The entire Council is little more than a social club, carrying out the Director's dictates' and passing out benefits among themselves.

The Council approach flies in the face of President Obama's intentions to implement the final recommendations of the of the Ocean Policy Task Force.[4] In Monday's announcement he emphasized the importance of Public and Stakeholder participation in matters affecting the oceans and the need to reduce user conflicts. We look forward to the opportunity to testify how NMFS and the Council are responding to that Executive Order.

The Council has totally abandoned any efforts to collaborate with fishermen on fishery management and, instead, has simply lined up with NMFS on an uninformed, ill-conceived, top-down dictatorial approach to managing resources. St. Thomas/St. John fishermen are the specific targets of this deliberate e conspiracy of ignorance because of their steady opposition

Recommendations

How would we change the current proposal?

1. The Council must address failures on the government side before imposing regulation or any restriction on fishermen. When I was DFW Director, I reviewed the landings data on a monthly basis. There is no excuse for the extended NMFS 3 year lag being accepted by the Council. Such a lag prevents fishermen from adjusting their fishing effort and virtually guarantees that accountability measures will be implemented. If you can't do your job, don't ask us to pay the price.
2. The new data program must be totally revised so that information reported by fishermen is accurate and detail provided by the port sampling program. Fishermen (or their representatives) must be involved in this revision. The current Council approach is even inconsistent with the current data proposals and needs to be revised accordingly.
3. We urge the Council to address the very real differences between the various areas.
    a. Are Puerto Rico's declining reef fish landings the result of overfishing or just changing fishing practices? Different

[4] http://www.whitehouse.gov/administration/eop/ceq/Press_Releases/July_19_2010

management approaches are required depending on the answer to that question.
   b. We do not believe St. Croix's rapid expansion of landings should be managed the same way that St. Thomas/St. John's long term regularity over nearly 4 decades.
4. We recommend ACL values for St. Thomas that approximate the lower limit of average catches. These are 8-15% under average landing values instead of the 25% in the proposed "preferred option".
5. There should be no possibility of invoking "Accountability Measures" unless fishermen receive in-season notification of landings so that they have the option to adjust catch levels and avoid over runs. This should be built into the ACL process.
6. Finally and most importantly, we urge the Council and NMFS to end its current dictatorial approach to fishery management and pursue a more cooperative and collaborative approach. This would benefit both fishery management and those being managed.

Thank you;

David A. Olsen, Ph.D., Chief Scientist
St. Thomas Fishermen's Association
8168 Crown Bay Marina, Ste. 310, PMB 379
St. Thomas, USVI 00802

Julian Magras, Chairman of the Board
St. Thomas Fishermen's Association
8168 Crown Bay Marina, Ste. 310, PMB 379
St. Thomas, USVI 00802

St. Thomas Fishermen's Association

Protecting our Natural Heritage and Culture

July 21, 2010

Good evening, my name is Julian Magras, Chairman of the Board of the St. Thomas Fishermen's Association.

Let me begin by saying, that we all support intelligent management of our resources. In fact, for several years we (the STFA) have worked closely with the Council in an attempt to achieve such management. However, in the past few years CFMC and NMFS have abandoned collaboration and assume that they will simply demand new rules without our input. I am here tonight to state respectfully, that we're not having any of that!

First of all, we do not understand how, after 3 years of Council discussion of one approach to managing Caribbean resources through quotas for each island and species groups, NMFS Regional Director, Roy Crabtree can introduce the radical changes shown in this document and have it presented, voted on and go to public hearing in a single day. This hearing is premature as the material contained in it has not been discussed adequately in the Council and the consequences considered. Much of this is covered in Chief Scientist of the STFA, Dr. David Olsen's comments.

Secondly, we continue to object to Council discrimination against St. Thomas/St. John fishermen. All of your regulations affect us more than either Puerto Rico or St. Croix. Over 85% of the area under your jurisdiction is the area fished by St. Thomas/St. John fishermen. This violates National Standard 4 of the Magnusan Act and you cannot make this discrimination go away simply by ignoring it.

We totally reject NMFS's assertion that they cannot use Virgin Islands data in managing Virgin Islands resources. They are attempting to ignore half a million daily catch reports and over 12,000 port sampled catches. This data can and must be used before we will agree to anything. The Virgin Islands will not once again be punished with Puerto Rico data as what happened in the Sustainable Fisheries Act. Furthermore, the new catch reporting scheme is a serious mistake. No fishermen will ever fill out those forms accurately. It will take fishermen at least 2-3 hours to fill out this report for each trip. It is unrealistic to think that such documentation can take place after a full day out at sea. The STFA encourages you to sit down with local fishermen and develop an approach that will supply accurate data in a manner that fishermen can reasonably carry out.

Next, we do not support the way that average landings are being used to estimate overfishing levels. In St. Thomas, where landings have been constant for nearly 4 decades, constancy should lead to ACL values that are close to current landing levels. In St. Croix, where catches have been expanding, a different approach should be used. Finally, in Puerto Rico, where reef fish landings have been declining from either overfishing or changing fishing practices, the Council is totally ignoring its responsibilities for management by using long term averages.

We also believe that you must use all available information before setting ACLs. This must include average size trends in the port sampling data, whether or not new fishing methods have begun on new resources, and how to deal with the Hind Bank which every year produces larger fish. This is not overfishing.

The STFA opposes the use of accountability measures unless NMFS supplies in-season notification of landings so that we can adjust our fishing effort. Dr. Olsen was able to monitor landings on a monthly basis when he was the Director at DFW. If you can't do it, then forget about accountability measures.

You must also address corruption in the Council. Illegal payments were made to a former DFW Director. She is now using her position on the SSC to solicit grants to study the fisheries she regulates. So with these illegal payments taking place the Sustainable Fisheries Act is an illegal document because she was representing her own interests and not the people of the Virgin Islands.

Also, a close friend of the Regional Director has approached a number of us about marketing Central American seafood in the USVI. He is currently being funded to co-opt the STFA trap reduction program. It is easy to view this entire process as an attempt or maybe even conspiracy to shut down Virgin Islands fisheries so that imports can be substituted.

Then, we have 2 representatives for the VI which do not represent but rather go along with what the CFMC request of them. In return they are compensated by trips and cash. Example here tonight we have Carlos Fachette representative from St. Croix chairing this meeting he will be paid $800.00 for this trip, per diem and hotel stay same thing happened in St. Croix last night when the representative from St. Thomas Winston Ledee chaired the meeting there. So in total, $3,000.00 was spent for 2 people to attend 2 meeting. What do the Fishermen and the people of the VI get nothing but continuous battle to keep our industry open?

Perhaps most disturbing, the present Director of Fish & Wildlife, Beulah Dalmida-Smith shows no real interest in engaging or working with fishermen. Her lack of participation in the Fishery Advisory Council meetings is a prime example of her indifference. Mrs. Smith also took a 3 week vacation in the midst of annual registration and this very important meeting tonight. I contend, this was strategically planned so she didn't have to deal with this issue in front of the public. As Director, she should have AND MOST IMPORTANTLY SHE SHOULD HAVE WANTED to be here to fight for the fishermen and the people of the VI. It bewilders me why we place someone in such a position that shows absolutely NO concern for the very people she was hired to serve, the fishing and boating population.

Open your eyes people look at all the disasters all over the world. What's going to happen to us here in the VI when ships carrying food can't get in? The farmers and the fishermen will have to feed you. Help us help our community. Governor John deJongh, Delegate Donna M. Christensen and Senators we are asking you once again put a stop to this mess with the Caribbean Fishery Management Council and fight for your fishermen. Puerto Rico has nothing to lose in this process. The Virgin Islands has culture, a tourism product and vital food producing industry at stake.

Finally, we wish to state again, to the CFMC, that you will never be successful until you return to cooperation and collaboration with local fishermen. Until you do, we are going to continue oppose every action you propose. After all, it's OUR livelihoods and community at stake.

Subject: Re: Annual Catch Limits
From: Olsen41@aol.com
Date: Thu, 22 Jul 2010 12:53:54 -0400 (EDT)
To: JMagras@srmedicalcenter.org, Bill.Arnold@noaa.gov, Joe.Kimmel@noaa.gov, miguel_rolon_cfmc@yahoo.com
CC: cbryan@legvi.org, winstonledee@yahoo.com

A couple of other points:

1. It must be clearly stated that the ACL's being set are for the commercial landings only. If recreational landings become known, either the overall ACL should be adjusted or a separate allocation provided. There should be no possibility that recreational landings could lead to an over run of the commercial ACL.
2. The relationship between the Caribbean-wide ACL and the separate island ACLs must be clearer. There should be no possibility that over runs in Puerto Rico or St. Croix will lead to accountability measures in St. Thomas/St. John, and vice versa.
3. You need to do something about this data proposal-it is doomed from the start. The port sampling side is probably OK but the fisherman catch reports portion is a total failure. You are going to generate less accurate data than you are currently getting and that is bad. In fact, all of these ACLs are based upon fiction. If you test reliability by looking for agreement with port sampling or look for known seasonal trends, you won't find any.
4. We're never going to accept that you can't provide landing results on a bi-monthly or quarterly basis. I did and there is no excuse for you all not being able to.
5. Personally, I think you are being extremely cowardly in the way you are addressing the situation in St. Croix. I think that you're opening yourselves up for lawsuits.
6. What you need to do is sit down with us and work out an approach that we can support both to the data and the ACLs. If you do, you can quiet down the opposition and have support instead of acrimony and opposition.

David A. Olsen, Ph.D.
Chief Scientist, St. Thomas Fishermen's Association
8168 Crown Bay Marina, Ste. 310, PMB 379
St. Thomas, VI 00802

(340) 998-2798

www.stfavi.org

In a message dated 7/22/2010 12:40:24 P.M. SA Western Standard Time, JMagras@srmedicalcenter.org writes:

> Good afternoon;
>
> Below you will find concerns that the STFA had with the presentation last night.
>
> 1. It must be made clear in writing as part of the document that islands will be separated in Sectors for setting the ACL's. (STT/STJ, STX & PR) Once this has been done the STFA wants 85% of it's landings as the ACL due to the level averages running the same over 3 decades with very little to no change.
>
> 2. Action 2 (b) Queen Conch Complex. There is another problem here where as in STT there is a virgin stock conch fishery. So use our current landings would be a problem. What the STAF would like to see is the 50,000 lb quota that was put in place in 2007 by DFW be the quota. If a fishery develops then we would request the quota to be revisited.
>
> 3. Action 4 (b) Recreational Bag Limit-Alternative 7. There is a problem here because a charter boat can take 10 people out and everyone would be able to catch 10 of each reef fish. They should only be allowed 10 total fish per angler sine it's for personal consumption.
>
> 4. Action 5 (a) Triggering Accountability Measures Alternative 3 & (c). The problem with this is that the mandate by the reauthorization of the act doesn't go into effect until January 1, 2011. So all of these dates in this document referring to any rules must be changed to at least January 1, 2010. If the process is longer than expected then it needs to be changed then to the effective date of implementation.
>
> 5. Action 5 (b) Applying Accountability Measures Alternative 2. Another problem here with the wording SEASON. The STFA will not except a season reduction for over runs but would except a reduction of over runs by poundage. The problem here is that NMFSC needs to be held accountable for processing the data on a monthly basis or quarterly basis so the stakeholders can see what's going on and if they need to scale back or if they are on target. Fishermen will not accept anymore failures from NMFSC. This federally funded department must step up. If the fishermen have requirements to turn their reports by the 15 of the following month then NMFSC must be held accountable also.
>
> No Accountability Measures should be enforced until NMFSC has done their job.

Julian Magras

Chairman of the Board STFA

PS: I am open for discussion.