WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

Amendment 14 to the Fishery Management Plan for Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region

Including
A Final Supplemental Environmental Impact Statement,
A Regulatory Impact Review and
An Initial Regulatory Flexibility Analysis

MEASURES TO END BOTTOMFISH OVERFISHING IN THE HAWAIIAN ARCHIPELAGO

Western Pacific Regional Fishery Management Council
1164 Bishop Street, Suite 1400
Honolulu, Hawaii 96813
December 19, 2007

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
PROGRAM PLANNING AND INTEGRATION
Silver Spring, Maryland 20910

DEC 20 2007

Dear Reviewer:

In accordance with provisions of the National Environmental Policy Act (NEPA), we enclose for your review the National Oceanic and Atmospheric Administration (NOAA) *Final Supplemental Environmental Impact Statement (FSEIS) for Amendment 14 to the Fishery Management Plan for Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region—Measures to End Bottomfish Overfishing in the Hawaiian Archipelago, Including a Final Supplemental Environmental Impact Statement, a Regulatory Impact Review and an Initial Regulatory Flexibility Analysis.*

This FSEIS is prepared pursuant to NEPA to assess the environmental impacts associated with NOAA proceeding with an action to implement fishery management measures to end bottomfish overfishing in Hawaii. The FSEIS supplements the FEIS for the Fishery Management Plan for Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region, which was made available to the public on June 17, 2005 (FR 70 35250; EIS No. 20050237).

This action will implement a phased management approach that includes a combination of limited seasonal closures, annual catch limits (called Total Allowable Catch or TAC), bag limits, and new permit and reporting requirements for non-commercial fishermen who fish for bottomfish in Federal waters in the Main Hawaiian Islands. Additional copies of the FSEIS may be obtained from the Responsible Program Official identified below. The document is also accessible electronically through the Western Pacific Fishery Management Council's website at http://www.wpcouncil.org/bottomfish/Documents/BottomfishOverfishingFSEIS-December2007.pdf.

NOAA is not required to respond to comments received as a result of issuance of the FSEIS. However, comments received by February 15, 2008, will be reviewed and considered for their impact on issuance of a record of decision (ROD). Please send comments to the responsible official identified below. The ROD will be made available publicly following final agency action in April 2008.

Responsible Program Official:

William L. Robinson
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National Marine Fisheries Service
National Oceanic and Atmospheric Administration
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Comments on the proposed rule will be accepted at www.regulations.gov under RIN 0648-AU22

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Sincerely,

for Rodney F. Weiher, Ph.D.
NOAA NEPA Coordinator

Enclosure

Amendment 14 to the Fishery Management Plan
For The Bottomfish and Seamount Groundfish Fisheries
Of The Western Pacific Region
Including
A Final Supplemental Environmental Impact Statement
A Regulatory Impact Review and
An Initial Regulatory Flexibility Analysis

MEASURES TO END BOTTOMFISH OVERFISHING IN THE HAWAIIAN ARCHIPELAGO

December 19, 2007

Responsible Agency:

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Abstract:

Based on fishery information and 2003 data analyzed by the National Marine Fisheries Service's (NMFS) Pacific Islands Fisheries Science Center, NMFS determined that overfishing of the bottomfish species complex was occurring within the Hawaiian Archipelago with the primary problem being excess fishing mortality in the main Hawaiian Islands (MHI). The NMFS Regional Administrator for the Pacific Islands Regional Office notified the Western Pacific Regional Fishery Management Council (Council) of this overfishing determination on May 27, 2005. In response, the Council prepared Amendment 14 to the Bottomfish Fishery Management Plan (FMP), which recommended closure of federal waters around Penguin and Middle Banks to fishing for bottomfish in order to end the overfishing.

However, before Secretarial review of Amendment 14 was initiated by NMFS, new stock assessment information indicated a need to re-examine this action. A stock assessment completed by PIFSC in 2006 concluded the required reduction in fishing mortality based on 2004 data would be 24 percent, a significantly higher amount than the 15 percent previously recommended (Moffitt et al. 2006, Appendix 2). In addition, a phase-out of the bottomfish fishery by 2011 in the Northwestern Hawaiian Islands (NWHI) was mandated through the Presidential Monument designation (FR 36443, June 26, 2006). This may be significant because the bottomfish are assessed as a stock complex combining the MHI and the NWHI, and because larval transport may allow for one area to serve as a source of recruitment to other areas such that

management action in one may affect fish stocks in the other. This permanent closure will also result in the elimination of one of the major sources of locally-caught bottomfish for use in the local markets and restaurants. After the NWHI closure, experienced NWHI commercial bottomfish vessel operators will either begin fishing in the MHI or discontinue fishing for bottomfish.

To end bottomfish overfishing, the Council is recommending this amendment to the Bottomfish FMP which would utilize a phased approach. Fishing mortality would be controlled in 2007 and 2008 through the use of seasonal closures in all sectors of the MHI bottomfish fishery, in conjunction with a total allowable catch limit (TAC) in the commercial sector and bag limits for the non-commercial sector. In 2009 and beyond, a single fleetwide TAC would be applied to both the commercial and non-commercial sectors. Adaptive management would be utilized to address new information or significant changes in the fishery or fishery conditions.

In May 2005, a Final Environmental Impact Statement (FEIS) on the Bottomfish FMP was completed and it was made available to the public on June 17, 2005; a copy of this document may be found at http://www.fpir.noaa.gov/DIR/dir_public_documents.html#eis (NMFS Pacific Regional Office website). To date, no record of decision has been published for this FEIS. Following the publication of the 2005 FEIS, relevant bottomfish fisheries information became available regarding bottomfish overfishing and a Draft Supplemental Environmental Impact Statement (2006 DSEIS) was made available on April 14, 2006 (71 FR 19505) and focused on a range of alternatives the Council considered to end overfishing. However, before this 2006 DSEIS went to final draft, the 2006 bottomfish stock assessment (Moffitt et al., 2006; Appendix 2) was completed, indicating the need to reduce fishing mortality by a larger percentage than the previous year. In light of the 2006 bottomfish stock assessment, the 2006 DSEIS needed substantial revision, and the document was reissued as a revised Draft SEIS, dated June 27, 2007. Comments on the 2007 draft SEIS were considered in this Amendment and Final SEIS.

The purpose of this combined Final SEIS and revised amendment to the Bottomfish FMP is to analyze a range of management alternatives to end bottomfish overfishing in the Hawaiian Archipelago.

ABBREVIATIONS AND ACRONYMS

APA	Administrative Procedure Act
B	Stock Biomass
BMUS	Bottomfish Management Unit Species
BiOp	Biological Opinion
BLNR	Board of Land and Natural Resources, State of Hawaii
BRFA	Bottomfish Restricted Fishing Area
CDP	Community Development Program
CDPP	Community Demonstration Project Program
CFR	Code of Federal Regulations
cm	centimeters
CML	Commercial Marine License
CNMI	Commonwealth of the Northern Mariana Islands
CPUE	Catch per Unit Effort
CRE FMP	Coral Reef Ecosystem Fishery Management Plan
CZMA	Coastal Zone Management Act
DBEDT	Department of Business, Economic Development and Tourism, State of Hawaii
DLNR	Department of Land and Natural Resources, State of Hawaii
DOCARE	Division of Conservation and Resources Enforcement, State of Hawaii
DPEIS	Draft Programmatic Environmental Impact Statement
DSEIS	Draft Supplemental Environmental Impact Statement
E	Fishing Effort
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
F	Fishing Mortality
FEIS	Final Environmental Impact Statement
FEP	Fishery Ecosystem Plan
FFS	French Frigate Shoals
fm	fathoms
FMP	Fishery Management Plan
FOIA	Freedom of Information Act
FR	Federal Register
ft	feet
FWCA	Fish and Wildlife Coordination Act
GPS	Global Positioning System
HAPC	Habitat Areas of Particular Concern
HAR	Hawaii Administrative Rules
HDAR	Division of Aquatic Resources, State of Hawaii
HINWR	Hawaiian Islands National Wildlife Refuge
HIR	Hawaiian Islands Reservation
HLCC	Hawaiian Lee Countercurrent
HMRFS	Hawaii Marine Recreational Fishing Survey
HURL	Hawaii Undersea Research Laboratory
IFQ	Individual Fishing Quota
kg	kilograms

km	kilometers
lb	pounds
m	meters
M	Natural Mortality Rate
MFMT	Maximum Fishing Mortality Threshold
MHI	Main Hawaiian Islands
MMPA	Marine Mammal Protection Act
MPA	Marine Protected Area
MSA	Magnuson–Stevens Fishery Conservation and Management Act
MSST	Minimum Stock Size Threshold
MSY	Maximum Sustainable Yield
MUS	Management Unit Species
NEC	North Equatorial Current
NEPA	National Environmental Policy Act
NHRC	North Hawaiian Ridge Current
nm	nautical miles
NMFS	National Marine Fisheries Service
NMSA	National Marine Sanctuaries Act
NOAA	National Oceanic and Atmospheric Administration
NWHI	Northwestern Hawaiian Islands
NWR	National Wildlife Refuge
NWRSAA	National Wildlife Refuge System Administration Act
NPSG	North Pacific Subtropical Gyre
OLE PID	Office for Law Enforcement, Pacific Islands Division (NMFS)
OY	Optimum Yield
PIRO	Pacific Islands Regional Office (NMFS)
PIFSC	Pacific Islands Fisheries Science Center (NMFS)
PMUS	Pelagic Management Unit Species
PRIA	Pacific Remote Island Areas
RFA	Regulatory Flexibility Act
SBREFA	Small Business Regulatory Enforcement Fairness Act
SFA	Sustainable Fisheries Act
SPR	Spawning Potential Ratio
SSBP	Spawning Stock Biomass Proxy
SSBPR	Spawning Stock Biomass Proxy Ratio
SSC	Scientific and Statistical Committee
STCC	Subtropical Countercurrent
TAC	Total Allowable Catch
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
WPacFIN	Western Pacific Fisheries Information Network
WPRFMC	Western Pacific Fishery Management Council
ZMC	Zonal Maximum Sustainable Yield Contribution

SUMMARY

Overview

Based on fishery information and 2003 data analyzed by the National Marine Fisheries Service's (NMFS) Pacific Islands Fisheries Science Center, NMFS determined that overfishing of the bottomfish species complex was occurring within the Hawaiian Archipelago with the primary problem being excess fishing mortality in the main Hawaiian Islands (MHI). The MHI bottomfish fishery occurs in both State of Hawaii (State) waters (0-3 nm) and Federal waters of the Exclusive Economic Zone (3-200), therefore both the State of Hawaii and the Western Pacific Regional Fishery Management Council (Council) share management authority and responsibility. Historically, the State has taken the lead in managing the MHI bottomfish fishery, however, because overfishing in the MHI bottomfish fishery was determined to be occurring, the Council is required by the MSA to take appropriate management action to end the overfishing.

The NMFS Regional Administrator for the Pacific Islands Regional Office notified the Council of this overfishing determination on May 27, 2005. In response, the Council prepared and transmitted to NMFS in May, 2006, Amendment 14 to the Bottomfish Fishery Management Plan (FMP), which recommended closure of federal waters around Penguin and Middle Banks to fishing for bottomfish in order to end the overfishing.

However, before Secretarial review of Amendment 14 was initiated by NMFS, a new stock assessment indicated a need to re-examine this action. A stock assessment completed by PIFSC in 2006 concluded the required reduction in fishing mortality based on 2004 data would be 24 percent, a significantly higher amount than the 15 percent previously recommended (Moffitt et al. 2006, Appendix 2). In addition, a phase-out of the bottomfish fishery by June 2011 in the Northwestern Hawaiian Islands (NWHI) was mandated through the Presidential Monument designation. This may be significant because the bottomfish are assessed as a single stock complex across the MHI and the NWHI, and because larval transport may allow for one area to serve as a source of immigration to other areas such that management action in one may affect fish stocks in the other. This permanent closure will also result in the elimination of one of the major sources of locally-caught bottomfish for use in the local markets and restaurants. After the NWHI closure, experienced NWHI commercial bottomfish vessel operators will either begin fishing in the MHI or discontinue fishing for bottomfish.

To end bottomfish overfishing, the Council is recommending this amendment to the Bottomfish FMP which would utilize a phased approach. The necessary reductions in fishing mortality would be achieved in 2007 and 2008 through the use of a seasonal closure in conjunction with an annual limit on the total allowable catch (TAC) and non-commercial bag limits. In 2007-08 the TAC will be calculated based on commercial fishing data and, once reached, both commercial and non-commercial bottomfish fishing would be prohibited. As fishery monitoring improves (especially for the non-commercial component), overfishing would be prevented in 2009 and beyond through the implementation of a fleetwide TAC based on and applied to the combined commercial and the non-commercial sectors.

In May 2005, a Final Environmental Impact Statement (FEIS) on the Bottomfish FMP was completed and made available to the public on June 17, 2005. On March 30, 2006, a Draft Supplemental Environmental Impact Statement (DSEIS), focused on the 2006 recommendations for a 15% reduction in bottomfish fishing mortality, was made available with a 45-day comment period (closed on May 30, 2006). Before the 2006 DSEIS was finalized, the 2006 stock assessment was completed. In addition, other events as described below resulted in recommendation of new alternatives to end overfishing. In light of these developments, the 2006 DSEIS was not finalized and a revised 2007 DSEIS was prepared in conjunction with the revised Amendment 14. The 2007 DSEIS was distributed for a 45-day public comment period on June 28, 2007. Public comments were considered in this Amendment and Final SEIS.

The Council originally recommended an annual summer closure from May 1 to August 31 of each year for the entire MHI bottomfish fishery (both commercial and non-commercial vessels). Targeting, possessing, landing, or selling MHI Deep 7 species (Deep 7 bottomfish species: onaga (*Etelis coruscans*), ehu (*Etelis carbunculus*), gindai (*Pristipomoides zonatus*), kalekale (*Pristipomoides sieboldii*), hāpu‘upu‘u (*Epinephelus quernes*), ‘ōpakapaka (*Pristipomoides filamentosus*), and lehi (*Aphareus rutilans*)) would be prohibited during the closed season. The Council could not fully implement this alternative, however, without a commitment from the State of Hawaii to adopt parallel regulations in State waters.

The Council received a letter from the State’s Department of Land and Natural Resources (DLNR) on April 5, 2006, stating that they would not support a corresponding seasonal closure. This precluded the Council from moving forward with the recommended summer seasonal closure as it would not achieve the necessary reduction in fishing mortality if applied only to Federal waters. In addition, a seasonal closure of Federal waters would be extremely difficult to enforce without corresponding State regulations. Therefore, the Council recommended its secondarily preferred alternative which would close Penguin and Middle Banks, as these areas are within federal waters and their closure would not require complementary State regulations.

However, before Secretarial review of Amendment 14 was initiated by NMFS, several notable events and changes occurred which indicated a need to re-examine the prudent course of action with regards to ending overfishing of bottomfish in the MHI. The most significant factors are as follows:

- A stock assessment completed by NOAA’s Pacific Islands Fisheries Science Center (PIFSC) in 2006 concluded the required reduction in MHI fishing mortality, based on data through 2004, would be 24 percent in order to end overfishing (Moffitt et al. 2006, Appendix 2). This assessment used a dynamic production model and assuming management measures would be applied only to the MHI, and concluded that MHI fishing effort would need to be reduced by 24 percent from the 2004 level to bring archipelago-wide fishing mortality down to the maximum fishing mortality threshold (MFMT) ratio of 1.0.

- A phase-out of the NWHI bottomfish fishery by June, 2011, was mandated through the Presidential Monument designation. After the NWHI closure, experienced NWHI commercial bottomfish vessel operators will either begin fishing in the MHI or discontinue fishing for bottomfish.

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- Congress passed the newly reauthorized Magnuson-Stevens Act (MSA). Section 104 of the reauthorized MSA mandates that annual catch limits (ACLs) be implemented for all fisheries and Section 305(4)(k) contains a provision regarding State consistency with federal fishery management plans for Hawaii's bottomfish fisheries.

- Updated bottomfish habitat mapping is being undertaken by PIFSC with resulting estimates of bottomfish habitat in federal waters, as opposed to state, being greatly increased. Current estimates place 53 percent of the habitat between 100 – 400 m in Federal waters with 47 percent in State waters (Parke, 2007)

- The State of Hawaii has revised its proposed changes to the current bottomfish closed areas. The changes have resulted in reduced benefits to be gained by these closed areas as compared to those originally analyzed.

- The current voluntary data collection system the State is utilizing for the non-commercial[1] fishery —while a useful tool— is not adequate to estimate the non-commercial bottomfish catch. The State cannot require data collection, such as vessel trip reports, without legislative action, whereas, the Council and NMFS can do this with the MSA as the statutory basis. In addition, the State's commercial fishery data system provides generalized spatial information, which is of limited use to fishery scientists and managers when considering area-based management or impacts.

Background

Bottomfish fisheries within the Hawaiian Archipelago are separated into two broad management sub-areas, the MHI and the NWHI. The NWHI is further separated into two management zones; the Mau Zone and Hoomalu Zone. New mapping indicates approximately 47 percent of bottomfish habitat (100 – 400 m) in the MHI is within the jurisdiction of the State of Hawaii (0 to 3 miles offshore) with the rest in Federal waters (Parke, 2007). Historically, bottomfish fishing in the MHI has been managed by the State of Hawaii (State). Through a cooperative data sharing agreement, NMFS obtains commercial bottomfish landings data from the State's Division of Aquatic Resources (HDAR). The State's current management measures in the MHI include bottomfish vessel registration, commercial fishing reporting, non-commercial bag limits for two bottomfish species (onaga and ehu), and 12 revised restricted bottomfish fishing areas. Recent analysis has determined that the State's prior bottomfish restricted fishing areas (BRFAs) encompassed 9.2 percent of what the researchers define as "suitable habitat" for the deep-slope bottomfish while the newly enacted 12 BRFAs encompass 11.2 percent (Parke, 2007). Parke

[1] The term "non-commercial" is used in this document to include recreational and subsistence fishing. Fishing related to scientific research is not explicitly considered in this document, but if it occurs any related fishing mortality will need to be considered in future TAC calculations.

(2007) assumes a direct relationship between suitable habitat and bottomfish catch, indicating that the State's new BRFAs would reduce bottomfish fishing mortality by two percent over the 2004 baseline.

The MSA requires the Secretary of Commerce (Secretary) acting through NMFS to report annually to Congress on the status of fisheries within each regional fishery management council's geographical area of authority. This annual report identifies those fisheries that are overfished, are approaching a condition of being overfished, or have overfishing occurring. The bottomfish management unit species (BMUS) stocks within the Hawaiian Archipelago are assessed by NMFS as a single multi-species complex. The overfishing threshold levels for the BMUS stock complex are specified in Amendment 6[2] of the Bottomfish FMP. Because of the time it takes to obtain and process the fisheries data, stock assessments are usually conducted on annual fisheries data that are lagging behind the current calendar year. For example, the full set of 2003 bottomfish data was compiled and analyzed in 2005 and 2004 data were just recently analyzed in a 2006 stock assessment (Moffitt et al. 2006).

Bottomfish in the Hawaiian Archipelago are a collection, or complex, of deep-slope snappers, groupers, and jacks. However, the primary species of concern are the Deep 7 bottomfish species: onaga (*Etelis coruscans*), ehu (*Etelis carbunculus*), gindai (*Pristipomoides zonatus*), kalekale (*Pristipomoides sieboldii*), hāpu'upu'u (*Epinephelus quernes*), 'ōpakapaka (*Pristipomoides filamentosus*), and lehi (*Aphareus rutilans*).

The 2006 stock assessment indicates that the archipelagic bottomfish multi-species stock complex is not overfished but overfishing is occurring (Moffitt et al. 2006). Further, because the MHI is the zone primarily contributing to the overfishing, the intent of this action is to reduce fishing mortality in the MHI as it is the most effective means to end bottomfish overfishing in the Hawaiian Archipelago (Moffit et al. 2006). In addition, pursuant to Monument regulations, fishing in the NWHI will be phased out by 2011 and until then the limited entry NWHI fishery's catch is controlled by a catch quota.

The ratio of current fishing mortality (F) to estimated fishing mortality at maximum sustainable yield (F_{MSY}) exceeded the maximum fishing mortality threshold (MFMT) ratio of 1.00. The Hawaii archipelagic bottomfish stock complex F ratio is obtained by adding the weighted F contributions of the three management zones (MHI, Mau, and Hoomalu) by using effort, which is the amount of bottomfish fishing gear used over a given unit of time, as a proxy for fishing mortality. The Hawaii archipelagic values also include a weighted factor based on the amount of bottomfish habitat in each management zone. These habitat factors are 0.447, 0.124, and 0.429 for the MHI, Mau and Hoomalu Zones, respectively.

The data indicate that MHI fishing mortality metrics are well above those of the other two zones showing that excessive fishing pressure in the MHI is the major contributor to overfishing in the archipelago. Since the archipelagic fishing mortality ratio exceeds the MFMT value of 1.0, corrective management measures are mandated. Assuming management measures were applied solely to the MHI, an iterative computation using the dynamic production model indicates that

[2] 68 FR 46112, August 5, 2003.

fishing effort would have to be reduced from the 2004 level by 24 percent to bring archipelago-wide fishing mortality down to the MFMT of 1.00 (Moffitt et al. 2006).

Management of the bottomfish multi-species stock complex in the Hawaiian Archipelago is confounded by collection of data from only one sector (commercial) in the MHI. The lack of information on the non-commercial catch in the MHI has been pointed out many times as a significant data gap hindering determination of actual total catch and effort (Martell et al. 2006, Moffitt et al. 2006).

This latest document was prepared because the new information and events described above, including the 2006 stock assessment have changed the scope with regards to ending overfishing. This document describes the alternatives considered in detail to end the overfishing, identifies the impacts associated with each alternative, and describes current data gaps and areas requiring coordination with the State. Furthermore, the document identifies the management action proposed by the Council for review and implementation by NMFS.

Description of the Alternatives Considered

To meet the purpose and need of the Federal action to end overfishing of the Hawaiian Archipelago bottomfish stock complex and in light of the new information described above, the Council is considering several alternatives intended to reduce Deep 7 bottomfish fishing mortality in the MHI. As previously discussed, excess fishing effort within the MHI is the primary management area of concern in addressing overfishing. To determine the appropriate range of reasonable alternatives, the Council conferred with fisheries experts, Council staff, NMFS, members of the fishing community, and members of the public through meetings and workshops held throughout Hawaii (see Section 1.7).

A range of reasonable alternatives was developed taking into account the following: (a) the best available scientific information on the bottomfish species' life histories, habitats, and stock assessments; (b) the requirements of the MSA; and (c) the potential impacts to cultural, social, biological, enforcement, ecosystem, and economic factors. Under all the alternatives, the State's current bottomfish regulations would continue including: (i) the 12 no-fishing BRFAs throughout the MHI (ii) a non-commercial bag limit (currently five ehu and/or onaga per trip per person), (iii) required bottomfish vessel registration, and (iv) prohibited use of bottom longline, nets, traps, and trawls to take bottomfish in addition to the State's other gear restrictions applicable to all fisheries in State waters. Under all alternatives the Council is anticipated to continue to utilize principles of adaptive management under the MSA process to address changes in the fishery or larger marine environment.

Alternative 1: No Action

Alternative 1 is to take no Federal action; that is, no Federal management measures would be recommended by the Council for approval and implementation at this time. Under this alternative, overfishing in the bottomfish fishery in the Hawaiian Archipelago would continue.

Alternative 1 would allow continued open access for entry into the MHI fishery. MHI commercial fishermen would be required to submit catch reports but non-commercial fishermen would not to be required to submit catch reports, so the non-commercial catch component of the total harvest would remain unknown.

Alternative 2: May – September Seasonal Closure

Under Alternative 2, an annual summer closure would be implemented from May 1st to September 30th for the entire MHI bottomfish fishery (both commercial and non-commercial vessels). Targeting, possessing, landing, or selling Deep 7 species caught in the MHI would be prohibited during the closed season. The NWHI bottomfish fishery would remain open until it is phased out in 2011. Bottomfish imports and NWHI bottomfish would be exempt from the prohibition. All vessel operators (both commercial and non-commercial) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and would be required to complete and submit reports of their catch, fishing effort, and area fished. In addition, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

Implementing this seasonal closure for both the commercial and non-commercial fishery, based on mean monthly landings, would result in an approximate 25 percent reduction of fishing mortality, however, parallel State regulations would be needed for this alternative to be feasible and effective, although the reauthorized MSA allows preemption of State management authority under certain conditions to ensure the State manages their fisheries in a manner consistent with Federal objectives. Based on mean monthly landings (1998-2004), a May through September closed period, would meet the current 24 percent target reduction, if significant temporal redistribution of fishing effort does not occur. During the open season the non-commercial component would have to adhere to the existing State non-commercial bag limit of five ehu and/or onaga per trip per person, however, this limit may be changed and/or other species may be added.

Alternative 3: Fleetwide TAC

Alternative 3 would implement a fleetwide (i.e. combined commercial and non-commercial) TAC designed to result end overfishing. Under this alternative commercial and non-commercial catches would be reported within a specified time limit (as close to 'real time' as is feasible) and a regulatory mechanism would be put into place to close the fishery for the remainder of the fishing year when the combined TAC is reached. The fishing year would begin October 1st.

The TAC would initially be set at 178,000 pounds of the Deep 7 species (all species combined), representing a 24 percent reduction from the 2004 fleetwide reported MHI bottomfish catch of these species (Moffitt et al. 2006) and would be applied to the MHI commercial Deep 7 bottomfish fishery. Bottomfishing would be allowed each fishing year until the TAC was reached, and thereafter no fishing for Deep 7 bottomfish (commercial or non-commercial) would be permitted in the MHI. The TAC would be anticipated to be revised by NMFS in subsequent years based on future stock conditions.

Alternative 4: Commercial TAC and Non-commercial Bag Limit

Alternative 4 would implement a TAC for the commercial fishery only and close that sector when the TAC is reached. The bottomfish fishing year would start on October 1 which makes it more likely the fishery will be open during the important holiday periods and continue until the TAC was reached. The non-commercial sector would have to adhere to the existing State non-commercial bag limit of 5 ehu and/or onaga per trip per person, however, this limit may be changed and/or other species may be added by the State.

The TAC would initially be set at 178,000 pounds of the Deep 7 species (all species combined), representing a 24 percent reduction from the 2004 fleetwide reported MHI bottomfish catch of these species (Moffitt et al. 2006) and would be applied to the MHI commercial Deep 7 bottomfish fishery. Bottomfishing would be allowed each fishing year until the TAC was reached, and thereafter no fishing for Deep 7 bottomfish (commercial or non-commercial) would be permitted in the MHI. The TAC would be anticipated to be revised by NMFS in subsequent years based on future stock conditions.

Alternative 5: TAC w/ Limited Access and Non-commercial Bag Limit

Alternative 5 would implement a commercial TAC in combination with a limited access program for the commercial sector. A limited access system will simplify the determination and monitoring of individual quotas by limiting the number of participants. Only those with limited access permits would be allowed to fish commercially for the Deep 7 bottomfish in the MHI. Each limited access vessel would be required to stop fishing when the TAC was reached. The limited access system would allocate a certain number of permits based on criteria related to past participation in the fishery. The non-commercial catch component would be limited by maintaining the State's existing bag limit but possibly would include other species. The fishing year would begin October 1st.

The TAC would initially be set at 178,000 pounds of the Deep 7 species (all species combined), representing a 24 percent reduction from the 2004 fleetwide reported MHI bottomfish catch of these species (Moffitt et al. 2006) and would be applied to the MHI commercial Deep 7 bottomfish fishery. Bottomfishing would be allowed each fishing year until the TAC was reached, and thereafter no fishing for Deep 7 bottomfish (commercial or non-commercial) would be permitted in the MHI. The TAC would be anticipated to be revised by NMFS in subsequent years based on future stock conditions.

Alternative 6: Commercial IFQs and Non-commercial Bag Limit

Alternative 6 would allocate individual fishing quotas (IFQs) to all commercial fishermen (open access), whereby each fisherman is required to stop fishing for the reminder of the fishing year when their individual quota was reached. The sum of quotas would be calculated to meet the necessary fishing mortality reduction. In a sense this alternative is also management using a TAC, however, the TAC is subdivided into individual quotas. The number of fishermen would likely be limited to past participants in the fishery and quota amounts would likely be determined based on individual historical catches. Once a commercial fisherman had landed his respective

IFQ, that person would not be permitted to fish for, possess, or sell any bottomfish until the following year. The non-commercial component would have to adhere to the existing State non-commercial bag limit of 5 ehu and/or onaga per trip per person, however, this limit may be changed and/or other species may be added by the State.

The sum of the IFQs would initially be set at 178,000 pounds of the Deep 7 species (all species combined), representing a 24 percent reduction from the 2004 fleetwide reported MHI bottomfish catch of these species (Moffitt et al. 2006). The sum of the IFQs would be anticipated to be revised by NMFS in subsequent years based on future stock conditions.

Each MHI commercial bottomfish participant with an IFQ would be issued a set of bottomfish stamps, with each stamp representing a certain number of pounds of bottomfish and all the stamps totaling the fisherman's total IFQ. The fisherman would be required to submit a stamp to the dealer at the point of sale. Once all the stamps were submitted the fisherman would be prohibited from fishing until the next open season. The fisherman's bottomfish stamps would be non-transferable.

Under this alternative, commercial fishermen would be required to continue reporting their catches and to stop fishing when their individual quota was reached. Fishery data would be analyzed in real time to monitor landings versus quotas.

IFQs could be implemented in a number of ways; two methods are outlined, as follows:

1. Provide equal quotas (of the TAC divided) to all historical participants. Under this alternative, historical highliners would get the same quota as part-time fishermen. Variations could provide equal quotas to a subset of all historical participants, such as those most active in recent years.

2. Provide individual quotas that are equal to a percent of each fisherman's historical catch providing this would not exceed the TAC. Under this alternative, fishermen's quotas would be relative to their individual historical catches. Variations could provide similar quotas to a subset of all historical participants, such as those most active in recent years.

Alternative 7: Phased-in TAC Management (Preferred)

Under Alternative 7 the MHI Deep 7 bottomfish fishery would ultimately be managed under a TAC which would be based on, and applied to, both commercial and non-commercial catches combined. Alternative 7 would utilize a phased-in approach. Phase 1 consisted of a May-September 2007 seasonal closure of waters around the MHI to both commercial and non-commercial fishing for the Deep 7 species. The 2007 seasonal closure was analyzed and implemented for Federal waters by NMFS (72 FR 27065; May 14, 2007) and by the Hawaii DLNR for State waters[3] and is, therefore, not part of the action analyzed in this document.

Phase 2 would implement a commercial Deep 7 TAC of 178,000 lb (a 24 percent reduction of MHI commercial Deep 7 catches as compared to 2004). Tracking of commercial landings towards this TAC initiatedwhen the fishery reopened on October 1, 2007. During the open

[3] See http://www.hawaii.gov/dlnr/dar/bottomfishing.htm

period, non-commercial catches would continue to be managed by bag limits, however they would be changed from the current five onaga and/or ehu combined per person per trip, to five of any Deep 7 species combined per person per trip and they would be extended into Federal waters via Federal rulemaking under the Council process to facilitate effective enforcement. Once commercial Deep 7 landings reached the TAC, both the commercial and non-commercial sectors would be closed. Phase 2 also includes a Federal permit requirement for all non-commercial fishermen who target or catch BMUS in Federal waters of the MHI.

Phase 3 (beginning in 2008) would implement Federal reporting requirements for non-commercial permittes (owners or operators) who target or catch BMUS species in the MHI. Vessel operators would be responsible for reporting by each trip. The reports would provide fishery scientists with the data needed to calculate and track a non-commercial portion of the overall TAC.

Phase 4 would include a second seasonal closure to MHI Deep 7 fishing from May – August 2008, followed by implementation of a combined commercial and non-commercial Deep 7 TAC beginning September 1, 2008 (and in subsequent years). With the new reporting requirements non-commercial data would become available to calculate and track the non-commercial portion of the TAC and the non-commercial bag limits would be dropped. Note that eliminating the non-commercial bag limit is dependent on the quality of non-commercial catch data provided by fishermen to the State and NMFS so that an appropriate combined commercial and non-commercial TAC may be recommended by the Council and approved by the Secretary of Commerce acting through NMFS.

Summary of Environmental Consequences of the Alternatives Considered

This document describes the potential direct and indirect impacts on each of the affected components of the human environment, as well as the potential cumulative impacts of the alternatives described in detail. Table 1 provides a brief comparison of the alternatives, their impacts, and other salient points.

Table 1: Summary Comparison of the Alternatives

Factor	**Alt. 1: No Action**	**Alt. 2: May - Sept. Closure**	**Alt. 3: Fleetwide TAC (comm.. & non-comm.)**	**Alt. 4: Commercial TAC & non-comm. bag limit**	**Alt. 5: TAC w/ Limited Access & non-comm. bag limit**	**Alt. 6: Commercial IFQs & non-comm. bag limit**	**Alt. 7: Phased-in TAC Management**
Sufficient to End Overfishing	no	yes	yes	yes	yes	yes	yes
Most direct control of F	no	no	yes	yes	yes	yes	yes
Requires at-sea enforcement	no	minimal	no	no	no	no	minimal
Could use mainly dockside enforcement	NA	yes	yes	yes	yes	yes	yes
Requires complementary State regulations	no	yes	yes	yes	yes	yes	yes
Impact distributed evenly throughout HI	yes	yes	yes	yes	yes	yes	yes
Requires non-commercial catch reporting	no	yes	yes	yes	yes	yes	yes
Includes TAC per new MSA	no	no	yes	yes	yes	yes	yes

Factor	Alt. 1: No Action	Alt. 2: May - Sept. Closure	Alt. 3: Fleetwide TAC (comm.. & non-comm.)	Alt. 4: Commercial TAC & non-comm. bag limit	Alt. 5: TAC w/ Limited Access & non-comm. bag limit	Alt. 6: Commercial IFQs & non-comm. bag limit	Alt. 7: Phased-in TAC Management
Prevents fishing during time of peak spawning	no	yes	no	no	no	no	yes*
Displaces fishing effort	no	yes	no	no	no	no	no
Improves monitoring effectiveness	no	yes, new non-comm. reporting reqs	yes, new non-comm. reporting reqs	yes, new non-comm. reporting reqs	yes, new non-comm. reporting reqs	yes, new non-comm. reporting reqs	yes, new non-comm. reporting reqs
Provides long-term benefits to fish biomass in all areas	no	yes	yes	yes	yes	yes	yes
Future fishery participation relies on past reported history	no	no	no	no	yes	yes	no
Start of fishing year	NA	Oct. 1st	Oct. 1st	Oct. 1st	Oct. 1st	Oct. 1st	Sept. 1st
May result in significant levels of	No	No	Some potential for high-	Some potential for high-grading	Some potential for high-	Greater potential for high-grading	Some potential for high-grading but not

* For the first two years (2007 and 2008) of implementation.

Factor	Alt. 1: No Action	Alt. 2: May - Sept. Closure	Alt. 3: Fleetwide TAC (comm.. & non-comm.)	Alt. 4: Commercial TAC & non-comm. bag limit	Alt. 5: TAC w/ Limited Access & non-comm. bag limit	Alt. 6: Commercial IFQs & non-comm. bag limit	Alt. 7: Phased-in TAC Management
fishing mortality from high-grading or regulatory discards			grading but not anticipated to be significant	but not anticipated to be significant	grading but not anticipated to be significant	but not anticipated to be significant	anticipated to be significant

Selection of a Preferred Alternative

As described earlier in this document, the Council at its 131st meeting recommended annual seasonal closures as its preferred management measure to end MHI bottomfish overfishing. As described above, the Council recognizes that because a major portion of the fishery occurs in State waters, parallel State and Federal seasonal closure regulations must be promulgated in order for a seasonal closure to be effective in ending overfishing. The Council therefore requested that the State notify the Council of its commitment to cooperatively adopt seasonal closure regulations. However, the State did not commit to adopting seasonal closure regulations and the Council subsequently recommended implementation of its secondarily preferred alternative, the closure of federal waters around Penguin and Middle Banks.

However, in light of the developments and events described above, most notably the 2006 stock assessment calling for a 24 percent reduction in fishing effort in the MHI, the reauthorization of the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 (MSRA), the impending total closure of the commercial bottomfish fishery in the NWHI in 2011 as part of the President's monument designation, and the recognition that the non-commercial sector is likely a large part of the catch in the MHI and as such needs to be accounted for through mandatory catch reporting; the Council reconsidered the alternatives described above at its 137th meeting (March 13-16, 2007). After reviewing available scientific information and public comments received to date, the Council recommended that NMFS implement a seasonal closure via a temporary rule for emergency measures that would close all Federal waters around the MHI to commercial and non-commercial bottomfish fishing for the Deep 7 bottomfish management unit species during the months of May through September 2007 to immediately reduce fishing mortality while long-term management measures are implemented. Based on historical bottomfish landings, this closure period represents 24 percent of annual MHI Deep 7 fishing effort. This time period will also maximize protection for bottomfish during their peak spawning season, and minimize social and economic impacts to the fishery as other fishing opportunities are available during the summer, for example, trolling for pelagic fishes. In addition, bottomfish fishing will be allowed during the important winter holiday season when bottomfish are in high demand. In this instance, State managers agreed to mirror these regulations for State waters, thus providing the necessary mechanism for this alternative to be effectively implemented. The 2007 seasonal closure was implemented for Federal waters by NMFS (72 FR 27065; May 14, 2007) and by the Hawaii DLNR for State waters.[4]

The MSRA set forth new requirements related to overfishing, including new annual catch limit (ACL) and accountability measures (AM) provisions for federally managed fisheries in the U.S. Exclusive Economic Zone (EEZ). Section 104(a)(10) of the MSRA amends section 303(a) of the Magnuson- Stevens Act to require that any FMP shall "establish a mechanism for specifying annual catch limits in the plan (including a multi-year plan), implementing regulations and annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure accountability''(72 FR 7016; February 14, 2007). In addition to ending overfishing of bottomfish, Alternative 7 is consistent with these requirements as it establishes annual catch limits or total allowable catch (TAC) and accountability measures (i.e. closure of the fishery) for the MHI bottomfish fishery.

[4] See http://www.hawaii.gov/dlnr/dar/bottomfishing.htm

At its 137th meeting, the Council took initial action to recommend adoption of Alternative 7 which would utilize the phased-in TAC management described above. The Council took final action to modify its previously recommended preferred Alternative 7 at its 138th meeting held June 19 through June 22, 2007 in Honolulu, Hawaii. Modifications to issues raised as part of Alternative 7 were analyzed in an options paper (Appendix 5). It is believed that Alternative 7's combination of annual closures to all sectors once the commercial TAC is reached, seasonal closures to all sectors in 2007 and 2008, reduced bag limits for non-commercial participants, and annual commercial and non-commercial TACs will effectively end overfishing of bottomfish in the Hawaii Archipelago. Therefore, Alternative 7 is the management action recommended by the Council for review and implementation by NMFS.

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CHAPTER 1: INTRODUCTION

1.1 Introduction

The Main Hawaiian Islands (MHI) bottomfish fishery occurs in both State of Hawaii (State) waters (0-3 nm) and Federal waters of the Exclusive Economic Zone (EEZ; 3-200), therefore both the State of Hawaii and the Western Pacific Regional Fishery Management Council (Council) share management authority and responsibility. Historically, the State has taken the lead in managing the MHI bottomfish fishery. However, because overfishing in the MHI bottomfish fishery was determined to be occurring by the National Marine Fisheries Service (NMFS), the Council is required by the Magnuson-Stevens Fishery Conservation and Management Act (MSA) to take appropriate management action to end the overfishing.

The MSA is the principal Federal statute providing for management of U.S. marine fisheries including those within the EEZ. The inner boundary of the EEZ is the seaward limit of each of the coastal states, commonwealths, territories, or possessions of the United States. The EEZ extends from this inner boundary to 200 miles offshore. The management of the fishery resources in the waters of the EEZ is vested in the Secretary of Commerce and in eight regional fishery management councils. Each council has authority over fisheries in specific coastal regions. The area under the jurisdiction of the Western Pacific Fishery Management Council, collectively referred to as the Western Pacific Region, includes the waters of the EEZ surrounding the State of Hawaii, the Territory of American Samoa, the Territory of Guam, the Commonwealth of the Northern Mariana Islands, and the U.S. Pacific Remote Island Areas[5].

As promulgated under the MSA, the councils are responsible for the preparation of Fishery Management Plans (FMPs) or amendments to those FMPs for each fishery under their authority that requires conservation and management. The councils transmit these FMPs to NMFS, acting on behalf of the Secretary, for review and approval, disapproval, or partial approval. Once approved, NMFS implements the FMP or FMP amendment through regulations and enforcement. Federal fisheries in the Western Pacific Region are currently managed under five species-based FMPs: Pelagics, Bottomfish and Seamount Groundfish, Coral Reef Ecosystems, Crustaceans, and Precious Corals. On November 10, 2005 (70 FR 68443), NMFS published a notice announcing the availability for public review of the Draft Programmatic Environmental Impact Statement (DPEIS)—Toward an Ecosystem Approach for the Western Pacific Region: From Species-Based Fishery Management Plans to Place-Based Fishery Ecosystem Plans, dated October 27, 2005. The DPEIS analyzes the realignment of the existing fishery regulations contained in the Western Pacific Region's five species-based FMPs into geographically-based fishery ecosystem plans and regulations as recommended by the Council at its 130th meeting (December 20, 2005). That DPEIS was revised and distributed for public comment in March 2007, and is currently being finalized. Any action taken on the Hawaiian bottomfish fishery would be incorporated into the Hawaii Fishery Ecosystem Plan.

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[5] The PRIA consist of Howland, Baker, Wake and Jarvis Islands, Kingman Reef and Johnston, Palmyra and Midway Atolls

1.2 Fishery Management Plan for Bottomfish and Seamount Groundfish

The combined FMP, environmental assessment, and Regulatory Impact Review for the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region (commonly referred to as the Fishery Management Plan for Bottomfish and Seamount Groundfish of the Western Pacific Region or Bottomfish FMP) was prepared by the Council and approved by the Secretary in 1986 (68 FR 46112; August 5, 2003). The Bottomfish FMP established a moratorium on the commercial harvest of seamount groundfish stocks at the Hancock Seamounts in the Northwestern Hawaiian Islands (NWHI), the only exploitable seamount groundfish (e.g., alfonsin) habitat in the Western Pacific Region. This moratorium remains in effect until August 31, 2010 (69 FR 51400). Consequently, there currently is no seamount groundfish fishery in the Western Pacific Region. The Bottomfish FMP also implemented a permit system for bottomfish fishing in the EEZ around the NWHI and established a bottomfish fishery management framework that includes measures such as catch limits, size limits, area or seasonal closures, fishing effort limitation, fishing gear restrictions, access limitation, permit and/or catch reporting requirements, and a rules-related notice system (see Section 3.4.3.1.2 for the list of FMP regulations). Table 2 provides the current list of Bottomfish Management Unit Species (BMUS).

Table 2: Bottomfish Management Unit Species

Common Name	Local Name	Scientific Name
Snappers		
Silver jaw jobfish	Lehi (H), palu-gustusilvia (S)	*Aphareus rutilans*
Grey jobfish	Uku (H), asoama (S)	*Aprion virescens*
Squirrelfish snapper	Ehu (H), palu-malau (S)	*Etelis carbunculus*
Longtail snapper	Onaga, ulaula (H), palu-loa (S)	*Etelis coruscans*
Blue stripe snapper	Ta‘ape (H), savane (S); funai (G)	*Lutjanus kasmira*
Yellowtail snapper	Yellowtail kalekale (H), palu-i iusama (S)	*Pristipomoides auricular*
Pink snapper	‘Ōpakapaka (H), palu-tlena lena (S), gadao (G)	*Pristipomoides filamentosus*
Yelloweye snapper	Yelloweye ‘ōpakapaka, kalekale (H), Palusina (S)	*Pristipomoides flavipinnis*
Snapper	Kalekale (H)	*Pristipomoides sieboldii*
Snapper	Gindai (H, G), palu-sega (S)	*Pristipomoides zonatus*
Jacks		

Common Name	Local Name	Scientific Name
Giant trevally	White ulua (H), tarakito (G), sapo-anae (S)	*Caranx ignoblis*
Black jack	Black ulua (H), tarakito (G), tafauli (S)	*Caranx lugubris*
Thick lipped trevally	Pig ulua, butaguchi (H)	*Pseudocaranx dentex*
Amberjack	Kāhala	*Serioila dumerili*
Groupers		
Blacktip grouper	Fausi (S), gadau (G)	*Epinephelus fasciatus*
Sea bass	Hāpuʻupuʻu (H)	*Epinephelus quernus*
Lunartail grouper	Papa (S)	*Variola louti*
Emperors		
Ambon emperor	Filoa-gutumumu (S)	*Lethrinus amboinensis*
Redgill emperor	Filoa-paloomumu (S), mafuti (G)	*Lethrinus rubrioperculatus*
Seamount groundfish		
Alfonsin		*Beryx splendens*
Raftfish/butterfish		*Hyperoglyphe japonica*
Armorhead		*Pseudopentaceros richardsoni*

Note. G = Guam; H = Hawaii; S = American Samoa.

The Bottomfish FMP has been amended nine times since approval in 1986. These amendments are as follows:

Amendment 1 established the potential for limited access systems for bottomfish fisheries in the EEZ surrounding American Samoa and Guam.

Amendment 2 divided the EEZ around the NWHI into two zones: the Hoomalu Zone to the northwest and the Mau Zone to the southeast. The amendment also established a limited access program for the Hoomalu Zone.

Amendment 3 defined when a stock is determined to be in an overfished condition. Amendment 3 also delineated the process by which overfishing is monitored and evaluated.

Amendment 4 established regulations that require permitted vessel owners or operators to notify NMFS at least 72 hours before leaving port if they intend to fish in a 50 nautical miles "protected species study zone" around the NWHI. This notification allows Federal observers to be placed on board bottomfish vessels to record interactions with protected species if this action is deemed necessary.

Amendment 5 established a bottomfish limited access program for the Mau Zone and a framework for a Community Development Program.

Amendment 6 identified and described Essential Fish Habitat (EFH) for managed species of bottomfish, discussed measures to minimize bycatch and bycatch mortality in the bottomfish fishery, described fishing communities in the Western Pacific Region, and supplemented Amendment 3 by providing criteria for identifying when overfishing has occurred in the fishery.

Amendment 7 brought the Bottomfish FMP into conformity with the Coral Reef Ecosystem Fishery Management Plan (CRE FMP) by prohibiting fishing for BMUS in the CRE FMP's no-take areas and amending the BMUS list to exclude species now managed under the CRE FMP.

Amendment 8 added federal waters surrounding the PRIA and CNMI to the FMP. It also established new permitting and reporting requirements for vessel operators targeting bottomfish species around the PRIA to improve understanding of the ecology of these species and the activities and harvests of the vessel operators that target them.

Amendment 9 prohibited large vessels (50 ft or longer) from fishing for bottomfish in Federal waters within 50 nm around Guam and it established Federal permitting and reporting requirements for these large vessels.

Additional information on these amendments may be found in Section 2.3.1 of the Final Environmental Impact Statement—Bottomfish and Seamount Groundfish Fishery of the Western Pacific Region (70 FR 35275; June 17, 2005), dated May 2005, and available from the Council website (www.wpcouncil.org) or the NMFS PIRO website[6]. In addition, the Programmatic EIS titled Toward an Ecosystem Approach for the Western Pacific Region: From Species-Based Fishery Management Plans to Place-based Fishery Ecosystem Plans, dated March 2007, contains information on the bottomfish fisheries and prior NEPA analyses.

In May 2005, a Final Environmental Impact Statement (FEIS) on the Bottomfish FMP was completed and was made available to the public on June 17, 2005. On March 30, 2006, a Draft Supplemental Environmental Impact Statement (DSEIS), focused on the 2006 recommendations for a 15% reduction in bottomfish fishing mortality, was made available with a 45-day comment period (closed on May 30, 2006). Before the 2006 DSEIS was finalized, the 2006 stock assessment was completed. In addition, other events as described in this document resulted in recommendation of new alternatives to end the overfishing of bottomfish. In light of these developments, the 2006 DSEIS was not finalized and a revised 2007 DSEIS was prepared in

[6] (http://www.fpir.noaa.gov/DIR/dir_public_documents.html#eis).

conjunction with the revised Amendment 14. Comments on the revised DSEIS have been considered in this Final Amendment and SEIS.

1.3 Overfishing Determination

The MSA requires the Secretary to annually report to Congress on the status of fisheries within each regional fishery management council's geographical area of authority and identify those fisheries that are overfished or approaching a condition of being overfished (16 U.S.C 1854(e)(1)). Based on MSA National Standard guidelines, a stock or population is subject to overfishing if the fishing mortality rate exceeds the maximum fishing mortality threshold (MFMT) for one year (50 CFR 600.310). The MFMT for the Hawaiian Archipelago bottomfish management unit species complex is specified in Amendment 6 of the Bottomfish FMP.[7] Relying on the expertise and advice of NMFS' Pacific Islands Fisheries Science Center (PIFSC), NMFS has determined that overfishing of the bottomfish multi-species complex is occurring within the Hawaiian Archipelago, primarily in the Main Hawaiian Islands (MHI) bottomfish management area. The Secretary of Commerce informed the Council on May 27, 2005 that according to MSA National Standard 1 guidelines and the associated reference points adopted by the Council, the bottomfish multi-species stock complex in the Hawaiian Archipelago was experiencing overfishing. The NMFS Regional Administrator for the Pacific Islands Region provided formal notice to this on June 14, 2005 (70 FR 34452; June 14, 2005). NMFS determined that "the MHI is the zone that contributes most of the problems in terms of both reduced biomass and overfishing." The Regional Administrator further stated, "[t]herefore, it is likely that reducing fishing mortality here [MHI] would be the most effective means to end overfishing in the Hawaiian Archipelago" (70 FR 3442; June 14, 2005).

Bottomfish in the Hawaiian Archipelago are a collection, or complex, of deep-slope snappers, groupers, and jacks. The primary species of concern are the Deep 7 bottomfish species: onaga, ehu, gindai, kalekale, hāpu'upu'u, 'ōpakapaka and lehi The Hawaiian Archipelago bottomfish fisheries are separated into two management areas, MHI and NWHI. The NWHI is further separated into two smaller management zones; the Mau Zone and Hoomalu Zone. Recent sonar-based mapping has shown approximately 47 percent of the bottomfish fishing grounds in the MHI to be within the waters of the State (0 to 3 nm offshore) with the remaining 53 percent in Federal waters (Parke, 2007). Historically, management of bottomfish fishing in the Hawaiian Archipelago has been conducted under a cooperative arrangement; that is, management of the bottomfish fishery in the MHI has been the responsibility of the State, and management of the NWHI bottomfish fishery has been the responsibility of the Council and NMFS. The State's MHI management measures include bottomfish vessel registration, restricted fishing gears, commercial fishing reporting, non-commercial catch limits (five fish combined) for two bottomfish species (onaga and ehu), and 19 restricted fishing areas where bottomfish fishing is prohibited. Most bottomfish habitat in the NWHI occurs in Federal waters (3 to 200 nm offshore) and the NWHI bottomfish fishery has been managed under the Council's Bottomfish FMP. The State has changed the size, location, and number of BRFAs from 19 to 12 based on recent sonar mapping of bottomfish habitat throughout the MHI. Recent analysis has determined that the State's prior BRFAs encompassed 9.2 percent of what the researchers define as "suitable habitat" for the deep-slope bottomfish, within depth range of 50-200 fm, while the new 12 BRFAs encompass 11.2 percent (Parke, 2007). Parke (2007) assumes a direct relationship between suitable habitat and bottomfish catch, indicating that the State's new BRFAs would reduce bottomfish fishing mortality by two percent over the 2004 baseline.

The 2006 stock assessment indicates that the archipelagic bottomfish multi-species stock complex is not overfished but overfishing is occurring (Moffitt et al. 2006). Further, because the MHI is the zone primarily contributing to the overfishing, the intent of this action is to reduce fishing mortality in the MHI as the most effective means to end bottomfish overfishing in the Hawaiian Archipelago (70 FR 34452; June 14, 2005). The prior stock assessment based on 2003 data which originally triggered the overfishing determination indicated a need for a 15 percent reduction in fishing effort, however, the 2006 determination is being addressed in this document.

The ratio of current fishing mortality (F) to estimated fishing mortality at maximum sustainable yield (F_{MSY}) exceeded the MFMT of 1.0. The Hawaii archipelagic bottomfish stock complex F ratio is obtained by adding the weighted F contributions of the three management zones (MHI, Mau, and Hoomalu) by using effort, which is the amount of bottomfish fishing gear used over a given unit of time, as a proxy for fishing mortality. The Hawaii archipelagic values also include a weighted factor based on the amount of bottomfish habitat in each management zone. These habitat factors are 0.447, 0.124, and 0.429 for the MHI, Mau and Hoomalu Zones, respectively.

The control rule was first applied to the Hawaii bottomfish stock in the 2003 Bottomfish and Seamount Groundfish Annual Report (WPRFMC 2004) using data through 2002. In the analysis for the 2006 assessment, scientists at PIFSC updated the time series to include 2003 and 2004 data for both the dynamic production model reference values and status determinations. Additionally, they used the fitted model to back-calculate (hindcast) control rule criteria for data years 1988−2001 to evaluate changes in biomass and fishing mortality ratios over a longer time span (Moffitt et al. 2006). Archipelagic biomass and fishing mortality ratios have both declined over this time period. According to the model hindcasts, the biomass ratio has remained above the control rule minimum stock size threshold (MSST) ratio of 0.70 throughout this time span, whereas the fishing mortality ratio, though improving recently, has exceeded the maximum fishing mortality threshold (MFMT) ratio of 1.00 every year since 1988.

The management zone metrics indicate that MHI fishing mortality is well above the other two zones and that excessive fishing pressure in the MHI is the major contributor to overfishing in the archipelago. Since the archipelagic fishing mortality ratio exceeds the MFMT value of 1.0, corrective management measures are mandated. The management zone metrics clearly show excessive fishing pressure in the MHI Zone, therefore, assuming management measures were applied solely to the MHI, an iterative computation using the dynamic production model indicates that the F_metric_{MHI}, and hence MHI fishing effort, would have to be reduced from the 2004 level by 24 percent to bring archipelago-wide fishing mortality down to the MFMT of 1.00. A larger reduction would be needed to support a risk-averse management policy; such as choosing a target reference point less than the threshold reference point (Moffitt et al. 2006).

Management of the bottomfish multi-species stock complex in the Hawaiian Archipelago is confounded by issues of single sector (commercial) representation in fisheries data in the MHI, the spatial distribution of fishing effort on the stocks, and the proxies used to measure fishing impacts. Fishing effort is heavily skewed towards the MHI, with approximately 3,600 bottomfish vessels registered in the MHI and about 300 of these reporting commercial catch in 2004 (Moffitt et al. 2006). Only eight bottomfish vessels can operate in the NWHI with all catches included in commercial catch reports. In the MHI, there is a potentially significant, but unquantified, non-commercial catch which is currently not subject to mandatory reporting. This lack of information on the non-commercial catch in the MHI has been pointed out many times as a significant data gap hindering determination of actual total catch and effort (Martell et al. 2006, Moffitt et al. 2006).

The Council's preferred alternative (Alternative 7) would utilize a phased-in approach. Phase 1 was to consist of a May-September 2007 seasonal closure of waters around the MHI to both commercial and non-commercial fishing for the Deep 7 species. The 2007 seasonal closure was analyzed and implemented for Federal waters by NMFS pursuant to section 305c of the MSA (72 FR 27065; May 14, 2007) and by the Hawaii DLNR for State waters[8] and is, therefore, not part of the action analyzed in this document. The Council recommended a May 1 – September 30, 2007 closure, however, due to processing time the actual commencement date was May 15, 2007. The Alternatives are described in Chapter 2.

1.4 Statement of Purpose and Need

The purpose of this action is to end overfishing in the bottomfish fishery in the Hawaiian Archipelago by reducing fishing mortality in the MHI, which has been identified as the area where excessive fishing mortality is occurring (Moffitt et al. 2006). Included in this purpose is minimizing adverse impacts on fishery participants; associated shoreside businesses; and Hawaii's communities, residents, and visitors to the extent possible while ending overfishing.

1.5 Proposed Federal Action

The proposed Federal action is establishment of a management regime to end overfishing in the Hawaiian Archipelago bottomfish multispecies stock complex through the approval and implementation of Amendment 14 and associated regulations. Based on the Council's recommendation to date, Amendment 14's preferred alternative would implement a phased-in approach whereby in 2007 and 2008 the objective would be achieved through use of seasonal closures in conjunction with limiting catches through TACs and non-commercial bag limits. Also included in the proposed action is the implementation of Federal non-commerical permit and reporting requirements. As fishery monitoring improves, overfishing would be prevented in 2009 and beyond through implementation of TACs based on and applied to non-commercial and commercial landings. When the annual TAC is reached, both commerical and non-commerical fishery sectors would be closed for the remainder of the fishing year.

This document includes a 2007 Final SEIS ("Measures to End Bottomfish Overfishing in the Hawaiian Archipelago"[9]) to comply with the requirements of the National Environmental Policy

[8] See http://www.hawaii.gov/dlnr/dar/bottomfishing.htm
[9] Available at: http://wpcouncil.org/bottomfish/Documents/BottomfishOverfishingFSEIS-March302006.pdf

Act (NEPA). This document describes the alternatives considered to end the overfishing, identifies the impacts associated with each alternative, and describes current data gaps and areas requiring further research and coordination with the State of Hawaii.

1.6 Action Area

The action area includes waters of the U.S. EEZ (3 to 200 nm offshore) around the Hawaiian Archipelago. For management purposes, the Hawaiian Archipelago is divided into two management areas: the MHI and the NWHI (see Figure 1). The Bottomfish FMP divides the Federal waters of the NWHI further into two smaller management zones: the Mau Zone and the Hoomalu Zone. The MHI are the waters surrounding the inhabited Hawaiian Islands and where regulations in the proposed action would take effect.

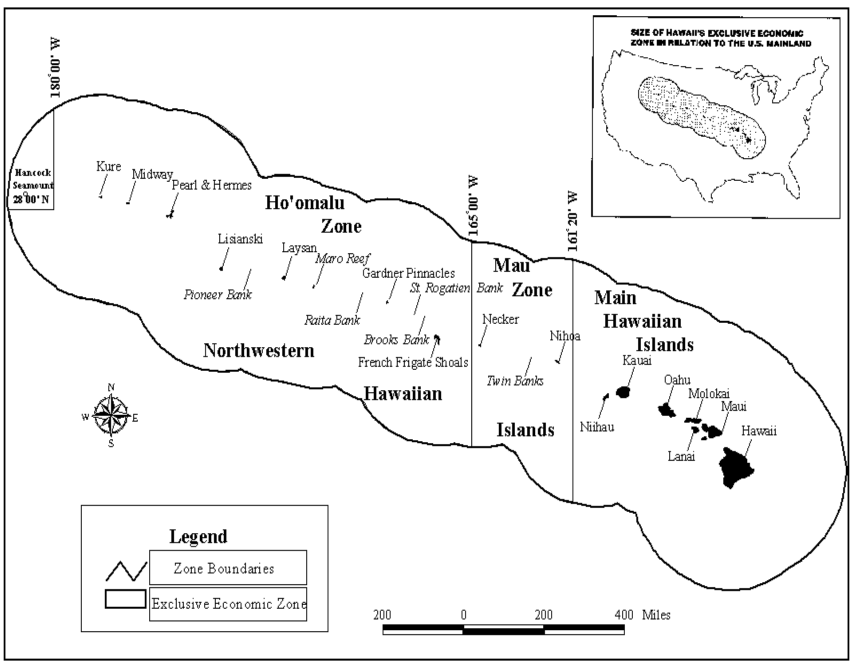

Figure 1: Map of the Hawaiian Archipelago Showing the NWHI and the MHI Bottomfish Management Areas

1.7 Public Participation

The alternatives described in this document were discussed and an opportunity for public comment was provided at the 94th Meeting of the Council's Science and Statistical Committee held February 20-22, 2007, in Honolulu, Hawaii, at the 137th Council Meeting held March 13-16, 2007 in Honolulu, Hawaii, and at the 138th Council Meeting held June 19-22, 2007 in Honolulu, Hawaii.

In addition, the public scoping process for this Supplemental EIS included public meetings which were held throughout the Hawaiian Islands as follows:

1. April 16, 2007, 6-9 p.m., Lanai High and Elementary School, Lanai City, Lanai
2. April 17, 2007, 6-9 p.m., Ala Moana Hotel-Carnation Room, Honolulu, Oahu
3. April 18, 2007, 6-9 p.m., Waiakea High School Cafeteria, Hilo, Hawaii
4. April 19, 2007, 6-9 p.m., King Kamehameha Kona Beach Hotel, Kona, Hawaii
5. April 20, 2007, 6-9 p.m., Maui Community College, Kahului, Maui
6. April 21, 2007, 6-9 p.m., Chiefess Kamakahelei Middle School, Lihue, Kauai
7. April 24, 2007, 4-7 p.m., Mitchell Pauole Center, Kaunakakai, Molokai

Prior meetings that included discussion of MHI bottomfish data collection, overfishing determination, and proposed solutions included the following:

- the 127th Council meeting held May 31 to June 2, 2005;
- the 129th Council meeting held November 8 to 11, 2005;
- the 89th Scientific and Statistical Committee (SSC) meeting held May 17 to 19, 2005;
- the 90th SSC meeting held October 18 to 20, 2005;
- the Bottomfish Plan Team meeting held April 26 to 28, 2005;
- other meetings with members of the Hawaii Bottomfish Plan Team were held July 18, August 3, August 8, September 27, and October 21, 2005; and
- targeted bottomfish fishermen meetings were held November 17, 22, 25, and 29, and December 1, 2005.

Additional public meetings were held on:

1. December 12, 2005, in Hilo, Hawaii
2. December 13, 2005, in Kona, Hawaii
3. December 14, 2005, in Kauai
4. December 15, 2005, in Maui
5. December 20, 2005, in Honolulu, Hawaii

The formal scoping process for the 2006 DSEIS and the revised 2007 DSEIS was initiated with a publication of a Notice of Intent in the *Federal Register* on November 28, 2005 (70 FR 71258). This notice invited the public to attend public scoping meetings to provide their comments and perspectives regarding the proposed action and related issues.

As announced in the Notice of Intent, local newspaper advertisements, radio announcements, and meeting flyers, seven public scoping meetings were held across the MHI in January 2006. The dates and locations of the meetings were:

1. January 6, 2006, from 6-9 p.m., at the Lanai High and Elementary School, Lanai City, Lanai.

2. January 7, 2006, 6-9 p.m. at the Mitchell Pauole Center Conference Room, Kaunakakai, Molokai.

3. January 9, 2006, from 6- 9 p.m. at the University of Hawaii, Hilo Campus Center, Hilo, Hawaii;

4. January 10, 2006, from 6-9 p.m. at the King Kamehameha Hotel, Kona, Hawaii;

5. January 11, 2006, from 6-9 p.m. at the Maui Beach Hotel, Kahului, Maui;

6. January 12, 2006, from 6-9 p.m. at the Ala Moana Hotel, Honolulu, Oahu; and

7. January 13, 2006, from 6:-9 p.m. at Chiefess Kamakahelei Middle School, Lihue, Kauai

Public Hearings on the DSEIS were held as follows:

1. Maui, Hawaii—May 18, 2006, from 7-9 p.m. at the Maui Beach Hotel, Kahului, Maui, HI;

2. Kauai, Hawaii—May 22, 2006, from 7-9 p.m. at Chiefess Kamakahelei Middle School, Lihue, HI; and

3. Oahu, Hawaii—May 25, 2006, from 7-9 p.m. at the Ala Moana Hotel, Honolulu, HI.

Comments received at the public meetings, Public Hearings, and in writing during the 2006 and 2007 DSEIS public comment periods are addressed in this document as appropriate and are included as Appendix 4. However, it should be noted that several public comments focused directly on the 2006 DSEIS (April 14, 2006; 71 FR 19505) and are no longer relevant to this document in light of the new stock assessment data published in the interim. All public comments were considered in the preparation of the analyses in this Final SEIS.

1.8 Papahānaumokuākea Marine National Monument

On June 12, 2006, the President issued a proclamation establishing the Northwestern Hawaiian

Islands Marine National Monument, since renamed Papahānaumokuākea Marine National Monument, a status which significantly affects the NWHI commercial fishing operations. National monument designation supersedes the proposed NWHI National Marine Sanctuary.

The President's proclamation on June 15, 2006, mandated the closure of the NWHI bottomfish fishery by June 15, 2011, and the immediate closures of all other commercial fisheries within the monument's boundaries. However, Native Hawaiian cultural practices, including sustenance fishing, may be allowed to continue with a valid Monument permit. Although the commercial bottomfish and associated pelagic fishing operations in the NWHI may continue over the five-year period, they will be subject to a landing limit on each species complex. No more than 350,000 pounds of bottomfish and no more than 180,000 pounds of pelagic fish may be landed within a given year. Furthermore, over the next five years, all bottomfish fishing operations in the NWHI must comply with new area closures, vessel monitoring and reporting requirements in addition to existing regulations. By phasing out NWHI commercial fishing operations and restricting non-commercial access to the NWHI, monument status reduces, but does not eliminate, outside impacts.

Bottomfish overfishing is primarily occurring in the MHI, as described briefly in Section 2.1.4 (for details see Sections 3.3.3.3 and 3.3.3.4.1 of this document, and Moffitt et al. (2006)). During the phase-out and closure of the NWHI fishery, fishing effort may shift from the NWHI to the MHI. This effort shift may exacerbate the fishing pressures on the MHI. To estimate the shift in fishing effort from the NWHI, it is essential to examine the current fishing activity of the eight vessels operating there. In 2003, fishermen made 76 trips into NWHI fishing areas (see Tables 13 - 14), and those trips resulted in 220,000 lbs of bottomfish landings (see Tables 16 - 17). This amount falls well within the imposed landing limit (350,000 lbs annually) for the next five years. Bottomfish landings (by pounds) also fall within zone-specific maximum sustainable yields. In 2003, fishermen landed 77,000 lbs in the Mau Zone and 145,000 lbs in the Hoomalu Zone, less than the areas' maximum sustainable yields of 97,904 lbs and 339,728 lbs, respectively. It appears the landing limit imposed for the next five years will have limited effect on current fishing operations in the NWHI, and it is expected that the NWHI landings will be relatively stable, unless affected by outside factors (e.g. a buyout).

If all of the vessels that currently operate in the NWHI shift effort to the MHI (once the NWHI fishery is closed), similar landings could be made without effort control measures such as a seasonal closure which would ensure no landings are taken during the entire closure period. Because the annual landing per vessel varies greatly in this small fishery, it may be misleading to use the average catch-per-vessel to gauge the impact of a per-vessel shift in effort. It remains to be seen how fishermen will react to the NWHI fishery closure; reactions may include shifting to the MHI bottomfish fishery, shifting fishery or gear type (likely to pelagics, longline or troll), or ceasing fishing operations altogether. It also possible that a buyout program will be established for the current NWHI bottomfish fishermen. If structured appropriately, a buyout could limit or eliminate fishing effort shift by scrapping the vessel outright or removing the USCG fishing endorsement from the vessel. The Council recommended a control date of June 2, 2005, for the MHI bottomfish fishery which could be used by the Council and NMFS as criteria to limit fishing effort or participation in a future limited entry program (70 FR 40305; July 13, 2005).

NMFS will continue to regularly assess and update the status of the Hawaiian Archipelago bottomfish stocks complex. State and Federal programs are in place to monitor shifts in effort from the NWHI to the MHI and other fisheries. The purpose and need of the Federal action in this document is to end overfishing in the Hawaiian Archipelago bottomfish stock complex by reducing Deep 7 fishing mortality within the MHI. Although the establishment of the monument does not affect this Federal action at this time, the continual assessment of the status of the bottomfish stock, coupled with information from ongoing fishery monitoring programs, may indicate the need for additional Federal actions in the future.

CHAPTER 2: ALTERNATIVES

Chapter 2 presents the alternatives being considered to end bottomfish overfishing as well as the alternatives that were considered but eliminated from further consideration. As indicated in NMFS' notification to the Council of bottomfish overfishing in the Hawaiian Archipelago (see Section 1.3), overfishing primarily occurs in the MHI, and therefore, reducing fishing mortality there would be the most effective means to end bottomfish overfishing in the Hawaiian Archipelago. Under all alternatives the Council is anticipated to continue to utilize principles of adaptive management under the MSA process to address changes in the fishery or larger marine environment.

2.1 Alternatives Considered But Not Analyzed in Further Detail

2.1.1 Inclusion of the Entire Hawaii BMUS Complex

Options were considered regarding the range of species to be included in this management action. Although the overfishing control rule is applied to the entire BMUS list (see Table 2), due to a lack of formal species specific stock assessments, consideration for this action was focused on those species that are of particular concern (i.e. the Deep 7). Inclusion of other BMUS was not considered in detail due to their life history parameters, stock condition, targetability, and other reasons as described below. Narrowing the management action also minimizes potential unnecessary negative impacts of this action on fishery participants and the regional economy. Based on the following discussion, consideration of the inclusion of non-Deep 7 BMUS in the management action was considered but not carried forward or analyzed in further detail.

The Bottomfish FMP applies to the entire U.S. Western Pacific Region and therefore includes species that are harvested in Hawaii, American Samoa, and the Mariana Islands. However a number of BMUS are not known to be caught in Hawaii (e.g. the lunartail grouper, *Variola louti;* and the two emperors, *Lethrinus amboinensis* and *L. rubrioperculatus),* and thus are not further considered or discussed in this document.

Other than the Deep 7 species, the BMUS most frequently reported landed is uku (*Aprion virescens,* see Table 18). Unlike the Deep 7 species, uku are frequently targeted by trolling and are caught at shallower depths. Uku were rejected for inclusion in the measures considered in detail because their targeted spawning potential ratio (SPR) value in the MHI is 0.39[11], which is well above the 20 percent threshold and considered to indicate a healthy stock status.

Ta'ape (*Lutjanus kasmira*) is the second most frequently landed BMUS outside of the Deep 7. This species was introduced from French Polynesia nearly 50 years ago to enhance nearshore fisheries. Ta'ape have adapted well and spread rapidly throughout the Hawaiian Archipelago (introduced in MHI and now found in the NWHI), and are commonly harvested in abundance by numerous gear types. Because of its abundant populations, fishermen often raise concerns that ta'ape competes for prey and habitat with other more important food and sport fish. At numerous

[11] See: http://www.pifsc.noaa.gov/wpacfin/hi/dar/Pages/hi_fish_4.php

Council public meetings and hearings regarding the bottomfish fishery, fishermen and other interested members of the public routinely request that the State or Federal fishery agencies develop a program to eradicate the species. Although no formal assessments have been conducted on the stock status of ta’ape, reported harvests have been relatively stable over the past five years. Restricting harvests of ta‘ape does not appear to be warranted at this time nor would it be well received by fishermen or the public who perceive this species as over-abundant and a nuisance.

White ulua (*Caranx ignobilis*) is targeted by shore-based and small boat-based fishermen and has a pivotal role in ancient and contemporary Hawaiian culture. Ulua have become an important target for shoreline non-commercial fishermen, and were a driving force behind the founding of several sports fishing clubs in Hawaii in the early part of the twentieth century (Gaffney 2000). White ulua is targeted with a variety of gears including shore casting, slide bait, spear, whipping, and handline. Although still a popular sports fish, large ulua are subject to ciguatera poisoning and have not been widely marketed since the early 1980s. The lack of markets has reduced commercial landings by over 50 percent and for this reason this species is not considered vulnerable to overfishing and is not considered in detail for management measures.

Kāhala is the BMUS most often associated with incidences of ciguatera fish poisoning. Prior to 1980, kāhala was harvested commercially in Hawaii. Peak annual landings (over 150,000 lbs) were recorded in the early 1950s. During the 1960s and early 1970s, kāhala remained a significant non-target catch in the handline fishery targeting high-value deep-sea snappers, like ‘ōpakapaka, onaga, and uku. The full-time bottomfish fishermen who frequented the Penguin Bank area during the 1970s reported that kāhala comprised 20 to 30 percent of their annual catch. As is the case with ulua, since the early 1980s, kāhala has been shunned by seafood marketers due to potential ciguatera toxicity, and most commercial fishermen now discard it when caught. The lack of markets has reduced commercial landings by over 50 percent and for this reason this species is not considered vulnerable to overfishing and is not considered in detail for management measures.

The State’s BRFAs and non-commercial catch limits were implemented in 1998 with the intent of rebuilding the local abundance of onaga and ehu resources in the MHI. The list of prohibited species was expanded to include other deep-slope bottomfish commonly caught while targeting onaga and ehu including gindai, kalekale, hāpu‘upu‘u, lehi, and ‘ōpakapaka (together making up the Deep 7). The primary rationale for including the additional deep-slope species was due to high mortality rates generally associated with barotrauma (physical damage to the fish as air in the swim bladder expands during ascent) while bringing the fish to the surface. These seven species are all caught using the same gear type and fishing methods and all inhabit the deep slopes, although some partitioning occurs by depth ranges. Fishing for any of the Deep 7 incurs a likelihood of hooking the others. In addition, bottomfish fishermen are now familiar with the seven deep-slope species managed by the State through the BRFAs and bag limits. The Council, its advisors, and the public have suggested that any new Federal bottomfish management action in the MHI should be consistent with the bottomfish species managed under the State’s regime. For these reasons and because of the abundance and other characteristics of the non-Deep 7 BMUS as described above, the management measures considered in detail here focus only on the

Deep 7. As available landings data is expanded with the addition of non-commercial catch data, additional BMUS may be considered for future management measures if warranted.

2.1.2 Gear Restrictions

Implementing gear restrictions as an alternative to end bottomfish overfishing was also considered. Limiting use of fishing gear (e.g., reels, hooks) on bottomfish fishing vessels could include creating limits on the number of stations or reels each vessel could use, the type of reel (electric, hydraulic, hand), the number of hooks on each line (between 5 and 12 hooks are typically used), and so forth. Such measures could attempt to control the fishing power of each vessel and therefore limit fishing effort, however, because of the following reasons, consideration of gear restrictions was considered but not carried forward or analyzed in further detail.

Implementation of gear restrictions in the bottomfish fishery would likely be ineffective and difficult to enforce. Bottomfish vessels typically operate between two and four reel stations while fishing. The number of reels and hooks per line is not dependent on the size of the vessel. Rather the specific configuration of the gear and number of stations used is dependent on a number of variables, including the number of fishermen, overall ocean conditions, wind speed and direction, current, tide, depth of water, topography of the fishing grounds, location of the fish, and if the vessel is drifting or anchored. Such variables make it difficult to use gear restrictions to control effort in the bottomfish fishery. In addition, bottomfish reels are also used to target pelagic species at fish aggregation devices and seamounts. Therefore, prohibiting the use of this gear on vessels may impact non-bottomfish fisheries which would be an unnecessary burden on the fishing community and on enforcement resources.

2.1.3 Rolling Closures

During several Council advisory group meetings, it was suggested that the Council consider using short, continuous, alternating open and closed fishing periods or alternating monthly closures to minimize potential impacts to commercial fishermen and the markets which depend on a continuous supply of bottomfish product. The concern is that a typical three or five month seasonal closure would allow foreign imports to replace the local supply of bottomfish to retail markets and restaurants.

There is concern that foreign suppliers of bottomfish, which often market imported fish under their Hawaiian names, (e.g. onaga and ‘ōpakapaka), could make permanent inroads and shut out local suppliers. Based on the following discussion, consideration of rolling closures as an alternative to end overfishing was considered but not carried forward and analyzed in further detail.

The proposal to use rolling closures could help to minimize direct fishing and market impacts by allowing fishermen to deliver product on a consistent basis. Two options were explored under this proposal. The first would call for rotating closures on a weekly basis. For example, fishermen could fish the first week of January and not fish the second, fish the third week and not the fourth, and so on. The second option would assign each State-registered fisherman an odd or even number. These fishermen would then be allowed to land fish only during their assigned even or odd weeks. The BF registration numbers or trailer license plates were suggested as means to identify fishermen.

There were a number of concerns raised with each of these options. The primary concern for both would be the increased administrative burden of monitoring and enforcing such complex programs. Although the administrative burden to NMFS would be relatively minimal in assigning fishermen to fishing schedules, record keeping, including mailouts (estimate $5,000), most of the burden with any rolling closure proposal would pertain to enforcement activities. Enforcement could be conducted dockside and in the markets. However, the 3,600 registered bottomfish fishermen primarily use trailers to launch their vessels. Vessel size ranges from 12 to 60 feet with an average of about 21 feet in length. The potential ports of entry where bottomfish could be landed include major harbors as well as numerous boat ramps and would likely require additional resources to monitor. In addition, fishermen who fish during a closed week could easily hold the fish for delivery to market the following week because of the long shelf life of most bottomfish species. If an alternating number system were to be used, fishermen could also partner with other fishermen allowing them to switch off and rotate vessels so that they could both fish continuously.

Based on comments the Council received during public hearings, meetings, and forums, the majority of fishermen indicated that they would prefer a block (i.e., summer 3–month closure) during a period when other fishing opportunities are available. Alternating monthly closures were also brought up in public meetings, however, this too was thought to present considerable administrative burden and enforcement difficulties. In addition, both alternating monthly or other rolling closures are expected to result in a smaller reduction in fishing effort as it is expected that fishery participants would fish harder and longer just before and after the numerous short-term closed periods thus displacing a certain proportion of the fishing effort.

2.1.4 Closure or Limitations in the NWHI Bottomfish Fishery

Consideration of a closure or other limits on the NWHI bottomfish fishery as an alternative to end overfishing was considered but not carried forward or analyzed in further detail. Based on the best available information, the overfishing condition in the Hawaiian Archipelago bottomfish species complex is largely attributable to the MHI (Moffitt et al. 2006), not the NWHI, and therefore closing the NWHI bottomfish fishery is not an effective alternative to address the overfishing problem due to the excess rate of fishery mortality, observed in the Hawaiian Archipelago. For details see Sections 3.3.3.3 and 3.3.3.4.1 and Moffitt et al. (2006). The NWHI bottomfish fishery is very limited with a maximum of eight vessels allowed to fish, as well as catch quotas in place as part of the monument regulations.

In addition, on June 15, 2006, the President issued a proclamation establishing the Northwestern Hawaiian Islands Marine National Monument (since renamed Papahānaumokuākea Marine National Monument), a status that significantly affects the NWHI commercial fishing operations. The President’s proclamation calls for the closure of most fisheries within the NWHI monument’s boundaries immediately and of the NWHI bottomfish fishery by June 15, 2011. In addition monument regulations have imposed a quota, closed additional areas off to vessels, and imposed other restrictions on fishing activities in effect until the 2011 closure. In light of the above information explained in more detail in Section 1.8 and including the existing limitations on the fishery, NWHI bottomfish fishery participants are able to continue fishing under the monument catch quotas and their activities are not expected to inhibit ending overfishing in the bottomfish complex.

2.1.5 Closure of Penguin Bank and Middle Bank

During the process to develop measures to end overfishing in the MHI bottomfish fishery the Council originally recommended an annual summer closure from May 1 to August 31 of each year for the entire MHI bottomfish fishery (both commercial and recreational vessels). This recommendation was based on analysis and public scoping. Targeting, possessing, landing, or selling MHI Deep 7 species would be prohibited during the proposed closed season, however, the Council could not fully implement this alternative, however, without a commitment from the State of Hawaii to adopt parallel regulations in State waters. The Council received a letter from the State's Department of Land and Natural Resources on April 5, 2006, stating that they would not support a corresponding seasonal closure. Therefore, the Council recommended its secondarily preferred alternative, to close Penguin and Middle Banks, as these areas are entirely within federal waters and their closure does not require support from the State of Hawaii.

Closing Penguin and Middle banks would have reduced fishing mortality, however, it would cause the fishing communities and participants of Oahu (for Penguin Bank) and to a lesser degree Kauai (for Middle Bank) to bear nearly the entire brunt of the impact to their livelihoods and economy. This is because the proximity of these offshore banks to these communities predicates that they are fished almost exclusively by participants from these two areas (Figure 2). Approximately 30 percent of the MHI reported commercial bottomfish landings are on Oahu, and Penguin Bank is the source of 46 percent of these landings. In fact, Penguin and Middle banks together represent between 16 percent and 20 percent of entire MHI bottomfish landings as compared to the 2003 baseline (Kawamoto et al. 2005: based on 1998-2004 and 1990-2004 data respectively).

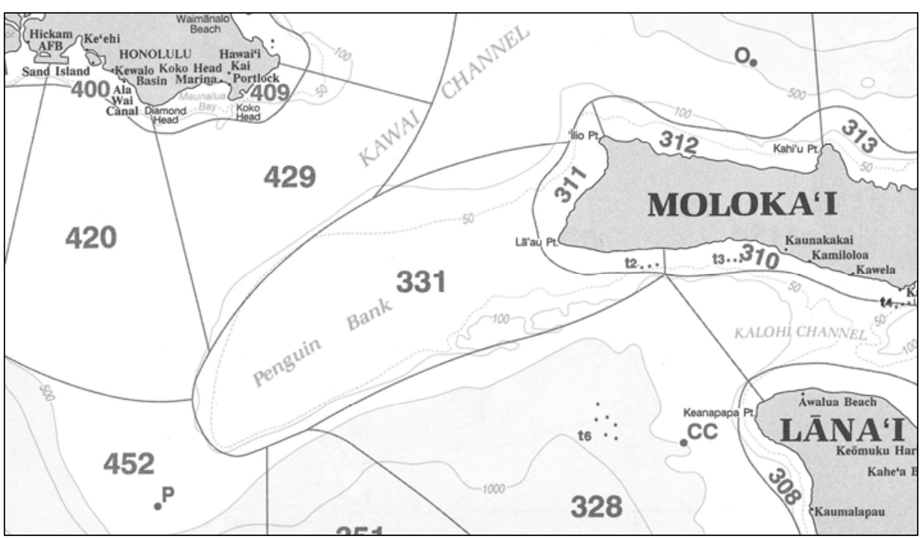

Figure 2: Commercial Fisheries Statistical Chart of Penguin Bank Area.

In the intervening time period, PIFSC completed its 2006 bottomfish complex stock assessment and determined that a 24 percent reduction was needed. The Penguin and Middle Bank area closure would not provide a 24 percent reduction in fishing effort. Therefore, the closure of Penguin and Middle Banks would not meet the purpose and need of this action and is not further considered in this document.

2.2 Alternatives under Consideration

To meet the purpose and need of this action and in light of the new information described above, the Council considered several alternatives to reduce bottomfish fishing mortality in the MHI. To determine the appropriate range of reasonable alternatives, the Council conferred with fisheries experts, Council staff, NMFS, members of the fishing community, and members of the public through meetings and workshops held throughout Hawaii (see Section 1.7). In addition, the reauthorized MSA specifies that new annual catch limit measures (e.g., Total Allowable Catch or TACs) to end overfishing be implemented by 2011.

A range of reasonable alternatives was developed taking into account the following: (a) the best available scientific information on the bottomfish species' life histories, habitats, and stock assessments; (b) the requirements of the MSA; and (c) the potential impacts to cultural, social, biological, enforcement, ecosystem, and economic factors. Under all the alternatives with the exception of a change in the bag limit under Alternative 7, the State's current bottomfish regulations would continue under the State's recognized authority in State waters, including: (i) the 12 no-fishing BRFAs throughout the MHI, (ii) a non-commercial bag limit (currently five ehu and/or onaga per trip per person), (iii) required bottomfish vessel registration, and (iv) prohibited use of bottom longline, nets, traps, and trawls to take bottomfish in addition to the State's other gear restrictions applicable to all fisheries in State waters.

HDAR revised the number and locations of their BRFAs[12] in 2007 and there are now 12 located in State waters except the one at Penguin Bank which is in federal waters approximately five nm offshore. Also under consideration are modifications to HDAR's existing Commercial Fisheries Statistical Area reporting grids to allow for better evaluation of the effectiveness of the BRFAs.

To achieve the purpose and need for the Federal action (i.e., a reduction in MHI fishing mortality to end overfishing), the State and the Federal management agencies would need to establish parallel requirements to allow effective enforcement and to achieve the goal of ending overfishing. Without parallel regulations it would be impossible to validate where a fish was caught (State or Federal waters) and, therefore, enforcement of seasonal closures or closures following the achievement of a TAC could not be enforced. For example, with the seasonal closure alternatives both State and Federal waters would have to be closed simultaneously to fishing for the Deep 7 species, and when the TAC is reached both State and Federal waters would need to be closed once the limit was reached. The effectiveness of the catch limits in reducing bottomfish fishing mortality would be monitored through non-commercial and

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[12] See: http://www.hawaii.gov/dlnr/dar/bottomfishing.htm

commercial reporting as well as cooperative enforcement activities. Under all alternatives the Council is anticipated to continue to utilize principles of adaptive management under the MSA process to address changes in the fishery or larger marine environment.

Total Allowable Catch-based Management Measures

Under Alternatives 3 - 7, management of the fishery would utilize TACs calculated to prevent overfishing. All would provide relatively direct control of fishing mortality through adherence to the TAC. The first annual TAC will be set based on biomass estimates and other scientific and commercial information utilized during the stock assessment and review process. TACs set in subsequent years may take into account non-commercial fisheries information derived from new non-commercial permit and reporting requirements.

Some potential issues and challenges associated with a move towards using TACs to manage fishing mortality in the bottomfish fishery include: using a TAC for the Deep 7 species complex, rather than on a per-species basis could be problematic in the future if it becomes apparent some species stocks are in need of more stringent reductions in harvest than others; a TAC could lead to a “race for the fish” scenario and a corresponding potential flooding of the market early in the season; allocating catch between commercial and non-commercial fishing sectors could become necessary; managers must have the capacity to effectively monitor harvest levels in a timely manner to be able to close the fishery upon reaching the TAC; and the potential for highgrading in which discards are not accounted for in the TAC. The Council is anticipated to continue to utilize principles of adaptive management under the MSA process to address these issues if they become problematic.

The 2007 fishing year TAC was derived using State of Hawaii commercial catches for 2004 as this was the baseline cited by PIFSC in the 2006 stock assessment. The total 2004 reported MHI catch of Deep 7 species was 233,998 lb (Table 3), and 24 percent of that is 56,160 lb. This yields a TAC of approximately 177,838 lb (76 percent of 233,998 lb) which was rounded off to 178,000 lb for ease of management. This TAC would be used under Alternatives 3 – 7 for the first year and would be calculated annually after that based on future stock conditions.

Table 3. Reported MHI Landings of Deep 7 Species (lb) in 1998 - 2004

Species	‘Ōpaka-paka	Onaga	Ehu	Hāpu‘-upu‘u	Gindai	Kalekale	Lehi	**TOTAL**
1998	141,958	58,325	23,728	11,346	3,346	19,886	8,647	267,236
1999	129,155	60,981	19,429	10,106	2,390	11,190	9,859	243,110
2000	149,879	74,531	29,522	16,183	3,653	16,659	10,834	301,261
2001	100,003	54,993	20,911	11,105	3,127	11,759	10,427	212,325
2002	108,917	68,981	17,441	8,411	2,129	11,451	9,536	226,866
2003	115,719	71,560	15,489	10,208	2,039	9,922	8,573	233,510
2004	102,168	85,072	22,178	8,018	2,104	7,785	6,673	233,998

Source: Kawamoto et al. (2005)

The TAC, explained above, would initially be set at 178,000 pounds of the Deep 7 species (all species combined), representing a 24 percent reduction from the 2004 fleetwide reported MHI bottomfish catches of these species (Moffitt et al. 2006) and would be applied to the MHI commercial Deep 7 bottomfish fishery. In Alternatives 3 - 7 the bottomfish fishing year would continue until the TAC was reached, and thereafter, no fishing for Deep 7 bottomfish (commercial or non-commercial) would be permitted in the MHI. Because of this, consistent regulations for State waters would be needed such that State waters would also be closed when the TAC was reached. To effectively control fishing mortality using a TAC, catch reporting and analysis need to be done in as timely a manner as possible to minimize the potential for exceeding the TAC. The NWHI bottomfish fishery would remain open until its June, 2011 designated closure pursuant to monument regulations (71 FR 51134; August 29, 2006).

The non-commercial sector's contribution to total catch of bottomfish in the MHI is largely unknown which is a particular challenge when determining how to effectively and equitably reduce fishing mortality and implement TACs. All alternatives under consideration include provisions requiring non-commercial participants to obtain federal permits and to complete and submit federal catch reports, which will over time lead to an improved database of total catches in both sectors and could in the long-term lead to sector allocations. Sector allocations are not considered in this document.

Start of Fishing Year

Under Alternatives 2-6 the bottomfish fishing year would generally start on October 1 to ensure the fishery is open during the important holiday periods as described in Section 3.4.4.1.

2.2.1 Alternative 1: No Action

Alternative 1 is to take no Federal action; that is, no changes to Federal management measures would be recommended by the Council for approval and implementation at this time.

Under this and all other alternatives, the State of Hawaii's bottomfish management measures, which were established in 1998 under Department of Land and Natural Resources (DLNR) administrative rule (HAR Chapter 13-94) may remain in place or could be changed by DLNR. The State's current bottomfish management regime includes: (i) 12 BRFAs throughout the MHI, (ii) a non-commercial bag limit of five ehu and/or onaga per trip per person, (iii) required bottomfish vessel registration, and (iv) prohibited use of bottom longline, nets, traps, and trawls to take bottomfish. Seven species, including deep-slope snappers and a grouper, were identified for management under the State regulations. The State's original BRFAs were delineated according to bottom topography, location of reported bottomfish landings, proximity to access points and points of observation to facilitate effective enforcement, and recommendations from fishermen, with their primary purpose being to protect critical bottomfish habitat and presumed spawning and nursery habitat areas.

Under the No Action Alternative, there would continue to be open access for entry into the MHI fishery. MHI commercial fishermen would be required to submit catch reports but non-commercial fishermen would not to be required to submit catch reports, and the non-commercial catch component of the total bottomfish harvest would continue to be estimated through sampling and surveys.

2.2.2 Alternative 2: May – September Seasonal Closure

Under Alternative 2, an annual summer closure would be implemented from May 1st through September 30th for the entire MHI bottomfish fishery (both commercial and non-commercial vessels). Targeting, possessing, landing, or selling Deep 7 species caught in the MHI would be prohibited during the closed season. Studies on four Hawaiian snappers indicate they may spawn serially over an extended period with spawning greatest during the summer months, and peaks from July to September (Haight et al. 1993). ‘Ōpakapaka’s spawning season was determined in a study in the NWHI to be from June – December with peak spawning in August (Kikkawa 1980). Ehu, or ‘ula ‘ula, were determined to spawn in the NWHI from July – September in a study by Everson (1984) and onaga females with ripe ovaries have been reported during August and September. Therefore, an annual summer closure is anticipated to provide additional benefits by prohibiting fishing during peak spawning periods and thus reduce fishing mortality of spawning bottomfish potentially leading to an increase in the spawning stock biomass.

The NWHI bottomfish fishery would remain open until it is phased out in 2011. Bottomfish imports and NWHI bottomfish would be exempt from the prohibition. All vessel operators (both commercial and non-commercial) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and would be required to complete and submit reports of their catch, fishing effort, and area fished. In addition, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

Implementing this seasonal closure for both the commercial and non-commercial fishery, based on mean monthly landings, would result in an approximate 25 percent reduction of fishing mortality, however, parallel State regulations would be needed for this alternative to be feasible and effective, although the reauthorized MSA allows preemption of State management authority under certain conditions to ensure states manage their fisheries in a manner consistent with Federal objectives. Based on mean monthly landings (1998-2004), a May through September closed period is estimated to reduce annual landings by 25.3 percent.

During the open season the non-commercial component would have to adhere to the existing State non-commercial bag limit of five ehu and/or onaga per trip per person, however, this limit may be changed and/or other species may be added by the State.

The effectiveness of the seasonal closure in reducing bottomfish fishing mortality would be monitored through non-commercial and commercial reporting as well as enforcement activities, which mostly would be conducted shore-side. At-sea enforcement or air surveillance could also occur during the closed season.

2.2.3 Alternative 3: Fleetwide Total Allowable Catch

Alternative 3 would implement a fleetwide (commercial and non-commercial) TAC calculated by PIFSC and selected by the Council to prevent overfishing. Under this alternative commercial and non-commercial catches would be reported within a specified time limit (as close to ‘real time’ as is feasible) and a mechanism would be put into place to close the fishery when the combined TAC is reached.

All vessel operators (both commercial and non-commercial) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and to obtain permits, as well as to complete and submit reports of their catches, fishing effort, and area fished. To facilitate recognition of bottomfish registered vessels from the air, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

To achieve the purpose and need for the Federal action (i.e., a reduction in MHI fishing mortality to end overfishing), the State would need to establish a parallel requirement as both State and Federal waters would have to be closed to harvest of Deep 7 species once the TAC was reached. The effectiveness of the catch limits in reducing bottomfish fishing mortality would be monitored through non-commercial and commercial reporting as well as cooperative enforcement activities.

For the first year, 2007 - 2008, the TAC would be set at 178,000 lb of the Deep 7 species (all species combined), representing a 24 percent reduction from the 2004 fleetwide MHI commercial bottomfish catches of these species (Kawamoto et al. 2005) . The bottomfish fishing year would start on October 1 to ensure the fishery is open during the important holiday periods and continue until the TAC was reached. Thereafter, no fishing for Deep 7 bottomfish (commercial or non-commercial) would be permitted in the MHI. The NWHI bottomfish fishery would remain open until 2011. The TAC would be reassessed and adjusted as new data are made available, including new stock assessments, data on catches in the non-commercial fishery, and annual commercial landings data.

2.2.4 Alternative 4: Commercial TAC & Non-commercial Bag Limit

Alternative 4 would implement a TAC, calculated by PIFSC and selected by the Council to prevent overfishing, for the commercial fishery only and close that sector when the TAC is reached. The bottomfish fishing year would start on October 1 to ensure the fishery is open during the important holiday periods and continue until the TAC was reached. The non-commercial sector would have to adhere to the existing State non-commercial bag limit of five ehu and/or onaga per trip per person, however, this limit may be changed and/or other species may be added by the State.

All vessel operators (both commercial and non-commercial) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and to obtain permits, as well as to complete and submit reports of their catches, fishing effort, and area fished. To facilitate recognition of bottomfish registered vessels from the air, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

To achieve the purpose and need for the Federal action (i.e., a reduction in MHI fishing mortality to end overfishing), the State would need to establish a parallel requirement as both State and Federal waters would have to be closed to harvest of Deep 7 species once the TAC was reached. The effectiveness of the catch limits in reducing bottomfish fishing mortality would be monitored through non-commercial and commercial reporting as well as cooperative enforcement activities.

2.2.5 Alternative 5: TAC w/ Limited Access & Non-commercial Bag limit

This alternative would implement a commercial TAC, calculated by PIFSC and selected by the Council to prevent overfishing, in combination with a limited access program for the commercial sector. A limited access program would simplify the determination and monitoring of individual quotas by limiting the number of participants. Only those with limited access permits would be allowed to fish commercially for Deep 7 bottomfish in the MHI. Each limited access vessel would be required to stop fishing when their individual quota was reached. The limited access system would allocate a certain number of permits based on criteria related to past participation in the fishery. The bottomfish fishing year would start on October 1 to ensure the fishery is open during the important holiday periods and continue until the TAC was reached. The non-commercial sector would have to adhere to the existing State non-commercial bag limit of five ehu and/or onaga per trip per person, however, this limit may be changed and/or other species may be added by the State.

All vessel operators (both commercial and non-commercial) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and to obtain permits, as well as to complete and submit reports of their catches, fishing effort, and area fished. To facilitate recognition of bottomfish registered vessels from the air, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

To achieve the purpose and need for the Federal action (i.e., reductions in MHI fishing mortality to end overfishing), the State would need to establish a parallel requirement as both State and Federal waters would have to be closed to takes of Deep 7 species once the limit was reached. The effectiveness of the catch limits in reducing bottomfish fishing mortality would be monitored through non-commercial and commercial reporting as well as cooperative enforcement activities.

2.2.6 Alternative 6: Commercial IFQs & Non-commercial Bag Limit

Alternative 6 would allocate individual fishing quotas (IFQs) to all commercial fishermen whereby each fisherman is required to stop fishing for the reminder of the fishing year when their individual quota was reached. The sum of quotas would be calculated by PIFSC to meet the necessary percent fishing mortality reduction. In a sense this alternative is also management using a TAC, however, the TAC is subdivided into individual quotas. The number of fishermen would likely be limited to past participants in the fishery and quota amounts would likely be determined based on individual historical catches. Once a commercial fisherman had landed his respective IFQ, that person would not be permitted to fish for, possess, or sell any bottomfish until the following year. The non-commercial component would have to adhere to the existing State non-commercial bag limit of 5 ehu and/or onaga per trip per person, however, this limit may be changed and/or other species may be added by the State.

Each MHI commercial bottomfish participant with an IFQ would be issued a set of bottomfish stamps, with each stamp representing a certain number of pounds of bottomfish and all the stamps totaling the fisherman's total IFQ. The fisherman would be required to submit a stamp to the dealer at the point of sale. Once all the stamps were submitted the fisherman would be prohibited from fishing until the next open season. The fisherman's bottomfish stamps would be non-transferable.

Under this alternative, commercial fishermen would be required to continue reporting their catches and to stop fishing when their individual quota was reached. Fishery data would be analyzed in real time to monitor landings versus quotas.

IFQs could be implemented in a number of ways; two methods are outlined, as follows:

1. Provide equal quotas (of the TAC divided) to all historical participants. Under this alternative, historical highliners would get the same quota as part-time fishermen. Variations could provide equal quotas to a subset of all historical participants, such as those most active in recent years.

2. Provide individual quotas that are equal to a percent of each fisherman's historical catch providing this would not exceed the TAC. Under this alternative, fishermen's quotas would be relative to their individual historical catches. Variations could provide similar quotas to a subset of all historical participants, such as those most active in recent years.

2.2.7 Alternative 7: Phased-in TAC Management (Preferred)

Under Alternative 7, the MHI Deep 7 bottomfish fishery would ultimately be managed under an annual Total Allowable Catch limit (TAC) which would be based on, and applied to, both commercial and non-commercial catches (i.e., a fleetwide TAC). There currently are no available data on non-commercial catches and this alternative would provide for collection of this data through permitting and reporting procedures. Alternative 7 would utilize a phased-in approach with four main phases.

Phase 1 would consist of a May-September 2007, seasonal closure of waters around the MHI to both commercial and non-commercial fishing for the Deep 7 species. The 2007 seasonal closure has already been analyzed and implemented for Federal waters by NMFS (72 FR 27065; May 14, 2007) and by the Hawaii DLNR for State waters[13] and is therefore not part of the action analyzed in this document.

Phase 2 would implement a commercial Deep 7 TAC of 178,000 lb (a 24 percent reduction of MHI commercial Deep 7 catches as compared to 2004). Tracking of commercial landings towards this TAC would begin when the fishery reopens on October 1, 2007. During the open period, non-commercial catches would continue to be managed by bag limits, however bag limits would be changed from the current five onaga and/or ehu combined per person per trip, to five of any Deep 7 bottomfish species combined per person per trip and the bag limits would be extended into Federal waters via Federal rulemaking under the Council process to facilitate effective enforcement. Once commercial Deep 7 landings reached the TAC, both the commercial and non-commercial sectors would be closed. Phase 2 would also implement a Federal permit requirement for all non-commercial fishermen who target or catch BMUS species in Federal waters of the MHI. Timing for the permit requirement will go into effect as soon as procedures

[13] See http://www.hawaii.gov/dlnr/dar/bottomfishing.htm

are implemented for the permit process. The permit will be required to be updated annually and will be based on administrative costs (see Chapter 6, Paperwork Reduction Act, section 6.2.9).

Phase 3 would implement Federal reporting requirements for non-commercial fishermen who target or catch BMUS species in the MHI. Vessel operators would be responsible for reporting by each trip. The reports would provide fishery scientists with the data needed to calculate and track a non-commercial portion of the overall TAC. As is the case with many reporting systems in the Western Pacific Region, the validity of the non-commercial catch reports will be difficult to confirm. However, the ongoing Hawaii Marine Recreational Statistics Survey will provide a second data stream which may be compared to the catch reports. In addition, enforcement activities are expected to include dockside spot checks and interviews which may then be compared to filed catch reports.

Phase 4 would include a second seasonal closure to MHI Deep 7 fishing from May – August 2008, followed by implementation of a combined commercial and non-commercial Deep 7 TAC beginning September 1, 2008. With the new reporting requirements non-commercial data would become available to calculate and track the non-commercial portion of the TAC and the non-commercial bag limits would be dropped and a combined commercial and non-commercial TAC would be utilized. Note that eliminating the non-commercial bag limit is dependent on the quality of non-commercial catch data provided by fishermen to the State and NMFS so that an appropriate non-commercial TAC may be selected by the Council.

The combination of Alternative 7's 2007-2008 seasonal closures, commercial TACs and non-commercial bag limits is intended to ensure that appropriate action is taken to end overfishing with the limited data available in the short-term.

In subsequent years (2009 and beyond) the MHI Deep 7 fishery would be managed via a combined commercial and non-commercial TAC calculated by PIFSC and selected by the Council to prevent overfishing of these species. This number is likely to vary according to stock status and environmental conditions. Under this alternative, PIFSC would work with the Council's advisory bodies to provide the Council by May 30 with a proposed TAC for each year. There would be no further seasonal closures or non-commercial bag limits. The bottomfish fishing year would start on October 1 to ensure the fishery is open during the important holiday periods and continue until the TAC was reached.

Successful implementation of this alternative would require cooperation with the State of Hawaii in the development of complementary State regulations. Note that complementary regulations would likely require State legislative and/or administrative rule changes and may require additional funding.

The Council took final action to select Alternative 7 as its preferred alternative at the 137th Council meeting in Honolulu, Hawaii in March, 2007. Several issues within this recommendation were clarified at the 138th Council meeting which occurred June 19-22, 2007 (Options Paper at Appendix 5). At the 138th Council meeting, the Council clarified its recommendation by reviewing an options paper (see Appendix 5) which describes five topics and two or more sub-alternatives under each topic. In summary, the Council recommended the following features be part of Alternative 7:

Sub-Alternative 1B: Federal Requirements with State Cooperation.

NMFS and/or the Council would encourage the Hawaii DLNR to support the implementation of complementary State regulations to require that fishing operations that fish for or retain BMUS in State waters at any time during the year be subject to Federal permit and reporting requirements.

Sub-Alternative 2E: Require all Non-commercial Participants to Have Non-commercial Permits

Under this alternative each and every non-commercial bottomfish fishery participant would be required to have a Federal permit in order to fish for bottomfish in Hawaii. Vessel operators and owners would be responsible for ensuring that Federal catch reports were correctly completed within 24 hours after each fishing trip and transmitted to NMFS within 72 hours after each fishing trip. If desired, each participant could also indicate their portion (percent) of the total trip catch, if no percentages were indicated it would be assumed that each participant listed caught an equal portion of the total trip catch.

Sub-Alternative 3B: Require Reporting of All Trips by Permitted Vessels

Under this alternative catches of all species on all trips by permitted vessels would be subject to Federal reporting requirements.

Sub-Alternative 4D: Require Reporting of the Latitude and Longitude of Each Fishing Location

Under this alternative catch and effort would be reported by latitude and longitude (to the nearest degree).

Sub-Alternative 5B: Implement Non-commercial Bag Limits in Federal Waters

Under this alternative a Federal non-commercial bag limit of no more than five Deep 7 fish (all species combined) per person, per day, would be implemented for Federal waters around the MHI.

Sub-Alternative 6B: Do not Explicitly Consider TAC Overages or Underages
Under this alternative TAC overages and underages would not be explicitly considered in the determination of future TACs but would instead be implicitly considered via the results of stock assessments undertaken in future years.

CHAPTER 3: AFFECTED ENVIRONMENT

3.1 Introduction

This chapter describes the environmental resources that may be affected by the proposed action or the alternatives. It is based primarily on the corresponding chapter in the FEIS for the Bottomfish and Seamount Groundfish Fishery of the Western Pacific Region (WPRFMC 2005a), and has been updated to incorporate more recent information, including the 2004 fishery data made available in the Bottomfish FMP annual report (WPRFMC 2005b) and additional analyses conducted by PISFC staff.

The Bottomfish FMP (WPRFMC 1986), its amendments, and implementing regulations define the fishery management area and sub-areas within the EEZ surrounding the State of Hawaii as follows. The inner boundary of the fishery management area is a line coterminous with the seaward boundaries of the State of Hawaii (i.e., the 3-mile limit). The outer boundary of the fishery management area is a line drawn in such a manner that each point on it is 200 nautical miles from the baseline from which the territorial sea is measured.

The Federal bottomfish fishery management area in Hawaii is divided into three sub-areas (Figure 2) with the following designations and boundaries:

(1) Main Hawaiian Islands (MHI) means the EEZ of the Hawaiian Islands Archipelago lying to the east of 161°20' W longitude.

(2) Northwestern Hawaiian Islands (NWHI) means the EEZ of the Hawaiian Islands Archipelago lying to the west of 161°20' W. Midway Island is treated as part of the Northwestern Hawaiian Islands Sub-area.

> (i) Hoomalu Zone means that portion of the EEZ around the NWHI west of 165°W longitude.
>
> (ii) Mau Zone means that portion of the EEZ around the NWHI between 161°20' W longitude and 165° W longitude.

(3) Hancock Seamount means that portion of the EEZ in the Northwestern Hawaiian Islands west of 180°00' W longitude and north of 28°00' N latitude.

As noted above, the proposed action will not affect the groundfish resources of the Hancock Seamount, and that sub-area will not be considered further in this document.

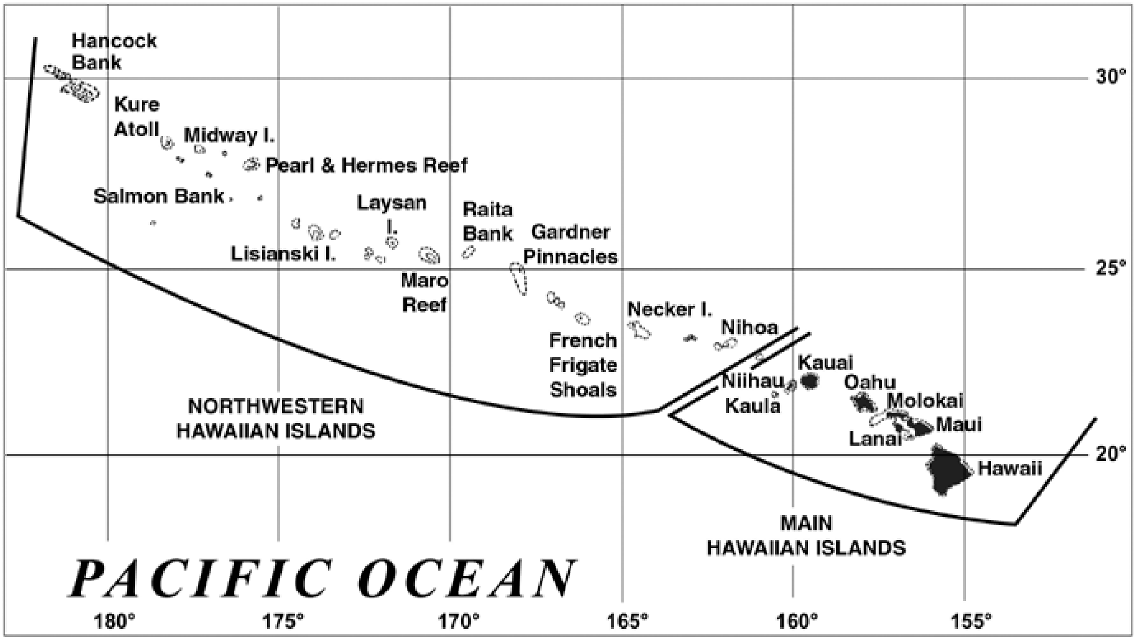

Figure 2: The Hawaiian Archipelago.

3.2 Oceanographic Setting

The ocean is a three-dimensional medium stratified vertically in terms of light penetration, temperature, nutrient concentrations, and concentrations of dissolved oxygen. Toward the surface is the photic zone, the waters that receive the sun's light. In Hawaii, this zone extends as deep as about 100 meters (55 fm). Surface waters are mixed by the wind creating a chemically homogeneous layer varying from about 120 meters (66 fm) deep in winter to perhaps 30 meters (16 fm) deep in summer. Below this mixed layer is a zone of rapidly decreasing temperature called the thermocline. Below the thermocline, temperature decreases gradually to the bottom. Primary production by phytoplankton and benthic macroalgae consumes nutrients in the photic zone, resulting in low ambient nutrient concentrations in the mixed layer. As organisms die and sink out of the photic zone and through the thermocline, decomposition produces inorganic nutrients while consuming oxygen. Thus, the surface mixed layer is low in nutrients but high in oxygen, whereas the reverse is true below the thermocline.

The BMUS occupy habitat within and below the photic zone and mixed layer, although the species of most concern, onaga and ehu, tend to occupy waters deeper than 150 meters (82 fm). Typically, metabolic processes are slow in such deep waters with low oxygen concentrations. Top carnivores in this cold, dark, relatively low-energy environment tend be long-lived, with slow growth rates and delayed reproductive maturity. Such is generally the case for deep-slope bottomfish, which makes them more susceptible to overfishing.

3.2.1 Currents and Eddies

The depth of the thermocline (middle layer of the ocean where differences in water temperature inhibit mixing with the surface layer) varies greatly over the ocean, setting up gradients in water density and pressure that result in large-scale water movements called geostrophic currents. In the North Pacific Ocean the geostrophic currents form a large, basin-scale, clockwise movement called the North Pacific Subtropical Gyre (NPSG), centered at about 28°N. At the latitude of Hawaii, circulation is roughly east to west, reinforcing the wind-driven surface currents. Between about 18°N and 22°N, the currents are strongly influenced by the islands. According to Juvic and Juvic (1998):

> The North Equatorial Current (NEC) forks at Hawaiʻi Island; the northern branch becomes the North Hawaiian Ridge Current (NHRC) and intensifies near the islands with a typical width of 65 miles (100 km) and speed of 0.5 knots (25cm/s). West of the islands, two elongated circulations appear. A clockwise circulation is centered at 19°N, merging to the south with the southern branch of the NEC. A counterclockwise circulation is centered at 20°30'N. Between them is the narrow Hawaiian Lee Countercurrent (HLCC), extending in longitude from 170°W to 158°W. Surface currents over the western islands and northeast of the NHRC are variable, and their average is smaller than can be estimated from existing data.

Within the NPSG, the westward flowing northern edge of the NEC grazes the Hawaiian Islands, mainly near the Big Island. The NHRC can be thought of as a small part of the NEC that turns northwest to flow along the windward side of the chain instead of turning southwest to pass south of Hawaii Island. Ten years of shipboard acoustic Doppler current profiler data collected by NOAA shows a mean westward flow of the NHRC through the ridge between Oahu and Nihoa, and extending along the lee side of Nihoa and Necker to depths from 20 to 250 m (E. Firing, UH-SOEST, personal communication).

The Subtropical Counter Current (STCC) is an eastward flowing surface current found typically along 24°N from 130°E to 160°W. The eastward flowing HLCC is generally located along 20°N and extends from about 150°E to just west of the Hawaiian Islands (Kobashi and Kawamura 2002). The formations of the STCC and HLCC have recently been attributed to the "wake effect" that results from the combination of the westward trades winds blowing over the Hawaiian Archipelago.[14]

Generally within the lee of the archipelago there are an abundance of mesoscale eddies created from a mixture of wind, current, and sea floor interactions. The eddies, which can rotate either clockwise or counter clockwise, have important biological impacts, and likely play an important role in larval transport (E. Firing, UH-SOEST, personal communication). Eddies create vertical fluxes, with regions of divergence (upwelling) where the thermocline shoals and deep nutrients

[14] http://science.nasa.gov/headlines/y2002/10apr_hawaii.htm

are pumped into surface waters enhancing phytoplankton production, and also regions of convergence (downwelling) where the thermocline deepens.

3.2.2 Productivity Trends

Most oceanic food webs (excluding, for example, those around volcanic vents) depend on primary producers (phytoplankton and macroalgae) to convert inorganic nutrients and the sun's energy into organic compounds that are then consumed and incorporated at successively higher trophic levels. Growth rates of primary producers may be limited by the availability of light or the lack of essential nutrients. Most often in the sea, the limiting factor is the availability of nitrogen. A deep and strong thermocline is an effective barrier to the transport of inorganic nitrogen to surface waters. Climatological cycles, winds and currents, as noted above, can greatly affect the depth of the thermocline and the rate of nutrient recharge. These events and cycles may be quite transitory, with annual or longer duration, such as the El Niño–Southern Oscillation, or even longer. For example, Polovina et al. (1994) showed that decadal-scale climate changes resulted in changes in the mixed layer depth and ultimately changes in productivity of the entire ecosystem in the North Pacific Ocean. Productivity changes at all trophic levels in the NWHI varied by 30 to 50 percent as a result of this documented decadal-scale climate cycle. Thus, it is important to understand that the "carrying capacity" of the environment, or potential productivity of an ecosystem, is dynamic and may fluctuate considerably in response to oceanographic conditions as mediated by climatological cycles and events. In terms of bottomfish resources, these cycles may be expressed as variability in stock size, recruitment, growth rates, or other factors. The relationship of climate change (e.g. Pacific Decadal Osscillation) on bottomfish producitivity in the MHI is not well understood and requires further research in order to be taken into account by fishery managers.

3.3 The Hawaiian Archipelago's Deepwater Bottomfish

3.3.1 Habitat Requirements

Based on information in the 2005 FSEIS, commercially important deepwater bottomfish inhabit the deep slopes of island coasts and banks at depths of 100 to 400 meters (55 to 218 fm). The distribution of adult bottomfish in the region is correlated with suitable physical habitat. Because of the volcanic nature of the islands within the region, most bottomfish habitat consists of steep-slope areas on the margins of the islands and banks. The habitat of the six most important bottomfish species tend to overlap to some degree, as indicated by the depth ranges where they are caught. Within the overall depth range, however, individual species are more common at specific depths. Thus, depth alone may not indicate satisfactory habitat, and both the quantity and quality of habitat at depth are important. Bottomfish are typically distributed in a nonrandom patchy or discontiguous pattern, reflecting bottom topography and oceanographic conditions. Much of the habitat within the depths of occurrence of bottomfish is a mosaic of sandy low-relief areas and rocky high-relief areas. An important component of the habitat for many bottomfish species appears to be the association of high-relief areas with water movement. In the Hawaiian Islands and at Johnston Atoll, bottomfish density has been shown to be correlated with areas of high relief and current flow (Haight 1989; Haight et al. 1993a; Ralston et al. 1986). Although the water depths utilized by bottomfish may overlap somewhat, the available resources may be partitioned by species-specific behavioral differences. In a study of the feeding habitats of the commercial bottomfish in the Hawaiian Archipelago, Haight et al. (1993b) found that ecological competition between bottomfish species appears to be minimized through species-specific habitat utilization. Species may partition the resource through depth and time of feeding activity, and through different prey preferences. Although deepwater snappers are generally thought of as top-level carnivores, several snapper species in the Pacific are known to incorporate significant amounts of zooplankton in their diets (Haight et al. 1993b).

Cooperative studies by the DLNR, the University of Hawaii, and NOAA, using submersibles and remotely operated vehicles, are investigating, among other things, bottomfish habitat. Results indicate that the preferred habitat for the snapper species consists of hard substrate with a relatively large number of holes and crevices that serve as shelter for smaller fish and shrimp on which onaga and ehu are presumed to feed[15]. In pinnacle habitats in particular, the abundance of small fish and invertebrates is similar to, if not greater than, that observed on shallow water coral reef habitats. Onaga and ehu, as well as their potential prey species, were found to be absent over sand substrates as well as hard substrates with few holes. The presence of one species of potential prey fish, longtailed slopefish (*Symphysanodon maunaloae),* appears to be highly correlated with the presence of ehu and onaga. Several potential competitor species have also been also observed in these habitats including the hogo (*Pontinus macrocephalus*), moray eels (*Gymnothorax berndti* and *G. nuttingi*), kalekale (*Pristipomoides sieboldii*), and the hāpuʻupuʻu (*Epinephelus quernus*). Juvenile onaga and ehu were found in an area of small, low carbonate (limestone) features scattered over an otherwise sandy bottom. Unlike juvenile ʻōpakapaka, which have been found to occupy shallower depths than adults, juvenile onaga and ehu have been found to occupy the same depths as adults.

3.3.1.1 Essential Fish Habitat and Habitat Areas of Particular Concern

The MSA identifies essential fish habitat (EFH) as those waters and substrate necessary to fish for spawning, breeding, feeding, and growth to maturity. This includes the marine areas and their chemical and biological properties that are utilized by the organism. Substrate includes sediment, hard bottom, and other structural relief underlying the water column along with their associated biological communities. As part of Amendment 6 to the Bottomfish FMP, the Council designated EFH for bottomfish MUS that were approved by NMFS in 1999 (64 FR 19068; April 19, 1999).

In addition to and as a subset of EFH, the Council described habitat areas of particular concern (HAPC) based on the following criteria: ecological function of the habitat is important, habitat is sensitive to anthropogenic degradation, development activities are or will stress the habitat, and/or the habitat type is rare.

In considering the potential impacts of a proposed action on EFH, all designated EFH must be considered. Thus, the designated areas of EFH and HAPC for all Council FMPs are shown in Table 4.

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[15] Information found at: http://www.nurp.noaa.gov/Spotlight/HI_bottomfish.htm

Table 4: EFH and HAPC for all Western Pacific FMPs.

FMP	EFH (Juveniles and Adults)	EFH (Eggs and Larvae)	HAPC
Pelagics	Water column down to 1,000 meters (547 fm)	Water column down to 200 meters (109 fm)	Water column above seamounts and banks down to 1,000 meters 547 fm)
Bottomfish and Seamount Groundfish	**Bottomfish:** Water column and bottom habitat down to a depth of 400 meters (219 fm) Seamount groundfish: (adults only) water column and bottom from 80 to 600 meters (44 to 328 fm)	**Bottomfish:** Water column down to a depth of 400 meters (218 fm) Seamount groundfish: (including juveniles) epipelagic zone (0 to 200 nm offshore)	**Bottomfish:** All escarpments and slopes between 40–280 meters (22 to 153 fm), and three known areas of juvenile ‘ōpakapaka habitat Seamount groundfish: not identified
Precious Corals	Keahole Point, Makapuu, Kaena Point, Westpac, Brooks Bank, 180 Fathom Bank deepwater precious coral (gold and red) beds, and Milolii, Auau Channel, and S. Kauai black coral beds	NA	Makapuu, Westpac, and Brooks Bank deepwater precious corals beds and the Auau Channel black coral bed
Crustaceans	Bottom habitat from shoreline to a depth of 100 meters (55 fm)	Water column down to 150 meters (82 fm)	All banks within the NWHI with summits less than 30 meters (16 fm)
Coral Reef Ecosystems	Water column and benthic substrate to a depth of 100 meters (55 fm)	Water column and benthic substrate to a depth of 100 meters (55 fm)	All MPAs identified in FMP, all PRIAs, many specific areas of coral reef habitat (see FMP)

All areas are bounded by the shoreline and the outer boundary of the EEZ, unless otherwise indicated. Source: Amendment 6 to the Bottomfish FMP.

3.3.2 Management Unit Species

3.3.2.1 Bottomfish Management Unit Species

The bottomfish fisheries in the region target an assemblage of species from the taxonomic groups: Lutjanidae (snappers), Serranidae (groupers), Carangidae (jacks), and Lethrinidae (emperors). Table 5 presents the list of bottomfish management unit species (BMUS) designated under the Bottomfish FMP.

Table 5: Bottomfish Management Unit Species

Common Name	Local Name	Scientific Name
Snappers		
Silver jaw jobfish	*Lehi* (H); *palu-gustusilvia* (S)	*Aphareus rutilans*
Grey jobfish	*Uku* (H); *asoama* (S)	*Aprion virescens*
Squirrelfish snapper	*Ehu* (H); *palu-malau* (S)	*Etelis carbunculus*
Longtail snapper	*Onaga*, *ulaula* (H); *palu-loa* (S)	*Etelis coruscans*
Blue stripe snapper	*Ta'ape* (H); *savane* (S); *funai* (G)	*Lutjanus kasmira*
Yellowtail snapper	Yellowtail, *kalekale* (H); *Palu-i Iusama* (S)	*Pristipomoides auricilla*
Pink snapper	*'Ōpakapaka* (H); *palu-tlena lena* (S); *gadao* (G)	*Pristipomoides filamentosus*
Yelloweye snapper	Yelloweye *'ōpakapaka*, *kalekale* (H); *Palusina* (S)	*Pristipomoides flavipinnis*
Snapper	*Kalekale* (H)	*Pristipomoides sieboldii*
Snapper	*Gindai* (H,G); *palu-sega* (S)	*Pristipomoides zonatus*
Jacks		
Giant trevally	White *ulua* (H); *tarakito* (G); *sapo-anae* (S)	*Caranx ignoblis*
Black jack	Black *ulua* (H); *tarakito* (G); *tafauli* (S)	*Caranx lugubris*
Thick lipped trevally	*Pig ulua*, *butaguchi* (H)	*Pseudocaranx dentex*
Amberjack	*Kāhala*	*Seriola dumerili*
Groupers		
Blacktip grouper	*Fausi* (S); *gadau* (G)	*Epinephelus fasciatus*
Sea bass	*Hāpu'upu'u* (H)	*Epinephelus quernus*
Lunartail grouper	*Papa* (S)	*Variola louti*
Emperors		
Ambon emperor	*Filoa-gutumumu* (S)	*Lethrinus amboinensis*

Redgill emperor	*Filoa-paloomumu* (S); *mafuti* (G)	*Lethrinus rubrioperculatus*
Seamount groundfish		
Alfonsin		*Beryx splendens*
Raftfish/butterfish		*Hyperoglyphe japonica*
Armorhead		*Pseudopentaceros richardsoni*

Note: G = Guam; H = Hawaii; S = American Samoa.

Relatively little is known about the reproduction and early life history of deepwater bottomfish in the region. Spawning occurs over a protracted period with peaks from July to September (Haight et al. 1993b). The eggs are released directly into the water column and hatch in three to four days. The planktonic larval phase is thought to last at least 25 days (Leis 1987) and for some species this phase may be considerably longer. For example, the pelagic stage for ‘ōpakapaka is believed to last as long as six months (Moffitt and Parrish 1996). Experimental work at the Hawaii Institute of Marine Biology found that ‘ōpakapaka eggs incubated at temperatures characteristic of adult habitat did not hatch, but those incubated in water at surface temperatures hatched and were reared for up to four months (C. Kelly, HURL, personal communication). This indicates that surface currents or eddies could play an integral role in the dispersal of some bottomfish larvae.

Larval advection simulation research indicates that larval exchange may occur throughout the Hawaiian Archipelago and that the amount of larval exchange between the NWHI and the MHI is correlated with the duration of the larval phase, with the highest larval exchange occurring with the longest larval phase durations (Kobayashi 1998). The direction of larval exchange is subject to oceanographic circulation patterns as well as large-scale temperature or climate variation, leading to oceanographic regime shifts of different scales (e.g., El Niño, the Pacific Decadal Oscillation). Many such oceanographic events and their resultant impacts to marine ecosystems have been described, including impacts to Pacific pelagic species (Polovina et al. 2001) and other Pacific fisheries including the Hawaiian lobster fishery (Polovina 2005). Data on actual larval exchange rates between the MHI and NWHI are lacking. Preliminary research indicates that genetic connectivity does exist between MHI and NWHI bottomfish species.

Little is known of the life history of the juvenile fish after settling out of the plankton, but research on ‘ōpakapaka (*P. filamentosus)* indicates the juveniles utilize nursery grounds well away from the adult habitat (Parrish 1989). Most of the target species have a relatively high age at maturity, long life span, and slow growth rate. These factors, combined with considerable variation in larval recruitment, make these species more susceptible to overfishing (Haight et al. 1993a).

3.3.2.2 The Deep 7 Species

The Hawaiian Archipelago bottomfish fisheries target bottomfish species and species complexes at characteristic depths. At shallow depths (surface to 40 fm) uku are fished while drifting or slowly trolling over relatively flat bottom. Deeper water species complexes (e.g., ‘ōpakapaka at 40 to 120 fm; onaga at 80 to 150 fm) are found along high-relief, deep slopes and are fished with a different method, vertical handline. In 1998, the State established bottomfish management regulations focused on seven of these deepwater species: onaga, ehu, kalekale, ‘ōpakapaka, gindai, lehi, and hāpu‘upu‘u. These are termed the “Deep 7.” All but hāpu‘upu‘u are snappers. The paragraphs below are drawn from the 2005 FEIS and briefly summarize information regarding the Deep 7 species.

Onaga: Large specimens of onaga will reach at least three feet in length and weigh up to 30 pounds. They inhabit deep, rocky bottoms offshore and are known to occur between 80 and 250 fathoms (fm). Onaga are commonly caught off the bottom or in areas of steep drop-offs, ledges, and pinnacles. Onaga feed on small fishes, squids, and crustaceans, and are thought to reach sexual maturity at about 21 inches and five pounds, at approximately five years of age. Females with ripe ovaries have been reported during August and September. Onaga are distributed throughout the Indo-Pacific region.

Ehu: Adult ehu will reach a length of at least 24 inches and a weight of up to about 12 pounds. They inhabit deeper offshore water beyond the reef, mainly occurring over rocky bottoms, usually between 80 and 218 fathoms. They feed on fishes and larger invertebrates such as squids, shrimps, and crabs, and reach sexual maturity at about 11.7 inches fork length, or one pound in weight, at approximately three years of age. Ehu, or ‘ula ‘ula, were determined to spawn in the NWHI from July – September in a study by Everson (1984). Ehu are distributed throughout the Indo-Pacific region.

Kalekale: Large specimens of kalekale can reach up to 24 inches in length and six pounds. Commonly, they are found at around 12 inches in length. They inhabit deeper offshore water beyond the reef, occurring over rocky bottoms usually between 40 and 200 fathoms. They feed on fish, shrimps, crabs, polychaetes, cephalopods, and urochordates. Fish of 14 inches fork length are approximately two pounds in weight and five years of age. Kalekale are distributed throughout the Indo-Pacific region.

‘Ōpakapaka: Large specimens will reach a length of at least three feet and weigh up to about 20 pounds, with a maximum known age of 18 years. They inhabit deeper offshore water beyond the reef, occurring over rocky bottoms, usually between 40 and 120 fathoms. Fish apparently migrate into shallower depths near 40 fathoms at night. They feed on small fishes, squids, shrimps, crabs, pyrosomes, and zooplankton. Sexual maturity is reached at about 1.8 years and they generally spawn at about 2.2 years (1.5 pounds, 13 inches fork length). Their spawning season in the NWHI was determined in a 1980 study to be from June – December with peak spawning in August (Kikkawa 1980).

In 1989, Henry Okamoto, Hawaii Division of Aquatic Resources, initiated a tagging study to evaluate the growth and movement of deepwater species, particularly ‘ōpakapaka. Between 1989 and 1994, 4,240 ‘ōpakapaka and other bottomfish were tagged using surgically placed anchor tags with stiff nylon streamers. Fishermen have since recaptured and reported 397 ‘ōpakapaka between 1989 and 2003. The majority of tagged ‘ōpakapaka were caught from the same island complex as their release site, but a small number were caught from island complexes different from where they were released. Thus, the study suggests that ‘ōpakapaka are able to move between islands, and cross channels, with water depths of 1,400 fathoms or less. Interisland crossing of ‘ōpakapaka tagged and recaptured include fish that moved from Oahu to Molokai (22 nautical miles, depths exceeding 300 fathoms), Oahu to Kauai (60 nautical miles, depths exceeding 1,400 fathoms) and Maui to the Big Island (27 nautical miles, depths exceeding 1,000 fathoms). ‘Ōpakapaka are distributed throughout the Indo-Pacific region.

Gindai: Gindai will reach up to 20 inches in length and six pounds in weight. They inhabit deeper offshore water beyond the reef, occurring over rocky bottoms, usually between 60 and 130 fathoms. They feed on fishes, shrimps, crabs, cephalopods, and other invertebrates. Gindai are distributed throughout the Indo-Pacific region.

Lehi: Large lehi specimens will reach a length of at least three feet and weigh up to about 30 pounds. They inhabit reefs and rocky bottom areas usually between 60 and 100 fathoms. They feed on fish, squid, and crustaceans. Lehi are distributed throughout the Indo-Pacific region.

Hāpu‘upu‘u: This grouper reaches lengths of up to four feet and weighs up to 60 pounds. They occur in waters 11 to 208 fathoms deep. They feed mainly on fish and crustaceans. The hāpu‘upu‘u is endemic to the Hawaiian Islands and Johnston Island.

3.3.3 Status of the Stocks

3.3.3.1 Spawning Potential Ratio

Amendment 3 to the Bottomfish FMP defines recruitment overfishing as a condition in which the ratio of the spawning stock biomass per recruit at the current level of fishing to the spawning stock biomass per recruit that would occur in the absence of fishing (termed spawning potential ratio, or SPR) is equal to or less than 20 percent. Given the scarcity of data, and using the best available information, the Council previously used SPR as a proxy for maximum sustainable yield (MSY). The 1996 reauthorization of the MSA by the Sustainable Fisheries Act (SFA) contained new requirements for monitoring potential overfishing.

However, the Council, NMFS and the State have amassed 18 years of SPR data for the Hawaiian Archipelago bottomfish fisheries, and the values are useful to illustrate of the status of the bottomfish stocks in the three Hawaii management zones. Although no longer used to judge whether a stock is overfished under the FMP, SPRs are still calculated and monitored for Hawaiian BMUS and incorporated in the control rules as a species-specific, secondary layer of precaution. SPR for each species is calculated as the product of two ratios:

$$SPR = (CPUE_{current} / CPUE_{virgin}) \times (\%\ Mature_{current} / \%\ Mature_{virgin}) \times 100.$$

For the MHI, species-specific CPUE values (targeted CPUEs) can be estimated. To calculate targeted CPUEs, Moffitt et al. (2006) screened the catch data to include only trips on which at least 50 percent of the catch is of the targeted species and use only these trips to calculate CPUE. Targeted CPUE values for opakapaka, onaga, ehu, and uku were calculated. Targeted trips for other species were either not present or infrequent in the data. Partial CPUE values, computed by dividing the landings for each species by the total effort for the entire complex, were used in the above equation if targeted CPUE values could not be estimated. SPR contribution values are calculated for each management zone separately, which are then combined into an archipelagic value in an additive fashion using management zone weighting factors (Wt) based on the relative length of the 100-fathom contour within the zone:

$$SPR_{Archipelago} = (SPR_{MHI} \times Wt_{MHI}) + (SPR_{Mau} \times Wt_{Mau}) + (SPR_{Ho'omalu} \times Wt_{Ho'omalu})$$

The positive weighting factors add up to 1.0. Table 6 displays archipelagic estimates of SPR for each of the five major BMUS species: opakapaka, onaga, ehu, uku, and hapu’upu’u and Figure 3 shows these trends graphically.

For further details see Moffitt et al. (2006).

Table 6: Annual Archipelago SPR Estimates for Five Major BMUS

Year	Ehu	Hāpu‘upu‘u	Onaga	‘Ōpakapaka	Uku
1986	41	55	53	51	58
1987	61	71	61	69	65
1988	37	56	42	49	62
1989	51	70	38	69	68
1990	44	57	36	57	52
1991	44	58	42	57	53
1992	51	67	41	68	61
1993	54	65	53	67	73
1994	38	51	39	53	52
1995	41	48	33	54	56
1996	43	49	39	52	57
1997	42	49	25	52	51
1998	38	44	22	47	50
1999	37	47	34	46	55
2000	39	49	27	52	52
2001	40	51	26	51	48

Year	Ehu	Hāpu‘upu‘u	Onaga	‘Ōpakapaka	Uku
2002	37	45	26	47	45
2003	36	50	31	48	43
2004	36	44	28	43	42
M	43	54	37	54	55
SD	7	9	11	8	8

Source: 2003 Bottomfish Annual Report, WPRFMC 2005b.

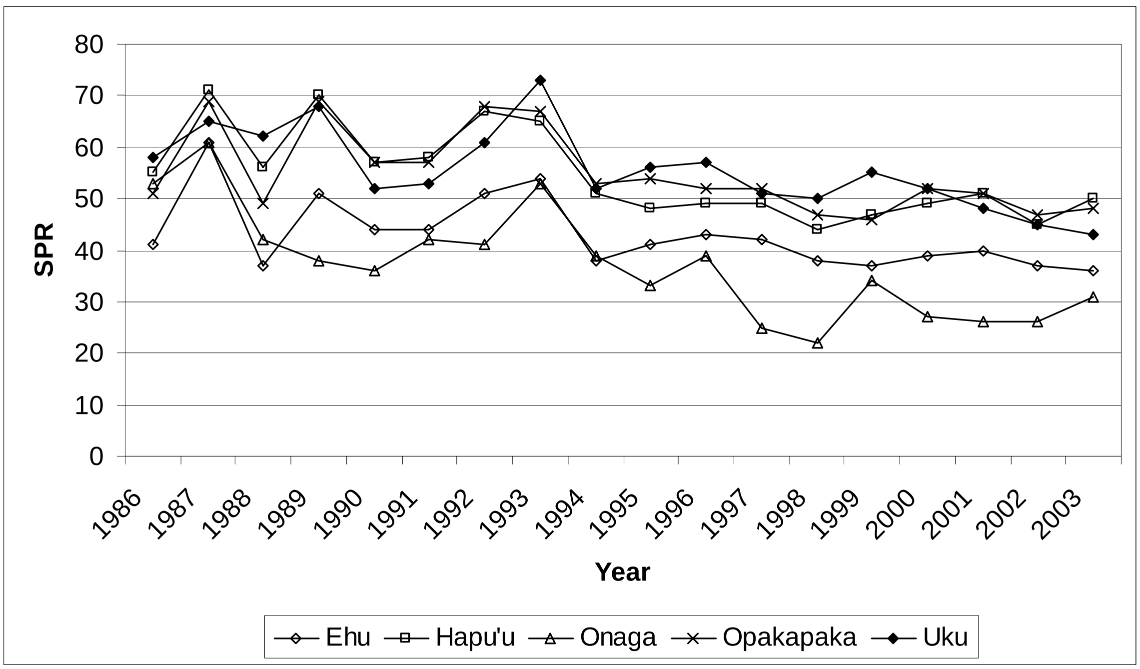

Figure 3: SPR Trends by BMUS Stock.
Source: 2003 Bottomfish Annual Report, WPRMC 2005c.

While the bottomfish populations may be genetically connected throughout the archipelago, localized depletion of stocks in the MHI has been apparent for the past decade (WPRFMC 2005b). Table 7 provides a breakdown of the above SPR ratios for the three Hawaii zones using aggregate CPUE. With the exception of onaga in the Hoomalu Zone, all of the NWHI SPRs are above 50 percent. In the MHI, however, the SPRs are substantially lower, with the onaga SPR at around 10 percent.

Table 7: 2003 SPRs (%) by BMUS Stock by Zone.

Zone	Ehu	Hāpu'upu'u	Onaga	'Ōpakapaka	Uku
MHI	26	29	9	21	26
Mau	58	61	53	57	58
Hoomalu	62	63	46	62	63

Source: WPRMC 2005b.

3.3.3.2 Overfishing Criteria

Reauthorization of the MSA included additional requirements for the quantification of fish stock status with respect to overfishing. The MSA seeks to ensure long-term fishery sustainability by halting or preventing overfishing, and by rebuilding any overfished stocks. Overfishing occurs when fishing mortality (F) is higher than the level which produces MSY, defined as the maximum long-term average yield that can be produced by a stock on a continuing basis. A stock is deemed to be overfished when stock biomass (B) has fallen to a level substantially below the biomass producing MSY. There are two indicators that managers must monitor to determine the status of a fishery: the level of F in relation to F at MSY (F_{MSY}), and the level of B in relation to B at MSY (B_{MSY}).

The National Standard Guidelines (50 CFR §600.305 et. seq.) for National Standard 1 call for the development of control rules identifying "good" versus "bad" fishing conditions in the fishery and the stock, and describing how a variable such as F will be controlled as a function of some stock size variable such as B to achieve good fishing conditions. The MSY control rule is useful for specifying the required "objective and measurable criteria for identifying when the fishery is overfished." The National Standard Guidelines (50 CFR 600.310) refer to these criteria as "status determination criteria" and state that they must include two limit reference points or thresholds as follows: one for F that identifies when overfishing is occurring, and a second for B or its proxy that indicates when the stock is overfished. The status determination criterion for F is the maximum fishing mortality threshold (MFMT), and minimum stock size threshold (MSST) is the criterion for B. If fishing mortality exceeds the MFMT for a period of one year or more, overfishing is occurring. If stock biomass falls below MSST in a given year, the stock or stock complex is overfished. When the Council has been notified by the Secretary, through NMFS, that overfishing is occurring, the Council must take remedial action in the form of a new FMP, an FMP amendment, or proposed regulations to end the overfishing.

The National Standard guidelines state that the MFMT may be expressed as a single number or as a function of some measure of the stock's productive capacity, and that it "must not exceed the fishing mortality rate or level associated with the relevant MSY control rule" (50 CFR 600.310(d)(2)(i)). The guidelines further state that "to the extent possible, the MSST should equal whichever of the following is greater: one-half the MSY stock size, or the minimum stock size at which rebuilding to the MSY level would be expected to occur within 10 years if the stock or stock complex were exploited at the maximum fishing mortality threshold" (50 CFR 600.310(d)(2)(ii)). Although not required, warning reference points (e.g., B_{FLAG}) may be specified in advance of B or F approaching or reaching their respective thresholds. When such a reference point is reached, the Council may begin preparations for action to control F.

A target control rule specifies the relationship of F to B for a harvest policy aimed at achieving a given target. OY is one such target, and National Standard 1 requires that conservation and management measures both prevent overfishing and achieve OY on a continuing basis. OY is the yield that will provide the greatest overall benefits to the nation, and is defined on the basis of MSY, as reduced by any relevant economic, social, or ecological factor. MSY is therefore an upper limit for OY. A target control rule can be specified using reference points similar to those used in the MSY control rule, such as F_{TARGET} and B_{TARGET}. While MSST and MFMT are limits, the target reference points are guidelines for management action, not constraints. The technical guidance for National Standard 1 states that "Target reference points should not be exceeded more than 50 percent of the time, nor on average" (Restrepo et al. 1998).

A supplement to Amendment 6 of the Bottomfish FMP, approved by NMFS in 2003 (68 FR 46112; August 5, 2003), specified how the Council would comply with the new requirements of National Standard 1. Because of the paucity of data for all bottomfish species and island areas managed under the Bottomfish FMP, the Council's control rules and overfishing thresholds are specified for multi-species complexes. Standardized values of catch-per-unit-effort and fishing effort are used as proxies for biomass and fishing mortality, respectively. The stock status determination criteria are specified for those proxies using defaults recommended in the NMFS technical guidance for implementing National Standard 1.

The MSY control rule is specified as the MFMT. The MFMT and MSST are dependent on the natural mortality rate (M). In addition to the thresholds MFMT and MSST, a warning reference point, B_{FLAG}, is also specified at a point above the MSST to provide a trigger for consideration of management action prior to B reaching the threshold.

MFMT, MSST, and B_{FLAG} are specified as follows:

MFMT:	$F(B) = F_{MSY}B/cB_{MSY}$	for $B \leq cB_{MSY}$
	$F(B) = F_{MSY}$	for $B > cB_{MSY}$
MSST:	cB_{MSY}	
B_{FLAG}:	B_{MSY}	
	Where $c = \max(1 - M, 0.5)$	

Standardized values of fishing effort (E) and catch per unit effort (CPUE) are used as proxies for F and B, respectively, so E_{MSY}, $CPUE_{MSY}$, and $CPUE_{FLAG}$ are used as proxies for F_{MSY}, B_{MSY}, and B_{FLAG}, respectively. In cases where reliable estimates of $CPUE_{MSY}$ and E_{MSY} are not available, they are estimated from catch and effort time series, standardized for all identifiable biases. In Hawaii, archipelago-wide estimates of the reference points are calculated as the weighted averages of estimates for each of the three management zones.

A secondary set of reference points is specified to evaluate stock status with respect to recruitment overfishing. A secondary "recruitment overfishing" control rule is specified to control fishing mortality with respect to that status. The rule can be applied only to those component stocks (species) for which adequate data are available. The ratio of a current spawning stock biomass proxy ($SSBP_t$) to a given reference level ($SSBP_{REF}$) is used to determine if individual stocks are experiencing recruitment overfishing. SSBP is CPUE scaled by percent mature fish in the catch. When the ratio $SSBP_t/SSBP_{REF}$, or the "SSBP ratio" (SSBPR) for any species drops below a certain limit ($SSBPR_{MIN}$), that species would be considered to be recruitment overfished and management measures would be implemented to reduce fishing mortality on that species, regardless of the effects on other species within the stock complex. The rule would apply only when the SSBPR drops below the $SSBPR_{MIN}$, but it would continue until the ratio achieves the "SSBPR recovery target" ($SSBPR_{TARGET}$), which would be set at a level no less than $SSBPR_{MIN}$. These two reference points and their associated recruitment overfishing control rule, which prescribes a target fishing mortality rate ($F_{RO-REBUILD}$) as a function of the SSBP ratio, are as specified below, with E_{MSY} used as a proxy for F_{MSY}.

$F_{RO-REBUILD}$: $F(SSBPR) = 0$ for $SSBPR \leq 0.10$

$F(SSBPR) = 0.2F_{MSY}$ for $0.10 < SSBPR \leq SSBPR_{MIN}$
$F(SSBPR) = 0.4F_{MSY}$ for $SSBPR_{MIN} < SSBPR \leq SSBPR_{TARGET}$

$SSBPR_{MIN}$: 0.20
$SSBPR_{TARGET}$: 0.30

Reference values for biomass and fishing mortality are needed for application of the control rules. Because estimates of biomass and fishing mortality are not available for any of the areas involved, proxies of CPUE and effort at MSY, respectively, are used to establish reference values. The current values for CPUE and E are compared to the reference values and their ratio determines the current status of the fishery relative to control rule thresholds. The best available reference value estimates are used. Refinement of reference value estimates and standardization of catch and effort data for the bottomfish fishery are ongoing activities and the 2005 and 2006 stock assessments are described below.

3.3.3.3 2005 Stock Assessment

In 2005 NMFS' PIFSC conducted a stock assessment on Hawaiian archipelagic bottomfish stocks using commercial fisheries data through 2003. This assessment concluded there was excess fishing mortality for the archipelago as a whole.

The status of stocks control rule contained in the Bottomfish FMP uses reference values to establish thresholds that are determined by the ratio of current year values of CPUE and effort compared to reference values (Bottomfish Amendment 6 Supplement, 2003) as described in Section 3.3.3.2. The MFMT is set at the effort achieving MSY, such that overfishing is determined to be occurring when the current year effort ratio is greater than 1.0. The biomass threshold, MSST, is defined as 1.0 minus natural mortality. Natural mortality for species of the bottomfish complex is largely unknown, therefore, estimates are used. Various sources report natural mortality estimates ranging from 0.30 to 0.90. The precautionary value of 0.30 was selected for the purpose of establishing the MSST. The resulting MSST is 0.70.

A three parameter model was fit to the NWHI daily CPUE and the MHI per trip CPUE time series with parameters of intrinsic rate of increase, r; Mau Zone carrying capacity, k; and MHI catchability, q. NWHI q values used in the model were based on standardized estimates obtained from a research depletion study carried out in the Commonwealth of the Northern Mariana Islands (CNMI). A four-step pattern of MHI q was used to simulate changes in catchability expected from changes in technology and experience of MHI fishermen. Carrying capacity values for the Hoomalu Zone and MHI were based on the Mau Zone k adjusted by relative length of 100-fathom contour for the zones.

The status of the stocks for the Hawaiian archipelago as a whole and its three management areas for the year 2003 is presented in Table 8. Although landings and CPUE values are determined for the three sub-management areas, the National Standard 1 assessment of the bottomfish complex is evaluated at the archipelagic level.

Table 8: Status of Stocks Parameters for the Hawaiian Archipelago, Data Through 2003.

ZONE	CPUE RATIO (2003 VALUE/ MSY VALUE)	EFFORT RATIO (2003 VALUE/ MSY VALUE)
Threshold	Above 0.7	Below 1.0
Hawaiian Archipelago (all areas combined)	0.82	1.13
MHI	0.47	1.88
Mau Zone	1.01	0.96
Hoomalu Zone	1.13	0.39

Source: Kobayashi and Moffitt 2005.

Under MSA National Standard 1 guidelines, the Hawaiian archipelagic bottomfish multi-species stock complex was not overfished since the biomass standard using the CPUE ratio was 0.82, above the threshold value of 0.7 established as the MSST. However, overfishing using the fishing effort ratio was occurring for the archipelago when evaluated as a whole since the 2003 effort ratio was 1.13, above the threshold value of 1.0 established as the MFMT.

The Secretary of Commerce informed the Council on May 27, 2005 that according to MSA National Standard 1 guidelines and the associated reference points adopted by the Council, the bottomfish multi-species stock complex in the Hawaiian Archipelago was experiencing overfishing. The NMFS Regional Administrator for the Pacific Islands Region provided formal notice to this on June 14, 2005 (70 FR 34452; June 14, 2005). NMFS determined that “the MHI is the zone that contributes most of the problems in terms of both reduced biomass and overfishing." The Regional Administrator further stated, "[t]herefore, it is likely that reducing fishing mortality here [MHI] would be the most effective means to end overfishing in the Hawaiian Archipelago" (70 FR 3442, June 14, 2005).

3.3.3.4 2006 Stock Assessment

During the development of this amendment, PIFSC conducted an updated stock assessment using one additional year's data [through 2004] (Moffitt et al. 2006, Appendix 2). This stock assessment employed the same dynamic production model approach with updated data. In the Hoomalu Zone and Mau Zone, the analysis used commercial fishery data (catch-per-day) from State of Hawaii commercial vessel logbooks and interview data for the 1988 to 2004 period. In the MHI, State of Hawaii commercial catch data for the 1948−2004 period were used. A simplified three-parameter dynamic production model was fit simultaneously to the three time series of catch data by nonlinear regression. The model used is similar to the one described by Kobayashi (1996). This approach reduces the number of fitted parameters by using outside information for some parameters and incorporating some shared parameters where applicable. It has been shown to be a useful approach for short time series involving geographically separate regions thought to have similar biological dynamics (Polovina 1989).

The 2006 stock assessment used the same basic equation for the dynamic production model (Moffitt et al. 2006) from Hilborn and Walters (1992) with a slight modification to the catch formula that prevents catch from exceeding population size at high levels of exploitation (Dr. Richard B. Deriso, Inter-American Tropical Tuna Commission, pers. comm.). For each management zone, zonal maximum sustainable yield (MSY) contribution (ZMC) reference points for the bottomfish fishery are calculated separately. Tables 9 and 10 provide the metrics which resulted from that model and which "indicate that MHI fishing mortality metrics are well above those of the other two zones and that excessive fishing pressure in the MHI is the major contributor to overfishing in the archipelago" (Moffitt et al. 2006). Figure 4 shows the trajectories of the MHI metrics.

Table 9: Dynamic Production Model Specifications for the 2006 Stock Assessment

Archipelagic Reference Values for Dynamic Production Model Parameters			
Model Parameter	**Reference Value**		
Carrying Capacity (k) [lbs]	7,131,473		
B_{MSY} [lbs]	3,565,736		
MSY [lbs]	811,225		
Zonal Model Outputs and Metrics			
Model Output/Metric	**MHI**	**Mau**	**Ho'omalu**
Catchability (q) [per day]	Period / q value: < 1961 0.000166; 1961–1984 0.000190; 1985–1991 0.000238; 1992–present 0.000285	0.000991	0.000262
Intrinsic Rate of Population Increase (r)	0.455011	0.455011	0.455011
Zonal Carrying Capacity Contribution [lbs]	3,186,215	882,608	3,062,650
Zonal MSY Contribution (ZMC) [lbs]	362,441	100,399	348,385
Biomass at ZMC [lbs]	1,593,107	441,304	1,531,325
$CPUE_{ZMC}$ [lbs per day]	405	437	400
E_{ZMC} [days]	895	230	870
Zonal Weighting Factors (proportion of archipelagic 100 fathom contour)	0.447	0.124	0.429

Source: Moffitt et al. (2006)

Table 10: Status of the Stocks Parameters in the Hawaiian Archipelago, Data Through 2004

ZONE	CPUE RATIO B STATUS (2004 VALUE/ MSY VALUE)	EFFORT RATIO F STATUS (2004 VALUE/ MSY VALUE)
Threshold	Above 0.7	Below 1.0
Hawaiian Archipelago (all areas combined)	0.79	1.22
MHI	0.42	2.11
Mau Zone	1.02	0.88
Hoomalu Zone	1.09	0.40

Source: Moffitt, et al. 2006

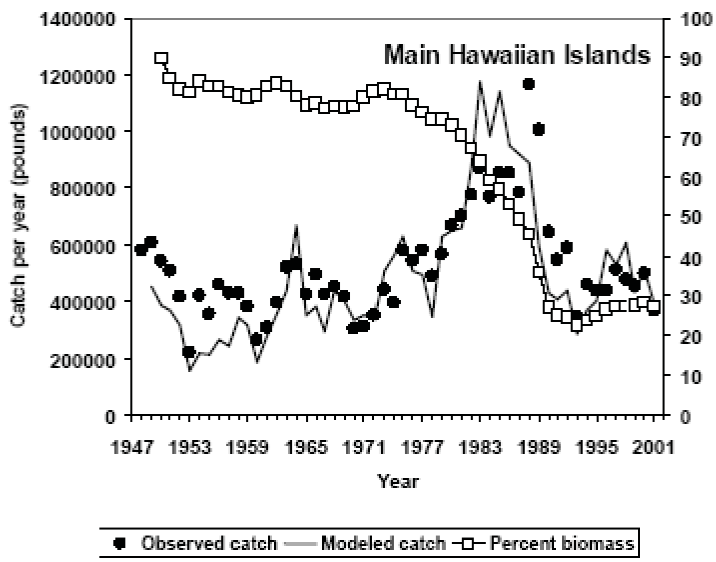

Figure 4: Trajectories of observed catch, modeled catch, and modeled percent of virgin biomass for aggregate BMUS stocks in the MHI
Source: Moffitt et al. (2006)

3.4 Fisheries

The deep-slope bottomfish fishery in Hawaii concentrates on species of eteline snappers, carangids, and a single species of grouper concentrated at depths of 30 to 150 fathoms (55 to 275 m). The fishery can be divided into two geographical areas (see Figure 1) as follows: 1) the inhabited MHI with their surrounding reefs and offshore banks; and 2) the NWHI, a chain of largely uninhabited islets, reefs and shoals extending 1,200 nautical miles across the North Pacific. Recent mapping has shown in the MHI, approximately 47 percent of the bottomfish habitat lies in State waters. Bottomfish fishing grounds within Federal waters (3 to 200 nm offshore) around the MHI include Middle Bank, most of Penguin Bank and approximately 45 nautical miles of 100-fathom bottomfish habitat in the Maui–Lanai–Molokai complex (Figure 5).

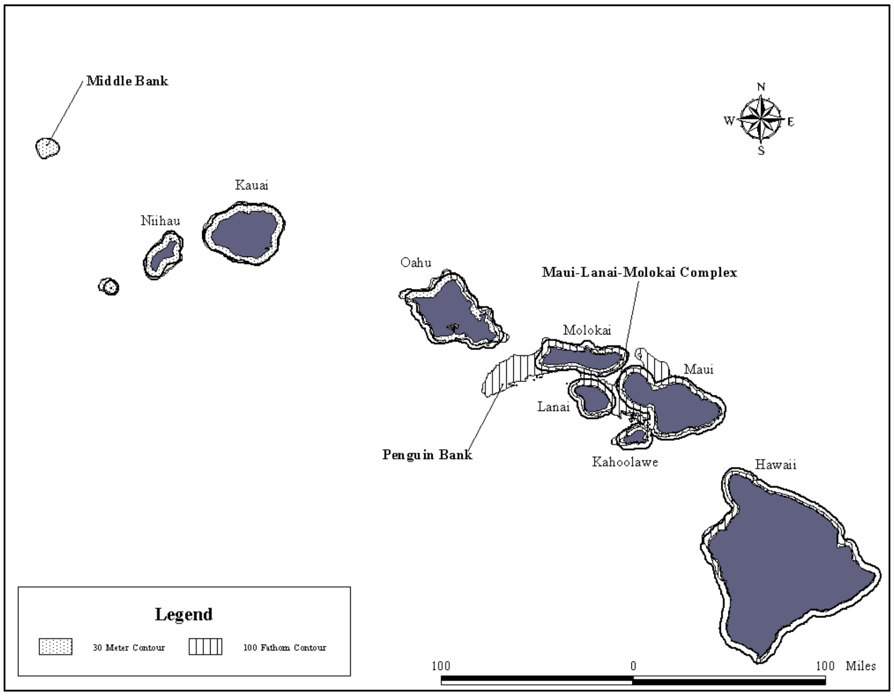

Figure 5: Bottomfish Habitat in the MHI.

Data from various surveys indicate that the importance of the MHI fishery varies significantly among fishermen of different islands. According to a 1987 survey of boat fishing club members, bottomfish represented roughly 13 percent of the catch of Hawaii fishermen, 25 percent of the catch of Oahu and Kauai fishermen, and 75 percent of the catch of Maui fishermen (Meyer Resources 1987). A survey of licensed commercial fishermen conducted about the same time indicated that the percentage of respondents who used bottomfish fishing methods was 25 percent on Hawaii, 28 percent on Kauai, 29 percent on Oahu, 33 percent on Lanai, 50 percent on Molokai, and 51 percent on Maui (Harman and Katekaru 1988). Presumably, the differences among islands relate to the proximity of productive bottomfish fishing grounds.

Oahu landings account for roughly 30 percent of the MHI commercial landings of the Deep 7 species from 1998 to 2004. Maui landings from the same time period represent 36 percent, with Hawaii, Kauai and Molokai/Lanai representing 18, 10 and 5 percent, respectively (Kawamoto and Tao 2005). Specific bottomfish fishing locales favored by fishermen vary seasonally according to sea conditions and the availability and price of target species. Historically, Penguin Bank is one of the most important bottomfish fishing grounds in the MHI, as it is the most extensive shallow shelf area in the MHI and within easy reach of major population centers. Penguin Bank is particularly important for the MHI catch of uku, one of the few bottomfish species available in substantial quantities to Hawaii consumers during summer months.

3.4.1 History

Bottomfish fishing was a part of the economy and culture of the indigenous people of Hawaii long before European explorers first visited the islands. Descriptions of traditional fishing practices indicate that Native Hawaiians harvested the same deep-sea bottomfish species as the modern fishery, and used some of the same specialized gear and techniques employed today (Iversen et al. 1990). The poo lawaia (expert fishermen) within the community knew of dozens of specific koa (fishing areas) where bottomfish could be caught (Kahaulelio 1902). As Beckley (1883) noted, each koa could be precisely located:

> Every rocky protuberance from the bottom of the sea for miles out, in the waters surrounding the islands, was well known to the ancient fishermen, and so were the different kinds of rock fish likely to be met with on each separate rock. [They] took their bearing for the purpose of ascertaining the rock which was the habitat of the particular fish they were after, from the positions of the different mountain peaks.

European colonization of the Hawaiian Islands during the early nineteenth century and the introduction of a cash economy led to the development of a local commercial fishery. As early as 1832, fish and other commodities were sold near the waterfront in Honolulu (Reynolds 1835). Other fish markets were established on the islands of Maui and Hawaii. John Cobb (1902), who investigated the Hawaiian Archipelago's commercial fisheries in 1900 for the U.S. Fish Commission, reported that the bottomfish ulaula, uku, and ulua were three of the five fish taken commercially on all the Hawaiian Islands.

Initially, the commercial fishing industry in Hawaii was monopolized by Native Hawaiians, who supplied the local market with fish using canoes, nets, traps, spears, and other traditional fishing devices (Cobb 1902; Jordan and Evermann 1902). However, the role that Native Hawaiians played in the Hawaiian Archipelago's fishing industry gradually diminished during the latter half of the nineteenth century as successive waves of immigrants of various ethnicities and nationalities arrived in Hawaii. Between 1872 and 1900, the non-indigenous population increased from 5,366 to 114,345 (Office of Hawaiian Affairs 1998). Kametaro Nishimura, credited by some to be the first Japanese immigrant to engage in commercial fishing in Hawaii, began his fishing career in the islands in 1885, harvesting bottomfish such as ʻōpakapaka, ulua, and uku (Miyasaki 1973). By the turn of the century, Japanese immigrants to Hawaii dominated the bottomfish fishery using wooden-hulled "sampans" propelled by sails or oars (Cobb 1902). The sampan was brought to Hawaii by Japanese immigrants during the late nineteenth century, and over time Japanese boat builders in Hawaii adapted the original design to specific fishing conditions found in Hawaii (Goto et al. 1983). The bottomfish fishing gear and techniques employed by the Japanese immigrants were imitations of those traditionally used by Native Hawaiians, with slight modifications (Konishi 1930).

During the early years of the commercial bottomfish fishery, vessels restricted their effort to areas around the MHI. Cobb (1902) recorded that some of the best fishing grounds were off the coast of Molokai and notes that large sampans with crews of four to six men were employed in the fishery. Typically, the fleet would leave Honolulu for the fishing grounds on Monday and return on Friday or Saturday. The fishing range of the sampan fleet increased substantially after the introduction of motor powered vessels in 1905 (Carter 1962). Fishing activity was occurring around the NWHI at least as early as 1913, when one commentator stated: “Fishing for *ulua* and *kāhala* is most popular, using *bonito* for bait, fishermen seek this [sic] species in a 500 mile range toward Tori-Jima [NWHI]” (Japanese Consulate 1913, as cited in Yamamoto 1970:107). Within a few years, more than a dozen sampans were fishing for bottomfish around the NWHI (Anon. 1924; Konishi 1930). Fishing trips to the NWHI typically lasted 15 days or more, and the vessels carried 7 to 8 tons of ice to preserve their catch (Nakashima 1934). The number of sampans traveling to the more distant islands gradually declined because of the limited shelter the islands offered during rough weather and the difficulty of maintaining the quality of the catch during extended trips (Konishi 1930). However, during the 1930s, at least five bottomfish fishing vessels ranging in size from 65 to 70 feet continued to operate in the waters around the NWHI (Hau 1984). In addition to catching bottomfish, the sampans harvested lobster, reef fish, turtles, and other marine animals (Iversen et al. 1990).

During World War II, the bottomfish fishery in Hawaii virtually ceased operations, but recommenced shortly after the war ended (Haight et al. 1993a). The late 1940s saw as many as nine vessels fishing around the NWHI. By the mid-1950s, vessel losses and depressed fish prices resulting from large catches had reduced the number of fishery participants. During the 1960s, only one or two vessels were operating around the NWHI.

There was renewed interest in harvesting the bottomfish resources of the NWHI in the late 1970s following a collaborative study of the marine resources of the region by State and Federal agencies (Haight et al. 1993a). The entry of several modern boats into the NWHI fishery and the resultant expanding supply of high-valued bottomfish such as ‘ōpakapaka and onaga made possible the expansion of the tourism-linked restaurant market by allowing a regular and consistent supply of relatively fresh fish (Pooley 1993a). Markets for Hawaii bottomfish further expanded after wholesale seafood dealers began sending fish to the U.S. mainland. By 1987, 28 vessels were active in the NWHI bottomfish fishery, although only 12 were fishing for bottomfish full-time. Some of the part-time vessels also engaged in the pelagic or lobster fisheries (Iversen et al. 1990). In 1989, the Council developed regulations that divided the fishing grounds of the NWHI bottomfish fishery into the Hoomalu Zone and Mau Zone. Limited access programs were established for the Hoomalu Zone and Mau Zone in 1988 and 1999, respectively, to avoid economic overfishing (Pooley 1993b; WPRFMC 1998b).

The 1970s also saw major changes in the composition and operations of the bottomfish fishery around the MHI. The fishery changed from one dominated in terms of catch and effort by a relatively small number of full-time professional fishermen to one dominated by hundreds of part-time commercial and non-commercial fishermen (NMFS 2003). This change was the result of a number of factors. The popularity of offshore fishing increased in Hawaii with the increase in the availability of both locally built and imported small fiberglass boats. In addition, the rise in fuel prices during the 1970s made fishing for bottomfish particularly attractive to fishermen as it consumed less fuel than trolling and generated higher-value fish catches to offset fuel costs. Finally, as navigation systems, bottom-sounders, and hydraulic or electric powered reels became more affordable, the skill level and experience necessary to fish bottomfish successfully was reduced and the labor associated with hauling up the lines was considerably lightened.

During the early 1980s, with the development of a much larger market for bottomfish, bottomfish fishermen fishing around the MHI were able to obtain premium prices for their catches, and thus were motivated to increase their landings (Pooley 1993a). However, the number of vessels participating in the MHI fishery declined after peaking at 583 in 1985. The decrease in fishing effort suggests that some bottomfish fishermen perceived a growing shortage of bottomfish in the MHI fishery and switched to other fisheries, particularly targeting pelagics. Currently, most fishermen landing bottomfish commercially switch between fisheries targeting seasonal abundance and market prices. Few fishermen target bottomfish exclusively year round.

In 1998, concerns generated from PIFSC and the Council's Bottomfish Plan Team about low SPR values in the MHI led the State of Hawaii to close certain areas around the MHI to bottomfish fishing, including areas of Penguin Bank within the EEZ.[16] In addition, recent State rules established a non-commercial bag limit of five onaga or ehu, or a mix of both, per person per day. This bottomfish management regime requires any person who may fish for bottomfish (any of the seven species) to register their vessel with the HDAR and display the letters "BF" on their boat. This rule applies to all vessels used for targeting bottomfish fishing, whether the owner is a non-commercial or a commercial fisherman. Of the 3,600 vessels registered with the HDAR as of August 2005, about 40 percent declared themselves non-commercial fishermen (HDAR Bottomfish Survey 2005). It is unknown how many of these vessels, registered as non-commercial, have fished for bottomfish since 1998.

The Hawaiian Archipelago's sport fishing charter boat fleet began to develop during the early 1950s as Hawaii became an increasingly popular tourist destination (Markrich 1994). What started as a few charter boats operating out of harbors such as Kewalo Basin and Kona has evolved into a highly competitive industry involving nearly 200 vessels statewide (Hamilton 1998; Walker 1996). The charter boat fleet mainly targets pelagic game fish such as billfish and tuna. However, a few charter boats take bottomfish fishing trips if patrons are interested (Hamilton 1998). Most of the charter boats engaged in bottomfish fishing are based on the islands of Maui and Kauai.

3.4.2 Fishing Gear and Methods

The basic design of the handline gear used in the Hawaiian Archipelago's bottomfish fisheries has remained essentially unchanged from gear used by early Native Hawaiians (Haight et al. 1993a). The gear consists of a main line with a 2 to 4 kilograms weight attached to the terminus. Several 40 to 60 centimeters sidelines with circle hooks are attached above the weight at 0.5 to 1.0 meters intervals. A chum bag containing chopped fish or squid may be suspended above the highest of these hooks. The gear is pulled after several fish are hooked.

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[16] The State of Hawaii claims the authority to manage and control the marine, seabed, and other resources within "archipelagic waters." These archipelagic waters encompass a number of bottomfish fishing grounds, such as parts of Penguin Bank, that lie inside the EEZ. An October 24, 1997, memorandum from NOAA/General Counsel Southwest Region to the Council Chairman declared that, despite any contentions by the State of Hawaii to the contrary, for purposes of federal fishery management, state waters do not extend beyond 3 miles from the coast.

Circle hooks used in the bottomfish fishery are flat by design. “Kirbed” or “reversed” hooks (bent or offset to the right or left side) are also available but are not generally used. The flat circle hooks are designed to be self-setting and work well for fish that engulf the bait and move off with it in their mouth. As a fish moves off with the baited hook, the line will trail out of the corner of the fish’s mouth. The hook will be drawn into the corner of the mouth where the motion of the fish in relation to the pull of the line will rotate the hook through the corner of the jaw. Circle hooks, unlike J type hooks, are generally not effective for fish that pick at the bait or mouth the bait and spit it out (K. Kawamoto, PIFSC, personal communication).

Fishermen use the circle hook for its self-setting ability and for its curved design with its long inward-pointing hook point that makes it difficult for the fish to rid itself of the hook once it is embedded. The circle hook shank is typically thicker and round in cross section (unlike the thinner straight J type hooks), which tends to minimize ripping or wearing a hole in the fish’s jaw. An additional characteristic of the circle hook design that appeals to fishermen is that it is less prone than other hooks to snagging on rocky or hard substrate bottoms and difficult to snag flat or smooth surfaces. This characteristic minimizes the loss of gear (K. Kawamoto, PIFSC, personal communication).

All bottomfish fishermen in Hawaii target the same assemblage of bottomfish species. The ability to target particular species varies widely depending on the skill of each captain. Electronic navigation and fish-finding equipment greatly aid fishermen in returning to a particular fishing spot and catching desired species with little incidental catch (Haight et al. 1993a). According to Hau (1984), ‘ōpakapaka is one of the primary target species due to the relatively high price it commands as a result of its constant demand at the fish auction. Hāpu‘upu‘u and white ulua are sought because of their sturdiness and ability to retain good flesh quality. In addition, white ulua can be caught in rough sea conditions when other species are difficult to capture. Because of potential ciguatera toxicity, however, ulua are not usually targeted. Kāhala are one of the least valuable bottomfish because large specimens have a reputation for carrying the ciguatera toxin, and because of high densities of parasites in the flesh.

As detailed in Section 3.3.1.1, commercially important deepwater bottomfish inhabit the deep slopes of island coasts and banks at depths of 100 to 400 meters (about 54.7 to 218.7 fathoms). The distribution of adult bottomfish is highly correlated with suitable physical habitat. In addition to depth, both the quantity and quality of habitat are important and generally include locations of high-relief areas with water movement. Fishermen target specific areas by drifting or anchoring their vessels taking into consideration ocean currents (both surface and at depth), wind speed and direction and sea conditions. These environmental constraints limit the time during which bottomfish fishing can be conducted.

3.4.3 Existing Regulatory Regimes

3.4.3.1 Federal Management Regime

3.4.3.1.1 Overview of the Fishery Management Plan and Amendments

The Bottomfish FMP was implemented in 1986. It prohibits certain destructive fishing techniques, including explosives, poisons, trawl nets, and bottom-set gillnets; establishes a moratorium on the commercial harvest of seamount groundfish stocks at the Hancock Seamounts; and implements a permit system for fishing for bottomfish in the EEZ around the NWHI. (The moratorium on the commercial harvest of seamount groundfish stocks at the Hancock Seamounts, the only exploitable seamount habitat in the management area, remains in effect.) At its 123rd meeting (June 21–24, 2004), the Council approved an extension of the moratorium until August 31, 2010 (69 FR 51400). Consequently, there is no seamount groundfish fishery in the region.) The plan also establishes a management framework that includes adjustments such as catch limits, size limits, area or seasonal closures, fishing effort limitation, fishing gear restrictions, access limitation, permit and/or catch reporting requirements, and a rules-related notice system.

The Bottomfish FMP has been amended seven times since 1986. Implemented in 1987, Amendment 1 includes the establishment of potential limited access systems for bottomfish fisheries in the EEZ surrounding American Samoa and Guam within the framework measures of the Bottomfish FMP. Amendment 2 (1988) divides the EEZ around the NWHI into two zones: the Hoomalu Zone to the northwest and the Mau Zone to the southeast. The amendment also establishes a limited access system for the Hoomalu Zone. Amendment 3 (1991), which has been supplanted by Amendment 6, defines recruitment overfishing as a condition in which the ratio of the spawning stock biomass per recruit at the current level of fishing to the spawning stock biomass per recruit that would occur in the absence of fishing is equal to or less than 20 percent. Amendment 3 also delineates the process by which overfishing is monitored and evaluated. Amendment 4 (1990) requires vessel owners or operators to notify NMFS at least 72 hours before leaving port if they intend to fish in a 50 nautical miles "protected species study zone" around the NWHI. This notification allows Federal observers to be placed on board bottomfish vessels to record interactions with protected species if this action is deemed necessary. Amendment 5 (1999) establishes a limited access system for the Mau Zone and a framework for a Community Development Program. Amendment 6 (1999) identifies and describes essential fish habitat for managed species of bottomfish, discusses measures to minimize bycatch and bycatch mortality in the bottomfish fishery, provides criteria for identifying when overfishing has occurred in the fishery and describes fishing communities in the region. Amendment 6 initially was only partially approved, with the provisions for bycatch, overfishing and fishing communities in Hawaii disapproved. The disapproved provisions were rewritten and the revised provisions have been implemented. Amendment 7 (2003) brings the Bottomfish FMP into conformity with the Coral Reef Ecosystem (CRE) FMP by prohibiting fishing for BMUS in the CRE FMP's no-take areas, and amending the BMUS list to exclude species now managed under the CRE FMP.

3.4.3.1.2 Fisheries Management Plan Regulations

For the complete list of Federal regulations for Western Pacific Region fisheries, see 50 CFR Part 665. The following can be found at 50 CFR § 665.61.

Gear Restrictions

(1) Fishing for bottomfish and seamount groundfish with bottom trawls and bottom-set gillnets is prohibited.

(2) Possession of a bottom trawl and bottom-set gillnet by any vessel having a Hoomalu Zone permit or Mau Zone permit or otherwise established to be fishing for bottomfish or seamount groundfish in the management sub-areas is prohibited.
(3) The possession or use of any poisons, explosives, or intoxicating substances for the purpose of harvesting bottomfish and seamount groundfish is prohibited.

Permits

(1) The owner of any vessel used to fish for BMUS in the NWHI sub-area must have a permit and the permit must be registered for use with the vessel. A single vessel cannot be registered for use with a Hoomalu Zone permit and a Mau Zone permit at the same time.
(2) Hoomalu Zone limited access permit:

(i) A Hoomalu Zone permit may not be sold or otherwise transferred to a new owner. A Hoomalu Zone permit or permits may be held by a partnership or corporation. If 50 percent or more of the ownership of the vessel passes to persons other than those listed in the original application, the permit will lapse and must be surrendered to the NMFS Regional Administrator.

(ii) Upon application by the owner of a permitted vessel, the NMFS Regional Administrator will transfer that owner's permit to a replacement vessel owned by that owner, provided that the replacement vessel does not exceed 60 feet (18.3 m) in length. The replacement vessel must be put into service no later than 12 months after the owner applies for the transfer, or the transfer shall be void. An owner of a permitted vessel may apply to the Regional Administrator for transfer of that owner's permit to a replacement vessel greater than 60 feet (18.3 meters or 10 fathoms) in length. The Regional Administrator may transfer the permit upon determining, after consultation with the Council and considering the objectives of the limited access program, that the replacement vessel has catching power that is comparable to the rest of the vessels holding permits for the fishery, or has catching power that does not exceed that of the original vessel, and that the transfer is consistent with the objectives of the program. The Regional Administrator shall consider vessel length, range, hold capacity, gear limitations, and other appropriate factors in making determinations of catching power equivalency and comparability of the catching power of vessels in the fishery.

(iii) Hoomalu Zone limited access permit renewal: A qualifying landing for Hoomalu Zone permit renewal is a landing of at least 2,500 pounds (1,134 kg) of BMUS from the Hoomalu Zone or a landing of at least 2,500 pounds (1,134 kg) of fish from the Hoomalu Zone, of which at least 50 percent by weight was BMUS. A permit is eligible for renewal for the next calendar year if the vessel covered by the permit made three or more qualifying landings during the current calendar year.

(iv) The NMFS Regional Administrator may issue new Hoomalu Zone limited access permits if the Regional Administrator determines, in consultation with the Council that bottomfish stocks in the Hoomalu Zone are able to support additional fishing effort. When the Regional Administrator has determined that new permits may be issued, they shall be issued to applicants based upon eligibility, determined as follows:

(a) Point system:

Two points will be assigned for each year in which the applicant was owner or captain of a vessel that made three or more of any of the following types of landings in the NWHI: Any amount of BMUS, regardless of weight, if made on or before August 7, 1985; at least 2,500 pounds (1,134 kg) of BMUS, if made after August 7, 1985; or at least 2,500 pounds

(1,134 kg) of any fish lawfully harvested from the NWHI, of which at least 50 percent by weight was bottomfish, if made after August 7, 1985. One point will be assigned for each year in which the applicant was owner or captain of a vessel that landed at least 6,000 pounds (2,722 kg) of bottomfish from the MHI. For any one year, points will be assigned for landings in the NWHI sub-area or MHI sub-area, but not in both sub-areas. New permits shall be awarded to applicants in descending order, starting with the applicant with the largest number of points. If two or more persons have an equal number of points, and there are insufficient new permits for all such applicants, the new permits shall be awarded by the Regional Administrator through a lottery.

(b) Before the NMFS Regional Administrator issues a Hoomalu Zone permit to fish for bottomfish, the primary operator and relief operator named on the application form must have completed a protected species workshop conducted by NMFS.

(c) An applicant must own at least a 25 percent share in the vessel that the permit would cover, and only one permit will be assigned to any vessel.

(3) Mau Zone limited access permit:

(i) Eligibility for new Mau Zone limited access permits:

(a) The NMFS Pacific Islands Regional Office (PIRO) will issue an initial Mau Zone permit to a vessel owner who qualifies for at least 3.0 points under the following point system: An owner who held a Mau Zone permit on or before December 17, 1991, and whose permitted vessel made at least one qualifying landing of BMUS on or before December 17, 1991, shall be assigned 1.5 points; an owner whose permitted vessel made at least one qualifying landing of BMUS during 1991 shall be assigned 0.5 point; an owner whose permitted vessel made at least one qualifying landing of BMUS during 1992 shall be assigned 1.0 point; an owner whose permitted vessel made at least one qualifying landing of BMUS during 1993 shall be assigned 1.5 points; an owner whose permitted vessel made at least one qualifying landing of BMUS during 1994 shall be assigned 2.0 points; an owner whose permitted vessel made at least one qualifying landing of BMUS during 1995 shall be assigned 2.5 points; and an owner whose permitted vessel made at least one qualifying landing of BMUS during 1996 shall be assigned 3.0 points. A "qualifying landing" means any amount of BMUS lawfully harvested from the Mau Zone and offloaded for sale. No points shall be assigned to an owner for any qualifying landings reported to the State more than one year after the landing.

(b) More than one Mau Zone permit may be issued to an owner of two or more vessels provided each of the owner's vessels for which a permit will be registered for use has made the required qualifying landings for the owner to be assigned at least 3.0 eligibility points.

(c) A Mau Zone permit holder who does not own a vessel at the time initial permits are issued must register the permit for use with a vessel owned by the permit holder within 12 months from the date the permit was issued. In the interim, the permit holder may register the permit for use with a leased or chartered vessel. If within 12 months of initial permit issuance, the permit holder fails to apply to the NMFS PIRO to register the permit for use with a vessel owned by the permit holder, then the permit expires.

(d) Before the NMFS PIRO issues a Mau Zone permit to fish for bottomfish, the primary operator and relief operator named on the application form must have completed a protected species workshop conducted by NMFS.

(e) A Mau Zone permit may be held by an individual, partnership, or corporation. No more than 49 percent of the underlying ownership interest in a Mau Zone permit may be sold, leased, chartered, or otherwise transferred to another person or entity. If more than 49 percent of the underlying ownership of the permit passes to persons or entities other than those listed in the original permit application supplemental information sheet, then the permit expires and must be surrendered to the NMFS PIRO. A Mau Zone permit holder may apply to the NMFS PIRO to register the permit for use with another vessel if that vessel is owned by the permit holder and is no longer than 60 feet (18.3 m). If a Mau Zone permit holder sells the vessel, for which the permit is registered for use, the permit holder must within 12 months of the date of sale apply to the NMFS PIRO to register the permit for use with a vessel owned by the permit holder. If the permit holder has not applied to register a replacement vessel within 12 months, then the permit expires. If a permitted vessel owned by the permit holder is sold or becomes not seaworthy, the Mau Zone permit with which the vessel was registered may be registered for use with a leased or chartered vessel for a period not to exceed 12 months from the date of registration of the leased or chartered vessel. If by the end of that 12-month period the permit holder fails to apply to the NMFS PIRO to register the permit for use with a vessel owned by the permit holder, then the permit expires.

(ii) A Mau Zone permit will be eligible for renewal if the vessel for which the permit is registered for use made at least five separate fishing trips with landings of at least 500 pounds (227 kg) of BMUS per trip during the calendar year. Only one landing of BMUS per fishing trip to the Mau Zone will be counted toward the landing requirement. If the vessel for which the permit is registered for use fails to meet the landing requirement, the owner may apply to the NMFS Regional Administrator for a waiver of the landing requirement. Grounds for a waiver are limited to captain incapacitation, vessel breakdowns, and the loss of the vessel at sea if the event prevented the vessel from meeting the landing requirement. Lack of profitability is not sufficient for waiver of the landing requirement.

Prohibitions

It is unlawful for any person to do any of the following:
(1) Fish for bottomfish or seamount groundfish using prohibited gear.
(2) Fish for, or retain on board a vessel, BMUS in the Hoomalu Zone or Mau Zone without the appropriate permit registered for use with that vessel.
(3) Serve as primary operator or relief operator on a vessel with a Mau Zone or Hoomalu Zone permit without completing a protected species workshop conducted by NMFS.
(4) Fail to notify the USCG at least 24 hours prior to making any landing of bottomfish taken in the Hoomalu Zone.
(5) Fish within any protected species study zone in the NWHI without notifying the NMFS PIRO of the intent to fish in these zones. Protected species study zones means the waters within 50 nautical miles around the following islands of the NWHI and as measured from the following coordinates: Nihoa Island 23°05' N latitude, 161°55' W longitude; Necker Island 23°35' N latitude, 164°40' W longitude; French Frigate Shoals 23°45' N latitude, 166°15' W longitude; Gardner Pinnacles 25°00' N latitude, 168°00' W longitude; Maro Reef 25°25' N latitude, 170°35' W longitude; Laysan Island 25°45' N latitude, 171°45' W longitude; Lisianski Island 26°00' N latitude, 173°55' W longitude; Pearl and Hermes Reef 27°50' N latitude, 175°50' W longitude; Midway Island 28°14' N latitude, 177°22' W longitude; and Kure Island 28°25' N latitude, 178°20' W longitude.

Notification

(1) The owner or operator of a fishing vessel must inform the NMFS PIRO at least 72 hours (not including weekends and holidays) before leaving port of his or her intent to fish within the protected species study zones. The notice must include the name of the vessel, name of the operator, intended departure and return dates, and a telephone number at which the owner or operator may be contacted during the business day (8 a.m. to 5 p.m.) to indicate whether an observer will be required on the subject fishing trip.
(2) The operator of a fishing vessel that has taken bottomfish in the Hoomalu Zone must contact the USCG, by radio or otherwise, at the 14th District, Honolulu, HI; Pacific Area, San Francisco, CA; or 17th District, Juneau, AK, at least 24 hours before landing, and report the port and the approximate date and time at which the bottomfish will be landed.

At-Sea Observer Coverage

All fishing vessels must carry an observer when directed to do so by the NMFS Regional Administrator.

Reporting and Recordkeeping

Any person who is required to do so by applicable State law or regulation must make and/or file all reports of MUS landings containing all data and in the exact manner required by applicable State law or regulation.

Papahānaumokuākea Marine National Monument

As described in Section 1.8, on June 15, 2006, the President issued a proclamation establishing the Northwestern Hawaiian Islands Marine National Monument (since renamed Papahānaumokuākea Marine National Monument). The President’s proclamation calls for the closure of most fisheries within the NWHI monument’s boundaries immediately and of the NWHI bottomfish fishery by June 15, 2011. In addition monument regulations have imposed a quota, closed additional areas off to bottomfishing vessels, and imposed vessel anchoring restrictions.

3.4.3.1.3 Observer Program

During the period 1990–1993, observers were placed on NWHI bottomfish vessels to monitor protected species interactions, particularly interactions with the Hawaiian monk seal. More recently, the Hawaii-based NWHI bottomfish fishery was monitored under a mandatory observer program between 2003 and 2005. During this time, PIRO personnel conducted daily shore-side dock rounds in Honolulu to determine which fishing vessels were in port. The information was used to generate an estimate of fishing effort on a real-time basis by assuming that a vessel was fishing when it is absent from the harbor. From the fourth quarter of 2003 through the second quarter of 2005, observer coverage in the bottomfish fleet averaged 21.4 percent, and there were no interactions observed between protected species and NWHI bottomfish vessels.

3.4.3.1.4 Data Collection

NMFS' PIFSC manages the Western Pacific Fisheries Information Network (WPacFIN), a partnership with the State and territorial governments in the region for collecting, processing, analyzing, sharing, and managing fisheries data. Through the cooperative efforts of the member agencies, WPacFIN provides fisheries data and information to NMFS as well as to the Council and its various committees and advisory bodies to develop, implement, evaluate, and amend FMPs for the region. WPacFIN staff assists island agencies (including HDAR) in designing and implementing appropriate local fisheries data collecting, monitoring, analyzing and reporting programs, complete with associated microcomputer-based data processing systems. Staff members also help promote data standards to facilitate information analyses and reports.

In regards to bottomfish fishery-dependent data collection, the HDAR has played a central role both within the MHI as well as the NWHI. Any fisherman who sells fish in Hawaii is required to have a Commercial Marine License (CML). These licenses may be "reporting" or "non-reporting." A non-reporting license holder is typically a crewman on a vessel for which the captain does all the reporting. Reporting fishermen must submit Monthly Fishing Reports to HDAR by the tenth of the following month.

For commercial fishermen with limited-entry Federal NWHI bottomfish fishing permits, a NWHI Bottomfish Trip Daily Log is required for every day fished. These forms are due to HDAR by the tenth of the month after the end of the trip. These fishermen must also complete a NWHI Bottomfish Trip Sales Report for each fishing trip, but are not required to submit the Monthly Fishing Report.

There are no mandatory reporting or permit programs for non-commercial fisheries in the State. Non-commercial fisheries do constitute significant harvests of fisheries resources in the State, and the lack of quality data in relation to non-commercial fishing patterns and harvests does hamper fishery management decisions. The Hawaii Marine Non-commercial Fishing Survey (HMRFS) collects voluntary non-commercial fishing information on several fisheries in the State (e.g., shoreline pole and line); however, the HMRFS has not been effective in capturing quality data from the Hawaii non-commercial bottomfish fishery. In terms of landings, the non-commercial bottomfish fishery (those without ever having a CML and those with expired CMLs) is believed to harvest 25 percent to 70 percent of the total bottomfish catch based on preliminary results from HDAR's 2005 Bottomfish Fishery Survey.

3.4.3.1.5 Federal Enforcement

Enforcement of Federal fishery regulations around Hawaii is shared by the U.S. Coast Guard and NOAA's Office for Law Enforcement. The USCG's Fourteenth District covers over 12 million square miles of the Western and Central Pacific Ocean. Two high-endurance cutters are home-ported in Honolulu; however their patrol efforts also include the North Pacific off Alaska and the Eastern Pacific off Central and South America. The Coast Guard has two buoy tenders stationed in Honolulu which also perform law enforcement patrols around the Main Hawaiian Islands. Four patrol boats are also stationed throughout the Main Hawaiian Islands. The District's air wing is based on Oahu and consists of four C-130 aircraft and four HH-65 helicopters that are used for both search and rescue and law enforcement.

NOAA's Office for Law Enforcement, Honolulu Field Office, is responsible for enforcing Federal laws and regulations pertaining to Federally regulated fisheries and Federally protected living marine resources, and for responding to alleged violations throughout the Hawaiian Islands and the Western Pacific Ocean. Enforcement is accomplished in cooperation with the USCG and the State. The NOAA Office for Law Enforcement does not have any vessels of its own and relies on the USCG to conduct water-based patrols.

3.4.3.2 State of Hawaii Management Regime

The State's bottomfish fishery is managed by the Hawaii Department of Land and Natural Resources, Division of Aquatic Resources. In response to low and decreasing SPR values for onaga and ehu in the MHI, HDAR developed and implemented new regulations for bottomfish fishing in State waters in 1998 (Hawaii Administrative Rules [HAR] 13-94; effective June 1, 1998). This rule established regulations for the deep-sea bottomfish fishery managed by the State and includes gear restrictions, non-commercial bag limits, 19 areas closed to bottomfish fishing (BRFAs), requirements for registration and identification of bottomfish fishing vessels, and a control date for possible future implementation of a limited access management regime. HDAR is currently proposing new BRFAs throughout the State.

The State, in 2007, revised the existing BRFAs by reducing the number from 19 to 12 and increasing the size and amount of suitable habitat they would contain[17]. Recent analysis has determined that the State's prior 19 BRFAs encompass 9.2 percent of what the researchers define as "suitable habitat" for the deep-slope bottomfish while the new 12 BRFAs encompass 11.2 percent (Parke, 2007). Parke (2007) assumes a direct relationship between suitable habitat and bottomfish catch, indicating that the State's new BRFAs would reduce bottomfish fishing mortality by two percent over the 2004 baseline.

3.4.3.2.1 State Regulations

State regulations require any person who takes marine life for commercial purposes, whether within or outside of the State, to first obtain a commercial marine license from the HDAR.

HAR 13-94, Bottomfish Management, defines "bottomfish" as seven deepwater species, including onaga, ehu, kalekale, ʻōpakapaka, gindai, hāpuʻupuʻu, and lehi. Use or possession of nets, traps, trawls or bottomfish longlines in bottomfish fishing is prohibited. Non-commercial fishermen are limited to a maximum of five onaga or ehu, or a mix of both, per person. The rule also established 19 areas around the MHI closed to bottomfish fishing. Bottomfish fishing vessels must be registered with the State and identified with the letters "BF" and appropriate registration numbers (Department of Boating and Ocean Recreation vessel registration, Federal fishery permit numbers or USCG vessel documentation number) on the vessel. A control date of

[17] http://www.hawaii.gov/dlnr/dar/bottomfish.htm

June 1, 1998 was also established to potentially qualify applicants for a future limited-entry program for commercial bottomfish fishing.

HAR 13-95, Rules Regulating the Taking and Selling of Certain Marine Resources, establishes a minimum size of one pound for the sale of ‘ōpakapaka, onaga, and uku.

In September of 2005, Governor Linda Lingle, signed HAR 13 60.5, NWHI Marine Refuge, that put all State waters from Nihoa to Kure Atoll into a no extraction marine refuge. All commercial and non-commercial fishing is now prohibited in these waters.

3.4.3.2.2 State Data Collection

The State provides fishermen with a Commercial Fisheries Statistical Chart, a grid to facilitate reporting of catch by area. The inshore reporting grid areas are irregular shapes, and do not mirror known fishing grounds or habitat, and are not aligned with known management areas. The seaward boundaries of the inner grid areas generally lie two miles from shore. However, the grid has not been geo-referenced (Walter Ikehara, NMFS, formerly of HDAR, personal communication). The offshore grids are aligned by latitude and longitude on a Mercator Projection, giving standard 20 minute square grid areas. Any fisherman who sells fish in Hawaii is required to have a Commercial Marine License (CML). These licenses may be “reporting” or “non-reporting.” A non-reporting license holder is typically a crewman on a vessel for which the captain does all the reporting. Reporting fishermen must submit Monthly Fishing Reports to HDAR by the tenth of the following month. Starting March 1, 2006, HDAR began a policy where fishermen wanting to renew their annual CML have to submit all of their missing reports or HDAR will not issue the fishermen a CML. This policy is intended to facilitate more complete and timely reporting (R. Kokubun, HDAR, personal communication).

The shortcomings associated with reporting bottomfish based on the Commercial Fisheries Statistical grids are particularly problematic when Penguin Bank is considered. Penguin Bank (see grid 331 in Figure 6) is almost entirely in Federal waters and is a highly popular bottomfish fishing area. The edge of the reporting grid parallels the bank slope that is recognized as prime bottomfish habitat. Adjacent grids, such grid 429, include the bottomfish habitat on the east coast of Oahu. Fish reported from grid 429 could have come from Makapuu Point off east Oahu or from the western edge of Penguin Bank. However, when meeting with active bottomfish fishermen who frequent Penguin Bank, they indicate that all catches taken in the Penguin Bank area are reported as coming from 331. Another problem associated with reporting grid 331 is that it does not allow for finer evaluation of fish caught from different locations on the Bank. Without good spatial data it is difficult to predict the immediate consequences of the action, and to monitor subsequent changes when the action is taken.

The problems with the existing reporting grids are clear, however until recently HDAR has been hesitant to revise the grid system because of concerns with an inability to compare historical to new catch area information. HDAR is now working with NMFS to make revisions as the importance of improving the reporting grid to facilitate monitoring and assessments is recognized by HDAR, and options for improving the grid system are now being considered by that office.

A State-Federal data sharing agreement has been in place since 1988 and has been a foundation for fishery management in Hawaii. With regards to the bottomfish fishery, the State’s existing data represent the best available information and NMFS relies on such data to conduct assessments of the Hawaii bottomfish stocks.

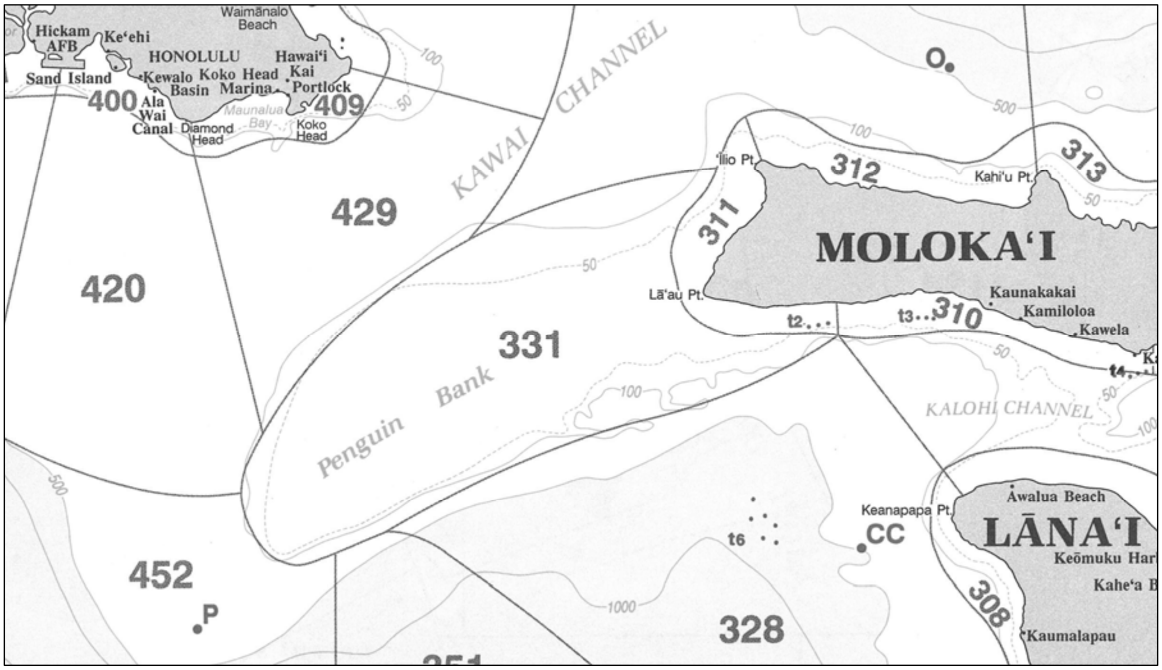


Figure 6: State of Hawaii CML Statistical Grids around Penguin Bank

3.4.3.2.3 State Enforcement

The Board of Land and Natural Resources (BLNR), which oversees the operations of the DLNR, has police powers, and appoints and commissions enforcement officers within the Division of Conservation and Resources Enforcement (DOCARE). Enforcement Officers enforce statutes and regulations of the State in all State lands including public lands, State parks, forest reserves, forests, aquatic life, and wildlife areas, Kahoolawe Island Reserve, and any other lands and waters within the State. Violations can be dealt with through the State criminal court system, administratively, or through the BLNR. There are approximately 130 DOCARE officers in the State, and as mentioned earlier, their area of responsibility is wide-ranging and includes both terrestrial and marine areas. DOCARE possesses several small vessels (approximately 25 ft) and two larger vessels (approximately 35 ft).

Given the apparent lack of adequate funding for DOCARE over the past years, DOCARE has not had the ability to properly enforce the State’s existing BRFAs (G. Moniz, DOCARE, personal communication). A consistent comment heard during the public scoping meetings for the DSEIS (and this revised DSEIS) was that there has been limited enforcement of the BRFAs and the non-commercial bottomfish bag limit. DOCARE states that in the eight years that the State’s BRFAs have existed, the State has only received two complaints about fishermen illegally fishing within a BRFA (G. Moniz, DOCARE, personal communication).

3.4.4 Commercial Fisheries

3.4.4.1 Participation and Effort

In the small boat fishery around the MHI the social distinction between "non-commercial" and "commercial" fishermen is extremely tenuous (Pooley 1993a). A statewide survey of small boat fishermen conducted during 1995 to 1996 indicated that of the 42 fishermen interviewed who predominately use bottomfish fishing gear, 80 percent sold a portion of their catch (WPRFMC 1996). However, most of those selling fish are just trying to cover fishing trip expenses and do not expect a profit from their operation. The individuals participating in the MHI fishery who make trips longer than 24 hours are mostly full-time commercial fishermen. They typically operate larger boats than the part-time commercial/non-commercial fishermen and are able to fish during rough weather and venture further from port to fish less-exploited areas off Kauai, Niihau, and east Maui that are less accessible to the small boat fishermen.

The majority of participants in the MHI fishery shift from species group to species group and from the bottomfish fishery to other fisheries, primarily the pelagic fishery, in response to seasonal fish abundance or fluctuations in price. Except for those individuals who fish commercially on a full-time basis, most fishermen usually fish for bottomfish no more than 60 days a year (WPRFMC 1996). Based on a 2005 survey conducted by HDAR, Saturday is the most common day of the week to go bottomfish fishing in the MHI. Seasonal price variability causes part-time commercial fishermen to concentrate their bottomfish fishing effort during December, when they can take advantage of the year-end holiday demand for red snappers. Pelagic species are often an important secondary target during bottomfish fishing trips regardless of the season.

The number of fishermen engaged in commercial bottomfish fishing in the MHI increased dramatically in the 1970s and 1980s, but then declined in the early 1990s, rebounded somewhat in the late 1990s, but in 2002 reached its lowest level since 1977 (Table 11; Figure 7). The decline in vessels and fishing effort may be due to the long-term decrease in catch rates in the bottomfish fishery and a shift of fishing effort towards tuna and other pelagic species.

Table 11: Number of Commercial Vessels in the MHI Bottomfish Fishery, 1948–2002.

Year	No. Vessels	Year	No, Vessels	Year	No. Vessels
1948	207	1968	116	1988	572
1949	196	1969	130	1989	537
1950	164	1970	219	1990	501
1951	126	1971	198	1991	469
1952	110	1972	185	1992	407
1953	106	1973	238	1993	403
1954	103	1974	241	1994	423
1955	108	1975	295	1995	400
1956	106	1976	306	1996	487
1957	102	1977	377	1997	502
1958	96	1978	414	1998	498
1959	76	1979	423	1999	483
1960	69	1980	461	2000	495
1961	65	1981	430	2001	404
1962	98	1982	526	2002	386
1963	110	1983	541	*2003**	325
1964	87	1984	558	*M*	465
1965	85	1985	583	*SD*	66
1966	97	1986	538		
1967	99	1987	535		

* 2003 Data Incomplete.
Source: WPRFMC 2005b.

In contrast to the MHI fishery, bottomfish fishing in the NWHI is conducted solely by part-time and full-time commercial fishermen. The vessels venturing into the NWHI tend to be larger than those fishing around the MHI, as the distance to fishing grounds is greater (Haight et al. 1993a).

The medium-sized powered vessels are 42 to 49 feet long. Because their smaller size limits fishing range and hold capacity, they usually operate in the lower (southeastern) end of the

NWHI (Mau Zone) or in the MHI. The larger powered vessels are 47 to 64 feet long. With an average fuel capacity of 1,500 gallons, the vessels have a maximum range (round trip) of 1,800 miles. The average maximum hold capacity is 4,000 pounds.

Many of the boats that fish in the Mau Zone switch to different fisheries and move to other fishing grounds during the year. The majority of vessels fish in the Mau Zone during a season that generally extends from November to April.

A 1993 survey of participants in the NWHI fishery found that vessels fishing in the Mau Zone made an average of 12.7 trips to the area to target bottomfish and 3.4 trips to target pelagic fish or a mixture of pelagic species and bottomfish (Hamilton 1994).

Because the NWHI bottomfish fishing grounds were divided into the Mau Zone and Hoomalu Zone in 1988, the Mau Zone has generally seen a greater share of the fishing effort as access to the Hoomalu Zone was restricted under a limited access program (WPRFMC 1999). Only five vessels harvested bottomfish in the Mau Zone in 1989, but during the 1990s an average of ten vessels fished in the area (Table 12). The amount of effort (fishing days) expended in the Mau Zone has fluctuated along with the number of active vessels. Mau Zone activity levels peaked in 1994 with a total of 594 fishing days as a result of a combination of relatively large fleet size and intensive activity by each vessel.

Table 12: Number of Vessels in the NWHI Bottomfish Fishery, 1984–2003

Year	Mau	Hoomalu	Total[2]	Year	Mau	Hoomalu	Total[2]
1984	NA	NA	19	1995[1]	10	5	15
1985	NA	NA	23	1996[3]	13	3	16
1986	NA	NA	24	1997[3]	9	6	15
1987	NA	NA	28	1998[2]	7	7	13
1988	4	12	13	1999[3]	7	6	13
1989	5	5	10	2000[3]	6	5	11
1990	14	5	16	2001[3]	6	5	11
1991[1]	14	4	17	2002[3]	5	4	9
1992[1]	8	5	13	2003[3]	5	4	9
1993[1]	8	4	12	*M*	8.31	5.25	13.06
1994[1]	12	5	16	*SD*	3.36	1.98	2.59

Note. [1]Based on NMFS and HDAR data. [2] Total may not match sum of areas due to vessel participation in both areas. [3]Based on HDAR data. Source: WPRFMC 2005b

Eighty-one permits to fish in the Mau Zone have been issued since 1989, but only 37 of the permits were actually used. The turnover rate has been high, with only 38 percent of the 37 active vessels fishing in the Mau Zone for more than 2 years. A limited access program was established for the Mau Zone in 1999, and ten vessels are allowed to fish in the area under the Bottomfish FMP. Permits to fish in the Mau Zone are nontransferable and subject to a use-it-or-lose-it requirement. At present, there is no procedure for issuance of new Mau Zone limited access permits. Currently, there are 4 permitted bottomfish vessels fishing the Mau Zone.

A limited access program was established for the Hoomalu Zone in 1989. Since 1995, the number of vessels allowed to fish in the area has been set at seven. Permits to fish in the Hoomalu Zone are non-transferable and subject to a use-it-or-lose-it requirement. New Hoomalu Zone limited access permits are issued based on a point system. Since 1989, 17 permits to fish in the Hoomalu Zone have been issued, of which 15 have been used. In comparison to the Mau Zone, the Hoomalu Zone exhibits more continuity in participation, but the turnover has still been fairly high. Only about half of the active vessels have fished in the Hoomalu Zone for more than two years. Currently, there are four permitted bottomfish vessels active in the fishery.

Table 13 summarizes the number of trips taken per year in each of the Hawaii bottomfish fishing zones. In the Mau Zone, the greatest number of trips occurred in 1994 and 1995 at nearly 100 in each year. From 1998 to 2002 the number of trips to this zone has averaged 49, although in 2002, 76 trips were made.

The number of trips to the Hoomalu Zone peaked in its inaugural year, 1988, and has only reached 50 trips once thereafter (1998). Between 1998 and 2002, the average number of trips made there was 38 per year.

Recorded (commercial) trips in the MHI peaked at 5,091 in 1989. Prior to 1979, there had never been a year with more than 2,000 trips. The MHI fishery peaked in the period 1983–1989, when the annual number of trips averaged 4,414. The highest number of MHI annual trips since then is 3,810 in 2000. The average number of MHI trips between 1998 and 2002 was 3024. The 2003 total, although incomplete, appears to be the lowest in 25 years (see Figure 10).

Table 13: Number of Trips in the Hawaii Bottomfish Fishery, 1988–2003

Year	Mau	Hoomalu	Total NWHI	MHI
1988	21	72	93	4,911
1989	22	28	50	5,091
1990	55	25	80	3,242
1991[1]	84	47	131	2,895
1992[1]	55	37	92	3,401
1993[1]	72	34	106	1,977
1994[1]	99	41	140	2,333

Year	Mau	Hoomalu	Total NWHI	MHI
1995[1]	97	33	130	2,031
1996[2]	81	26	107	2,780
1997[2]	53	38	91	3,158
1998[2]	39	50	89	3,023
1999[2]	30	48	78	2,970
2000[2]	47	36	83	3,810
2001[2,3]	55	41	87	2,761
2002[2,]	76	26	102	2,556
2003[2,4]	37	39	76	1,517
M	54	37	90	2,556
SD	28	15	32	1,186

Note. [1]NWHI data from combination NMFS and HDAR. [2]Data from HDAR. [3]2001 data are a combination of HDAR data sets. [4]Incomplete data. Source: WPRFMC 2005b, 2003 Bottomfish Annual Report.

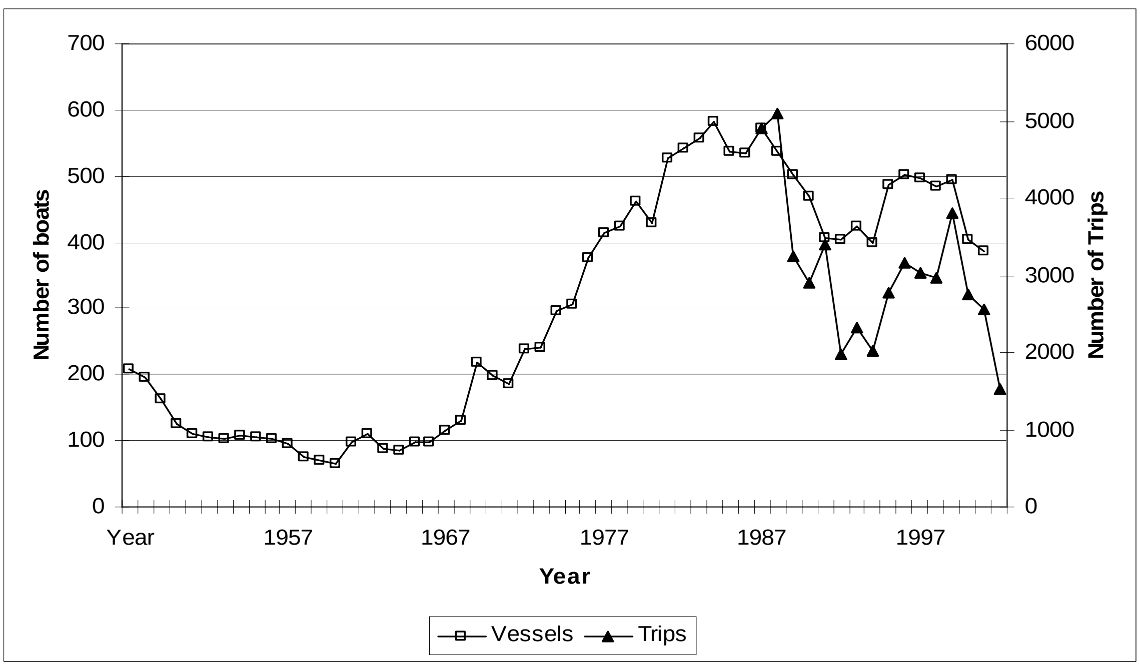


Figure 7: MHI Bottomfish Vessels and Trips by Year.
Source: WPRFMC 2005b, Bottomfish 2003 Annual Report.

Table 14 summarizes the number of MHI bottomfish fishing trips by area. For the most recent years for which data were available there was an average 445 trips to Penguin Bank and only nine to Middle Bank. Tables 14, 15 and 19 use State waters to describe the existing HDAR inshore reporting areas which extend 0 -2 miles from shore, not covering the entire State jurisdiction of 0 -3 miles. Federal waters was used to describe anything outside the State's 0 – 2 miles to the 200-mile limit of the EEZ.

Table 14: Summary of Number of Trips[1] by Area

Zone Name	2000	2001	2002	2003
Hawaii (island) State water (0–2)	638	499	427	403
Hawaii (island) Federal water	890	752	565	489
Hawaii (island) both	1,526	1,249	992	891
MMLK State water (0–2)	480	359	363	355
MMLK Federal water	909	605	613	558
MMLK both	1,386	960	973	908
Penguin Bank Federal water	480	377	496	426
MMLK plus 331 Federal water	1,865	1,336	1,469	1,332
Oahu State water (0–2)	203	143	184	214
Oahu Federal water	361	255	335	402
Oahu both	563	398	518	612
Kauai State water (0–2)	143	140	187	112
Kauai Federal water	333	236	193	93
Kauai both	475	376	379	205
Middle Bank Federal water	17	8	7	5

Note. MMLK (Maui, Molokai, Lanai, Kahoolawe) does not include Penguin Banks, unless mentioned otherwise.
[1] Trip/License by areas may not be additive because the fisherman may have fished in more than one area during a single trip. A trip to more than one area may be divided into State and Federal or multiple areas within each broad destination. Trip = 1 day fished. Source: Kawamoto and Tao 2005.

Table 15 summarizes the number of participants using State and Federal bottomfish fishing areas around the MHI. As reflected by the numbers of trips shown in Table 13, Penguin Bank is a highly popular area, used on average during the past 4 years by 61 license holders. In contrast, Middle Bank, much less accessible to smaller boats and those based farther south, was used on average by only about three license holders per year.

Table 15: Summary of Unique License Numbers[1] by Area

Zone Name	2000	2001	2002	2003
Hawaii (island) State water (0–2)	76	62	64	57
Hawaii (island) Federal water	116	98	84	44
Hawaii (island) both	178	153	131	89
MMLK State water (0–2)	81	63	61	59
MMLK Federal water	102	91	80	66
MMLK both	146	120	112	99
Penguin Bank Federal water	77	58	59	50
MMLK plus 331 Federal water	209	168	163	145
Oahu State water (0–2)	56	41	51	53
Oahu Federal water	76	51	52	46
Oahu both	120	81	91	89
Kauai State water (0–2)	32	35	40	37
Kauai Federal water	61	46	42	16
Kauai both	85	71	66	44
Middle Bank Federal water	5	4	2	2

Note. MMLK (Maui, Molokai, Lanai, Kahoolawe) does not include Penguin Banks, unless mentioned otherwise.
[1]Trip/License by areas may not be additive because the fisherman may have fished in more than one area during a single trip. A trip to more than one area may be divided into State and Federal or multiple areas within each broad destination. Trip = 1 day fished. Source: Kawamoto and Tao 2005.

3.4.4.2 Landings

Only commercial landings data are available for the MHI fishery because the State does not require a saltwater non-commercial fishing license and there are no State or Federal reporting requirements for non-commercial fishing in the waters around Hawaii. It is estimated that the non-commercial/sustenance catch in the MHI bottomfish fishery is about equal to the commercial catch (WPRFMC 1999). Charter boat operators are considered to be commercial fishermen under Hawaii statute and therefore are required to submit monthly catch reports. Consequently, charter boat catches are included in estimates of commercial landings.

Based on recent (1999 to 2003) landings data, commercial bottomfish catches in the MHI fishery represent approximately 60 percent of the total commercial bottomfish landings in Hawaii (WPRFMC 2003). If, as has been suggested, unreported non-commercial landings, virtually all of which are from the MHI, are approximately equal to the reported commercial landings from the MHI, it would mean that about 75 percent of the Hawaiian Archipelago's bottomfish landings are from the MHI. The annual bottomfish landings in the MHI have been fairly stable for the past 10 years (Table 16), however, in the past 3 years landings have trended downward (Figure 8) reflecting a rather sharp drop in participation.

Table 16: Commercial Bottomfish Landings in the MHI and NWHI 1984–2003 (1,000 lbs)

Year	Mau	Hoomalu	Total NWHI	MHI[2]
1984	NA	NA	661	807
1985	NA	NA	922	763
1986	NA	NA	869	810
1987	NA	NA	1,015	783
1988	NA	NA	625	1,164
1989	118	184	303	1,006
1990	249	173	421	646
1991[1]	103	283	387	548
1992[1]	71	353	424	587
1993[1]	98	287	385	348
1994[1]	160	283	443	458
1995[1]	166	202	369	440
1996[1]	133	176	309	440
1997[1]	105	241	346	513
1998[1]	66	266	332	479
1999[2]	54	269	323	455
2000	49	213	262	497
2001	50	236	286	367
2002	112	127	239	351
2003	99	152	251	334
2004	97	169	266	366
M	108.13	225.88	449.43	579.14

Note. [1]NWHI data from combination NMFS and HDAR. 2. Data from HDAR
Source: 1984-2001WPRFMC 2005b; 2002-2004 Moffitt et al. 2006.

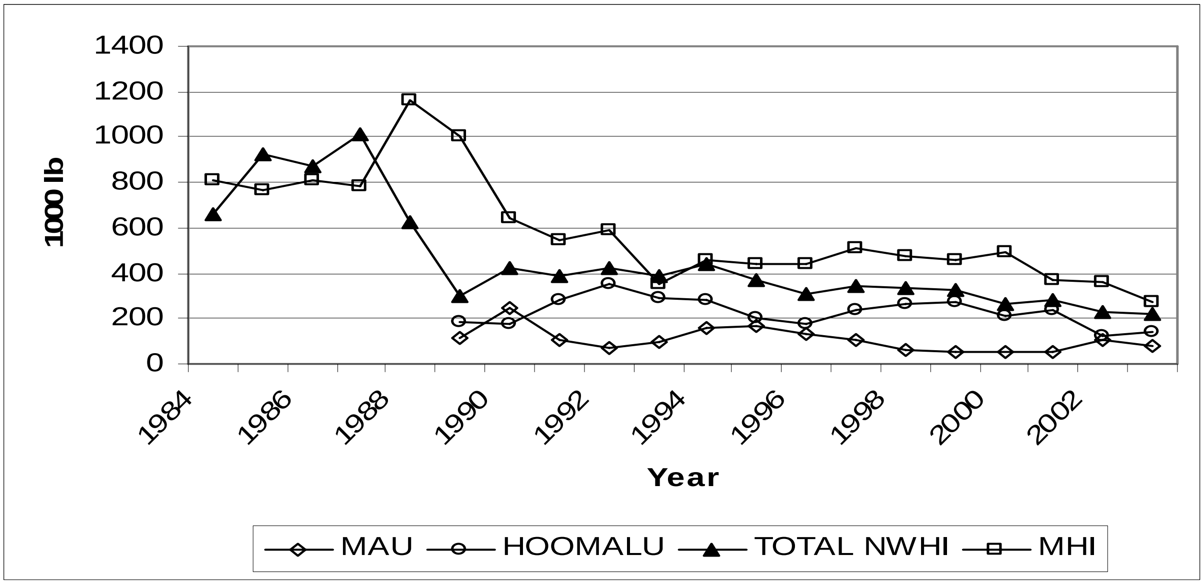


Figure 8: Commercial Bottomfish Landings in Hawaii by Year and Management Zone
Source: WPRFMC 2005b

Total NWHI bottomfish landings grew dramatically in the mid-1980s and then tailed off, stabilizing in the 1990s at a level slightly below the MHI bottomfish landings (Table 16).

The ex-vessel sales of BMUS in 2002 clearly show the substantial effects of changes in fishing strategy and participation in the fishery. The overall vessel sales reports indicate that the total NWHI BMUS landings were substantially lower in 2002 (Table 16). A single vessel dropped out of each management zone with varying effects on the overall zone landings. Although the Mau Zone lost a vessel, there were some vessels that did increase their targeting of bottomfish contrary to their usual pelagic species/mixed species targeting strategy. The BMUS landings in the Mau Zone increased by 116 percent (Table 16) while the number of trips increased by 38 percent. The Hoomalu Zone lost a single participating highliner vessel and the effects of that loss were realized in the 49 percent decrease in landings and the 36 percent decrease in the number of trips from that zone.

In 2003, the number of vessels fishing in the Mau and Hoomalu Zones remained constant from the previous year, but the number of trips taken changed substantially in both zones. In 2003, Mau Zone trips decreased by 51 percent, while Hoomalu Zone trips increased by 50 percent. These shifts in effort resulted in a 29 percent decrease in Mau Zone landings and a 21 percent increase in Hoomalu Zone landings.

In the MHI, landings peaked in the 1988 to 1989 period, coincident with the historical maximum number of recorded trips. In recent years, landings have trended downward, with the 2003 landings being the lowest since 1970, reflecting the 25-year low in number of trips.

Table 17 summarizes NWHI BMUS landings by species. From 1991 through 1998, ‘ōpakapaka landings were greater than those of any other species in the NWHI. From 1999 through 2001, however, onaga landings were higher than those of any other species. For the two most recent years, uku landings have predominated. For comparison, Table 18 summarizes MHI BMUS landings by species over the same period. ‘Ōpakapaka landings were greater than those of any other species in every year.

Table 19 summarizes bottomfish landings from areas around the MHI. Reflecting the pattern observed for effort and participation, the landings for Penguin Bank are substantial, but those for Middle Bank are the lowest for any of the areas. The Penguin Bank landings have averaged nearly 60,000 pounds annually, but there has been a general downward trend over the past four years.

Table 17: NWHI BMUS Landings by Species (1,000 lbs)

Species	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
‘Ōpakapaka	79	86	145	158	145	105	79	109	87	77	53	67	36	20
Onaga	21	46	23	40	42	53	30	55	48	93	92	73	54	50
Ehu	25	20	8	11	15	8	17	15	17	17	13	14	10	10
Hāpu‘upu‘u	85	59	57	59	68	54	49	57	70	59	23	31	29	36
Butaguchi	103	75	79	64	61	47	46	51	38	28	29	32	29	20
Uku	77	69	86	33	78	75	62	37	55	36	43	59	60	82
Other BMUS	23	22	18	19	27	17	25	19	15	11	9	12	11	6

Source: WPRFMC 2005b, 2003 Bottomfish Annual Report.

Table 18: MHI BMUS Landings by Species (1,000 lbs)

Species	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
‘Ōpakapaka	147	134	178	103	158	137	171	172	168	155	179	108	108	91
Onaga	108	89	72	43	52	49	81	83	69	72	89	54	67	50
Ehu	34	27	29	18	18	21	34	31	28	23	35	22	17	11
Hāpu‘upu‘u	15	14	14	9	13	14	14	17	14	12	19	12	8	7
Uku	109	90	88	61	72	59	64	81	74	108	96	66	56	36

Source: WPRFMC 2005b, 2003 Bottomfish Annual Report.

Table 19: Summary of Pounds Caught by Area

Zone Name	2000	2001	2002	2003
Hawaii (island) State water (0–2)	31,713	21,567	16,689	22,310
Hawaii (island) Federal water	47,422	39,450	29,302	24,191
Hawaii (island) both	79,135	61,017	45,991	46,501
MMLK State water (0–2)	46,304	31,909	37,430	38,616
MMLK Federal water	105,527	61,962	69,338	61,407
MMLK both	151,831	93,871	106,768	100,023
Penguin Bank Federal water	77,910	52,391	62,913	45,459
MMLK plus 331 Federal water	229,741	146,262	169,681	145,482
Oahu State water (0–2)	6,014	4,621	6,933	9,768
Oahu Federal water	31,190	17,097	19,066	19,877
Oahu both	37,204	21,718	25,999	29,645
Kauai State water (0–2)	13,203	10,082	10,665	7,272
Kauai Federal water	22,028	25,676	28,822	22,104
Kauai both	35,231	35,758	39,487	29,376
Middle Bank Federal water	Confidential Data[1]			

Note. MMLK (Maui, Molokai, Lanai, Kahoolawe) does not include Penguin Banks, until mentioned otherwise. [1]Trip/License by areas may not be additive because the fisherman may have fished in more than one area during a single trip. A trip to more than one area may be divided into State and Federal or multiple areas within each broad destination. Trip = 1 day fished. Source: Kawamoto and Tao, 2005.

To illustrate the importance of Penguin Bank and Middle Bank to the MHI bottomfish fishery, Figure 9 plots landings of the seven major bottomfish species from those two areas as a proportion of the total MHI landings of those species. That proportion has varied from a low of 12 percent in 1999 to a high of 25 percent in 1994. The proportion was 19 percent in 2004.

There is an annual cycle of landings from Penguin and Middle Banks, as can be seen in Figure 10. Landings peak in December and January and are lowest in June and July.

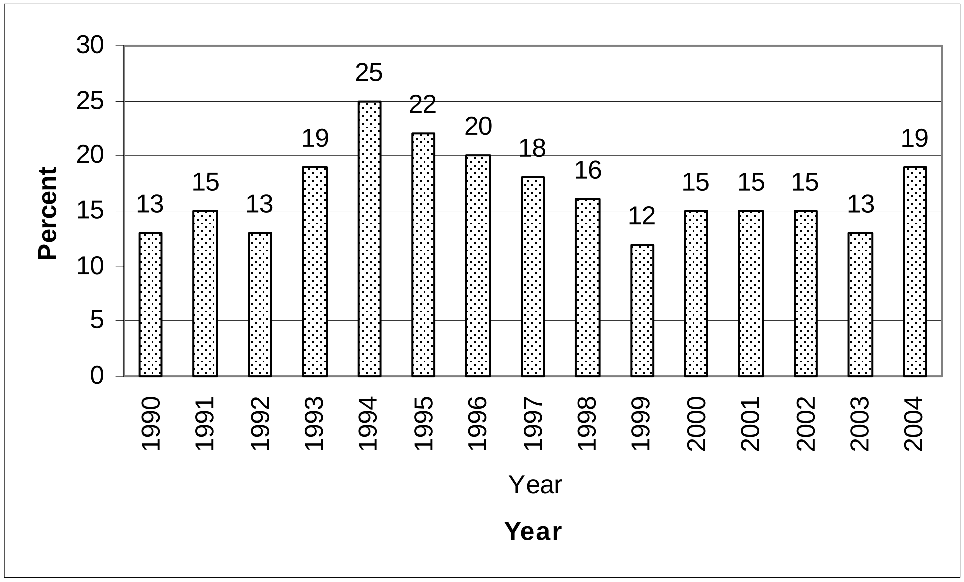


Figure 9: Landings from Penguin and Middle Banks as a Percentage of Total MHI Landings (Deep 7 Species)
Source: Kawamoto and Tao, 2005.

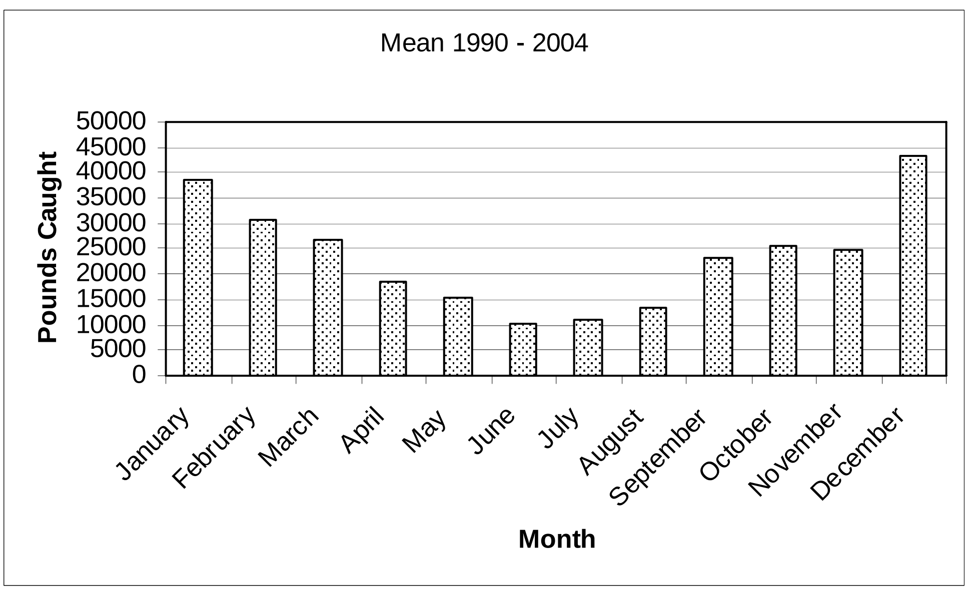


Figure 10: Monthly Landings From Penguin and Middle Banks.
Source: Kawamoto and Tao, 2005.

The following tables present additional, newer analyses of landings by species and landings by month in the Hawaii bottomfish fishing zones. Tables 20 to 22 and Figure 11 show the species composition of the three bottomfish management zones in the Hawaiian Islands archipelago between 1996 and 2004. Between five and seven species compose over 90 percent of catch in each management area. In the MHI, catches are dominated by ‘ōpakapaka, onaga, uku, ta‘ape, papio/ulua, ehu, and kalekale, with ‘ōpakapaka, onaga and uku accounting for almost two-thirds of landings. Another distinguishing feature of MHI bottomfish catches is the relatively large amount of ta‘ape, which compose over 13 percent of landings. Ta‘ape is found in only relatively small quantities in landings from the Mau Zone and is not recorded in Hoomalu Zone landings.

Uku or the green snapper, *Aprion virescens*, is also a major component of MHI bottomfish catches, and is the most dominant species of bottomfish catches from the Mau Zone, where it composes almost 40 percent of the catch. The other dominant species in Mau Zone catches include butaguchi, ‘ōpakapaka, hāpu‘upu‘u, onaga, and ehu. Butaguchi, ‘ōpakapaka, and hāpu‘upu‘u all make similar contributions to the catch, while onaga forms less than 10 percent of catches. In the neighboring Hoomalu Zone, onaga, and ‘ōpakapaka make up just over half of the catches, with the remaining part of the catch composed principally of hāpu‘upu‘u, uku, and butaguchi.

These catch composition data indicate quite clearly that there are major differences in the catch composition between the three zones. ‘Ōpakapaka and onaga account for about half the landings from the MHI and Hoomalu Zone but are a much smaller fraction (21 percent) of the Mau Zone landings, which are dominated by shallow water bottomfish species, particularly uku and butaguchi.

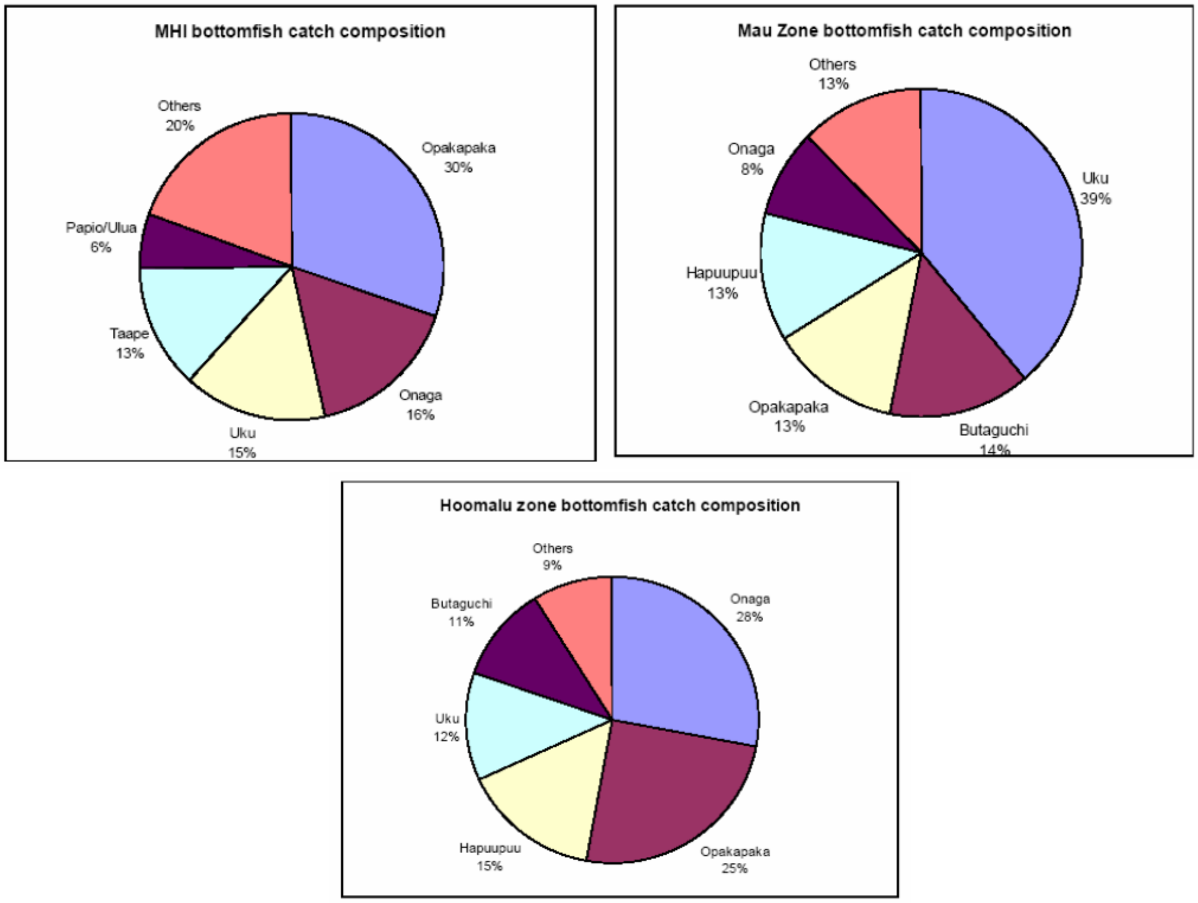


Figure 11: Average Species Composition (1996–2004) of Bottomfish Catches from the Three Bottomfish Management Zones in the Hawaiian Archipelago

Source: Kawamoto and Gonzales, 2005a.

Table 20: MHI BMUS Pounds Caught, Totals by Species and Year, 1996–2004

	Year								
Species Name	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Hāpuʻupuʻu	11466	14215	11346	10106	16183	11105	8411	10208	8018
Kāhala	5526	12108	21805	17599	22573	13823	11336	4886	6952
Kalekale	21788	21252	19886	11190	16659	11759	11451	9922	7785
ʻŌpakapaka	148730	145807	141958	129155	149879	100003	108917	115719	102168
Uku	53309	67976	61105	89834	80036	57469	56930	44254	67776
Ehu	28286	25798	23728	19429	29522	20911	17441	15489	22178
Onaga	67550	69145	58325	60981	74531	54993	68981	71560	85072
Papio/Ulua	35579	41330	40770	25039	23409	24585	20605	1046	1765
Lehi	8839	12367	8647	9859	10834	10427	9536	8573	6673
Gindai	3143	2812	3346	2390	3653	3127	2129	2039	2104
Taʻape	44195	85491	74851	70073	55041	47551	39399	37895	43528
Armorhead	0	0	0	0	0	0	0	0	0
Butaguchi	3261	5926	1944	1796	2653	1737	1649	1632	1341
Gunkan ulua	*	192	315	*	*	123	421	1072	1038
White ulua	6213	2204	3717	2977	4046	4202	4114	12255	11087
Yellow-tail kalekale	0	0	0	0	0	*	*	0	44

Note: Pounds caught are from adjusted values whenever possible. Asterisks indicate that information was removed because it was derived from fewer than 3 licensees and is therefore confidential. Source: Kawamoto and Gonzales 2005a.

Table 21: Mau Zone BMUS Pounds Caught, total by Species and Year, 1996–2004

Species Name	Year								
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Hāpu‘upu‘u	20166	13838	7517	5777	4657	4266	17110	17376	*
Kāhala	205	0	*	*	*	*	*	*	*
Kalekale	7729	3985	1630	1257	2638	2016	3099	1310	872
‘Ōpakapaka	15632	26586	9428	7918	6987	4182	15405	6372	10609
Uku	47610	24621	32152	27144	13033	19086	44679	53177	46769
Ehu	12238	4070	3091	4231	5159	6083	6702	3269	2497
Onaga	10865	17301	1835	3969	3462	3824	9725	6107	9573
Papio/Ulua	*	0	*	0	0	0	0	0	0
Lehi	201	*	*	*	*	*	*	*	0
Gindai	3487	1036	613	1109	841	608	1400	885	915
Ta‘ape	40	*	*	*	*	*	*	*	*
Armorhead	0	0	0	0	0	0	0	0	0
Butaguchi	25289	16461	9113	7229	14365	8328	10391	8741	11558
Gunkan ulua	872	547	450	248	183	224	1169	420	283
White ulua	818	500	237	*	298	551	785	*	*
Yellow-tail kalekale	*	0	*	*	0	0	*	*	*

Note. Pounds caught are from adjusted values whenever possible. Asterisks indicate that information was removed because it was derived from fewer than 3 licensees and is therefore confidential. Source: Kawamoto and Gonzales 2005a.

Table 22: Hoomalu Zone BMUS Pounds Caught, Totals by Species and Year, 1996–2004

Species Name	Year								
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Hāpu‘upu‘u	21892	44490	65313	56018	20595	21107	12670	19800	23089
Kāhala	*	*	0	*	0	*	0	0	*
Kalekale	1708	3913	3710	3201	1563	1499	1053	1149	1039
‘Ōpakapaka	61568	85465	75537	71841	50487	52901	22846	15960	21389
Uku	16328	14853	23040	13758	29824	36491	14861	41721	35872
Ehu	6163	11230	14988	14161	8487	8372	3836	7579	7443
Onaga	18997	38296	49851	94594	91354	70630	47204	48379	62463
Papio/Ulua	0	0	0	0	0	0	0	*	0
Lehi	0	*	0	0	*	0	*	0	0
Gindai	1684	4289	4501	2860	1153	1362	1546	1982	2384
Ta‘ape	0	0	0	0	0	0	0	0	0
Armorhead	0	0	*	*	*	0	0	0	*
Butaguchi	23515	36817	30257	22726	21388	19432	20325	14614	13033
Gunkan ulua	0	0	0	0	*	0	0	0	*
White ulua	11646	5244	6523	2638	1624	5249	2939	507	*
Yellow-tail kalekale	0	0	0	0	0	0	0	0	0

Note: Pounds caught are from adjusted values whenever possible. Asterisks indicate that information was removed because it was derived from fewer than 3 licensees and is therefore confidential. Source: Kawamoto and Gonzales 2005a.

Table 23: MHI BMUS Pounds Caught, Totals by Month and Year, 1996–2004

Month	Year								
	1996	1997	1998	1999	2000	2001	2002	2003	2004
January	53,913	57,773	83,724	41,694	36,722	53,068	41,446	36,027	44,366
February	31,793	49,515	50,500	38,532	76,062	39,302	30,018	29,006	27,899
March	39,422	44,093	59,069	23,414	41,962	39,919	31,590	43,604	18,747
April	27,485	49,829	21,049	23,257	21,017	15,107	41,743	22,804	24,408
May	33,442	39,580	24,274	43,720	46,075	36,673	35,601	26,174	24,551
June	29,063	19,230	27,453	41,339	45,679	22,055	20,026	28,205	19,606
July	21,726	25,949	28,874	32,397	19,217	22,966	20,091	10,465	24,401
August	36,038	35,942	32,975	27,990	26,018	16,679	16,034	14,445	24,009
September	37,985	43,304	27,091	35,115	42,427	18,703	37,909	30,453	32,537
October	42,197	39,819	32,598	41,357	24,360	26,998	17,953	38,647	31,022
November	36,172	45,343	30,030	33,580	26,445	37,458	30,072	19,419	43,451
December	48,701	56,246	54,106	68,045	83,108	32,892	38,838	37,301	52,532

Note. Pounds caught are from adjusted values whenever possible. Source: Kawamoto and Gonzales, 2005a.

Table 24: Mau Zone BMUS Pounds Caught, Totals by Month and Year, 1996–2004

Month	Year								
	1996	1997	1998	1999	2000	2001	2002	2003	2004
January	13,330	15,195	7,792	3,331	2,158	1,060	1,218	5,074	6,348
February	12,349	21,853	11,791	4,411	1,116	3,009	6,840	9,152	10,069
March	11,729	10,340	10,596	3,918	0	3,528	14,170	11,886	7,539
April	11,712	18,329	1,871	498	665	1,675	10,558	4,901	10,068
May	12,011	6,527	896	5,337	4,038	4,495	8,161	11,646	15,143
June	19,154	9,420	3,238	0	8,215	2,665	3,913	15,981	8,674
July	13,399	8,206	1,567	4,832	10,243	7,180	12,190	2,658	11,094
August	11,667	5,022	2,576	1,877	13,205	8,954	10,778	14,010	3,608
September	15,032	602	2,563	11,345	2,981	9,547	10,516	5,667	6,782
October	9,606	1,580	13,790	9,910	3,215	1,547	15,255	5,510	8,874
November	5,007	4,986	6,065	7,188	2,460	4,620	10,865	7,925	3,651
December	10,220	6,941	3,883	7,617	5,943	1,347	7,342	4,318	4,724

Note: Pounds caught are from adjusted values whenever possible. Source: Kawamoto and Gonzales, 2005a.

Table 25: Hoomalu Zone BMUS Pounds Caught, Totals by Month and Year, 1996–2004

	Year								
Month	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
January	18,379	17,395	16,112	28,454	15,890	31,447	7,455	2,570	6,551
February	8,195	10,309	17,021	21,406	20,223	21,801	10,079	16,918	6,659
March	9,074	24,540	21,509	29,789	28,657	14,234	16,061	9,062	2,220
April	14,631	25,114	18,960	24,318	21,207	19,509	6,377	21,553	18,506
May	9,630	21,267	18,457	19,028	22,054	16,522	9,621	10,101	15,688
June	14,622	11,131	20,377	30,530	13,515	17,458	8,545	13,424	14,973
July	14,182	19,297	24,165	18,433	10,188	18,678	5,178	14,123	19,954
August	11,279	20,444	23,197	26,220	20,905	12,680	10,952	11,041	17,033
September	8,791	21,655	31,516	19,868	16,180	15,042	4,538	10,448	7,413
October	22,489	25,946	35,480	16,116	22,802	16,857	16,049	11,222	22,711
November	9,821	27,014	21,265	22,922	17,867	13,801	12,384	13,630	20,084
December	22,438	20,550	25,673	24,824	17,376	19,334	20,052	17,606	17,501

Note: Pounds caught are from adjusted values whenever possible. Source: Kawamoto and Gonzales, 2005a.

Table 26: Summary of Pounds Caught (Deep 7 Species) in the MHI by Month, 1992–2004

Month	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
January	57,226	35,839	41,351	54,854	40,228	38,597	59,489	28,136	23,739	36,585	30,199	29,918	32,135
February	28,224	22,323	34,868	49,352	24,176	29,573	29,824	22,689	60,214	22,275	19,855	21,031	21,453
March	33,345	16,456	29,416	32,402	29,735	26,097	37,486	13,542	32,340	24,748	22,254	35,563	12,902
April	39,069	10,926	15,466	18,240	18,833	28,920	8,857	10,426	13,634	6,837	29,032	15,322	16,534
May	23,527	11,559	12,226	16,317	15,277	20,107	9,742	16,859	19,573	16,267	12,519	14,874	12,286
June	11,599	9,717	10,848	10,618	11,131	5,992	9,262	10,368	14,996	9,098	3,250	15,958	6,734
July	14,437	10,922	14,068	10176	10,636	10,597	6,621	7,807	5,377	9,484	4,232	4,636	9,216
August	11,065	17,597	21,840	8,738	19,617	1,5845	11,107	8,955	9,208	7,489	7,860	8,292	8,577
September	17,595	33,102	35,029	26,225	26,579	20,317	15,341	20,368	24,220	8,736	26,709	21,294	15,494
October	35,785	29,622	37,287	15,131	29,794	22,477	21,199	26,597	15,341	18,626	12,328	28,557	19,691
November	23,848	22,640	14,448	28,774	26,357	30,477	17,696	24,217	17,914	26,829	24,855	12,043	35,235
December	44,500	49,247	52,030	59,810	37,439	42,397	40,612	53,146	64,705	25,351	33,773	26,022	43,741
TOTALS	340,220	269,950	318,877	330,637	289,802	291,396	267,236	243,110	301,261	212,325	226,866	233,510	233,998

Note: Deep 7 BMUS species list does not include uku (*Aprion virescens*). 1998 is the year that State instituted bottomfish species area closures and non-commercial bottomfish bag limits. Data sets used were all from the most recent HDAR data received as of October 2005. Source: Kawamoto et al. 2005.

Table 27: Summary of Pounds Caught (Deep 7 Species) in MHI Federal Jurisdiction by Month, 1990–2004

Month	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
January	5,409	6,933	5,481	7,461	7,352	12,509	11,801	7,263	16,711	3,649	3,441	6,099	4,284	3,799	5,763
February	4,800	5,822	4,497	3,742	8,978	8,906	6,348	5,517	5,147	2,197	12,468	5,270	3,600	2,023	3,003
March	5,662	1,449	4,895	3,924	7,778	7,975	6,124	2,882	5,458	1,193	7,955	6,043	3,083	5,310	457
April	4,717	3,266	4,760	1,607	3,882	6,615	4,643	4,770	1,313	1,377	2,053	1,325	4,503	1,019	1,328
May	834	3,264	3,277	1,825	3,807	6,025	1,631	3,997	1,166	2,510	713	2,073	2,020	566	2,641
June	1,049	2,048	1,606	1,317	3,993	2,746	1,759	1,538	372	997	929	747	747	2,033	0
July	2,023	2,693	1,944	1,289	7,271	2,124	1,599	2,869	402	1164	398	1240	216	104	163
August	3,670	2,470	1,114	3,800	6,381	1,985	1,924	3,198	1,099	988	194	1039	245	227	386
September	4,012	1,661	1,447	5,154	8,341	5,996	2,509	6,099	1,417	1,378	3,195	816	4,166	3,405	2,061
October	3,923	6,690	4,935	7,096	7,816	4,252	7,481	5,156	3,623	4,030	2,157	1,848	2,024	5,718	5,969
November	5,440	5,994	3,895	4,528	4,008	3,078	6,511	3,812	2,866	1,280	1,341	3,076	3,905	1,796	11,021
December	6,129	3,820	5,108	10,141	11,259	10,081	5,485	5,031	3,685	8,096	11,082	3,280	5,433	4,138	12,328
Summary	47,668	46,110	42,959	51,884	80,866	72,292	57,815	52,132	43,259	28,859	45,926	32,856	34,226	30,138	45,120

Note: Deep 7 BMUS species list does not include uku (*Aprion virescens*). 1998 is the year that State of Hawaii instituted bottomfish species area closures and non-commercial bottomfish bag limits. Source: Kawamoto et al. 2005.

Table 28: Federal Area Pounds Caught as Percentage of the Total Deep 7 Species Pounds Caught

Month	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
January	20%	15%	10%	21%	18%	23%	29%	19%	28%	13%	14%	17%	14%	13%	18%
February	13%	17%	16%	17%	26%	18%	26%	19%	17%	10%	21%	24%	18%	10%	14%
March	14%	10%	15%	24%	26%	25%	21%	11%	15%	9%	25%	24%	14%	15%	4%
April	14%	26%	12%	15%	25%	36%	25%	16%	15%	13%	15%	19%	16%	7%	8%
May	5%	25%	14%	16%	31%	37%	11%	20%	12%	15%	4%	13%	16%	4%	21%
June	11%	18%	14%	14%	37%	26%	16%	26%	4%	10%	6%	8%	23%	13%	0%
July	7%	14%	13%	12%	52%	21%	15%	27%	6%	15%	7%	13%	5%	2%	2%
August	13%	14%	10%	22%	29%	23%	10%	20%	10%	11%	2%	14%	3%	3%	5%
September	15%	6%	8%	16%	24%	23%	9%	30%	9%	7%	13%	9%	16%	16%	13%
October	14%	15%	14%	24%	21%	28%	25%	23%	17%	15%	14%	10%	16%	20%	30%
November	14%	20%	16%	20%	28%	11%	25%	13%	16%	5%	7%	11%	16%	15%	31%
December	14%	12%	11%	21%	22%	17%	15%	12%	9%	15%	17%	13%	16%	16%	28%
Summary	13%	15%	13%	19%	25%	22%	20%	18%	16%	12%	15%	15%	15%	13%	19%

Note: Deep 7 BMUS species list does not include uku (*Aprion virescens*). 1998 is the year that State of Hawaii instituted bottomfish species area closures and non-commercial bottomfish bag limits. Table data are expressed percentages of pounds caught, [(PB + MB)/MHI] × 100. Source: Kawamoto et al. 2005.

Table 29: Pounds of Deep 7 Species Caught at Penguin Bank by Month, 1990–2004

Month	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
January	5,409	6,933	5,481	7,088	7,352	11,533	11,759	6,476	16,711	3,649	3,441	6,099	4,284	3,799	5,763
February	4,493	5,805	2,759	3,742	8,909	8,417	5,784	5,499	5,147	2,197	12,359	5,270	3,600	2,023	2,955
March	5,662	1,449	3,806	2,458	7,717	7,683	5,957	2,882	5,458	1,193	7,352	6,043	3,083	5,310	457
April	4,717	3,225	4,714	1,607	3,178	5,927	4,619	4,770	1,313	1,209	2,053	1,322	4,503	1,019	1,328
May	834	3,160	3,277	1,816	3,558	3,014	1,631	3,949	1,166	2,510	713	2,073	2,020	566	1,890
June	1,049	1,139	1,606	1,317	3,080	2,022	1,759	1,285	372	997	603	744	606	2,033	0
July	2,017	2,684	884	1,289	5,483	1,375	1,599	2,252	402	1,164	355	1236	216	104	152
August	2,284	2,222	563	3,800	4,714	1,985	1,924	3,198	1,099	988	194	1039	245	227	386
September	3,775	1,639	874	5,154	7,136	5,735	2,446	6,099	1,417	1,378	2,026	775	4,166	3,359	2,061
October	3,923	6,690	4,505	6,939	6,792	4,252	7,481	5,156	3,623	4,030	1,414	1,840	2,024	5,714	5,969
November	5,408	5,688	3,874	4,528	2,877	3,014	5,746	3,812	2,866	1,280	813	3,076	3,905	1,796	11,021
December	6,129	3,727	4,896	9,806	10,954	9,069	5,455	5,031	3,685	8,096	10,943	3,275	5,433	4,061	12,328

Note: Deep 7 BMUS species list does not include uku (*Aprion virescens*). 1998 is the year that State of Hawaii instituted bottomfish species area closures and non-commercial bottomfish bag limits. Area 331 is the only area designated in the State statistical reporting area as Penguin Bank. Data sets used were all from the most recent HDAR data received as of October 2005.Source: Kawamoto et al. 2005.

Table 30: Pounds of Deep 7 Species Caught at Middle Bank by Month, 1990–2004

Month	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
January	0	0	0	373	0	976	42	787	0	0	0	0	0	0	0
February	307	17	1,738	0	69	489	564	18	0	0	109	0	0	0	48
March	0	0	1,089	1,466	61	292	167	0	0	0	603	0	0	0	0
April	0	41	46	0	704	688	24	0	0	168	0	3	0	0	0
May	0	104	0	9	249	3,011	0	48	0	0	0	0	0	0	751
June	0	909	0	0	913	724	0	253	0	0	326	3	141	0	0
July	6	9	1,060	0	1,788	749	0	617	0	0	43	4	0	0	11
August	1,386	248	551	0	1,667	0	0	0	0	0	0	0	0	0	0
September	237	22	573	0	1,205	261	63	0	0	0	1169	41	0	46	0
October	0	0	430	157	1,024	0	0	0	0	0	743	8	0	4	0
November	32	306	21	0	1,131	64	765	0	0	0	528	0	0	0	0
December	0	93	212	335	305	1,012	30	0	0	0	139	5	0	77	0

Note: Deep 7 BMUS species list does not include uku (*Aprion virescens*). 1998 is the year that State of Hawaii instituted bottomfish species area closures and non-commercial bottomfish bag limits. Areas denoted as Middle Bank are 578, 579, 593, and 594. Data sets used were all from the most recent HDAR data received as of October 2005. Source: Kawamoto et al. 2005.

Tables 24 to 26 and Figure 12 show the monthly landings of BMUS from the three management zones in the Hawaiian Archipelago. There is a clear difference in the seasonal pattern of landings between the MHI and the two zones in the NWHI. MHI bottomfish landings peak annually between November and March, which reflects the demand for red snappers over the holiday season between Thanksgiving and the New Year period including the Chinese and Vietnamese New Years. On the other hand, landings from the MHI are lowest in the summer months, between June and August, presumably as MHI fishermen participate in other fisheries (e.g., pelagic trolling), use the longer days for vessel maintenance, or take vacations at this time. By contrast, both the Mau and Hoomalu Zone monthly landings do not show much of a seasonal pattern, being relatively steady throughout the year, with the suggestion of a response from the Mau Zone to offset the mid-year trough in the MHI production.

Tables 27 to 30 summarize data on the Deep 7 bottomfish species complex to illustrate the impacts of closing those waters under Federal jurisdiction in the MHI. This includes primarily Penguin Bank and Middle Bank; the majority of these areas beyond the 3-mile limit under the jurisdiction of the State. Not surprisingly, Figure 13 shows that the seasonal pattern of landings observed for the MHI in Figure 15 is similar for the Deep 7 bottomfish complex. The monthly percentage of the MHI bottomfish landings formed by catches from Federal waters ranges on average from 13 to 18 percent (Figure 14) with an overall average of 17 percent.

The average monthly pattern of landings of Deep 7 species from the two principal bottom-fishing grounds in Federal waters are shown in Figure 15. The monthly landings at Penguin Bank reflect the trend for the MHI as a whole except these landings exhibit a much sharper decline during the summer months, lasting from April to September. The data for the Deep 7 landings at Middle Bank are much patchier, with many months in different years with no landings from this fishing ground. However, the average trend suggests that the pattern of landings from this fishing ground is more or less the reverse of the typical MHI pattern, with landings peaking between May and October.

In summary, the patterns for the MHI show that landings as a whole decline in the late spring to summer period, presumably as a result of less fishing activity as fishermen take vacations or possibly perform maintenance on their vessels. Market demand for bottomfish in this period does not appear to decline, and is compensated by production from the two NWHI fishing grounds – that are far less seasonal in their production – and possibly by an increase in production, at least in some years, from Middle Bank in the MHI. Moreover, this seasonal production pattern is also reflected in bottomfish imports into the State, which show a response to the MHI production decline, by peaking between June and September.

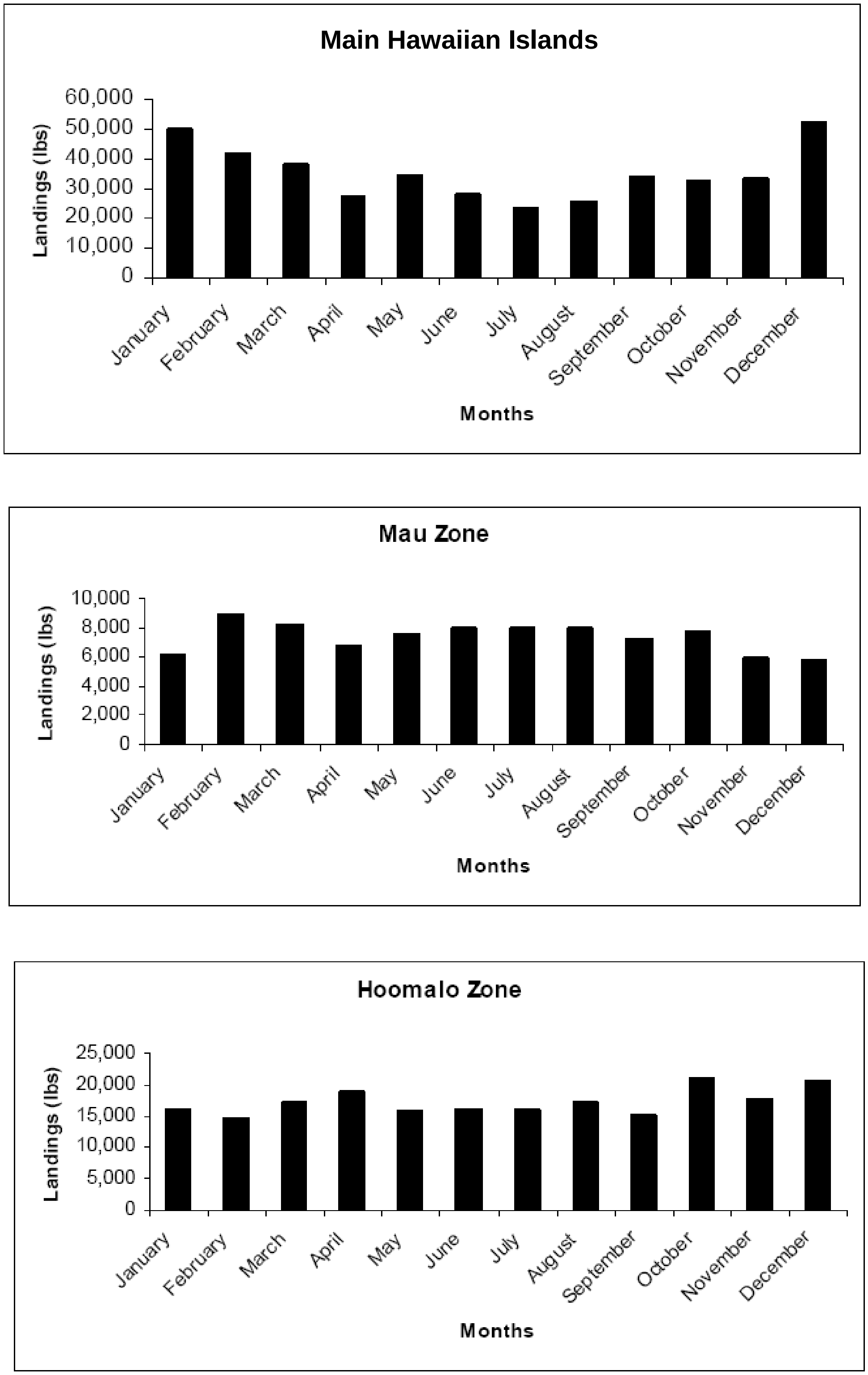
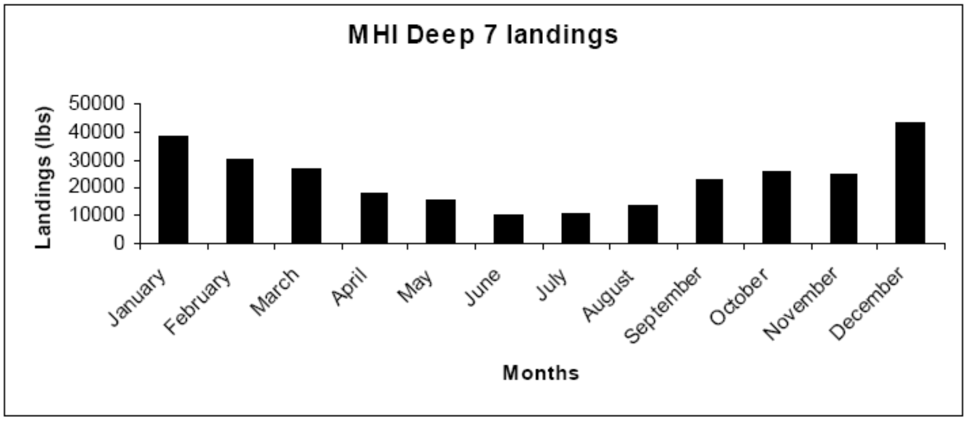


Figure 12: Average Monthly Landings between 1996 and 2004 for the Three Bottomfish Management Areas in the Hawaiian Archipelago.
Source: Kawamoto and Gonzales 2005a.



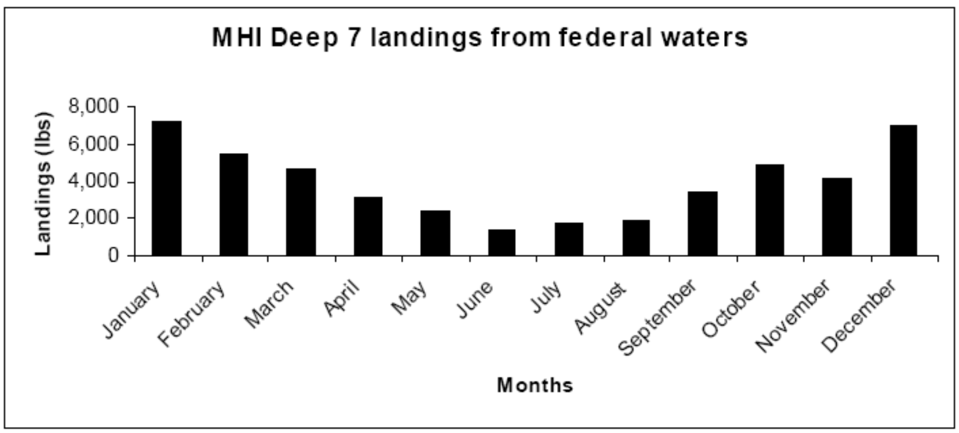


Figure 13: Average Monthly Landings of Deep 7 Species from MHI and from Federal Waters in the MHI.
Source: Kawamoto et al. 2005.

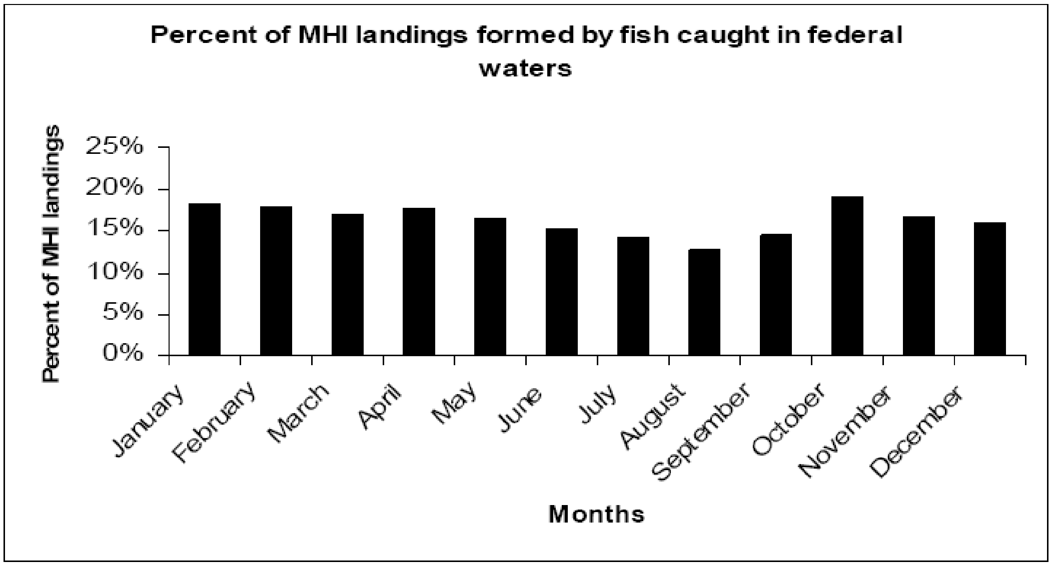
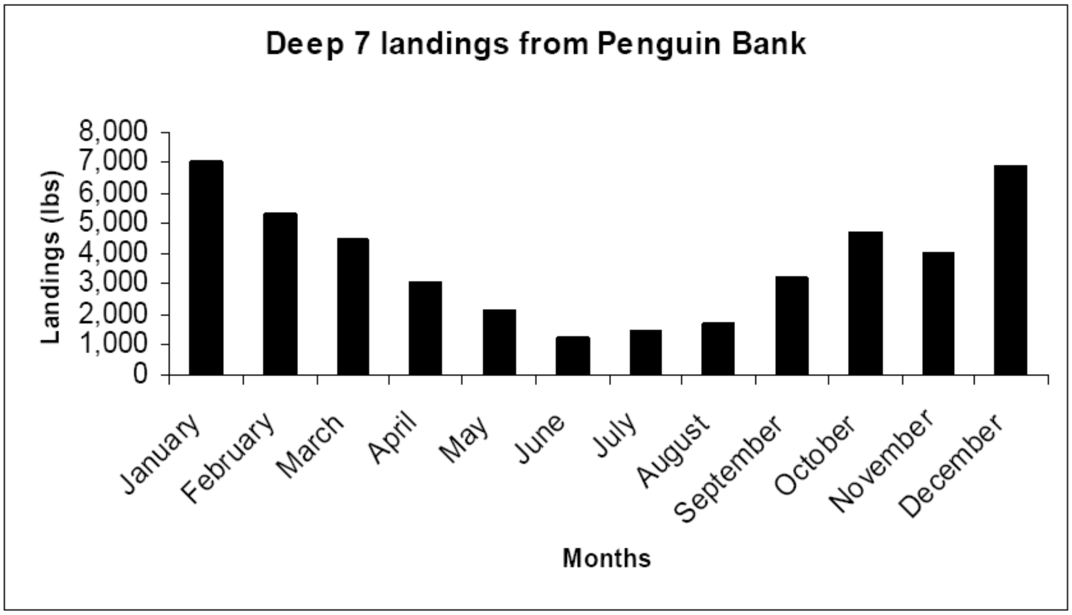


Figure 14: Average Monthly Percentage of Bottomfish Landings Formed by Fish Caught in Waters under Federal Jurisdiction in the MHI.
Source: Kawamoto et al. 2005.



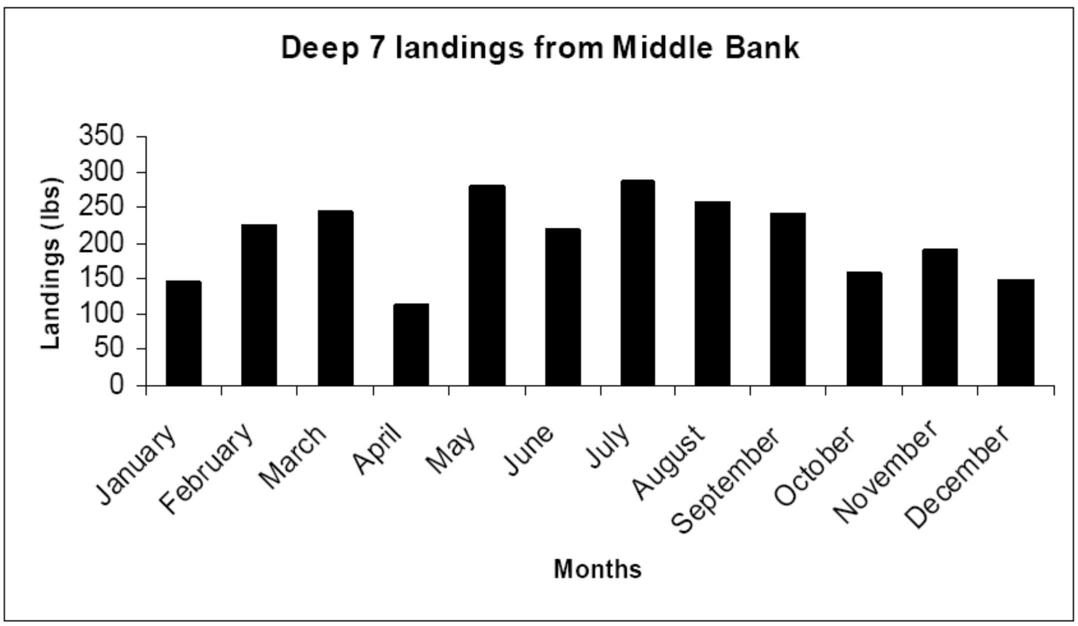


Figure 15: Landings of the Deep 7 Bottomfish Complex from the Two Principal Bottomfish Fishing Areas under Federal Jurisdiction in the MHI.
Source: Kawamoto et al. 2005.

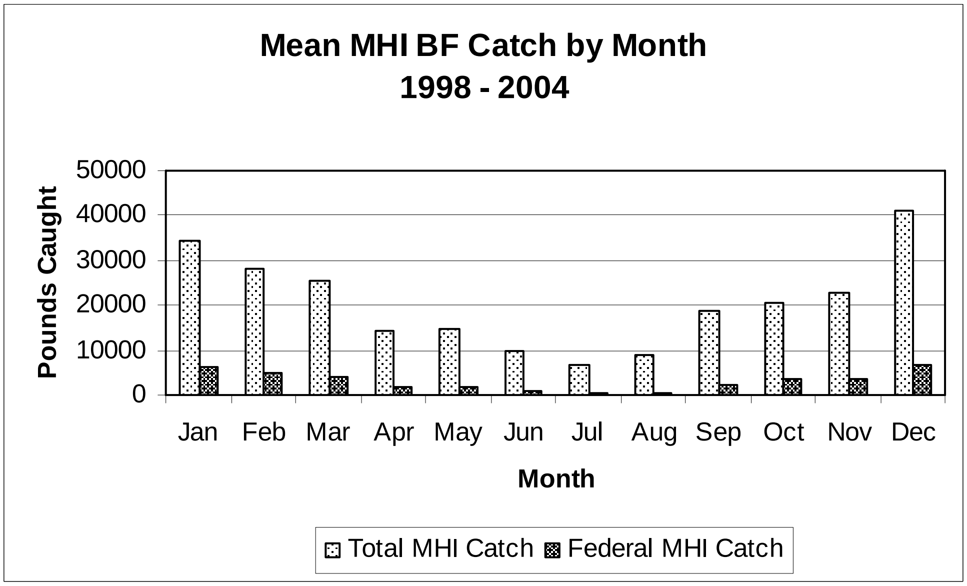


Figure 16: Mean MHI Bottomfish Catches by Month, 1998–2004.
Source: Kawamoto and Gonzales 2005a.

The annual cycle of landings from Penguin and Middle Banks shown in Figure 15 is also apparent in the annual cycle of landings in the entire MHI (Figure 16). The percentage of landings from Federal waters in the MHI by month is shown in Figure 17.

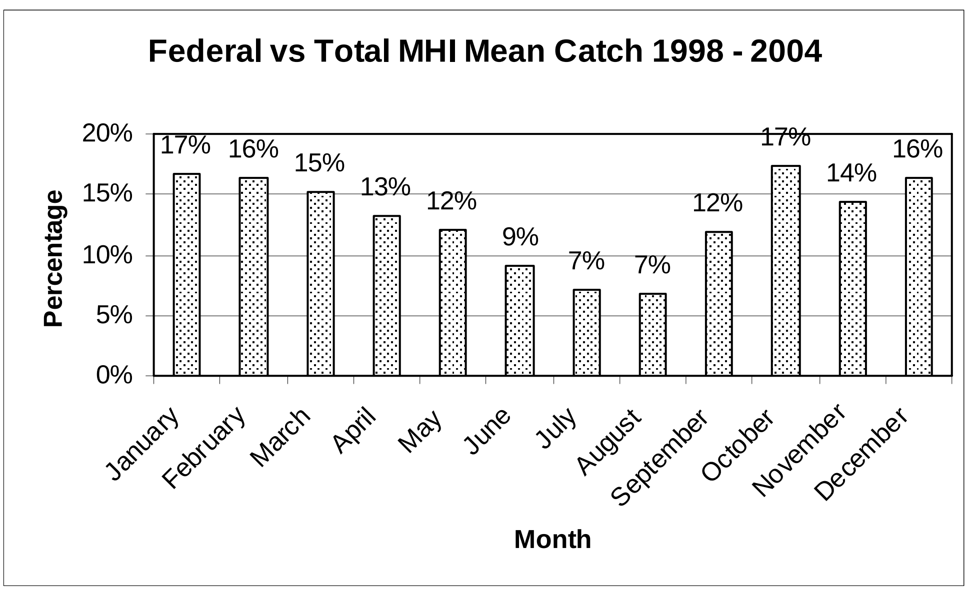


Figure 17: Federal Area Landings as a Percentage of the Total MHI Landings, 1998–2004.
Source: Kawamoto et al. 2005.

3.4.4.3 CPUE

Table 31 presents a time-series of trip CPUE values in the Hawaii bottomfish fishing zones. In the MHI, the greatest CPUE was recorded in the mid-1950s. There seems to have been a discontinuity between 1981 and 1982 with more recent numbers being markedly lower. The absolute lowest CPUE value was recorded in 1996 and 1998. The 2003 CPUE increased from that of 2002, but was still only 45 percent of the long-term mean value.

In the Mau Zone, CPUE on a per trip basis peaked in the late 1960s, with the lowest recorded value from 1993. CPUE has been relatively constant in recent years, but a 6-year high was recorded in 2003. The 2003 CPUE was 130 percent of the mean of the previous 5 years.

In the Hoomalu Zone, trip CPUE has been relatively constant for many years. The 2003 value was the lowest in 19 years, but was still 90 percent of the mean of the previous 5 years. Figure 18 plots the trend in bottomfish CPUE in pounds per trip for the MHI fishery. The declining trend from 1948 to 1991 is apparent. Since 1992, the trend has been relatively stable.

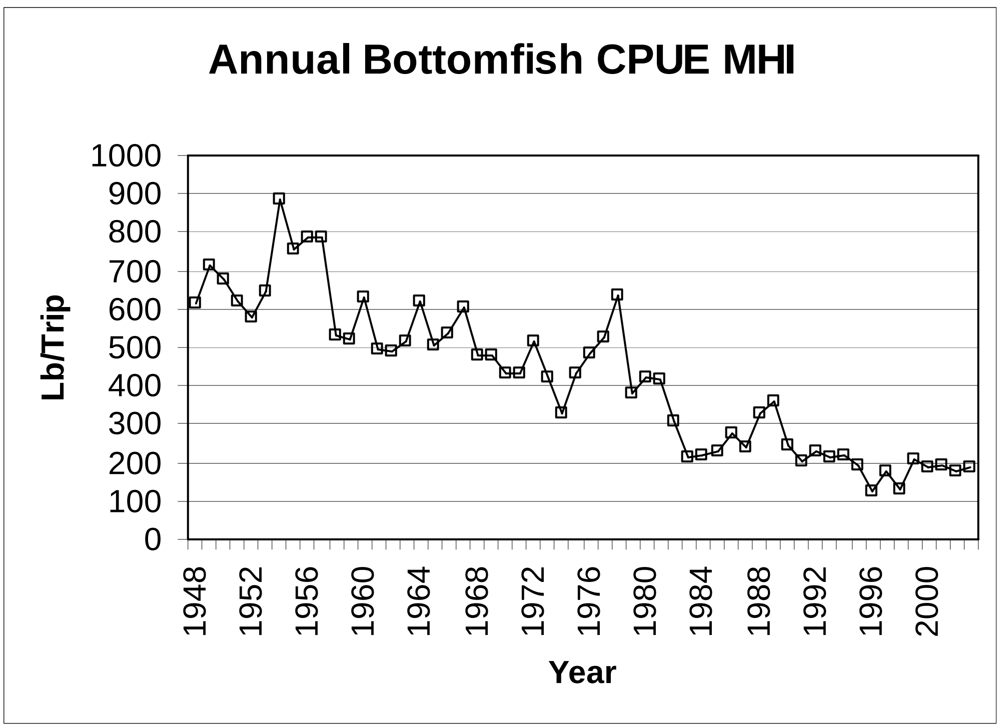


Figure 18: Bottomfish CPUE Trends in the MHI.
Source: WPRFMC 2005b, 2003 Bottomfish Annual Report.

Table 31: Bottomfish CPUE in the MHI and NWHI, 1948–2003 (lb/trip)

Year	MHI	Mau	Hoomalu	Year	MHI	Mau	Hoomalu
1948	614	5,968	14,635	1977	527	4,387	4,000
1949	713	6,788	4,614	1978	635	4,753	3,550
1950	677	4,966	6,072	1979	380	5,361	4,951
1951	621	4.980	8,228	1980	421	6,210	6,687
1952	577	7,407	4,766	1981	416	1,336	8,167
1953	645	8,937	7,627	1982	307	NA	7,953
1954	887	6,158	8,613	1983	214	2,242	3025
1955	755	4,659	9,336	1984	220	4,308	4,085
1956	784	2,523	5,202	1985	230	4,239	5,909
1957	789	3,958	1,535	1986	274	2,206	5,301
1958	533	NA	6,254	1987	237	2,889	8,187
1959	519	NA	5,897	1988	329	2,136	4,702
1960	630	6,379	8,139	1989	361	5,412	5,328
1961	496	6,999	7,978	1990	245	4,454	4,793
1962	491	4,641	NA	1991	202	2,413	5,928
1963	518	6,410	NA	1992	228	2,092	7,388
1964	619	8,028	8,390	1993	213	1,992	8,040
1965	503	6,656	NA	1994	218	3,748	4,651
1966	536	4,413	NA	1995	193	2,460	5,544
1967	602	14,749	NA	1996	125	2,823	5,870
1968	478	6,055	NA	1997	176	3,294	5,234
1969	480	11,484	NA	1998	130	2,518	5,198
1970	433	7,111	NA	1999	209	2,926	4,605
1971	433	4,784	NA	2000	187	2,654	5,212
1972	514	2,386	NA	2001	194	2,066	5,300
1973	421	3,224	NA	2002	179	2,496	4,651
1974	329	3,367	NA	2003	190	3,293	4,481
1975	430	5,439	NA	*M*	424	4,676	6,096
1976	485	4653	NA	*SD*	196	2,493	2,187

Source: WPRFMC 2005b, 2003 Bottomfish Annual Report.

Table 32: Bottomfish CPUE in the MHI and NWHI, 1984–2003 (lb/day)

Year	Mau	Hoomalu	Combined	Year	Mau	Hoomalu	Combined
1984	NA	NA	682	1995	306	582	442
1985	NA	NA	736	1996	298	563	407
1986	NA	NA	800	1997	429	574	521
1987	NA	NA	877	1998	364	527	484
1988	322	866	786	1999	337	534	486
1989	677	808	763	2000	260	601	513
1990	573	675	611	2001	283	543	467
1991	333	671	525	2002	438	412	425
1992	239	639	491	2003	508	490	496
1993	267	723	523	*M*	374	615	581
1994	353	629	526	*SD*	122	116	139

Source: WPRFMC 2005b, 2003 Bottomfish Annual Report.

Calculations of partial CPUEs (CPUE by species) in the MHI for the major bottomfish species (2003 Annual Report) showed that values for all species except ʻōpakapaka were less than half of their earlier values. The decline is most apparent for ehu. If species targeting is taken into consideration, all four species for which there are sufficient data (ʻōpakapaka, onaga, ehu, and uku) show MHI CPUE less than or equal to 50 percent of their earlier values.

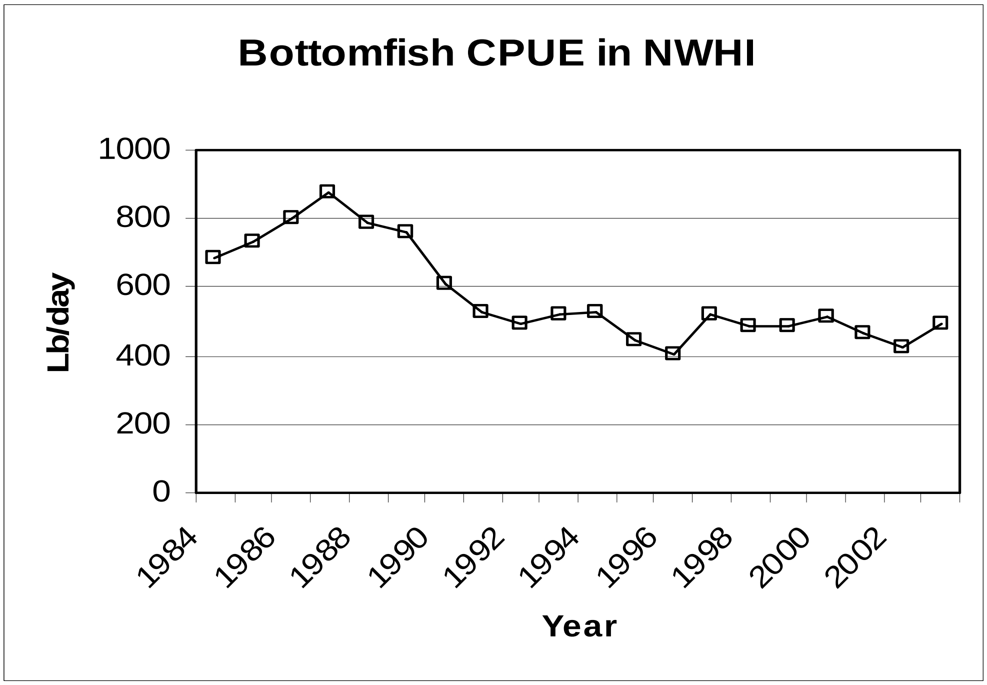


Figure 19: Bottomfish CPUE Trends in the NWHI.
Source: WPRFMC 2005b, 2003 Bottomfish Annual Report.

For the NWHI, a better measure of CPUE is pounds per day, due to the greater variability in the length of trips. On a catch-per-day basis (Table 32), the 2002 and 2003 CPUE in the Mau Zone were the highest since the 1989 to 1990 period. The 2003 CPUE was 151 percent of the mean of the previous 5 years. In the Hoomalu Zone, the highest daily CPUEs were also recorded in the late 1980s, but unlike the trend in the Mau Zone, CPUEs in the past two years in the Hoomalu Zone were the lowest recorded from that area. The 2003 Hoomalu daily CPUE was 94 percent of the mean for the previous 5 years. The combined CPUE trend can be seen in Figure 19.

3.4.4.4 Revenues and Prices

Inflation-adjusted gross revenue in the MHI bottomfish fishery grew steadily in the 1980s (Table 33) as a result of increases in both real prices and landings (WPRFMC 2003). However, beginning in 1990, revenue in the MHI fishery decreased sharply as both MHI bottomfish prices and landings declined. Inflation-adjusted revenue in the MHI fishery reached its lowest levels ever in 2001. Revenues from 2001 to 2003 were all less than the previous minimum value, although the trend was a slight increase over those years. Similarly, inflation-adjusted revenues in the NWHI fishery reached their lowest levels ever in the 2001 to 2003 period, with 2003 having the lowest recorded level.

Revenue from the MHI fishery has always been greater than that from the NWHI. Before the mid-1980s, MHI bottomfish revenue made up over 80 percent of the total Hawaii bottomfish revenue. The proportion declined due to a dramatic increase in NWHI bottomfish landings in the mid-1980s, and the MHI revenue was about 50 percent of the total during the period 1985–1987.

Since then, revenues in both areas have declined, but revenue from the MHI fishery remains above that of the NWHI. It was 67 percent of the total in 2003.

Historically, bottomfish catches from the MHI have tended to command higher aggregate prices than those caught in the NWHI, reflecting a larger proportion of preferred species and greater freshness. In the late 1990s, however, the prices appeared to converge, perhaps due to softness of the upscale part of the Hawaii market during an economic recession in the State (WPRFMC 1999). From 2001 through 2003, however, the price differential between MHI and NWHI fish widened considerably, possibly as a result of the large increase in imported bottomfish substituting in the market for NWHI fish. The 2003 inflation-adjusted per pound price for NWHI fish was the lowest ever recorded. This was in marked contrast to the inflation-adjusted prices received for MHI bottomfish, which reached their highest level in 13 years.

Table 33: Inflation-Adjusted BMUS Revenue and Price, MHI and NWHI, 1984–2003

Year	MHI Revenue ($1,000)	NWHI Revenue ($1,000)	MHI Price ($)	NWHI Price ($)
1984	3,179	2,388	4.21	3.61
1985	3,341	3,078	4.65	3.33
1986	3,432	3,178	4.53	3.66
1987	3,733	3,661	5.00	3.61
1988	4,940	2,254	4.46	3.61
1989	4,396	1,075	4.68	3.56
1990	2,978	1,416	4.99	3.35
1991	2,123	1,305	4.15	3.37
1992	2,180	1,485	4.02	3.50
1993	1,762	1,336	4.13	3.47
1994	2,009	1,548	4.09	3.50
1995	1,992	1,161	3.81	3.14
1996	1,719	1,067	4.23	3.45
1997	1,703	1,185	3.63	3.43
1998	1,631	993	3.73	3.19
1999	1,482	1,173	3.65	3.64
2000	1,717	944	3.84	3.85
2001	1,309	750	3.79	3.21
2002	1,396	777	4.13	3.39
2003	1,460	716	4.35	3.13

Source: WPRFMC 2005b, 2003 Bottomfish Annual Report.

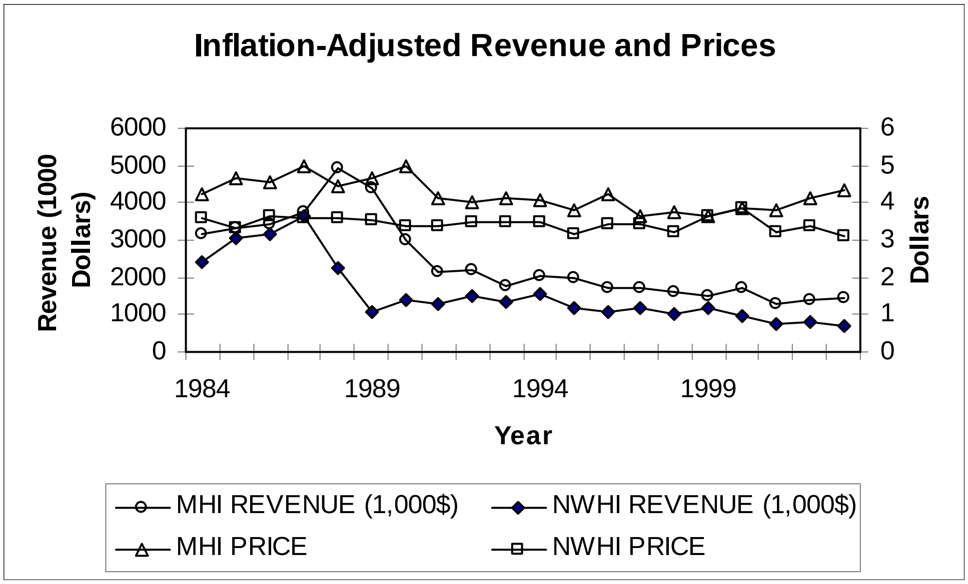


Figure 20: Annual Revenues and Average Prices by Bottomfish Management Zone.
Source: WPRFMC 2005b, 2003 Bottomfish Annual Report.

Table 34: MHI Bottomfish Prices by Month and Year for the Deep 7 Species (2000–2004)

Onaga					
Month	**2000**	**2001**	**2002**	**2003**	**2004**
January	6.61	5.94	6.21	6.19	6.54
February	5.12	6.34	6.19	6.46	6.37
March	6.07	5.73	6.46	5.85	6.77
April	7.55	6.95	5.59	6.20	6.90
May	7.05	7.13	6.81	6.24	6.91
June	6.78	6.61	7.74	6.25	7.39
July	**8.09**	7.48	**8.09**	**7.77**	7.22
August	7.48	**8.42**	7.43	6.73	**8.06**
September	5.64	6.78	5.70	5.23	6.70
October	6.03	5.57	5.50	5.34	5.99
November	7.05	4.98	5.62	6.25	5.70
December	6.05	7.54	6.16	7.72	6.93

‘Ōpakapaka					
Month	**2000**	**2001**	**2002**	**2003**	**2004**
January	5.09	4.33	5.24	5.67	5.57
February	4.14	4.68	5.38	5.20	5.24
March	4.62	4.55	5.72	4.76	5.63
April	**6.07**	5.02	4.76	5.47	5.54
May	5.02	5.18	5.57	5.38	5.27
June	4.86	4.75	**6.03**	5.00	5.56
July	5.30	5.11	6.08	5.52	5.39
August	5.20	5.62	5.81	5.24	5.41
September	4.40	4.94	4.93	5.05	5.36
October	4.59	4.75	4.70	4.78	4.81
November	5.31	4.34	4.48	5.12	4.69
December	4.29	**5.76**	4.84	**6.12**	**5.73**

Ehu					
Month	**2000**	**2001**	**2002**	**2003**	**2004**
January	4.65	3.82	4.52	4.81	4.57
February	3.60	4.52	5.20	4.16	4.92
March	4.42	4.09	4.99	4.39	5.34
April	5.27	5.05	4.27	5.12	5.24
May	4.58	4.85	4.72	4.24	4.53
June	4.36	4.62	5.74	4.10	4.78
July	**5.80**	5.09	**6.84**	5.13	3.16
August	5.21	5.26	5.54	5.37	5.27
September	4.22	5.06	4.50	4.13	**5.61**
October	4.64	4.92	4.55	4.40	4.78
November	4.80	4.11	4.50	5.24	4.34
December	4.43	**5.61**	4.32	**6.08**	5.35

Lehi					
Month	**2000**	**2001**	**2002**	**2003**	**2004**
January	3.21	2.98	3.48	3.61	4.06
February	3.03	3.19	3.43	**3.65**	3.38
March	3.48	2.63	3.46	3.54	3.24
April	3.43	2.78	3.02	2.97	3.05
May	3.01	2.32	3.08	2.70	2.39
June	2.68	2.47	1.87	2.65	3.83
July	2.81	3.43	**4.59**	2.62	2.95
August	3.16	**3.62**	2.38	2.87	3.48
September	3.15	2.71	2.95	3.06	3.19
October	3.09	2.84	2.87	2.76	**4.10**
November	**3.49**	2.50	2.67	3.16	3.51
December	3.03	3.19	3.02	3.27	3.54

Kalekale					
Month	**2000**	**2001**	**2002**	**2003**	**2004**
January	**3.75**	2.69	3.15	2.91	3.39
February	2.58	3.23	3.77	3.21	3.37
March	2.92	3.23	**4.32**	3.02	**4.35**
April	3.49	3.27	3.22	3.33	3.73
May	3.31	3.07	3.14	2.81	3.70
June	3.25	2.94	3.29	3.10	3.93
July	3.64	2.97	3.98	1.42	3.10
August	3.49	**3.69**	4.11	2.89	3.87
September	2.87	3.12	3.34	3.19	4.14
October	3.28	3.44	3.31	3.16	3.42
November	3.54	2.64	2.88	3.18	2.93
December	2.74	3.39	2.64	**3.93**	3.21
Gindai					
Month	**2000**	**2001**	**2002**	**2003**	**2004**
January	**4.36**	3.03	3.41	3.17	3.30
February	3.48	3.98	4.02	3.39	3.86
March	3.46	3.59	4.19	3.16	3.87
April	3.77	**4.02**	3.62	2.87	3.58
May	3.93	3.30	3.43	2.91	3.84
June	3.67	2.79	4.17	2.50	3.95
July	4.11	3.58	**4.65**	3.92	3.34
August	4.08	3.68	3.66	3.82	3.61
September	3.65	3.60	3.16	3.62	**4.25**
October	3.52	3.52	3.40	3.74	3.58
November	3.75	2.89	3.03	3.66	3.74
December	3.29	3.32	3.08	**4.28**	3.55

Hāpu‘upu‘u					
Month	**2000**	**2001**	**2002**	**2003**	**2004**
January	3.37	3.07	4.65	4.40	4.99
February	3.57	3.79	4.40	4.12	**5.43**
March	3.78	3.55	4.64	4.16	4.67
April	4.69	4.25	4.24	4.05	5.06
May	3.60	3.73	3.89	4.67	4.50
June	3.46	4.42	**6.47**	3.73	4.27
July	4.25	4.35	3.55	4.51	4.62
August	**4.74**	**4.79**	3.68	5.07	4.71
September	3.81	3.97	4.24	4.40	5.31
October	3.36	4.22	3.92	3.97	3.86
November	3.05	3.90	4.25	4.91	4.58
December	3.22	4.77	4.06	**5.09**	5.04

Source: Kawamoto and Gonzales 2005c.

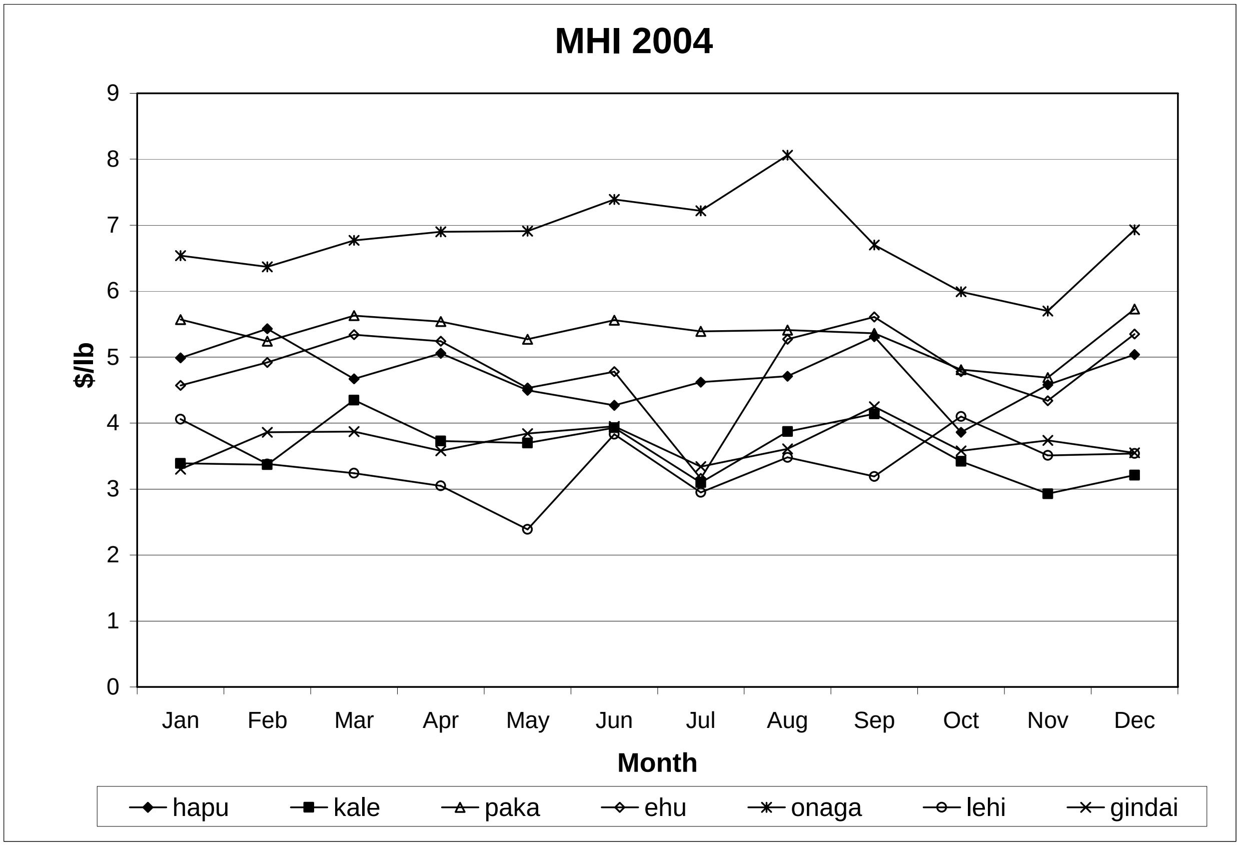


Figure 21: Average Prices by Species by Month for the MHI.
Source: Kawamoto and Gonzales 2005c.

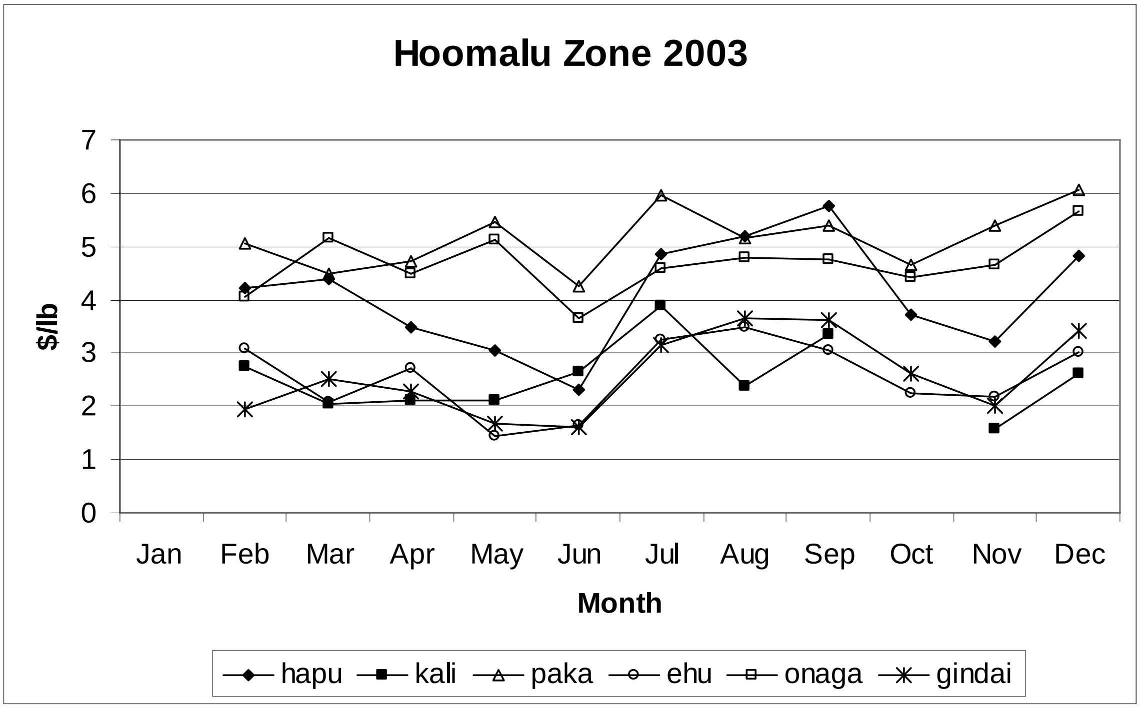


Figure 22: Average Prices by Species by Month for the Hoomalu Zone.
Source: WPRFMC 2005b, 2003 Bottomfish Annual Report.

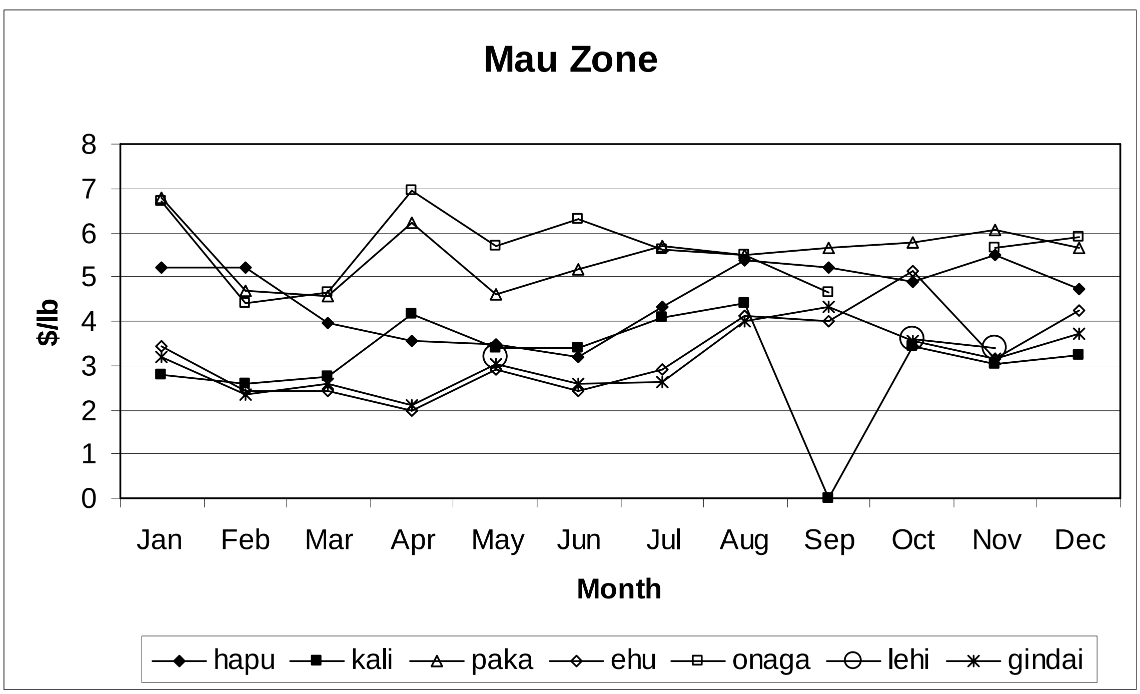


Figure 23: Average Prices by Species by Month for the Mau Zone.
Source: WPRFMC 2005b, 2003 Bottomfish Annual Report.

3.4.5 Processing and Marketing

A market for locally caught bottomfish was well-established in Hawaii by the late nineteenth century. Today, fresh bottomfish continues to be important seafood for Hawaii residents and visitors. Nearly all bottomfish caught in the NWHI fishery are sold through the Honolulu fish auction (United Fishing Agency, Ltd.). Prices received at the auction change daily, and the value of a particular catch may even depend on its bidding position within the auction (Hau 1984). Bottomfish caught in the MHI fishery are sold in a wide variety of market outlets (Haight et al. 1993a). Some are marketed through the fish auction in Honolulu and intermediary buyers on all islands. Sales of MHI bottomfish also occur through less formal market channels. For example, local restaurants, hotels, grocery stores, and individual consumers are important buyers for some fishermen. In addition to being sold, MHI bottomfish are consumed by fishermen and their families, given to friends and relatives as gifts, and bartered in exchange for various goods and services.

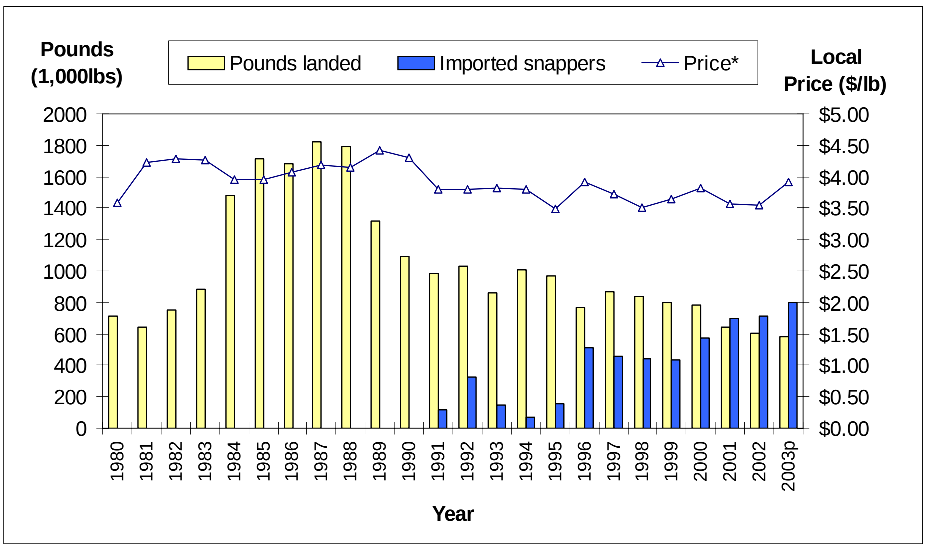


Figure 24: Hawaii Bottomfish Demand (Annual, Inflation-Adjusted Ex-Vessel Price and Supplies [Domestic Landings and Imported Fresh Snapper]), 1980–2003.
Source: WPRFMC 2005b, 2003 Bottomfish Annual Report.

Historically, the demand for bottomfish in Hawaii has been largely limited to fresh fish. Seventy years ago Hamamoto (1928) remarked that fish dealers in Honolulu refused to buy fish that had been harvested in the NWHI and frozen on board because the demand for frozen product was so low. In recent years the price differential between frozen and fresh product has narrowed for some species of bottomfish, but the price differential remains substantial for onaga and ehu, the two highest priced fish. In the past, bottomfish catches from the MHI have tended to command higher aggregate prices than those caught in the NWHI, reflecting the greater freshness required by the “sashimi” grade market. Bottomfish caught around the MHI are iced for only 1 to 2 days before being landed, whereas NWHI fresh catches may be iced for 10 days or more. By the late

1990s, however, the prices for MHI and NWHI catches have converged, perhaps due to the softness of the upscale part of the Hawaii market (WPRFMC 1999).

Household consumers in Hawaii prefer and restaurants often serve plate-sized bottomfish with the head attached. Medium to large bottomfish from the MHI are often targeted for export markets and local high-end specialty restaurants that demand the highest sashimi quality. Bottomfish caught around the NWHI tend to be the medium to large fish (over 5 pounds) preferred for the restaurant fillet market. Because the percent yield of edible material is high, handling costs per unit weight are lower, and more uniform portions can be cut from the larger fish.

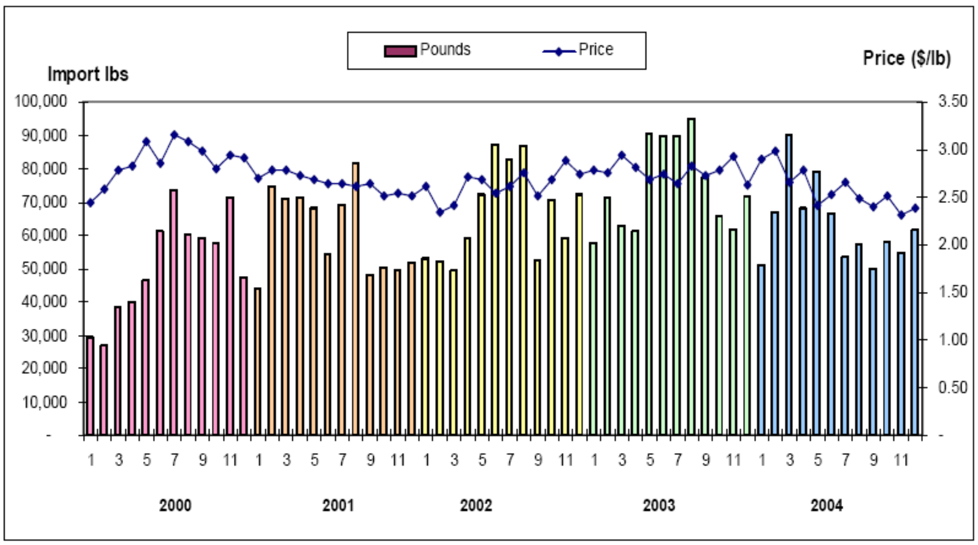


Figure 25: Monthly Imports of Bottomfish into Hawaii, 2000-2004.
Source: PIFSC 2005, unpublished data.

Pooley (1987) showed that Hawaii auction market prices increase when MHI landings drop. However, during the 1990s the relationship between price and volume faltered, perhaps due to an increase in imported fresh fish that competed in the market with locally caught bottomfish (WPRFMC 1999; Figure 24). According to U.S. Customs data for the Port of Honolulu, 715,000 pounds of snapper were imported in calendar year 2002, worth $1.92 million ($2.68 per pound; WPRFMC 2004). This amount exceeded domestic supplies and was a significant factor in ex-vessel prices. Not only has the quantity of foreign-caught fresh fish increased in recent years, but the number of countries exporting fresh fish to Hawaii has also increased. Fifteen years ago, for example, fresh snapper was exported to Hawaii mainly from within the South Pacific region. In recent years, Tonga and Australia have been the largest sources of fresh snapper, with Fiji, New Zealand, Indonesia, Samoa, Vietnam, Chad, and Madagascar being other sources.[17]

[17]http://www.st.nmfs.gov/pls/webpls/trade_dist_allproducts_mth.results?qtype=IMP&qmonthfrom=01&qmonthto=01&qyearfrom=1996&qyearto=2005&qproduct=%25&qdistrict=32&qsort=COUNTRY&qoutput=TABLE

To further explore the value of Hawaii's fresh local bottomfish, and the role imports play in the market, the Council sponsored a study of the attitudes and beliefs of Hawaii restaurateurs and executive chefs (Coffman 2004). The objectives of the study were to (1) determine the value added to NWHI bottomfish in Hawaii's restaurants and (2) determine whether NWHI bottomfish are easily substituted for, both in chefs' and customers' preferences, with bottomfish from other places or other types of fish. Table 35 summarizes the quantitative information derived from interviews with 24 of Hawaii's top chefs and six seafood wholesalers.

Table 35: Hawaii Chefs and Wholesalers Perceptions of Hawaii Bottomfish

INTERVIEW RESULT	PERCENTAGE OF CHEFS INTERVIEWED
Knew if their fish was from the MHI or the NWHI	0
Only serve Hawaii-caught bottomfish	19
Try to serve Hawaii-caught bottomfish	29
Advertise bottomfish dishes as "Fresh Island Fish" or similar	29
Volunteered that the price of bottomfish is high and/or rising	29
Volunteered concern over bottomfish sustainability	73
Volunteered concern about fishing regulations driving up bottomfish prices	14
Said customers are willing to pay more for Hawaii-caught bottomfish	42.8
Said customers are not willing to pay more for Hawaii-caught bottomfish	19
Said customers expect Hawaii-caught bottomfish to be less expensive in Hawaii relative to other fish dishes	9.5
Named bottomfish on list of "most desirable fish species"	77.3
	Other Chef Responses
Average percentage of meals that are fish	48.6
Average percentage of fish meals that are bottomfish	26.5
Average price of Hawaii-caught bottomfish dish	$29.52
Average price of an imported bottomfish dish	$28.46
Average portion size of a bottomfish dish	6.78 oz
Average product yield of whole fish (usefulness increases if stock made)	50%
Average days last month with bottomfish on menu	26.8
Average days last year with bottomfish on menu	325.4
Average percentage customers who are visitors to Hawaii	40.7%

INTERVIEW RESULT	Percentage of Wholesalers Interviewed
Said MHI are better in quality than NWHI bottomfish	100
Said NWHI and imported bottomfish are comparable in quality	33
Said imported better than NWHI bottomfish	33
Said quality difference between imported and NWHI bottomfish depends on the country of origin	66
Said price of bottomfish is high, but steady	33

Source: WPRFMC 2004.

The survey found that it was typical for the restaurant to purchase Hawaii-caught bottomfish fillets from a wholesaler at a price of $12 to $16 per pound. NWHI bottomfish were more suitable for filleting than MHI fish because of their larger size, but the higher quality of MHI fish allowed their use for sashimi. Summary conclusions of the study were as follows:

> Bottomfish is a popular dish in most of Oahu's top-end restaurants. Several of the most noted "boutique type" restaurants only serve Hawaii-caught bottomfish. The expensive prices as well as the inconsistency of supply of both MHI and NWHI bottomfish make it difficult for most restaurants to serve only Hawaii-caught fish. Most restaurants serve a combination of Hawaii-caught and imported bottomfish. Because of obvious time factors, MHI bottomfish are considered the freshest and highest quality by most wholesalers while NWHI bottomfish can be comparable to some imports. It seems that some countries' fishermen are able to come into port soon enough, handle the fish well enough, and can fly the bottomfish to Hawaii in a manner timely enough to rival the average quality of a bottomfish boat that comes into port from the NWHI every few weeks. The NWHI bottomfish fishery does, however, help fill the niche of Oahu restaurants who only serve Hawaii-caught fish.

3.4.6 Bycatch

Most fisheries have both non-target species (not the target of fishing, but kept for consumption or sale) and bycatch (discards). If a fish not targeted by the fishery, or any part of it, is used or sold, it is considered an incidental catch of a non-target species, not a "bycatch". Thus, for example, in years past, when the "finning" of sharks was allowed, the discarded shark carcass was not a bycatch. It is also important to note that the MSA includes turtles as fish, but not marine mammals or seabirds. The following discussion focuses on bycatch of species generally regarded as fish. Turtles along with marine mammals and seabirds are discussed later, in the protected species section.

3.4.6.1 Magnuson–Stevens Act Definitions and Requirements

Bycatch is defined as follows in the MSA (§3[2, 12, 9, and 33]):

> The term "bycatch" means 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 non-commercial catch and release fishery management program.
>
> The term "fish" means finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds. In addition, sea turtles are defined as "fish" under the MSA.
>
> The term "economic discards" means fish which are the target of a fishery, but which are not retained because they are of an undesirable size, sex, or quality, or for other economic reasons.
>
> The term "regulatory discards" means fish harvested in a fishery which fishermen are required by regulation to discard whenever caught, or are required by regulation to retain but not sell.

The National Standard Guidelines (50 CFR 600.350(c)) extend the definition of bycatch to include the following:

> Fishing mortality due to an encounter with fishing gear that does not result in capture of fish (i.e., unobserved fishing mortality).

The 1996 SFA amendments to the MSA added two key requirements of FMPs regarding bycatch. First, the new National Standard 9 (MSA §301(a)(9)) requires that

> conservation and management measures shall, to the extent practicable, (a) minimize bycatch and (b) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

Second, MSA §303(a)(11) requires that FMPs

> establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority:
>
> (a) minimize bycatch; and
> (b) minimize the mortality of bycatch which cannot be avoided.

3.4.6.2 Available Estimates of Bycatch and Bycatch Mortality

In Hawaii, there are two separately managed bottomfish fisheries: a strictly commercial fishery in the NWHI; and a mixed commercial, non-commercial fishery in the MHI. Although these fisheries use the same gear and methods, the motivations of the NWHI commercial operators and MHI commercial, non-commercial fishermen differ. This situation results in different bycatch compositions between the two groups. The NWHI commercial fishermen seek the highest economic return on their catch and therefore may release lower valued species, especially early in a trip, thereby conserving both ice and hold space.

Bottomfish fishermen in the NWHI and the MHI have been voluntarily involved with the State's ulua and multi-species tagging programs. Fishermen have routinely reported that they release many unwanted fishes alive (Kawamoto, PIFSC, personal communication). Data on bycatch in the NWHI commercial fishery is available from the catch report program, from limited NMFS observer data, and from NMFS research cruises in the NWHI.

Because the State and NMFS do not have permit, logbook, or catch reporting system for non-commercial marine fishermen, there are no data on bycatch for this sector. Non-commercial fishermen may be more inclined to retain a greater variety of species for home consumption or distribution to relatives and friends, and thus their bycatch percentages are likely substantially less than that of the commercial sector (Kawamoto, PIFSC, personal communication).

Bottomfish gear types and fishing strategies are highly selective for desired species and sizes. Management measures that serve to further reduce bycatch in the bottomfish fishery include prohibitions on the use of bottom trawls, bottom gillnets, explosives, and poisons.

3.4.6.3 Bycatch in the Main Hawaiian Islands Bottomfish Fishery

A summary of the bycatch in the MHI bottomfish fishery is given in Figures 30 and 31. This information is from catch and effort data submitted to HDAR by MHI commercial bottomfish fishery participants during 2003 and 2004. Bycatch as defined by the MSA and the National Standard guidelines includes not only discards but unobserved mortality, which is defined as "mortality due to an encounter with fishing gear that does not result in capture of the fish." The State's catch and effort report collects information on "lost" fish, that is, fish that are lost after being hooked. In the deepwater bottomfish fishery the species identification and reported number of "lost" fish are questionable because they are lost for various or unknown reasons during retrieval at depths that are not directly observable. Therefore the positive species identification and number of fish are likely inaccurate. The percentage of mortality of these "lost" fish is unknown and it is likely that not all die from the encounter. Therefore, the fish "lost" numbers are considered conservative as under the MSA they are all counted as unobserved mortalities (including those that survive). Overall, bycatch in the MHI bottomfish fishery is low, with only 8.5 percent of the catch included in the bycatch category (Figure 26).

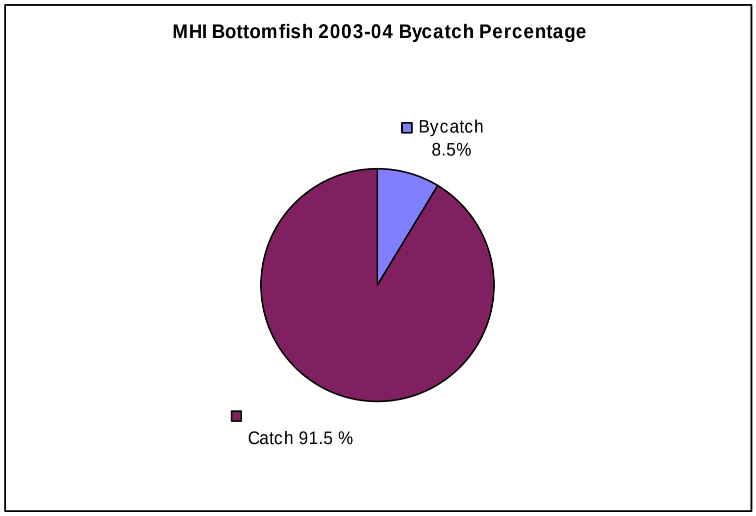


Figure 26: Ratio of Bycatch to Catch in the MHI.
Source: Kawamoto and Gonzales 2005b.

The average bycatch ratios and composition of the MHI bottomfish catch for 2003 and 2004 combined are presented in Figure 26. The total bycatch in the fishery for the combined years is 8.5 percent. Each individual set of species (Pelagic Management Unit Species [PMUS], BMUS, and miscellaneous) contributes to this overall percentage.

PMUS catches comprise under one percent (0.9 percent) of the total catch with less than one percent (0.3 percent of total catch) being considered bycatch. The majority of the pelagic bycatch consists of sharks (88 percent of PMUS bycatch).

The targeted BMUS in the MHI bottomfish fishery consists of six snappers and one grouper species, collectively known in Hawaii as the Deep 7 species complex. Very little of the targeted Deep 7 species catch (3.3 percent) is reported as bycatch. Looking at the entire BMUS complex (Deep 7 and other BMUS) the bycatch percentage rises to 7.5 percent. The majority of the BMUS bycatch is composed of kāhala, butaguchi, and white ulua. All of these species are members of the jack family (Carangidae) and are not included in the Deep 7 species complex. Ninety-three percent of all kāhala (*Seriola dumerili* and *S. rivoliana*) were reported as bycatch. Release rates of kāhala are high because these fish are known to be ciguatoxic and therefore have little or no market value in Hawaii.

The miscellaneous species category includes over 30 species of near-shore and pelagic fishes that are occasionally caught while bottomfish fishing. Miscellaneous species account for less than one percent (0.7 percent) of the overall bycatch, but comprise 4.4 percent of the overall catch.

Table 36: Bycatch Percentage by Species Grouping for 2003-2004

Species Group	Number Landed	Number Released	Number Damaged	Number Lost	Total Number Caught	Percent Bycatch	Percent of Catch
PMUS	317	122	0	4	443	0.3	0.9
BMUS (Deep 7)	39,569	61	0	1,541	41,171	3.3	86.0
Other BMUS	2,147	1,950	0	47	4,144	4.2	8.7
Total BMUS (Deep 7 and Other)	41,716	2,011	0	1,588	45,315	7.5	94.7
Misc. species	1,760	26	0	304	2,090	0.7	4.4
Totals	43,793	2,159	0	1,896	47,848	8.5	100.0

Source: Kawamoto and Gonzales 2005b.

At public meetings conducted in support of this proposed management action, numerous comments were made by fishermen from Hilo to Kauai regarding the significant increase in the last three years of fish loss to shark predation. Several fishermen reported that during certain times at certain locations, no fish can be brought to the surface without it being taken by sharks.

3.4.6.4 Bycatch in the NWHI Bottomfish Fishery

The major discard species in the NWHI bottomfish fishery are given in Table 36. It should be noted that a large percentage of the snappers and the grouper listed are included as bycatch because of damage from sharks. State logbook data and observer programs conducted by NMFS indicate that total discards (including damaged target species) account for approximately 8 to 23 percent of the total catch in bottomfish fisheries in the Hawaiian Archipelago (Nitta 1999; WPRFMC 1998a). Carangids, sharks, and miscellaneous reef fish (pufferfish, moray eels, etc.) are the most numerous discard species. Two species in particular, kāhala (*Seriola dumerili, S. rivoliana*) and butaguchi (*Pseudocaranx dentex*), make up the majority of the bycatch. It is believed that the discarding of these types of fish (e.g., sharks, jacks) does not result in mortality as these types of fish do not suffer from barotraumas when brought up from depth. Most species are not kept because of their unpalatability, however some carangids (large jacks and amberjacks) are also discarded because of concerns of ciguatera poisoning.[18] Butaguchi, which commands a low price in the Hawaii market, may be discarded in the early days of a fishing trip because this species has a poor product shelf-life. The major discard species in the NWHI bottomfish fishery as reported by NMFS observers are given in Table 37. It should be noted that a large percentage of the snappers and the grouper listed are included as bycatch because of damage from sharks.

[18] Ciguatera fish poisoning results from eating a fish containing a neurological toxin produced by a microscopic dinoflagellate algae. The algae grow epiphytically on benthic macroalgae (seaweeds) and are ingested by herbivorous fish that in turn are eaten by larger carnivorous fish, with each step concentrating the toxin. In humans, ciguatera poisoning may cause severe illness or even death.

In bottomfish fishing operations, the largest proportion of lost fish and gear is attributable to interactions with sharks (Nitta 1999). From time to time some fishing areas are dominated by sharks such that the majority of hooked fish are either stolen or damaged. It appears that the time periods of high incidences of predator damage to the catches are not constant over years or even areas. Predator abundance and fishery losses vary and the reasons for this occurrence are unknown. The estimated economic losses experienced by fishermen as a result of shark interference with fishing operations are substantial (Kobayashi and Kawamoto 1995). In the NWHI, the gray reef shark (*Carcharhinus amblyrhnchos*) is believed to be the species of shark that interferes most with the bottomfish catch.

Data collected by NMFS during research bottomfish fishing cruises indicate the potential species composition of bycatch in the NWHI bottomfish fishery (Figure 27). Research bottomfish fishing is less likely to exclusively successfully target commercial species; however, Figure 30 indicates the specific families of species that may be caught in association with bottomfish fishing operations.

The most recent data available (WPRFMC 2004) reinforce the trends described above, including the differences in strategy between Mau and Hoomalu Zone operations. In both zones in 2002, 100 percent of the sharks and kāhala were discarded. In the Mau Zone, butaguchi was frequently discarded in 2002 (22 percent), unlike in 2001 when only 1 percent was discarded. The only other significant discard was omilu (*Caranx melampygus*) at 9 percent, a decrease from the 38 percent recorded in 2001.

Table 37: Percent Discards From Bottomfish Trips with NMFS Observers, 1990–1993

Species	No. Caught	No. Discarded	Percent Discarded
Kāhala	2,438	2,266	92.9
Kalekale (yellowtail)	40	22	55
Sharks	176	92	52.3
Miscellaneous fish	115	59	51.3
Ulua (white)	127	62	48.8
Miscellaneous snapper/jack	189	91	48.1
Butaguchi	3,430	1,624	47.3
Ulua (black)	23	10	43.5
Ta‘ape	110	40	36.4
Miscellaneous fish unidentified	174	26	14.9

Kalekale	874	52	6
‘Ōpakapaka	5,092	107	2.1
Ehu	1,185	20	1.7
Uku	2,209	28	1.3
Hāpu‘upu‘u	1,593	19	1.2
Gindai	459	3	0.7
Onaga	1,141	8	0.7
Alfonsin	1	0	0
Armorhead	1	0	0
Lehi	3	0	0

Source: Nitta 1999.

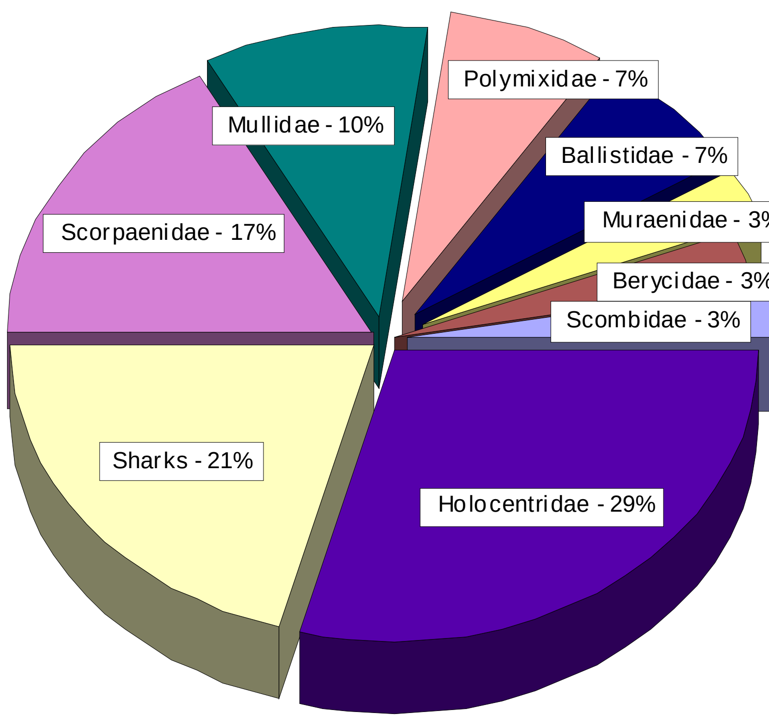


Figure 27: NMFS Research Cruise Estimates of Bottomfish Bycatch in Hawaii.
Note: Percent of total number; Source: WPRFMC 1998a.

In the Hoomalu Zone, several lesser valued species were commonly discarded, including kalekale (48 percent in 2002 and 24 percent in 2001), butaguchi (20 percent in 2002 and 32 percent in 2001) and white ulua (*C. ignoblis*; 63 percent in 2002, 70 percent in 2001). Tables 38 and 39 summarize information from the Mau and Hoomalu Zones, respectively for bycatch in 2002 and compare rates to those of 2001.

Table 38: Mau Zone Bycatch by Species in 2001 and 2002

SPECIES	NO. RELEASED IN 2002	NO. SOLD IN 2002	% BYCATCH 2002	NO. RELEASED IN 2001	% BYCATCH IN 2001
Pelagic MUS					
Shark	57	0	100	55	100
Tiger shark	3	0	100	1	100
Bottomfish MUS					
Ehu	2	2,070	<1	8	<1
Hāpu‘upu‘u	12	1,254	1	0	0
Butaguchi	184	641	22	10	1
Black Ulua	2	81	2	0	0
Kāhala	226	0	100	653	100
Miscellaneous Species					
Omilu	20	193	9	30	38
Barracuda	1	9	10	0	0

Table 39: Hoomalu Zone Bycatch by Species in 2001 and 2002

SPECIES	NO. RELEASED IN 2002	NO. SOLD IN 2002	% BYCATCH 2002	NO. RELEASED IN 2001	% BYCATCH IN 2001
Pelagic MUS					
Shark	8	0	100	34	100
Tiger shark	4	0	100	3	100
Bottomfish MUS					
‘Ōpakapaka	1	2206	<1	1	<1
Kalekale	439	474	48	264	24
Butaguchi	303	1248	20	767	32
White Ulua	221	128	63	532	70
Kāhala	1610	0	100	3360	100
Miscellaneous Species					
Omilu	43	0	100	41	82

Source: PIFSC, unpublished data.

The Council’s supplement to the bycatch provisions of Amendment 6 (WPRFMC 2002b) includes four types of nonregulatory measures aimed at further reducing bycatch and bycatch mortality, and improving bycatch reporting: (1) outreach to fishermen and engagement of fishermen in management, including research and monitoring, in order to raise their awareness of bycatch issues and of options to reduce bycatch; (2) research into fishing gear and method modifications to reduce bycatch and bycatch mortality; (3) research into the development of markets for discarded fish species; and (4) improvement of data collection and analysis systems to better measure bycatch.

3.4.7 Non-commercial Fishery

Statistics for this fishery are very limited; there are no requirements for saltwater fishing licenses or catch reporting for non-commercial fishermen in Hawaii and hence, there is no system for collecting quality data. Over the years, occasional surveys have been fielded, but no systematic collection of non-commercial fisheries data has been sustained. The NMFS Marine Recreational Fisheries Statistical Survey, active in other parts of the country, was discontinued in Hawaii in the mid-1980s. However, this program has returned as the Hawaii Marine Recreational Fishing Survey (HMRFS), and has been ongoing for five years collecting data using a dual survey approach consisting of random telephone surveys and a fisherman intercept survey conducted at boat launch ramps, small boat harbors, and shoreline fishing sites. To date, however, an insufficient number of intercepts of bottomfish fishermen have occurred to allow reliable catch and effort determinations for this fishery.

The State's bottomfish fishing registration requirement, however, does offer one way to compare the commercial and non-commercial sectors of the fishery. Each applicant is required to specify commercial or non-commercial status. As of mid-2003, there were 3,194 vessels registered to fish for bottomfish in Hawaii. The breakdown for each island is shown in Table 40.

Table 40: Registered Commercial and Non-commercial Bottomfish Vessels by Island

Category	Kauai	Oahu	Molokai	Lanai	Maui	Hawaii
Commercial	271	519	1	5	271	757
Non-commercial	109	921	25	16	107	174
Total by Island	380	1443	26	21	378	933
Total Commercial	1,824					
Total Non-commercial	1,352					
Percent Non-commercial by Island	28.7	63.8	96.2	76.2	28.3	18.6
Total Percent Non-commercial	42.6					

Source: HDAR presentation to WPRFMC.

Included in the State's 1998 bottomfish regulations was a control date for a possible future limited-entry bottomfish fishery. Some fishermen registered to protect their right to participate in the bottomfish fishery if they should so choose in the future. Some others registered because it was not clear to them that reef fish were not included in the regulations. The proportions of respondents in these categories are not known, and it is not known whether they registered as commercial or non-commercial vessels. From Table 39, it appears that about 40 percent of the registered bottomfish fishing vessels in Hawaii are non-commercial. Registered vessels range in size from 8 feet to 65 feet in length. However, the vast majority of the registered vessels lie in the range 14 feet to 30 feet in length. The largest size class is 19 feet, with about 380 vessels represented (HDAR presentation to WPRFMC).

Recently, the HDAR surveyed Hawaii's registered bottomfish vessel owners by mail. The return rate was approximately 20 percent. Of the 722 completed questionnaires, only 38 percent said they actually fished for deepwater bottomfish in the previous year. Forty-eight percent said they sometimes fish for deepwater bottomfish, but had not done so during the previous year. Fourteen percent said they do not bottomfish at all. Forty-four percent had either electric or hydraulic bottomfish line pullers. Thirty-eight percent had GPS units and forty-six percent had depth sounders. Of those who fished, most fished with another person (results ranged from one to five), fished two lines (results ranged from one to five) with, most often, five hooks per line (results ranged from one to thirteen). Bottomfish fishing effort varied cyclically over an annual cycle with the most effort occurring during November and December, and least effort during April and May. Weekends and holidays were the favored days for bottomfish fishing. State grid number 52 (331) was the preferred fishing area.

Two hundred and seventy-six of the respondents (38 percent) claimed commercial status, although not all had current licenses. If this proportion holds true for the entire fishery, then 62 percent of the registered vessels are non-commercial by this estimate.

From these two estimates we can roughly estimate that about half the registered bottomfish fishing vessels are non-commercial. Landings of onaga and ehu by the non-commercial sector are restricted to five per person, but other species are not subject to catch limits. Nevertheless, it is likely those landings by non-commercial bottomfish vessels average much less than their commercial counterparts because of differences in vessel capability, fishing skill, and avidity. At this time it is not possible to estimate what the total non-commercial landings are. In the future, more bottomfish fisherman intercepts conducted in the HMRFS may provide this estimate.

The National Research Council review of the NMFS Marine Recreational Fisheries Statistical Survey (MRFSS) has been critical of the sampling methods and statistical algorithms employed to develop recreational catch totals. As such, the National Research Council recommends that HMRFS catch estimates should not be used for management purposes until these problems have been fixed.

3.5 Protected Species

Protected species include those species listed as endangered or threatened under the Endangered Species Act (ESA), all marine mammals (listed or unlisted) as they are protected under the Marine Mammal Protection Act (MMPA), and seabirds.

3.5.1 Marine Mammals

Protected marine mammals fall into two categories: species listed under the ESA and those species that are not listed but otherwise protected under the MMPA. Cetaceans and pinnipeds are discussed separately in the sections below.

3.5.1.1 Listed Cetaceans

There are six species of cetaceans listed under the ESA that occur within the area of operation of the bottomfish fishery of the Western Pacific Region. These species are the blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), sei whale (*Balaenoptera borealis*), sperm whale (*Physeter macrocephalus*), and right whale (*Eubalaena glacialis*) which is also known as the North Pacific right whale (*Eubalaena japonica*).

Although these whales may be found within the action area and could interact with the bottomfish fishery in the Hawaii Archipelago, no reported or observed incidental takes of these species have occurred in the history of the bottomfish fishery. According to the 2002 Biological Opinon (BiOP) issued by NMFS on the ongoing operations of the region's bottomfish fisheries, the dearth of sightings/observations (except for humpback whales during the winter months) of these species in the area of the proposed action indicate that the probability of an encounter of these species with the bottomfish fishery is extremely low. Therefore, the 2002 BiOp concluded that the bottomfish fishery is not likely to adversely affect blue, fin, humpback, right, sei, and sperm whales.

Due to the presence of up to 10,000 humpback whales that visit Hawaii waters each winter, there is a possibility that these whales could interact with bottom fishing gear. However, these interactions are expected to be infrequent (no reported or observed interactions to date) and the effects are expected to be insignificant because the small circle hooks used in this fishery nearly eliminate the likelihood of the hooks injuring the whale. Similarly, the relatively light test line used in this fishery is not likely to adversely affect a whale in the unlikely event that one should become entangled.

3.5.1.2 Non-listed Cetaceans

Species of marine mammals that are not listed under the ESA but are protected under the MMPA and occur in the areas of the Hawaii Archipelago where bottomfish fisheries operate are as follows:

Whales

- Blainsville beaked whale (*Mesoplodon densirostris*)
- Bryde's whale (*Balaenoptera edeni*)
- Cuvier's beaked whale (*Ziphius cavirostris*)
- Dwarf sperm whale (*Kogia simus*)
- False killer whale (*Pseudorca crassidens*)
- Killer whale (*Orcinus orca*)
- Longman's beaked whale (*Indopacetus pacificus*)
- Melon-headed whale (*Peponocephala electra*)
- Minke whale (*Balaenoptera acutorostrata*)
- Pygmy killer whale (*Feresa attenuata*)
- Pygmy sperm whale (*Kogia breviceps*)
- Short-finned pilot whale (*Globicephala macrorhynchus*)

Dolphins

- Bottlenose dolphin (*Tursiops truncatus*)
- Dall's porpoise (*Phocoenoides dalli*)
- Fraser's dolphin (*Lagenodelphis hosei*)
- Risso's dolphin (*Grampus griseus*)
- Rough-toothed dolphin (*Steno bredanensis*)
- Spinner dolphin (*Stenella longirostris*)
- Spotted dolphin (*Stenella attenuata*)
- Striped dolphin (*Stenella coeruleoalba*)

Of the above species, the bottomfish fishery has been documented to interact with only one species, the bottlenose dolphin (*Tursiops truncatus*; Nitta and Henderson 1993). Although bottlenose dolphins have been observed stealing hooked fish off of bottomfish lines, the extent of such interactions are believed to be few. A rate of 2.67 dolphin damaged fish per 1000 was observed by NMFS observers during 1990–1993 (Kobayashi and Kawamoto 1995). The impact of the bottomfish fishery on the behavior or foraging success of bottlenose dolphins is unknown, but not believed to be adverse. The other species listed above may be found within the action area and could interact with bottomfish fisheries in the Western Pacific Region, however, no reported or observed incidental takes of these species have occurred in these fisheries.

3.5.1.3 Listed Pinniped: The Hawaiian Monk Seal

The Hawaiian monk seal was listed as an endangered species pursuant to the ESA on November 23, 1976 (41 FR 51612) and remains listed as endangered. It is estimated that approximately 1,200 Hawaiian monk seals currently exist in the Hawaiian Archipelago (NMFS 2007). The present total population of approximately 1,200 individuals is small and declining. The population is already so small as to be in the range where there is concern about long-term maintenance of genetic diversity (NMFS 2007)

The monk seal population is mainly located in the NWHI with six main breeding sites and respective sub-populations identified. Monk seals are also found in the MHI where their numbers appear to be increasing. It is speculated that food is a limiting factor, among other factors, in pup survival in the NWHI although surprisingly this does not appear to hold true in the MHI.

Several fisheries operate in the areas utilized by the Hawaiian monk seal. Federally-managed fisheries include the bottomfish fishery, the pelagic longline fishery (transit only), the crustacean fishery, and the precious coral fishery. Other fisheries that operate in areas utilized by the monk seal include fisheries managed by the State of Hawaii. These fisheries include: the state-managed MHI bottomfish fishery, commercial and non-commercial nearshore fisheries, akule fishery, collection for the aquarium trade, and commercial and non-commercial gillnet fisheries. Hawaiian monk seals interact with several of these fisheries, particularly the shore-based *ulua* fishery and the nearshore gillnet fishery[19]. Monk seals have also interacted with the bottomfish fishery.

[19] http://www.fpir.noaa.gov/PRD/prd_hawaiian_monk_seal.html

Monk seals have been observed taking bait and fish from actively fished bottomfish fishing gear. They have also been observed taking baited hooks, and have been seen with embedded hooks from previous hooking events (Table 41). Sometimes the hooks have trailing lines which pose a potential entanglement hazard. NMFS researchers and veterinarians responded to many of the reported hookings. They successfully de-hooked the majority of the seals, treated them, and provided descriptions of the wounds caused by the hook. In NMFS' 2002 BiOp, based on these descriptions and outcome (when known), the injuries sustained by monk seals from embedded hooks were classified into injuries or serious injuries (NMFS 2002). An embedded hook was considered a serious injury if it hooked in the mouth deeper than the lip. Thus, hooks embedded inside the mouth, in the tongue, the mandible or upper jaw, throat, or deeper are classified as serious injuries, whereas "lip hookings" and other shallow embedded hooks are considered nonserious. The rationale for this division is that foraging would likely be impeded by the serious injuries. Hooks embedded in the lip or shallowly embedded hooks in other body areas would most likely fall out and would not impair feeding or other activities. Considering the information available, the above classification approach is consistent with the views expressed by researchers and veterinarians in a workshop held to discuss the serious injury guidelines.[20]

There is some overlap with the type of hook used in the bottomfish fishery (circle hooks) and the hook used in the most popular non-commercial fishery, the shore-based *ulua* fishery. However, the shore-based *ulua* fishery uses a slide bait swivel with a wire leader, and the *ulua* circle hook tends to be larger than that used in the bottomfish fishery.

Of the reported monk seal hookings that have occurred since 1982 (Table 41), many have been positively attributed to the shore-based *ulua* fishery. However two hookings were positively attributed to the bottomfish fishery in the NWHI. A few other hookings involved hooks that could have been from either the shore-based *ulua* fishery or the bottomfish fishery, or they were unidentified, and as such could not be positively discounted as having not come from the bottomfish fishery.

The MHI bottomfish fishery catches some species that may be forage resources for monk seals. Recent research on monk seal diets suggest that deepwater bottomfish (not necessarily the potentially regulated species) are part of the monk seal diet (unpublished report, NMFS Pacific Islands Fisheries Science Center, Honolulu). However, under current levels of fishing pressure in the MHI, the monk seal population is growing, pupping is increasing, and the pups appear to be foraging successfully. Considering that monk seal foraging success appears to be high in the MHI despite fishing pressure, competition for forage with the MHI bottomfish fishery does not appear to adversely impact monk seals in the MHI at this time.

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[20]"Injury of pinnipeds: A brief discussion of injuries reported for pinnipeds indicated that an animal hooked in the mouth (internally) or trailing gear should be considered seriously injured. Some participants felt that an animal hooked in its body would likely not be seriously injured." (Differentiating Serious and Non-Serious Injury of Marine Mammals taken Incidental to Commercial Fishing Operations: Report of the Serious Injury Workshop held in Silver Spring, MD, April 1-2, 1997)

Table 41: List of Hook and Net Entanglements as a Source of Information on Fishery Interactions (Source: NMFS Unpublished Data)

	Date and Location	Description	Outcome
1	1982 NWHI - French Frigate Shoals	Adult female observed with hook in lower lip.	Hook identified as bottomfish hook, hook later came out on its own
2	1985 NWHI - Kure Atoll	Weaned female hooked in lip	Hook removed and identified as small hook and rig characteristic of on-site recreational fishery
3	1989 MHI - Kauai	Juvenile female hooked	Hook removed and identified as type used in either the shore-based *ulua* fishery or the bottomfish fishery
4	1991 NWHI - Kure Atoll	Juvenile seal observed with hook in lip	Seal later seen without hook, hook not identified.
5	1991 NWHI - Kure Atoll	Weaned female pup hooked in right side of mouth	Hook removed and identified as small, and characteristic of on-site recreational fishery.
6	1993 MHI - Kauai (Kipu Kai Ranch)	Adult male reported with a hook in its lower jaw trailing about 3' of line	Hook reported as a large "ulua" hook, trailing 100 lb. monofilament line, seal later seen without hook.
7	1994 MHI – Kauai (Shipwreck Beach)	Seal reported with a large hook in mouth and trailing about 6' of line	Hook type unknown, possibly longline related
8	1994 NWHI- French Frigate Shoals	Pregnant female hooked in mouth with about 2' of line trailing	Hook type unknown, possibly longline related
9	1994 MHI - Oahu (Makua)	Adult female entangled in gillnet	Entangled and drowned
10	1994 NWHI-"No Name Bank" in Hoomalu Zone	Adult seal hooked during active bottomfishing; seal had stolen catch and had become hooked	Fisherman pulled seal to boat and cut leader 12"-18" from the seal.
11	1995 MHI – Kauai (Hanamaulua Bay)	Juvenile male found dead, necropsy revealed hook in lower esophagus	Hook was identified as an *ulua* slide rig
12	1996 MHI - Oahu (Ala Moana Beach)	Adult male hooked loosely in lower right mandible	Hook removed and identified as an *ulua* slide rig
13	1996 NWHI - French Frigate Shoals	Adult male observed with hook in mouth	Hook removed and identified as type used in either the shore-based *ulua* fishery or the bottomfish fishery
14	1996 MHI - Maui (Kaupo)	Adult seal hooked with ulua hook in mouth or jaw with trailing line	Seal reportedly hooked during a fishing tournament and cut loose
15	1996 MHI - Oahu	Weaned male with hook in right cheek	Hook was removed by bystander, but hook type is unreported
16	1998 MHI – Maui (Hana)	Juvenile female reported with a #7 or #9 *ulua* hook	Seal was later examined, no hook was found, but some minor trauma was observed in the mouth
17	2000 MHI - Molokai	Juvenile male observed with 2 hooks and line embedded in chest	Seal was later examined, no hook or line present, but slight injury was documented.

	Date and Location	Description	Outcome
18	2000 MHI - Kauai (Ha'ena Beach)	Adult female with hook in mouth	Hook removed and identified as an *ulua* slide rig
19	2001 MHI - Kauai (Mahaulepu Beach)	Juvenile female with hook in lower lip and base of jaw	Hook removed and identified as type used in the recreational *ulua* fishery
20	2001 MHI - Kahoolawe	Adult male reported with hook in abdomen or front flipper	Seal never resighted, hook type unknown
21	2001 MHI - Hawaii (South Point)	Weaned male photographed with small hook in back, trailing line	Hook very small and line very light, Seal later observed without hook
22	2001 MHI - Hawaii (South Point)	Weaned male hooked	Hook removed and identified as type used in the recreational *ulua* fishery
23	2002 MHI - Oahu (Makua)	Immature seal entangled in nearshore gillnet	Reported released alive by local divers
24	2002 MHI - Kauai	Adult female hooked through neck, trailing 10-15 ft of monofilament	Hook identified as type used in the recreational *ulua* fishery
25	2002 MHI - Oahu (Ewa Beach)	Adult female hooked in lip, trailing steel leader	Hook removed and identified as an *ulua* slide rig
26	2003 MHI - Kauai (Kapaa)	Adult female hooked in corner of mouth	Hook removed and identified as recreational sabiki rig, used by shorecasters
27	2003 MHI - Kauai (Poipu)	Adult female observed hooked by *ulua* slide rig and trailing line	Later observed without hook
28	2003 MHI - Molokai (Laau)	Adult male hooked in back of mouth, outside mandible	Hook removed and identified as an *ulua* slide rig
29	2003 MHI - Kauai (Poipu)	Seal observed hooked by *ulua* slide rig and trailing line	Second-hand report that seal was hooked and fisherman cut line
30	2003 MHI - Kauai (Ahukini Pier)	Adult seal observed hooked in mouth or lip	Multiple reports of hooking by *kawakawa* fisherman who retrieved all possible line before cutting it
31	2004 MHI - Kauai (Kapaa)	Juvenile male hooked in lip, then entangled in gill net	Released alive from net; hook removed later that day and identified as an *ulua* slide rig
32	2004 MHI - Kauai (Larsen's)	Adult male hooked by *ulua* slide rig	Hook surgically removed
33	2004 MHI - Kauai (Poipu)	Subadult male observed with *ulua* hook in lip	Seal later observed without hook
34	2004 MHI - Oahu (Mokuleia)	Seal observed with hook in lip	Unconfirmed but reliable report, hook type unknown
35	2004 MHI - Kauai (Lydgate Park)	Juvenile male hooked in lower jaw muscle	Hook removed and identified as an *ulua* slide rig
36	2005 MHI - Kauai (Near Hanamaulu Beach Park)	Divers reported a seal with line trailing from its mouth	No subsequent resightings, hook type unknown

	Date and Location	Description	Outcome
37	2005 MHI - Oahu (Barbers Pt/Germaine's Luau)	Adult seal observed thrashing in water, apparently entangled in net	Responder found no seal, but net had large hole where the seal may have been entangled and freed itself
38	2005 MHI - Oahu (near Makaha)	Adult seal observed with fishing line trailing from mouth	Bystanders reported hauled out seal with about 3' of bright green line trailing from mouth, hook was never sighted
39	2005 MHI - Kauai (Pila'a Beach)	Juvenile Female hooked in corner of mouth, outside jaw	Hook was removed and identified as a circle hook, with no gear or line
40	2005 MHI - Kauai (North Larsen's)	Weaned female hooked in corner of mouth with trailing line	Circle hook and heavy line typical of shorefishing targeting *ulua* but no slide rig was present. Hook removed
41	2005 MHI - Kauai (Poipu)	Adult female hooked in corner of mouth with 8” of line trailing	Resighted without hook, but slight blood smear at left corner of mouth, hook type unidentified
42	2005 MHI - Kauai (Ahukini)	Adult male with small hook in right cheek, outside of mouth, and 1’ of trailing line	Photographed with small 'J' hook "damashi" rig characteristic of whipping for small fish, seal later resighted without hook
43	2005 MHI - Kauai (Kukuiula Harbor)	Subadult seal hooked and trailing line with a bleach bottle	Diver reported approaching in boat and cutting line about 2’ from seal, A dead subadult female with healing hook injury in the mouth was found in the vicinity a month later. Probably same animal
44	2006 MHI - Kauai (North Larsen's)	Juvenile female hooked in right corner of mouth	Hook was removed and identified as an *ulua* slide rig
45	2006 MHI - Oahu (Velzyland)	Adult seal reported hooked in chest and trailing a little line	Hook type identified only as 3”, no follow up information
46	2006 MHI - Kauai (Kapaa)	Juvenile male reported hooked in mouth	Fishermen reported cutting seal free, seal examined same day, no hook found but recent small wound in mouth hook type unidentified
47	2006 MHI - Kauai (Kapaa)	Juvenile male hooked in corner of mouth	Hook removed, and identified as an *ulua* slide rig
48	2006 MHI - Kauai (Larsen's)	Juvenile male hooked in right side of mouth	Hook removed, and identified as a circle hook with about 8" nylon coated wire leader
49	2006 MHI - Oahu (Waimanalo)	Weaned female entangled in gillnet	Diver reported finding dead seal in gill net off Makai Pier, carcass later recovered

ESA Consultation History

The Bottomfish FMP has been amended seven times since its implementation in 1986. Three section 7 consultations have been completed for the Bottomfish FMP. The first was completed in 1986, and considered the effects of the implementation of the newly established Bottomfish FMP. The second was completed in 1991, and considered the effects of the fishery on Hawaiian monk seals and the proposed action to close certain portions of the NWHI to fishing to create a "protected species study zone" as per Amendment 4 to the Bottomfish FMP, which included the following measures: 1) expansion of the 50 nm study zone to include Nihoa Island, Necker Island, and Maro Reef; 2) institution of a framework process for NMFS to modify the study zone; and 3) a requirement that vessels fishing in the NWHI take an observer upon request of NMFS. The protected species zone was initially implemented through emergency regulation (55 FR 49050), later amended to include modification of the zone at the discretion of NMFS (56 FR 24351). The rule-making allowed NMFS to place observers on bottomfish vessels in the protected species zone to collect information on protected species interactions in the fishery. Both the 1986 and the 1991 consultations determined that the fishery was not likely to jeopardize the continued existence of the Hawaiian monk seal or listed sea turtles.

In March 2002, NMFS completed another formal consultation under ESA section 7 and released its Biological Opinion (BiOp) for the Bottomfish FMP. The BiOp stated the fishery may incidentally hook monk seals, and identified seven instances of hookings that could have been attributable to direct interactions with the fishery. However, the hooks are also the type used in the shoreline ulua fishery. The BiOp also determined that one seal would be hooked every 2.9 years, and that one serious injury/mortality would result from a hooking every 6.7 years. NMFS therefore concluded that few monk seals will be hooked or die as a result of interactions with the NWHI commercial bottomfish fishery. The BiOp concluded that the bottomfish fishery of the Western Pacific Region is not likely to jeopardize the continued existence of the Hawaiian monk seal or destroy or adversely modify their critical habitat; and that the fishery is not likely to adversely affect any listed whales or sea turtles. In 2003, NMFS initiated a bottomfish observer program to further evaluate the significance of this interaction. From the fourth quarter of 2003 through the second quarter of 2005, observer coverage in the bottomfish fleet averaged 21.4 percent, and there were no interactions observed between protected species and bottomfish vessels. The alternatives considered in this document will not modify the execution of the bottomfish fishery in any manner not already analyzed in the previous BiOps, and will likely result in reduced bottomfish fishing pressure, increased bottomfish fishery information, and improved fishery management. Thus, the implementation of the preferred alternative is not expected to affect monk seals except to reduce the potential for interactions, and to reduce the competition between monk seals and the fishery.

3.5.1.4 Other Pinniped: The Northern Elephant Seal

Although uncommon in the action area of the bottomfish fishery, the northern elephant seal (*Mirounga angustirostris*) has been observed in the MHI and the NWHI. In 2002 a yearling appeared on the island of Hawaii, was captured, and transported to the Marine Mammal Center in California for rehabilitation and reintroduction to the wild.

Although this species may occasionally be found within the action area and could interact with the U.S. fisheries of the Western Pacific Region, no reported or observed incidental takes of this species have occurred in the bottomfish fishery. There is no current expectation of future interactions between this species and the bottomfish fishery and therefore, this species will not be considered further in this document.

3.5.2 Listed Sea Turtles

All sea turtles are designated as either threatened or endangered under the ESA. The five species of sea turtles known to be present in the region in which bottomfish vessels operate are: the leatherback (*Dermochelys coriacea*), the olive ridley (*Lepidochelys olivacea*), the hawksbill *(Eretmochelys imbricata*), the loggerhead (*Caretta caretta*), and the green turtle (*Chelonia mydas*).

Leatherback turtles and hawksbill turtles are classified as endangered. The breeding populations of Mexico olive ridley turtles are currently listed as endangered, and all other olive ridley populations are listed as threatened. The loggerhead turtles and the green turtles are listed as threatened (note that the green turtle is listed as threatened under the ESA throughout its Pacific range, except for the endangered population nesting on the Pacific coast of Mexico).

Leatherbacks have the most extensive range of any living reptile and have been reported circumglobally from latitudes 71°N to 42°S in the Pacific and in all other major oceans. The diet of the leatherback turtle generally consists of cnidarians (i.e., medusae and siphonophores) in the pelagic environment. They lead a completely pelagic existence, foraging widely in temperate waters except during the nesting season, when gravid females return to beaches to lay eggs. Typically, leatherbacks are found in convergence zones and upwelling areas in the open ocean, along continental margins, and in archipelagic waters.

The loggerhead turtle is a cosmopolitan species found in temperate and subtropical waters and inhabiting continental shelves, bays, estuaries, and lagoons. Major nesting grounds are generally located in warm temperate and subtropical regions, generally north of 25°N or south of 25°S latitude in the Pacific Ocean. For their first several years of life, loggerheads forage in open ocean pelagic habitats. Both juvenile and subadult loggerheads feed on pelagic crustaceans, mollusks, fish and algae. As they age, loggerheads begin to move into shallower waters, where, as adults, they forage over a variety of benthic hard and soft bottom habitats.

The olive ridley is one of the smallest living sea turtles (carapace length usually between 60 and 70 cm) and is regarded as the most abundant sea turtle in the world. Since the directed take of sea turtles was stopped in the early 1990s, the nesting populations in Mexico seem to be recovering, with females nesting in record numbers in recent years. The olive ridley turtle is omnivorous and identified prey include a variety of benthic and pelagic items such as shrimp, jellyfish, crabs, snails, and fish, as well as algae and sea grass.

The hawksbill turtle is rapidly approaching extinction in the Pacific, primarily due to the harvesting of the species for its meat, eggs, and shell, as well as the destruction of nesting habitat. Hawksbills have a relatively unique diet of sponges.

Green turtles in Hawaii are genetically distinct and geographically isolated, which is uncharacteristic of other regional sea turtle populations. Both nesting and foraging populations of green turtles in Hawaii appear to have increased over the past 20 years. In Hawaii, green turtles nested historically on beaches throughout the archipelago, but now nesting is restricted primarily to beaches in the NWHI. More than 90 percent of the Hawaiian population of the green turtle nests at French Frigate Shoals (FFS). Satellite tagging of these animals indicates that most of them migrate to the MHI to feed, and then return to the NWHI to breed. The four other species of sea turtles are seen in the waters of the NWHI only on rare occasions.

In their 2002 BiOp, NMFS determined that although hawksbill, leatherback, loggerhead, and olive ridley turtles may be found within the action area and could interact with the FMP bottomfish fishery, there have been no reported or observed incidental takes of these species in the history of the bottomfish fisheries. In addition, hawksbill, leatherback, and olive ridley turtle species are likely to occur relatively rarely in the action area. Therefore, NMFS concluded that the bottomfish fishery is not likely to adversely affect hawksbill, leatherback, loggerhead, and olive ridley turtles.

Prior biological opinions discussed the potential for adverse effects from vessel lighting and activity near and around nesting beaches utilized by the green turtle. There are no documented green turtle takes resulting from past fishery operations near nesting beaches. There are also no documented takes of green turtles from past fishing operations. The green turtle population has increased in the NWHI in recent years without corresponding interactions with the bottomfish fishery (Laurs 2000). Therefore, NMFS concludes that the bottomfish fishery is not likely to adversely affect green turtles.

3.5.3 Seabirds

Although there are several seabird colonies in the MHI, the NWHI colonies harbor more than 90 percent of the total Hawaiian Archipelago seabird population. The NWHI provide most of the nesting habitat for more than 14 million Pacific seabirds. More than 99 percent of the world's Laysan albatross (*Phoebastria immutabilis*) and 98 percent of the world's black-footed albatross (*P. nigripes*) return to the NWHI to reproduce. Of the 18 species of seabirds recorded in the NWHI, only the short-tailed albatross (*P. albatrus*) is listed as endangered under the ESA. The short-tailed albatross population is the smallest of any of the albatross species occurring in the North Pacific. Land-based sighting records indicate that 15 short-tailed albatrosses have visited the NWHI over the past 60 years. Five of these visits were between 1994 and 1999 (NMFS 1999).

3.5.4 Bottomfish Fishery Observer Program

From October 2003 – June 2005, the Hawaii-based bottomfish NWHI fishery was monitored under a mandatory NMFS observer program. Data for seven calendar quarters are available on the PIRO website. From the fourth quarter of 2003 through the second quarter of 2005, observer coverage in the bottomfish fleet averaged 21.4 percent, and there were no observed interactions with sea turtles or marine mammals. There were a total of six observed seabird interactions, including two unidentified boobies, one brown booby, one black-footed albatross and two Laysan albatrosses. Only the black-footed albatross interaction occurred during bottomfish fishing operations. All of the other interactions were observed in transit during trolling operations.

3.6 Economic, Social, and Cultural Setting

3.6.1 Hawaii Overview

Hawaii's economy is dominated by tourism and defense, with tourism by far the leading industry in terms of employment and expenditures. The two represent approximately one quarter of Gross State Product without consideration of ancillary services and also comprise the largest shares of "export" earnings.

Hawaii's Gross State Product

Year	Gross State Product (million $)	Per Capita State Product	Resident Population
2005	53,710	$42,119	1,275,194

Source: DBEDT 2005. Table 13.02

Hawaii's "Export" Industries

Year	Sugar (million $)	Pineapple (million $)	U.S. Military (million $)	Tourism (million $)
2004[21]	94	123	4,772	10,862

Source: DBEDT 2006

Natural resource production remains important in Hawaii, although nothing compared to the period of the sugar and pineapple plantations from throughout the first 60 or 70 years of the 20th century. Crop and livestock sales were $516.1 million in 2004, with the primary diversified agriculture crops being flower and nursery products, $94.5 million; macadamia nuts, $40.1 million; coffee, $19.8 million; cattle, $22.1 million; milk, $20.2 million (DBEDT 2006). Aquaculture production was $28.1 million in 2004 (DBEDT 2006), although much of aquaculture's value to Hawaii comes from development of technology. Commercial fishing ex-vessel value was $57.5 million, not including value added by the seafood processing sector (WPacFIN 2007), lower than some earlier years due to the closure of the longline fishery for swordfish from 2000-2004.

Hawaii's commercial economy has been particularly vibrant over the past five years, with a 7.5 percent growth in Gross State Product in 2005 and an average of 5.8 percent annual growth rate since 2000. Figure 28 indicates the long-term trend in Gross State Product (1970-2005), with the inflation-adjusted figures clearly showing the downturns in the early 1980s and the mid-1990s, followed by sustained growth recently.

[21] 2004 is the most recent year when complete industry statistics are available.

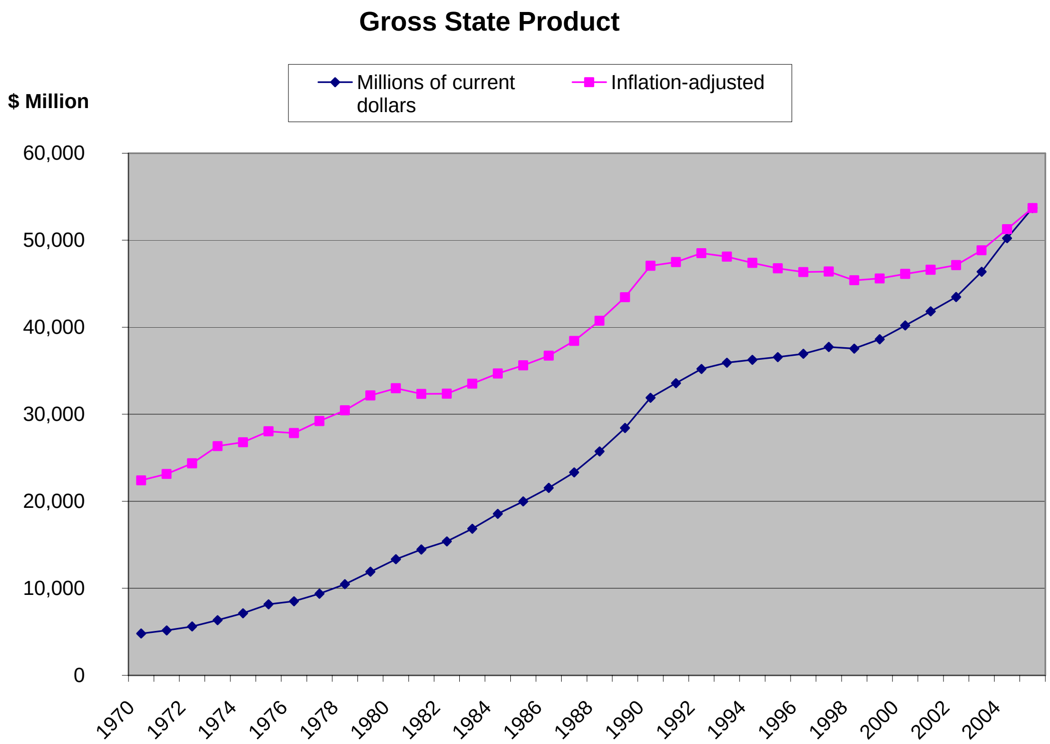

Figure 28: Gross State Product, 1970-2005

The current unemployment rate (2006, see Table 42) of 2.6 percent (DBEDT 2007) is the lowest in the United States by far, and less than half the U.S. average rate. This marks a major turn-around from the 1990s when Asian economies declined, the U.S. military down-sized due to the end of the Cold War, and Hawaii plantation agriculture was battered by the cost effects of global trade. Construction, manufacturing and agriculture account for only 9 percent of wage and salary jobs. About 30 percent of civilian workers are professional or managerial. Federal, state and local government accounts for 20 percent of wage and salary jobs (DBEDT 2006).

Table 42: Hawaii Employment Statistics

	2006
Civilian labor force	651,850
Employed	635,100
Unemployment rate	2.6%
Payroll jobs	624,650
Real personal income ($ million)	46,766

Tourism arrivals increased almost monotonically from 1970-1990, but growth was slower in the 1990s until the past three years. There were 7.4 million tourists in Hawaii in 2005. This represents a daily rate of 185,445 tourists, 13 percent of the "de facto" population (resident, tourist, and military combined), indicating the weight of tourism in many sectors of Hawaii's economy and society (DBEDT 2005). Tourism arrivals have become more evenly distributed across source locations, with the continental U.S. and Japan being the mainstays, but with arrivals increasing from Europe and China. Nonetheless, Hawaii's economy remains subject to national and international economic factors.

Total federal expenditures were $12.2 billion in 2004, with 85,900 military personnel and dependents and 31,300 federal civilian workers (not all of whom work on military bases, DBEDT 2006). Research and development spending by the federal government (2003) was $349.6 million representing the importance of the University of Hawaii and a number of other public and private research entities in particular.

Despite these successes, at some individual and community levels, Hawaii's commercial economy has been less successful. For example, per capita disposable income in Hawaii ($29,174) has fallen to below the national average despite a cost of living nearly double the national average (Table 43).

Table 43: Hawaii Cost of Living Comparison

Cost of Living Analysis: Ratio of Honolulu living costs compared to U.S. Average at four income levels				
	Income level 1	Income level 2	Income level 3	Income level 4
Honolulu cost of living indexed to U.S. average	192.9	171.6	161.9	155.1
Rent, utilities	241.4	235.4	230.3	229.0

Source: DBEDT 2005. Table 14.11

Indeed, per capita Gross State Product is the same today as it was in 1990. Hawaii per capita income has fallen from 122.5% of the U.S. average in 1970 to 99% in 2005 (Figure 29). Much of this is attributable to housing costs, with the average single family house selling for $744,174 in 2005, with the median being $590,000, the latter discrepancy also indicating the uneven nature of the housing industry in Hawaii over the past several years.

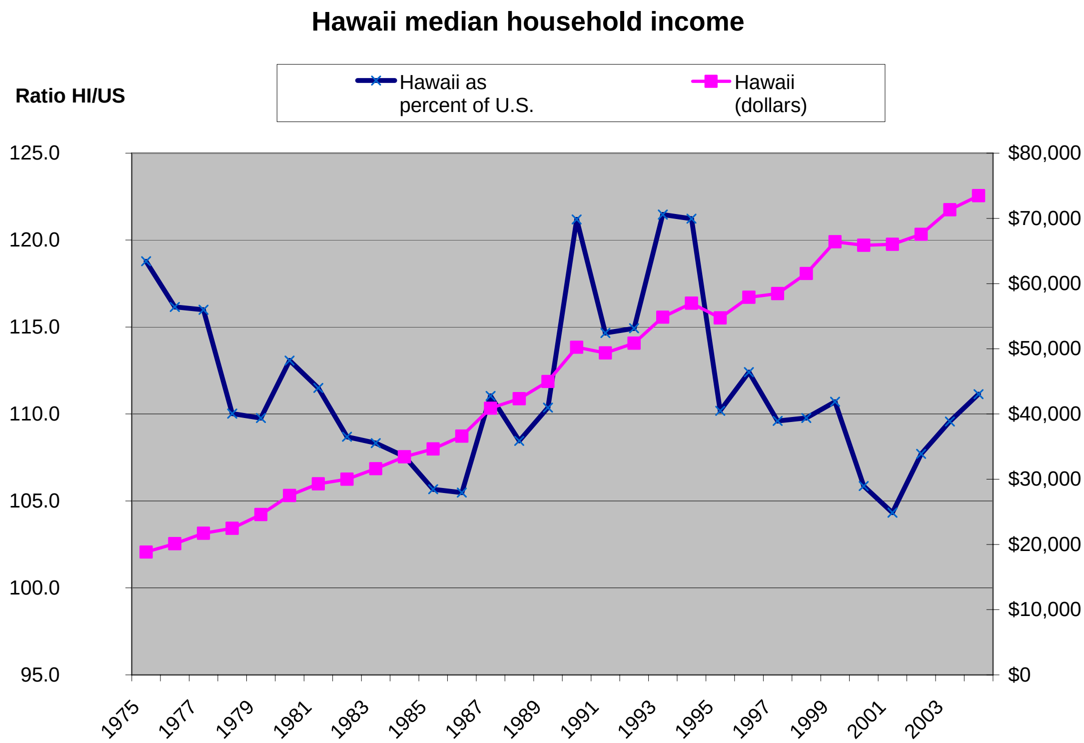

Figure 29: Hawaii Median Household Income, 1975-2005

Tourism is a service industry, and as such, tends to have lower wage levels than manufacturing, for example. So the dominance of tourism means that many workers in Hawaii holds more than one job, with 16 percent of the workforce reporting they work 49 or more hours per week (DBEDT 2005. Table 12.38). Similarly, the benefits of the commercial economy are not spread evenly across either islands or ethnic groups in Hawaii. In 2004, 8.4 percent of Hawaii's population was below the poverty line (DBEDT 2005. Table 13.23). The effect of these conditions is that the value of common use resources, such as shorelines, forests, and the ocean, is important for both subsistence and recreational reasons.

The State of Hawaii has been attempting to diversify its economy for many years. Industries encouraged are science and technology, film and television production, sports, ocean research and development, health and education tourism, diversified agriculture and floral and specialty food products. (DBEDT, 2006) However, these remain a small percentage of the Hawaii commercial economy at this time.

Recent economic trends analysis (Bank of Hawaii, October 2005) concluded the following:

> Strong Hawaii employment data through August 2005 confirm recently reported first half Honolulu inflation, yielding strong Hawaii real personal income growth, suggesting that good economic momentum continued into third quarter 2005. Flattening summer tourism numbers against seasonal capacity constraints, combined with a stronger dollar and continued travel cost pressure from rising fuel costs, support the forecast of slower visitor arrivals growth going into 2006. As noted with

last month’s semiannual construction forecast revisions, construction growth is also expected to slow during 2006 because of completion of the military construction ramp-up and decreases in private authorizations. But strong overall economic growth should spill over from 2005 to 2006 for Hawaii, with only a modest slowing in the local expansion’s pace.

3.6.1.1 Fishing-Related Economic Activities

The most recent estimate of the ex-vessel value of fish sold by the Hawaii-based fisheries is $ 70.9 million. This amounts to a small percentage of Gross State Product, in fact, less than 1%. On the other hand, the seafood industry is an important component of local and tourist consumption, and recreational and subsistence fishing represents a substantial proportion of the local population (estimated at 109,000 participants, 8.6% of Hawaii’s population).[22] And additional 41,000 tourists are also reported to go fishing while in Hawaii, and total fishing expenditures (resident and tourist combined) were estimated at $125 million.

The most recent estimate of the total economic contribution of the commercial and non-commercial fishing sectors to the state economy indicated that in 1992, these sectors contributed $118.79 million of output (production) and $34.29 million of household income, employing 1,469 people (Sharma et al. 1999. These contributions accounted for 0.25 percent of total state output ($47.4 billion), 0.17 percent of household income ($20.2 billion), and 0.19 percent of employment (757,132 jobs). Recreational, subsistence and sport (e.g. charter) fisheries provide additional but unquantified economic benefits in terms of angler satisfaction, protein sources, and tourism revenues.

Hawaii’s pelagic fisheries are responsible for the largest share of annual commercial landings and ex-vessel revenue, with 28.2 million pounds of pelagic fish landed in 2005 at an ex-vessel value of $66.7 million. The domestic longline fishery for tuna, swordfish, and other pelagic species is the largest component of the fishery, landing 23 million pounds in 2005 with an ex-vessel value of $58 million. Among the demersal fisheries, commercial harvests of CRE MUS dominate, with MHI and NWHI bottomfish relatively close behind (Table 44). The rest of Hawaii’s commercial fisheries are relatively small, with annual fishery ex-vessel revenues of less than $150,000.

Table 44 : Ex-vessel Revenues From Hawaii’s Demersal Fisheries.

	Pounds Sold	Ex-vessel Revenue
Coral reef species (2005)	701,624	$1,796,764
MHI bottomfish (2003)	272,569	$1,460,000
NWHI bottomfish (2003)	222,000	$851,219
MHI crustaceans (2005)	10,091	$110,927
Precious corals (1997)	415	$10,394
Total	1,206,699	$4,229,304

[22] DBEDT, 2005. Table 7.56.

Another perspective on the role of bottomfish in Hawaii is to compare landings with pelagic, reef fish, and other fish. Table 45 shows the changing patterns from 2000 to 2003 (NMFS 2004).

Table 45: Annual Estimated Commercial Landings in Hawaii (1,000 lbs), 2000–2003

Year	Pelagic Fish	Bottomfish	Reef Fish	Other Fish
2000	26,763	718	199	957
2001	22,011	660	250	591
2002	22,330	621	345	662
2003	21,993	602	315	661

Estimates of the economic activity in the various sectors (commercial and non-commercial) of Hawaii's bottomfish fishery can be obtained from various published data. For the period 1994 to 1998, the ex-vessel value of annual commercial landings in the NWHI and MHI bottomfish fisheries averaged about $1,096,200 and $1,625,800, respectively (WPRFMC 1999). Based on data collected in a cost-earnings study of Hawaii's charter fishing industry (Hamilton 1998), it is estimated that the charter boat fleet earns about $342,675 per year from taking patrons on bottomfish fishing trips. Finally, based on information gathered in a cost-earnings study of Hawaii's small boat fishery (Hamilton and Huffman 1997), it is estimated that annual personal consumption expenditures for non-commercial vessels engaged in bottomfish fishing total about $2,827,096. Non-commercial vessels are fishing boats that do not sell any portion of their catch.

However, the above values reflect only the direct revenues and expenditures in the various sectors of the bottomfish fishery. They do not take into account that employment and income are also generated indirectly within the State by commercial and non-commercial fishing for bottomfish. The fishery has an economic impact on businesses whose goods and services are used as inputs in the fishery, such as fuel suppliers, chandlers, gear manufacturers, boatyards, tackle shops, ice plants, bait shops, and insurance brokers. In addition, the fishery has an impact on businesses that use fishery products as inputs for their own production of goods and services. Firms that buy, process, or distribute fishery products include seafood wholesale and retail dealers, restaurants, hotels, and retail markets. Both the restaurant and hotel trade and the charter fishing industry are closely linked to the tourism base that is so important to Hawaii's economy. Finally, people earning incomes directly or indirectly from the fishery make expenditures within the economy as well, generating additional jobs and income.

A more accurate assessment of current contributions of the bottomfish fishery to the economy can be obtained using the Type II output, income and employment multipliers calculated by Sharma et al. (1999) for Hawaii's (non-longline) commercial and non-commercial fishing sectors. Applying these multipliers to an approximation of the final demand in each of the sectors involved in bottomfish fishing, it is estimated that this fishing activity contributes $10.78 million of output (production) and $2.51 million of household income to the State economy and creates the equivalent of 113 full-time jobs (Table 46).

Table 46: Estimated Output, Household Income, and Employment Generated by Bottomfish Fishing Activity in Hawaii.

Fishery	Sales ($)	Final Demand ($)	Output ($)	Household Income ($)	Employment (jobs)[1]
NWHI bottomfish fishery					
Commercial vessels[2]	1,096,200	580,986	1,382,747	482,218	25
MHI bottomfish fishery					
Commercial vessels[2]	1,625,800	861,674	2,050,784	715,189	36
Charter vessels[3]	305,664	293,437	760,002	269,962	14
Non-commercial vessels[4]		2,827,096	6,587,134	1,046,026	38
Total			10,780,667	2,513,431	113

[1] Calculated as full-time jobs. The input–output model assumes that fishing accounts for 20 percent of the employment time of part-time commercial fishermen (Sharma et al. 1999).
[2]Average annual sales estimate for the period 1994–1998 from Western Pacific Regional Fishery Management Council (1999).
[3]Sales estimate based on the following assumptions: 199 active vessels; average annual sales of $76,800 per vessel from charter fees and mount commissions; and two percent of total sales attributed to bottomfish fishing trips (Hamilton 1998).
[4]Expenditure estimates based on the following assumptions (Hamilton and Huffman 1997; Pan et al. 1999):

Number of non-commercial boats	2,490
Annual number of bottomfish fishing trips	3.81
Average trip costs	$84.75
Average fixed costs: apportioned according to ratio of bottomfish fishing trips to total number of trips	$213

3.6.2 Fishing Communities

The 1996 SFA amendments to the MSA added a definition of "fishing community" (MSA §(16)) and required that fishing communities be considered in the fishery impact statement (§303(a)(9)) and in certain other contexts, such as any proposal for limited access to a fishery (§303(b)(6)) and any plan to end overfishing (§304(e)(4)).

The MSA defines "fishing community" (§3(16)):

> The term "fishing community means a community which is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and included fishing vessel owners, operators, and crew and U.S. fish processors that are based in such community.

The SFA also added National Standard 8 (§301(a)(8)), which states the following:

> Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and the rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (a) provide for the sustained participation of such communities and (b) to the extent practicable, minimize adverse economic impacts on such communities.

The National Standard Guidelines further specify that (50 CFR 600.345):

> A fishing community is a social or economic group whose members reside in a specific location and share a common dependency on commercial, recreational, or sustenance fishing or on directly related fisheries-dependent services and industries (e.g., boatyards, ice suppliers, tackle shops).

And furthermore:

> The term "sustained participation" means continued access to the fishery within the constraints of the condition of the resource.

To address the requirements of the SFA, the Council prepared a comprehensive document with amendments to all four of its FMPs. Amendment 6 to the Bottomfish FMP, Amendment 8 to the Pelagics FMP, Amendment 10 to the Crustaceans FMP, and Amendment 4 to the Precious Corals FMP were published in September 1998 and submitted to NMFS for review. NMFS only partially approved the amendments, as described in a *Federal Register* notice published on April 19, 1999 (64 FR 19067). Three components of the amendments were disapproved: the bycatch provisions (MSA §301(a)(9), §303(a)(11), and other sections) for the Bottomfish and Pelagics FMPs, the overfishing provisions (§303(a)(10) and other sections) for the Bottomfish, Pelagics, and Crustaceans FMPs, and for all four FMPs, the description of the State of Hawaii as a single fishing community (MSA §301(a)(8), §303(a)(9), and other sections).

The Council prepared and submitted supplements to the amendments to address the disapproved sections of Bottomfish FMP Amendment 6, Pelagic FMP Amendment 8, Crustaceans FMP Amendment 10, and Precious Corals Amendment 4 regarding the identification of fishing communities. The fishing communities supplement (WPRFMC 2002c) reconsidered the original identifications and identified a new set of fishing communities within Hawaii. It provided additional background and analysis to justify those identifications. It does not modify the identification of American Samoa, the Northern Mariana Islands, and Guam as fishing communities, as these definitions were approved in the original SFA amendments.

With respect to Hawaii, the findings indicated that fishing and related services and industries are important to all of Hawaii's inhabited islands that the social and economic cohesion of fishery participants is particularly strong at the island level, and that fishing communities are best not distinguished according to fishery or gear type. The most logical unit of analysis for describing the community setting and assessing community-level impacts is the island. In each of the four FMP amendments, each of the islands of Kauai, Niihau, Oahu, Maui, Molokai, Lanai, and Hawaii is identified as a fishing community for the purposes of assessing the effects of fishery conservation and management measures on fishing communities, providing for the sustained participation of such communities, minimizing adverse economic impacts on such communities, and for other purposes under the MSA. These definitions were subsequently approved by NMFS.

The social analysis provided in this section is driven by the SFA requirement that impacts to fishing communities be considered in the context of fishery management decisions and by the NEPA requirement that the social and cultural effects of alternatives be discussed (40 CFR 1508.8). Section 3.6.1 of this document provides an overview of standard socioeconomic variables, including a summary of income and employment data for the affected area. The present section includes data on population size and ethnicity and a description of the sociocultural setting of the bottomfish fisheries in the Western Pacific Region.

The sociocultural aspects of a fishery include the shared technology, customs, terminology, attitudes, and values related to fishing. While it is the fishermen that benefit directly from the fishing lifestyle, individuals who participate in the marketing or consumption of fish or in the provision of fishing supplies may also share in the fishing culture. An integral part of this framework is the broad network of interpersonal social and economic relations through which the cultural attributes of a fishery are transmitted and perpetuated. The relations that originate from a shared dependence on fishing and fishing-related activities to meet economic and social needs can have far-reaching effects in the daily lives of those involved. For example, they may constitute important forms of social capital, that is, social resources that individuals and families can draw on to help them achieve desired goals.

The products of fishing supplied to the community may also have sociocultural significance. For instance, beyond their dietary importance fish may be important items of exchange and gift giving that also help develop and maintain social relationships within the community. Alternatively, at certain celebratory meals various types of seafood may become imbued with specific cultural meanings.

Finally, the sociocultural context of fishing may include the contribution fishing makes to the cultural identity and continuity of the broader community or region. As a result of this contribution the activity of fishing may have existence value for some members of the general public. Individuals who do not fish themselves and are never likely to fish may derive satisfaction and enjoyment from knowing that these fisheries exist. They may value the knowledge that the fishing traditions, customs, and ways of life are being preserved.

3.6.2.1 Population Size and Ethnicity

The 1990 census listed the population of Hawaii as 1,108,229. This figure rose to 1,179,198 in 1995 and to 1,211,537 in 2000. The population increased by a rate of 6.9 percent between 1990 and 1999.

The State of Hawaii is divided into five counties. The county of Maui includes the islands of Kahoolawe, Lanai, Maui and Molokai (except that portion of Molokai known as the Kalaupapa Settlement which constitutes a separate county, Kalawao County). The county of Honolulu encompasses the island of Oahu and the Northwestern Hawaiian Islands excluding Midway Atoll. Kauai County consists of the islands of Kauai and Niihau. The populations of the four major counties are provided in Table 47.

Table 47: Hawaii Population by County

Area	1990 Census	2000 Census
Hawaii State	1,108,229	1,211,537
Honolulu County, HI	836,231	874,154
Hawaii County, HI	120,317	148,677
Kauai County, HI	51,177	58,463
Maui County, HI	100,374	128,094

Source: U.S. Census Bureau.

The 2000 Census redefined the way ethnicity is measured in a number of ways, allowing individuals to identify themselves as one race or a combination of races, as well as having a separate classification system for Hispanic or Latino and race. As a result, describing the makeup of Hawaii's population is more complex. Perhaps the most accurate way to describe Hawaii's population is to report the proportions of race alone or in combination with one or more other races. In 2000, 39.3 percent of Hawaii residents described themselves as white, 2.8 percent as black or African American, 2.1 percent as American Indian or Alaska native, 58 percent as Asian, 23.3 percent as native Hawaiian and other Pacific Islander, and 3.9 percent as some other race. These proportions add up to more than 100 percent because many individuals reported more than one race. Of the 78.6 percent of residents who reported just one race, 24.5 percent listed White, 1.8 percent Black or African American, 41.6 percent Asian (including 4.7 percent Chinese, 14.1 percent Filipino, 16.7 percent Japanese, 1.9 percent Korean, and 0.6 percent Vietnamese), and 9.4 percent Native Hawaiian and other Pacific Islander.

In 1995 and 1996, Hamilton and Huffman (1997) conducted a survey of small-boat owners who engage in Hawaii's commercial and non-commercial fisheries, including the troll, pelagic handline and bottomfish handline fisheries. The survey found that the three largest ethnic groups represented in the sample were Japanese (33 percent), mixed with part Hawaiian (16 percent) and Caucasian (12 percent). Hamilton and Huffman (1997) speculated that the high proportion of Japanese and part Hawaiians in the sample reflects the traditional connections that these two ethnic groups have with the sea. These sociocultural connections are discussed further in the following section.

With specific regard to the NWHI bottomfish fishery, a 1993 survey of 15 owner-operators and hired captains who participate in the fishery found that 87 percent were Caucasian and 13 percent were part Hawaiian (Hamilton 1994). However, it is likely that the ethnic composition of the deckhands aboard these vessels is much more mixed and reflects the highly diverse ethnic character of the State's total population.

3.6.2.2 Sociocultural Setting

Over the past 125 years, the sociocultural context of fishing in Hawaii has been shaped by multiethnic participants in local fisheries. Although certain ethnic groups have predominated in Hawaii's fisheries in the past and ethnic enclaves continue to exist within certain fisheries, the fishing tradition in Hawaii is generally characterized by a partial amalgamation of multicultural attributes. An examination of the way in which the people of Hawaii harvest, distribute, and consume seafood reveals remnants of the varied technology, customs and values of Native Hawaiians and immigrant groups from Japan, China, Europe, America, the Philippines, and elsewhere.

3.6.2.3 Social Aspects of Fish Harvest

Commercial fishing first became important in the Hawaiian Islands with the arrival of the British and American whaling fleets during the early nineteenth century. The whalers made the Islands their provisioning and trading headquarters because of their central location in the Pacific (Nakayama 1987). This trade reached its zenith in the 1850s when more than 400 whaling vessels arrived in Honolulu annually (Shoemaker 1948). European- and American-owned trading concerns, called "factors," were established to service the whalers and gradually became the dominant enterprises in Honolulu. The significance of whaling to Hawaii's economy waned considerably during the late nineteenth century by which time plantation agriculture centered on sugar and pineapple production had grown in importance. A number of the trading companies that supported the whaling industry, however, adjusted to these economic changes and remained at the heart of Hawaii's industrial and financial structure (Shoemaker 1948).

The introduction of a cash economy into Hawaii and the establishment of communities of foreigners in the islands also led to the development of a local commercial fishery. As early as 1832, it was the custom for fish and other commodities to be sold in a large square near the waterfront in Honolulu (Reynolds 1835). In 1851, the first regular market house for the sale of fishery products was erected (Cobb 1902). The territorial government replaced this market in 1890 with an elaborate structure that Cobb (1902, p. 435) referred to as "one of the best [market houses] in the United States." Other fish markets were established on the islands of Maui and Hawaii. Locally caught bottomfish were in high demand at these markets. In Bryan's (1915) list of seafood preferences by the various "nationalities" in Hawaii, all of the bottomfish species listed (i.e., hāpu'upu'u, kāhala, 'ōpakapaka and uku) were among the types of fish purchased by all social groups. Bryan (1915, p. 371) noted that some of the snappers "may be procured almost every day, there being more than a hundred thousand pounds sold annually in the Hawaiian markets." Jordan and Evermann (1902) wrote of uku: "This fish is common about Honolulu, being brought into the market almost every day. It is one of the best of food-fishes." Gindai is also referred to as “one of our best food fishes” by Brigham (1908). Cobb (1902) reported that ulaula, uku, and ulua were among the five species of fish taken commercially on all the islands. Titcomb (1972) wrote that ‘ōpakapaka was one of the most common fish on restaurant menus prior to World War II.

Initially, commercial fishing in Hawaii was monopolized by Native Hawaiians, who supplied the local market with fish using canoes, nets, traps, spears, and other traditional fishing devices (Cobb 1902; Jordan and Evermann 1902; Konishi 1930). However, the role that Native Hawaiians played in Hawaii’s fishing industry gradually diminished through the latter half of the nineteenth century. During this period, successive waves of immigrants of various races and nationalities arrived in Hawaii, thus increasing the non-indigenous population from 5,366 in 1872 to 114,345 in 1900 (Office of Hawaiian Affairs 1998). The new arrivals included Americans, Chinese, Portuguese, and Filipinos, but particularly significant in terms of having a long-term impact on the fishing industry was the arrival of a large number of Japanese. The Japanese, like the majority of the early immigrants, were contracted to work on Hawaii’s sugarcane plantations. When contract terms expired on the plantations, many of the Japanese immigrants who had been skilled commercial fishermen from the coastal areas of Wakayama, Shizuoka, and Yamaguchi Prefectures in Japan turned to the sea for a living (Okahata 1971). Later, experienced fishermen came from Japan to Hawaii for the specific purpose of engaging in commercial fishing. The bottomfish fishing gear and techniques employed by the Japanese immigrants were slight modifications of those traditionally used by Native Hawaiians.

During much of the twentieth century, Japanese immigrants to Hawaii and their descendants were preeminent in Hawaii’s commercial fishing industry. The tightly knit communities that the first Japanese immigrants formed both helped ease the transition to American society and retarded the process of acculturation (Tamura 1994). The Japanese were able to maintain their separate communities in Hawaii more effectively than any other immigrant group. Among those Japanese communities of particular significance were the settlements of commercial fishermen and their families in the Palama, River Street, and Kakaako areas of Honolulu adjacent to the harbor (Lind 1980).

The adherence of Japanese immigrants to traditional cultural practices included Japanese religious observances, and many of the religious activities of communities such as Kakaako were centered on fishing (Miyasaki 1973). Various traditional Japanese taboos and rituals directed how a new fishing boat was to be launched, when a vessel could leave or return to port, what items could be brought on board a boat, and many other aspects of fishing behavior (Hamamoto 1928; Katamoto 1984). Over the years, succeeding generations of fishermen of Japanese ancestry in Hawaii became more “Americanized,” but many Japanese fishing traditions persisted. For example, Japanese immigrant fishermen brought from Japan the Shinto practice of building a jinsha (shrine) dedicated to a deity such as Konpira-sama or Ebisu-sama (Kubota 1984; Miyasaki 1973). Today, an Ebisu jinsha constructed at Maalaea on the island of Maui during the early 1900s still stands, and fishermen of Japanese ancestry as well as others who share a common bond in fishing continue each year to ceremonially bless individual fishing vessels (Kubota 1984; T. Arine, personal communication 2000. Maui Jinsha).

In addition to ethnic and community ties, the physical danger of fishing as an occupation also engendered a sense of commonality among fishermen. Describing the captains and crews of the early sampan fleet in Hawaii, Okahata (1971, p. 208) wrote the following: “It is said that the fishermen were in a clan by themselves and were imbued with a typical seaman’s reckless daring spirit of ‘death lies only a floor board away.’” The extreme isolation of the NWHI and the limited shelter they offered during rough weather made fishing trips to these islands particularly hazardous. The perils of fishing in the NWHI for bottomfish and other species captured the attention of the public media (e.g., Inouye 1931; Lau 1936).

As late as the 1970s, the full-time professional fishermen in Hawaii were predominately of Japanese descent (Garrod and Chong 1978). However, by that period hundreds of local residents of various ethnicities were also participating in Hawaii’s offshore fisheries as part-time commercial and non-commercial fishermen. In addition, a growing number of fishermen from the continental United States began relocating to Hawaii. Many of the new arrivals came to the islands because declining catch rates in some mainland fisheries had led to increasingly restrictive management regimes.

Today, the people who participate in Hawaii’s bottomfish fishery and other offshore fisheries make up an ethnically mixed and spatially dispersed group numbering several hundred individuals, although actual numbers are difficult to ascertain. Most are year-round residents of Hawaii, but some choose to maintain principal residences elsewhere. Participants in the bottomfish fishery do not reside in a specific location and do not constitute a recognizable fishing community in any geographical sense of the term. There are a few rural villages in the State where most residents are at least partially economically dependent on fishing for pelagic species (Glazier 1999). In general, however, those who are dependent on or engaged in the harvest of fishery resources to meet social and economic needs do not include entire cities and towns, but subpopulations of metropolitan areas and towns. These subpopulations make up fishing communities in the sense of social groups whose members share similar lifestyles associated with fishing.

Most of the vessels that participate in the NWHI bottomfish fishery utilize harbor facilities at Kewalo Basin, a harbor located in the metropolitan Honolulu area. Three vessels operate from Port Allen Harbor on Kauai. Nearly all of the participants in the NWHI bottomfish fishery reprovision in Honolulu and offload their catch at the fish auction. In addition, most of the large-volume, restaurant-oriented wholesalers that buy, process, and distribute fishery products are located in the greater Honolulu area. Businesses whose goods and services are used as inputs in Hawaii’s offshore commercial fisheries, such as ice plants, marine rail ways, marine suppliers, welders, and repair operations, are similarly concentrated in Honolulu. However, the contribution of the harvesting and processing of fishery resources to the total economic fabric of Honolulu is negligible in comparison to other economic activities in the metropolitan area, such as tourism. In other words, Honolulu is the center of a major portion of commercial fishing-related activities in the State, but it is not a community substantially dependent upon or substantially engaged in fisheries in comparison to its dependence upon and engagement in other economic sectors.

The bottomfish fishing fleet that concentrates its effort in the waters around the MHI consists mainly of vessels trailer operating from numerous launching facilities scattered throughout the State (Hamilton and Huffman, 1997). Glazier (1999) identified 55 ramps and harbors used by commercial and non-commercial fishing boats. This number does not include several private boat mooring and launching facilities. Many of these harbors and ramps offer minimal shore-side support services, and even some of the large, well-developed harbors are remote from any central business district or residential area. However, the extensive network of launching sites provides fishermen living anywhere on a given island ready access to multiple fishing grounds (Glazier, 1999).

The motivations for fishing among contemporary Hawaii fishermen tend to be mixed even for a given individual (Glazier 1999). In the small boat fishery around the MHI, the distinction between “recreational” and “commercial” fishermen is extremely tenuous (Pooley 1993a). Hawaii’s seafood market is not as centralized and industrialized as U.S. mainland fisheries, so it has always been feasible for small-scale fishermen to sell any or all of their catch for a respectable price. Money earned from part-time commercial fishing is an important supplement to the basic incomes of many Hawaii families.

It is also important to note that many people in Hawaii who might be considered commercial fishermen hold non-fishing jobs that contribute more to their household income than does fishing (Pooley 1993a). For some fishermen, non-fishing jobs are not a choice, but a necessity because of the inability to earn an adequate return from fishing. Many participants in Hawaii’s offshore fisheries often catch insufficient fish to cover even fuel, bait, and ice expenses, but they continue fishing simply for the pleasure of it. Some go so far as to pursue non-fishing occupations that allow them to maximize the time they can spend fishing regardless if it is profitable or not (Glazier 1999).

Even those fishermen who rely on fishing as their primary source of income have other reasons for their occupational choice besides financial gain. For example, a 1993 survey of owner–operators and hired captains who participate in the NWHI bottomfish fishery found that enjoyment of the lifestyle or work itself is an important motivation for fishing among fishery participants (Table 48).

Table 48: Motivations of 1993 Active Vessel Captains and Owners in the NWHI Bottomfish Fishery

Motivation	**Mau Zone**						**Hoomalu Zone**	
	Owner-operated vessels $N = 5$		Hired captain vessels $N = 3$				All vessels $N = 4$	
			Captain		Owner			
	Most Important	Somewhat Important	Most Important	Somewhat Important	Most Important	Somewhat Important	Most Important	Somewhat Important
Enjoy the lifestyle	20%	60%	67%	33%	NA	NA		50%
Enjoy the work		20%		67%	NA	NA	25%	25%
Primary source of income	60%	40%	33%				50%	25%
Source of additional income		20%				33%		
No other source of employment		20%						
Long-term family tradition				33%				50%
Long-term investment goals	20%	20%	NA	NA	33%	33%		50%
Tax write off			NA	NA		33%		
Cover a portion of fixed costs	20%		NA	NA				
Recreational purposes			NA	NA	33%			
Plan to operate it myself	NA	NA	NA	NA	33%			

Source: Hamilton (1994).

Fulfillment of social obligations may also at times be an important reason for fishing. Fish are an important food item among many of the ethnic groups represented in Hawaii, especially during various social events. Fishermen are expected to provide fish during these occasions and may make a fishing trip especially for that purpose (Glazier 1999).

Finally, some Hawaii fishermen feel a sense of continuity with previous generations of fishermen and want to perpetuate the fishing lifestyle. The aforementioned 1993 survey of participants in the NWHI bottomfish fishery found that half of the respondents who fish in the Hoomalu Zone were motivated to fish by a long-term family tradition (Table 48). This sense of continuity is also reflected in the importance placed on the process of learning about fishing from “old timers” and transmitting that knowledge to the next generation. A recent sociocultural survey of small trolling vessel captains in Hawaii found that many of those interviewed either descend from long-time fishing families or have worked in fishing or fishing-related work since they were in their teens (Glazier 1999). The average captain had almost 18 years of offshore fishing experience. The survey found that 35 percent of boat captains were taught how to fish by their fathers, grandfathers, or uncles, while 32 percent reported being taught by friends (Glazier 1999). Only 14 percent indicated that they taught themselves. Most Hawaii fishermen consider knowledge and experience to be more important factors in determining fishing success than high-tech gear. An example of the value placed on information passed down from previous generations of fishermen is the monument that one town on Oahu has recently proposed to commemorate the kupuna (elders) of that area who are recognized for their fishing skills and knowledge (Ramirez 2000).

Whatever the motivations for fishing, the contributions of friends and family members to these efforts are often substantial. Small boat fishing in Hawaii is almost always a cooperative venture involving friends or relatives as crew members (Glazier 1999). In addition, wives, in particular, often play an essential role in shore-side activities such as the transport of fish to markets, purchase of ice, vessel maintenance, bookkeeping, and so forth (Glazier 1999).

In Hawaii, during the past several years there have been a number of highly publicized clashes between the owners of large and small fishing boats and between fishermen who are newcomers and those who are established residents (Glazier 1999). The reasons for these conflicts are complex, but the perception that the State’s marine resources are being damaged and depleted by certain groups of fishermen is a central factor. Fish landing statistics support the notion that catch rates in some fisheries are on the decline. Many fishermen have found that fishing is no longer a profitable enterprise and have dropped out of the industry (Glazier 1999). The situation is aggravated by a depressed State economy that has made it more difficult for many fishermen to find the financial resources to support marginal fishing operations.

In some cases, government regulations have helped alleviate competition among fishermen. In 1991, for example, a longline vessel exclusion zone ranging from 50 to 75 nautical miles was established around the MHI to prevent gear conflicts between large longline vessels and small troll and handline boats. However, government regulations have also added to the level of tension and feelings of frustration among fishermen. For instance, many fishermen in Hawaii have adjusted to natural variations in the availability of various types of fish by adopting a multi-species, multi-gear, highly flexible fishing strategy. However, this strategy is increasingly constrained by the implementation of limited access programs in Hawaii's major commercial fisheries (Pooley 1993a).

With the highly competitive and divisive environment, fishermen's attempts at organizing to promote their shared interests, whether in the market or lobbying government for changes in policy, have generally been fragmented. Nevertheless, some fishermen in Hawaii are represented by a hui or organization, and these voluntary associations often facilitate coordination and cooperation for the mutual benefit of their members. A case in point is the Maui Cooperative Fishermen's Association, which is comprised of bottomfish fishermen, many of whom are part timers. The Association negotiates product prices with one or more seafood distributors who, in turn, supply local hotels and restaurants with fresh fish.

Glazier (1999) observed that membership in a Hawaii fishing hui can instill a strong feeling of camaraderie and solidarity among fishermen. The cohesion within these organizations constitutes available social capital for both their members and the broader community. For example, fishing clubs often organize or participate in community service projects (Glazier 1999). Examples of more ad hoc forms of cooperation among fishermen are also common. For instance, fishermen may take turns trucking each other's fish from distant landing sites to the central fish auction in Honolulu, thereby reducing transportation costs (Glazier 1999).

Close social relationships also continue to be maintained between some fishermen and fish buyers. For example, small-boat fishermen on Kauai and the Kona side of the island of Hawaii tend to sell their catch directly to local buyers who, in turn, sell it to restaurants or retail markets (Glazier 1999). By sending their fish directly to dealers fishermen not only avoid the commission charged by the auction but also enjoy the price stability over the long-term that comes with an established reciprocal relationship. As Peterson (1973, p. 59) noted, "A fisherman feels that if he is 'good to the dealer' in supplying him with fish that he needs to fill his order, 'the dealer will be good to him' and give him a consistently fair price for his fish."

3.6.2.4 Social Aspects of Fish Distribution and Consumption

Archaeological evidence indicates that seafood was part of the customary diet of the earliest human inhabitants of the Hawaiian Islands (Goto 1986). An early European visitor to Hawaii observed that "there is no animal food which a Sandwich Islander esteems so much as fish" (Bennett 1840, p. 214). Nineteenth century immigrants to Hawaii from Asia also possessed a culture in which fish was an integral part of the diet. Despite the "exorbitant" fish prices that Hawaii residents have often encountered in the markets, the level of consumption of seafood in the islands has historically been very high. One early commentator noted the following:

> In the Honolulu market 2,000,000 pounds of fresh salt water fish valued at $5,000,000 are sold annually. These figures represent a high price for a food that abounds in the waters all around the Islands, yet the people of this community, who are great lovers of the products of the sea, will gratify their tastes even at this expense (Anon 1907).

Still today, per capita seafood consumption in Hawaii is at least twice as high as the national average (Shomura 1987).

Because seafood was such a significant item in the diets of local residents, the fish markets themselves became important institutions in Hawaii society. Dole (1920, p. 20) noted that the fish market located in the busiest section of Honolulu was more than a commercial establishment, it was also "Honolulu's political center where impromptu mass meetings were held; it was, in a way, a social center also, especially on Saturdays for then business was at its height." Much of the retailing of fish now occurs through self-service supermarkets, but Honolulu's fish markets have endured and continue to be centers of social interaction for some island residents.

The fish markets comprise retail units the majority of which are single proprietorship, family-type operations. Close social connections have developed between retailers and consumers, as the success of the dealers is largely a function of their ability to maintain good relations with their customers and maintain a stable clientele (Garrod and Chong 1978). One journalist wrote of the Oahu Market, where fresh fish and produce have been sold for nearly a century, "In the hustle and bustle of daily life in downtown Honolulu, many people are drawn to Oahu Market because of its informal charm and the feeling of family one gets while shopping there" (Chinen 1984).

Early in the last century Bryan (1915) developed a list of the various fish purchased in the Honolulu market by each of Hawaii's principal nationalities. The ethnic identification of Hawaii's kamaaina (long-time residents) with particular species has continued to the present day. The large variety of fish typically offered in Hawaii's seafood markets reflects the diversity of ethnic groups in Hawaii and their individual preferences, traditions, holidays, and celebrations.

Many of the immigrant groups that came to Hawaii brought with them cultures in which fish are not only an integral part of the diet but have symbolic and even transformative connotations. Certain fish communicate messages of solidarity, favor, opulence, and the like or are believed to impart specific desirable traits to the diners (Anderson 1988, Baer-Stein 1999). For example, some types of bottomfish that are red in color have found acceptance within the Japanese community in Hawaii as a substitute for red *tai* (sea bream, *Pagrus major*)—a traditional Japanese symbol of good luck and, therefore, an auspicious fish to be served on festive occasions (Hawaii Division of Aquatic Resources 1979, Shoji 1983). The red color of these fish also symbolizes prosperity and happiness.[23] The December peak in landings of ‘ōpakapaka, onaga, kalekale, and ehu reflect the demand for them as an important dish in feasts celebrating *Oshogatsu* (Japanese New Year's), considered the most important cultural celebration for people of Japanese ancestry in Hawaii. Serving these fish is also important during non-seasonal events such as wedding and birthday banquets. For Hawaii residents of Chinese descent, fish or *yu* is an important item during feasts celebrating *Tin nien* (Chinese lunar New Year) and other ritual observances, as it is a homophone for abundance (Choy 1989). Fish also symbolize regeneration

[23] The reason *tai* is regarded as a celebratory fish among Japanese is thought to be due not only to its beauty of form and color but also because *tai* suggests the word *medetai*, meaning auspicious (Shoji 1983).

and freedom because of their rapid ability to propagate as well as their speed and unconfined lifestyle (Baer-Stein 1999). Fish with white, delicately flavored flesh are in particularly high demand by the Chinese community during New Year celebrations and other festive occasions (Peterson 1973).

Furthermore, an insistence on quality, as well as quantity and variety, has long been a hallmark of Hawaii's seafood markets. For example, the Japanese immigrants to Hawaii came from a society in which fishermen, fish dealers, and even cooks typically handle prized fish with considerable care (Joya 1985). Hawaii seafood consumers continue to demand fresh fish. Both the discriminating tastes of local residents and the symbolic meaning of some fish are linked to the importance of fish as gifts. In Hawaii, various types of high-priced fish such as red snapper are highly regarded as gifts (Peterson 1973). Such sharing and gift-giving may play an important role in maintaining social relations, as exemplified by the traditional Japanese obligation to engage in reciprocal exchanges of gifts according to an intricate pattern of established norms and procedures (Ogawa 1973). Those who neglect the obligation to reciprocate, risk losing the trust of others and eventually their support.

The sharing of fish among members of the extended family and community is also an early tradition of the indigenous people of Hawaii. The social responsibility to distribute fish and other resources among relatives and friends remains a salient feature of contemporary Hawaiian life, and distribution occurs on both a regular basis and during special occasions (Glazier 1999). Among Native Hawaiians, fish is considered a customary food item for social events such as a wedding, communion, school graduation, funeral, or a child's first birthday (baby *luau*; Glazier 1999).

3.6.2.5 Social Significance of Fishing to the Broader Community

Commercial fishing has been part of Hawaii's economy for nearly two centuries. Long-established fishing-related infrastructure in Honolulu such as the fish markets and Kewalo Basin mooring area has helped define the character of the city. Moreover, for some major ethnic groups in Hawaii such as the Japanese and Native Hawaiians, the role that their ancestors played in the development of commercial fisheries in the islands remains an important part of their collective memory. In 1999, for example, the Japanese Cultural Center of Honolulu organized an exhibition commemorating the past involvement of Japanese in Hawaii's commercial fishing industry.

Given the historical significance of commercial fishing in Hawaii, it is likely that some local residents consider the fishing industry to be important part of the cultural identity and heritage of the Islands. Individuals who have never fished and do not intend to may nonetheless value knowing others are fishing and that this activity is continuing to contribute to Hawaii's social, cultural, and economic diversity. Individuals support the image of Hawaii as a fishing society, as evidenced by the high demand for books, magazines, and television programs about fishing in Hawaii.

Just as Hawaii's fishing tradition is an integral part of the Islands' heritage and character, the image of Hawaii has become linked with some types of locally caught seafood. Among the fish species that have become closely identified with Hawaii are bottomfish such as 'ōpakapaka and onaga. The continued availability of these seafoods in Hawaii has important implications for the mainstay of the State economy—tourism. Many Japanese tourists visiting Hawaii want to enjoy the traditional foods and symbols of prosperity of Japan while they vacation in Hawaii, including various types of high-quality fresh fish (Peterson 1973). Hawaii tourists from the U.S. mainland and other areas where fish is not an integral part of the customary diet typically want to eat seafood because it is perceived as part of the unique experience of a Hawaii vacation. For both Japanese and U.S. mainland tourists, the experience of consuming fish in Hawaii may be enriched if the fish eaten is actually caught in the waters around Hawaii. Suryanata (2000) observes that markets within the State for "grown in Hawaii" products have expanded in the past decade through the proliferation of gourmet restaurants that feature "Pacific Rim" and "Hawaii Regional Cuisine." This marketing strategy eschews traditional symbols constructed by the tourism industry in favor of inciting an appreciation of the social relationships and physical environment that make Hawaii an unique place.

Suryanata (2000) also notes that place-based specialty food can retain its appeal to buyers beyond a vacation period or even attract buyers who have never been to the place in question. Just as consumption of organic food may signify a commitment to certain environmental and social values, consumption of products from Hawaii can symbolize a partial fulfillment of a desire to experience or relive a Hawaii vacation. According to a national seafood marketing publication, the power of this constructed value to influence prospective buyers has not been lost on Hawaii's seafood dealers:

> When it comes to selling seafood the Hawaiians have a distinct advantage. Their product comes with built-in aloha mystique, and while they've emphasized the high quality of the fish taken from their waters, they've also taken full advantage of the aura of exotic Hawaii itself in promotion on the mainland and, now, in Europe (Marris 1992, p. 75).

Local production of food as opposed to a reliance on imports also creates opportunities to foster social connections between consumers and their food producers. As noted above, much of the retailing of fish in Hawaii now occurs through supermarkets, and a large quantity of the seafood sold is imported. However, personal connections still exist between consumers and the individuals who harvest and retail fish. Such connections may have broad public value. For example, a recent article by agricultural researchers identified proximity as one of the key attributes of a sustainable food system:

> A sustainable food system is one in which "food is grown, harvested, processed, marketed, sold, [and] consumed as close to home as possible." An emphasis on locally grown food, regional trading associations, locally owned processing, local currency, and local control over politics and regulation is found within a proximate system. A proximate food system will have "grocery stores close to home which carry local items with little or no corporately owned products to compete," and would provide "specialty items that characterize the bioregion" (Kloppenburg et al. 2000, p. 182).

3.6.2.6 Social Significance of Subsistence Fishing

As is the case for most Pacific islands, fishing has been an essential part of Hawaii's culture and society since its first inhabitants settled in the archipelago. As waves of immigrants have arrived, Hawaii has been changed from a self-sufficient subsistence economy to a multi-ethnic cash and wage society largely dependent on imports, tourism and federal spending. As described in Section 3.6.1.1, commercial fishing comprises a small part of Hawaii's total economy. Nevertheless fishing, in all its myriad forms, continues to play a significant role in Hawaii's society and culture. These forms vary by place and individual, ranging from subsistence activities by residents to non-consumptive recreational tag and release fishing and snorkeling by tourists, to commercial harvests of the "red fish" that are culturally important and much anticipated for Christmas and New Year's holiday celebrations. The longest human use of Hawaii's marine resources has obviously been that of subsistence use. The continuing importance of subsistence activities to today's Native Hawaiians has been recently described by Davianna McGregor (McGregor 2007) as follows below. Although McGregor wrote primarily about Native Hawaiians, her words are also relevant for many other groups and individuals in Hawaii.

Through subsistence, families attain essential resources to compensate for low incomes. They can also obtain food items, especially seafood that might be prohibitively expensive in a strict cash economy. If families on fixed incomes were required to purchase these items, they would probably opt for cheaper, less healthy food that would predispose them to health problems. In this respect, subsistence not only provides food, but also ensures a healthy diet.

Subsistence generally requires a great amount of physical exertion (e.g. fishing, diving, hunting), which is a valuable form of exercise and stress reduction and contributes to good physical and mental health. It is also a form of recreation that the whole family can share in. Family members of all ages contribute to different phases of subsistence, be it active hunting, fishing, gathering, or cleaning and preparing the food for eating. Older family members teach younger ones how to engage in subsistence and prepare the food, thus passing on ancestral knowledge, experience, and skill.

Another benefit of subsistence is sharing and gift giving within the community. Families and neighbors exchange resources when they are abundant and available, and the elderly are often the beneficiaries of resources shared by younger, more able-bodied practitioners. Most ku'aina believe that generosity is rewarded with better luck in the future.

Resources obtained through subsistence are also used for a variety of special life cycle occasions that bond families and communities. Resources such as fish, limu, opihi, wild venison, and so on are foods served at luau for baby birthdays, graduations, weddings, and funerals. Ohana and community residents participate in these gatherings, which cultivate and reinforce a sense of family and community identity. If ohana members had to purchase such resources rather than acquire through subsistence, the cost would be prohibitive, and the number of ohana gatherings would decrease. Subsistence activities therefore enable ohana to gather frequently and reinforce important relationships and support networks.

The author provides case studies of five cultural kipuka or areas in which Native Hawaiian traditions and lifestyles have persisted most strongly. In each area, subsistence fishing, hunting and gathering continues to play an essential role in allowing Hawaiians (and surely some non-Hawaiians as well) to interact with the natural environment and to continue their family and cultural traditions on a daily basis.

Few studies have attempted to quantify the importance of subsistence activities to Hawaii's residents. One study that did so was conducted by the University of Hawaii and focused on Molokai. A random survey of Molokai families found that 28 percent of their food came from subsistence activities, and for Native Hawaiian families 38 percent of their food came from subsistence activities. The authors also noted that virtually every family interviewed stated that subsistence was important (not just a necessary component but a desirable one) to the lifestyle of Molokai. (Matsuoka et al. *in* McGregor 2007). Molokai is likely to represent the high end of the scale of subsistence activities among the islands due to its relative isolation, lack of employment opportunities, rural character and continued availability of natural resources. However subsistence fishing, hunting and gathering are important and respected aspects of life for many Hawaii residents.

Fishing plays many roles in the lives of Hawaii residents and tourists, in addition to providing subsistence resources. A myriad of books, television shows and magazines highlight various aspects of Hawaii's fisheries and fishery resources and local newspapers provide lively commentary on fishery issues. Hawaii's image as a marine wonderland is a major tourism draw and many tourists are likely to either view fish (e.g. go snorkeling visit an aquarium or buy attire, souvenirs or art with a fish motif), catch fish (e.g. go fishing) or eat fish during their visit. Indeed locally caught fish comprise many of Hawaii's "signature dishes" which are a tourism draw in themselves.

Shoreline fishing is an important social and competitive activity in Hawaii. Shoreline fishing tournaments are extremely popular and both young and old fishermen can be seen along Hawaii's shores every weekend (HDAR 2000). Many of these will be targeting ulua but pulses of weke, akule and opelu will also draw crowds of fishermen to certain areas, including Honolulu's shoreline and major harbors. Smaller groups gather regularly at harbors, beaches, cliffs and breakwalls in the early morning and evening hours to fish and talk story with their friends and neighbors.

Fishing clubs provide another avenue for social interaction, support, and service. Schultz et al. (2006) provide a list of 25 fishing clubs that were active in 2003. Many of Hawaii's fishing clubs focus on pelagic fishing, however the majority of club members are also likely to target non-pelagic species over the course of a year. Fishing clubs usually meet at least one time per month and often engage in community services such as providing fishing opportunities for young, disabled or senior citizens who would otherwise be unable to participate. Not only do fishing clubs allow for social interaction between old friends, they also bring together people from many disparate social and economic groups that may not otherwise interact on a regular basis (Schultz et al. 2006).

As described in Section 3.4.4.2, landings by commercial fishermen (those who sell at least one fish during the year) are captured through the State's reporting system. The volume and ex-vessel value of these landings are described in Chapter 4. Due to the lack of either State or Federal reporting requirements for recreational (i.e. non-commercial, including subsistence) fishermen, available estimates of their landings are based primarily on data collected through intermittent creel and phone surveys. Estimates of non-commercial catches have varied widely over the past decade, perhaps due to differences in survey definitions and/or wording, or perhaps due to differences in sample design and subsequent data extrapolation. In several recent cases, no definition of the term "recreational" was provided to survey respondents, which is believed to have resulted in double-counting of catches by fishermen who consider their motivation for fishing to be recreational, but who nevertheless sell some of their catch. Assuming that these respondents followed State laws, their catches are categorized as, and included with, other commercial catches and to count them again as non-commercial catches inappropriately inflates total Hawaii landings. Reported commercial landings alone convey to some degree the importance of fishing to Hawaii's society. As described in Section 3.6.1.1, these landings and their sales (and related jobs and shoreside support industries) are a significant part of Hawaii's dwindling primary production industries.

To have a complete understanding of the importance of fishing to Hawaii's society, fishing and fishery related data need to be obtained and disaggregated based on both fishing motivation (e.g. subsistence, family and cultural traditions, fun, camaraderie, competition, non-consumptive uses, income, or profit) and fish disposition (e.g. consumed by family, used for ohana or community events, bartered, displayed, or sold). Such information would provide a clearer picture of the many roles that fish and fishing play in Hawaii's contemporary society. This is becoming increasingly important as non-fishermen have become interested and active in the management of Hawaii's fisheries and have sought to have their voices heard. One major initiative has been a movement to establish marine protected areas in which no fishing is allowed. Several such areas have been implemented, some with the agreement of the majority of affected fishermen, others against their wishes. Other recent concerns include the potential impacts of fishing on protected species such as the Hawaiian monk seal and green sea turtle, as well as questions regarding the appropriate levels of scientific analysis needed for decision making in a social and political environment of conflicting values and priorities.

3.6.3 Native Hawaiian Community

As discussed in Section 3.7.1 of the 2005 Final Environmental Impact Statement, individuals who participate in Hawaii's bottomfish fishery and other offshore fisheries comprise an ethnically diverse group. A survey by Hamilton and Huffman (1997) of small-boat owners who engage in Hawaii's commercial and non-commercial fisheries, including the troll, pelagic handline, and bottomfish fisheries, found that the overall distribution of survey participants' ethnicities is similar to that found in Hawaii's statewide population in that the three most common ethnicities are Japanese, part Hawaiian, and Caucasian. Part Hawaiians made up 16 percent of the small-boat owners surveyed.

Vessels used in the NWHI bottomfish fishery were not included in the Hamilton and Huffman (1997) survey, but information on the ethnicity of some participants in this fishery is available from a 1993 survey conducted by Hamilton (1994). This earlier survey of 15 owner–operators and hired captains who participate in the NWHI bottomfish fishery found that 87 percent were Caucasian and 13 percent were part Hawaiian. However, it is likely that the ethnic composition of the deckhands aboard these vessels is much more mixed and reflects the highly diverse ethnic character of the State's total population.

With regard to the income levels of small-boat owners in Hawaii, Hamilton and Huffman (1997) reported that the mean household income of the survey respondents is above the State average, although the income levels of full-time fishermen tend to be less than those of non-commercial fishermen. Information on the household income of participants in the NWHI bottomfish fishery is unavailable.

The public scoping process for the 2005 Bottomfish FEIS, the 2006 DSEIS as well as the revised DSEIS, contained in this document, identified people of Hawaiian ancestry as being both a minority population and a low-income population with a particular interest in the use of the marine resources in Hawaii, including the bottomfish resources. These interests arise from complex historical and contemporary economic, social, cultural, and political circumstances that are discussed below. Given the significance of these special circumstances, impacts on the Native Hawaiian community were made a separate impact topic in the Environmental Consequences section of this document (see Chapter 4).

At present, people of Native Hawaiian ancestry make up about 21 percent of Hawaii's population (Department of Business, Economic Development and Tourism 1999). By most statistical measures, they have the lowest incomes and poorest health of any ethnic group in the State. Native Hawaiians have long been among the most economically disadvantaged ethnic or racial group in Hawaii in terms of standard of living, degree of unemployment, dependence on transfer payments, and limited alternative employment opportunities. In recent years, Native Hawaiians have had the highest proportion of individuals living below the poverty line. In 1989, 6 percent of all the families in the State had incomes classified below the Federal poverty level (Office of Hawaiian Affairs 1998). During the same period, 14 percent of Native Hawaiians lived below the poverty line. Nearly 15 percent of Native Hawaiian households receive public assistance income, compared with 6.8 percent of households in the State (Office of Hawaiian Affairs 1998). In several residential areas, more than one third of Native Hawaiian households receive public assistance.

For centuries, Native Hawaiians relied on seafood as their principal source of protein. However, the availability of many traditional seafoods has been significantly diminished. Over-exploitation and ecological degradation of inshore areas by pollution have had a pronounced negative impact on Native Hawaiian marine sustenance practices. Shomura (1987), for instance, notes that between 1900 and 1986, the harvest of coastal fish species in Hawaii declined by 80 percent, and catches of neritic-pelagic species declined by 40 percent. Perhaps the changes in diet that resulted from loss of access to sea resources have contributed to the poor health of Native Hawaiians. Of all racial groups living in Hawaii, Native Hawaiians are the group with the highest proportion of multiple risk factors leading to illness, disability, and premature death (Look and Braun 1995).

There is abundant historical and archaeological evidence of the social importance of fishing in traditional Hawaiian culture. With specific regard to bottomfish, this significance was of both an economic and ritual nature (Iversen et al. 1990). Bottomfish such as kāhala, ulua, and ulaula (onaga) are specifically mentioned in traditional prayers used by fishermen, and fishing for these species was associated with religious rites. The cultural significance of bottomfish species to Hawaiian society is also indicated by the growth stage names for ʻōpakapaka, white ulua, kāhala, and the various names for ulaula and uku.

There may continue to be a strong cultural and religious connection between contemporary Native Hawaiians and certain species of bottomfish (Iversen et al. 1990). Some present-day Native Hawaiian consumers of these bottomfish may still associate these fish with traditional beliefs and with their dependence upon the fish for food. Because of the high cost of some bottomfish, they may be frustrated in maintaining such a traditional connection. Industry sources report that Native Hawaiians purchase proportionally less bottomfish than other ethnic groups, possibly because other types of fish cost less, and if Native Hawaiians have less disposable income to spend on fish, they would likely opt to purchase less costly species (Iversen et al. 1990).

In general current federal efforts to define traditional native fishing rights in the EEZ beyond the territorial seas have not recognized or addressed traditional Native Hawaiian access to open sea fishing rights (Murakami 1991). *Konohiki* fishing rights are traditional nearshore fishing rights. Prior to annexation, the Kingdom of Hawaii codified these rights, identifying the interests of the King (Government), *konohiki* (landlords, resource managers) and *ahupua`a* tenants (common people). Tenants of the *ahupua`a* had a right to take fish and sea life from the reefs and fishing grounds adjacent to and appurtenant to an ahupua`a, subject to the right and responsibility of the *konohiki* to manage and conserve the fishery resources. Shortly after annexation, in 1898, Congress sought to extinguish "exclusive" fishing rights and open fisheries to all, subject to "vested" rights of those who registered and established their fishing rights within a two year period (Murakami 1991). Federal and local courts have diverged regarding applicable law for these fishing rights. The status of these fishing rights is clouded and it is not clear what effect these rights have on modern activities involving the nearshore fisheries. These traditional fishing rights entitled all people access to fisheries which provided the bulk of the protein nutrition necessary for the community's survival, and thus the appurtenant rights to fish the nearshore area are subsistence rights.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

For each alternative, the potential direct and indirect impacts on each of the affected components of the human environment are described in Sections 4.1 through 4.8. Under the MSA the Council is required to take into account traditional indigenous fishing practices, therefore impacts to Native Hawaiians are discussed. Also discussed are impacts to the regional economy (Section 4.9), environmental justice (Section 4.10) and the potential cumulative impacts of the alternatives in Section 4.11.

It is difficult to assess the full ramification of any of the alternatives considered because of a data-poor environment in relation to several of the environmental resource categories. Where data are lacking, a qualitative assessment of the possible consequences is presented.

A May 15-September 30, 2007, seasonal closure of waters around the MHI to both commercial and non-commercial fishing was implemented for the Deep 7 species. The 2007 seasonal closure was implemented for Federal waters by NMFS pursuant to section 305c of the MSA (72 FR 27065; May 14, 2007) and by the Hawaii DLNR for State waters[24] and is, therefore, not part of the action analyzed in this document. The Council recommended a May 1 – September 30, 2007, closure, however, due to processing time the actual commencement date was May 15, 2007. This closure was enacted prior to completion of the amendment to the FMP to eliminate overfishing in an expedient manner.

4.0 All Total Allowable Catch (TAC)-based Alternatives

Under Alternatives 3 - 7, management of the fishery would utilize a TAC calculated to prevent overfishing. All would provide direct control of commercial fishing mortality through adherence to the TAC. Alternatives 4 – 7 would control the non-commercial catch through continued adherence to bag limits and other measures while the new reporting requirements would provide data for future stock assessments and potential determination of a TAC that would include the non-commercial sector. The TAC would be set annually by the Council based on biomass estimates made during the stock assessment process. For the first fishing year, 2007 - 2008, the TAC would be set at 178,000 lb of the Deep 7 species (all species combined), representing a 24 percent reduction from the 2004 fleetwide MHI commercial bottomfish catches of these species (Kawamoto et al. 2005).

Some potential issues and challenges associated with a move towards using TACs to manage fishing mortality in the bottomfish fishery include: using a TAC for the Deep 7 species complex, rather than on a per-species basis, could be problematic in the future if it becomes apparent some species stocks are in need of more stringent reductions in harvest than others; a TAC could lead to a “race for the fish” scenario and a corresponding potential flooding of the market early in the season; allocation of catch between commercial and non-commercial fishing sectors could become necessary; capacity to effectively monitor harvest levels in a timely manner to be able to close the fishery upon reaching the TAC; the potential for high-grading in which discards are not

[24] See http://www.hawaii.gov/dlnr/dar/bottomfishing.htm

accounted for in the TAC; and the potential for fishermen to direct additional effort to other species (non-Deep 7), thus increasing the total fishing effort and associated fishing mortality. The Council is anticipated to continue to utilize principles of adaptive management under the MSA process to address these issues should they become problematic.

In terms of impacts, high-grading would be a concern under all options using a TAC or an IFQ. High-grading to maximize value can occur within species (e.g. discarding small fish in favor of larger fish) or between species (e.g discarding low-value species in favor of higher-value species). Although the extent of fishing mortality from high-grading in this fishery is currently unknown, it is not believed to be significant. For example, the MHI bottomfish fishery is primary a day fishery with participants rarely taking trips that last more than one day. In addition, the majority of fish being caught by fishery participants in the MHI bottomfish fishery rarely exceeds vessel hold capacity and all of the deep-seven bottomfish are marketable. It is generally recognized that under an IFQ management system (Alt. 6), high-grading could be more of a potential problem as commerical fishermen are motivated to maximize profits and lesser value fish couting against one's IFQ could lead to higher discarding rates.

It is recognized that both commercial and non-commercial reporting could be hampered by a general lack of motivation on behalf of non-commercial fishery participants because of lack of understanding as well as their knowledge that reporting may lead to TACs being reached more quickly. The WPFMC and NMFS will continue to work on education and outreach efforts to engage non-commercial fishery participants and help them understand the importance of providing accurate fishing information.

Enforcement of these alternatives would include increased and real time shore-based monitoring of commercial landings and sales to determine when the TAC was reached under Alternatives 3, 4, 5 and 7 or when each commercial participant's IFQ was reached under Alternative 6.

4.1 Alternative 1: No Action

Alternative 1 is to take no Federal action; that is, no further Federal management measures would be recommended by the Council at this time.

Under this and all other alternatives, the State of Hawaii's bottomfish management measures, which were established in 1998 under Department of Land and Natural Resources (DLNR) administrative rule (HAR Chapter 13-94) may remain in place or could be changed by DLNR. The State's current bottomfish management regime includes: (i) 12 BRFAs throughout the MHI, (ii) a non-commercial bag limit of five ehu and/or onaga per trip per person, (iii) required bottomfish vessel registration, and (iv) prohibited use of bottom longline, nets, traps, and trawls to take bottomfish. Seven species, including deep-slope snappers and a grouper, were identified for management under the State regulations. The State's prior BRFAs were delineated according to bottom topography, location of reported bottomfish landings, proximity to access points and points of observation for ease of enforcement, and recommendations from fishermen, with their primary purpose being to protect critical bottomfish habitat and presumed spawning and nursery habitat areas.

Furthermore, this alternative would allow continued open access for entry into the MHI fishery, and commercial fishermen would continue to be required to submit catch reports. Non-commercial fishermen would continue not to be required to submit catch reports, and the non-commercial catch component would continue to be unknown.

Based on recent mapping information of bottomfish habitat, HDAR reduced the number of BRFAs from 19 to 12, modified their locations, standardized their boundaries to corresponding minutes of latitude and longitude, and increased their size. Also under consideration are modifications to HDAR's existing Commercial Fisheries Statistical Area reporting grids to facilitate assessment of BRFAs. As detailed in Section 3.4.3.2.2, there are numerous shortcomings associated with the existing commercial fisheries statistical reporting grid system in relation to bottomfish habitat and location of BRFAs. The current shortcomings do not allow for evaluation of the BRFAs' effectiveness. Problems include BRFA boundaries that straddle multiple reporting grids or occupy only a portion of a single grid and reporting grid boundaries that parallel or are adjacent to 100-fathom depth contour lines.

Regardless of new State actions, this alternative would not end the bottomfish overfishing which the 2006 stock assessment estimated to be 24 percent above sustainable fishing levels.

4.1.1 Target Species

Uncertainty about the effectiveness of the State's BRFAs and fishermen's responses to them, and uncertainty about factors external to the fishery management regime (such as market demand and prices for fresh MHI bottomfish), hamper reliable estimations of future fishing activity. Recent analysis has determined that the State's prior BRFAs encompassed 9.2 percent of what the researchers define as "suitable habitat" for the deep-slope bottomfish while the 12 new BRFAs encompass 11.2 percent, yielding a two percent net increase in suitable habitat closed to fishing (Parke, 2007). Parke (2007) assumes a direct relationship between suitable habitat and bottomfish catch, indicating that the State's new BRFAs would reduce bottomfish fishing mortality by two percent over the 2004 baseline. Although there may be some additional spatial protection provided for target species that occupy the increased BRFA areas, this action alone would not meet the 24 percent reduction in MHI fishing mortality currently needed to end overfishing of the Deep 7 species.

Absent revisions to the State's BRFAs, short-term fishing activities under Alternative 1 would continue as described in Chapter 3. There is a trend of declining commercial fishing activity, apparent for the past 20 years; however, landings of the Deep 7 species have fluctuated yet has not been reduced significantly in the past decade (see Table 3). Recent years' fishing activity information indicates that this downward trend may have flattened. Thus, fishing pressure and overfishing would likely increase at least over the mid-term, as high fuel costs are believed to cause fishermen to switch from trolling to bottomfish fishing. In this scenario the abundance of target species would further decline and Federal action may be required to end overfishing. If the overfishing of bottomfish in Hawaii is allowed to continue, the potential is high for reaching an "overfished" state in the bottomfish fishery, which left unchecked could cause the fishery to collapse and require the implementation of a rebuilding plan to recover target species which could result in entire fishery wide closures.

4.1.2 Non-target Species and Bycatch

Non-target species are those that are caught incidentally, but retained for consumption or sale. Bycatch are those species that are caught incidentally but are not retained (i.e., discarded).

As described in Section 3.4.6, bycatch is not well reported in the MHI bottomfish fishery, but is believed to be small (8.5 percent of the total catch). Hawaii bottomfish fishing gears are highly selective and skilled bottomfish fishermen target particular species, reducing capture of non-target species and bycatch.

Fish may be discarded because they are associated with ciguatera poisoning (e.g., kāhala), are unpalatable (e.g., moray eels), are damaged (e.g., shark bites), or because they have a shorter shelf life or may fetch a relatively low price in the market (e.g., ulua). Unlike others, commonly discarded species (i.e., jacks, including ulua and kāhala) are believed to not suffer barotrauma (death resulting from sudden pressure change) effects when brought up from depth and are often released alive (Kelley and Moffitt 2004).

Bycatch rates in the NWHI are not directly comparable to the MHI bottomfish fishery as the latter is primarily a day trip fishery with little chance of catches exceeding available storage space. Non-commercial effort in the MHI, which may not be as adept at targeting due to their lower avidity rates (thus leading to higher catches of non-target fish) and which does not focus on marketable fish, is thus believed to result in less discards of damaged or other unmarketable, yet edible, fish.

As described in Section 4.1.1, it can be reasonably anticipated that catches of target species will be somewhat reduced if prime fishing areas were closed under HDAR's modified BRFAs, however, recent analysis only finds a two percent reduction when using prime habitat as a proxy for catches (Parke, 2007). If the decline results in a reduced market supply of fresh local bottomfish, currently low priced species may attain a higher value, with an associated greater incentive to land and sell fish that are currently discarded (e.g., butaguchi), thereby leading to possible shifting of commercial targets and concurrent reductions in bycatch.

At recent public meetings and in HDAR's bottomfish survey conducted in 2005, fishermen commented that they are experiencing more frequent catches of the introduced invasive blue line snapper or ta'ape (*Lutjanus kasmira*). Increased catches of this non-indigenous nuisance species, however, are not an immediate management concern.

Under Alternative 1, information would continue to be collected only from the commercial fishery, and the impact of the non-commercial fishery on non-target stocks would remain unknown.

4.1.3 Protected Species

Potential impacts to protected species were analyzed by NMFS during their Endangered Species Act consultation on the bottomfish fishery completed in 2002. Details are described in Section 3.5. The following section summarizes the anticipated impacts from Alternative 1.

ESA -Listed Species

Impacts to listed species are minimized or avoided through adherence to the conservation recommendations outlined in the 2002 BiOp issued by NMFS pursuant to the Endangered Species Act of 1973, as amended. As described in Section 3.5, NMFS' 2002 BiOp describes several monk seals that have been found with embedded hooks mostly of the type used by either the shoreline ulua fishery or the bottomfish fishery, although positive attribution of these hooks to a particular fishery is difficult (NMFS 2002). In their BiOp, NMFS concluded that the bottomfish fishery is not likely to jeopardize the continued existence of the Hawaiian monk seal or result in the destruction or adverse modification of its critical habitat. NMFS also concluded that the bottomfish fishery is not likely to adversely affect any listed whales or sea turtles. Under this alternative no regulatory changes would be implemented, fishery operations and impacts would be expected to continue as described in Chapter 3 and NMFS' conclusions would be expected to remain valid.

Marine Mammals Not Listed Under the ESA

The Hawaii bottomfish fishery is listed as a Category III fishery under Section 118 of the MMPA. A Category III fishery is one that has a low likelihood or no known incidental takings of marine mammals. Observer data from the NWHI Protected Species Study Zone taken in 1990 to 1993 recorded few interactions between marine mammals (monk seals and bottlenose dolphins) and bottomfish gear, and those that did occur were typically characterized by removal of fish and bait from fishing lines without any hookings or entanglements (Nitta and Henderson 1993). These interactions have been determined by NMFS to constitute a low-level risk to bottlenose dolphins. From October 2003 – June 2005, the Hawaii-based bottomfish NWHI fishery was monitored under a mandatory NMFS observer program. Data available on PIRO's website indicate that from the fourth quarter of 2003 through the second quarter of 2005, observer coverage in the bottomfish fleet averaged 21.4 percent and no interactions with marine mammals were observed. Based on this information, the MHI bottomfish fishery is believed not to interact significantly with marine mammals.

Seabirds

As described in Section 3.5, between 2003-2005 there were a total of six seabird interactions, including two unidentified boobies, one brown booby, one black-footed albatross and two Laysan albatrosses observed in the NWHI bottomfish fishery. Only the black-footed albatross interaction occurred during bottomfish fishing operations. All of the other interactions were observed in transit during trolling operations.

These few, low-level interactions would be expected to continue in the NWHI until the 2011 closure. These interactions may affect a limited number of seabirds; however, they would not be expected to result in impacts to seabird distribution, survival, or population structure. Although there are several seabird colonies in the MHI, the NWHI colonies harbor more than 90 percent of the total Hawaiian Archipelago seabird population. The NWHI provide most of the nesting habitat for more than 14 million Pacific seabirds. No interactions between seabirds and MHI bottomfish vessels have been reported or observed, and based on the above information it is believed that MHI bottomfish fishing activities pose little to no threat to Hawaii seabird populations.

4.1.4 EFH, Biodiversity, and Ecosystems

Essential fish habitat (EFH) and habitat areas of particular concern (HAPC) that were designated for all management unit species under the Council's existing FMPs are presented in Table 5. Weighted lines or baited hooks may rest on the bottom substrate during bottomfish fishing operations, and may impact substrate EFH and HAPC. However, larger onaga and ʻōpakapaka are often targeted at depths 20 meters (10.9 fm) from the bottom, a depth that reduces the opportunity for gear interactions with the substrate (Kelley and Moffitt 2004). However, lost bottomfish fishing gear, including anchors and anchors lines, have the potential to impact the substrate. Research conducted in NWHI bottomfish fishing sites found low counts of this type of fishing debris (Raita and St. Rogatien Banks), but no data were presented for MHI sites (Kelley and Moffitt 2004).

No adverse effects to water column EFH and HAPC have been attributed to bottomfish fishing in Hawaii (G. Davis, PIRO, personal communication). Some have theorized that sending a weighted handline with baited hooks and a small chum bag to bottom depths, generally to 50 fathoms and below, may introduce parasites or disease into the water column, but to date no such problems have been reported or documented in Hawaii's bottomfish fisheries (Kelley and Moffitt 2004).

The use of explosives, poisons, trawl nets, and other destructive gears that may adversely affect EFH and HAPC is prohibited under the Bottomfish FMP.

Deepwater precious coral beds designated as EFH or HAPC are well below the depths fished (or anchored in) by the bottomfish fishery and thus bottomfish fishing activities are not expected to directly or indirectly affect deepwater precious corals or their habitat. Shallower black coral beds occur within the depth range fished for bottomfish and individual colonies of black coral species may be damaged or destroyed by anchors or weights on the terminal end of a fishing line. Yet, because black coral has a resilient exoskeleton, only a direct hit to its base by an anchor may possibly damage it (Kelley and Moffitt 2004).

Areas of EFH and HAPC for crustacean and coral reef management unit species are relatively shallow compared to the typical depths at which bottomfish harvests occur. However, when fishing in deeper waters, fishermen may anchor their vessels to maintain a position over productive fishing areas. Anchoring is generally conducted at depths from 80 to 120 meters (40 to 60 fm). At this range of depths, anchor damage is believed to be minimal because the majority of the habitat is composed of a mosaic of sandy, low-relief areas and rocky, high-relief areas. Typically, the anchor used to maintain a vessel's position over a rocky area is constructed of three-fourths inch steel reinforcing rod (rebar) fashioned in the shape of a four-sided J-hook. Because the rebar is bendable, the anchor's design helps prevent it from becoming inextricably lodged on the bottom and reduces damage to habitat during recovery.

Indirect impacts to water column EFH or HAPC could occur through pollutant discharges from bottomfish fishing vessels. The day-to-day operations of a fishing vessel can produce a number of waste products, including oil, sewage, and garbage that may affect marine habitat. To the extent that these activities and events are subject to environmental regulations, their effects on EFH and HAPC are likely to be avoided, minimized, or mitigated.

A bottomfish fishing vessel striking the bottom could physically destroy habitat in the immediate area. A subsequent breakup of the vessel and release of fuel and oil could result in habitat pollution and mortality of marine life. However, considering that bottomfish fishing vessel groundings are rare events, groundings pose a remote threat to EFH or HAPC.

It is believed that bottomfish fishing activities do not significantly impact bottom-dwelling invertebrates such as cnidarians (e.g., corals that are not reef-building), sponges, sea stars, and urchins (Kelley and Moffitt 2004). The impacts of bottomfish fishing on competitors, predators, or prey of target species (e.g., kāhala, ulua) are not well understood. Some species may simultaneously be competitors, predators, and prey. However, overall, Kelly and Moffitt (2004) found that at the NWHI sites studied, impacts on competitors and prey species are not likely to be significant.

Hawaii's bottomfish fishery is a hook-and-line fishery, which is considered to have low collateral impacts (Morgan and Chuenpagdee 2003). Existing data from studies in the MHI and NWHI indicate that bottomfish fishing activities are not significantly impacting the deep-benthic ecosystem in terms of bycatch removal, marine debris or derelict fishing gear, biodiversity, and competitor or predator release (Kelley and Moffitt 2004). According to a recent interagency study, the coral reef ecosystem of the NWHI has been found to be in "pristine" condition (Maragos and Gulko 2002), despite decades of bottomfish fishing activities in the NWHI.

The preceding discussion finds that the bottomfish fishing impacts associated with fishing debris, disease or parasite introduction from chum bait, and anchoring present few potential adverse impacts on EFH, HAPC, biodiversity and ecosystem functions. Thus, under Alternative 1, the continuation of Hawaii bottomfish fisheries would not be expected to adversely affect the EFH and HAPC for any species managed under the FMPs of the Western Pacific Region. Recent (2007), revisions to the State's BRFAs may further reduce the potential for bottomfish fishing impacts to EFH and HAPC in the MHI.

4.1.5 Fishery Sectors

Uncertainty about the effectiveness of the State's BRFAs and fishermen's responses to them, as well as uncertainty about factors external to the fishery management regime (such as market demand and prices for fresh MHI bottomfish), hamper reliable estimations of future fishing activity. However, it can be reasonably anticipated that catches of target species will be reduced if prime fishing areas are contained in the new BRFAs. The distribution of these losses among fishery sectors will largely be a function of the location of area closures, and the proximity and viability of remaining open areas.

The State has amended their BRFAs as described in Section 3.4.3.2, however, the revised BRFAs increase protection of suitable habitat by approximately two percent (Parke, 2007). Parke (2007) assumes a direct relationship between suitable habitat and bottomfish catch, indicating that the State's new BRFAs would reduce bottomfish fishing mortality by two percent over the 2004 baseline. Although they would provide some additional habitat protection and corresponding decrease in fishing mortality it would not meet the 24 percent reduction which is currently needed to end overfishing.

Short-term fishing activities under Alternative 1 would continue as described in Chapter 3 or continue with the revised BRFAs in place. This alternative would not address or end the overfishing identified by NMFS The impacts of continued overfishing, which is most likely to occur under the no-action alternative, would over time impact all fishery sectors as biomass of the Deep 7 species would decline.

Fishing pressure (e.g., overfishing) would likely increase at least over the mid-term, as high fuel costs are believed to be causing fishermen to switch from trolling to bottomfish fishing. If this continues, bottomfish stocks and catch rates will further decline and fishery participants in all sectors will see lower returns both in fiscal and nonmonetary terms (e.g., angler satisfaction, protein sources, and social benefits) terms. If the overfishing of bottomfish in Hawaii is allowed to continue, the potential is high for reaching an "overfished" state in the bottomfish fishery, which would require a rebuilding plan under which more draconian measures would be needed such as severely limiting or prohibiting bottomfish fishing for an extended period of time.

4.1.6 Fishing Communities

As described in Section 3.6.2, on the basis of the requirements of the 1996 Sustainable Fisheries Act amendments to the MSA, the Council designated each of the islands of Kauai, Niihau, Oahu, Maui, Molokai, Lanai, and Hawaii as fishing communities. The impact of Alternative 1 on some or all of these fishing communities would potentially be adverse. Some the State's revised BRFAs effectively close available bottomfish fishing areas within easy reach of given communities, therefore, those community members may no longer participate to the same extent in the bottomfish fishery due to high fuel prices, safety, and an unwillingness to travel to different areas. Therefore, communities that benefit from the bottomfish fishery, directly and indirectly as well as economically and culturally may be adversely affected by Alternative 1. If under this alternative overfishing of bottomfish in Hawaii is allowed to continue, the potential is high for reaching an "overfished" state in the bottomfish fishery, which would require management to implement a rebuilding plan and would likely require drastic reductions in allowable fishing. An overfished resource and possible collapse of the fishery would likely result in significant negative impacts on Hawaii's fishing communities.

4.1.7 Native Hawaiian Community

In the short term, Alternative 1 would allow Native Hawaiians participating in Hawaii's bottomfish fisheries to fish at current levels and in current locations, thus providing economic and cultural benefits (see Sections 3.6.2.3 to 3.6.2.5). The State's revised BRFAs may have effectively closed some available bottomfish fishing areas within easy reach of areas where

Native Hawaiians fish, therefore, some of those community members may no longer be able to participate in the bottomfish fishery due to high fuel prices and an unwillingness to travel to different areas. Therefore, communities that benefit from the bottomfish fishery, directly and indirectly as well as economically and culturally may be adversely affected by Alternative 1. If under this alternative overfishing of bottomfish in Hawaii is allowed to continue, the potential is high for reaching an "overfished" state in the bottomfish fishery, which would require management to implement a rebuilding plan and would likely require drastic reductions in allowable fishing. Under this scenario, the economic and cultural benefits drawn from sustainable bottomfish resources for Native Hawaiian communities would cease, thereby negatively impacting the ability of Native Hawaiians to gain economically from catching bottomfish as well as their ability to perpetuate their cultural traditions of fishing and fish sharing among community members.

4.1.8 Administration and Enforcement

Under Alternative 1, the existing management costs of Hawaii's Federal bottomfish fisheries would continue. These include the administration and enforcement costs of management of the NWHI bottomfish fishery with its limited-entry system, permit requirements, gear restrictions, and at-sea observer coverage requirements.

The USCG and the Special Agent in Charge, Pacific Islands Division, Office for Law Enforcement (SAC PID OLE) were requested to provide comments on the enforceability of each of the alternatives considered in detail in this document. Their responses were as follows. Under this alternative, the USCG would maintain its current level of bottomfish fishery support to the DLNR. This support consists of USCG units reporting to DLNR vessels sighted engaged in bottomfish fishing in the BRFAs during the course of normal operations. The USCG does not believe this level of enforcement is sufficient to ensure that vessels are not fishing in the closed areas. Presently, PID OLE investigates 1-2 cases a year involving vessels fishing for or retaining bottomfish species without a permit. In addition, the PID OLE participates annually in 2-3 aerial and surface USCG patrols.

NMFS estimates administrative costs of $10,000 annually to administer the current NWHI bottomfish permits, $650,000 to administer the NWHI observer program [25] and $750,000 for enforcement. These costs would apply as a baseline for all alternatives until June 2011, when the NWHI fishery is closed.

4.2 Alternative 2: May – September Seasonal Closure

Under Alternative 2, an annual summer closure would be implemented from May 1st through September 30th for the entire MHI bottomfish fishery (both commercial and non-commercial vessels). Targeting, possessing, landing, or selling Deep 7 species caught in the MHI would be prohibited during the closed season. Studies on four Hawaiian snappers indicate they may spawn serially over an extended period with spawning greatest during the summer months, and peaks from July to September (Haight et al. 1993). Opakapaka's spawning season was determined in a

[25] The observer program has not placed an observer in the NWHI bottomfish fishery since 2005.

study in the NWHI to be from June – December with peak spawning in August (Kikkawa 1980). Ehu, or ‘ula ‘ula, were determined to spawn in the NWHI from July – September in a study by Everson (1984) and onaga females with ripe ovaries have been reported during August and September. Therefore, an annual summer closure is anticipated to provide additional benefits by prohibiting fishing during peak spawning periods and thus reduce fishing mortality of spawning bottomfish potentially leading to an increase in the spawning stock biomass.

The NWHI bottomfish fishery would remain open until it is phased out in 2011. Bottomfish imports and NWHI bottomfish would be exempt from the prohibition. All vessel operators (both commercial and non-commercial) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and would be required to complete and submit reports of their catch, fishing effort, and area fished. In addition, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

Implementing this seasonal closure for both the commercial and non-commercial fishery, based on mean monthly landings, would result in an approximate 25 percent reduction of fishing mortality, however, parallel State regulations would be needed for this alternative to be feasible and effective, although the reauthorized MSA allows preemption of State management authority under certain conditions to ensure states manage their fisheries in a manner consistent with Federal objectives. Based on mean monthly landings (1998-2004), a May through September closed period is estimated to reduce annual landings by 25.3 percent.

During the open season the non-commercial component would have to adhere to the existing State non-commercial bag limit of 5 ehu and/or onaga per trip per person, however, this limit may be changed and/or other species may be added by the State.

The effectiveness of the seasonal closure in reducing bottomfish fishing mortality would be monitored through non-commercial and commercial reporting as well as enforcement activities, which mostly would be conducted shore-side. At-sea enforcement or air surveillance could also occur during the closed season.

4.2.1 Target Species

A May 1 – September 30 seasonal closure, for the commercial and the non-commercial fisheries, is estimated to result in a 25 percent reduction in fishing mortality, through limiting fishing effort, as compared to the 2004 baseline (data from Kawamoto et al. 2005; Figure 30). Deepwater bottomfish throughout the MHI would be protected during the closed season. However, some fishing effort could shift to open periods reducing some of the potential benefits of the no-fishing period. The extent of effort shifting to open periods is unknown. However, with no fishing allowed for more than 40 percent of the year, the amount of effort able to be shifted to the rest of the year would be limited. The sensitivity of the bottomfish fishery to adverse weather conditions indicates shifting of effort is expected to be minimal. Historically, the highest levels of bottomfish fishing effort occur in the winter months, during the holiday season when there is high demand for bottomfish. Market forces may also be an important factor that deters effort if price per pound values drop as a result of market flooding during the open period. In addition, the closure would occur during the time bottomfish activity has been historically lower than in winter months because in spring a portion of fishermen switch to other fisheries such as trolling for ahi which become plentiful. Both the pelagic troll (e.g., yellowfin) and the hook-and-line mackerel (akule and ‘ōpelu) fisheries are at their peak during the summer period and therefore represent alternate non-commercial and commercial fishing opportunities during the bottomfish closed season.

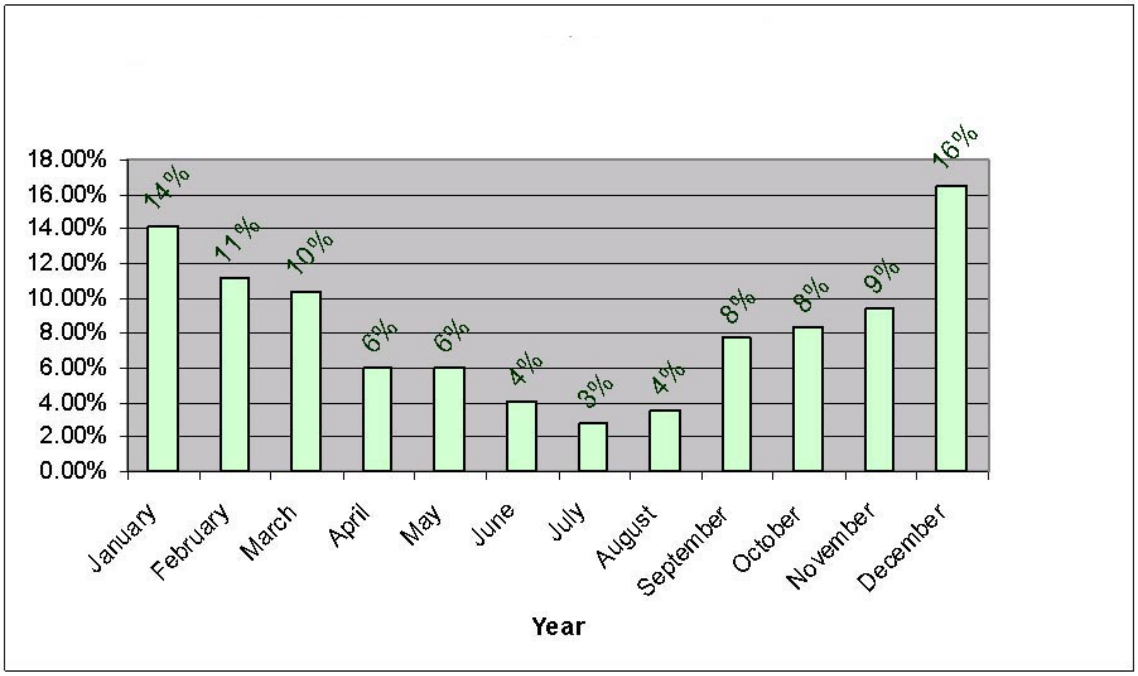

Figure 30: Percentage of MHI Landings by Month (Deep 7 Species).
Source: Kawamoto and Gonzales 2005b.

Studies of gonadal development on four of the Hawaiian snappers indicate they may spawn serially over an extended period, however, spawning is greatest during the summer months, and peaks from July to September (Haight et al. 1993). An annual summer closure would provide additional benefits by prohibiting fishing during the peak spawning period and thus reducing fishing mortality of spawning bottomfish and potentially leading to an increase in the spawning stock biomass.

Required reporting by non-commercial fishermen under Alternative 2 would provide information on their catch and effort. Such information is not currently collected, and thus, fishery scientists and managers do not know the total fishery catch taking place. Having complete information would improve the scientific understanding of influences on Hawaii’s bottomfish stocks and would be expected to improve fishery management.

4.2.2 Non-target Species and Bycatch

Under Alternative 2 the catch of non-target species and bycatch by those targeting the Deep 7 would be eliminated during the closed season. Regulatory bycatch is not expected because fishermen would most likely not be targeting non-Deep 7 bottomfish below depths of 30 fm. For example, trolling for uku often occurs at around 15 fm, therefore it would be highly unlikely to catch an onaga while trolling for uku. The cessation of catches of Deep 7 species during the closure period may increase prices for current low-priced species and there may be a greater incentive to land and sell fish that are currently discarded (e.g., ulua), leading to a possible shifting of commercial targets and concurrent reductions in bycatch. Non-commercial fishermen, in general, are expected to have less targeting skill than commercial fishermen, and therefore may have higher non-target catches. They should, however, be less influenced by market value and therefore may be expected to retain more non-target species than commercial fishermen.

If fishermen chose to target non-Deep 7 species, there are four species of snappers that could be targeted. Two of these, yellowtail snapper and yelloweye snapper, are currently a minor component of deep slope landings. The catch rates for these species may not support a commercial enterprise which may be a deterrent to fishermen targeting these species. The third snapper, ta'ape, is usually not targeted due to its relatively low commercial value and the fourth snapper, uku is targeted with different gear at much shallower depths where bycatch of Deep 7 species is highly unlikely. Deep bottomfish fishing for ulua or kāhala could result in Deep 7 bycatch during the closed season which would be classified as regulatory discards. Depending on the skill of the fishermen at alleviating barotrauma this could result in discard mortality. Recent education and outreach activities have been conducted by the WPFMC, NMFS, and the State of Hawaii that include pamphlets and demonstrations on various techniques to reduce barotrauma on deep-water bottomfish.

Reporting requirements (including information on non-target catches and bycatch) for non-commercial fishermen under Alternative 2 would improve the scientific understanding of influences on non-target stocks and would be expected to improve fishery management.

4.2.3 Protected Species

Potential impacts to protected species were analyzed by NMFS during their Endangered Species Act consultation on the bottomfish fishery completed in 2002. Details are described in Section 3.5. The following section summarizes the anticipated impacts from Alternative 2.

ESA-Listed Species

In their 2002 BiOp NMFS concluded that the bottomfish fishery is not likely to jeopardize the continued existence of the Hawaiian monk seal or result in the destruction or adverse modification of its critical habitat. NMFS also concluded that the bottomfish fishery is not likely to adversely affect any listed whales or sea turtles. As described in Section 3.5, the 2002 BiOp discusses several monk seals that have been found with embedded hooks mostly of the type used by either the shoreline ulua fishery or the bottomfish fishery, although positive attribution of these hooks to a particular fishery is difficult (NMFS 2002).

Limited monk seal/hook interactions in the NWHI bottomfish fishery (see Section 3.5) would have the potential to increase if NWHI fishing activity increased to fill unmet market demand; however, this is not going to occur to any significant degree because the NWHI fishery is now limited by an annual quota in addition to the limited number of permits and the impending complete closure of the fishery in 2011 pursuant to the Presidential monument regulations. In addition no interactions with monk seals were observed by NMFS during its 2003-2005 monitoring of the NWHI fishery.

Alternative 2's summer closures are not expected to result in any significant impacts to listed species as although they are likely to lead to temporal changes in the annual distribution of fishing effort they are not expected to result in significant increases in bottomfishing effort or significant changes to bottomfish fishing methods or areas. Some participants may increase their pelagic fishing effort during the summer months, however NMFS has also concluded that the MHI pelagic small-boat (i.e., non-longline) fishery is not likely to jeopardize the continued existence of any listed species (NMFS 2004). The 2004 pelagic BiOp estimated the annual takes of listed species expected by the combined Hawaii-based handline, troll, and pole-and-line pelagic fisheries to be:

1. Hardshell sea turtle: 6 captured and 1 killed
2. Leatherback sea turtle: 1 captured and none killed.

Based on the above information, the MHI bottomfish fishery is believed not to interact significantly with ESA listed species and Alternative 2's summer closures including the potential the relocation of MHI bottomfish effort to the pelagic small-boat fishery, would not be expected to result in any impacts to listed species not already considered.

Marine Mammals Not Listed Under the ESA

The Hawaii bottomfish fishery is listed as a Category III fishery under Section 118 of the MMPA. A Category III fishery is one that has a low likelihood or no known incidental takings of marine mammals. Observer data from the NWHI Protected Species Study Zone taken in 1990 to 1993 recorded few interactions between marine mammals (monk seals and bottlenose dolphins) and bottomfish gear, and those that did occur were typically characterized by removal of fish and bait from fishing lines without any hookings or entanglements (Nitta and Henderson 1993). These interactions have been determined by NMFS to constitute a low-level risk to bottlenose dolphins. From October 2003 – June 2005, the Hawaii-based bottomfish NWHI fishery was monitored under a mandatory NMFS observer program. Data available from PIRO's website indicate that from the fourth quarter of 2003 through the second quarter of 2005, observer coverage in the bottomfish fleet averaged 21.4 percent, and there were no observed interactions with marine mammals. Based on this information, the MHI bottomfish fishery is believed not to interact significantly with marine mammals and this alternative, including the potential the relocation of MHI bottomfish effort to the pelagic small-boat fishery, (also a Category III fishery) would not be expected to result in any impacts to marine mammals not already considered.

Seabirds

Between 2003-2005, there were a total of six seabird interactions comprised of two unidentified boobies, one brown booby, one black-footed albatross and two Laysan albatrosses observed in the NWHI fishery. Only the black-footed albatross interaction occurred during bottomfish fishing operations. All of the other interactions were observed in transit during trolling operations.

These few, low-level interactions would be expected to continue in the NWHI until the 2011 closure. These interactions may affect a limited number of seabirds; however, they would not be expected to result in impacts to seabird distribution, survival, or population structure. Although there are several seabird colonies in the MHI, the NWHI colonies harbor more than 90 percent of the total Hawaiian Archipelago seabird population. The NWHI provide most of the nesting habitat for more than 14 million Pacific seabirds. No interactions between seabirds and MHI bottomfish vessels have been reported or observed, and based on the above information it is believed that MHI bottomfish fishing activities pose little to no threat to Hawaii seabird populations.

4.2.4 EFH, Biodiversity, and Ecosystems

As discussed in Section 4.1.4, bottomfish fishing activities have been found to not adversely affect EFH and HAPC for any management unit species managed under the FMPs of the Western Pacific Region. Implementing a seasonal closure under Alternative 2 is not expected to adversely affect EFH or HAPC due to the low impacts of this fishery. The potential for increased bottomfish fishing effort in the open season is not expected to significantly affect EFH or HAPC because hook-and-line bottomfish fishing is considered to have low collateral impacts on bycatch and habitat. Similarly, the impacts of any increased pelagic effort during the closed season are expected to be limited due to the use of hook-and-line gear in that fishery.

Under Alternative 2, local biodiversity and ecosystems may experience some positive effects because cessation of bottomfish fishing activity for the five-month period would allow protective benefits such as undisturbed fish growth and spawning, and other benefits of non-capture.

4.2.5 Fishery Sectors

As described in the previous Sections, based on historical MHI landings, it is estimated that a May through September closure of the MHI bottomfish fishery would result in up to a 25.3 percent reduction in landings of the Deep 7 species as compared to the 2004 baseline. Similar to a closed area scenario, fishery participants may increase their fishing during the open season to compensate. However, given that summer months have historically been a time of lower bottomfish fishing activity (Figure 30), significant increases in effort during the open season are unlikely. Implementing seasonal closure during these months will minimize adverse impacts on all fishery sectors while meeting the objectives of this action. Immediate impacts of the closure on the commercial and non-commercial fishery sectors would be evenly distributed under Alternative 2. A summer closure would reduce the availability of “high end” fresh bottomfish to the local markets leading to an increased reliance on imported bottomfish during the closed season. This could have negative impacts on the entire commercial fishery sector because market channels for fresh MHI bottomfish would be lost and may have to be regained each year.

The non-commercial component would have to adhere to the existing State non-commercial bag limit of 5 ehu and/or onaga per trip per person; however, this limit may be changed and/or other species may be added. This would continue existing limits and therefore should cause no additional burden at this time.

Vessel registration and reporting requirements under Alternative 2 would represent an ongoing burden on all sectors. In the long term, the increase in information available to fishery scientists and managers should result in increased fish abundance and improved fishing opportunities.

4.2.6 Fishing Communities

Alternative 2 is not expected to result in significant or disproportionate negative impacts on fishing communities throughout Hawaii. As seen in Figure 30 the summer months between May and August represent the lowest amounts of monthly bottomfish landings, with the winter months of December through February having the highest amount of landings. There would, however, likely be some number of bottomfish fishermen from each community who would be negatively impacted by a summer closure because there are those who prefer year-round bottomfish fishing to other types of fishing and those others who prefer summer fishing to other times of year. Under this alternative, however, fishery participants among Hawaii's fishing communities would be allowed to fish for bottomfish during the remaining seven months of the year and would be able to fish for other types of fish (i.e., troll for ahi) during the summer bottomfish closure. Thus, to the extent that Alternative 2 would curtail fishing opportunities, the direct and indirect economic and cultural benefits (see Sections 3.6.2.3 to 3.6.2.5) for fishermen and their families, seafood consumers, and their broader island communities would be reduced.

Vessel registration and reporting requirements under Alternative 2 are not expected to have negative impacts on fishing communities despite the time commitments required. In the long term, positive impacts to fishing communities may occur from more accurate information on how many boats are bottomfish fishing, the amount of bottomfish they catch, and enhanced enforcement capabilities. Improved management of Hawaii's bottomfish would ensure that future opportunities to fish sustainable bottomfish stocks are provided for Hawaii's fishing communities.

4.2.7 Native Hawaiian Community

A May to September bottomfish closure would likely have similar impacts on Native Hawaiian fishermen as by experienced commercial and non-commercial fishing sectors, and Hawaii's fishing communities. For Native Hawaiians, however, who once exercised sovereignty and self-determination in the Hawaiian Archipelago, and whose activities were governed by customary and traditional practices, any curtailment or reduction of access rights and cultural practices, albeit for a relatively short period during the closure, reduces their ability to practice and continue their culture. The loss of any customary access and practice could be viewed as a permanent loss of culture for Native Hawaiian communities. On the other hand, the objective of the seasonal closure is to reduce fishing mortality, thereby ensuring a sustainable resource. A sustainable and accessible bottomfish resource would provide positive impacts to Native Hawaiians. Seasonal restricted fishing periods for a variety of marine organisms were practiced under the ahupuaa system of traditional Native Hawaiian resource management.

4.2.8 Administration and Enforcement

Administration and enforcement of Alternative 2 would require the expansion of the current commercial reporting requirements to include similar requirements for non-commercial participants. All MHI vessel owners who target bottomfish are already required to register their vessels; however, under this alternative they would be required to renew their registration annually. The vessel registration system would need to be expanded accordingly. This will provide current information on the maximum number of fishery participants and to facilitate effective enforcement by removing the “BF” markings from vessels no longer active in the fishery.

Enforcing the summer closed season would require that a parallel closure occur in State waters because shore-based determinations of the origin (i.e., from State vs. Federal waters) of MHI bottomfish landed or sold would be impossible. In addition, enforcement of this alternative would require significant shore-based monitoring of landings and sales. This would be intended to ensure that only imported bottomfish, or bottomfish harvested by federally-permitted NWHI vessels, were sold during the closure period.

From the USCG’s perspective, at-sea enforcement of this measure would be simple and straightforward with their existing resources, as the mere possession of bottomfish would be illegal. However, due to the large number of vessels permitted to fish for bottomfish and the large area around the MHI in which they could fish, the effective enforcement of this alternative would require an extremely strong shore-side enforcement component, and would likely result in the need for less at-sea enforcement. Adequate assets with which to conduct shore-side enforcement, however, currently are not available from SAC PID OLE, and additional personnel, vehicles, and equipment would be required.

NMFS Pacific Islands Region estimates that approximately $400,000 would be required in FY2008 to implement federal commercial and non-commercial bottomfish permits, and ongoing costs would range from $300,000 the second year to $440,000 in 2013. The costs of implementing federal reporting are even higher, ranging from $1,250,000 in FY2008 to $1,600,000 in FY2013. OLE estimates costs for enforcement may be between $750,000 - $900,000 annually.

4.3 Alternative 3: Fleetwide Total Allowable Catch

Alternative 3 would implement a fleetwide (commercial and non-commercial) TAC calculated by PIFSC and selected by the Council to prevent overfishing. Under this alternative commercial and non-commercial catches would be reported within a specified time limit (as close to ‘real time’ as is feasible) and a mechanism would be put into place to close the fishery when the combined TAC is reached.

All vessel operators (both commercial and non-commercial) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and to obtain permits, as well as to complete and submit reports of their catches, fishing effort, and area fished. To facilitate recognition of bottomfish registered vessels from the air, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

To achieve the purpose and need for the Federal action (i.e., a reduction in MHI fishing mortality to end overfishing), the State would need to establish a parallel requirement as both State and Federal waters would have to be closed to harvest of Deep 7 species once the TAC was reached. The effectiveness of the catch limits in reducing bottomfish fishing mortality would be monitored through non-commercial and commercial reporting as well as cooperative enforcement activities.

For the first year, 2007 - 2008, the TAC would be set at 178,000 lb of the Deep 7 species (all species combined), representing a 24 percent reduction from the 2004 fleetwide MHI commercial bottomfish catches of these species as described in Section 2.2 (Kawamoto et al. 2005), and would be applied to the entire MHI bottomfish fishery. The bottomfish fishing year would start on October 1 to ensure the fishery is open during the important holiday periods and continue until the TAC was reached. Thereafter, no fishing for Deep 7 bottomfish (commercial or non-commercial) would be permitted in the MHI. The NWHI bottomfish fishery would remain open until 2011. The TAC would be reassessed and adjusted as new data are made available, including new stock assessments, data on catches in the non-commercial fishery, and annual commercial landings data.

4.3.1 Target Species

Implementing a hard TAC would provide direct control of fishing mortality and because this TAC is fleetwide, taking into account both commercial and non-commercial fishery, it is expected that mortality of target species would be reduced a sufficient amount to end overfishing and allow more of the Deep 7 to survive to breeding resulting in a build-up of Deep 7 biomass over time.

High-grading of catches in terms of species kept or size would be a concern under management by use of TACs. High-grading to maximize value can occur within species (i.e., discarding small fish in favor of larger fish) or between species (e.g., discarding low-value species in favor of higher-value species). Deep-slope bottomfish generally have a high mortality rate resulting from barotrauma (physical damage to the fish as air in the swim bladder expands during ascent) after they are brought to the surface. If, and to what extent, high-grading occurs, additional bottomfish mortality may occur due to barotrauma. However, there are ways to mitigate barotrauma and increase the survivability of the deep-water fish with gas bladders. The simplest is by venting the air bladder with a needle. Once the bladder has been vented, the fish can swim back down to depth and force gases back into the body fluids increasing the chances of survival. This technique has been used with Deep 7 species very successfully in mark/recapture studies. Another way to increase survivability is if unwanted fish are released "at depth" using some of the new techniques to sink the fishes quickly back down so that their barotrauma is reduced (e.g. Git-R-Down© Barotrauma Reversing Fish Release). In addition there could be mortality of Deep 7 species due to regulatory discards after TAC is reached while targeting bottomfish species other than the Deep 7. Recent education and outreach activities have been conducted by the

WPFMC, NMFS, and the State of Hawaii that include pamphlets and demonstrations on various techniques to reduce barotrauma on deep-water bottomfish.

However, high-grading of target species would more likely occur in an individual fishery quota (IFQ) system than in a TAC system. Under a TAC system, fishermen would compete against each other and time to land as many of the Deep 7 species as possible before the TAC is filled. This competition would likely discourage discarding of Deep 7 species. Under the IFQ system, fishermen would have the luxury of time to sort through their catch to maximize profit, potentially resulting in increased bycatch rates of, and impacts on, target species.

Required reporting by non-commercial fishermen under this alternative would provide information on their catch and effort which would then be used to better assess the impacts of the two sectors and lead to better regulations to end overfishing in the most expeditious manner. Such information is not currently collected, and thus, fishery scientists and managers do not know the total fishery catch taking place. Having complete information would improve the scientific understanding of influences on Hawaii's bottomfish stocks and would be expected to improve fishery management. Without a reasonable estimate of non-commercial catch, determining and monitoring a fleetwide TAC would be difficult.

4.3.2 Non-target Species and Bycatch

Under this alternative, catches of non-target species and bycatch by fishermen targeting Deep 7 species would be eliminated during the 2007-2008 seasonal closures. If affected fishermen switch to targeting bottomfish other than the Deep 7 species, catches of these species could increase. However stocks of non-Deep 7 species are believed to be generally healthy and able to withstand some increases in fishing pressure. It is not anticipated that there will be significant increases as the Deep 7 species are clearly preferred and shallow water species are not generally regarded as substitute products.

As described above, fishing under a TAC can create a situation in which each fisherman attempts to maximize their individual harvest of the quota species in the shortest time period possible (i.e., before the TAC is reached). Due to limited storage capacity, this may lead to increased discards of less desirable species.

High-grading within the Deep 7 species could also result in increased bycatch if fishermen discard small fish in favor of larger fish or discard low-value species in favor of higher-value species. Deep-slope bottomfish generally have a high mortality rate resulting from barotrauma (physical damage to the fish as air in the swim bladder expands during ascent) after they are brought to the surface. If, and to what extent, high-grading occurs, additional bottomfish mortality may occur due to barotrauma. However, there are ways to mitigate barotrauma and increase the survivability of the deep-water fish with gas bladders. The simplest is by venting the air bladder with a needle. Once the bladder has been vented, the fish can swim back down to depth and force gases back into the body fluids increasing the chances of survival. This technique has been used with Deep 7 species very successfully in mark/recapture studies. Another way to increase survivability is if unwanted fish are released "at depth" using some of the new techniques to sink the fishes quickly back down so that their barotrauma is reduced (e.g.

Git-R-Down© Barotrauma Reversing Fish Release). Ideally, discarded Deep 7 species mortalities would be counted against the TAC to ensure that overfishing does not occur regardless of the extent of highgrading; however, enforcement of this would be difficult. Over time an estimate would be able to be made as reporting requirements for non-commercial and commercial include reporting of discards. Recent education and outreach activities have been conducted by the WPFMC, NMFS, and the State of Hawaii that include pamphlets and demonstrations on various techniques to reduce barotrauma on deep-water bottomfish.

Non-commercial fishermen in general are expected to have less targeting skill than commercial fishermen, and therefore may have higher non-target catches. They should, however, be less influenced by market value and therefore may be expected to retain more non-target species than commercial fishermen.

Required reporting (including information on non-target catches and bycatch) by non-commercial fishermen under Alternative 7 would improve the scientific understanding of influences on non-target stocks and would be expected to improve fishery management.

4.3.3 Protected Species

Potential impacts to protected species were analyzed by NMFS during their Endangered Species Act consultation on the bottomfish fishery completed in 2002. Details are described in Section 3.5. The following section summarizes the anticipated impacts from Alternative 3.

ESA-Listed Species

In their 2002 BiOp, NMFS concluded that the bottomfish fishery is not likely to jeopardize the continued existence of the Hawaiian monk seal or result in the destruction or adverse modification of its critical habitat. NMFS also concluded that the bottomfish fishery is not likely to adversely affect any listed whales or sea turtles. As discussed in Section 3.5, the 2002 BiOp describes several monk seals that have been found with embedded hooks mostly of the type used by either the shoreline ulua fishery or the bottomfish fishery, although positive attribution of these hooks to a particular fishery is difficult (NMFS 2002).

Limited monk seal/hook interactions in the NWHI bottomfish fishery (see Section 3.5) would have the potential to increase if NWHI fishing activity increased to fill unmet market demand; however, this is not going to occur to any significant degree because the NWHI fishery is limited by the number of permits and impending complete closure of the fishery in 2011 pursuant to the Presidential monument regulations. In addition no interactions with monk seals were observed by NMFS during its 2003-2005 monitoring of the NWHI fishery.

Alternative 3's fleetwide TAC is not expected to result in any significant impacts to listed species as although it may lead to temporal changes in the annual distribution of fishing effort it is not expected to result in increases in bottomfishing effort or significant changes to bottomfish fishing methods or areas. Some participants may increase their pelagic fishing effort after the bottomfish TAC is reached however NMFS has also concluded that the MHI pelagic small-boat (i.e., non-longline) fishery is not likely to jeopardize the continued existence of any listed species

(NMFS 2004). Based on the above information, the MHI bottomfish fishery is believed not to interact significantly with ESA listed species and Alternative 3's fleetwide TAC, including the potential the relocation of MHI bottomfish effort to the pelagic small-boat fishery, would not be expected to result in any impacts to listed species not already considered.

Marine Mammals Not Listed Under the ESA

The Hawaii bottomfish fishery is listed as a Category III fishery under Section 118 of the MMPA. A Category III fishery is one that has a low likelihood or no known incidental takings of marine mammals. Observer data from the NWHI Protected Species Study Zone taken in 1990 to 1993 recorded few interactions between marine mammals (monk seals and bottlenose dolphins) and bottomfish gear, and those that did occur were typically characterized by removal of fish and bait from fishing lines without any hookings or entanglements (Nitta and Henderson 1993). These interactions have been determined by NMFS to constitute a low-level risk to bottlenose dolphins. Observer coverage of the NWHI fishery from 2003 - 2005 did not record any interactions with marine mammals. Based on this information, the MHI offshore bottomfish fishery is believed not to interact significantly with marine mammals and the relocation of MHI bottomfish effort to the pelagic small-boat fishery, (also a Category III fishery) would not be expected to result in any impacts to protected species not already considered.

Seabirds

Between 2003-2005 there were a total of six observed seabird interactions, including two unidentified boobies, one brown booby, one black-footed albatross and two Laysan albatrosses in the NWHI bottomfish fishery. Only the black-footed albatross interaction occurred during bottomfish fishing operations. All of the other interactions were observed in transit during trolling operations.

These few, low-level interactions would be expected to continue in the NWHI until the 2011 closure. These interactions may affect a limited number of seabirds; however, they would not be expected to result in impacts to seabird distribution, survival, or population structure. Although there are several seabird colonies in the MHI, the NWHI colonies harbor more than 90 percent of the total Hawaiian Archipelago seabird population. The NWHI provide most of the nesting habitat for more than 14 million Pacific seabirds. No interactions between seabirds and MHI bottomfish vessels have been reported or observed, and based on the above information it is believed that MHI bottomfish fishing activities pose little to no threat to Hawaii seabird populations.

4.3.4 EFH, Biodiversity, and Ecosystems

As discussed in Section 4.1.4, bottomfish fishing activities have been found not to adversely affect EFH and HAPC for management unit species managed under the FMPs of the Western Pacific Region.

Implementing Alternative 3's TAC is not expected to adversely affect EFH or HAPC. The precise effects of a potential "race for the fish" situation are unknown but are not be expected to result in significant impacts as hook-and-line bottomfish fishing has been found to have low collateral impacts on bycatch and habitat. Implementing catch limits via a TAC would impact the number of bottomfish removed, which could either result in fewer fish caught, or if extensive high-grading occurs, in more fish caught. The former would have positive impacts on overall abundance with corresponding impacts on the ecosystem, while the latter (which is considered highly unlikely) could have negative impacts. The impacts of any increased pelagic effort by displaced bottomfish fishermen are expected to be negligible due to the use of hook-and-line gears in the small-boat pelagic fishery.

Under this alternative local biodiversity and ecosystems may experience some positive effects over time due to reductions in bottomfish harvests leading to increased bottomfish biomass and corresponding trophic cascading effects.

4.3.5 Fishery Sectors

The use of a fleetwide TAC under Alternative 3 would be anticipated to result in a bunching of fishing effort at the beginning of each fishing year (October 1) as fishery participants would be aware that once the TAC was reached the fishery would be closed to all sectors. The October 1 start of the fishing year would ensure the fleet can fish during the holiday season to provide the markets with desired red fish as described in Section 3.4.4.1. Given that the majority of commercial landings are already made during the winter season this is not likely to radically change these operations, however it may lead to market "floods" that temporarily reduce fresh fish prices and adversely impact commercial fishermen.

Once the TAC is reached, this alternative may lead to an increased reliance on NWHI-caught bottomfish until this fishery is closed in 2011 and on increased imports of bottomfish. An increased reliance on imported bottomfish would be anticipated to have negative impacts on the entire commercial fishery sector as market channels for fresh MHI bottomfish would be lost and have to be regained each year.

Fishery sectors (both commercial and non-commercial) and participants may be differentially impacted depending on their ability and willingness to "race to the fish" and some may upgrade their vessels (e.g., buy large vessels or more powerful engines for existing vessels) or fish during adverse weather in order to achieve high catches before the TAC is reached. These responses would be anticipated to result in over-capitalization (i.e., otherwise unnecessary investments to upgrade vessels) of the fishery and threats to the safety of fishery participants. However given that bottomfish fishing currently occurs without incident throughout the year it is believed that existing participants are aware of and able to deal with all types of weather and sea conditions.

As compared to the use of year-round non-commercial bag limits under Alternative 1, the non-commercial sector may be negatively impacted by having to compete with the commercial sector for a combined bottomfish TAC as when the TAC is reached both sectors would be prohibited from Deep 7 fishing until the next year. This approach could impact the non-commercial sector differently then the commercial due to their preferred fishing pattern which is believed to consist of fishing infrequently, (e.g. on weekends) throughout the year, with each trip resulting in relatively small catches. Under Alternative 7, once the combined TAC is reached non-commercial participants would have to switch to another target species or stop fishing regardless of the extent of their harvests up to that point.

4.3.6 Fishing Communities

Alternative 3 is not expected to result in significant or disproportionate negative impacts on fishing communities throughout Hawaii, rather they would all be impacted evenly. Most communities would be compensated by other fishery activities such as trolling for pelagic species during the no bottomfish fishing period. The non-commercial sector would be subject to the fleetwide TAC and, therefore, when the TAC is reached and the fishery closes they too would be prohibited from fishing for the Deep 7 for the rest of the fishing year. This impact would have trickle down effects on fishing communities where non-commercial fishing for bottomfish is most common which is believed to be mainly on Oahu. Community impacts of the TAC being reached and the fishery closing may include less availability of Deep 7 fish for consumption, reduced purchases of bottomfish fishing supplies, and increased competition for unrestricted BMUS and pelagic species by the non-commercial sector.

Because the TAC would be applied fleetwide throughout the MHI, it is likely that much of the MHI stocks would be harvested by Oahu-based fishermen, because that fishing community has the highest number of participants. Fishing communities from other islands could be affected if it was perceived that Oahu fishermen, for example, were harvesting most of the fish. This sentiment could lead participants from non-Oahu fishing communities to go fishing in bad weather to ensure that they get their fair share. This could result in the loss of vessels and human life and reduce the direct and indirect benefits fishing communities receive from the fishery. A race to the fish situation could also flood local fish markets with bottomfish, thereby, positively impacting consumers, but negatively impacting fishermen because of low prices. It is difficult, however, to accurately predict the outcome on communities of implementing TACs as this would be a new type of fisheries management for the bottomfish fishery community. It is expected, however, that negative impressions and resulting outcomes would be minimized by the ongoing community education program, public meetings, and Fishers Forums being held to provide information to and elicit feedback from the community at large.

4.3.7 Native Hawaiian Community

The implementation of a fleetwide bottomfish TAC could result in a fishery closure before some Native Hawaiian fishermen catch an amount of bottomfish comparable to previous years' amounts. This could adversely impact Native Hawaiian fishermen who depend on catching bottomfish to supplement their income, to perpetuate their culture, or to share with their community. Broader level cultural impacts would be anticipated once the TAC is met and both commercial and non-commercial bottomfish fishing is prohibited until October 1. For Native Hawaiians, who once exercised sovereignty and self-determination in the Hawaiian Archipelago, and whose activities were governed by customary and traditional practices, any curtailment or reduction of access rights and cultural practices reduces their ability to practice and continue their culture. The loss of any customary access and practice could be viewed as a permanent loss of culture for Native Hawaiian communities. On the other hand, the objective of the TAC is to reduce fishing mortality, thereby ensuring a sustainable resource. A sustainable and accessible bottomfish resource would provide positive impacts to Native Hawaiians over time and into the future.

4.3.8 Administration and Enforcement

Administration and enforcement of Alternative 3 would require the implementation of Federal permit and reporting requirements for non-commercial participants. All MHI vessel owners who target bottomfish are already required to register their vessels; however, under Alternative 3 they would be required to renew their registration annually. The vessel registration system would need to be expanded accordingly. This would provide current information on the maximum number of fishery participants and to facilitate effective enforcement by removing the “BF” markings from vessels no longer active in the fishery.

Effective and ongoing implementation of the TAC would require it be determined, analyzed, and published in a timely manner prior to the start of each fishing season. Although it is known that current fishing mortality needs to be reduced by 24 percent, in subsequent years this number is likely to vary according to stock status and environmental conditions. Under this alternative, PIFSC would work with the Council’s advisory bodies to provide the Council by May 30 with a proposed TAC for each year to be implemented prior to the start of the fishing year. However, without a reasonable estimate of non-commercial catches, monitoring a fleetwide TAC would be difficult.

Enforcement of this alternative would include increased and real time shore-based monitoring of fishery landings and sales to determine when the TAC was reached. Additional at-sea enforcement would not likely be required but occasional monitoring would supplement shore-side monitoring when the TAC was reached. All vessel owners would be required to mark their vessels with the registration number to be visible from aircraft to facilitate effective enforcement and vessel monitoring. Joint efforts between the State of Hawaii and Federal law enforcement capacities would greatly enhance enforcement of this alternative especially with regards to monitoring the non-commercial bag limits during 2007-2008.

The USCG believes it has sufficient resources to enforce this alternative. USCG at-sea enforcement would not be necessary until the TAC was reached and the fishery closed. However, effectively monitoring progress towards reaching the TAC would require a strong shore-side component to track catch, effort, landings, and sales, as well as monitor recordkeeping and reporting requirements. SAC PID OLE would require additional personnel and equipment to provide the shore-side enforcement component. SAC PID OLE would require additional personnel and equipment to accomplish the shore-side enforcement function.

NMFS Pacific Islands Region estimates that approximately $400,000 would be required in FY2008 to implement federal commercial and non-commercial bottomfish permits, and ongoing costs would range from $300,000 the second year to $440,000 in 2013. The costs of implementing federal reporting are even higher, ranging from $1,250,000 in FY2008 to $1,600,000 in FY2013. OLE estimates costs for effective enforcement of this alternative may be between $750,000-$900,000 annually.

4.4 Alternative 4: Commercial TAC & Non-commercial Bag Limit

Alternative 4 would implement a TAC for the commercial fishery only and close that sector when the TAC is reached. The bottomfish fishing year would start on October 1 to ensure the fishery is open during the important holiday periods and continue until the TAC was reached. The non-commercial sector would have to adhere to the existing State non-commercial bag limit of 5 ehu and/or onaga per trip per person, however, this limit may be changed and/or other species may be added by the State.

All vessel operators (both commercial and non-commercial) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and to obtain permits, as well as to complete and submit reports of their catches, fishing effort, and area fished. To facilitate recognition of bottomfish registered vessels from the air, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

To achieve the purpose and need for the Federal action (i.e., a reduction in MHI fishing mortality to end overfishing), the State would need to establish a parallel requirement as both State and Federal waters would have to be closed to harvest of Deep 7 species once the TAC was reached. The effectiveness of the catch limits in reducing bottomfish fishing mortality would be monitored through non-commercial and commercial reporting as well as cooperative enforcement activities.

4.4.1 Target Species

Implementing a commercial hard TAC would provide relatively direct control of fishing mortality in this sector and is expected that mortality of target species would be reduced and this would allow more of the Deep 7 to survive to breeding, resulting in a build-up of Deep 7 biomass over time.

High-grading of catches in terms of species kept or size would be a concern under management by use of TACs. High-grading to maximize value can occur within species (i.e., discarding small fish in favor of larger fish) or between species (e.g., discarding low-value species in favor of higher-value species). Deep-slope bottomfish generally have a high mortality rate resulting from barotrauma (physical damage to the fish as air in the swim bladder expands during ascent) after they are brought to the surface. If, and to what extent, high-grading occurs, additional bottomfish mortality may occur due to barotrauma. However, there are ways to mitigate barotrauma and increase the survivability of the deep-water fish with gas bladders. The simplest is by venting the air bladder with a needle. Once the bladder has been vented, the fish can swim back down to depth and force gases back into the body fluids increasing the chances of survival. This technique has been used with Deep 7 species very successfully in mark/recapture studies. Another way to increase survivability is if unwanted fish are released “at depth” using some of the new techniques to sink the fishes quickly back down so that their barotrauma is reduced (e.g. Git-R-Down© Barotrauma Reversing Fish Release). In addition there could be mortality of Deep 7 species due to regulatory discards after TAC is reached while targeting bottomfish species other than the Deep 7. Recent education and outreach activities have been conducted by the

WPFMC, NMFS, and the State of Hawaii that include pamphlets and demonstrations on various techniques to reduce barotrauma on deep-water bottomfish.

Under this TAC system, commercial fishermen would compete against each other and time to land as many of the Deep 7 species as possible before the TAC is filled. This competition would likely discourage discarding of Deep 7 species.

Required reporting by non-commercial fishermen under this alternative would provide information on their catch and effort which would then be used to better assess the impacts of the two sectors and lead to better regulations to end overfishing in the most expeditious manner. Such information is not currently collected, and thus, fishery scientists and managers do not know the total fishery catch taking place. Having complete information would improve the scientific understanding of influences on Hawaii's bottomfish stocks and would be expected to improve fishery management.

4.4.2 Non-target Species and Bycatch

Under Alternative 4, catches of non-target species and bycatch by fishermen targeting Deep 7 species would be prohibited after the TAC is reached. If affected fishermen switch to targeting bottomfish other than the Deep 7 species, catches of these species could increase. However stocks of non-Deep 7 species are believed to be generally healthy and able to withstand some increases in fishing pressure. It is not anticipated that there will be significant increases as the Deep 7 species are clearly preferred and shallow water species are not generally regarded as substitute products.

As described above, fishing under a TAC can create a situation in which each fisherman attempts to maximize their individual harvest of the quota species in the shortest time period possible (i.e., before the TAC is reached). Due to limited storage capacity, this may lead to increased discards of less desirable species resulting in higher bycatch rates.

High-grading within Deep 7 species could also result in increased bycatch if fishermen discard small fish in favor of larger fish or discard low-value species in favor of higher-value species. Deep-slope bottomfish generally have a high mortality rate resulting from barotrauma (physical damage to the fish as air in the swim bladder expands during ascent) after they are brought to the surface. If, and to what extent, high-grading occurs, additional bottomfish mortality may occur due to barotrauma. However, there are ways to mitigate barotrauma and increase the survivability of the deep-water fish with gas bladders. The simplest is by venting the air bladder with a needle. Once the bladder has been vented, the fish can swim back down to depth and force gases back into the body fluids increasing the chances of survival. This technique has been used with Deep 7 species very successfully in mark/recapture studies. Another way to increase survivability is if unwanted fish are released "at depth" using some of the new techniques to sink the fishes quickly back down so that their barotrauma is reduced (e.g. Git-R-Down© Barotrauma Reversing Fish Release). Discarded dead Deep 7 species would be counted against the TAC, thus ensuring that overfishing does not occur regardless of the extent of high-grading. Recent education and outreach activities have been conducted by the WPFMC, NMFS, and the State of

Hawaii that include pamphlets and demonstrations on various techniques to reduce barotrauma on deep-water bottomfish.

Non-commercial fishermen in general are expected to have less targeting skill than commercial fishermen, and therefore may have higher non-target catches. They should, however, be less influenced by market value and therefore may be expected to retain more non-target species than commercial fishermen.

Required reporting (including information on non-target catches and bycatch) by non-commercial fishermen under Alternative 4 would improve the scientific understanding of influences on non-target stocks and would be expected to improve fishery management.

4.4.3 Protected Species

Potential impacts to protected species were analyzed by NMFS during their Endangered Species Act consultation on the bottomfish fishery completed in 2002. Details are described in Section 3.5. The following section summarizes the anticipated impacts from Alternative 4.

ESA-Listed Species

In their 2002 BiOp, NMFS concluded that the bottomfish fishery is not likely to jeopardize the continued existence of the Hawaiian monk seal or result in the destruction or adverse modification of its critical habitat. NMFS also concluded that the bottomfish fishery is not likely to adversely affect any listed whales or sea turtles. As described in Section 3.5 the 2002 BiOp discusses several monk seals that have been found with embedded hooks mostly of the type used by either the shoreline ulua fishery or the bottomfish fishery, although positive attribution of these hooks to a particular fishery is difficult (NMFS 2002).

Limited monk seal/hook interactions in the NWHI bottomfish fishery (see Section 3.5) would have the potential to increase if NWHI fishing activity increased to fill unmet market demand; however, this is not going to occur to any significant degree because the NWHI fishery is now limited by an annual quota in addition to the limited number of permits and the impending complete closure of the fishery in 2011 pursuant to the Presidential monument regulations. In addition, no interactions with monk seals were observed by NMFS during its 2003-2005 monitoring of the NWHI fishery.

Implementation of Alternative 4's commercial TACs in conjunction with the continuation of non-commercial bag limits is not expected to result in any significant impacts to listed species as although they may result in temporal changes in the annual distribution of fishing effort, they are not anticipated to result in significant increases in bottomfishing effort or significant changes to bottomfish fishing methods or areas. Some participants may increase their pelagic fishing effort once the TAC is reached, however NMFS has also concluded that the MHI pelagic small-boat (i.e., non-longline) fishery is not likely to jeopardize the continued existence of any listed species (NMFS 2004). Based on the above information, the MHI bottomfish fishery is not believed to interact significantly with ESA listed species and Alternative 4's TAC and non-commercial bag limits, including the potential relocation of MHI bottomfish effort to the pelagic small-boat fishery, would not be expected to result in any impacts to listed species not already considered.

Marine Mammals Not Listed Under the ESA

The Hawaii bottomfish fishery is listed as a Category III fishery under Section 118 of the MMPA. A Category III fishery is one that has a low likelihood or no known incidental takings of marine mammals. Observer data from the NWHI Protected Species Study Zone taken in 1990 to 1993 recorded few interactions between marine mammals (monk seals and bottlenose dolphins) and bottomfish gear, and those that did occur were typically characterized by removal of fish and bait from fishing lines without any hookings or entanglements (Nitta and Henderson 1993). These interactions have been determined by NMFS to constitute a low-level risk to bottlenose dolphins. Observer coverage of the NWHI fishery from 2003 – 2005 did not record any interactions with marine mammals. Based on this information, the MHI bottomfish fishery is believed not to interact significantly with marine mammals and this alternative, including the potential relocation of MHI bottomfish effort to the pelagic small-boat fishery, (also a Category III fishery) would not be expected to result in any impacts to marine mammals not already considered.

Seabirds

Between 2003 - 2005 there were a total of six observed seabird interactions, including two unidentified boobies, one brown booby, one black-footed albatross and two Laysan albatrosses in the NWHI bottomfish fishery. Only the black-footed albatross interaction occurred during bottomfish fishing operations. All of the other interactions were observed in transit during trolling operations.

These few, low-level interactions would be expected to continue in the NWHI until the 2011 closure. These interactions may affect a limited number of seabirds; however, they would not be expected to result in impacts to seabird distribution, survival, or population structure. Although there are several seabird colonies in the MHI, the NWHI colonies harbor more than 90 percent of the total Hawaiian Archipelago seabird population. The NWHI provide most of the nesting habitat for more than 14 million Pacific seabirds. No interactions between seabirds and MHI bottomfish vessels have been reported or observed, and based on the above information it is believed MHI bottomfish fishing activities pose little to no threat to Hawaii seabird populations.

4.4.4 EFH, Biodiversity, and Ecosystems

As discussed in Section 4.1.4, bottomfish fishing activities have not been found to adversely affect EFH and HAPC for any management unit species managed under the FMPs of the Western Pacific Region.

Implementing a TAC system under this alternative is not expected to adversely affect EFH or HAPC. The precise effects of a potential “race for the fish” situation are unknown but are not be expected to result in significant impacts as hook-and-line bottomfish fishing is considered to have low collateral impacts on bycatch and habitat. Implementing catch limits via a TAC would impact the number of bottomfish removed, which could either result in fewer fish caught, or if extensive high-grading occurs, in more fish caught. The former would have positive impacts on overall abundance with corresponding impacts on the ecosystem, while the latter could have negative impacts. The impacts of any increased pelagic effort by displaced bottomfish fishermen are expected to be negligible due to the use of hook-and-line gears in the small-boat pelagic fishery.

Under this alternative local biodiversity and ecosystems may experience some positive effects over time due to reductions in bottomfish harvests leading to increased bottomfish biomass and corresponding trophic cascading effects.

4.4.5 Fishery Sectors

The use of a commercial TAC under this alternative would be anticipated to result in a bunching of fishing effort at the beginning of each fishing year (October 1 in 2007 and September 1 thereafter) as fishery participants would be aware that once the TAC was reached the fishery would be closed. Given that the majority of commercial landings are already made during the winter season this is not likely to radically change these operations, however it may lead to market "floods" that temporarily reduce fresh fish prices and adversely impact commercial fishermen.

Once the TAC is reached, this alternative is expected to lead to an increased reliance on imported and NWHI bottomfish (until the NWHI fishery is closed in 2011). An increased reliance on imported bottomfish would be anticipated to have negative impacts on the entire commercial fishery sector as market channels for fresh MHI bottomfish would be lost and have to be regained each year.

The commercial fishery sector and its participants may be differentially impacted depending on their ability and willingness to "race to the fish" and some may upgrade their vessels (e.g., buy larger vessels or more powerful engines for existing vessels) or fish during adverse weather in order to achieve high catches before the TAC is reached. These responses would be anticipated to result in over-capitalization (i.e., otherwise unnecessary investments to upgrade vessels) of the fishery and could result in threats to the safety of fishery participants. However given that bottomfish fishing currently occurs without incident throughout the year it is believed that existing participants are aware of and able to deal with all types of weather and sea conditions.

The non-commercial sector would continue to fish with the existing bag limits in place and they would not be competing with the commercial sector. Under Alternative 4, once the TAC is reached commercial participants would have to switch to another target species or stop fishing regardless of the extent of their harvests up to that point.

4.4.6 Fishing Communities

Alternative 4 is not expected to result in significant or disproportionate negative impacts on fishing communities throughout Hawaii; rather, they would all be impacted evenly. Most communities would be compensated by other fishery activities such as trolling for pelagic species if the commercial TAC was reached and the fishery was closed.

Because the commercial TAC would be applied throughout the MHI, it is likely that much of the MHI stocks would be harvested by Oahu-based fishermen, because that fishing community has the highest number of participants. Fishing communities from other islands could be affected if it was perceived that Oahu fishermen, for example, were harvesting most of the fish. This sentiment could lead participants from non-Oahu fishing communities to go fishing in bad weather to ensure that they get their fair share before the TAC would be reached. This could result in the loss of vessels and human life and reduce the direct and indirect benefits fishing communities receive from the fishery. A race to the fish situation could also flood local fish markets with bottomfish, thereby, positively impacting consumers, but negatively impacting fishermen because of low prices. It is difficult, however, to accurately predict the outcome on communities of implementing TACs as this would be a new type of fisheries management for the bottomfish fishery community. It is expected, however, that negative impressions and resulting outcomes would be minimized by the ongoing community education program, public meetings, and Fishers Forums being held to provide information to and elicit feedback from the community at large.

4.4.7 Native Hawaiian Community

The implementation of a commercial bottomfish TAC could result in a fishery closure before some Native Hawaiian fishermen catch an amount of bottomfish comparable to previous years' amounts. This could adversely impact Native Hawaiian fishermen who depend on catching bottomfish to supplement their income, to perpetuate their culture, or to share with their community. Broader level cultural impacts would be anticipated once the TAC is met and commercial bottomfish fishing is prohibited until October 1. For Native Hawaiians, who once exercised sovereignty and self-determination in the Hawaiian Archipelago, and whose activities were governed by customary and traditional practices, any curtailment or reduction of access rights and cultural practices reduces their ability to practice and continue their culture. The loss of any customary access and practice could be viewed as a permanent loss of culture for Native Hawaiian communities. On the other hand, the objective of the TAC is to reduce fishing mortality, thereby ensuring a sustainable resource. A sustainable and accessible bottomfish resource would provide positive impacts to Native Hawaiians over time and into the future.

4.4.8 Administration and Enforcement

Administration and enforcement of Alternative 4 would require the expansion of the current reporting requirements to include requirements for non-commercial participants. All MHI vessel owners who target bottomfish are already required to register their vessels; however, under this alternative they would be required to renew their registration annually. The vessel registration system would need to be expanded accordingly. This would provide current information on the maximum number of fishery participants and to facilitate effective enforcement by removing the "BF" markings from vessels no longer active in the fishery

Effective implementation would require that the TAC be determined, analyzed, and published in a timely manner prior to the start of each fishing season. Although it is known that current fishing mortality needs to be reduced by 24 percent, in subsequent years this number is likely to vary according to stock status and environmental conditions. Under this alternative, PIFSC would work with the Council's advisory bodies to provide the Council by May 30 with a proposed TAC for each year to be implemented prior to the start of the fishing year.

Enforcement of this alternative would include increased and real time shore-based monitoring of commercial landings and sales to determine when the TAC was reached. Additional at-sea enforcement would not likely be required but occasional monitoring would supplement shore-side monitoring when the TAC was reached. All vessel owners would be required to mark their vessels with the registration number to be visible from aircraft to facilitate effective enforcement and vessel monitoring. Joint efforts between the State of Hawaii and Federal law enforcement capacities would greatly enhance enforcement of this alternative especially with regards to monitoring the non-commercial bag limits.

The USCG believes it has sufficient resources to enforce this alternative. USCG at-sea enforcement would not be necessary until the TAC was reached and the fishery closed. However, effectively monitoring progress towards reaching the TAC would require a strong shore-side component to track catch, effort, landings, and sales, as well as monitor recordkeeping and reporting requirements. SAC PID OLE would require additional personnel and equipment to provide the shore-side enforcement component.

NMFS estimates that approximately $400 K would be required in FY2008 to implement federal commercial and non-commercial bottomfish permits, and ongoing costs would range from $300 K the second year to $440 K in 2013. The costs of implementing federal reporting are even higher, ranging from $1,250 K in FY2008 to $1,600 K in FY2013. OLE estimates costs for effective enforcement between $750 K-$900 K annually.

4.5 Alternative 5: TAC w/ Limited Access & Non-commercial Bag Limit

This alternative includes implementing a commercial TAC in combination with a limited access program. A limited access system will simplify the determination and monitoring of individual quotas by limiting the number of participants. Only those with limited access permits would be allowed to fish for the Deep 7 bottomfish in the MHI. All limited access vessels would be required to stop fishing when the commercial TAC was reached. The limited access system would allocate a certain number of permits based on criteria related to past participation in the fishery. The non-commercial component would have to adhere to the existing State non-commercial bag limit of 5 ehu and/or onaga per trip per person, however, this limit may be changed and/or other species may be added by the State.

Under all alternatives with TACs, all vessel operators (both commercial and non-commercial) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and to obtain permits, as well as to complete and submit reports of their catches, fishing effort, and area fished. To facilitate recognition of bottomfish registered vessels from the air, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

Under all of these variations, to achieve the purpose and need for the Federal action (i.e., a reduction in MHI fishing mortality to end overfishing), the State would need to establish a parallel requirement as both State and Federal waters would have to be closed to takes of Deep 7 species once the limit was reached. The effectiveness of the catch limits in reducing bottomfish fishing mortality would be monitored through non-commercial and commercial reporting as well as cooperative enforcement activities.

4.5.1 Target Species

Limiting access to the fishery would not have significant impacts to the target species beyond those of implementing a TAC to reduce mortality. A limited access program is simply another tool which could be used to reduce the level of fishing effort in the bottomfish fishery which would have a positive impact of biomass of target species over time.

The non-commercial bag limits would mimic the State's current requirements (not more than five onaga and ehu combined/per trip/per person) and could be changed as more information becomes available. These limits would impact target species if they result in fewer being caught, however, until non-commercial data become available it is not known what the current catches are. Non-commercial fishers would begin reporting their catches under the new requirements.

Limiting access in the MHI bottomfish fishery would provide direct control over the total number of fishermen. The State of Hawaii established a control date in 1998 when their BRFAs, non-commercial bag limits and bottomfish registration program were implemented. The State has not used the control date to further manage the fishery. The Council recommended, at its 127th meeting in June 2005, to implement a Federal control date that was established in August 2005 (rule published July 17). Either of the State or Federal control dates could be used if considering a limited-entry or quota-based management regime.

Only a small percentage of commercial fishermen target and land bottomfish as their primary fishing activity. The majority of Hawaii commercial fishermen land less than 1,000 pounds of bottomfish per year and switch between the bottomfish fishery and other fisheries. Establishing a limited-entry program without implementing additional output controls (landing limits) would not prevent fishing mortality from increasing through an increase in fishing activity.

Implementing a TAC would provide direct control of fishing mortality in the commercial sector. High-grading of catches in terms of species kept or size would be a concern under management by use of TACs. High-grading to maximize value can occur within species (i.e., discarding small fish in favor of larger fish) or between species (e.g., discarding low-value species in favor of higher-value species). Deep-slope bottomfish generally have a high mortality rate resulting from barotrauma (physical damage to the fish as air in the swim bladder expands during ascent) as they are brought to the surface. If, and to what extent, high-grading occurs, additional bottomfish mortality may occur due to barotrauma. However, there are ways to mitigate barotrauma and increase the survivability of the deep-water fish with gas bladders. The simplest is by venting the air bladder with a needle. Once the bladder has been vented, the fish can swim back down to depth and force gases back into the body fluids increasing the chances of survival. This technique has been used with Deep 7 species very successfully in mark/recapture studies. Another way to increase survivability is if unwanted fish are released “at depth” using some of the new techniques to sink the fishes quickly back down so that their barotrauma is reduced (e.g. Git-R-Down© Barotrauma Reversing Fish Release). Under a TAC system, fishermen would compete against each other and time to land as many of the Deep 7 species as possible before the TAC is filled. This competition would likely discourage discarding of Deep 7 species. However, there could be mortality of Deep 7 species due to regulatory discards after TAC is reached while targeting bottomfish species other than the Deep 7. Recent education and outreach activities have been conducted by the WPFMC, NMFS, and the State of Hawaii that include pamphlets and demonstrations on various techniques to reduce barotrauma on deep-water bottomfish.

Required reporting by non-commercial fishermen would provide information on their catch and effort which could then be used to better assess the impacts of the two sectors and lead to better regulations to end overfishing in the most expeditious manner. Such information is not currently collected, and thus, fishery scientists and managers do not know the total fishery catch taking place. Having complete information would improve the scientific understanding of influences on Hawaii’s bottomfish stocks and would be expected to improve fishery management.

4.5.2 Non-target Species and Bycatch

Under Alternative 5, catches of non-target species and bycatch by fishermen targeting Deep 7 species would be prohibited after the TAC is reached. If affected fishermen switch to targeting bottomfish other than the Deep 7 species, catches of these species could increase. However stocks of non-Deep 7 species are believed to be generally healthy and able to withstand some increases in fishing pressure. It is not anticipated that there will be significant increases as the Deep 7 species are clearly preferred and shallow water species are not generally regarded as substitute products.

As described above, fishing under a TAC can create a situation in which each fisherman attempts to maximize their individual harvest of the quota species in the shortest time period possible (i.e., before the TAC is reached). Due to limited storage capacity, this may lead to increased discards of less desirable species resulting in higher bycatch rates.

High-grading within Deep 7 species could also result in increased bycatch if fishermen discard small fish in favor of larger fish or discard low-value species in favor of higher-value species. Deep-slope bottomfish generally have a high mortality rate resulting from barotrauma (physical damage to the fish as air in the swim bladder expands during ascent) after they are brought to the surface. If, and to what extent, high-grading occurs, additional bottomfish mortality may occur due to barotrauma. However, there are ways to mitigate barotrauma and increase the survivability of the deep-water fish with gas bladders. The simplest is by venting the air bladder with a needle. Once the bladder has been vented, the fish can swim back down to depth and force gases back into the body fluids increasing the chances of survival. This technique has been used with Deep 7 species very successfully in mark/recapture studies. Another way to increase survivability is if unwanted fish are released “at depth” using some of the new techniques to sink the fishes quickly back down so that their barotrauma is reduced (e.g. Git-R-Down© Barotrauma Reversing Fish Release). Discarded dead Deep 7 species would be counted against the TAC, thus ensuring that overfishing does not occur regardless of the extent of high-grading. Recent education and outreach activities have been conducted by the WPFMC, NMFS, and the State of Hawaii that include pamphlets and demonstrations on various techniques to reduce barotrauma on deep-water bottomfish.

Non-commercial fishermen in general are expected to have less targeting skill than commercial fishermen, and therefore may have higher non-target catches. They should, however, be less influenced by market value and therefore may be expected to retain more non-target species than commercial fishermen.

Required reporting (including information on non-target catches and bycatch) by non-commercial fishermen under Alternative 4 would improve the scientific understanding of influences on non-target stocks and would be expected to improve fishery management.

4.5.3 Protected Species

Potential impacts to protected species were analyzed by NMFS during their Endangered Species Act consultation on the bottomfish fishery completed in 2002. Details are described in Section 3.5. The following section summarizes the anticipated impacts from Alternative 5.

ESA-Listed Species

In their 2002 BiOp, NMFS concluded that the bottomfish fishery is not likely to jeopardize the continued existence of the Hawaiian monk seal or result in the destruction or adverse modification of its critical habitat. NMFS also concluded that the bottomfish fishery is not likely to adversely affect any listed whales or sea turtles. As described in Section 3.5, the 2002 BiOp discussed several monk seals that have been found with embedded hooks mostly of the type used by either the shoreline ulua fishery or the bottomfish fishery, although positive attribution of these hooks to a particular fishery is difficult (NMFS 2002).

Limited monk seal/hook interactions in the NWHI bottomfish fishery (see Section 3.5) would have the potential to increase if NWHI fishing activity increased to fill unmet market demand; however, this is not going to occur to any significant degree because the NWHI fishery is now limited by an annual quota in addition to the limited number of permits and the impending complete closure of the fishery in 2011 pursuant to the Presidential monument regulations. In addition, no interactions with monk seals were observed by NMFS during its 2003-2005 monitoring of the NWHI fishery.

Implementation of Alternative 5's commercial TACs in conjunction with a limited access system and the continuation of non-commercial bag limits is not expected to result in any significant impacts to listed species as although they may result in temporal changes in the annual distribution of fishing effort, they are not anticipated to result in significant increases in bottomfishing effort or significant changes to bottomfish fishing methods or areas. Some participants may increase their pelagic fishing effort once the TAC is reached, however NMFS has also concluded that the MHI pelagic small-boat (i.e., non-longline) fishery is not likely to jeopardize the continued existence of any listed species (NMFS 2004). Based on the above information, the MHI bottomfish fishery is not believed to interact significantly with ESA listed species and Alternative 5's commercial TAC, limited access system and non-commercial bag limits, including the potential relocation of MHI bottomfish effort to the pelagic small-boat fishery, would not be expected to result in any impacts to listed species not already considered.

Marine Mammals Not Listed Under the ESA

The Hawaii bottomfish fishery is listed as a Category III fishery under Section 118 of the MMPA. A Category III fishery is one that has a low likelihood or no known incidental takings of marine mammals. Observer data from the NWHI Protected Species Study Zone taken in 1990 to 1993 recorded few interactions between marine mammals (monk seals and bottlenose dolphins) and bottomfish gear, and those that did occur were typically characterized by removal of fish and bait from fishing lines without any hookings or entanglements (Nitta and Henderson 1993). These interactions have been determined by NMFS to constitute a low-level risk to bottlenose dolphins. Observer coverage of the NWHI fishery from 2003 - 2005 averaged 21.4 percent and did not record any interactions with marine mammals. Based on this information, the MHI bottomfish fishery is believed not to interact significantly with marine mammals and this alternative, including the potential relocation of MHI bottomfish effort to the pelagic small-boat fishery, (also a Category III fishery) would not be expected to result in any impacts to marine mammals not already considered.

Seabirds

Between 2003-2005 there were a total of six observed seabird interactions, including two unidentified boobies, one brown booby, one black-footed albatross and two Laysan albatrosses in the NWHI bottomfish fishery. Only the black-footed albatross interaction occurred during bottomfish fishing operations. All of the other interactions were observed in transit during trolling operations.

These few, low-level interactions would be expected to continue in the NWHI until the 2011 closure. These interactions may affect a limited number of seabirds; however, they would not be expected to result in impacts to seabird distribution, survival, or population structure. Although there are several seabird colonies in the MHI, the NWHI colonies harbor more than 90 percent of the total Hawaiian Archipelago seabird population. The NWHI provide most of the nesting habitat for more than 14 million Pacific seabirds. No interactions between seabirds and MHI bottomfish vessels have been reported or observed, and based on the above information it is believed MHI bottomfish fishing activities pose little to no threat to Hawaii seabird populations.

4.5.4 EFH, Biodiversity, and Ecosystems

As discussed in Section 4.1.4, bottomfish fishing activities have not been found to adversely affect EFH and HAPC for any management unit species managed under the FMPs of the Western Pacific Region.

Implementing a limited access TAC system under this alternative is not expected to adversely affect EFH or HAPC. The precise effects of a potential "race for the fish" situation are unknown but are not be expected to result in significant impacts as hook-and-line bottomfish fishing is considered to have low collateral impacts on bycatch and habitat. Implementing catch limits via a TAC would impact the number of bottomfish removed, which could either result in fewer fish caught, or if extensive high-grading occurs, in more fish caught. The former would have positive impacts on overall abundance with corresponding impacts on the ecosystem, while the latter could have negative impacts. The impacts of any increased pelagic effort by displaced bottomfish fishermen are expected to be negligible due to the use of hook-and-line gears in the small-boat pelagic fishery.

Under this alternative local biodiversity and ecosystems may experience some positive effects over time due to reductions in bottomfish harvests leading to increased bottomfish biomass and corresponding trophic cascading effects.

4.5.5 Fishery Sectors

Limiting access in the MHI bottomfish fishery would provide direct control over the total number of fishery participants. However, only a small percentage of those in the commercial fishery sector target and land bottomfish as their primary fishing activity. The large majority of commercial fishers switch between fisheries and lands less than 1,000 pounds of bottomfish per year (see Figure 31). This would make the process of determining who gets to remain in the fishery difficult and ultimately result in economic and cultural losses to those not permitted. Establishing a MHI limited entry program is supported by many full-time commercial fishermen; however, part-time commercial and non-commercial fishermen have not been supportive of a limited entry system in the bottomfish fishery in the MHI.

Criteria to establish initial qualified fishermen under a limited-entry program would likely be based on historical participation in the MHI bottomfish fishery. To qualify a commercial fisherman, historical information from the State commercial marine license and catch reporting program would be used. With the lack of information, qualifying non-commercial fishermen under a limited-entry program would be more difficult. The State's 1998 bottomfish management regime requires any person who may fish for bottomfish (any of the seven species) to register their vessel, one time only, with the Hawaii Division of Aquatic Resources (HDAR) and display the letters "BF" on their boat. This rule applies to all vessels used for bottomfish fishing, whether the owner is a non-commercial, sustenance or commercial fisherman. Of the 3,600 vessels registered with the HDAR, about 40 percent have declared themselves as non-commercial. Because non-commercial fishermen are not required to report their catches, the number of non-commercial vessels used for bottomfish fishing since 1998 is not known. Based on the public meetings during the development of this document and public comments received on the 2006 DSEIS and this revised DSEIS establishing a MHI limited-entry program is supported by many full-time commercial fishermen; however, part-time commercial and non-commercial fishermen do not seem to support limited-entry.

Figure 31 presents reported commercial landings during the years 1998 – 2004, sorted by landing volumes. The majority of those reporting landings caught less than 500 lb of the Deep 7. The mean number of those with CMLs reporting for the years 1998-2004 is also presented in Table 49.

Figure 31: Number of Commercial Fishery Participants by Annual Landing Volumes

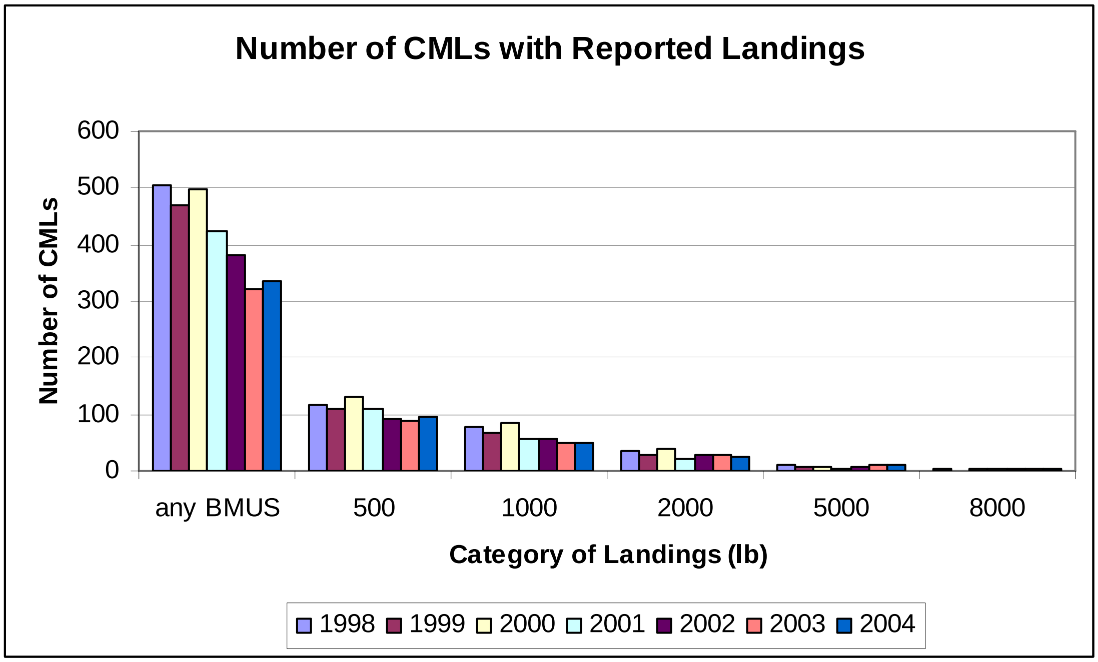

Table 49. Mean Annual Number of CMLs Reporting, Sorted by Landing Volumes (1998-2004)

Landings (lb)	Number of CMLs
1-500	313
501-1,000	42
1,001 – 2,000	35
2,001 – 5,000	21
5,001 – 8,000	5
>8,000	3

The use of a commercial TAC under Alternative 5 would be anticipated to result in a bunching of fishing effort at the beginning of each fishing year (October 1) as commercial fishery participants would be aware that once the TAC was reached the fishery would be closed. Given that the majority of commercial landings are already made during the winter season this is not likely to radically change these operations, however it may lead to market "floods" that temporarily reduce fresh fish prices and adversely impact commercial fishermen.

Once the TAC is reached, this alternative may lead to an increased reliance on NWHI until this fishery is closed in 2011 and on increased imports of bottomfish. An increased reliance on imported bottomfish would be anticipated to have negative impacts on the entire commercial fishery sector as market channels for fresh MHI bottomfish would be lost and have to be regained each year.

The commercial fishery sector and individual participants may be differentially impacted depending on their ability and willingness to "race to the fish" and some may upgrade their vessels (e.g., buy large vessels or more powerful engines for existing vessels) or fish during adverse weather in order to achieve high catches before the TAC is reached. These responses would be anticipated to result in over-capitalization (i.e., otherwise unnecessary investments to upgrade vessels) of the fishery and threats to the safety of fishery participants.

The non-commercial sector would continue to fish with the existing bag limits in place and they would therefore not be directly competing with the commercial sector.

4.5.6 Fishing Communities

Because the limited access program would be applied fleetwide throughout the MHI, it is likely that much of the MHI stocks would be harvested by Oahu-based fishermen, because that fishing community has the highest number of participants and therefore would be likely to have substantial numbers of fishery participants in the access program. Fishing communities may be impacted if they have bottomfish fishermen who do not receive limited access permits and therefore are prohibited from continuing commercial bottomfishing race to the fish situation could still occur as the TAC is set which could also flood local fish markets with bottomfish, thereby, positively impacting consumers, but negatively impacting fishermen because of low prices. It is difficult, however, to accurately predict the outcome on communities of implementing limited access and TACs as this would be a new type of fisheries management for the bottomfish fishery community. It is expected, however, that negative impressions and resulting outcomes would be minimized by the Council's educating the community and holding public meetings and forums to elicit feedback and suggestions from the community at large.

4.5.7 Native Hawaiian Community

The implementation of limited access and TACs could result in Native Hawaiian bottomfish fishermen becoming shut out of the commercial fishery if they are not granted a limited access permit. This could adversely impact Native Hawaiian fishermen who depend on catching bottomfish to supplement their income, to perpetuate their culture, or to share with their community. Broader level cultural impacts would be anticipated for those with limited access permits once the TAC is met and both commercial and non-commercial bottomfish fishing is prohibited until October 1. For Native Hawaiians, who once exercised sovereignty and self-determination in the Hawaiian Archipelago, and whose activities were governed by customary and traditional practices, any curtailment or reduction of access rights and cultural practices reduces their ability to practice and continue their culture. The loss of any customary access and practice could be viewed as a permanent loss of culture for Native Hawaiian communities. On the other hand, the objective of the limited access and TACs is to reduce fishing mortality, thereby ensuring a sustainable resource. A sustainable and accessible bottomfish resource would provide positive impacts to Native Hawaiians over time and into the future.

4.5.8 Administration and Enforcement

The limited access system implementation would not expand enforcement needs; however, determining who and how the limited access permits are allocated would cause some initial administrative burden. Administration and enforcement of Alternative 5 would require the expansion of the current reporting requirements to include requirements for non-commercial participants. All MHI vessel owners who target bottomfish are already required to register their vessels; however, under this alternative they would be required to renew their registration annually. The vessel registration system would need to be expanded accordingly. This would provide current information on the maximum number of fishery participants and to facilitate effective enforcement by removing the “BF” markings from vessels no longer active in the fishery

Effective implementation would require that the TAC be determined, analyzed, and published in a timely manner prior to the start of each fishing season. (Although it is known that current fishing mortality needs to be reduced by 24 percent, this percentage is likely to change over time as fishery harvests are reduced and stocks increase.)

Enforcement of this alternative would include increased and real time shore-based monitoring of commercial landings and sales to determine when the TAC was reached. Additional at-sea enforcement would not likely be required but occasional monitoring would supplement shore-side monitoring when the TAC was reached. All vessel owners would be required to mark their vessels with the registration number to be visible from aircraft to facilitate effective enforcement and vessel monitoring. Joint efforts between the State of Hawaii and Federal law enforcement capacities would greatly enhance enforcement of this alternative especially with regards to monitoring the non-commercial bag limits.

The USCG believes it has sufficient resources to enforce this alternative. USCG at-sea enforcement would not be necessary until the TAC was reached and the fishery closed. However, effectively monitoring progress towards reaching the TAC would require a strong shore-side component to track catch, effort, landings, and sales, as well as monitor recordkeeping and reporting requirements. SAC PID OLE would require additional personnel and equipment to provide the shore-side enforcement component. SAC PID OLE would require additional personnel and equipment to accomplish the shore-side enforcement function.

NMFS Pacific Islands Region estimates that approximately $400,000 would be required in FY2008 to implement federal commercial and non-commercial bottomfish permits, and ongoing costs would range from $300,000 the second year to $440,000 in 2013. The costs of implementing federal reporting are even higher, ranging from $1,250,000 in FY2008 to $1,600,000 in FY2013. OLE estimates costs for effective enforcement between $750,000-$900,000 annually.

4.6 Alternative 6: Commercial IFQs & Non-commercial bag limit

Alternative 6 includes allocating individual fishing quotas (IFQs) to all commercial fishermen (open access), whereby each fisherman is required to stop fishing for the reminder of the fishing year when their individual quota was reached. The sum of quotas would be calculated to meet the current 24 percent fishing mortality reduction. In a sense, this alternative is also management using a TAC; however, the TAC is subdivided into individual quotas. The number of fishermen would likely be limited to past participants in the fishery and quota amounts would likely be determined based on individual historical catches. Once a commercial fisherman had landed his respective IFQ, that person would not be permitted to fish for, possess, or sell any bottomfish until the following year. The non-commercial component would have to adhere to the existing State non-commercial bag limit of 5 ehu and/or onaga per trip per person, however, this limit may be changed and/or other species may be added by the State.

Each MHI commercial bottomfish participant with an IFQ would be issued a set of bottomfish stamps, with each stamp representing a certain number of pounds of bottomfish and all the stamps totaling the fisherman's total IFQ. The fisherman would be required to submit a stamp to the dealer at the point of sale. Once all the stamps were submitted the fisherman would be prohibited from fishing until the next open season. The fisherman's bottomfish stamps would be non-transferable.

Under this alternative, commercial fishermen would be required to continue reporting their catches and to stop fishing when their individual quota was reached. Fishery data would be analyzed in real time to monitor landings versus quotas.

IFQs could be implemented in a number of ways; two methods are outlined, as follows:

1. Provide equal quotas (of the TAC divided) to all historical participants. Under this alternative, historical highliners would get the same quota as part-time fishermen. Variations could provide equal quotas to a subset of all historical participants, such as those most active in recent years.

2. Provide individual quotas that are equal to 76 percent of each and every fisherman's historical catch providing this did not exceed the TAC. Under this alternative, fishermen's quotas would be relative to their individual historical catches. Variations could provide similar quotas to a subset of all historical participants, such as those most active in recent years.

Under all alternatives with TACs, all vessel operators (both commercial and non-commercial) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and to obtain permits, as well as to complete and submit reports of their catches, fishing effort, and area fished. To facilitate recognition of bottomfish registered vessels from the air, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

Under all of these variations, to achieve the purpose and need for the Federal action (i.e. reductions in MHI fishing mortality to end overfishing), the State would need to establish a parallel requirement as both State and Federal waters would have to be closed to takes of Deep 7 species once the limit was reached. The effectiveness of the catch limits in reducing bottomfish fishing mortality would be monitored through non-commercial and commercial reporting as well as cooperative enforcement activities.

The 2006 Magnuson-Stevens Act requires that limited access privilege programs (i.e. IFQ programs) include provisions to the recover costs of the fishery's management, monitoring, data collection and analysis, and enforcement by providing for a program of fees to be paid by the quota holders. This includes the cost of the computer systems necessary to manage the disbursement and tracking of IFQ share ownership and annual allocations, as well as observer and enforcement programs. This would result in some increased economic burdens to fishery participants who are allocated an IFQ.

The MSA also requires that IFQ programs promote fishing safety; fishery conservation and management, and social and economic benefits; and they must specify the goals of the program; include provisions for regular monitoring and review by the Council and the Secretary; include an effective system for enforcement, monitoring, and management of the program including the use of observers or electronic monitoring systems; among other requirements. The 2006 MSA also includes a provision that limited access privilege programs establish a policy and criteria for the transferability of limited access privileges that is consistent with the policies for the fishery.

4.6.1 Target Species

Under Alternative 6, implementing a hard TAC through allocation of individual quotas would provide direct control of fishing mortality. High-grading of catches in terms of species kept or size would be a concern under management by use of IFQs. High-grading to maximize value can occur within species (i.e., discarding small fish in favor of larger fish) or between species (e.g., discarding low-value species in favor of higher-value species). Under a TAC system, fishermen would compete against each other and time to land as many of the Deep 7 species as possible before the TAC is filled. This competition would likely discourage discarding of Deep 7 species. However, under the IFQ system, fishermen would have the luxury of time to sort through their catch to maximize profit, potentially resulting in increased bycatch and discard of target species. Deep-slope bottomfish generally have a high mortality rate resulting from barotrauma (physical damage to the fish as air in the swim bladder expands during ascent) as they are brought to the surface. If, and to what extent, high-grading occurs, additional bottomfish mortality may occur due to barotrauma. However, there are ways to mitigate barotrauma and increase the survivability of the deep-water fish with gas bladders. The simplest is by venting the air bladder with a needle. Once the bladder has been vented, the fish can swim back down to depth and force gases back into the body fluids increasing the chances of survival. This technique has been used with Deep 7 species very successfully in mark/recapture studies. Another way to increase survivability is if unwanted fish are released "at depth" using some of the new techniques to sink the fishes quickly back down so that their barotrauma is reduced (e.g. Git-R-Down© Barotrauma Reversing Fish Release). Recent education and outreach activities have been conducted by the WPFMC, NMFS, and the State of Hawaii that include pamphlets and demonstrations on various techniques to reduce barotrauma on deep-water bottomfish.

These limits would mimic the State's current requirements (not more than 5 onaga and ehu combined/per trip/per person) and could be changed as more information becomes available. These limits would impact target species if they result in fewer being caught, however, until non-commercial data become available it is not known what the current catches are.

IFQs may also lead fishery participants to make sure that they achieve their individual quotas out of fear that future quotas (or their share of them) may otherwise be reduced. This can result in increased impacts on target species as compared to other management approaches.

Required reporting by non-commercial fishermen would provide information on their catch and effort which could then be used to better assess the impacts of the two sectors and lead to better regulations to end overfishing in the most expeditious manner. Such information is not currently collected, and thus, fishery scientists and managers do not know the total fishery catch taking place. Having complete information would improve the scientific understanding of influences on Hawaii's bottomfish stocks and would be expected to improve fishery management.

4.6.2 Non-target Species and Bycatch

Under an IFQ system, fishermen can catch their quota of the Deep 7 species throughout the year without time constraints or competitive pressure and can limit their fishing to periods of favorable weather or high market prices. An IFQ system could encourage higher retention of non-target species that would result in a reduction of bycatch. As fishermen realize their overall Deep 7 catch will be limited, they will seek opportunities to maximize their fishing time by retaining marketable non-target species that may have not been previously retained.

Non-commercial fishermen, in general, are expected to have less targeting skill than commercial fishermen, and therefore may have higher non-target catches. They should, however, be less influenced by market value and therefore may be expected to retain more non-target species than commercial fishermen.

Required reporting (including information on non-target catches and bycatch) by non-commercial fishermen under Alternative 6 would improve the scientific understanding of influences on non-target stocks and would be expected to improve fishery management.

4.6.3 Protected Species

Potential impacts to protected species were analyzed by NMFS during their Endangered Species Act consultation on the bottomfish fishery completed in 2002. Details are described in Section 3.5. The following section summarizes the anticipated impacts from Alternative 6.

ESA-Listed Species

In their 2002 BiOp NMFS concluded that the bottomfish fishery is not likely to jeopardize the continued existence of the Hawaiian monk seal or result in the destruction or adverse modification of its critical habitat. NMFS also concluded that the bottomfish fishery is not likely to adversely affect any listed whales or sea turtles. As described in Section 3.5, the 2002 BiOp discusses several monk seals that have been found with embedded hooks mostly of the type used by either the shoreline ulua fishery or the bottomfish fishery, although positive attribution of these hooks to a particular fishery is difficult (NMFS 2002).

Limited monk seal/hook interactions in the NWHI bottomfish fishery (see Section 3.5) would have the potential to increase if NWHI fishing activity increased to fill unmet market demand; however, this is not going to occur to any significant degree because the NWHI fishery is now limited by an annual quota in addition to the limited number of permits and the impending complete closure of the fishery in 2011 pursuant to the Presidential monument regulations. In addition no interactions with monk seals were observed by NMFS during its 2003-2005 monitoring of the NWHI fishery.

Implementation of Alternative 6's commercial IFQs and continued non-commercial bag limits is not expected to result in any significant impacts to listed species as although it may result in some temporal changes in the annual distribution of fishing effort depending on how the IFQs are allocated, it is not anticipated to result in significant increases in bottomfishing effort or significant changes to bottomfish fishing methods or areas. Some participants may increase their pelagic fishing effort once their IFQ is reached, however NMFS has also concluded that the MHI pelagic small-boat (i.e., non-longline) fishery is not likely to jeopardize the continued existence of any listed species (NMFS 2004). Based on the above information, the MHI bottomfish fishery is not believed to interact significantly with ESA listed species and Alternative 6's commercial IFQs and non-commercial bag limits, including the potential relocation of MHI bottomfish effort to the pelagic small-boat fishery, would not be expected to result in any impacts to listed species not already considered.

Marine Mammals Not Listed Under the ESA

The Hawaii bottomfish fishery is listed as a Category III fishery under Section 118 of the MMPA. A Category III fishery is one that has a low likelihood or no known incidental takings of marine mammals. Observer data from the NWHI Protected Species Study Zone taken in 1990 to 1993 recorded few interactions between marine mammals (monk seals and bottlenose dolphins) and bottomfish gear, and those that did occur were typically characterized by removal of fish and bait from fishing lines without any hookings or entanglements (Nitta and Henderson 1993). These interactions have been determined by NMFS to constitute a low-level risk to bottlenose dolphins. Observer coverage of the NWHI fishery from 2003 -2005 averaged 21.4 percent and did not record any interactions with marine mammals. Based on this information, the MHI bottomfish fishery is believed not to interact significantly with marine mammals and this alternative, including the potential the relocation of MHI bottomfish effort to the pelagic small-boat fishery (also a Category III fishery) would not be expected to result in any impacts to marine mammals not already considered.

Seabirds

Between 2003-2005 there were a total of six observed seabird interactions, including two unidentified boobies, one brown booby, one black-footed albatross and two Laysan albatrosses in the NWHI bottomfish fishery. Only the black-footed albatross interaction occurred during bottomfish fishing operations. All of the other interactions were observed in transit during trolling operations.

These few, low-level interactions would be expected to continue in the NWHI until the 2011 closure. These interactions may affect a limited number of seabirds; however, they would not be expected to result in impacts to seabird distribution, survival, or population structure. Although there are several seabird colonies in the MHI, the NWHI colonies harbor more than 90 percent of the total Hawaiian Archipelago seabird population. The NWHI provide most of the nesting habitat for more than 14 million Pacific seabirds. No interactions between seabirds and MHI bottomfish vessels have been reported or observed, and based on the above information it is believed that MHI bottomfish fishing activities pose little to no threat to Hawaii seabird populations.

4.6.4 EFH, Biodiversity, and Ecosystems

As discussed in Section 4.1.4 bottomfish fishing activities have been found to not adversely affect EFH and HAPC for any management unit species managed under the FMPs of the Western Pacific Region. Implementing Alternative 6 is not expected to adversely affect EFH or HAPC due to the low impacts of this fishery. Management using an IFQ system would not lead to increased bottomfish fishing effort during any particular season except perhaps when prices are highest. Also when a participant reaches his individual quota they cease fishing for the Deep 7 species for the remainder of the calendar year. An IFQ system is not expected to significantly affect EFH or HAPC because hook-and-line bottomfish fishing is considered to have low collateral impacts on bycatch and habitat.

An IFQ system would allow fishery participants to spread out their fishing effort according to individual preferences. This would be unlikely to have any negative impacts to biodiversity. Reducing and ending the overfishing should have some net positive impact to the ecosystem through increased biomass of the target species in the bottomfish fishery in the MHI and corresponding trophic-level cascading effects.

4.6.5 Fishery Sectors

The major benefits to implementing the TAC through allocating IFQs is that it would provide the opportunity for a year-round fishery (with IFQs and seasonal closure this refers to fishing year), promote safety at sea by eliminating any propensity towards a “race to the fish” fishery, protect the participation of small-scale fishermen, and enhance business planning and financial stability. Allocation of initial IFQ shares would be determined based on criteria, such as: current CML and average annual landings from logbooks during a specified time period, and may include a provision allowing one year to be dropped which would benefit fishermen who had a bad year or could not fish for a year due to disability or illness.

The impacts of Alternative 6 on the commercial fishery sector would vary depending on how the IFQs were implemented. Because the sum of the IFQs cannot exceed the prescribed TAC for any given year, the size of each commercial fisherman’s quota would be inversely related to the total number of fishermen who received IFQs (the more who are included, the smaller each one’s share must be). Quotas that are too small to support even one fishing trip are clearly likely to go unused. Impacts on those commercial, sport, and "expense" fishermen who do not qualify for an IFQ would be adverse.

If equal quotas (totaling 76 percent of the fleetwide 2004 catch) were provided to each participant, highliners would get the same quota as part-time fishermen, and vice versa. This would leave some without enough quota, while others would have unused quota. Without a method to transfer (trade) quota between fishermen, this would have disproportionately adverse impacts on the highliners. If equal quotas were provided to a subset of all historical participants (such as those most active in recent years), those included would each have a higher quota, but those excluded would have no quota.

If individual quotas (equal to 76 percent of each fisherman's individual historical catch) were provided, all commercial participants would be anticipated to experience proportionately equally adverse impacts, and it is likely that more of the total quota would be used, even if there were no method to transfer quota between fishermen. If individual quotas were provided to a subset of all historical participants, such as those most active in recent years, individual quotas would not change, but some past participants would not have any quota.

Seasonal closures or TACs as discussed in other alternatives would result in time periods when no MHI bottomfish are landed, an impact that could be avoided under Alternative 6 if participants IFQs lasted through most of the year to the extent that these landings coupled with NWHI landings (until 2011) would be sufficient quantities to satisfy local demand. Thus, this alternative would be expected to have a more positive impact on the commercial fishery sector in terms of competition with imports than seasonal closures. If the IFQs provided a continuous supply of fresh MHI bottomfish to local markets, thus maintaining open market channels that would otherwise be expected to be filled by imports during the closed season. However, if landings were not able to keep up with demand as IFQs were reached and individuals stopped fishing for the remainder of the year, this alternative could lead to an increased reliance on imported bottomfish thus it would be anticipated to have negative impacts on the entire commercial fishery sector as market channels for fresh MHI bottomfish would be lost and may have to be regained each year. Experience has shown that if imports come to dominate market channels, it can be difficult for local producers to regain their market share as wholesalers and retailers can be reluctant to forgo their now-established supply chains. However, as Figure 25 shows, Hawaii currently imports bottomfish steadily throughout the year and will likely continue doing so to varying degrees depending availability of local sources and demand, and these in turn depend on local landings which is affected by weather, prices, effort, and NWHI catches; and seasonality (tourism, holidays), respectively.

Table 50 presents a preliminary analysis of the number of fishery participants anticipated to qualify for IFQs under various minimum landing requirements. These requirements range from minimum landings of at least 1 pound up to 5,001 pounds of BMUS from the MHI made between May and September of any one year between 1998 and 2004 (inclusive). Based on the information available in Table 48, all minimum landing thresholds would result in qualifying participants receiving IFQs below their historical landings and would thus be expected to result in full utilization of the available quota. Information on the mean historical landings by participants who caught more than 5,001 pounds is unavailable due to confidentiality requirements that prohibit the publication of data submitted by less than three individuals or operations.

Table 50: Anticipated Participation and IFQ Levels under Various Minimum Landing Requirements.

Minimum Landing Requirement to Qualify for May–Sept IFQ	Anticipated Number of Qualifying Participants (based on reported May–Sept MHI landings, 1998-2004)	Anticipated May–Sept. IFQ per Qualifying Participant (lbs)	Historical May–Sept. Mean Landings by Qualifying Participants (lbs)
1-500 lbs	970	25	89
501-1000 lbs	91	263	691
1001-2000 lbs	43	557	1,385
2001-5000 lbs	12	1,995	3,085
More than 5000 lbs	2	11,973	confidential

Source: PIFSC unpublished data.

Vessel registration and reporting requirements under Alternative 6 would represent an ongoing burden on all sectors. In the long term the increase in information available to fishery scientists and managers should result in increased fish abundance and improved fishing opportunities. The non-commercial sector would likely be the least impacted by this alternative since the fishery would be open for them all year with a requirement to adhere to the bag limits. This would allow those who fish infrequently throughout the year to continue this pattern. Adhering to the bag limit which is the same as the current State limit would not impact fishermen in any new way; however, potential future changes to bag limits which would limit catch more may impact the non-commercial sector to a greater degree.

4.6.6 Fishing Communities

The impacts of Alternative 6 on Hawaii's fishing communities would vary depending on how the IFQs were implemented. Providing equal IFQs to all participants could impact fishing communities if the result is to remove highliners from them. Although there are likely to be relatively small numbers of highliners within any one fishing community, their loss would likely result in reduced availability of bottomfish to local markets, family members and social circles. It would also represent a significant loss of fishing knowledge from the active fishery.

Highliners would be less likely to leave the fishery if their respective IFQs were based on their individual historical catch. Therefore, the anticipated impacts on fishing communities would not be expected to be negatively significant, as fishing opportunities for commercial MHI bottomfish participants within all of Hawaii's fishing communities would be maintained at 76 percent of their current levels. Also maintained would be the direct and indirect economic and cultural benefits (see Sections 3.6.2.3 to 3.6.2.5) for fishermen and their families, seafood consumers and their broader island communities.

Vessel registration and reporting requirements under Alternative 6 are not expected to have negative impacts on fishing communities despite the time commitments required. In the long term, positive impacts to fishing communities may occur from more accurate information on how many boats are bottomfish fishing, the amount of bottomfish they catch, and enhanced enforcement capabilities. Improved management of Hawaii's bottomfish would ensure that future opportunities to fish sustainable bottomfish stocks are provided for Hawaii's fishing communities.

4.6.7 Native Hawaiian Community

The implementation of IFQs would result in negative impacts to any Native Hawaiian commercial fishermen who do not have documented records of their historical participation in the fishery and therefore would not receive individual quotas. Native Hawaiian fishermen could also be adversely impacted if they are given IFQs that are less than their historical catches. No direct impacts to non-commercial fishery participants are expected as the existing bag limit would be unchanged.

For Native Hawaiians, who once exercised sovereignty and self-determination in the Hawaiian Archipelago, and whose activities were governed by customary and traditional practices, any curtailment or reduction of access rights and cultural practices reduces their ability to practice and continue their culture. The loss of any customary access and practice could be viewed as a permanent loss of culture for Native Hawaiian communities. On the other hand, the objective of the IFQs is to reduce fishing mortality, thereby ensuring a sustainable resource. A sustainable and accessible bottomfish resource would provide positive impacts to Native Hawaiian communities.

4.6.8 Administration and Enforcement

Administration and enforcement of Alternative 6 would require the expansion of the current reporting requirements to include requirements for non-commercial participants. All MHI vessel owners who target bottomfish are already required to register their vessels; however, under this alternative they would be required to renew their registration annually. The vessel registration system would need to be expanded accordingly. This would provide current information on the maximum number of fishery participants and to facilitate effective enforcement by removing the "BF" markings from vessels no longer active in the fishery.

Effective implementation would require that the TAC or total quota and the corresponding IFQs be determined, analyzed, and published in a timely manner prior to the start of each fishing season. Although it is known that current fishing mortality needs to be reduced by 24 percent, this percentage is likely to change over time as fishery harvests are reduced and stocks increase.

Enforcement of this alternative would include increased and real time shore-based monitoring of commercial landings and sales to determine when the TAC was reached. Shore-based

Federal/State enforcement will also be required to monitor compliance of the bottomfish stamp system under an IFQ system as dealers cannot be held wholly responsible for monitoring bottomfish stamps. All vessel owners would be required to mark their vessels with the registration number to be visible from aircraft to facilitate effective enforcement and vessel monitoring. Joint efforts between the State of Hawaii and Federal law enforcement capacities would greatly enhance enforcement of this alternative.

The USCG believes that establishing IFQs would involve even more manpower-intensive, shore-side enforcement than for a fleetwide TAC system, but not necessarily more at-sea enforcement activity. The USCG's existing assets are sufficient to accomplish their role in enforcing this alternative; however, SAC PID OLE would require additional personnel and equipment to accomplish the shore-side enforcement function.

NMFS Pacific Island Region estimates that approximately $400,000 would be required in FY2008 to implement federal commercial and non-commercial bottomfish permits, and ongoing costs would range from $300,000 the second year to $440,000 in 2013. The costs of implementing federal reporting are even higher, ranging from $1,250,000 in FY2008 to $1,600,000 in FY2013. OLE estimates that costs for enforcement may between $750,000-$900,000 annually.

4.7 Alternative 7: Phased-in TAC Management (Preferred)

Under Alternative 7 the MHI Deep 7 bottomfish fishery would ultimately be managed under a TAC which would be based on, and applied to, both commercial and non-commercial catches. There currently are no available data on non-commercial catches. Alternative 7 would utilize a phased-in approach with four main phases. Phase 1 consisted of a May -September 2007 seasonal closure of waters around the MHI to both commercial and non-commercial fishing for the Deep 7 species. The 2007 seasonal closure has already been analyzed and implemented for Federal waters by NMFS (72 FR 27065; May 14, 2007) and by the Hawaii DLNR for State waters[26] and is, therefore, not part of the action analyzed in this document.

Phase 2 would implement a commercial Deep 7 TAC of 178,000 lb (a 24 percent reduction of MHI commercial Deep 7 catches as compared to 2004). Tracking of commercial landings towards this TAC would begin when the fishery reopens on October 1, 2007. During the open period, non-commercial catches would continue to be managed by bag limits, however they would be changed from the current five onaga and/or ehu combined per person per trip, to five of any Deep 7 species combined per person per trip and they would be extended into Federal waters to facilitate effective enforcement. Once commercial Deep 7 landings reached the TAC, both the commercial and non-commercial sectors would be closed. Phase 2 would also implement a Federal permit requirement for all non-commercial fishermen who target or catch BMUS species in the MHI.

Phase 3 would implement Federal reporting requirements for non-commercial fishermen who target or catch BMUS species in the MHI. Reporting would be required from the vessel operator

[26] See http://www.hawaii.gov/dlnr/dar/bottomfishing.htm

of each trip. This would provide fishery scientists with the data needed to calculate and track a non-commercial portion of the overall TAC.

Phase 4 would include a second seasonal closure to MHI Deep 7 fishing from May – August 2008, followed by implementation of a combined commercial and non-commercial Deep 7 TAC beginning September 1, 2008. With the new reporting requirements non-commercial data would become available to calculate and track the non-commercial portion of the TAC, the non-commercial bag limits would be dropped and a combined commercial and non-commercial TAC would be utilized. Note that eliminating the non-commercial bag limit is dependent on the quality of non-commercial catch data provided by fishermen to the State and NMFS so that an appropriate non-commercial TAC may be selected by the Council.

The combination of Alternative 7's 2007-2008 seasonal closures, commercial TACs and non-commercial bag limits is intended to ensure that appropriate action is taken to end overfishing with the limited data available in the short-term.

In subsequent years (2009 and beyond) the MHI Deep 7 fishery would be managed via a combined commercial and non-commercial TAC calculated based on data provided by PIFSC and selected by the Council to prevent overfishing of these species. This number is likely to vary according to stock status and environmental conditions. Under this alternative, PIFSC would work with the Council's advisory bodies to provide the Council by May 30 with a proposed TAC for each year. There would be no further seasonal closures or non-commercial bag limits. The bottomfish fishing year would start on October 1 to ensure the fishery is open during the important holiday periods and continue until the TAC was reached. In addition, beginning in 2011, the advice from PISFC will include consideration of the effects of the NWHI closure on the anticipated need for conservative management approaches to end overfishing on the stock complex as a whole.

Successful implementation of this alternative would require cooperation with the State of Hawaii in the development of complementary State regulations. Note that complementary regulations would likely require State legislative and/or administrative rule changes that would require additional funding.

The Council took final action to select Alternative 7 as its preferred alternative at the 138th Council meeting in Honolulu, Hawaii (June 19-22, 2007). At the 138th Council meeting, the Council clarified its recommendation by reviewing an options paper (see Appendix 5) which describes five topics and two or more sub-alternatives under each topic. In summary, the Council recommended:

Sub-Alternative 1B: Federal Requirements with State Cooperation.
Under this alternative the Hawaii DLNR would implement complementary State regulations to require that fishing operations that fish for or retain BMUS in State waters at any time during the year be subject to Federal permit and reporting requirements.

Sub-Alternative 2E: Require all Non-commercial Participants to Have Non-commercial Permits

Under this alternative each and every non-commercial fishery participant would be required to have a Federal permit. Vessel operators and owners would be responsible for ensuring that Federal catch reports were correctly completed within 24 hours after each fishing trip and transmitted to NMFS within 72 hours after each fishing trip. If desired each participant could also indicate their portion (percent) of the total trip catch, if no percentages were indicated it would be assumed that each participant listed caught an equal portion of the total trip catch.

Sub-Alternative 3B: Require Reporting of All Trips by Permitted Vessels
Under this alternative catches of all species on all trips by permitted vessels would be subject to Federal reporting requirements.

Sub-Alternative 4D: Require Reporting of the Latitude and Longitude of Each Fishing Location
Under this alternative catch and effort would be reported by latitude and longitude (to the nearest degree).

Sub-Alternative 5B: Implement Non-commercial Bag Limits in Federal Waters
Under this alternative a Federal non-commercial bag limit of no more than five Deep 7 fish (all species combined) per person, per day, would be implemented for Federal waters around the MHI.

Sub-Alternative 6B: Do not Explicitly Consider TAC Overages or Underages
Under this alternative TAC overages and underages would not be explicitly considered in the determination of future TACs but would instead be implicitly considered via the results of stock assessments undertaken in future years.

4.7.1 Target Species

The 2007-2008 seasonal closures are estimated to result in 25 and 17 percent reductions in MHI commercial Deep 7 fishing mortality respectively, as compared to the 2004 baseline (data from Kawamoto et al. 2005; Figure 30). Some fishing effort could shift to open periods; however, implementation of the TAC would serve as a 'back up' to ensure that overfishing does not occur. Historically, the highest levels of bottomfish fishing effort occur in the winter months, during the holiday season when there is high demand for bottomfish. Market forces may further reduce commercial fishing mortality if prices drop as a result of market flooding during the holiday season.

Studies of gonadal development on four species of Hawaiian snappers indicate they spawn serially over an extended period, however, spawning is greatest during the summer months, and peaks from July to September (Haight et al. 1993).The summer closures thus would provide additional benefits by prohibiting fishing during the peak spawning period and thus reducing fishing mortality of spawning bottomfish leading to an increase in the spawning stock biomass and therefore achieve a reduction in F in the dynamic production model which is not captured in the current analysis and determination of 24% (see Haight et al. 1993).

The current impact of non-commercial fishing under existing bag limits is unknown as there are currently no non-commercial reporting requirements. Under Phase 1's seasonal closure, quantification of anticipated impacts on non-commercial fishing mortality cannot be estimated due to the lack of non-commercial fishing data, however they are anticipated to be similar as those for commercial fisheries as anecdotal information indicates that the two sectors have similar seasonal fishing patterns. Under Phase 2, the change in bag limits from the current five onaga and/or ehu combined per person per trip, to five of any Deep 7 species combined per person per trip would result in new limits on catches of the five additional species by the non-commercial sector during the open periods. However, once again it is not possible to predict the magnitude of catch reduction because the current catches are unknown, as are the future responses of fishery participants to the new rules.

Required reporting by non-commercial fishermen under Alternative 7 would provide information on their catch (including discards) and effort. These data are not currently collected, and thus, fishery scientists and managers do not know the total fishery catch taking place. Having complete information would improve the scientific understanding of influences on Hawaii's bottomfish stocks and would allow fishery managers to calculate and track a non-commercial portion of the overall TAC.

Once the MHI Deep 7 fishery moves to TAC management for both commercial and non-commercial sectors (2009 and beyond) the TACs provided by PIFSC and adopted by the Council and NMFS would be relied upon to prevent overfishing of these species. The TAC will be tracked using the State's commercial dealer data reporting system as well as catch data submitted by commercial and non-commercial fishery participants.

High-grading of catches in terms of species kept or size is a concern. High-grading to maximize value can occur within species (e.g., discarding small fish in favor of larger fish) or between species (e.g., discarding low-value species in favor of higher-value species). Deep-slope bottomfish generally have a high mortality rate resulting from barotrauma (physical damage to the fish as air in the swim bladder expands during ascent) as they are brought to the surface. If, and to what extent, high-grading occurs, additional bottomfish mortality may occur due to barotrauma. However, there are ways to mitigate barotrauma and increase the survivability of the deep-water fish with gas bladders. The simplest is by venting the air bladder with a needle. Once the bladder has been vented, the fish can swim back down to depth and force gases back into the body fluids increasing the chances of survival. This technique has been used with Deep 7 species very successfully in mark/recapture studies. Another way to increase survivability is if unwanted fish are released "at depth" using some of the new techniques to sink the fishes quickly back down so that their barotrauma is reduced (e.g. Git-R-Down© Barotrauma Reversing Fish Release). In addition there could be mortality of Deep 7 species due to regulatory discards after TAC is reached while targeting bottomfish species other than the Deep 7. Recent education and outreach activities have been conducted by the WPFMC, NMFS, and the State of Hawaii that include pamphlets and demonstrations on various techniques to reduce barotrauma on deep-water bottomfish.

Alternative 7 would be expected to result in some high-grading by species and/or size. However, high-grading of target species would more likely occur in an individual fishery quota (IFQ) system than in a TAC system. Under a TAC system, fishermen would compete against each other and time to land as many of the Deep 7 species as possible before the TAC is filled. This competition would likely discourage discarding of Deep 7 species. Discarded Deep 7 species would be counted against the TAC, thus ensuring that overfishing does not occur regardless of the extent of high-grading.

Sub-alternative 6B would rely on the incorporation of each year's fishing data into future stock assessments and TAC calculations to ensure that overfishing does not occur. The lag between the end of the each fishing year and incorporation of its fishing data into a new stock assessment or TAC calculation is unknown but based on experience to date is likely to be at least two years. This could result in continued overfishing, followed by the fishery going into an overfished condition as biomass was reduced.

4.7.2 Non-target Species and Bycatch

Under Alternative 7, catches of non-target species and bycatch by fishermen targeting Deep 7 species would be eliminated during the 2007-2008 seasonal closures. If affected fishermen switch to targeting bottomfish other than the Deep 7 species, catches of these species could increase. However stocks of non-Deep 7 species are believed to be generally healthy and able to withstand some increases in fishing pressure. It is not anticipated that there will be significant increases as the Deep 7 species are clearly preferred and shallow water species are not generally regarded as substitute products.

As described above, fishing under a TAC can create a situation in which each fisherman attempts to maximize their individual harvest of the quota species in the shortest time period possible (i.e., before the TAC is reached). Due to limited storage capacity, this may lead to increased discards of less desirable species resulting in higher bycatch rates.

High-grading within Deep 7 species could also result in increased bycatch if fishermen discard small fish in favor of larger fish or discard low-value species in favor of higher-value species. Deep-slope bottomfish generally have a high mortality rate resulting from barotrauma as they are brought to the surface. If, and to what extent, high-grading occurs, additional bottomfish mortality may occur due to barotrauma. However, there are ways to mitigate barotrauma and increase the survivability of the deep-water fish with gas bladders. The simplest is by venting the air bladder with a needle. Once the bladder has been vented, the fish can swim back down to depth and force gases back into the body fluids increasing the chances of survival. This technique has been used with Deep 7 species very successfully in mark/recapture studies. Another way to increase survivability is if unwanted fish are released "at depth" using some of the new techniques to sink the fishes quickly back down so that their barotrauma is reduced (e.g. Git-R-Down© Barotrauma Reversing Fish Release). To minimize bycatch mortality due to barotrauma the Council is distributing informational fact sheets to fishery participants on how to maximize the survival of these fish through careful fish handling and release procedures. Discarded Deep 7 species would be counted against the TAC, thus ensuring that overfishing does not occur regardless of the extent of high-grading. Recent education and outreach activities have been conducted by the WPFMC, NMFS, and the State of Hawaii that include pamphlets and demonstrations on various techniques to reduce barotrauma on deep-water bottomfish.

Non-commercial fishermen in general are expected to have less targeting skill than commercial fishermen, and therefore may have higher non-target catches. They should, however, be less influenced by market value and therefore may be expected to retain more non-target species than commercial fishermen.

Required reporting (including information on non-target catches and bycatch) by non-commercial fishermen under Alternative 7 would improve the scientific understanding of influences on non-target stocks and would be expected to improve fishery management.

4.7.3 Protected Species

Potential impacts to protected species were analyzed by NMFS during their Endangered Species Act consultation on the bottomfish fishery completed in 2002. Details are described in Section 3.5. The following section summarizes the anticipated impacts from Alternative 7.

ESA-Listed Species

In their 2002 BiOp NMFS concluded that the bottomfish fishery is not likely to jeopardize the continued existence of the Hawaiian monk seal or result in the destruction or adverse modification of its critical habitat. NMFS also concluded that the bottomfish fishery is not likely to adversely affect any listed whales or sea turtles. As described in Section 3.5, several monk seals have been found with embedded hooks mostly of the type used by either the shoreline ulua fishery or the bottomfish fishery, although positive attribution of these hooks to a particular fishery is difficult.

Limited monk seal/hook interactions in the NWHI bottomfish fishery (see Section 3.5) would have the potential to increase if NWHI fishing activity increased to fill unmet market demand; however, this is not going to occur to any significant degree because the NWHI fishery is now limited by an annual quota in addition to the limited number of permits and the impending complete closure of the fishery in 2011 pursuant to the Presidential monument regulations. In addition, no interactions with monk seals were observed by NMFS during its recent monitoring of the NWHI fishery from 2003 - 2005.

Alternative 7's phased-in fleetwide TAC is not expected to result in any significant impacts to listed species. Although it may lead to temporal changes in the annual distribution of fishing effort, it is not expected to result in increased bottomfishing effort or significant changes in bottomfish fishing methods or areas. Some participants may increase their pelagic fishing effort after the bottomfish TAC is reached. However, the potential increase in pelagic effort from this alternative is not expected to be significant because most of the bottomfishers likely to engage in increased pelagic fishing effort already troll in conjunction with their bottomfishing trips. Thus, it is likely that the increase in pelagic fishing effort will be limited to the time that would have been spent with bottomfishing gear actually in the water. NMFS concluded that the MHI pelagic small-boat (i.e., non-longline) fishery is not likely to jeopardize the continued existence of any listed species (NMFS 2004), and this alternative is not expected to significantly increase that pelagic effort.

Based on the above information, the MHI bottomfish fishery may adversely affect Hawaiian monk seals, but it is not likely to jeopardize the continued existence of any listed species, and Alternative 7's phased-in fleetwide TAC, including the potential relocation of MHI bottomfish effort to the pelagic small-boat fishery, is not expected to result in any impacts to listed species not already considered.

Marine Mammals Not Listed Under the ESA

The Hawaii bottomfish fishery is listed as a Category III fishery under Section 118 of the MMPA. A Category III fishery is one that has a low likelihood or no known incidental takings of marine mammals. Observer data from the NWHI Protected Species Study Zone taken in 1990 to 1993 recorded few interactions between marine mammals (monk seals and bottlenose dolphins) and bottomfish gear, and those that did occur were typically characterized by removal of fish and bait from fishing lines without any hookings or entanglements (Nitta and Henderson 1993). These interactions have been determined by NMFS to constitute a low-level risk to bottlenose dolphins. Observer coverage of the NWHI fishery from 2003 – 2005 did not record any interactions with marine mammals. Based on this information the MHI bottomfish fishery is believed not to interact significantly with marine mammals and this alternative, including the relocation of MHI bottomfish effort to the pelagic small-boat fishery (also a Category III fishery) is not expected to result in any impacts to marine mammals not already considered.

Seabirds

Between 2003-2005 there were a total of six observed seabird interactions including two unidentified boobies, one brown booby, one black-footed albatross and two Laysan albatrosses observed in the NWHI bottomfish fishery. Only the black-footed albatross interaction occurred during bottomfish fishing operations. All of the other interactions were observed in transit during trolling operations.

These few, low-level interactions would be expected to continue in the NWHI until the 2011 closure. These interactions may affect a limited number of seabirds; however, they would not be expected to result in impacts to seabird distribution, survival, or population structure. Although there are several seabird colonies in the MHI, the NWHI colonies harbor more than 90 percent of the total Hawaiian Archipelago seabird population. The NWHI provide most of the nesting habitat for more than 14 million Pacific seabirds. No interactions between seabirds and MHI bottomfish vessels have been reported or observed and based on the above information it is believed that MHI bottomfish fishing activities pose little or no threat to Hawaii seabird populations.

4.7.4 EFH, Biodiversity, and Ecosystems

As discussed in Section 4.1.4, bottomfish fishing activities have been found not to adversely affect EFH and HAPC for management unit species managed under the FMPs of the Western Pacific Region.

Implementing Alternative 7's TAC is not expected to adversely affect EFH or HAPC. The precise effects of a potential "race for the fish" situation are unknown but are not be expected to result in significant impacts as hook-and-line bottomfish fishing has been found to have low collateral impacts on bycatch and habitat. Implementing catch limits via a TAC would impact the number of bottomfish removed, which could either result in fewer fish caught, or if extensive high-grading occurs, in more fish caught. The former would have positive impacts on overall abundance with corresponding impacts on the ecosystem, while the latter (which is considered highly unlikely) could have negative impacts. The impacts of any increased pelagic effort by displaced bottomfish fishermen are expected to be negligible due to the use of hook-and-line gears in the small-boat pelagic fishery.

Under this alternative local biodiversity and ecosystems may experience some positive effects over time due to reductions in bottomfish harvests leading to increased bottomfish biomass and corresponding trophic cascading effects. Also, during the 2007-2008 closed seasons, local biodiversity and ecosystems may experience additional positive effects because cessation of bottomfish fishing activity for the four or five-month period would allow protective benefits such as undisturbed fish growth and spawning, and other benefits of non-capture.

4.7.5 Fishery Sectors

Alternative 7's phased-in approach, combined with an ongoing and extensive public awareness and feedback process, is anticipated to achieve the goal of ending overfishing with the least risk of alienating or unduly impacting fishery participants. The 2007-2008 summer closures would occur during the time that bottomfish activity is low as fishermen switch to other fisheries. Both the pelagic troll (e.g., yellowfin) and the hook-and-line mackerel (akule and ʻōpelu) fisheries are at their peak during the summer period and therefore represent alternate fishing opportunities during the summer closures. Also because the summer closures would be implemented for just two years, fishermen who do normally fish year-round for bottomfish and rely on the income, would be able to anticipate a potential resumption of fishing during the summer months in 2009 and beyond. However, despite removing the closed season the fishery may not be open during the summer months in some years if the TAC is reached early. Although this would be an inconvenience and a disruption of their intended summer bottomfish fishing, at least the participants would have already experienced summer closures and therefore would likely have a plan to fall back on.

Immediate impacts of the summer closures on the commercial and non-commercial fishery sectors would be evenly distributed under Alternative 7. However any closures would reduce the availability of "high end" fresh bottomfish to the local markets leading to an increased reliance on imported bottomfish. This could have negative impacts on the entire commercial fishery sector because market channels for fresh MHI bottomfish would be lost and would have to be regained each year. On the other hand, prices for NWHI bottomfish may rise as they will represent the only source of Hawaii-caught bottomfish.

The economic impacts of the summer closures are expected to be greatest for commercial fishermen who rely on in part or in full on Deep 7 bottomfish for their income. The actual income loss by the fishermen would vary depending on their levels of fishing effort. Assuming 380 active MHI commercial bottomfish fishing operations (the 2000 – 2003 average), the average impact would be minimal ($525 per operation).[3] The same would be true, without the dollar value, for non-commercial fishing operations. Although it is unknown how much target species substitution would occur, the above figures would indicate the maximum cost for the fleet and the potential average cost per vessel (assuming 380 active vessels). However, fishermen would be able to offset some of this loss in income by targeting different species and adjusting their fishing patterns accordingly.

The non-commercial sector would be further impacted by increased restrictions in the changed bag limit; however, quantification of these impacts is not possible due to the current lack of non-commercial data. For example, it is not known how often current bag limits for onaga and ehu are met by non-commercial fishermen. Also unknown are their (currently unlimited) catches of lehi, opakapaka, gindai, kalekale or hapuupuu. If per trip non-commercial catches of these species are high, Alternative 7's new bag limits will adversely affect non-commercial fishermen. If they are low the anticipated corresponding impacts will also be low.

The use of TACs under this alternative would be anticipated to result in a bunching of fishing effort at the beginning of each fishing year (October 1 in 2007 and September 1 thereafter) as fishery participants would be aware that once the TAC was reached the fishery would be closed to all sectors. Given that the majority of commercial landings are already made during the winter season this is not likely to radically change these operations, however it may lead to market "floods" that temporarily reduce fresh fish prices and adversely impact commercial fishermen.

Once the TAC is reached, this alternative is expected to lead to an increased reliance on imported and NWHI bottomfish (until the NWHI fishery is closed in 2011). An increased reliance on imported bottomfish would be anticipated to have negative impacts on the entire commercial fishery sector as market channels for fresh MHI bottomfish would be lost and have to be regained each year.

Fishery sectors (both commercial and non-commercial) and participants may be differentially impacted depending on their ability and willingness to "race to the fish" and some may upgrade their vessels (e.g., buy larger vessels or more powerful engines for existing vessels) or fish during adverse weather in order to achieve high catches before the TAC is reached. These responses would be anticipated to result in over-capitalization (i.e., otherwise unnecessary investments to upgrade vessels) of the fishery and could result in threats to the safety of fishery participants. However given that bottomfish fishing currently occurs without incident throughout

3 This figure can be compared with average ex-vessel returns for small boat fishermen in Hawaii of $42,000 (Hamilton 1997).

the year it is believed that existing participants are aware of and able to deal with all types of weather and sea conditions.

The non-commercial sector may be impacted by having to compete with the commercial sector for the combined bottomfish TAC as when the TAC is reached both sectors would be prohibited from Deep 7 fishing until the next year. This approach could impact the non-commercial sector differently then the commercial due to their preferred fishing pattern which is believed to consist of fishing infrequently, (e.g. on weekends) throughout the year, with each trip resulting in relatively small catches. Under Alternative 7, once the combined TAC is reached non-commercial participants would have to switch to another target species or stop fishing regardless of the extent of their harvests up to that point.

Under sub-alternative 1B, the Council's current recommendation would be implemented via complementary State regulations and Federal permits and catch reporting would be required for all Hawaii-based non-commercial fishing operations that fish for or retain BMUS in either State or EEZ waters around the MHI at any time during the year. This would make available to fishery scientists and managers comprehensive and timely catch and effort data from all fishery sectors. Such information would greatly improve fishery and stock assessments and would provide the necessary information for the calculation and tracking of the non-commercial portion of the TAC. The implementation of electronic, web-based or telephone reporting options would reduce the burden of this requirement on fishery participants. As compared to the no action alternative, this alternative would have a positive impact on target stocks as it would allow comprehensive management and monitoring in both State and Federal waters.

Under sub-alternative 2E, each and every non-commercial fishery participant would be required to have a Federal permit. Vessel operators and owners would be responsible for ensuring that catch reports were correctly completed and transmitted to NMFS. This would ensure that a responsible party was present on each fishing trip. It would also provide fishery participants who do not own vessels a mechanism by which to officially record their participation. This would facilitate their being granted access rights if the fishery eventually becomes a limited access fishery, or being granted quota share if the fishery is eventually managed under individual fishing quotas. Requiring that every participant have a Federal permit would provide a comprehensive list of potential participants; although not all will necessarily be active. This would meet the requirements of the reauthorized MSA to establish a registry of all recreational fishery participants and would allow for the wide distribution of relevant fishery or regulatory information. These permits could also be made a pre-requisite for non-commercial bag limits. This alternative would have the largest burden of all alternatives on fishery participants and administrators. Based on available information it is estimated that there are 750 active non-commercial bottomfish fishing vessels. Assuming that each vessel carries an average of 2.6 participants per trip (Hamilton and Huffman 1997, Table G5), this gives a rough estimate of 1,950 non-commercial deepwater bottomfishing participants who would each be required to obtain permits under this alternative. This is considered the upper bound for active participants as some participants may fish on more than one vessel during the year. It is unknown how many inactive participants would also apply for permits under this alternative.

Under sub-alternative 3B, the requirement for all catches of all species on all trips by permitted vessels to be reported would provide comprehensive information on the fishing activities of these vessels. This would provide information on non-commercial catches of BMUS and would be expected to improve fishery and stock assessments. This alternative would also provide partial information on non-commercial trips targeting non-BMUS (information would be incomplete as non-commercial vessels that don't target BMUS at any time during the year would not be required to report). This alternative would reduce the potential for confusion among non-commercial fishery participants regarding which trips were required to be reported.

Sub-alternative 4D would provide highly detailed spatial information that would further enhance fishery and stock assessments and allow for a wide variety of future area-based management measures. However it would increase the reporting burden on fishery participants as they would definitely have to either fill out their catch reports during the fishing trip, or somehow record their catch and effort at each location for later reference when they fill out their trip report on land. In the worst case scenario, no such real time records would be kept and recall problems would result in inaccurate catch reports. The use of vessel-based electronic reporting or recording devices would solve this problem and mitigate the reporting burden if they allow for the easy entry and/or transmission of fishing locations, effort and catches while at sea.

4.7.6 Fishing Communities

Alternative 7 is not expected to result in significant or disproportionate negative impacts on fishing communities throughout Hawaii; rather, they would all be impacted evenly. Most communities would be compensated by other fishery activities such as trolling for pelagic species during the no bottomfish fishing period.

Because the TAC would be applied fleetwide throughout the MHI, it is likely that much of the MHI stocks would be harvested by Oahu-based fishermen, because that fishing community has the highest number of participants. Fishing communities from other islands could be affected if it was perceived that Oahu fishermen, for example, were harvesting most of the fish. This sentiment could lead participants from non-Oahu fishing communities to go fishing in bad weather to ensure that they get their fair share. This could result in the loss of vessels and human life and reduce the direct and indirect benefits fishing communities receive from the fishery. A race to the fish situation could also flood local fish markets with bottomfish, thereby, positively impacting consumers, but negatively impacting fishermen because of low prices. It is difficult, however, to accurately predict the outcome on communities of implementing TACs as this would be a new type of fisheries management for the bottomfish fishery community. It is expected, however, that negative impressions and resulting outcomes would be minimized by the ongoing community education program, public meetings, and Fishers Forums being held to provide information to and elicit feedback from the community at large.

4.7.7 Native Hawaiian Community

Alternative 7's phased-in approach, combined with an ongoing and extensive public awareness and feedback process, is anticipated to achieve the goal of ending overfishing with the least risk of alienating or unduly impacting fishery participants, including Native Hawaiians. The 2007-

2008 summer closures would occur during the time that bottomfish activity is low as fishermen switch to other fisheries and would likely have similar impacts on Native Hawaiians as on other fishery participants

Seasonal fishing restrictions for a variety of marine organisms were practiced under the ahupua‘a system used in traditional Native Hawaiian resource management, as the people had an intimate understanding and respect for the life histories and seasonal nature of the life cycles of their valued marine resources. This tradition may make the 2007-2008 summer closures more acceptable to Native Hawaiians as compared to other alternatives.

The implementation of a fleetwide bottomfish TAC could result in a fishery closure before some Native Hawaiian fishermen catch an amount of bottomfish comparable to their previous years' amounts. This could adversely impact Native Hawaiian fishermen who depend on catching bottomfish to feed their families, to supplement their income, to perpetuate their culture, or to share with their community. Broader level cultural impacts would be anticipated once the TAC is met and both commercial and non-commercial bottomfish fishing is prohibited until the next fishing year. For Native Hawaiians, who once exercised sovereignty and self-determination in the Hawaiian Archipelago, and whose activities were governed by customary and traditional practices, any curtailment or reduction of access rights and cultural practices reduces their ability to practice and continue their culture. The loss of any customary access and practice could be viewed as a permanent loss of culture for Native Hawaiian communities. On the other hand, the objective of the seasonal closures and the TAC is to reduce fishing mortality, thereby ensuring a sustainable resource. In the long-term, a sustainable and accessible bottomfish resource would provide positive impacts to Native Hawaiians as compared to the current situation.

4.7.8 Administration and Enforcement

Administration and enforcement of Alternative 7 would require the implementation of Federal permit and reporting requirements for non-commercial participants. All MHI vessel owners who target bottomfish are already required to register their vessels; however, under Alternative 7 they would be required to renew their registration annually. The vessel registration system would need to be expanded accordingly. This would provide current information on the maximum number of fishery participants and facilitate effective enforcement by removing the "BF" markings from vessels no longer active in the fishery. As described in Appendix 5, based on available information it is estimated that there are 750 active non-commercial bottomfish fishing vessels. Assuming that each vessel carries an average of 2.6 participants per trip (Hamilton and Huffman 1997, Table G5), this gives a rough estimate of 1,950 non-commercial deepwater bottomfishing participants who would each be required to obtain permits under this alternative. This is considered the upper bound for active participants as some participants may fish on more than one vessel during the year. It is unknown how many inactive participants would also apply for permits under this alternative. NMFS estimates costs of administering the permit program to be $600 K.

Effective and ongoing implementation of the TAC would require it be determined, analyzed, and published in a timely manner prior to the start of each fishing season. Although it is known that current fishing mortality needs to be reduced by 24 percent, in subsequent years this number is likely to vary according to stock status and environmental conditions. Under this alternative, PIFSC would work with the Council's advisory bodies to provide the Council by May 30 with a proposed TAC for each year.

Alternative 7 would also increase administrative costs to process the one catch report required for each fishing day per registered non-commercial vessel. Assuming that each of 750 vessels takes an average total of 14 trips per year (including both bottomfishing and other fishing trips; HDAR 2006), there would be 10,500 new catch reports per year to process. PIFSC estimates that it could cost approximately $1,370 K annually to process the new reports. The use of vessel-based electronic reporting or recording devices would mitigate the administrative burden if they allow for the electronic submission of catch reports which would not have to be key punched by NMFS staff.

Enforcing the 2007-2008 summer closures seasons would require that a parallel closure occur in State waters because reliable shore-based determinations of the origin (i.e., from State vs. Federal waters) of MHI bottomfish landed or sold would be impossible. In addition, enforcement of this alternative would require significant shore-based monitoring of landings and sales. This would be intended to ensure that only imported bottomfish, or bottomfish harvested by federally-permitted NWHI vessels, were sold during the closure period.

Effective and ongoing implementation of the TAC would require it be determined, analyzed, and published in a timely manner prior to the start of each fishing season. Although it is known that current fishing mortality needs to be reduced by 24 percent, in subsequent years this number is likely to vary according to stock status and environmental conditions. Under this alternative, PIFSC would work with the Council's advisory bodies to provide the Council by May 30 with a proposed TAC for each year. The requirement for Federal permits and reporting in State waters under sub-alternative 1B would increase NMFS' administrative and enforcement burden.

Enforcement of this alternative would include increased and real time shore-based monitoring of fishery landings and sales to determine when the TAC was reached. Additional at-sea enforcement would not likely be required but occasional monitoring would supplement shore-side monitoring when the TAC was reached. The implementation of electronic or web-based reporting would reduce the administrative burden of this alternative. All vessel owners would be required to mark their vessels with the registration number to be visible from aircraft to facilitate effective enforcement and vessel monitoring. Joint efforts between the State of Hawaii and Federal law enforcement capacities would greatly enhance enforcement of this alternative especially with regards to monitoring the non-commercial bag limits during 2007-2008.

The USCG believes it has sufficient resources to enforce this alternative. USCG at-sea enforcement would not be necessary until the TAC was reached and the fishery closed. However, effectively monitoring progress towards reaching the TAC would require a strong shore-side component to track catch, effort, landings, and sales, as well as monitor recordkeeping and reporting requirements. SAC PID OLE would require additional personnel and equipment to provide the shore-side enforcement component.

Sub-alternative 5B includes implementation of complementary Federal non-commercial bag limit regulations which would allow enforcement of the non-commercial bag limit in EEZ waters. This would enhance current enforcement capabilities and provide the maximum assurance that non-commercial bag limits were not being exceeded.

NMFS estimates costs of administering the non-commercial permit and reporting program to be up to $1,970,000 annually. OLE estimates costs of between $3-4 million annually to adequately enforce this alternative. New enforcement costs would include hiring 5-6 special agents and/or enforcement officers as well as one administrative personnel to support these agents/officers. Due to the continuous fluxion in market prices OLE has not attempted here to address the infrastructure and office space costs for the necessary additional hires, these would represent additional costs for this alternative.

4.8 Impacts to the Regional Economy

The economic effects of implementing conservation measures for MHI bottomfish fisheries depend largely on how fishermen and the seafood market react to those measures. Fishermen might adjust to these measures by shifting their effort to other time-area strata. Similarly, there may be market shifts to non-MHI bottomfish substitutes during decreases in MHI bottomfish supply. The primary market alternatives are as follows: NWHI bottomfish (the designation of the NWHI Monument calls for the NWHI bottomfish fishery to be closed by June 15, 2011), imported bottomfish, or other species (non-bottomfish).

Regarding fishermen, the immediate management objective is to reduce bottomfish catch in the MHI by 24 percent, roughly 62,000 pounds of the deep snapper/grouper complex,[1] with an ex-vessel value of approximately $195,000. The aggregate economic impact would be small considering the size of the State's economy. Using an input/output approach,[2] as a rough order of magnitude, the total economic impact would be a $550,000 reduction in business sales with a loss of $200,000 in income. However, fishermen would be able to offset some of this loss in income by targeting different species and adjusting their fishing patterns accordingly.

The actual income loss by the fishermen would vary depending on their levels of fishing effort. Assuming 380 active MHI commercial bottomfish fishing operations (the 2000-2003 average), the average impact would be minimal ($525 per operation).[3] The same would be true, without the dollar value, for non-commercial operations. Although it is unknown how much target species substitution would occur, the above figures would indicate the maximum cost for the fleet and the potential average cost per vessel (assuming 380 active vessels).

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1 This analysis focuses on the seven species subject to special management consideration by the State of Hawaii. Other important bottomfish species are not included in this analysis (e.g., uku and ulua) and hence the totals here are lower than those based on the entire BMUS complex.

2 Modifying Leung and Pooley (2002) analysis of the pelagic longline fishery.

3 This figure can be compared with average ex-vessel returns for small boat fishermen in Hawaii of $42,000 (Hamilton 1997).

Local high-end restaurants' demand for Hawaii bottomfish lends much importance to the Hawaii bottomfish fishery, and hence, once harvested, bottomfish have potential for added value through the processing chain. In the short-term, NWHI bottomfish would presumably be the primary source of substitution in the market during the MHI seasonal closure. However, the recent monument designation for the NWHI calls for the NWHI bottomfish fishery to be closed by June 15, 2011. Following the closure of the NWHI commercial bottomfish fishery, imported bottomfish would be the only source of fresh bottomfish in Hawaii during the MHI seasonal closure.

In recent years (2003 to 2004), fish imports averaged 750,000 pounds, with the primary sources of imported snapper being Australia and Tonga.[27] Increasing annual imports by 62,000 pounds would represent a 9 percent increase in imports and would be within the observed year-to-year variability. The peak season for imports is May to August, which corresponds to the proposed period of seasonal closure for the MHI. A strong negative correlation between imports and MHI landings, suggests that when MHI landings decline, imports increase. An increase in imports in May to August would translate to a 21 percent increase during those four months. There is a consumer price element in which any decrease in the supply of bottomfish would be expected to increase prices by a certain percentage. Pooley (1987) computed the price flexibility coefficient to be 42 percent, meaning that a 24 percent decrease in supply would increase price by 10 percent, or roughly 32 cents with an attendant decrease in consumer satisfaction.

In addition, the Hawaii bottomfish fishery is also important culturally, a value not entirely reflected by the seafood market. Again, in many cases, NWHI bottomfish would be considered a substitute for MHI bottomfish, but substituting different snapper species from imports would not be as close a cultural substitute because these fish are not from local waters. More research would be required on the implications of this effect on Hawaii's communities, but one benefit would be that the proposed seasonal closure alternatives are not during the primary cultural celebration (i.e., New Years). Figure 32 shows the average monthly landings of Hawaii bottomfish. Figure 33 shows the average monthly snapper imports into Hawaii.

[27] NMFS foreign trade statistics: http://www.st.nmfs.gov/st1/trade/index.html

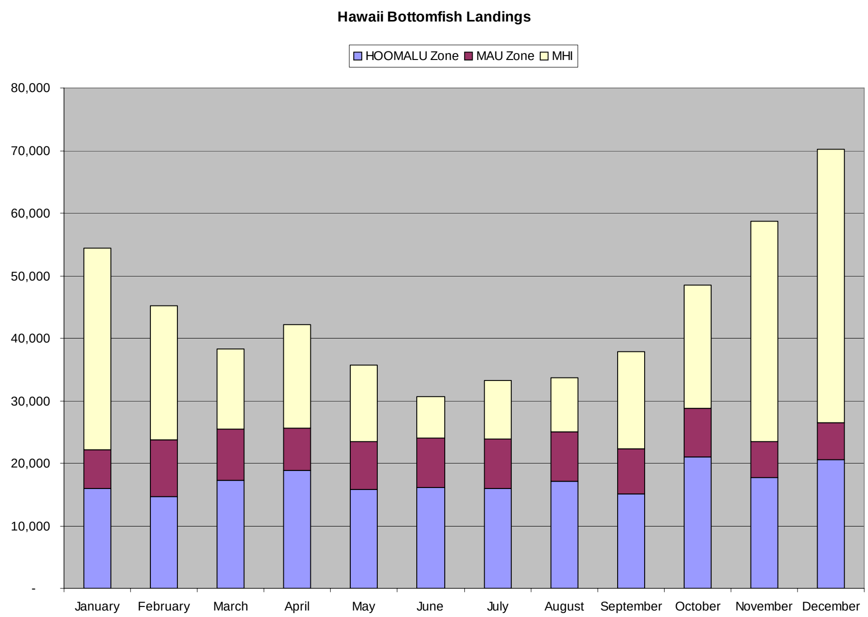

Figure 32: Average Monthly Landings of Hawaii Bottomfish.
Source: WPRFMC 2005b, 2003 Bottomfish Annual Report.

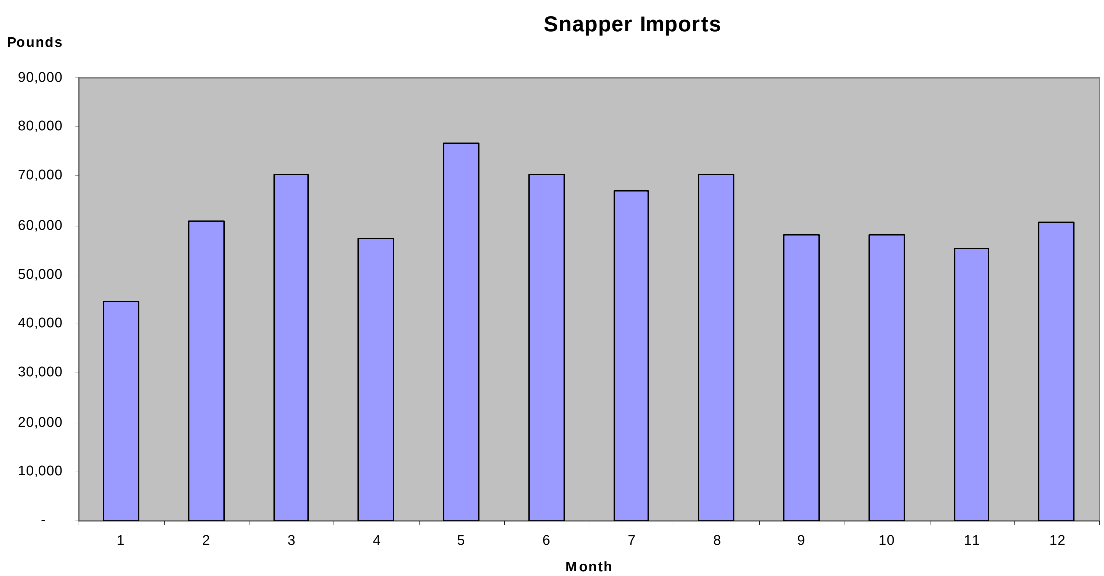

Figure 33: Average Monthly Snapper Imports to Hawaii.
Source: PIFSC Unpublished Data.

4.9 Environmental Justice

On February 11, 1994, President William Clinton issued Executive Order 12898 (EO 12898) titled "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." E.O. 12898 provides 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." E.O. 12898 also provides for agencies to collect, maintain, and analyze information on patterns of sustenance consumption of fish, vegetation, or wildlife that an agency action may also affect. Sustenance patterns of consumption may indicate the potential for disproportionately high and adverse human health or environmental effects on low-income populations, minority populations, and Indian tribes. A memorandum by President Clinton that accompanied E.O. 12898 made it clear that environmental justice should be considered when conducting NEPA analyses by stating the following: "Each Federal agency should analyze the environmental effects, including human health, economic, and social effects of Federal actions, including effects on minority populations, low-income populations, and Indian tribes, when such analysis is required by NEPA."[28]

Impacts of the proposed bottomfish management actions on Native Hawaiians were identified through the scoping process as an issue that may have environmental justice considerations and therefore, although the environnental effects of the proposed Federal action were considered with respect to all affected members of minority and low-income groups, impacts to Native Hawaiians from each of the alternatives are discussed in Sections 4.1.7, 4.2.7, 4.3.7, 4.4.7, and 4.5.7, 4.6.7, and 4.7.7. The alternatives considered in this document are not expected to result in any disproportionate adverse human health or environmental effects to minority populations or low-income populations of the Hawaiian Islands, rather, the impacts would be spread across all MHI Deep 7 fishery participants regardless of race or income. The implementation of management measures to prevent overfishing in the MHI are designed to have long-term positive environmental impacts.

4.10 Cumulative Effects

This section describes the potential cumulative effects of the proposed action and the alternative actions considered. The Council on Environmental Quality's regulations for implementing NEPA defines cumulative effects as the impact on the environment that 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 (40 CFR 1508.7 and 1508.25). The intent of the cumulative effects analysis is to capture the total effects of many actions over time that would be missed by evaluating each action individually. This cumulative effects analysis also describes the additive results of the actions considered in this document as they interact with factors external to the proposed actions. This evaluation addresses the direct and indirect effects of the alternatives as well as other

[28] Memorandum from the President to the Heads of Departments and Agencies. Comprehensive Presidential Documents No. 279 (Feb. 11, 1994).

factors that affect the physical, biological, and socioeconomic components associated with the Hawaiian Archipelago.

4.10.1 History of Bottomfish Fishing in Hawaii

As discussed in Section 3.4.1, the history of bottomfish fishing in Hawaii is extensive. Native Hawaiians were bottomfish fishing long before European explorers first visited the Hawaiian Islands, but the subsequent European colonization of Hawaii led to the development of a local cash economy and commercial fishing operations. By the beginning of the twentieth century, and after successive waves of immigrants arrived in Hawaii, the bottomfish fishery was dominated by Japanese fishermen who fished in the MHI as well as in NWHI. During World War II, bottomfish fishing effectively ceased in Hawaii, but by the late 1940s vessels were again plying the waters of the MHI and the NWHI in search of bottomfish. By the 1980s, Hawaii's bottomfish were at premium prices and vessel participation in the MHI peaked at 583 in 1985. Although the average price of bottomfish has remained relatively stable since the mid-1980s (see Section 3.4.4.4), the number of vessels participating in the MHI bottomfish fishery has decreased as has their CPUE (see Sections 3.4.4.1 and 3.4.4.3).

4.10.2 Past Management Actions Potentially Contributing to Cumulative Effects

In 1986, the Bottomfish FMP was implemented to manage bottomfish fisheries of the Western Pacific Region. The Bottomfish FMP established a list of management unit species as well as prohibited destructive fishing techniques (e.g., explosives, trawl nets, poisons). In 1989, the Council developed regulations under the FMP that divided the fishing grounds of the Hawaiian Archipelago into the following three bottomfish management sub-areas: (a) Hoomalu Zone, (b) Mau Zone, and (c) MHI (see Figure 1). Limited access programs were established for the Hoomalu Zone and Mau Zone in 1988 and 1999, respectively, to avoid "economic overfishing" (Pooley 1993b; WPRFMC 1998b).

In 1998, concerns about low SPRs led the State to close certain areas around the MHI to bottomfish fishing, including areas of Penguin Bank within waters of Federal jurisdiction (i.e., the 3 to 200 nm offshore; EEZ). In addition, the State of Hawaii established a non-commercial bag limit of five onaga or ehu, or a mix of both, per day per (non-commercial) fisherman. The State did not implement an effective monitoring program to be able to accurately assess what, if any, impacts these regulations had on bottomfish resources. It is clear that these regulations were not sufficient to avoid the overfishing which prompted the current action.

On September 29, 2005, Hawaii Governor Linda Lingle signed administrative rules (Chapter 13-60.5; Department of Land and Natural Resources) to establish all State waters (0 to 3 nm offshore) in the NWHI as a marine refuge. The rules exclude 100 percent of State waters from extractive uses, including commercial and non-commercial fishing, and require an entry permit for all other activities. It is not known what, if any, impact this closure will have on bottomfish resources as due to the generalized information collected under the current reporting system it is not known what percentage of bottomfish landings in the NWHI were caught in State waters.

Papahānaumokuākea Marine National Monument

On June 15, 2006, the President issued a proclamation establishing the NWHI Monument, since renamed Papahānaumokuākea Marine National Monument, a status that significantly affects the NWHI commercial fishing operations. The National Monument designation for the NWHI superseded the proposed NWHI Marine Sanctuary.

The President's proclamation on June 15, 2006, calls for the closure of some fisheries within the NWHI Monument's boundaries immediately and of the NWHI bottomfish fishery by June 15, 2011. Native Hawaiian cultural practices, including sustenance fishing may be permitted to continue. Whereas the commercial bottomfish and associated pelagic fishing operations in the NWHI may continue over the five-year period, they will be subject to a landing limit on each species complex. No more than 350,000 pounds of bottomfish and no more than 180,000 pounds of pelagic fish may be landed within a given year. Furthermore, over the next five years, all bottomfish fishing operations in the NWHI must comply with new area closures and vessel monitoring and reporting requirements, in addition to existing regulations. By phasing out NWHI commercial fishing operations and restricting non-commercial access to the NWHI, the monument status reduces, but does not eliminate, outside impacts.

It remains to be seen how fishermen will react to the NWHI fishery closure and therefore what the impacts may be. Reactions may include shifting effort to the MHI bottomfish fishery, shifting fishery or gear types (e.g. to pelagic trolling) and ceasing fishing operations altogether. It is also possible that a "buy out" program will be established for the current NWHI bottomfish fishermen. If structured appropriately, a buyout could limit or eliminate fishing effort shifting by scrapping the vessel outright or removing the fishing endorsement from the vessel. The Council recommended a control date of June 2, 2005 (70 FR 40305; July 13, 2005), for the MHI bottomfish fishery which could be used by the Council and NMFS as criteria to limit fishing effort or participation in a future limited entry program if it becomes necessary.

NMFS will continue to assess the status of the Hawaiian Archipelago bottomfish stock complex and State and Federal programs are in place to monitor shifts in effort from the NWHI to the MHI and other fisheries. The Council suggests that it is likely that the Federal actions considered here, in combination with revised State BRFAs, will make it unprofitable for those operating to shift their bottomfish fishing effort to the MHI. The purpose and need of the Federal action assessed in this document is to end overfishing in the Hawaiian Archipelago bottomfish stock complex by reducing fishing mortality within the MHI. Although the establishment of the Papahānaumokuākea Marine National Monument does not affect this Federal action at this time, the continued assessment of the status of the bottomfish stock, coupled with information from ongoing fishery monitoring programs, may require additional Federal actions in the future.

4.10.3 Reasonably Foreseeable Future Actions

4.10.3.1 Hawaii Bottomfish Stock Assessment and Habitat Mapping

In 2006, the NMFS' Pacific Islands Fisheries Science Center conducted and completed a new stock assessment for the bottomfish management unit species complex of the Hawaiian Islands (Moffitt et al. 2006). This new stock assessment recommended further reductions (24 percent instead of 15) in bottomfish fishing effort or mortality which was explained throughout this document.

Updated bottomfish habitat mapping is being undertaken by PIFSC with resulting estimates of bottomfish habitat in federal waters, as opposed to state, being greatly increased. Current estimates place 53 percent of the habitat in Federal waters with 47 percent in State waters (Parke, 2007). Improved mapping of bottomfish habitat and continued research activities (some of which are described below) may lead to better understanding of the ecology and life histories of BMUS which may contribute to improved management in the future.

4.10.3.2 Hawaiian Archipelago Fishery Ecosystem Plan

The Council is currently developing place-based Fishery Ecosystem Plans (FEPs) for areas within the Western Pacific Region including American Samoa, Hawaii, the Mariana Islands, and the Pacific Remote Island Areas. Future fishery management decisions will build on the structure that these plans will provide. As ecosystem science in the region progresses, the development and utilization of ecosystem indicators and models are likely to be powerful tools for fishery ecosystem management in the bottomfish fishery. In addition, the Council's shift toward a place-based approach will rely on enhanced opportunities for communities to participate in management (e.g., monitoring and cooperative research).

4.10.3.3 Hawaiian Archipelago Marine Ecosystem Research Plan

PIFSC is leading the development of a plan that will guide ecosystem research in the Hawaiian Archipelago well into the future. The plan that is currently in preparation is likely to address ecosystem issues including the following: connectivity; invasive species; resource utilization; indicators of change (biological and physical); ecosystem modeling and forecasting; and ecosystem sustainability, resilience, and recovery. PIFSC is collaborating with the following organizations on the development of the research plan: Hawaii Institute of Marine Biology, NOAA's National Marine Sanctuary Program, State of Hawaii, U.S. Fish and Wildlife Service, University of Hawaii, and the Council. The research plan is expected to be available for public review by summer 2007.

4.10.3.4 State of Hawaii Bottomfish Restricted Fishing Areas

HDAR has modified its existing 19 bottomfish BRFAs to 12 BRFAs which are larger in size and contain approximately two percent more bottomfish habitat. These modified bottomfish restricted fishing areas will likely serve to reduce fishing mortality by a small percent corresponding to the two percent increase in habitat under protection. The modified areas are distributed statewide and encompass both State and Federal waters. An amendment to the Hawaii Administrative Rules to establish the modified closed areas was enacted in 2007[29]. Successful implementation and enforcement of these restricted areas may allow them to serve as refugia and protected spawning areas for BMUS may contribute to increased biomass to some extent.

[29] See http://www.hawaii.gov/dlnr/dar/bottomfishing.htm

4.10.3.5 Hawaii Superferry

In late 2008, the new Hawaii Superferry is anticipated to begin providing inter-island transportation via a high-speed catamaran ferry which will be capable of transporting people and motor vehicles. Regular, one way service from Honolulu to Maui and Honolulu to Kauai is expected to cost between $50-60 per person and $60-70 per car each way. One way service with a truck and trailored boat is anticipated to cost between $170-240.[30] Ferry service may facilitate relatively easy inter-island transport of fishing boats which may impact local bottomfish stocks as the distribution of fishing effort and patterns may be shifted.

4.10.4 Cumulative Effects to Target Species

Past Management Actions

Past management actions (i.e., catch reports, closed areas, catch limits, and limited-entry) have all served to increase regulation of the bottomfish fisheries in Hawaii and thus can be viewed as positive actions for the sustainability of Hawaii's archipelagic bottomfish multi-species stock complex. However, as indicated in the purpose and need of this document, Hawaii bottomfish resources are experiencing overfishing; thus, further management action to reduce fishing effort on the stocks is required.

Reasonably Foreseeable Future Federal Actions

The future actions identified in Section 4.10.3 could positively impact target species as these actions aim to gain a better understanding of the life histories and status of bottomfish, the human utilization of bottomfish resources, and the ecosystem effects from the harvest of bottomfish species in Hawaii.

External Factors Potentially Impacting Target Species

External factors (outside of bottomfish management actions) that may have positive or negative direct, indirect, or cumulative effects on bottomfish resources include the following: (a) habitat degradation from sedimentation, (b) pollution, (c) vessel fuel prices (higher prices may result in shifts from trolling to bottomfish fishing), (d) market (i.e., supply and demand) variability in price per pound and quantity of imported fish, (e) degradation of Hawaii's boat ramps, and (f) creation of artificial habitats.

It is uncertain to what degree, if any, sedimentation or pollution negatively impact targeted BMUS. As described in Chapter 3, bottomfish generally are associated with areas of high relief and exposure to currents that carry prey items. Even though natural events or non-fishing related activities may have increased sedimentation of high-relief areas that are important to bottomfish the degree of this sedimentation is unknown, but is not believed to be significant (C. Kelly, personal communication). Similarly, the impact of non-fishing activity pollution on bottomfish

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[30] http://www.hawaiisuperferry.com/images/pdfs/HSF_Tariff_Maui_Kauai_Pricing.pdf. Accessed December 3, 2007.

populations is unknown. Examples of pollution are dumping of dredge material in the ocean and discharge of wastewater from cruise ships. To the extent that activities associated with sedimentation and pollution are subject to environmental regulations, their effect on target species could be avoided, minimized, or mitigated. However, an increase over current levels in sedimentation or pollution in areas where BMUS occur would likely be detrimental to discrete bottomfish stocks, but their overall impact on Hawaii Archipelagic bottomfish stocks is unknown.

Rising fuel prices could lead to more bottomfish fishing effort because it is generally recognized that bottomfish fishing (i.e., anchoring or drifting) uses less fuel than trolling, and therefore, it is less expensive (HDAR Bottomfishers' Survey 2005, unpublished data). However, as fuel prices in Hawaii fluctuate, with a trend generally upwards in recent years, bottomfish fishing operations have been significantly impacted. When fuel prices are extremely high, some fishermen may decide to cease fishing altogether, resulting in positive impacts to bottomfish stocks. Medium-to-high fuel prices may encourage fishermen to bottomfish rather than to troll, which might negatively impact bottomfish stocks. Furthermore, medium-to-high fuel prices may encourage commercial bottomfish fishermen to fish for longer periods to catch more fish to help offset costs incurred from high fuel prices. Because of current price volatility, the indirect impact of fuel prices on Hawaii Archipelagic bottomfish stocks is unknown.

As described in Chapter 3, average bottomfish prices per pound fluctuate by species, by month, by season, and by year. Therefore, market forces such as supply and demand can also indirectly impact bottomfish because high average prices could lead to increased bottomfish fishing effort, and lower prices could lead to reduced effort.

At public meetings, bottomfish fishermen have stated that the disrepair of Hawaii's boat ramps impedes launching fishing boats. With respect to target species, this deterrent to fishing can be seen as positive as it could decrease fishing effort.

The use of artificial reefs may provide potential positive impacts to target species; however, the extent to which several coordinating agencies will be able to successfully work together to create such reefs remains to seen.

Potential Effects of the Alternatives on Target Species

As described in Chapter 4, all of the action alternatives considered are designed to reduce the excessive fishing mortality rate on the Deep 7 species within the MHI. Therefore, all of the action alternatives are expected to positively impact bottomfish target stocks.

Potential Cumulative Effects on Target Species

The implementation of a Hawaiian Archipelago FEP will initially maintain current fishery regulations. However, future fishery management under the FEP is expected to positively impact target stocks because ecosystem variability prediction will likely play an increasingly important role in fisheries management.

The effect of a NWHI Monument designation on MHI target species is unknown. The commercial bottomfish and associated pelagic fishing operations in the NWHI may continue over the five-year period, but they will be subject to a landing limit on each species complex. No more than 350,000 pounds of bottomfish and no more than 180,000 pounds of pelagic fish may be landed within a given year. Furthermore, over the next five years, all bottomfish fishing operations in the NWHI must comply with new area closures and vessel monitoring and reporting requirements, in addition to existing regulations.

During the phase-out and eventual closure of the NWHI fishery on June 15, 2011, fishing effort may shift from the NWHI to the MHI. This effort shift may exacerbate the fishing pressures on the MHI. To estimate the shift in fishing effort from the NWHI, it is essential to examine the current fishing activity of the eight vessels operating there. In 2003, fishermen made 76 trips into NWHI fishing areas (see Table 13), and those trips resulted in 220,000 pounds of bottomfish landings (see Table 16). This amount falls well within the imposed landing limit (350,000 pounds annually) for the next five years. Bottomfish landings (by pounds) also fall within zone-specific maximum sustainable yields. In 2003, fishermen landed 77,000 pounds in the Mau Zone and 145,000 pounds in the Hoomalu Zone, less than the areas' maximum sustainable yields of 97,904 pounds and 339,728 pounds, respectively. It appears the landing limit imposed for the next five years will have limited effect on current fishing operations in the NWHI, and it is expected that the NWHI landings will be relatively stable, unless affected by outside factors (like a buyout).

A similar landing total could be reached if all the vessels that currently operate in the NWHI shift effort to the MHI once the NWHI fishery is closed. Because the annual landings per vessel vary greatly in this small fishery, it could be misleading to use the average catch per vessel to gauge the impact of a per-vessel shift in effort. It remains to be seen how fishermen will react to the NWHI fishery closure; reactions may include shifting to the MHI bottomfish fishery, shifting fishery or gear types (like to pelagics, longline or troll) and ceasing fishing operations altogether. It also raises the question as to whether the MHI offer an attractive alternative for vessels now operating in the NWHI. These vessels are presumably bigger and more expensive to operate than the smaller vessels that fish in the MHI. It seems quite possible that CPUEs in the MHI would not be high enough to support fishing by larger, more costly vessels. It is also possible that a "buy out" program will be established for the current NWHI bottomfish fishermen. If structured appropriately, a buyout could limit or eliminate fishing effort shift be scrapping the vessel or removing the fishing endorsement from the vessel. The Council recommended a control date of June 2, 2005, for the MHI bottomfish fishery which could be used by the Council and NMFS as criteria to limit fishing effort or participation in a future limited entry program (70 FR 40305; July 13, 2005).

NMFS will continue to assess the status of the Hawaiian Archipelago bottomfish stock complex annually. State and Federal programs are in place to monitor shifts in effort from the NWHI to the MHI and other fisheries. The purpose and need of the Federal action assessed in this document is to end overfishing in the Hawaiian Archipelago bottomfish stock complex by reducing fishing mortality within the MHI. Although the establishment of the NWHI Monument does not affect this Federal action at this time, the continual assessment of the status of the bottomfish stock, coupled with information from ongoing fishery monitoring programs, may require additional Federal actions in the future.

4.10.5 Non-target Species and Bycatch

Past, Present, and Reasonably Foreseeable Federal Future Actions

The Bottomfish FMP (1986) prohibits the use of explosives, poisons, trawl nets, and other destructive gears that may indiscriminately kill or capture non-target or bycatch species. Hawaii's bottomfish fisheries only use hook-and-line fishing gear, which is considered to have low collateral impacts on habitat and bycatch.

The amount of non-target species and bycatch within Hawaii's bottomfish fisheries has been evaluated through two management and monitoring programs: (a) mandatory commercial catch reporting and (b) the observer program. As described in Section 3.4.6.2, the State of Hawaii changed its Commercial Marine Landings (CML) forms in 2002 to include data fields describing the number of fish released. PIFSC and the State of Hawaii have a cooperative data sharing agreement from which PIFSC is able to evaluate bottomfish catch data including non-target species and bycatch information. The Pacific Island Regional Office's Observer Program monitored the NWHI bottomfish fishery from 1990 to 1993 and from 2003 through June 2005. Although currently inactive, this program may be renewed by NMFS as the requirement for vessels to carry observers if requested by NMFS remains in effect.

External Factors Potentially Impacting Non-target and Bycatch Species

One of the most important external factors affecting whether a non-target species is retained or discarded (i.e., bycatch) is Hawaii's seafood markets. For example, the largest percentage of bycatch within the fishery is comprised of amberjack/kāhala (*Seriola dumerili*). One hundred percent of kāhala is discarded because of fears of ciguatera poisoning. Before the United Fishing Agency (Hawaii's primary fish auction) ceased selling kāhala in 1983, nearly 72,500 pounds of kāhala were landed annually in Hawaii (P. Dalzell, WPFMC, personal communication). Currently, the only kāhala being sold in the State are ones that are farm-raised in a controlled environment and devoid of ciguatera. In the NWHI bottomfish fishery, butaguchi (*Psudeocaranx dentex*) are sometimes retained and sometimes discarded; the decision to discard or retain is largely dependent on market price and when the fish was caught during the fishing trip. That is, butaguchi caught early in the trip may be discarded because it has poor shelf life (see Section 3.4.6.2).

Potential Impacts of the Alternatives on Non-target and Bycatch Species

Alternatives 2 - 7 are expected to end overfishing of Deep 7 bottomfish by reducing MHI fishing mortality and total catches of non-target and bycatch species are expected to decrease proportionately. Regarding the alternatives that deal with seasonal closures (Alternatives 2 and 7) for the Deep 7 species and depending on market demand, the targeting of uku (*Aphareus rutilans*) could increase during the closed period. The impact this could have on uku stocks is unknown, but it is not expected to be significant.

Potential Cumulative Impacts on Non-target and Bycatch Species

Given the low amount of bycatch associated with Hawaii's bottomfish fisheries, and the fact that the largest percentage of species discarded (kāhala, ulua) do not suffer from barotrauma effects (sudden changes in pressure that typically result in fish death), the effects of the alternatives added to the effects of market forces are not expected to negatively impact non-target and bycatch species.

4.10.6 Protected Species

Marine Mammals

Hawaiian monk seals and bottlenose dolphins are the only species of marine mammals that have been identified as potentially impacted by Hawaii's bottomfish fisheries. For this reason, the cumulative impacts on those species are considered in this analysis.

Hawaiian Monk Seal

Past Federal Management Actions

The Bottomfish FMP (1986) and its amendments have established management measures to prevent, minimize, or mitigate interactions with protected species, especially the Hawaiian monk seal. For example, the Bottomfish FMP requires all Mau Zone or Hoomalu Zone permit holders to complete a protected species workshop to learn methods to best avoid and minimize interactions. Recently, bottomfish permit holders have voluntarily agreed to attend protected species workshops conducted by NMFS, as well as agreed to a voluntary fish retention program to reduce the possibility of Hawaiian monk seals following their fishing vessels. The Bottomfish FMP also allows the NMFS Regional Administrator to place observers on NWHI bottomfish vessels, which occurred from 1990 to 1993 and from 2003 to June 2005. The NWHI limited-entry programs under the Bottomfish FMP limited the number of vessels that could participate in the fishery, which thereby decreased the overall potential for interactions with protected species in the NWHI.

In the pelagic fishery, interactions between Hawaii-based longline vessels and protected species have motivated innovation in gear research and fishing techniques and resulted in new protective management measures. During the initial phase of the Hawaii-based longline fishery, fishing occurred near the NWHI which are home to several monk seal colonies. The NWHI comprise the seals main terrestrial habitats, with the largest population at French Frigate Shoals (Diaz-Soltero 1998). Prior to the development of the Hawaii-based longline fishery, from the 1950s through the 1970s, biologists documented a significant decline in the number of monk seals, which was probably part of a long-term trend. There have been fluctuations in population size since then due to a number of factors including human disturbance, reduced prey availability, shark predation, mobbing and entanglement in marine debris.

Evidence of interactions between Hawaiian monk seals and the Hawaii-based longline fishery was observed in 1990, and included three hooked seals and thirteen unusual wounds thought to have resulted from longline interactions. To eliminate interactions between monk seals and the longline fishery, the Council created the NWHI Protected Species Zone in 1991 which extends 50 nautical miles around the NWHI and includes the designated corridors between islands (56 FR 52214; October 14, 1991). Longline fishing is prohibited in this area. Since the establishment of the Protected Species Zone there have been no observed interactions between the Hawaii-based longline fishery and monk seals (Forney et al. 2000; Marine Mammal Commission 2000). In addition, Amendment 2 to the Pelagics FMP made permanent measures in an emergency rule that required all vessel operators to attend a training session on reducing and mitigating interactions with protected species.

Future Federal Management Actions

No management actions are being considered or planned by the Council or NMFS that may negatively impact Hawaiian monk seals or their critical habitat. PIFSC will continue its efforts to monitor the Hawaiian monk seal population, and PIRO will continue efforts to minimize interactions between humans and Hawaiian monk seals. Work may also be done to minimize impacts to monk seals from Galapagos sharks which may include shark depredation activities (MMC 2006).

External Factors Potentially Impacting Hawaiian Monk Seals

A comprehensive discussion of the external factors affecting Hawaiian monk seals is provided in Section 3.3.1.3 of the Bottomfish FEIS (2005). The external factors discussed include natural occurrences such as male aggression and mobbing, shark predation, disease, ecosystem productivity, regime shifts, as well as anthropogenic factors such as sea wall entrapments, hookings, research activities, marine debris, and vessel groundings.

Potential Effects of the Alternatives on Hawaiian Monk Seals

In 2002, NMFS found that Hawaii's bottomfish fishery is not likely to jeopardize the continued existence of the Hawaiian monk seal or result in the destruction or adverse modification of its critical habitat (NMFS 2002). NMFS made these findings because the bottomfish fishery is expected to result in low rates of hooking and low levels of competition for fishery resources between monk seals and the bottomfish fishery. As the alternatives considered in this document would either maintain the status quo, or reduce effort of bottomfish fishing in the MHI, the Council expects none of the alternatives to jeopardize the continued existence of the Hawaiian monk seals or result in the destruction or adverse modification of their critical habitat.

Potential Cumulative Effects on Hawaiian Monk Seals

The Hawaiian monk seal population is far below historic levels and has declined 3.9 percent per year on average from 1994-2006 (NMFS 2007). Further declines of this species may be linked to the various external factors mentioned earlier; however, it does not appear that Hawaii's bottomfish fisheries will play a significant role in the future status of this species. NMFS will continue to monitor monk seal populations as well as monitor for any signs of impact on monk seals from Hawaii's bottomfish fisheries.

Bottlenose and Other Dolphins

Past, Present, and Reasonably Foreseeable Federal Actions

From 1990 to 1993 and from 2003 – June 2005, the NWHI bottomfish fishery was observed by NMFS' observer program. A main objective of NMFS' observer program is to monitor fisheries for interactions with protected species. As described in Section 3.5.1.2, between 1990 and 1993 NMFS' NWHI bottomfish observer program observed bottlenose dolphins stealing hooked fish off bottomfish lines. Interaction rates between dolphins and the NWHI bottomfish fishery have been estimated based on observer coverage conducted from 1990 to 1993, and indicate that an average of 2.67 dolphin interactions, most likely involving bottlenose and rough-toothed dolphins, occurred for every 1,000 fish brought on board (Kobayashi and Kawamoto 1995). Theses interactions did not involve hookings or entanglements, but involved dolphins stealing hooked fish or bait off bottomfish lines. From October 2003 – June 2005, the Hawaii-based bottomfish NWHI fishery was monitored under a mandatory NMFS observer program. Data for seven calendar quarters are available on the PIRO website. From the fourth quarter of 2003 through the second quarter of 2005, observer coverage in the bottomfish fleet averaged 21.4 percent, and there were no observed interactions with bottlenose dolphins or any other marine mammals.

Hawaii's bottomfish fisheries have not been found to cause mortality or serious injury to bottlenose dolphins or other marine mammals and therefore have been classified as a Category III fishery under the MMPA.

From 1994 through 1999, six interactions with Risso's dolphins and two interactions with bottlenose dolphins were observed in the Hawaii-based longline fishery (NMFS observer program, unpub. data). In 1997, one interaction with a spinner dolphin was observed in the fishery (NMFS observer program, unpub. data). Two false killer whales were taken by the Hawaii-based longline fishery, one in 1997 and one in 1998 (NMFS observer program, unpub. data). In 1997, one short-finned pilot whale was taken by the longline fishery (NMFS observer program, unpub. data). From 1994 through 1999, five interactions with unidentified cetaceans were observed in the Hawaii-based longline fishery (NMFS observer program, unpub. data). Observer descriptions and photographs suggest that at least two of these unidentified cetaceans may have been Blainsville's beaked whales or Cuvier's beaked whales (Forney et al., 2000).

External Factors Potentially Impacting Bottlenose Dolphins

Exogenous factors that impact bottlenose dolphins in Hawaii have not been identified. However, for the purposes of this analysis, exogenous factors common to cetaceans are considered (for bottlenose dolphins) and include the following: (a) incidental take in other fisheries; (b) ship traffic, ship disturbance, and ship noise; and (c) marine debris and wastes disposal.

Incidental Take in Fisheries

Nearshore gillnet fisheries in Hawaii have been reported to interact with bottlenose dolphins; however, the rate of interactions or severity of interactions is not well known (Forney 2004).

Outside of Hawaii, marine mammal interactions in pelagic tuna fisheries are most frequent between purse seiners and dolphins in the Eastern Pacific Ocean (EPO) where purse seiners have traditionally targeted yellowfin tuna schools associated with dolphin pods. The development of the FAD-associated purse seine fishery in the EPO was part of the strategy adopted to reduce dolphin mortalities from purse seine fishing. In the Western and Central Pacific Ocean purse seine sets have been traditionally made on free swimming skipjack schools and skipjack schools associated with logs or other floating objects, which minimizes dolphin interactions.

Ship Traffic, Disturbance, and Anthropogenic Noise

Collisions with vessels and disturbance from low-frequency noise are potential threats to cetaceans. The increasing levels of anthropogenic noise in the world's oceans may have an adverse effect on marine mammals. The Marine Mammal Commission produces an annual report with the most recent 2005 version released in July 2006[31] describing a series of meetings on acoustic threats to marine mammals and ways to reduce the threats among other information. The effects of U.S. Naval operations on marine mammals, including sonar, underwater detonations, etc. could be a potential threat to various marine mammals including those around the Hawaiian Islands where the U.S. Navy continues to conduct sonar testing and other anti-submarine exercises.

Marine Debris and Waste Disposal

Activities that may have adverse effects on marine mammal habitat include the dispersal of marine debris, large oil spills, and other types of marine pollution. Petroleum has the potential to be toxic to marine mammals if it is inhaled, ingested, absorbed through the skin, mucous membranes, or eyes, or if it inhibits feeding by fouling the baleen plates of whales. Hydrocarbons can also bioaccumulate in zooplankton and fish eaten by marine mammals and other wildlife. Any detrimental effects of marine pollution on their prey species of marine mammals would be another potential impact. Aside from large, catastrophic spills, the long-term effects of low levels of petroleum exposure are unknown.

Marine debris can be toxic to marine mammals if ingested and it can entangle them, leading to decreased ability to breathe, feed, breed, swim, or haul out. The animals affected may be more vulnerable to predators or diseases, thus reducing their ability to survive, care for their young, and reproduce. These factors can have significance in local areas where there are high concentrations of marine debris, thus contributing to cumulative effects on marine mammals.

[31] http://www.mmc.gov/sound/

Potential Effects of the Alternatives on Bottlenose Dolphins

As discussed earlier, Hawaii's bottomfish fisheries have not been found to cause mortality or serious injury to bottlenose dolphins and therefore have been classified by NMFS as a Category III fishery under the MMPA. As Alternative 1 would maintain the status quo, and the other alternatives would reduce fishing effort in the MHI bottomfish fishery, the alternatives considered in this document are not expected to significantly impact bottlenose dolphins.

Potential Cumulative Effects on Bottlenose Dolphins

The potential cumulative effects on bottlenose dolphins mostly involve impacts associated with external factors. As the Hawaii bottomfish fisheries have not been found to hook or entangle bottlenose dolphins, these fisheries are unlikely to be contributing to cumulative impacts on bottlenose dolphins. Other fisheries including pelagic longline, troll, handline, and purse seine may interact with marine mammals including bottlenose dolphins.

Sea Turtles

As discussed in Section 3.5.2, interactions between sea turtles and Hawaii's bottomfish fisheries have neither been reported nor observed, and it was concluded in NMFS' 2002 BiOp that bottomfish fishing operations are not likely to adversely affect listed sea turtles. For this reason, the cumulative impact to sea turtles is not discussed further in this analysis.

For a complete discussion of cumulative impacts to sea turtles, see the 2001 FEIS on the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region, which is available on the Council's website at www.wpcouncil.org. In the Pelagics FEIS five major exogenous factors were identified and described in detail as having the potential to contribute to cumulative effects on sea turtles. They include:

- Fishery effects – pelagic
- Fishery effects – shore
- Impacts on nesting environment
- Impacts on marine environment
- Current and future regulatory regimes

Seabirds

Historically, the only types of birds that have interacted with fisheries managed under Council FMPs have been boobies and albatrosses. Although many other species of seabirds exist in Hawaii and Western Pacific Region, this analysis is limited to these two groups.

Past, Present, and Reasonably Foreseeable Federal Actions

From 1990 to 1993 and from 2003 through June 2005, the NWHI bottomfish fishery was observed by NMFS' observer program. A main objective of NMFS' observer program is to monitor fisheries for interactions with protected species. Prior to 1999, the Hawaii-based pelagic longline fisheries managed under the Council's Pelagics FMP were estimated to interact with around 2,000 albatross (black-footed and Laysan), primarily in the shallow-set fishery that targets swordfish. The short-tailed albatross, which is listed as endangered under the ESA, is thought to forage in areas where the Hawaii-based longline vessels fish. However, no interactions between the short-tailed albatross and the Hawaii-based longline fleet have ever been reported or observed. Between 1999 and 2003, the shallow-set component of the Hawaii-based longline fishery was not in operation, and in those years seabird interactions were lower than they were prior to 1999. In 2005, the Council amended the Pelagics FMP to require Hawaii-based longline vessels to use known seabird mitigation measures that have reduced seabird interaction rates by at least 95 percent of pre-1999 levels.

External Factors Potentially Impacting Seabirds

Exogenous factors known to impact seabird populations include the following: a) degradation of nesting habitats that include lead and other toxins (e.g., polychlorinated biphenyls) left over from military activities in the NWHI, b) invasive species such as rats that consume seabird eggs, and c) marine debris and plastics—albatrosses and other seabirds often consume floating plastics and pass the objects on to chicks while feeding, which can be lethal to birds of all ages. Seabirds also become entangled in marine debris ranging from derelict fishing gear to garbage and this also has lethal outcomes for a variety of seabirds. Pelagic longline fisheries outside U.S. fisheries are also likely to be an external factor substantially impacting seabird populations.

Potential Impacts of the Alternatives on Seabirds

PIRO observer data indicate that from 2003 – 2005, six interactions (three boobies, one black-footed albatross, and two Laysan albatrosses) were observed between seabirds and the NWHI bottomfish fishery. Out of the six, only one of those interactions occurred while operating bottomfish fishing gear, while the other five occurred while trolling. On the basis of these figures, bottomfish fishing in the NWHI constitutes a negligible risk to seabirds in the NWHI as populations of these seabirds in the NWHI range from tens of thousands (boobies, black-footed albatross) to hundreds of thousands (Laysan albatross; NMFS 2005). As seabird populations are substantially higher in the NWHI than in the MHI, and no interactions between seabirds and bottomfish fishing gear have ever been observed or reported in the MHI, the alternatives considered in this document are believed to pose no additional threat to seabird populations.

Potential Cumulative Effects on Seabird Populations

As Hawaii's bottomfish fisheries in the MHI appear to pose a negligible threat to seabird populations, maintaining their current populations or rebuilding those populations that were once substantially greater will depend on the extent to which external factors impacting seabirds are reduced or mitigated. For more information, consult NMFS's FEIS on "Seabird Interaction Mitigation Methods and Pelagic Squid Fishery Management" (NMFS 2005).

4.10.7 EFH, Biodiversity, and Ecosystems

Past Federal Actions

Pursuant to the 1996 Sustainable Fishery Act amendments to the MSA, the Council has designated EFHs and HAPCs for each management unit species listed under the Council's five FMPs (64 FR 19068; see Section 4.1.4). The Council and NMFS must ensure that any activities conducted in such areas do not adversely affect, to the extent possible, EFH or HAPC for any MUS. The use of explosives, poisons, trawl nets, and other destructive gears that may adversely affect any EFH or HAPC in the Western Pacific Region are prohibited under the Council's FMPs. No fishery under Council management or jurisdiction has been found to adversely affect the EFH or HAPC of any Western Pacific Region MUS.

Reasonably Foreseeable Future Federal Actions Potentially Affecting EFH, Biodiversity, and Ecosystems

There are no actions being planned by the Council or NMFS that are expected to adversely affect EFH or HAPC in the Western Pacific Region. The Council has begun a process to develop and implement place-based FEPs for areas within its jurisdiction. Future fishery ecosystem management actions will build upon the place-based FEPs framework and incorporate ecosystem management approaches (e.g., multi-species management, ecosystem indicators and models, and community-based management) as appropriate.

External Factors or Actions Potentially Affecting EFH, Biodiversity, and Ecosystems

External factors or actions that may potentially impact bottomfish EFH, biodiversity, and ecosystems are land-based pollution and sedimentation, ocean drilling and mining, vessel wastes, vessel groundings, oil spills, ocean dumping of toxic wastes, marine debris including derelict fishing gear, and military exercises with live ammunition. It is unknown what degree of impact these actions have had on bottomfish EFH, biodiversity, or ecosystems in the past, but they are suspected to be minimal. To the extent that these or potential activities and events are subject to environmental regulations, their effects on EFH, biodiversity, and ecosystems are likely to be avoided, minimized, or mitigated.

Potential Effects of the Alternatives on EFH, Biodiversity, and Ecosystems

Submersible surveys conducted on bottomfish fishing areas in the NWHI found that bottomfish fishing operations have negligible effects on EFH, biodiversity, and the benthic ecosystem. None of the alternatives considered in this document would modify the existing regulations prohibiting the destructive fishing methods. Fishing vessel activities can produce potential negative environmental impacts from lost oil, sewage, garbage and debris, and groundings. However, none of these factors are believed to have occurred and resulted in significant negative impacts on EFH, biodiversity, or benthic ecosystems on a broad or archipelagic scale. Nor are they believed to occur frequently, thereby adversely affecting EFH and ecosystems in an additive manner. Therefore, the alternatives considered in this document are not expected to have any adverse impacts on EFH, biodiversity, and benthic ecosystems.

Potential Cumulative Effects on EFH, Biodiversity, and Ecosystems

On the basis of the preceding discussion, the effects of continued bottomfish fishing in Hawaii, albeit with reduced effort in the MHI over recent years, combined with external factors are not expected to result in significant negative cumulative impacts to EFH, biodiversity, and benthic ecosystems.

4.10.8 Fishery Sectors

Past Federal Management Actions

Generally, the objectives of past fisheries management measures were intended to promote sustainable fisheries and are expected to have positive impacts on fishery participants in the long-term from the benefit of maintained fishing opportunities. Nevertheless, it is believed that many fishermen in Hawaii have the sense that government regulations are “boxing them in” and reducing their ability to maintain their characteristic highly flexible fishing strategy (Hamilton et al. 1996; Polovina and Haight 1999; Pooley 1993a). This flexibility is important for many smaller and medium-sized fishing operations because of the seasonal availability of various targeted species.

Reasonably Foreseeable Future Federal Management Actions

Fisheries management is an adaptive process, and Federal fisheries management decisions potentially affecting Hawaii’s bottomfish fishery sectors could arise at any time. Currently, the Council is developing FEPs for the Western Pacific Region. Future fisheries management decisions will build upon the institutional framework of place-based FEPs. Essential to successful implementation of fisheries ecosystem management are opportunities for community participation. The Council anticipates working closely with fishing communities as well as fishery sectors in furthering fishery ecosystem management in Hawaii.

On June 15, 2006, the President issued a proclamation establishing the Papahānaumokuākea Marine National Monument, a status that significantly affects the NWHI commercial fishing operations. The President’s proclamation calls for the closure of most fisheries within the NWHI Monument’s boundaries immediately and of the NWHI bottomfish fishery by June 15, 2011. However, Native Hawaiian cultural practices, including sustenance fishing may be permitted to continue.

As identified during public meetings, commercial bottomfish fishermen in Hawaii expressed interest in learning best practices and methods associated with seafood handling, so as to maintain a high quality product and maximize price per pound values. Dependent on Congressional funding, the Council and NMFS may coordinate seafood handling workshops for Hawaii’s bottomfish fishermen.

External Factors Potentially Impacting Fishery Sectors

Fuel Costs

A volatile price of fuel (as observed in 2005) is an influential factor affecting Hawaii's bottomfish fisheries. Although bottomfish fishing is considered less expensive than pelagic trolling, for many areas in Hawaii, traveling to and from bottomfish fishing grounds is still expensive considering fuel costs (HDAR Bottomfishers' Survey 2005, unpublished data). If fuel prices continue to increase, Hawaii's bottomfish fishery sectors could see more competition from fishermen switching to bottomfish fishing over trolling. Fuel prices in Hawaii have greatly fluctuated, and their impact on fishermen is believed to be significant. When fuel prices are extremely high, many fishermen decide not to go bottomfish fishing or trolling (HDAR Bottomfishers' Survey 2005, unpublished data).

Seafood Imports

Imports of bottomfish from Australia, New Zealand, Fiji, and Tonga and other areas impact market prices for Hawaii bottomfish. As described in Section 3.4.5, nearly 750,000 pounds of bottomfish are annually imported to Hawaii each year, with a strong negative correlation observed between MHI landings and imports—when MHI bottomfish landings are low, bottomfish imports increases.

Construction Jobs

An external factor that might be positively impacting Hawaii's fishing sector is a stronger Hawaii economy over recent years. Some islands in Hawaii have experienced dramatic increases in construction jobs over the last ten years, contributing to low unemployment rates. Within the past several years, Hawaii's construction industry has boomed and so has its high-value housing market, in which many part-time commercial bottomfish fishermen participate (M. Mitsuyasu, personal communication). Thus, the recent increase in construction has likely benefited these fishermen. As seen in Section 3.4.4.1, the number of MHI bottomfish vessels and the number of bottomfish fishing trips have declined in recent years. Although one cannot determine that this is directly attributable to Hawaii's construction boom, part-time commercial fishermen may not be supplementing their income with bottomfish catches as readily as in years past. The benefit to Hawaii's fishery sectors is less competition for catches at popular bottomfish grounds.

Boat Ramps and Harbors

At public meetings bottomfish fishermen stated that the disrepair of Hawaii's boat ramps impedes launching fishing boats. Fishermen have stated that boat ramps and harbors throughout the MHI are dilapidated and in need of repair (M. Mitsuyasu, personal communication).

Recruitment into Fishery

All fisheries, including the main Hawaiian bottomfish fishery, are affected by recruits into the fishery as current fishermen retire or exit the fisheries due to age, health, death, etc. that prevent them from further engaging in fishing activities. Low recruitment can impact the commercial and non-commercial bottomfish fishery by reducing overall fishing effort and mortality.

Potential Impacts of the Alternatives on Fishery Sectors

Alternative 1 (no action) would likely result in further decline of catch rates, and fishery participants in all sectors would see lower returns both in financial and nonmarket (e.g., angler satisfaction, food, and social benefits) terms. Alternatives 3 - 7 (TACs) are expected to impact all fishery sectors proportionately, unless a situation develops in which commercial fishermen increase their effort and the TAC is perceived to be disproportionately caught by commercial fishermen over the non-commercial sectors. However, given that the majority of commercial landings are already made during the winter season, this is not likely to significantly change these operations. Because of the lack of detailed information on non-commercial (including sustenance) fishing patterns, and the varying motivations of these groups, it is not known whether they would increase effort in light of a TAC. The impacts of Alternative 6 (IFQs) on the commercial fishery sector would vary depending on how its IFQs were implemented. If equal quotas were provided, highliners would get the same quota as part-time fishermen, and vice versa. This would leave some without enough quota, while others would have unused quota. If equal quotas were provided to a subset of all historical participants, such as those most active in recent years, those included would each have a higher quota, whereas those excluded would have none. Under this scenario, part-time commercial fishermen who have not been active in recent years would not have IFQs and therefore would not be able to commercially sell their fish, creating a significant impact. The sport and non-commercial (including sustenance) fishery sectors would be impacted under all alternatives which include the non-commercial sector in fleetwide TACs or which implement federal non-commercial bag limits.

Potential Cumulative Impacts on Fishery Sectors

As seen in the preceding discussion, the impacts of the proposed alternatives when combined with external factors suggest that Hawaii’s bottomfish fishery sectors are facing substantial cumulative impacts. It remains to be seen how much these cumulative impacts affect opportunities for Hawaii’s bottomfish fishery sectors.

4.10.9 Fishing Communities

Past, Present, and Reasonably Future Federal Actions

As described in Section 3.6.2, based on the requirements of the 1996 SFA amendments to the MSA, the Council designated under its FMPs, each of the islands of Kauai, Niihau, Oahu, Maui, Molokai, Lanai, and Hawaii as a fishing community.

External Factors Impacting Hawaii's Fishing Communities

Hawaii's Economy

Some islands in Hawaii have experienced dramatic increases in construction jobs over the last several years, contributing to low unemployment rates in Hawaii. Because of more available jobs, fishing communities on some islands may have reduced their dependence on fishing income, and consequently, fisheries. However, for islands that have experienced little growth (e.g., Molokai), fishing is still a major economic and social force within the community.

Boat Ramps and Harbors

At public meetings, bottomfish fishermen stated that the disrepair of Hawaii's boat ramps impedes launching fishing boats. Fishermen have stated that boat ramps and harbors throughout the MHI are dilapidated and in need of repair (M. Mitsuyasu, personal communication).

Fuel Costs

Recent volatile fuel prices are impacting Hawaii's fishing communities. Although bottomfish fishing is considered less expensive than pelagic trolling, for many areas in Hawaii, traveling to and from bottomfish fishing grounds is still expensive considering fuel costs (HDAR Bottomfishers' Survey 2005, unpublished data). If fuel prices continue to increase, Hawaii's fishing communities could be impacted as it could become simply too expensive to fish.

Potential Impacts of the Alternatives on Fishing Communities

Alternatives 2-7 are expected to proportionately impact all of Hawaii's fishing communities. However, impacts would be minimized because the fishing season would likely always be open during the months that have historically recorded the highest bottomfish landings, winter. Depending on how the IFQs are allocated under Alternative 6, fishing communities may be affected proportionately or disproportionately; however, the impacts would not be expected to be significant.

Potential Cumulative Effects on Hawaii's Fishing Communities

Hawaii's strong economic growth and low unemployment rate may draw fishermen away from bottomfish fishing, and thus offset the impact of recent volatile fuel prices or decrease the fishermen's need to supplement their income or diet with bottomfish catch. None of the alternatives are expected to significantly affect any one Hawaii fishing community more than another; however, closed seasons and overall reductions in total catch under a TAC system would impact all of Hawaii's fishing communities to some degree. The response of fishing communities to more restrictive regulations is unknown. Given rising fuel prices, increased regulations, and degraded access points (i.e., boat ramps), members of Hawaii's fishing communities are likely facing reduced fishing opportunities. Reduced fishing opportunities may impact Hawaii's fishing communities by reducing the economic and social benefits that these communities derive from fishing and the harvest of marine resources.

4.10.10 Native Hawaiian Communities

Past, Present, and Reasonably Foreseeable Future Federal Actions

The MSA provides means to address native, indigenous rights to resources managed by the Council through Section 305 (i) (2), the Western Pacific Community Development Program (CDP) Section 305 note, and the Western Pacific Community Demonstration Project Program (CDPP). The CDP provides an opportunity for the Council to make programmatic changes to fisheries it manages to address inequities in participation in these fisheries by native fishermen, however, no money is appropriated for this program. The CDPP is a regional grant program for which Congress has appropriated $500,000 per year for three to five demonstration projects by qualified native communities. These programs acknowledge that native people in the Western Pacific Region have had barriers to full participation in fisheries managed by the Council and therefore exist to enhance their participation in fisheries. Since 2004, the CDPP has funded 4 Native Hawaiian projects.

Although the regulations have not been finalized by NMFS, the Council (1999) recommended that one-fifth or 20 percent of the target number of Mau Zone limited-entry permits (ten) be allocated for Native Hawaiians under the Council's CDP.

External Factors Potentially Impacting Native Hawaiians

Although there are likely other external factors affecting Native Hawaiians, two of the most commonly recognized are discussed in the following section.

Diet and Health

On average, Native Hawaiians die at younger ages than other ethnic groups residing in Hawaii; have a higher prevalence of hypertension, diabetes, and asthma than other ethnic groups; and have a higher rate of obesity as an ethnic group (Johnson et al. 2003). Obesity is implicated as a significant risk factor in many chronic diseases. Changing dietary behaviors to reduce obesity is a fundamental aim of most weight loss programs, including several traditional Hawaiian diet programs developed and tested in Hawaii over the past two decades. These programs emphasized the health and cultural values of native foods. The majority of the participants realized short-term weight loss and improvements in health, but few individuals sustained a significant weight loss. Lack of access to fresh, affordable food is cited as one of the major barriers to long-term adherence to traditional Hawaiian diets. Changes that would support healthier lifestyles include "increase(d) access by Native Hawaiians to the land and ocean" and support of local food producers (Fujita et al. 2004).

Education

Native Hawaiian students are perceived, by the standards of contemporary education, to be underperformers (Pacific American Foundation/Hui Malama o Moomomi 2003). Personalized environments and experience-based learning have been identified as two critical factors for success in the schooling of Native Hawaiian students (Kawakami and Aton 2000). For

Hawaiians, the lesson and the learning of the lesson are ultimately interwoven with the situation and the environment of the learner; that is, every situation is a learning opportunity. Western educators recognized around the 1940s that Native Hawaiians have never conceived of education in terms of schooling alone or regarded education as separate from living (Wist 1940).

Kupuna (elder) wisdom is one of the essential components of the traditional Hawaiian learning that is neglected in contemporary education (Bartram et al. 2004). Unlike modern societies that typically receive information through a variety of sources such as writing and multimedia, Native Hawaiians depend on their kupuna to pass on cultural wisdom.

Potential Impacts of the Alternatives on Native Hawaiians

If the Council did not take action (Alternative 1), it is probable that the Secretary of Commerce through NMFS would take unilateral action to impose management measures designed to end overfishing in Federal waters. It is not possible to predict what those measures would consist of, but they would have to reduce MHI bottomfish fishing mortality (e.g., catches) to successfully end overfishing. Depending on what measures would be implemented, it is unlikely that special provisions would be designed for Native Hawaiians.

If no management action occurred by the Council or by NMFS, and the current overfishing condition led to an overfished condition, the result would be an alarmingly low level of bottomfish biomass levels, and the bottomfish fishery would likely collapse. Under this scenario, sustainable bottomfish resources would be unavailable, and Native Hawaiian communities would lose the economic and cultural benefits of catching bottomfish, such as traditional community fish sharing. Similarly, for the remainder of the alternatives, a reduction of access rights and cultural practices can be viewed as impacting Native Hawaiians by reducing their ability to practice and perpetuate their culture. The loss of any customary access and practice could be viewed as a permanent loss of culture for Native Hawaiian communities.

Potential Cumulative Impacts to Native Hawaiians

As mentioned above, Native Hawaiians are facing significant impacts from relatively poor diet and health, and education. Bottomfish management alternatives that reduce access to locally produced fish would preclude opportunities for intergenerational transmission of fishing knowledge, and consequently, would be detrimental to Native Hawaiian diet and health if a fishery closure occurred for an extended period of time. All of the action alternatives provide for expedient corrective measures that are designed to enhance bottomfish stocks. All of the action alternatives allow some bottomfishing for a part of the year. Therefore, Native Hawaiians will continue to have access to bottomfish in the Main Hawaiian Islands. However, the no-action Alternative has the potential to result in overfishing, which could cause an extended fishery closure.

4.10.11 Administration and Enforcement

Past, Present, and Reasonably Foreseeable Federal Actions

The Council has been involved in managing fisheries of the Western Pacific Region since the promulgation of the MSA in 1976. Since that time, the Council has developed, and the Secretary of Commerce has approved, the following five species-based management plans: Precious Corals (1983), Crustaceans (1983), Bottomfish and Seamount Groundfish (1986), Pelagics (1987), and Coral Reef Ecosystems (2004). With the exception of the Coral Reef Ecosystems FMP, each FMP has undergone a series of amendments. In the fall of 2005, the Council underwent a process to develop and implement place-based fishery ecosystem plans, thereby amending and reorganizing the species-based FMP regulations into place-based regulations.

In 2004, Congress appropriated funds to NMFS to establish the Pacific Islands Region, whereby the fishery resources occurring in the EEZ around U.S. Pacific Islands would no longer be under the administrative purview of NMFS' Southwest Region. Also during this transformation, the Honolulu Lab became the Pacific Islands Fisheries Science Center, and the NMFS' Office for Law Enforcement Pacific Islands Division was established.

On June 15, 2006, the President issued a proclamation establishing the Papahānaumokuākea Marine National Monument, a status that significantly affects the NWHI commercial fishing operations. The President's proclamation calls for the closure of most fisheries within the NWHI Monument's boundaries immediately and of the NWHI bottomfish fishery by June 15, 2011. However, Native Hawaiian cultural practices, including sustenance fishing may be allowed to continue with a valid Monument permit.

External Factors Potentially Impacting Administration and Enforcement

External factors that potentially impact Council and NMFS management and administration are new legislation, annual budgets, and litigation. External factors potentially affecting NMFS Office for Law Enforcement include restrictive annual budgets and the balance of enforcement priorities. Exogenous factors that impact the USCG include shifting priorities for which Homeland Security, search and rescue, annual budgets impacting staffing, and the maintenance and acquisition of assets are included.

Potential Impacts of the Alternatives on Administration and Enforcement

Based on the preceding discussion, the proposed management actions in this document could significantly impact administration and enforcement, taking into account Council and NMFS actions as well as external factors.. This action would add administrative burdens to NMFS and the USCG which would require allocation of additional resources or re-allocation of existing resources for increased enforcement capacities, implementation of permit and reporting requirements, and TAC determination and monitoring.

Alternative 1 (no action) would not impact administration and enforcement in the short term; however, no action in the long term could result in litigation or failure to manage bottomfish in a sustainable manner. Alternative 2 would not significantly affect enforcement agencies because enforcement during the closed season would mostly involve shore-based monitoring of landings and sales of the Deep 7 bottomfish species. Alternatives 3 - 7 would impact administration and enforcement as they would entail careful monitoring of catch data and an appropriate enforcement response.

Potential Cumulative Impacts to Administration and Enforcement

As more marine resource regulations are implemented and more closed areas are established (e.g. by the State), the responsibilities of the DOCARE, USCG and NMFS OLE also increase. This increase could be burdensome, especially if these agencies operate on budgets that do not account for additional marine resource enforcement responsibilities. In other words, unfunded mandates can significantly burden enforcement agencies.

CHAPTER 5: ENVIRONMENTAL MANAGEMENT ISSUES

5.1 Energy Requirements and Conservation Potential of the Alternatives and Mitigation Measures

The alternatives are distinguished by the amount and locations of bottomfish fishing in the MHI. The vessels used to target bottomfish consume energy in the form of petroleum-based fuels and electricity. None of the alternatives are expected to result in the consumption of significant amounts of energy, rather, reduced fishing effort would result in energy savings. However, reduced local catches of the Deep 7 bottomfish may lead to increased imports which could cause increased energy usage through importation by air from other Pacific regions.

5.2 Natural or Depletable Resource Requirements and Conservation Potential of the Alternatives and Mitigation Measures

Except for Alternative 1 (no-action), all of the alternatives are designed to end overfishing of MHI bottomfish. Reduced levels of fishing effort and corresponding decreases in fishing mortality are intended to increase natural resource values over time and promote sustainable fishery resources.

5.3 Urban Quality, Historic and Cultural Resources, and Design of the Built Environment Including Reuse and Conservation Potential of Alternatives and Mitigation Measures

None of the alternatives including the Preferred Alternative, would have an appreciable effect on urban quality or design of the built environment because of the small size of the bottomfish fishing fleet and its shore-side supporting infrastructure.

5.4 Possible Conflicts between the Alternatives and Other Land Use Plans

None of the alternatives conflict with the objectives or provisions of the NWHI Marine National Monument Management Plan or any other currently identified land use plan. The existing FMP provides for a sustainable fishery with little bycatch and minimal effects on protected species or ecosystem integrity in the NWHI and the MHI.

5.5 Adverse Impacts That Cannot Be Avoided

All of the alternatives (with the exception of the no-action alternative) include measures that would, in the short-term, produce unavoidable adverse impacts to fishery participants and the regional economy associated with bottomfish fishing and fish sales by reducing the overall fishing effort. However, reductions in bottomfish catches to end overfishing will also provide beneficial long-term impacts by promoting sustainability of bottomfish resources.

5.6 The Relationship between Local Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity

With the exception of Alternative 1 (no action), all of the alternatives were designed to reduce fishing pressure on Hawaii's bottomfish stocks. The objective of reducing fishing effort in the MHI is to enhance the long-term productivity of the Hawaiian Archipelago's bottomfish populations and sustainability of the bottomfish fishery.

5.7 Irreversible and Irretrievable Commitments of Resources

None of the alternatives would result in irreversible or irretrievable commitments of resources. The proposed Amendment to the Bottomfish and Groundfish FMP would help to eliminate overfishing of bottomfish fish stocks in the Main Hawaiian Islands.

5.8 Permits, Licenses, and Approvals Necessary to Implement the Proposed Action

No permits outside the purview of the NMFS and State of Hawaii HDAR are required for this action. However, except for Alternative 1 (no-action), all alternatives require close coordination and parallel regulations between NMFS and the State of Hawaii to ensure optimal success of implementation and enforcement. Close coordination includes continuing existing data sharing agreements, developing new reporting requirements for the non-commercial fishery and developing appropriate research and monitoring plans.

The proposed action will require a Federal Coastal Zone Management Consistency determination in coordination with the State of Hawaii (see Chapter 6, section 6.2.2). An Endangered Species Act consultation with the National Marine Fisheries Service has been initiated (see Chapter 6, section 6.2.4).

CHAPTER 6: CONSISTENCY OF THE ACTION WITH APPLICABLE LAW

6.1 MSA National Standards

Section 301 of the Magnuson-Stevens Act requires that regulations implementing any FMP or amendment be consistent with the ten National Standards listed below.

National Standard 1 states that conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

The preferred alternative is intended to end overfishing of the Deep 7 bottomfish complex in the main Hawaiian Islands such that the optimum yield from this fishery will be able to be sustainably harvested into the future. The intention of this action is to implement new management measures which will comply fully with National Standard 1 by ending overfishing in the MHI bottomfish fishery. This action also complies with NS 1 by implementing TAC-based management to ensure overfishing ends and is prevented in the future.

National Standard 2 states that conservation and management measures shall be based upon the best scientific information available.

The preferred alternative is based on the best currently available information on bottomfish landings data derived from the commercial bottomfish fleet's reporting requirements analyzed by scientists at NMFS' PIFSC. This alternative is also based on information contained in the latest stock assessment completed by NMFS in 2006 which went through the Information Quality Act review process and internal peer review. The stock assessment attempts to conform with provisions contained in the 2006 reauthorization of the MSA. In addition, PIFSC research aims to continuously improve stock assessment methods and to this end brought together a panel of stock assessment experts from an outside university in 2006 to review PIFSC's stock assessment methodology and the current bottomfish stock assessment (see Martell et al. 2006).

National Standard 3 states that, to the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

The preferred alternative is not expected to have a significant effect on the management of fish stocks as a unit despite the fact that this action aims to reduce fishing effort in a part of the complex's range. It was identified in NMFS' overfishing determination that the excessive fishing effort is occurring in the MHI part of the complex's range and not in the NWHI. This is because the bottomfish fishery in the NWHI is strictly controlled by a limited entry system with less than eight vessels permitted to fish and a maximum vessel length of 60 ft. Therefore, the alternative being considered in this amendment aims to manage the bottomfish stock complex as a unit by reducing a threat it one part of its range. The extent of adult spillover and larval transport between the MHI and the NWHI is still largely unknown, however, it is expected that a reduction of fishing effort in the MHI will have beneficial effects on the stock complex as a whole.

<u>National Standard 4</u> states that conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

The preferred alternative does not discriminate between residents of different States or allocate fishing privileges among fishermen. This action would impact equally Hawaii-based bottomfishermen from all fishery sectors and no other states. This action does, however, impact Hawaii-based fishery participants who fish in the MHI while not affecting the handful of limited entry participants who fish in the NWHI.

<u>National Standard 5</u> states that conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.

The preferred alternative includes consideration of efficiency in the utilization of the bottomfish resources of the MHI. The goal of the amendment is to end overfishing in the MHI deepwater bottomfishery, although, doing so would increase costs of administration and enforcement. In addition, ending overfishing will, over time, increase efficiency through increasing the sustainability of the resource through implementation of seasonal closures and TACs both designed to allow limited fishing during the peak holiday season when bottomfish is most in demand.

<u>National Standard 6</u> states that conservation and management actions shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources and catches.

The preferred alternative will control fishing mortality through a phased-in TAC. This TAC will be updated on an annual basis and will be able to account for variations in the fishery and the natural fluctuations of the resource.

<u>National Standard 7</u> states that conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

The preferred alternative would not duplicate other fishery regulations or add undue costs to fishing operations. There will be some costs associated with implementation of the new non-commercial reporting requirements and with development and monitoring of the TAC. However, these measures are necessary to end overfishing in the MHI bottomfish fishery.

<u>National Standard 8</u> states that conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing

communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

The preferred alternative considers and minimizes adverse impacts to Hawaii's fishing communities by implementing seasonal closures and TACs designed to allow limited fishing during the peak holiday season when bottomfish is most in demand. In addition, ending overfishing will over time minimize impacts through increasing sustainability of the resource for all.

National Standard 9 states that conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided minimize the mortality of such bycatch.

The preferred alternative is intended to reduce fishing effort and catch of Deep 7 bottomfish species which may concomitantly reduce bycatch in this fishery. The bottomfish fishery for species other than the Deep 7 would remain open however this is not expected to substantially increase bycatch of any other species due to the gear type (hook-and-line) which typically has minimal bycatch.

National Standard 10 states that conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

The preferred alternative is not expected to have any substantial implications to safety at sea during bottomfishing operations in the MHI. Its measures would not alter the method of fishing or the type of gear being used, rather would only cause changes in when fishers can fish and how much they can land on an annual basis. Although use of a fleetwide TAC may encourage a derby style fishery, this appears unlikely due to market factors in place because this is a fresh fish fishery and one where a large number of participants bring in relatively small catches.

*New ACLs and AM provisions - t*he MSA Reauthorization Act of 2006 (MSRA) set forth new requirements related to overfishing, including new annual catch limit (ACL) and accountability measures (AM) provisions for federally managed fisheries in the U.S. EEZ. Section 104(a)(10) of the MSRA amends section 303(a) of the Magnuson- Stevens Act to require that any FMP shall ''establish a mechanism for specifying annual catch limits in the plan (including a multi-year plan), implementing regulations and annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure accountability''(72 FR 7016; February 14, 2007). In addition to ending overfishing of bottomfish, Alternative 7 is consistent with these requirements as it establishes annual catch limits and accountability measures for this fishery.

6.2 Consistency with Other Law

Fishery management in federal waters of the U.S. is primarily governed pursuant to the Magnuson-Stevens Act, however, a number of other federal statutes are given consideration during fishery management decision making. These other statutes are briefly summarized below.

6.2.1 Administrative Procedures Act

All federal rulemaking is governed under the provisions of the Administrative Procedures 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 becomes effective, with some exceptions. This amendment complies with the provisions of the APA through the Council's extensive use of public meetings, requests for comments, and consideration of comments. The proposed rule associated with this amendment will have request for public comments which complies with the APA.

6.2.2 Coastal Zone Management Act

The Coastal Zone Management Act requires a determination that a recommended management measure has no effect on the land or water uses or natural resources of the coastal zone or is consistent to the maximum extent practicable with the enforceable policies of an affected state's approved coastal zone management program. A copy of this document will be submitted to the appropriate state government agency in Hawaii for review and concurrence with a determination that the recommended measures to eliminate bottomfish overfishing and enhance fishery data are consistent, to the maximum extent practicable, with the state coastal zone management program.

6.2.3 Information Quality Act

The Information Quality Act (Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Public Law 106-443)) which took effect October 1, 2002, directed 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." OMB directed each federal agency to issue its own guidelines, establish administrative mechanisms allowing affected persons to seek and obtain correction of information that does not comply with OMB guidelines, and report periodically to OMB on the number and nature of complaints.

The NOAA Section 515 Information Quality Guidelines require a series of actions for each new information product subject to the Information Quality Act. This document has used the best available information and made a broad presentation thereof. The process of public review of this document provides an opportunity for comment and challenge to this information, as well as for the provision of additional information. The stock information used in the overfishing determination for the bottomfish complex discussed here was developed by scientists at PIFSC, based on CPUE data, and considering long-term SPR data. Therefore, this Amendment and Final SEIS are in compliance with the IQA.

6.2.4 Endangered Species Act

The Endangered Species Act (ESA) requires that any action authorized, funded, or carried out by a Federal agency ensure its implementation would not jeopardize the continued existence of listed species or adversely modify their critical habitat. Species listed as endangered or threatened under the ESA that have been observed, or may occur, in the area managed by the Bottomfish and Seamount Groundfish FMP are listed below (and are described in more detail in Chapter 3):

- All Pacific sea turtles including: olive ridley sea turtles (*Lepidochelys olivacea*), leatherback sea turtles (*Dermochelys coriacea*), hawksbill turtles (*Eretmochelys imbricata*), loggerhead (*Caretta caretta*), and green sea turtles (*Chelonia mydas*).

- The humpback whale (*Megaptera novaeangliae*), sperm whale (*Physeter macrocephalus*), blue whale (*Balaenoptera musculus*), fin whale (*B. physalus*) and sei whale (*B. borealis*). In addition, one endangered pinniped, the Hawaiian monk seal (*Monachus schauinslandi*).

An ESA consultation was conducted by NMFS for species under their jurisdiction to ensure ongoing fisheries operations pursuant to the Bottomfish and Seamount Groundfish FMP are not jeopardizing the continued existence of any listed species or adversely modifying critical habitat. The biological opinion resulting from the consultation is briefly described below. The alternatives contained in this amendment for vessels targeting the MHI deepwater bottomfish complex are intended to end overfishing by reducing fishing mortality in the MHI with no other alteration to the operation of the bottomfish fishery, therefore, the Council believes that they are not likely to jeopardize the continued existence of any threatened or endangered species under NMFS' jurisdiction or destroy or adversely modify critical habitat.

Biological Opinions

The biological opinion issued in March 2002 by NMFS determined the ongoing operation of the western Pacific region's bottomfish and seamount fisheries, as managed under the Bottomfish and Seamount Groundfish Fishery Management Plan, is not likely to jeopardize the continued existence of the Hawaiian monk seal and is not likely to adversely affect any other threatened or endangered species under NMFS' jurisdiction, or destroy or adversely modify any critical habitat. This determination was made pursuant to section 7 of the Endangered Species Act. A formal consultation on the effects of this proposed action on Hawaiian monk seals has been reinitiated under Section 7 of the Endangered Species Act. Management measures in this amendment would be subject to any requirements resulting from that consultation.

6.2.5 Executive Order 12898- Environmental Justice

E.O. 12898 requires that "to the greatest extent practicable and permitted by law…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…"

The alternatives being considered in this amendment are not expected to result in any disproportionate adverse human health or environmental effects to minority populations or low-income populations of the Hawaiian Islands, rather, the impacts would be spread across all MHI Deep 7 fishery participants regardless of race or income.

6.2.6 Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) prohibits, with certain exceptions, the take of marine mammals in U.S. and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the United States. The MMPA gives the Secretary authority and duties for all cetaceans (whales, dolphins, and porpoises) and pinnipeds (seals and sea lions, except walruses). The MMPA requires NMFS to prepare and periodically review stock assessments of marine mammal stocks.

Under section 118 of the MMPA, NMFS must publish, at least annually, a List of Fisheries (LOF) that classifies U.S. commercial fisheries into one of three categories. These categories are based on the level of serious injury and mortality of marine mammals that occurs incidental to each fishery. Specifically, the MMPA mandates that each fishery be classified according to whether it has frequent, occasional, or a remote likelihood of or no known incidental mortality or serious injury of marine mammals.

NMFS uses fishery classification criteria, which consists of a two-tiered, stock-specific approach. As illustrated below, this two-tiered approach first addresses the total impact of all fisheries on each marine mammal stock and then addresses the impact of individual fisheries on each stock. This approach is based on the rate, in numbers of animals per year, of incidental mortalities and serious injuries of marine mammals due to commercial fishing operations relative to a stock's Potential Biological Removal (PBR) level. The PBR level is defined in 50 CFR 229.2 as the maximum number of animals, not including natural mortalities, which may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population.

Tier 1:
If the total annual mortality and serious injury across all fisheries that interact with a stock is less than or equal to 10 percent of the PBR level of this stock, all fisheries interacting with this stock would be placed in Category III. Otherwise, these fisheries are subject to the next tier of analysis to determine their classification.

Tier 2:
Category I: Annual mortality and serious injury of a stock in a given fishery is greater than or equal to 50 percent of the PBR level.
Category II: Annual mortality and serious injury of a stock in a given fishery is greater than 1 percent and less than 50 percent of the PBR level.

Category III: Annual mortality and serious injury of a stock in a given fishery is less than or equal to 1 percent of the PBR level.

The bottomfish fishery in waters of the Hawaii Archipelago is listed as Category III (71 FR 48802; August 22, 2006). The regulations governing Category III fisheries (found at 50 CFR 229.5) are listed below:

§ 229.5 Requirements for Category III fisheries.

- *General.* Vessel owners and crew members of such vessels engaged only in Category III fisheries may incidentally take marine mammals without registering for or receiving an Authorization Certificate.
- (b) *Reporting.* Vessel owners engaged in a Category III fishery must comply with the reporting requirements specified in §229.6.
- (c) *Disposition of marine mammals.* Any marine mammal incidentally taken must be immediately returned to the sea with a minimum of further injury unless directed otherwise by NMFS personnel, a designated contractor, or an official observer, or authorized otherwise by a scientific research permit in the possession of the operator.
- (d) *Monitoring.* Vessel owners engaged in a Category III fishery must comply with the observer requirements specified under §229.7(d).
- (e) *Deterrence.* When necessary to deter a marine mammal from damaging fishing gear, catch, or other private property, or from endangering personal safety, vessel owners and crew members engaged in commercial fishing operations must comply with all deterrence provisions set forth in the MMPA and any other applicable guidelines and prohibitions.
- (f) *Self-defense.* When imminently necessary in self-defense or to save the life of a person in immediate danger, a marine mammal may be lethally taken if such taking is reported to NMFS in accordance with the requirements of §229.6.
- (g) *Emergency regulations.* Vessel owners engaged in a Category III fishery must comply with any applicable emergency regulations.

The alternatives considered in this document would reduce bottomfish fishing effort in the MHI and are not expected to have any adverse impacts to marine mammals.

6.2.7 National Environmental Policy Act

This Final SEIS covers Federal actions related to a proposed amendment to the Council's ongoing management of fisheries managed under the Bottomfish and Seamount Groundfish Fishery Management Plan (FMP) (70 FR 35275; June 17, 2005). The purpose and need for the proposed Amendment 14 is to end overfishing in the bottomfish fishery in the Hawaiian Archipelago by reducing fishing mortality in the Main Hawaiian Islands. This Final SEIS supplements the May 2005 Final Environmental Impact Statement (FEIS), Bottomfish and Seamount Groundfish Fishery of the Western Pacific (WPRFMC 2005a). This document combines the NEPA analysis with the Council's proposed Bottomfish and Seamount Groundfish FMP amendment.

A range of alternatives to end overfishing in the Main Hawaiian Islands are considered in this SEIS and are described in Chapter 2, along with alternatives that were initially considered and rejected from further consideration.

Chapter 4 contains an evaluation of all reasonably foreseeable direct and indirect impacts of the alternatives (sections 4.1 through 4.7) and analyzes potential cumulative impacts of past, present and reasonably foreseeable future actions.

The document was prepared with involvement of interested parties including members of the public. Public participation occurred through multiple public meetings, and opportunities to review and comment on draft SEIS's. Public participation in the planning process is covered in detail in Chapter 1, section 1.7. On March 30 2006, a Draft Supplemental Environmental Impact Statement (DSEIS) which focused on the 2006 recommendations for a 15 percent reduction in bottomfish fishing mortality was made available to the public with a 45-day comment period that closed on May 30, 2006. Before the 2006 DSEIS was finalized however, the 2006 stock assessment was completed. In addition, other events as described in this document resulted in recommendation of new alternatives to end overfishing of bottomfish. These developments resulted in a revised 2007 DSEIS that was prepared in conjunction with the revised Amendment 14 that focused on a 24-percent reduction in bottomfish fishing mortality. The June 2007 DSEIS was released on June 28, 2007, for a 45-day public comment period that closed on August 27, 2007. All comments on both drafts, and from the public meetings, were considered in the development of the alternatives and the analysis of the environmental impacts. A summary of public comments and NMFS's response to the comments is presented in Appendix 4.

6.2.8 National Marine Sanctuaries Act

Under the National Marine Sanctuaries Act (NMSA), the Secretary is authorized to designate discrete areas of the marine environment as National Marine Sanctuaries to protect distinctive natural and cultural resources whose protection and beneficial use require comprehensive planning and management. The National Marine Sanctuary Program is administered by the Sanctuaries and Reserves Division of the National Oceanic and Atmospheric Administration (NOAA).

The alternatives considered in this document are not expected to have any adverse impacts on resources managed by the Hawaii Humpback Whale National Marine Sanctuary.

6.2.9 Paperwork Reduction Act

The purpose of the PRA is to minimize the burden on the public. The Act is intended to ensure that the information collected under the proposed action is needed and is collected in an efficient manner (44 U.S.C. 3501(1)).

The preferred alternative would require that all non-commercial fishermen who for bottomfish in the federal waters of the MHI to obtain Federal permits and for one person from each vessel to submit Federal catch reports. Permit eligibility would not be restricted in any way, and the permit would be renewable on an annual basis. NMFS anticipates that initial permit applications would require 0.5 hours per applicant, with renewals requiring an additional 0.5 hours annually. Based on the State of Hawaii vessel registration program and independent surveys, NMFS estimates that it may receive and process up to 800-5,000 permit applications each year. Thus, the total collection-of-information burden to fishermen for permit applications is estimated by NMFS at 400-2,500 hours per year. The cost for Federal permits has not been determined but would represent only the administrative cost and is anticipated to be less than $80 per permit.

Based on experience in other fisheries, NMFS anticipates the time requirement for filling out Federal catch reports to be approximately 20 minutes per vessel per fishing day. Only one logbook report per trip is required and assuming that the 1,800 current state registered vessels make 10 to 50 trips per year, and average 1.2 days per trip, NMFS estimates that the program would generate in the range of 18,000 to 90,000 daily fishing logbooks per year. Thus, the total collection-of-information burden estimate for fishing data reporting is estimated at 6,000-30,000 hours per year. The implementation of systems to allow electronic, web-based, or telephone reporting would reduce the burden of this requirement on fishery participants.

6.2.10 Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) requires federal agencies to assess the impacts of their proposed regulations on small entities and to seek ways to minimize economic effects on small entities that would be disproportionately or unnecessarily adversely affected.

In order to meet the requirements of the Regulatory Flexibility Act, 5 U.S.C. 601 *et seq*. (RFA) requires government agencies to assess the impact of their regulatory actions on small businesses and other small entities via the preparation of Regulatory Flexibility Analyses. The RFA requires government agencies to assess the impact of significant regulatory actions on small businesses and other small organizations. This amendment document includes an Initial Regulatory Flexibility Analysis (RIR/IRFA) as Appendix 1 in compliance with the RFA.

6.2.11 Executive Order 12866

In order to meet the requirements of Executive Order 12866 (E.O. 12866) the National Marine Fisheries Service requires that a Regulatory Impact Review be prepared for all regulatory actions that are of public interest. This review provides an overview of the problem, policy objectives, and anticipated impacts of the proposed action, and ensures that management alternatives are systematically and comprehensively evaluated such that the public welfare can be enhanced in the most efficient and cost effective way. In accordance with E.O. 12866, the following is set forth by the Council: (1) This rule is not likely to have an annual effect on the economy of more than $100 million or to adversely affect in a material way the economy, a sector of the economy, productivity, jobs, the environment, public health or safety, or state, local, or tribal governments or communities; (2) This rule is not likely to create any serious inconsistencies or otherwise interfere with any action taken or planned by another agency; (3) This rule is not likely to materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights or obligations of recipients thereof; (4) This rule is not likely to raise novel or policy issues arising out of legal mandates, or the principles set forth in the Executive Order; (5) This rule is not controversial.

The measures contained in this amendment are anticipated to yield net economic benefits to the nation by improving our ability to maintain healthy and productive marine ecosystems, and foster the long-term sustainable use of marine resources in an ecologically and culturally sensitive manner that relies on the use of a science-based ecosystem approach to resource conservation and management.

6.2.12 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) authorizes collection of fisheries data and coordination with other agencies for environmental decisions affecting living marine resources. Both formal and informal consultations, cooperative research, and data gathering programs are routinely pursued.

Implementation of this amendment will include coordination with the State of Hawaii's Department of Aquatic Resources in data gathering, compiling, and sharing. They and the agencies listed below have been consulted and have been part of a coordinated process to develop the alternatives under consideration, share results of ongoing research, and discuss future research needs.

6.3 Agencies and Organizations Consulted

The following agencies and organizations were consulted in the drafting of this document:

National Marine Fisheries Service, Pacific Islands Regional Office

NOAA, Office for Law Enforcement

NOAA General Counsel

National Marine Fisheries Service, Pacific Islands Fisheries Science Center

State of Hawaii, Department of Aquatic Resources

U.S. Coast Guard

CHAPTER 7: PROPOSED REGULATIONS

7.1 Proposed Federal Regulations

1. Under Subpart A add § 665.4 to read as follows:

§ 665.4 *Licensing and registration.* Any person who is required to do so by applicable state law or regulation must comply with licensing and registration requirements in the exact manner required by applicable state law or regulation.

2. Under Subpart B revise the definitions of Commercial Fishing, Fishing Year, and Trap, to read as follows:

Commercial fishing means fishing with the intent to sell all or part of the catch or fishing that results in the sale of all or part of the catch. All lobster fishing in Crustaceans Permit Area 1 is considered commercial fishing.

Fishing year means the year beginning at 0001 HST on January 1 and ending at 2400 HST on December 31, with the exception of fishing for Hawaii Restricted Bottomfish Species.

Trap means a box-like device used for catching and holding lobsters or fish.

3. Under Subpart B, add definitions for Hawaii Restricted Bottomfish Species, 2007-08 Fishing Year, and Hawaii Restricted Bottomfish Species Fishing Year for 2008-09 and After, and Main Hawaiian Islands Non-Commercial Fishing Permit to read as follows:

Hawaii Restricted Bottomfish Species 2007 Fishing Year means the year beginning at 0001 HST on October 1, 2007 and ending at 2400 HST on April 30, 2008.

Hawaii Restricted Bottomfish Species Fishing Year for 2008 and After means the year beginning at 0001 HST on September 1 and ending at 2400 HST on August 31 of the next calendar year.

Main Hawaiian Islands Non-Commercial Bottomfish Fishing Permit means the permit authorized under § 665.61 to own or fish from a vessel that is used in any non-commercial vessel-based fishing, landing or transshipment of bottomfish management unit species in the Main Hawaiian Islands Management Subarea. If any fish are sold or offered for sale by any participants on a vessel-based fishing trip under this section, the entire trip is considered to be a commercial trip.

4. Under Subpart B, revise § 665.13(g)(2) to read as follows:

(2) Permits issued under subpart E of this part expire at 2400 HST on December 31 with the exception of Main Hawaiian Islands Non-Commercial Bottomfish Fishing Permits which expire at 2400 HST time on August 31.

5. Under Subpart B, revise § 665.14(a) to read as follows:

§ 665.14(a) *Fishing record forms.* The operator of any fishing vessel subject to the requirements of §§665.21, 665.41, 665.61(a)(4), 665.81, or 665.602 must maintain on board the vessel an accurate and complete record of catch, effort, and other data on paper report forms provided by the Regional Administrator, or electronically as specified and approved by the Regional Administrator. All information specified by the Regional Administrator must be recorded on paper or electronically within 24 hours after the completion of each fishing day. The logbook information, reported on paper or electronically, for each fishing day of the fishing trip must be signed and dated or otherwise authenticated by the vessel operator in the manner determined by the Regional Administrator, and be submitted or transmitted via an approved method as specified by the Regional Administrator, and as required by this paragraph (a).

The owner and operator of any vessel registered to non-commercial bottomfish permits under § 665.61(a)(5) must ensure that a single, accurate and complete record of all catch, effort, and other data is completed on paper report forms provided by the Regional Administrator or electronically as specified and approved by the Regional Administrator, within 24 hr after the completion of each fishing trip, regardless of whether the fishing took place in State or Federal waters, or on the high seas. Each form must be signed and dated or otherwise authenticated by the vessel owner or operator in the manner determined by the Regional Administrator, and be submitted or transmitted via an approved method as specified by the Regional Administrator, and as required by this paragraph (a).

The operator of any vessel subject to the requirements of §§665.21, 665.41, 665.61(a)(4), 665.61(a)(5), or 665.81, must submit the original logbook form for each day of the fishing trip to the Regional Administrator within 72 hr of each fishing trip, unless the fishing was authorized under a PRIA troll and handline permit, a PRIA crustaceans fishing permit, or a PRIA precious corals fishing permit, in which case the original logbook form for each day of fishing within the PRIA EEZ waters must be submitted to the Regional Administrator within 30 days of each landing of MUS. For fisheries managed under §665.602, the original logbook form for each day of the fishing trip must be submitted to the Regional Administrator within 30 days of each fishing trip.

6. Under Subpart E, revise § 665.61(a) to read as follows:

§ 665.61(a)
Applicability. (1)The owner of any vessel used to fish for bottomfish management species in the Northwestern Hawaiian Islands Subarea, Pacific Remote Island Areas Subarea, Guam Subarea, or to fish non-commercially for bottomfish management unit species in the Main Hawaiian Islands Subarea, must have a permit issued under this section and the permit must be registered for use with that vessel.

7. Under Subpart E, add § 665.61(a)(5) to read as follows:

§ 665.61(a)(5) The owner of any fishing vessel that is used for, or any participant on, non-commercial vessel-based fishing, landing or transshipment of bottomfish management unit species in the Main Hawaiian Islands Management Subarea is required to obtain either a Main Hawaiian Islands non-commercial bottomfish permit or a State of Hawaii Commercial Marine License. If any fish are sold or offered for sale, by any participants on a vessel-based fishing trip under this section, the entire trip is considered to be a commercial trip. In either case, all participants must comply with State of Hawaii reporting, licensing and registration requirements as specified in §§ 665.3 and 665.4.

8. Under Subpart E, add § 665.62 (j) through (n) as follows:

(j) Falsify or fail to make or file reports of all fishing activities shoreward of outer boundary of the Main Hawaiian Islands Management Subarea, in violation of §§ 665.3 or 665.14(a).

(k) Own or fish from a vessel that is used to fish non-commercially for any bottomfish management unit species in the Main Hawaiian Islands Management Subarea without either a Main Hawaiian Islands non-commercial bottomfish permit or a State of Hawaii Commercial Marine License, in violation of §§ 665.4 or 665.61(a)(5).

(l) Fish for or possess any Hawaii Restricted Bottomfish Species as specified in § 665.71, in the Main Hawaiian Islands Management Subarea after a closure of the fishery, in violation of §§ 665.72(a) or 665.73(d)(1).

(m) Sell or offer for sale any Hawaii Restricted Bottomfish Species, as specified in § 665.71, after a closure of the fishery, in violation of §§ 665.72(b) or 665.73(d)(2).

(n) Use a vessel to harvest, retain or land more than a total of five fish of all species combined, identified as Hawaii Restricted Bottomfish Species as specified in § 665.71, by any individual participating in a vessel-based non-commercial fishing trip in the Main Hawaiian Islands Management Subarea in violation of § 665.74(a).

9. Under Subpart E, add § 665.71 to read as follows:

Hawaii Restricted Bottomfish Species means the following species:

Common Name	Local Name	Scientific Name
Silver jaw jobfish	Lehi	*Aphareus rutilans*
Squirrelfish snapper	Ehu	*Etelis carbunculus*
Longtail snapper	Onaga	*Etelis coruscans*
Pink snapper	Opakapaka	*Pristipomoides filamentosus*
Snapper	Kalekale	*Pristipomoides sieboldii*
Snapper	Gindai	*Pristipomoides zonatus*
Sea bass	Hapu‘upu‘u	*Epinephelus quernus*

10. Under Subpart E, add § 665.72 to read as follows:

§ 665.72 Closed seasons.

(a) All fishing for, or possession of, any Hawaii Restricted Bottomfish Species as specified in § 665.71, is prohibited in the Main Hawaiian Islands Management Subarea during May 1, 2008, through August 31, 2008, inclusive. All such species possessed in the Main Hawaiian Islands Management Subarea are presumed to have been taken and retained from that Subarea, unless otherwise demonstrated by the person in possession of those species.

(b) Hawaii Restricted Bottomfish Species, as specified in § 665.71, may not be sold or offered for sale during May 1, 2008 through August 31, 2008, inclusive, except as otherwise authorized by law.

(c) Fishing for, and the resultant possession or sale of Hawaii Restricted Bottomfish Species by vessels legally registered to Mau Zone, Hoomalu Zone or PRIA bottomfish fishing permits and conducted in compliance with all other laws and regulations, is exempted from paragraphs (a) and (b).

11. Under Subpart E, add § 665.73 to read as follows:

§ 665.73 Total Allowable Catch Limit

(a) The Hawaii Restricted Bottomfish Species Total Allowable Catch (TAC) limit for the 2007-08 fishing year is 178,000 lb (80,740 kg) caught by holders of Hawaii Commercial Marine Licenses.

(b) TAC limits for subsequent years will be set annually for the fishing year by the Council in consultation with NMFS, based on the best available scientific, commercial, and other information, and taking into account the associated risk of overfishing.

(c) The Regional Administrator shall publish a notice indicating the annual TAC limit in the Federal Register by August 31 of each year and shall use other means to notify permit holders of the TAC limit for the year.

(d) When the TAC limit specified in paragraphs (a) through (c) is reached, or projected to be reached based on analyses of available information, the Regional Administrator will file a notification to that effect with the Office of the Federal Register and use other means to notify permit holders. The notification will include an advisement that the fishery will be closed beginning at a specified date, not earlier than 14 days after the date of filing of the notification of the closure for public inspection at the Office of the Federal Register, until the end of the fishing year in which the TAC limit was reached. On and after the specified date, the following closure restrictions apply.

(1) No person may fish for or possess any Hawaii Restricted Bottomfish Species as specified in § 665.71, in the Main Hawaiian Islands Management Subarea, except as otherwise allowed by law.

(2) Hawaii Restricted Bottomfish Species, as specified in § 665.71, harvested from the Main Hawaiian Islands Management Subarea, may not be sold or offered for sale.

12. Under Subpart E, add § 665.74 to read as follows:

(a) *Bag limits.* No more than a total of five fish of all species combined, identified as Hawaii Restricted Bottomfish Species as specified in § 665.71, may be harvested, retained or landed per day by any individual participating in a vessel-based non-commercial fishing trip in the Main Hawaiian Islands Management Subarea.

CHAPTER 8: PREPARERS AND PUBLIC REVIEW

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Chapter 3: Affected Environment	Tony Beeching F. Kelly Finn Marcia Hamilton George Krasnick Eric Kingma Mark Mitsuyasu Paul Dalzell
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Appendix 2:	Staff from PIFSC
Appendix 3:	Staff from HDAR
Appendix 4:	Staff from NMFS
Appendix 5:	Staff from the Council

8.2 Document Distribution

The following agencies, organizations, and individuals will be provided copies of this document.

Federal Agencies

Director	NMFS PIFSC
Chief	NMFS Office for Law Enforcement Pacific Islands Division
Administrator	NMFS Pacific Islands Regional Office
General Counsel	Pacific Islands Region NOAA
General Counsel	General Counsel for Enforcement and Litigation, Pacific Islands Region
Admiral	U.S. Coast Guard (14th District)
Regional Director	U.S. Fish and Wildlife Service
Chairman	Marine and Fisheries Advisory Council
Regional Administrator	Environmental Protection Agency

U.S. Congressional Delegation

Representative	Commonwealth of the Northern Mariana Islands
Senators	State of Hawaii
Representatives	State of Hawaii
Representative	Territory of Guam
Representative	Territory of American Samoa

State/Territory/Commonwealth Agencies/Organizations

Governor	State of Hawaii
Director	American Samoa Department of Marine and Wildlife Resources
Director	CNMI Division of Fish and Wildlife
Director	CNMI Division of Environmental Quality
Director	Division of Aquatic Resources, DLNR
Director	Guam Division of Aquatic and Wildlife Resources
Director	Hawaii Coastal Zone Management Program
Director	Hawaii Department of Land and Natural Resources
Director	Hawaii Office of Environmental Quality Control
Administrator	Office of Hawaiian Affairs
Director	Public Libraries Hawaii

Other Organizations

Director	Center for Marine Conservation
Director	Earth Justice Legal Defense Fund
Director	Environmental Defense
President	Hawaii Audubon Society

President	Hawaii Bottomfish Association
President	Hawaii Fishermen's Foundation
President	Hawaii Seafood Industry Association
President	Hawaii Sport Fishing Club
President	Kawaihae Fishing Club
President	Keehi Sport Fishing Club
Director	Living Oceans Program, National Audubon Society
President	Maalaea Boat and Fishing Club
Commodore	Maui Trailer Boat Club
President	Marine Conservation Biology Institute
Director	The Nature Conservancy, Hawaii
President	The Ocean Conservancy
Director	Sierra Club, Hawaii
Director	United Fishing Agency, Hawaii
Director	University of Hawaii School of Law, Environmental Law
Director	University of Hawaii Institute of Marine Biology
Director	Western Pacific Fisheries Coalition
President	Windward Sport Fishing Club

Media

News Editor	Associated Press, Hawaii
Editor	Environment Hawaii
Editor	Hawaii Fishing News
Editor	Hawaii Tribune-Herald
Editor	Honolulu Advertiser (Oahu, Kauai, and Maui offices)
Editor	Honolulu Star Bulletin (Oahu, Kauai, and Maui offices)
Editor	Honolulu Weekly
Editor	Kauai Times
Editor	Maui News
Editor	Molokai Advertiser-News
Editor	The Garden Island, Kauai

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CHAPTER 10: INDEX

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APPENDIX 1: RIR and IRFA

Regulatory Impact Review and Initial Regulatory Flexibility Analysis
For
Amendment 14 to the Fishery Management Plan for the
Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region

I. INTRODUCTION

To comply with Executive Order 12866, the National Marine Fisheries Service (NMFS) requires that a Regulatory Impact Review be prepared for all regulatory actions that are of public interest. This review provides an overview of the problem, policy objectives, and anticipated impacts of regulatory actions, and ensures that management alternatives are systematically and comprehensively evaluated such that the public welfare can be enhanced in the most efficient and cost effective way. In addition, the Regulatory Flexibility Act, 5 U.S.C. 601 et seq., requires government agencies to assess the impact of their regulatory actions on small businesses and other small organizations via the preparation of Regulatory Flexibility Analyses.

This document examines the costs and benefits of regulatory actions proposed for the domestic bottomfish fisheries in the main Hawaiian Islands under the Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region (Bottomfish FMP). It also contains analyses of the economic impacts of this action on affected small businesses and other small organizations.

II. OBJECTIVE AND NEED FOR ACTION

The Pacific Islands Regional Administrator notified the Western Pacific Fishery Management Council (Council), on May 27, 2005, that the bottomfish management unit species complex in the Hawaii Archipelago had been determined to be in a state of overfishing (70 FR 34552, June 14, 2005).

Bottomfish in the Hawaiian Archipelago are a collection, or complex, of deep-slope snappers, groupers, and jacks. However, the primary species of concern are the “Deep 7” bottomfish species: onaga (*Etelis coruscans*), ehu (*Etelis carbunculus*), gindai (*Pristipomoides zonatus*), kalekale (*Pristipomoides sieboldii*), hāpuʻupuʻu (*Epinephelus quernes*), ʻōpakapaka (*Pristipomoides filamentosus*), and lehi (*Aphareus rutilans*). As required by the Magnuson-Stevens Act, the objective of this action is to end overfishing in the bottomfish complex in the Hawaiian Archipelago managed under the Bottomfish FMP while minimizing negative impacts to fishery participants, markets and the larger community; and increasing information on bottomfish stocks to aid in future management. This directly supports or is in compliance with all of the Bottomfish FMP’s eight objectives:

Objective 1: Protect against overfishing and maintain the long-term productivity of bottomfish stocks.

Objective 2: Improve the data base for future decisions through data reporting requirements and cooperative Federal/State/Territory programs.

Objective 3: Provide for consistency in Federal/State/Territory bottomfish management to ensure effective management across the range of the fisheries.

Objective 4: Protect bottomfish stocks and habitat from environmentally destructive fishing activities and enhance habitat if possible.

Objective 5: Maintain existing opportunities for rewarding fishing experiences by small-scale commercial, recreational, and subsistence fishermen, including native Pacific islanders.

Objective 6: Maintain consistent availability of high quality products to consumers.

Objective 7: Maintain a balance between harvest capacity and harvestable fishery stocks to prevent over-capitalization.

Objective 8: Avoid the taking of protected species and minimize possible adverse modifications to their habitat.

III. DESCRIPTION OF THE POTENTIALLY AFFECTED FISHERIES

The deep-slope bottomfish fishery in Hawaii concentrates on species of eteline snappers, carangids and a single species of grouper concentrated at depths of 30–150 fathoms (55–275 m). The fishery can be divided into two geographical areas (see Figure 1) the inhabited MHI with their surrounding reefs and offshore banks; and the Northwestern Hawaiian Islands (NWHI), a chain of largely uninhabited islets, reefs and shoals extending 1,200 nautical miles across the North Pacific. This document focuses on the MHI because it is the area that has been identified as requiring action to end bottomfish overfishing.

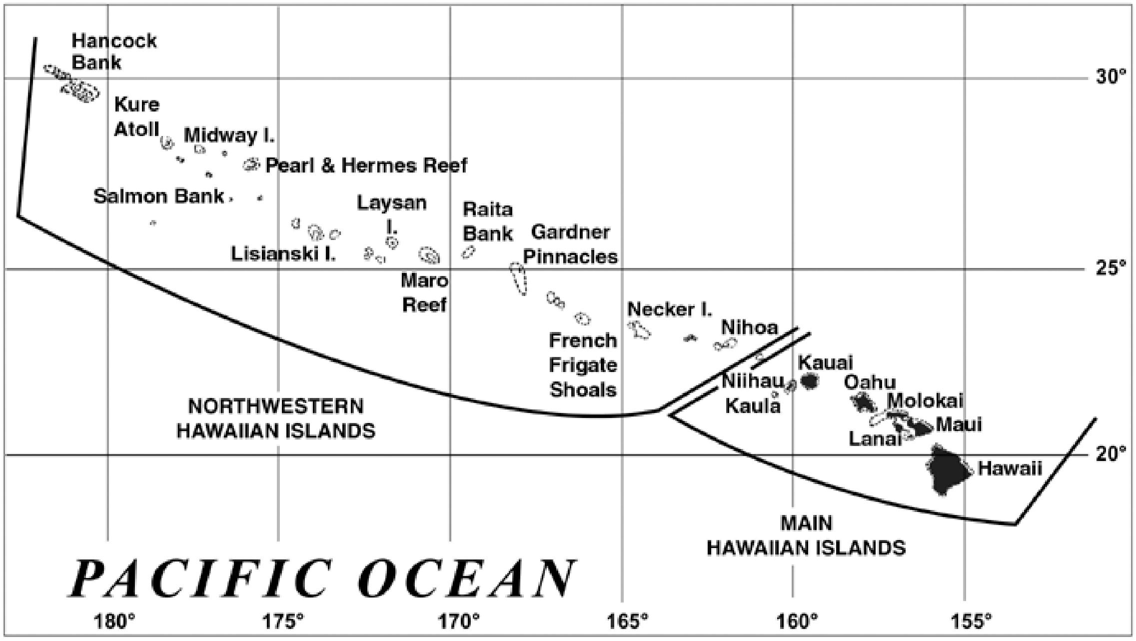

Figure 1. The Hawaii Archipelago

Participation and Effort

In the 1970s the bottomfish fishery around the MHI changed from one dominated, in terms of catch and effort, by a relatively small number of full-time professional fishermen to one dominated by hundreds of part-time commercial and non-commercial fishermen. This change was the result of a number of factors including the growth in popularity of offshore fishing in Hawaii concomitant with the increase in the availability of both locally-built and imported small fiberglass boats. In addition, the rise in fuel prices during the 1970s made fishing for bottomfish particularly attractive to fishermen as it consumed less fuel than trolling and generated higher-value fish catches to offset fuel costs. Finally, as navigation systems, bottom-sounders and hydraulic or electric powered reels became more affordable, the skill level and experience necessary to fish bottomfish successfully was reduced and the labor associated with hauling up the long lines was considerably less.

During the early 1980s, with the development of a much larger market for bottomfish, bottomfish fishermen fishing around the main Hawaiian Islands were able to obtain premium prices for their catches, and thus were motivated to increase their landings (Pooley 1993). However, the number of vessels participating in the MHI fishery declined after reaching a peak of 583 in 1985. The decrease in fishing effort suggests that some bottomfish fishermen perceived a growing shortage of bottomfish in the MHI fishery and switched to other fisheries, particularly targeting pelagic fishes. Currently, most fishermen landing bottomfish commercially switch between fisheries targeting seasonal abundance and market prices. Very few fishermen target bottomfish exclusively year round.

In 1998, concerns about decreasing catch rates led the State of Hawaii's Division of Aquatic Resources (HDAR) to close 19 areas around the MHI to bottomfish fishing, including areas of Penguin Bank within the EEZ.[32] In addition, new state rules established a non-commercial bag limit of five onaga or ehu, or a mix of both, per person per day. Since 1998 HDAR has required any person who may fish for any of the Deep 7 species to first register their vessel with HDAR and display the letters "BF" on their boat. This rule applies to all vessels used for targeting Deep 7 bottomfish, whether the owner is a non-commercial or a commercial fisherman.

Gear, Methods and Areas Fished

The basic design of the handline gear used in Hawaii's bottomfish fisheries has remained essentially unchanged from gear used by early Native Hawaiians (Haight et al. 1993). The gear consists of a main line with a 2-4 kilograms weight attached to the terminus. Several 40–60 centimeters sidelines with circle hooks are attached above the weight at 0.5-1.0 meters intervals. A chum bag containing chopped fish or squid may be suspended above the highest of these hooks. The gear is pulled after several fish are hooked.

All bottomfish fishermen in Hawaii target the same assemblage of bottomfish species. The ability to target particular species varies widely depending on the skill of each captain. Electronic navigation and fish-finding equipment greatly aid fishermen in returning to a particular fishing spot and catching desired species with little incidental catch (Haight et al. 1993). Commercially important deepwater bottomfish inhabit the deep slopes of island coasts and banks at depths of 100 to 400 meters. The distribution of adult bottomfish is highly correlated with suitable physical habitat. In addition to depth, both the quantity and quality of habitat are important and generally include locations of high-relief areas with water movement. Fishermen target specific areas by drifting or anchoring their vessels taking into consideration ocean currents (both surface and at depth), wind speed and direction and sea conditions. These environmental constraints limit the time during which bottomfish fishing can be conducted.

Specific bottomfish fishing locales favored by fishermen vary seasonally according to sea conditions and the availability and price of target species. In 2003, 40 percent of MHI commercial catches of all bottomfish combined were reported from fishing areas around Maui, Molokai and Lanai, 18 percent were from fishing areas around Penguin Bank, another 18 percent were reported from fishing areas around the island of Hawaii, and fishing areas around Oahu and Kauai each yielded another 12 percent (see Table 1). Due to their relatively remote locations, trips around Hawaii and Kauai are likely to have originated on those islands, however the origins of trips around Penguin and Middle Bank, as well as those around the islands of Maui, Molokai and Lanai are unknown as many vessels are known to cross the channels between nearby fishing areas.

[32]The State of Hawaii claims the authority to manage and control the marine, seabed, and other resources within "archipelagic waters." These archipelagic waters encompass a number of bottomfish fishing grounds, such as parts of Penguin Bank that lie inside the EEZ. An October 24, 1997, memorandum from NOAA/General Counsel Southwest Region to the Council Chairman declared that, despite any contentions by the State of Hawaii to the contrary, for purposes of federal fishery management, state waters do not extend beyond 3 miles from the coast.

Table 1. MHI commercial bottomfishing trips, participants, and landings, by fishing area

Year	2000	2001	2002	2003
Area Fished				
Maui, Molokai or Lanai	1,386 trips 146 participants 151,831 pounds	960 trips 120 participants 93,871 pounds	973 trips 112 participants 106,768 pounds	908 trips 99 participants 100,023 pounds
Hawaii	1,526 trips 178 participants 79,135 pounds	1,249 trips 153 participants 61,017 pounds	992 trips 131 participants 45,991 pounds	891 trips 89 participants 46,501 pounds
Penguin Bank	480 trips 77 participants 77,910 pounds	377 trips 58 participants 52,391 pounds	496 trips 59 participants 62,913 pounds	426 trips 50 participants 45,459 pounds
Oahu	563 trips 120 participants 37,204 pounds	398 trips 81 participants 21,718 pounds	518 trips 91 participants 28,999 pounds	612 trips 89 participants 29,645 pounds
Kauai	475 trips 85 participants 35,231 pounds	376 trips 71 participants 35,758 pounds	379 trips 66 participants 39,487 pounds	205 trips 44 participants 29,376 pounds
Middle Bank	17 trips 5 participants NA	8 trips 4 participants NA	7 trips 2 participants NA	5 trips 2 participants NA

Note: Areas are mutually exclusive, however, if a single participant fished in two areas on one physical trip, it was recorded as two "trips" here. Source of data: Kawamoto and Tao 2005.
Participants = vessels.

Commercial fishery

In the small boat fishery around the MHI the distinction between "recreational" and "commercial" fishermen is extremely tenuous (Pooley 1993). A statewide survey of small boat fishermen conducted during 1995–96 indicated that of the 42 fishermen interviewed who predominately used bottomfish fishing gear, 80 percent sold a portion of their catch (WPRFMC 1996). However, many of those selling fish are just trying to cover fishing trip expenses and do not expect a profit from their operation.

Hawaii's sportfishing charter boat fleet began to develop during the early 1950s as Hawaii became an increasingly popular tourist destination (Markrich 1994). What started as a few charter boats operating out of harbors such as Kewalo Basin and Kona has evolved into a highly competitive industry involving nearly 200 vessels statewide (Hamilton 1998; Walker 1996). The charter boat fleet mainly targets pelagic game fish such as billfish and tuna. However, a few charter boats take bottomfish fishing trips if patrons are interested (Hamilton 1998). Most of the charter boats engaged in bottomfish fishing are based on the islands of Maui and Kauai. Charter vessels may sell a portion of their catch and are categorized by the state as commercial vessels

The majority of commercial trips are day trips. The individuals participating in the MHI fishery who make trips longer than 24 hours are mostly full-time commercial fishermen. They typically operate larger boats than the part-time commercial/non-commercial fishermen and are able to fish during rough weather and venture further from port to fish less-exploited areas off Kauai, Niihau, and east Maui that are less accessible to the smaller boat fishermen.

Most fishery participants shift from species group to species group and from the bottomfish fishery to other fisheries, primarily the pelagics fishery, in response to seasonal fish abundance or fluctuations in price. Except for those individuals who fish commercially on a full-time basis, most fishermen usually fish for bottomfish no more than 60 days a year (WPRFMC 1996). Seasonal price variability causes part-time commercial fishermen to concentrate their bottomfish fishing effort during December, when they can take advantage of the year-end holiday demand for red snappers. Pelagic species are often an important secondary target during bottomfish fishing trips regardless of the season.

The number of commercial fishermen engaged in bottomfish fishing in the MHI increased dramatically in the 1970s and 1980s, but then declined in the early 1990s, rebounded somewhat in the late 1990s, but in 2002 reached its lowest level since 1977 (Figure 2). The decline in vessels and fishing effort may be due to the long-term decrease in catch rates in the bottomfish fishery and a shift of fishing effort towards tuna and other pelagic species. There were an average of 380 commercial vessels in the MHI bottomfish fishery between 2000 and 2003 (WPRFMC 2005).

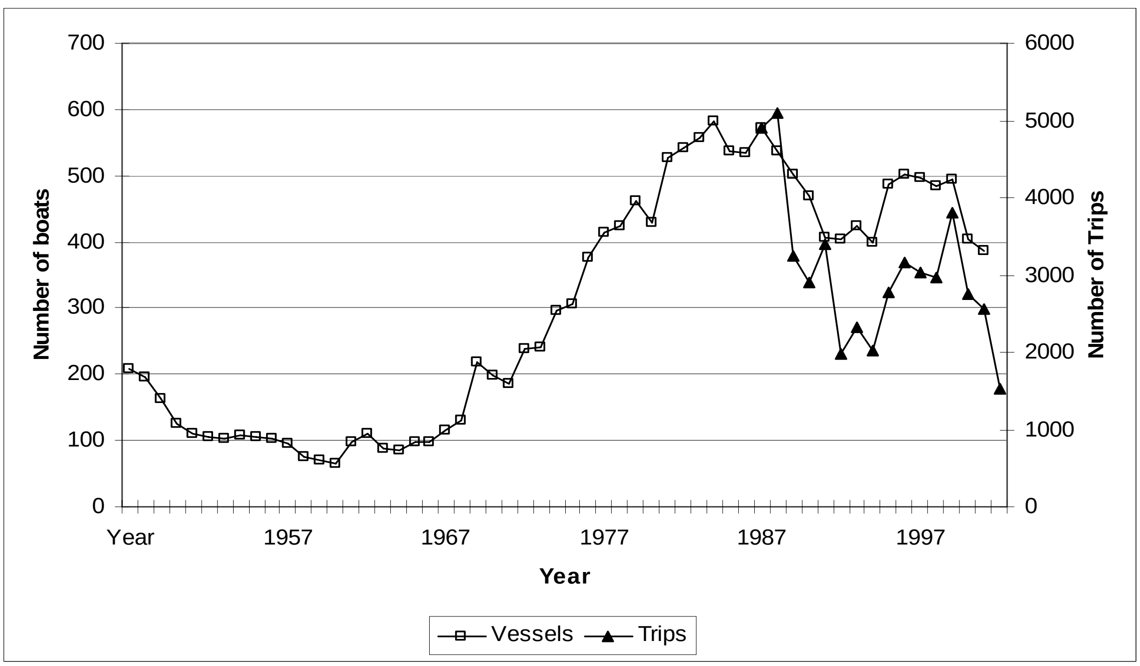

Figure 2. MHI Reported Commercial Bottomfish Vessels and Trips by Year
Source: WPRFMC 2005

Non-commercial Fishery
There are no requirements for saltwater fishing licenses or catch reporting for noncommercial fishermen in Hawaii and hence there is no system for collecting data on catch and effort in this

sector. Over the years, occasional surveys have been fielded, but no systematic collection of noncommercial fisheries data has been sustained. The NMFS Marine Recreational Fisheries Statistical Survey, active in other parts of the country, collected data for a period ending about 20 years ago, but was discontinued in Hawaii. Recently, this program has returned to Hawaii as the Hawaii Marine Recreational Fishing Survey, and is collecting data using a dual survey approach consisting of random telephone surveys and a fisherman intercept survey conducted at boat launch ramps, small boat harbors, and shoreline fishing sites. To date, however, an insufficient number of intercepts of bottomfish fishermen have occurred to allow catch and effort determinations for this fishery.

HDAR's bottomfish fishing vessel registration requirement, however, does offer one way to compare the commercial and non-commercial sectors of the fishery. Each applicant is required to specify commercial or non-commercial status. Non-commercial operations are primarily recreational but include those fishing for subsistence purposes (as long as no sales of fish occurred). As of mid-2003, there were 3,180 vessels registered to fish for bottomfish in the MHI, however, it is likely that many of those registered are not actively participating in the bottomfish fishery as this is a one time registry which does not require annual renewal. The distribution of bottomfishing registered vessels by island is presented in Table 2 which shows that the majority of the bottomfishing registered vessels are on Hawaii and Oahu.

Table 2. Registered Commercial and Non-commercial Bottomfish Vessels by Island

	Kauai	**Oahu**	**Molokai**	**Lanai**	**Maui**	**Hawaii**	**All Islands**
Commercial	271	519	1	5	271	757	1,824
Non- Commercial	109	921	25	16	107	174	1,352
Totals by Island	380	1443	26	21	378	933	3,180
Percent Non-Commercial	28.7	63.8	96.2	76.2	28.3	18.6	Mean % for all islands is 42.6 %

Note. Totals do not add [perhaps due to overlap]. Source: HDAR presentation to WPRFMC.

Included in HDAR's 1998 bottomfish regulations was a control date for a possible future limited entry bottomfish fishery. Some fishermen registered to protect their right to participate in the bottomfish fishery if they should so choose in the future. Others registered because it was not clear to them that reef fish were not included in the regulations. The proportions of respondents in these categories are not known, and it is not known whether they registered as commercial or non-commercial vessels. Registered vessels range in size from 8 feet to 65 feet in length, however, the vast majority of the registered vessels lie in the range 14 feet to 30 feet in length. The largest size class is 19 feet, with about 380 vessels represented (HDAR presentation to WPRFMC).

In 2006 HDAR surveyed all registered bottomfish vessel owners by mail. The return rate was about 20 percent. Of the 722 survey respondents who completed questionnaires, approximately 38 percent said they had actively fished for deep-water bottomfish in the previous year. Forty-eight percent said they occasionally fish for deep-water bottomfish, but hadn't done so during the previous year. Fourteen percent said they do not fish for bottomfish at all. Forty-four percent have either electric or hydraulic bottomfish line pullers. Thirty-eight percent have GPS units and 46 percent have depth sounders. Of those who fished, most fished with another person (range one to five), fished two lines (range one to five) with, most often, five hooks-per-line (range one to thirteen). Bottomfish fishing effort varied cyclically over an annual cycle with most effort during November and December, and least effort during April and May. Weekends and holidays were the favored days for bottomfish fishing. State grid number 52 (331) corresponding with Penguin Bank was by far the preferred fishing area.

Two hundred and seventy-six of the respondents (38 percent) reported that they fished commercially, although not all had current licenses. This result (3,180 registered vessels * 38 percent commercial status * 38 percent active in the past year yields 459 active commercial vessels) corresponds to the number of commercial participants reporting bottomfish landings to HDAR, which ranged from 495 to 325 between 2000-2003 (Figure 2).

In contrast, 62 percent of the survey respondents reported that were non-commercial fishermen (they did not sell any fish). If this proportion holds true for the entire database, then by this estimate, approximately 750 registered vessels are actively used for non-commercial and subsistence bottomfish fishing (3,180 vessels * 62 percent non-commercial status * 38 percent active).

Landings of onaga and ehu by the non-commercial sector are restricted to five fish (both species combined) per person, per day, but other species are not subject to catch limits. Nevertheless, it is likely typical landings by non-commercial bottomfish vessels average much less than their commercial counterparts because of differences in vessel capability, fishing skill, and avidity. At this time it is not possible to estimate the total non-commercial landings.

Commercial Fishery Landings and Revenues

Because there are no State or Federal reporting requirements for non-commercial fishing in the waters around Hawaii, only commercial landings data are available. Charter boat operators are considered to be commercial fishermen under Hawaii statute and therefore are required to submit monthly catch reports. Consequently, charter boat catches are included in estimates of commercial landings.

Based on recent (1999 to 2003) landings data, commercial bottomfish catches in the MHI represent approximately 60 percent of the total commercial bottomfish landings in Hawaii (WPRFMC 2005).

Table 3 presents the commercial landings of all MHI bottomfish species managed under the Bottomfish FMP (bottomfish management unit species or BMUS). Landings peaked in the 1988 to 1989 period, coincident with the historical maximum number of recorded trips. In recent years, landings have trended downward, with the 2003 landings being the lowest since 1970, reflecting the 25-year low in number of trips seen in Figure 2.

Table 3. MHI BMUS Landings, 1996–2004

Species Name	1996	1997	1998	1999	2000	2001	2002	2003	2004
Hāpu‘upu‘u	11,466	14,215	11,346	10,106	16,183	11,105	8,411	10,208	8,018
Kāhala	5,526	12,108	21,805	17,599	22,573	13,823	11,336	4,886	6,952
Kalekale	21,788	21,252	19,886	11,190	16,659	11,759	11,451	9,922	7,785
‘Ōpakapaka	148,730	145,807	141,958	129,155	149,879	100,003	108,917	115,719	102,168
Uku	53,309	67,976	61,105	89,834	80,036	57,469	56,930	44,254	67,776
Ehu	28,286	25,798	23,728	19,429	29,522	20,911	17,441	15,489	22,178
Onaga	67,550	69,145	58,325	60,981	74,531	54,993	68,981	71,560	85,072
Papio/Ulua	35,579	41,330	40,770	25,039	23,409	24,585	20,605	1,046	1,765
Lehi	8,839	12,367	8,647	9,859	10,834	10,427	9,536	8,573	6,673
Gindai	3,143	2,812	3,346	2,390	3,653	3,127	2,129	2,039	2,104
Ta‘ape	44,195	85,491	74,851	70,073	55,041	47,551	39,399	37,895	43,528
Armorhead	0	0	0	0	0	0	0	0	0
Butaguchi	3,261	5,926	1,944	1,796	2,653	1,737	1,649	1,632	1,341
Gunkan ulua	*	192	315	*	*	123	421	1,072	1,038
White ulua	6,213	2,204	3,717	2,977	4,046	4,202	4,114	12,255	11,087

Note: Asterisks indicate that information was removed because it was derived from fewer than three licensees and is therefore confidential. Source: Kawamoto and Gonzales 2005a.

Inflation-adjusted gross revenue in the MHI bottomfish fishery grew steadily in the 1980s as a result of increases in both real prices and landings (WPRFMC 2003). However, beginning in 1990, revenue in the MHI fishery decreased sharply as both MHI bottomfish prices and landings declined. Inflation-adjusted revenue in the MHI fishery reached its lowest levels ever in 2001 (Table 4).

Revenue from the MHI fishery has always been greater than that from the NWHI. Before the mid-1980s, MHI bottomfish revenue made up over 80 percent of the total Hawaii bottomfish revenue. The proportion declined due to a dramatic increase in NWHI bottomfish landings in the mid-1980s, and the MHI revenue was about 50 percent of the total during the period 1985–1987. Since then, revenues in both areas have declined, but revenue from the MHI fishery remains above that of the NWHI. It was 67 percent of the total in 2003.

Historically, bottomfish catches from the MHI have tended to command higher aggregate prices than those caught in the NWHI, reflecting a larger proportion of preferred species and greater freshness. In the late 1990s, however, the prices appeared to converge, perhaps due to softness of the upscale part of the Hawaii market during an economic recession in the State (WPRFMC 1999). From 2001 through 2003, however, the price differential between MHI and NWHI fish widened considerably, possibly as a result of the large increase in imported bottomfish substituting in the market for NWHI fish. The 2003 inflation-adjusted per pound price for NWHI fish was the lowest ever recorded. This was in marked contrast to the inflation-adjusted prices received for MHI bottomfish, which reached their highest level in 13 years (Table 4).

Table 4. Inflation-Adjusted MH BMUS Revenue and Price, 1996–2003

Year	MHI Revenue ($1,000)	MHI Price ($)
1996	1,719	4.23
1997	1,703	3.63
1998	1,631	3.73
1999	1,482	3.65
2000	1,717	3.84
2001	1,309	3.79
2002	1,396	4.13
2003	1,460	4.35

Source: WPRFMC 2005

Using 2000-2003 average participation and fleetwide revenues (380 commercial participants realizing a fleetwide annual average of $1,470,000 in ex-vessel revenues) each MHI commercial bottomfishing operation averages annual ex-vessel bottomfish revenues of approximately $3,870. However it is known that fishery effort, landings and revenues are not evenly distributed as up to 12 MHI commercial bottomfish fishermen have been identified as engaging in the fishery as their fulltime occupation.

In general the relative importance of MHI bottomfish to commercial participants as a percentage of overall fishing (or household) income is unknown as the total suite of fishing (or other income generating) activities undertaken by individual operations across the year has not been examined to date. Fifty-five respondents to a survey of Hawaii's primarily non-pelagic commercial small boat fishermen conducted in 1995-1996 reported taking an average of 82 – 155 commercial fishing trips (part and fulltime fishermen respectively) each year, with 17-20 of these targeting bottomfish and the remainder targeting other species (Hamilton and Huffman, 1997). Average vessel investment ranged from $34,420 to $36,781 and included the purchase of the vessel and trailer, electronics and other vessel upgrades as well as major fishing gear.

Deep 7 Commercial Landings and Revenues

Landings and revenues for Deep 7 species are the most relevant to this analysis as all alternatives allow continued fishing of other (non-Deep 7) bottomfish. Data for 2003-2004 are presented in Table 5.

Table 5. MHI Deep 7 Pounds Landed and Ex-vessel Revenues 2003–2004

Species Name	2003		2004	
	Pounds Landed	Ex-vessel Revenues	Pounds Landed	Ex-vessel Revenues
Hāpuʻupuʻu	10,208	$ 44,785	8,018	$ 39,209
Gindai	2,039	$ 7,061	2,104	$ 8,039
Kalekale	9,922	$ 30,395	7,785	$ 27,430
ʻŌpakapaka	115,719	$ 581,849	102,168	$ 547,304
Lehi	8,573	$ 28,220	6,673	$ 23,992
Ehu	15,489	$ 74,855	22,178	$ 108,449
Onaga	71,560	$ 434,453	85,072	$ 562,731

Source: Kawamoto and Gonzales 2005a.

As can be seen in Figure 3 and Table 6, Deep 7 landings (and associated revenues) are not evenly distributed across participants as the majority caught less than 500 lb of the Deep 7 species. The mean number of those with CMLs reporting for the years 1998-2004 is also presented in Table 6 (in general there is one reporting CML holder per fishing operation (vessel)).

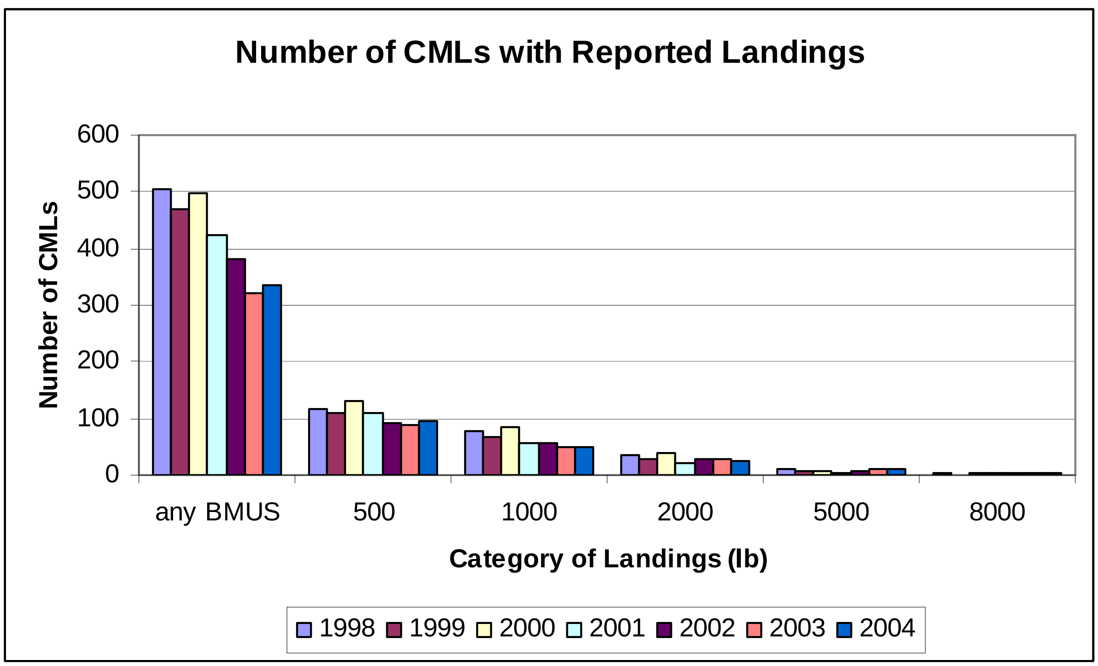

Figure 3. Number of Commercial Fishing Operations, Sorted by Annual Landing Volumes of Deep 7 Species

Table 6. Mean Number of Commercial Fishing Operations, Sorted by Landing Volumes of Deep 7 Species (1998-2004)

Annual Deep 7 Landings (lb)	Number of Reporting CMLs
1-500	313
501-1,000	42
1,001 – 2,000	35
2,001 – 5,000	21
5,001 – 8,000	5
>8,000	3

Source: Kawamoto and Gonzales 205a

Again, the distribution of Deep 7 landings is highly skewed with the vast majority of operations averaging 500 or less lb annually, and only eight averaging over 2,000 lb. Overall landings of Deep 7 species also vary by month, as illustrated in Table 7.

Table 7. 2004 MHI Commercial Landings of Deep 7 Species by Month (lb)

	Ehu	Gindai	Hapu-pupu	Kale-kale	Lehi	Onaga	Opaka-paka	Total
Jan.	2,563	179	941	855	1,195	10,640	15,739	37,296
Feb.	2,057	224	675	848	527	7,927	9,178	24,137
March	1,429	120	434	602	352	4,845	5,161	14,541
April	1,962	255	658	701	384	4,695	7,918	19,709
May	1,902	359	735	708	42	3,192	5,364	21,035
June	705	36	246	158	76	2,525	2,973	16,067
July	1,661	122	541	290	77	4,028	2,505	18,145
Aug.	1,109	42	455	300	74	2,497	4,124	15,549
Sept.	1,412	189	464	716	509	6,589	5,768	24,498
Oct.	1,463	165	309	486	697	7,618	9,225	24,995
Nov.	2,282	242	1,231	731	1,626	13,152	16,232	39,765
Dec.	3,889	233	1,428	1,362	1,125	17,718	18,603	47,852
Total	22,434	2,166	8,117	7,757	6,684	85,426	102,790	235,374

In addition, individual Deep 7 revenues will vary seasonally with changes in prices received (Figure 4).

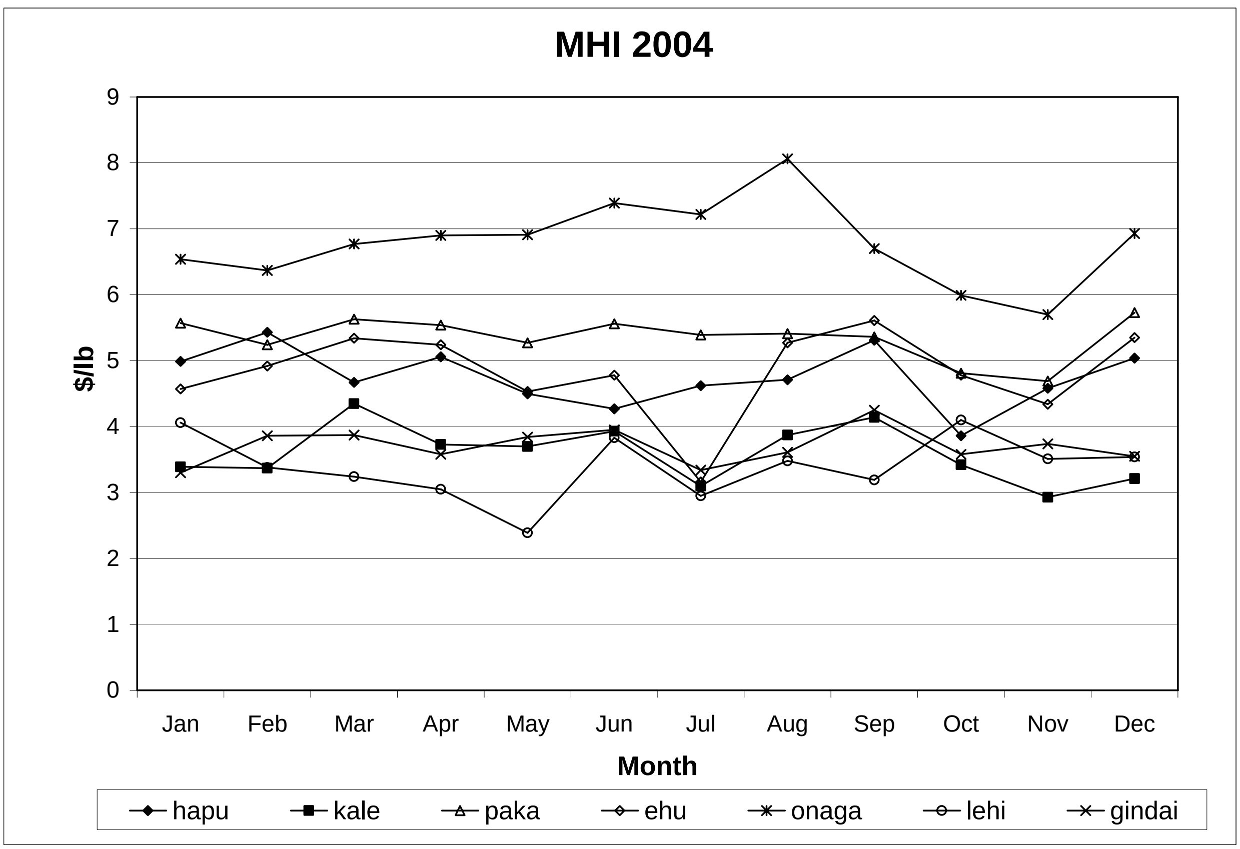

Figure 4. Average Deep 7 Prices by Species by Month for the MHI
Source: Kawamoto and Gonzales 2005c.

The relative importance of MHI Deep 7 species to individual fishing operations as a percentage of overall fishing (or household) income is unknown as the total suite of fishing (or other income generating) activities undertaken by individual operations across the year has not been examined to date.

Processing and Marketing

A market for locally caught bottomfish was well-established in Hawaii by the late nineteenth century. Bottomfish caught in the MHI fishery are sold in a wide variety of market outlets (Haight et al. 1993). Some are marketed through the Honolulu fish auction (United Fishing Agency, Ltd.) and others through intermediary buyers on all islands. Sales of MHI bottomfish also occur through less formal market channels. For example, local restaurants, hotels, grocery stores, and individual consumers are important buyers for some fishermen. In addition to being sold, MHI bottomfish are consumed by fishermen and their families, given to friends and relatives as gifts, and bartered in exchange for various goods and services.

Historically, the demand for bottomfish in Hawaii has been largely limited to fresh fish and household consumers in Hawaii prefer and restaurants often serve plate-sized bottomfish with the head attached. Medium to large bottomfish from the MHI are often targeted for export markets and local high-end specialty restaurants that demand the highest sashimi quality and Pooley (1987) found that Hawaii auction market prices increase when MHI landings drop (Figure 5).

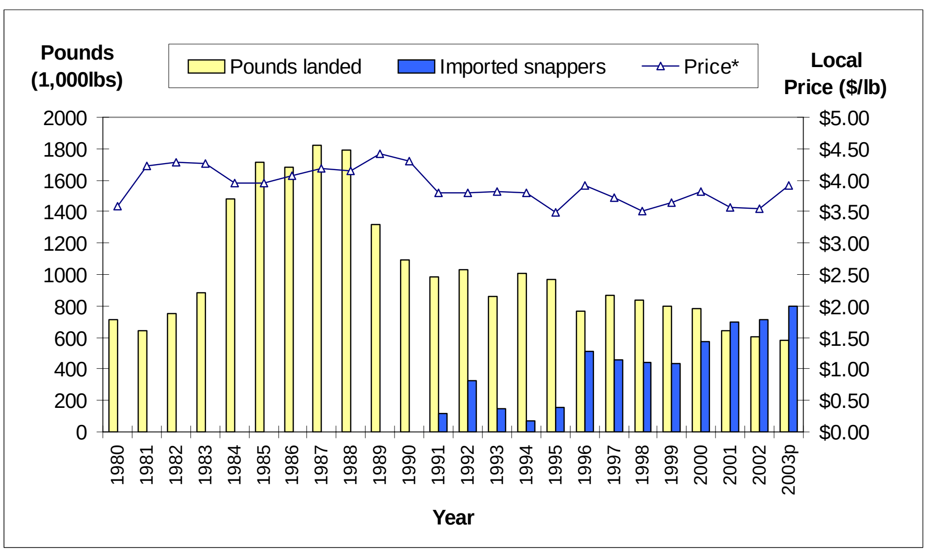

Figure 5. Hawaii Bottomfish Demand (Annual, Inflation-Adjusted Ex-Vessel Price and Supplies [Domestic Landings and Imported Fresh Snapper]), 1980–2003
Source: WPRFMC 2005

However, during the 1990s the relationship between price and volume faltered, perhaps due to an increase in imported fresh fish that competed in the market with locally caught bottomfish

(WPRFMC 1999). According to U.S. Customs data for the Port of Honolulu, 715,000 pounds of snapper were imported in calendar year 2002 (Figure 6), worth $1.92 million ($2.68 per pound; WPRFMC 2004). This amount exceeded domestic supplies and was a significant factor in ex-vessel prices. Not only has the quantity of foreign-caught fresh fish increased in recent years, but the number of countries exporting fresh fish to Hawaii has also increased. Fifteen years ago, for example, fresh snapper was exported to Hawaii mainly from within the South Pacific region. In recent years, Tonga and Australia have been the largest sources of fresh snapper, with Fiji, New Zealand, Indonesia, Samoa, Vietnam, Chad, and Madagascar being other sources.[33]

[33]http://www.st.nmfs.gov/pls/webpls/trade_dist_allproducts_mth.results?qtype=IMP&qmonthfrom=01&qmonthto=01&qyearfrom=1996&qyearto=2005&qproduct=%25&qdistrict=32&qsort=COUNTRY&qoutput=TABLE

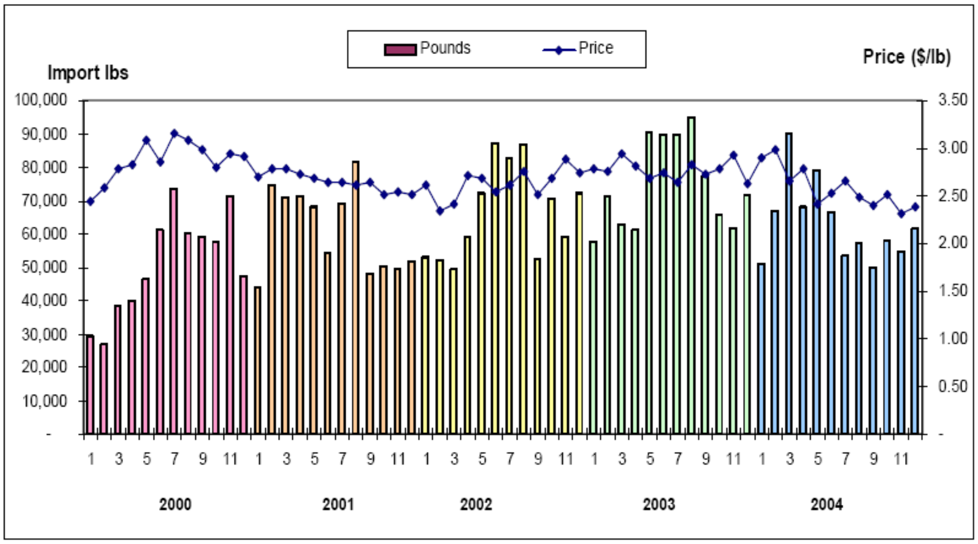

Figure 6. Monthly Imports of Bottomfish into Hawaii, 2000-2004
Source: PIFSC 2005, unpublished data.

To further explore the value of Hawaii's fresh local bottomfish, and the role imports play in the market, the Council sponsored a study of the attitudes and beliefs of Hawaii restaurateurs and executive chefs (Coffman 2004). Table 8 summarizes the quantitative information derived from interviews with 24 of Hawaii's top chefs.

Table 8. Hawaii Chefs' Survey Responses

INTERVIEW RESULT	PERCENTAGE OF CHEFS INTERVIEWED
Knew if their fish was from the MHI or the NWHI	0
Only serve Hawaii-caught bottomfish	19
Try to serve Hawaii-caught bottomfish	29
Advertise bottomfish dishes as "Fresh Island Fish" or similar	29
Volunteered that the price of bottomfish is high and/or rising	29
Volunteered concern over bottomfish sustainability	73
Volunteered concern about fishing regulations driving up bottomfish prices	14
Said customers are willing to pay more for Hawaii-caught bottomfish	42.8
Said customers are not willing to pay more for Hawaii-caught bottomfish	19
Said customers expect Hawaii-caught bottomfish to be less expensive in Hawaii relative to other fish dishes	9.5
Named bottomfish on list of "most desirable fish species"	77.3

Source: Coffman 2004

The survey found that it was typical for the restaurant to purchase Hawaii-caught bottomfish fillets from a wholesaler at a price of $12 to $16 per pound. NWHI bottomfish were more suitable for filleting than MHI fish because of their larger size, but the higher quality of MHI fish allowed their use for sashimi. Summary conclusions of the study were as follows:

> Bottomfish is a popular dish in most of Oahu's top-end restaurants. Several of the most noted "boutique type" restaurants only serve Hawaii-caught bottomfish. The expensive prices as well as the inconsistency of supply of both MHI and NWHI bottomfish make it difficult for most restaurants to serve only Hawaii-caught fish. Most restaurants serve a combination of Hawaii-caught and imported bottomfish. Because of obvious time factors, MHI bottomfish are considered the freshest and highest quality by most wholesalers while NWHI bottomfish can be comparable to some imports. It seems that some countries' fishermen are able to come into port soon enough, handle the fish well enough, and can fly the bottomfish to Hawaii in a manner timely enough to rival the average quality of a bottomfish boat that comes into port from the NWHI every few weeks. The NWHI bottomfish fishery does, however, help fill the niche of Oahu restaurants who only serve Hawaii-caught fish.

State and Federal Jurisdiction and Management

To date bottomfish fishing around the MHI has been managed by the State of Hawaii, although new mapping indicates the majority (53 percent) of MHI bottomfish habitat (100 – 400 m) is located within Federal jurisdiction (3-200 miles from shore). Through a cooperative data sharing agreement, NMFS obtains commercial bottomfish landings data from HDAR. The State's current management measures in the MHI include bottomfish vessel registration, commercial fishing reporting, non-commercial bag limits for two bottomfish species (onaga and ehu), and 19 restricted bottomfish fishing areas (BRFAs). The State has proposed changing the size, location, and number of BRFAs from 19 to 12 based on recent sonar mapping of bottomfish habitat throughout the MHI. Recent analysis has determined that the State's existing BRFAs encompass 9.2 percent of what the researchers define as "suitable habitat" for the deep-slope bottomfish while the newly proposed 12 BRFAs would encompass 11.2 percent, for a net increase of 2 percent as compared to the 2003 and 2004 baselines (Parke 2007). Current Federal regulations regarding bottomfishing in EEZ waters around the MHI prohibit the use of bottom trawls, bottom set gillnets, poisons or explosives.

Hawaii Regional Economy

Hawaii's economy is dominated by tourism and defense, with tourism by far the leading industry in terms of employment and expenditures. The two represent approximately one quarter of Gross State Product (Table 9) without consideration of ancillary services and also comprise the largest shares of "export" earnings (Table 10).

Table 9. Hawaii's Gross State Product

Year	Gross State Product (million $)	Per Capita State Product	Resident Population
2005	53,710	$42,119	1,275,194

Source: DBEDT 2005

Table 10. Hawaii's "Export" Industries

Year	Sugar (million $)	Pineapple (million $)	U.S. Military (million $)	Tourism (million $)
2004[34]	94	123	4,772	10,862

Source: DBEDT 2006

Natural resource production remains important in Hawaii, although nothing compared to the period of the sugar and pineapple plantations from throughout the first 60 or 70 years of the 20th century. Crop and livestock sales were $516.1 million in 2004, with the primary diversified agriculture crops being flower and nursery products, $94.5 million; macadamia nuts, $40.1 million; coffee, $19.8 million; cattle, $22.1 million; milk, $20.2 million (DBEDT 2006). Aquaculture production was $28.1 million in 2004 (DBEDT 2006), although much of aquaculture's value to Hawaii comes from development of technology. Commercial fishing ex-vessel value was $57.5 million, not including value added by the seafood processing sector (WPacFIN 2007), lower than some earlier years due to the closure of the longline fishery for swordfish from 2000-2004.

Hawaii's commercial economy has been particularly vibrant over the past five years, with a 7.5 percent growth in Gross State Product in 2005 and an average of 5.8 percent annual growth rate since 2000. Figure 7 indicates the long-term trend in Gross State Product (1970-2005), with the inflation-adjusted figures clearly showing the downturns in the early 1980s and the mid-1990s, followed by sustained growth recently.

[34] 2004 is the most recent year when complete industry statistics are available.

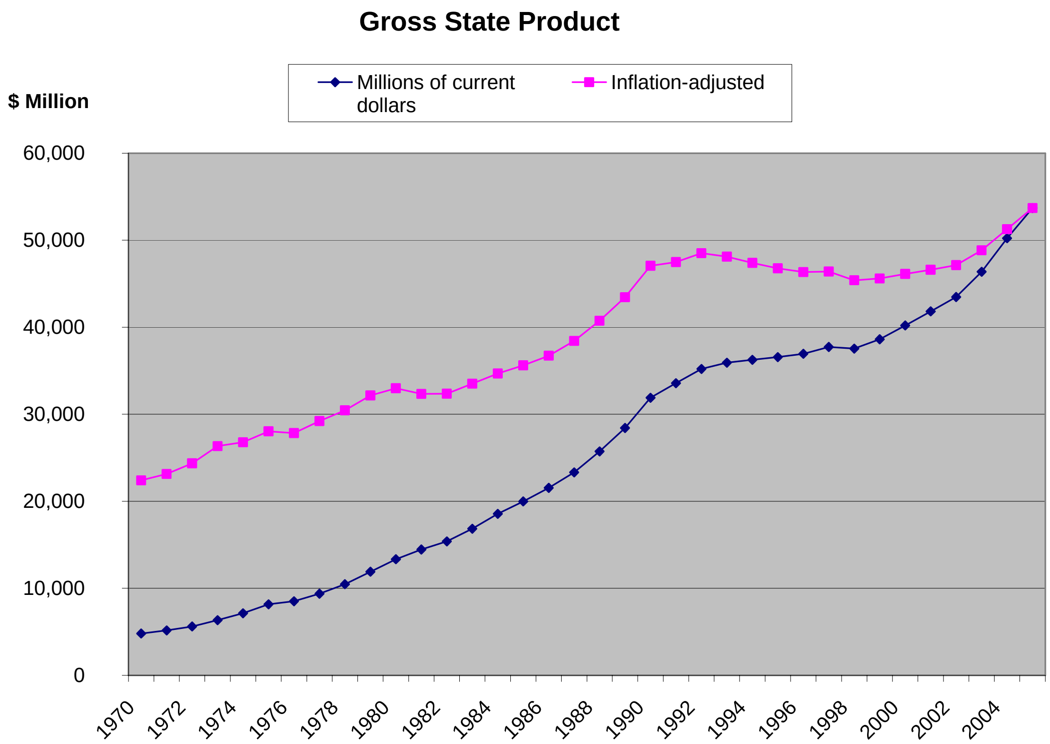

Figure 7: Gross State Product, 1970-2005

The 2006 unemployment rate (see Table 11) of 2.6 percent (DBEDT 2007) was the lowest in the United States by far, and less than half the U.S. average rate. This marks a major turn-around from the 1990s when Asian economies declined, the U.S. military down-sized due to the end of the Cold War, and Hawaii plantation agriculture was battered by the cost effects of global trade. Construction, manufacturing and agriculture account for only 9 percent of wage and salary jobs. About 30 percent of civilian workers are professional or managerial. Federal, state and local government accounts for 20 percent of wage and salary jobs (DBEDT 2006).

Table 11. Hawaii 2006 Employment Statistics

	2006
Civilian labor force	651,850
Employed	635,100
Unemployment rate	2.6%
Payroll jobs	624,650
Real personal income ($ million)	46,766

Tourism arrivals increased almost monotonically from 1970-1990, but growth was slower in the 1990s until the past three years. There were 7.4 million tourists in Hawaii in 2005. This represents a daily rate of 185,445 tourists, 13 percent of the "de facto" population (resident, tourist, and military combined), indicating the weight of tourism in many sectors of Hawaii's economy and society (DBEDT 2005). Tourism arrivals have become more evenly distributed across source locations, with the continental U.S. and Japan being the mainstays, but with arrivals increasing from Europe and China. Nonetheless, Hawaii's economy remains subject to national and international economic factors.

Total federal expenditures were $12.2 billion in 2004, with 85,900 military personnel and dependents and 31,300 federal civilian workers (not all of whom work on military bases, DBEDT 2006). Research and development spending by the federal government (2003) was $349.6 million representing the importance of the University of Hawaii and a number of other public and private research entities in particular.

Despite these successes, at some individual and community levels, Hawaii's commercial economy has been less successful. For example, per capita disposable income in Hawaii ($29,174) has fallen to below the national average despite a cost of living nearly double the national average (Table 12).

Table 12. Hawaii Cost of Living Comparison

Cost of Living Analysis: Ratio of Honolulu living costs compared to U.S. Average at four income levels				
	Income level 1	Income level 2	Income level 3	Income level 4
Honolulu cost of living Indexed to U.S. average	192.9	171.6	161.9	155.1
Rent, utilities	241.4	235.4	230.3	229.0

Source: DBEDT 2005. Table 14.11

Indeed, per capita Gross State Product is the same today as it was in 1990. Hawaii per capita income has fallen from 122.5% of the U.S. average in 1970 to 99% in 2005 (Figure 8). Much of this is attributable to housing costs, with the average single family house selling for $744,174 in 2005, with the median being $590,000, the latter discrepancy also indicating the uneven nature of the housing industry in Hawaii over the past several years.

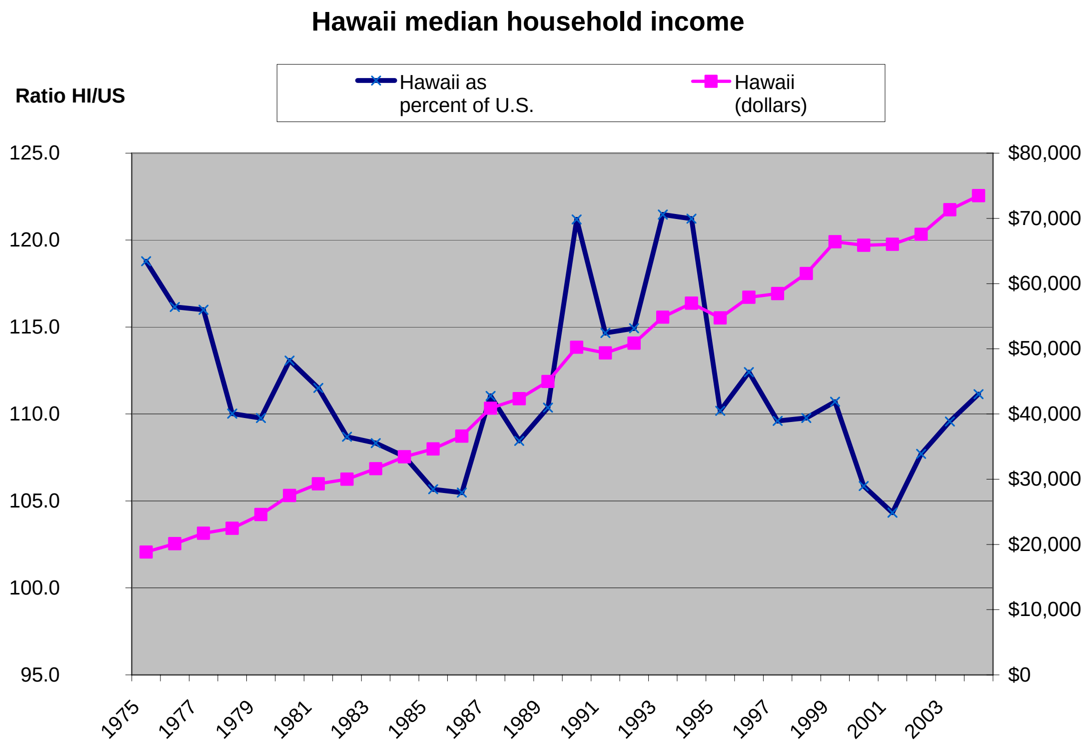

Figure 8. Hawaii Median Household Income, 1975-2005

Tourism is a service industry, and as such, tends to have lower wage levels than manufacturing, for example. So the dominance of tourism means that many workers in Hawaii holds more than one job, with 16 percent of the workforce reporting they work 49 or more hours per week (DBEDT 2005). Similarly, the benefits of the commercial economy are not spread evenly across either islands or ethnic groups in Hawaii. In 2004, 8.4 percent of Hawaii's population was below the poverty line (DBEDT 2005). The effect of these conditions is that the value of common use resources, such as shorelines, forests, and the ocean, is important for both subsistence and recreational reasons.

The State of Hawaii has been attempting to diversify its economy for many years. Industries encouraged are science and technology, film and television production, sports, ocean research and development, health and education tourism, diversified agriculture and floral and specialty food products. (DBEDT 2006) However these remain small percentage of the Hawaii commercial economy.

Recent economic trends analysis (Bank of Hawaii, October 2005) concluded the following:

> Strong Hawaii employment data through August 2005 confirm recently reported first half Honolulu inflation, yielding strong Hawaii real personal income growth, suggesting that good economic momentum continued into third quarter 2005. Flattening summer tourism numbers against seasonal capacity constraints, combined with a stronger dollar and continued travel cost pressure from rising fuel costs, support the forecast of slower visitor arrivals growth going into 2006. As noted with

last month's semiannual construction forecast revisions, construction growth is also expected to slow during 2006 because of completion of the military construction ramp-up and decreases in private authorizations. But strong overall economic growth should spill over from 2005 to 2006 for Hawaii, with only a modest slowing in the local expansion's pace.

Hawaii's Fishing-Related Economic Activities

The most recent estimate of the ex-vessel value of fish sold by Hawaii's fisheries is $ 70.9 million. This amounts to a small percentage of Gross State Product, in fact, less than 1%. On the other hand, the seafood industry is an important component of local and tourist consumption, and non-commercial fishing represents a substantial proportion of the local population (estimated at 109,000 participants, 8.6% of Hawaii's population).[35] And additional 41,000 tourists are also reported to go fishing while in Hawaii, and total fishing expenditures (resident and tourist combined) were estimated at $125 million.

The most recent estimate of the total economic contribution of the commercial and non-commercial fishing sectors to the state economy indicated that in 1992, these sectors contributed $118.79 million of output (production) and $34.29 million of household income, employing 1,469 people (Sharma et al. 1999). These contributions accounted for 0.25 percent of total state output ($47.4 billion), 0.17 percent of household income ($20.2 billion), and 0.19 percent of employment (757,132 jobs). Recreational, subsistence and sport (e.g. charter) fisheries provide additional but unquantified economic benefits in terms of angler satisfaction, protein sources, and tourism revenues.

Hawaii's pelagic fisheries are responsible for the largest share of annual commercial landings and ex-vessel revenue, with 28.2 million pounds of pelagic fish landed in 2005 at an ex-vessel value of $66.7 million. The domestic longline fishery for tuna, swordfish, and other pelagic species is the largest component of the fishery, landing 23 million pounds in 2005 with an ex-vessel value of $58 million. Among the demersal fisheries, commercial harvests of coral reef associated species dominate, with MHI and NWHI bottomfish relatively close behind (Table 13). The rest of Hawaii's commercial fisheries are relatively small, with annual fishery ex-vessel revenues of less than $150,000.

Table 13. Ex-vessel Revenues From Hawaii's Demersal Fisheries

	Pounds Sold	Ex-vessel Revenue
Coral reef species (2005)	701,624	$1,796,764
MHI bottomfish (2003)	272,569	$1,460,000
NWHI bottomfish (2003)	222,000	$851,219
MHI crustaceans (2005)	10,091	$110,927
Precious corals (1997)	415	$10,394
Total	1,206,699	$4,229,304

[35] DBEDT, 2005

Another perspective on the role of bottomfish in Hawaii is to compare landings with pelagic, reef fish, and other fish. Table 14 shows the changing patterns from 2000 to 2003 (NMFS 2004).

Table 14. Annual Estimated Commercial Landings in Hawaii (1,000 lbs), 2000–2003

Year	Pelagic Fish	Bottomfish	Reef Fish	Other Fish
2000	26,763	718	199	957
2001	22,011	660	250	591
2002	22,330	621	345	662
2003	21,993	602	315	661

Estimates of the economic activity in the commercial and non-commercial sectors of Hawaii's bottomfish fishery can be obtained from various published data. For the period 1994 to 1998, the ex-vessel value of annual commercial landings in the NWHI and MHI bottomfish fisheries averaged about $1,096,200 and $1,625,800, respectively (WPRFMC 1999). Based on data collected in a cost-earnings study of Hawaii's charter fishing industry (Hamilton 1998), it is estimated that the charter boat fleet earns about $342,675 per year from taking patrons on bottomfish fishing trips. Finally, based on information gathered in a cost-earnings study of Hawaii's small boat fishery (Hamilton and Huffman 1997), it is estimated that annual personal consumption expenditures for non-commercial vessels engaged in bottomfish fishing total about $2,827,096. Non-commercial vessels are fishing boats that do not sell any portion of their catch.

However, the above values reflect only the direct revenues and expenditures in the various sectors of the bottomfish fishery. They do not take into account that employment and income are also generated indirectly within the State by commercial and non-commercial fishing for bottomfish. The fishery has an economic impact on businesses whose goods and services are used as inputs in the fishery, such as fuel suppliers, chandlers, gear manufacturers, boatyards, tackle shops, ice plants, bait shops, and insurance brokers. In addition, the fishery has an impact on businesses that use fishery products as inputs for their own production of goods and services. Firms that buy, process, or distribute fishery products include seafood wholesale and retail dealers, restaurants, hotels, and retail markets. Both the restaurant and hotel trade and the charter fishing industry are closely linked to the tourism base that is so important to Hawaii's economy. Finally, people earning incomes directly or indirectly from the fishery make expenditures within the economy as well, generating additional jobs and income.

A more accurate assessment of current contributions of the bottomfish fishery to the economy can be obtained using the Type II output, income and employment multipliers calculated by Sharma et al. (1999) for Hawaii's (non-longline) commercial and non-commercial fishing sectors. Applying these multipliers to an approximation of the final demand in each of the sectors involved in bottomfish fishing, it is estimated that this fishing activity contributes $10.78 million of output (production) and $2.51 million of household income to the State economy and creates the equivalent of 113 full-time jobs (Table 15).

Table 15. Estimated Output, Household Income, and Employment Generated by Bottomfish Fishing Activity in Hawaii

Fishery	Sales ($)	Final Demand ($)	Output ($)	Household Income ($)	Employment (jobs)[1]
NWHI bottomfish fishery					
Commercial vessels[2]	1,096,200	580,986	1,382,747	482,218	25
MHI bottomfish fishery					
Commercial vessels[2]	1,625,800	861,674	2,050,784	715,189	36
Charter vessels[3]	305,664	293,437	760,002	269,962	14
Non-commercial vessels[4]		2,827,096	6,587,134	1,046,026	38
Total			10,780,667	2,513,431	113

1 Calculated as full-time jobs. The input–output model assumes that fishing accounts for 20 percent of the employment time of part-time commercial fishermen (Sharma et al. 1999). 2Average annual sales estimate for the period 1994–1998 from Western Pacific Regional Fishery Management Council (1999). 3Sales estimate based on the following assumptions: 199 active vessels; average annual sales of $76,800 per vessel from charter fees and mount commissions; and two percent of total sales attributed to bottomfish fishing trips (Hamilton 1998). 4Expenditure estimates based on the following assumptions (Hamilton and Huffman 1997; Pan et al. 1999):

Number of non-commercial boats	2,490
Annual number of bottomfish fishing trips	3.81
Average trip costs	84.75
Average fixed costs: apportioned according to ratio of bottomfish fishing trips to total number of trips	213

IV. DESCRIPTION OF THE ALTERNATIVES

Alternative 1: No Action

Alternative 1 is to take no Federal action; that is, no Federal management measures would be recommended by the Council for approval and implementation at this time. Under this alternative, overfishing in the bottomfish fishery in the Hawaiian Archipelago would continue.

Alternative 1 would allow continued open access for entry into the MHI fishery. MHI commercial fishermen would be required to submit catch reports but non-commercial fishermen would not to be required to submit catch reports, so the non-commercial catch component of the total harvest would remain unknown.

Alternative 2: May – September Seasonal Closure
Under Alternative 2, an annual summer closure would be implemented from May 1 to September 31 for the entire MHI bottomfish fishery (both commercial and non-commercial vessels). Targeting, possessing, landing, or selling Deep 7 species in the MHI would be prohibited during the closed season. All vessel operators (both commercial and non-commercial) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and would be required to complete and submit reports of their catch, fishing effort, and area fished. In addition, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

Implementing this seasonal closure for both the commercial and non-commercial fishery, based on mean monthly landings, results in an approximate 25 percent reduction of fishing mortality, however, parallel State regulations would be needed for this alternative to be feasible and effective due to enforcement abilities because bottomfish are found in both State and Federal waters. The reauthorized MSA allows preemption of State management authority under certain conditions to ensure States are managing their fisheries in a manner consistent with Federal objectives. The closure period would be estimated to reduce annual landings by 25.3 percent based on mean monthly landings (1998-2004), thus meeting the 24 percent reduction which is currently required to end the overfishing.

The effectiveness of the seasonal closure in reducing bottomfish fishing mortality would be monitored through mandatory non-commercial and commercial reporting as well as enforcement activities, which mostly would be conducted shore-side. At-sea enforcement or air surveillance may also occur during the closed season.

Alternative 3: Fleetwide TAC
Alternative 3 would implement a fleetwide (commercial and non-commercial) TAC designed prevent overfishing. Under this alternative commercial and non-commercial catches would be reported within a specified time limit (as close to 'real time' as is feasible) and a mechanism would be put into place to close the fishery when the combined TAC is reached.

All vessel operators (both commercial and non-commercial) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and to obtain permits, as well as to complete and submit reports of their catches, fishing effort, and area fished. To facilitate recognition of bottomfish registered vessels from the air, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

To achieve the purpose and need for the Federal action (i.e., to end overfishing), the State would need to establish a parallel requirement as both State and Federal waters would have to be closed to harvest of Deep 7 species once the TAC was reached. The effectiveness of the catch limits in reducing bottomfish fishing mortality would be monitored through non-commercial and commercial reporting as well as cooperative enforcement activities.

For the first year, 2007 - 2008, the TAC would be set at 178,000 lb of the Deep 7 species (all species combined), representing a 24 percent reduction from the 2004 fleetwide MHI commercial bottomfish catches of these species (Kawamoto et al. 2005), and would be applied to the entire MHI bottomfish fishery. The bottomfish fishing year would start on October 1 to ensure the fishery is open during the important holiday periods and continue until the TAC was reached. Thereafter, no fishing for Deep 7 bottomfish (commercial or non-commercial) would be permitted in the MHI. The NWHI bottomfish fishery would remain open until 2011. The TAC would be reassessed and adjusted as new data are made available, including new stock assessments, data on catches in the non-commercial fishery, and annual commercial landings data.

Alternative 4: Commercial TAC and Non-commercial Bag Limit
Alternative 4 would implement a TAC for the commercial fishery only and close that sector when the TAC was reached. The bottomfish fishing year would start on October 1 to ensure the fishery is open during the important holiday periods and continue until the TAC was reached. The non-commercial sector would have to adhere to the existing State non-commercial bag limit of 5 ehu and/or onaga per trip per person, however, this limit may be changed and/or other species may be added.

All vessel operators (both commercial and non-commercial) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and to obtain permits, as well as to complete and submit reports of their catches, fishing effort, and area fished. To facilitate recognition of bottomfish registered vessels from the air, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

To achieve the purpose and need for the Federal action (i.e., to end overfishing), the State would need to establish a parallel requirement as both State and Federal waters would have to be closed to harvest of Deep 7 species once the TAC was reached. The effectiveness of the catch limits in reducing bottomfish fishing mortality would be monitored through non-commercial and commercial reporting as well as cooperative enforcement activities.

Alternative 5: TAC w/ Limited Access & Non-commercial Bag Limit
Alternative 5 would implement a commercial TAC in combination with a limited access program for commercial fishery participants. A limited access system will simplify the determination and monitoring of individual quotas by limiting the number of participants. Only those commercial participants with limited access permits would be allowed to fish for the Deep 7 bottomfish in the MHI. Each limited access vessel would be required to stop fishing when their individual quota was reached. The limited access system would allocate a certain number of permits based on criteria related to past participation in the fishery. The non-commercial component would have to adhere to the existing State non-commercial bag limit of 5 ehu and/or onaga per trip per person, however, this limit may be changed and/or other species may be added.

All vessel operators (both commercial and non-commercial) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and to obtain permits, as well as to complete and submit reports of their catches, fishing effort, and area fished. To facilitate recognition of bottomfish registered vessels from the air, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

To achieve the purpose and need for the Federal action (i.e., to end overfishing), the State would need to establish a parallel requirement as both State and Federal waters would have to be closed to takes of Deep 7 species once the limit was reached. The effectiveness of the catch limits in reducing bottomfish fishing mortality would be monitored through non-commercial and commercial reporting as well as cooperative enforcement activities.

Alternative 6: Commercial IFQs and Non-commercial Bag Limit
Alternative 6 would allocate individual fishing quotas (IFQs) to all commercial fishermen (open access), whereby each fisherman is required to stop fishing for the reminder of the fishing year when their individual quota was reached. The sum of quotas would be calculated to prevent overfishing. In a sense this alternative is also management using a TAC, however, the TAC is subdivided into individual quotas. The number of fishermen would likely be limited to past participants in the fishery and quota amounts would likely be determined based on individual historical catches. Once a commercial fisherman had landed his respective IFQ, that person would not be permitted to fish for, possess, or sell any bottomfish until the following year.

Each MHI commercial bottomfish participant with an IFQ would be issued a set of bottomfish stamps, with each stamp representing a certain number of pounds of bottomfish and all the stamps totaling the fisherman's total IFQ. The fisherman would be required to submit a stamp to the dealer at the point of sale. Once all the stamps were submitted the fisherman would be prohibited from fishing until the next open season. The fisherman's bottomfish stamps would be non-transferable.

Under this alternative, commercial fishermen would be required to continue reporting their catches and to stop fishing when their individual quota was reached. Fishery data would be analyzed in real time to monitor landings versus quotas.

IFQs could be implemented in a number of ways; two methods are outlined, as follows:

1. Provide equal quotas (of the TAC divided) to all historical participants. Under this alternative, historical highliners would get the same quota as part-time fishermen. Variations could provide equal quotas to a subset of all historical participants, such as those most active in recent years.

2. Provide individual quotas that are equal to 76 percent of each fisherman's historical catch providing this would not exceed the TAC. Under this alternative, fishermen's quotas would be relative to their individual historical catches. Variations could provide similar quotas to a subset of all historical participants, such as those most active in recent years.

Alternative 7: Phased-in TAC Management (Preferred)
Under Alternative 7 the MHI Deep 7 bottomfish fishery would ultimately be managed under a TAC which would be based on, and applied to, both commercial and non-commercial catches. There currently are no reliable available data on non-commercial catches, however, therefore Alternative 7 would utilize a phased-in approach. Phase 1 was consisted of a May-September 2007, seasonal closure of waters around the MHI to both commercial and non-commercial fishing for the Deep 7 species. The 2007 seasonal closure has already been analyzed and

implemented for Federal waters by NMFS and by the Hawaii DLNR for State waters and is, therefore, not part of the action analyzed in this document.

Phase 2 would implement a commercial Deep 7 TAC of 178,000 lb (a 24 percent reduction of MHI commercial Deep 7 catches as compared to 2004, as currently required to end the overfishing). Tracking of commercial landings towards this TAC would begin when the fishery reopens on October 1, 2007. During the open period, non-commercial catches would continue to be managed by bag limits, however they would be changed from the current five onaga and/or ehu combined per person per trip, to five of any Deep 7 species combined per person per trip and they would be extended into Federal waters to facilitate effective enforcement. Once commercial Deep 7 landings reached the TAC, both the commercial and non-commercial sectors would be closed. Phase 2 would also implement a Federal permit requirement for non-commercial fishermen who target or catch Deep 7 species in the MHI.

Phase 3 would implement Federal reporting requirements for non-commercial fishermen who target or catch Deep 7 species in the MHI. This would provide fishery scientists with the data needed to calculate and track a non-commercial portion of the overall TAC.

Phase 4 would include a second seasonal closure to MHI Deep 7 fishing from May – August 2008, followed by implementation of a combined commercial and non-commercial Deep 7 TAC beginning September 1, 2008. Because non-commercial data would now be available to calculate and track the non-commercial portion of the TAC, the non-commercial bag limits would be dropped. Note that eliminating the non-commerical bag limit is dependent on the quality of non-commerical catch data provided by fishermen to the State and NMFS so that an appropriate non-commerical TAC may be selected by the Council.

The combination of Alternative 7's 2007-2008 seasonal closures, commercial TACs and non-commercial bag limits is intended to ensure that appropriate action is taken to end overfishing with the limited data available in the short-term.

In subsequent years (2009 and beyond) the MHI Deep 7 fishery would be managed via a commercial and non-commercial TAC calculated by PIFSC and selected by the Council to prevent overfishing of these species. This number is likely to vary according to stock status and environmental conditions. Under this alternative, PIFSC would work with the Council's advisory bodies to provide the Council by May 30 with a proposed TAC for each year. There would be no further seasonal closures or non-commercial bag limits. The effectiveness of the seasonal closures, bag limits and TACs in reducing bottomfish fishing mortality would be monitored through mandatory non-commercial and commercial reporting as well as enforcement activities, which mostly would be conducted shore-side. At-sea enforcement or air surveillance may also occur during the closed season.

V. SKILLS NECESSARY TO MEET COMPLIANCE REQUIREMENTS

No special skills would be required to comply with the proposed requirements associated with the alternatives under consideration to end overfishing in the MHI bottomfish fishery. Operators of commercial vessels would continue to have to annually obtain State fishing permits and submit State catch reports for all of their fishing effort and catch. In addition, they would have to stop fishing for Deep 7 species during certain time periods.

VI. IDENTIFICATION OF DUPLICATING, OVERLAPPING, AND CONFLICTING FEDERAL RULES

To the extent practicable, it has been determined that there are no Federal rules that may duplicate, overlap, or conflict with this proposed rule.

VII. DESCRIPTION OF SMALL BUSINESSES TO WHICH THE RULE WOULD APPLY

The alternatives considered apply only to the MHI commercial bottomfish fleet which since the 1970's has been comprised of hundreds of commercial and non-commercial fishery participants. The average number of commercial vessels active in the MHI bottomfish fishery from the years 2000 through 2003 was 308 vessels (WPRFMC 2004). The average annual MHI bottomfish ex-vessel revenue per commercial vessel over this same time period was $3,870, giving each vessel equal weight. The majority of vessels are owner operated, under 20 ft in length and are used to fish part-time, with the exception of approximately twelve full-time commercial fishery participants. All MHI commercial bottomfish fishing operations are considered to be small businesses; that is, they have gross revenues of less than $4 million annually, they are independently owned and operated, and they are not dominant in their field.

VIII. ECONOMIC IMPACTS OF THE ALTERNATIVES ON SMALL BUSINESSES

Alternative 1: No action
Absent new State actions, short-term fishing activities under Alternative 1 would continue as described in Section III. If the trend of declining commercial fishing activity, apparent for the past 20 years, continues, this may lead to an end of overfishing by proxy. There is, however, no reason to assume this scenario would occur as 2004 information indicates that this downward trend may have flattened. Thus fishing pressure (e.g. overfishing) would likely increase at least over the mid-term, as high fuel costs are believed to cause fishermen to switch from trolling to bottomfish fishing. Fishing pressure (e.g. overfishing) would likely increase at least over the mid-term, as high fuel costs are believed to be causing fishermen to switch from trolling to bottomfish fishing. Under this scenario the abundance of target species would further decline. If this continues, bottomfish stocks and catch rates will further decline and fishery participants in all sectors will see lower returns both in financial and nonmarket (e.g. angler satisfaction, protein sources, and social benefits) terms. The State is expected to revise their BRFAs however, the revised BRFAs would increase protection of suitable habitat by 2 percent (Parke 2007) as compared to the 2003 and 2004 baselines. Although this would provide some additional habitat protection and corresponding decrease in fishing mortality it would not meet the 24 percent reduction which is currently needed to end overfishing.

Uncertainty about the effectiveness of the State's existing and revised BRFAs and fishermen's responses to them, as well as uncertainty about factors external to the fishery management regime (such as market demand and prices for fresh MHI bottomfish), hamper reliable estimations of future fishing activity. However, it can be reasonably anticipated that catches of target species will be slightly reduced if the proposed revisions to the BRFAs are made. The distribution of these losses among fishery sectors will largely be a function of the location of area closures, and the proximity and viability of remaining open areas.

If the overfishing of bottomfish in Hawaii is allowed to continue, the potential is high for reaching an "overfished" state in the bottomfish fishery, which would require a rebuilding plan under which limited or no bottomfish fishing would be allowed for an extended period of time. An overfished and closed fishery would likely result in unquantifiable economic losses to all bottomfish fishermen, associated businesses, and local fish markets and restaurants. Over time, some of these losses may be stemmed as fishers switch to other fisheries, and fish markets and restaurants secure other sources of fish such as imports and catch from the NWHI.

Alternative 2: May – September Seasonal Closures

Based on historical MHI landings, it is estimated that a May through September closure of the MHI Deep 7 bottomfish fishery would result in up to a 25.3 percent reduction in commercial landings of the Deep 7 species as compared to the 2004 baseline. Although fishery participants may increase their fishing during the open season to compensate, given that summer months have historically been a time of lower bottomfish fishing activity significant increases in effort during the open season are unlikely. The summer closure would reduce the availability of "high end" fresh bottomfish to the local markets leading to an increased reliance on imported bottomfish during the closed season. This could have negative impacts on the entire commercial fishery sector because market channels for fresh MHI Deep 7 bottomfish would be lost and may have to be regained each year.

The ex-vessel revenue derived from the Deep 7 bottomfish landings made during the 5-month closure period in 2004 (used as the most recent year for which data are available) equals \$381,046 which is 29 percent of annual ex-vessel revenue from sales of MHI Deep 7 (see Tables 16 and 5). It is likely that some of these fishers displaced during the closure would replace some or all of their lost revenue by fishing for other species, such as pelagics. Because this alternative is a total closure they could not switch to Deep 7 fishing elsewhere, however, some may attempt to make up for some of their lost revenue by fishing harder or longer during the open season. However, given that May–September is generally a time of relatively lower Deep 7 fishing activity (Table 7), significant increases in effort during the open season are unlikely.

Table 16. Monthly Revenue (\$) by Species of MHI commercial catches of Deep 7 bottomfish in 2004

	May	June	July	August	Sept.	TOTAL
Opakapaka	28,268	16,530	13,502	22,311	30,916	111,527
Onaga	22,057	18,660	29,082	20,126	44,146	13,407
Ehu	8,616	3,370	5,249	5,844	7,921	231,000
Hapuupuu	3,308	1,050	2,499	2,143	2,464	11,464

	May	June	July	August	Sept.	TOTAL
Kalekale	2,620	621	899	1,161	2,964	8,265
Lehi	100	291	227	258	1,624	2,500
Gindai	1,379	142	407	152	803	2,883
TOTALS	66,348	40,664	51,865	51,995	90,838	381,046

The average number of commercial vessels active in the MHI bottomfish fishery between the years 2000 through 2003, was 380 (WPRFMC 2004). A seasonal closure of the Deep 7 bottomfish fishery in the MHI would impact all of these participants, forcing them to switch fisheries or earn less revenue during the closure. Many would be expected to easily switch to another fishery during the closure time such as pelagic trolling, however, some number would be more impacted than others by a summer closure as there are those who prefer year-round bottomfishing to other types of fishing and others who prefer summer fishing to other times of year.

The relative importance of MHI Deep 7 species to commercial participants as a percentage of overall fishing (or household) income is unknown as the total suite of fishing (or other income generating) activities undertaken by individual operations across the year has not been examined to date.

Alternative 3: Fleetwide TAC
The use of a fleetwide TAC under Alternative 3 would be anticipated to result in a bunching of fishing effort at the beginning of each fishing year (October 1) as fishery participants would be aware that once the TAC was reached the fishery would be closed to all sectors. The October 1 start of the fishing year would ensure the fleet could fish during the holiday season to provide the markets with desired red fish as described in Section III. Given that the majority of commercial landings are already made during the winter season this is not likely to radically change these operations, however it may lead to market “floods” that temporarily reduce fresh fish prices and adversely impact commercial fishermen.

For the first year, 2007 - 2008, the TAC would be set at 178,000 lb of the Deep 7 species (all species combined), representing a 24 percent reduction from the 2004 fleetwide MHI commercial bottomfish catches of these species (Kawamoto et al. 2005), and would be applied to the entire MHI bottomfish fishery. The bottomfish fishing year would start on October 1 to ensure the fishery is open during the important holiday periods and continue until the TAC was reached. Thereafter, no fishing for Deep 7 bottomfish (commercial or non-commercial) would be permitted in the MHI. The NWHI bottomfish fishery would remain open until 2011. The TAC would be reassessed and adjusted as new data are made available, including new stock assessments, data on catches in the non-commercial fishery, and annual commercial landings data.

Once the TAC is reached, this alternative may lead to an increased reliance on NWHI bottomfish until this fishery is closed in 2011 and on increased imports of bottomfish. An increased reliance on imported bottomfish would be anticipated to have negative impacts on the entire commercial fishery sector as market channels for fresh MHI bottomfish would be lost and have to be regained each year.

Commercial fishery participants may be differentially impacted depending on their ability and willingness to "race to the fish" and some may upgrade their vessels (e.g., buy larger vessels or more powerful engines for existing vessels) or fish during adverse weather in order to achieve high catches before the TAC is reached. These responses would be anticipated to result in over-capitalization (i.e., otherwise unnecessary investments to upgrade vessels) of the fishery and threats to the safety of fishery participants. However given that bottomfish fishing currently occurs without incident throughout the year it is believed that existing participants are aware of and able to deal with all types of weather and sea conditions.

The relative importance of MHI Deep 7 species to commercial participants as a percentage of overall fishing (or household) income is unknown as the total suite of fishing (or other income generating) activities undertaken by individual operations across the year has not been examined to date.

Alternative 4: Commercial TAC and Non-commercial Bag Limit
Alternative 4 would implement a TAC for the commercial fishery only and close that sector when the TAC is reached. The bottomfish fishing year would start on October 1 to ensure the fishery is open during the important holiday periods and continue until the TAC was reached. The non-commercial component would have to adhere to the existing State non-commercial bag limit of 5 ehu and/or onaga per trip per person, however, this limit may be changed and/or other species may be added.

The use of TACs under this alternative would be anticipated to result in a bunching of fishing effort at the beginning of each fishing year (October 1 in 2007 and September 1 thereafter) as fishery participants would be aware that once the TAC was reached the fishery would be closed to all sectors. Given that the majority of commercial landings are already made during the winter season this is not likely to radically change these operations, however it may lead to market "floods" that temporarily reduce fresh fish prices and adversely impact commercial fishermen.

Once the TAC is reached, this alternative is expected to lead to an increased reliance on imported and NWHI bottomfish (until the NWHI fishery is closed in 2011). An increased reliance on imported bottomfish would be anticipated to have negative impacts on the entire commercial fishery sector as market channels for fresh MHI bottomfish would be lost and have to be regained each year.

Commercial fishery participants may be differentially impacted depending on their ability and willingness to "race to the fish" and some may upgrade their vessels (e.g., buy larger vessels or more powerful engines for existing vessels) or fish during adverse weather in order to achieve high catches before the TAC is reached. These responses would be anticipated to result in over-capitalization (i.e., otherwise unnecessary investments to upgrade vessels) of the fishery and could result in threats to the safety of fishery participants. However given that bottomfish fishing currently occurs without incident throughout the year it is believed that existing participants are aware of and able to deal with all types of weather and sea conditions.

The relative importance of MHI Deep 7 species to commercial participants as a percentage of overall fishing (or household) income is unknown as the total suite of fishing (or other income generating) activities undertaken by individual operations across the year has not been examined to date.

Alternative 5: TAC w/ Limited Access and Non-commercial Bag Limit
Alternative 5 would implement a commercial TAC in combination with a limited access program for commercial fishery participants. A limited access system will simplify the determination and monitoring of individual quotas by limiting the number of participants. Only those commercial participants with limited access permits would be allowed to fish for the Deep 7 bottomfish in the MHI. Each limited access vessel would be required to stop fishing when their individual quota was reached. The limited access system would allocate a certain number of permits based on criteria related to past participation in the fishery. The non-commercial component would have to adhere to the existing State non-commercial bag limit of 5 ehu and/or onaga per trip per person, however, this limit may be changed and/or other species may be added.

Limiting access in the MHI bottomfish fishery would provide direct control over the total number of fishery participants. However, only a small percentage of those in the commercial fishery sector target and land bottomfish as their primary fishing activity. The large majority of commercial fishers switch between fisheries and lands less than 1,000 pounds of bottomfish per year (see Figure 3). This would make the process of determining who gets to remain in the fishery difficult and ultimately result in economic and cultural losses to those not permitted. Establishing a MHI limited entry program is supported by many full-time commercial fishermen, however, part-time commercial and non-commercial fishermen have not been supportive of a limited entry system in the bottomfish fishery in the MHI.

Criteria to establish initial qualified fishermen under a limited-entry program would likely be based on historical participation in the MHI bottomfish fishery. To qualify a commercial fisherman, historical information from the State commercial marine license and catch reporting program would be used.

The use of a commercial fleetwide TAC under Alternative 5 would be anticipated to result in a bunching of fishing effort at the beginning of each fishing year (October 1) as fishery participants would be aware that once the TAC was reached the fishery would be closed to all sectors. Given that the majority of commercial landings are already made during the winter season this is not likely to radically change these operations, however it may lead to market "floods" that temporarily reduce fresh fish prices and adversely impact commercial fishermen.

Once the TAC is reached, this alternative may lead to an increased reliance on NWHI until this fishery is closed in 2011 and on increased imports of bottomfish. An increased reliance on imported bottomfish would be anticipated to have negative impacts on the entire commercial fishery sector as market channels for fresh MHI bottomfish would be lost and have to be regained each year.

Commercial fishery participants may be differentially impacted depending on their ability and willingness to “race to the fish” and some may upgrade their vessels (e.g., buy larger vessels or more powerful engines for existing vessels) or fish during adverse weather in order to achieve high catches before the TAC is reached. These responses would be anticipated to result in over-capitalization (i.e., otherwise unnecessary investments to upgrade vessels) of the fishery and threats to the safety of fishery participants.

Alternative 6: Commercial IFQs and Non-commercial Bag Limit
Alternative 6 would allocate individual fishing quotas (IFQs) to all commercial fishermen (open access), whereby each fisherman is required to stop fishing for the reminder of the fishing year when their individual quota was reached. The sum of quotas would be calculated to prevent overfishing. In a sense this alternative is also management using a TAC, however, the TAC is subdivided into individual quotas. The number of fishermen would likely be limited to past participants in the fishery and quota amounts would likely be determined based on individual historical catches. Once a commercial fisherman had landed his respective IFQ, that person would not be permitted to fish for, possess, or sell any bottomfish until the following year.

Each MHI commercial bottomfish participant with an IFQ would be issued a set of bottomfish stamps, with each stamp representing a certain number of pounds of bottomfish and all the stamps totaling the fisherman’s total IFQ. The fisherman would be required to submit a stamp to the dealer at the point of sale. Once all the stamps were submitted the fisherman would be prohibited from fishing until the next open season. The fisherman’s bottomfish stamps would be non-transferable.

Under this alternative, commercial fishermen would be required to continue reporting their catches and to stop fishing when their individual quota was reached. Fishery data would be analyzed in real time to monitor landings versus quotas. The non-commercial component would have to adhere to the existing State non-commercial bag limit of 5 ehu and/or onaga per trip per person, however, this limit may be changed and/or other species may be added.

Commercial IFQs could be implemented in a number of ways; two methods are outlined, as follows:

1. Provide equal quotas (of the TAC divided) to all historical participants. Under this alternative, historical highliners would get the same quota as part-time fishermen. Variations could provide equal quotas to a subset of all historical participants, such as those most active in recent years.

2. Provide individual quotas that are equal to 76 percent of each fisherman’s historical catch providing this would not exceed the TAC. Under this alternative, fishermen’s quotas would be relative to their individual historical catches. Variations could provide similar quotas to a subset of all historical participants, such as those most active in recent years.

The impacts of Alternative 6 on the commercial fishery sector would vary depending on how the IFQs were implemented. Because the sum of the IFQs cannot exceed the prescribed TAC for any given year, the size of each fisherman's quota would be inversely related to the total number of fishermen who received IFQs (the more who are included, the smaller each one's share must be). Quotas that are too small to support even one fishing trip are clearly likely to go unused. Impacts on those commercial, sport, and "expense" fishermen who do not qualify for an IFQ would be adverse.

If equal quotas (totaling 76 percent of the fleetwide 2004 catch) were provided to each participant, highliners would get the same quota as part-time fishermen, and vice versa. This would leave some without enough quota, while others would have unused quota. Without a method to transfer (trade) quota between fishermen, this would have disproportionately adverse impacts on the highliners. If equal quotas were provided to a subset of all historical participants (such as those most active in recent years), those included would each have a higher quota, but those excluded would have no quota.

If individual quotas (equal to 76 percent of each fisherman's individual historical catch) were provided, all commercial participants would be anticipated to experience proportionately equally adverse impacts, and it is likely that more of the total quota would be used, even if there were no method to transfer quota between fishermen. If individual quotas were provided to a subset of all historical participants, such as those most active in recent years, individual quotas would not change, but some past participants would not have any quota.

Without knowing the number of participants that would be given an IFQ and their average revenue earned from bottomfishing it is impossible to predict the dollar value of the lost revenue implementation of IFQs would have other than to say that approximately 24 percent of annual ex-vessel Deep 7 revenues would be lost as compared to the 2004 baseline.

Seasonal closures or TACs would result in time periods when no MHI bottomfish are landed, an impact that could be avoided under Alternative 6 if participants IFQs lasted through most of the year to the extent that these landings coupled with NWHI landings (until 2011) would be sufficient quantities to satisfy local demand. Thus, this alternative would be expected to have a more positive impact on the commercial fishery sector in terms of competition with imports than seasonal closures. If the IFQs provided a continuous supply of fresh MHI bottomfish to local markets, thus maintaining open market channels that would otherwise be expected to be filled by imports during the closed season. However, if landings were not able to keep up with demand as IFQs were reached and individuals stopped fishing for the remainder of the year, this alternative could lead to an increased reliance on imported bottomfish thus it would be anticipated to have negative impacts on the entire commercial fishery sector as market channels for fresh MHI bottomfish would be lost and may have to be regained each year. Experience has shown that if imports come to dominate market channels, it can be difficult for local producers to regain their market share as wholesalers and retailers can be reluctant to forgo their now-established supply chains. However, as Figure 25 shows, Hawaii currently imports bottomfish steadily throughout the year and will likely continue doing so to varying degrees depending availability of local sources and demand, and these in turn depend on local landings which is affected by weather, prices, effort, and NWHI catches; and seasonality (tourism, holidays), respectively.

Table 17 presents a preliminary analysis of the number of fishery participants anticipated to qualify for IFQs under various minimum landing requirements. These requirements range from minimum landings of at least 1 pound up to 5,001 pounds of all BMUS from the MHI made between May and September of any one year between 1998 and 2004 (inclusive). Based on the information available in Table 17, all minimum landing thresholds would result in qualifying participants receiving IFQs below their historical landings and would thus be expected to result in full utilization of the available quota. Information on the mean historical landings by participants who caught more than 5,001 pounds is unavailable due to confidentiality requirements that prohibit the publication of data submitted by less than three individuals or operations.

Table 17. Anticipated Participation and IFQ Levels under Various Minimum BMUS Landing Requirements

Minimum BMUS Landing Requirement to Qualify for May–Sept IFQ	Anticipated Number of Qualifying Participants (based on reported May–Sept MHI landings, 1998-2004)	Anticipated May–Sept. IFQ per Qualifying Participant (lbs)	Historical May–Sept. Mean Landings by Qualifying Participants (lbs)
1-500 lbs	970	25	89
501-1000 lbs	91	263	691
1001-2000 lbs	43	557	1,385
2001-5000 lbs	12	1,995	3,085
More than 5000 lbs	2	11,973	confidential

Source: PIFSC unpublished data.

Alternative 7: Phased-in TAC Management (Preferred)
Under Alternative 7 the MHI Deep 7 bottomfish fishery would ultimately be managed under a TAC which would be based on, and applied to, both commercial and non-commercial catches. Because there currently are no available data on non-commercial catches Alternative 7 would utilize a phased-in approach. Phase 1 was consisted of a May-September 2007, seasonal closure of waters around the MHI to both commercial and non-commercial fishing for the Deep 7 species. The 2007 seasonal closure has already been analyzed and implemented for Federal waters by NMFS and by the Hawaii DLNR for State waters and is, therefore, not part of the action analyzed in this document.

Phase 2 would implement a commercial Deep 7 TAC of 178,000 lb (a 24 percent reduction of MHI commercial Deep 7 catches as compared to 2004). Tracking of commercial landings towards this TAC would begin when the fishery reopens on October 1, 2007. During the open period, non-commercial catches would continue to be managed by trip limits, however they would be changed from the current five onaga and/or ehu combined per person per trip, to five of any Deep 7 species combined per person per trip and they would be extended into Federal waters to facilitate effective enforcement. Once commercial Deep 7 landings reached the TAC, both the commercial and non-commercial sectors would be closed. Phase 2 would also implement a

Federal permit requirement for non-commercial fishermen who target or catch Deep 7 species in the MHI.

Phase 3 would implement Federal reporting requirements for non-commercial fishermen who target or catch Deep 7 species in the MHI. This would provide fishery scientists with the data needed to calculate and track a non-commercial portion of the overall TAC.

Phase 4 would include a second seasonal closure to MHI Deep 7 fishing from May – August 2008, followed by implementation of a combined commercial and non-commercial Deep 7 TAC beginning September 1, 2008. Because non-commercial data would now be available to calculate and track the non-commercial portion of the TAC, the non-commercial bag limits would be dropped. Note that eliminating the non-commerical bag limit is dependent on the quality of non-commerical catch data provided by fishermen to the State and NMFS so that an appropriate non-commerical TAC may be selected by the Council.

The combination of Alternative 7's 2007-2008 seasonal closures, commercial TACs and non-commercial bag limits is intended to ensure that appropriate action is taken to end overfishing with the limited data available in the short-term.

In subsequent years (2009 and beyond) the MHI Deep 7 fishery would be managed via a commercial and non-commercial TAC calculated by PIFSC and selected by the Council to prevent overfishing of these species. This number is likely to vary according to stock status and environmental conditions. Under this alternative, PIFSC would work with the Council's advisory bodies to provide the Council by May 30 with a proposed TAC for each year. There would be no further seasonal closures or non-commercial bag limits.

Alternative 7's phased-in approach, combined with an ongoing and extensive public awareness and feedback process, is anticipated to achieve the goal of ending overfishing with the least risk of alienating or unduly impacting fishery participants. The 2007-2008 summer closures would occur during the time that bottomfish activity is low as fishermen switch to other fisheries. Both the pelagic troll (e.g., yellowfin) and the hook-and-line mackerel (akule and ʻōpelu) fisheries are at their peak during the summer period and therefore represent alternate fishing opportunities during the summer closures. Also because the summer closures would be implemented for just two years, fishermen who do normally fish year-round for bottomfish and rely on the income, would be able to anticipate a potential resumption of fishing during the summer months in 2009 and beyond. However, despite removing the closed season the fishery may not be open during the summer months in some years if the TAC is reached early. Although this would be an inconvenience and a disruption of their intended summer bottomfish fishing, at least the participants would have already experienced summer closures and therefore would likely have a plan to fall back on.

The potential income loss by the fishermen would vary depending on their levels of fishing effort, catch composition, and ex-vessel revenues. Assuming that impacts were evenly distributed among 380 active MHI commercial bottomfish fishermen (the 2000-2003 average), the average impact of the 2008 seasonal May – August closure would be $555 per fishermen)[3] using data in Table 16. Although it is unknown how much target species substitution would occur, the above figures would indicate the maximum cost for the fleet and the potential average cost per vessel (assuming 380 active vessels). However, fishermen would be able to offset some of this loss in income by targeting different species and adjusting their fishing patterns accordingly.

However impacts will not be evenly distributed and are expected to be greatest for commercial fishermen who rely significantly on Deep 7 bottomfish for their income. As Table 6 illustrates, the majority of operations land 500 or less lb of Deep 7 in each year. Clearly these operations are less dependent on Deep 7 revenues than are those which land more than 2,000 lb per year.

The use of TACs under this alternative would be anticipated to result in a bunching of fishing effort at the beginning of each fishing year (October 1 in 2007 and September 1 thereafter) as fishery participants would be aware that once the TAC was reached the fishery would be closed to all sectors. Given that the majority of commercial landings are already made during the winter season this is not likely to radically change these operations, however it may lead to market “floods” that temporarily reduce fresh fish prices and adversely impact commercial fishermen.

Commercial participants may be differentially impacted by the TAC depending on their ability and willingness to “race to the fish” and some may upgrade their vessels (e.g., buy larger vessels or more powerful engines for existing vessels) or fish during adverse weather in order to achieve high catches before the TAC is reached. These responses would be anticipated to result in over-capitalization (i.e., otherwise unnecessary investments to upgrade vessels) of the fishery and could result in threats to the safety of fishery participants. However given that bottomfish fishing currently occurs without incident throughout the year it is believed that existing participants are aware of and able to deal with all types of weather and sea conditions.

Once the TAC is reached, this alternative is expected to lead to an increased reliance on imported and NWHI bottomfish (until the NWHI fishery is closed in 2011). An increased reliance on imported bottomfish would be anticipated to have negative impacts on the entire commercial fishery sector as market channels for fresh MHI bottomfish would be lost and have to be regained each year.

Table 18. Average annual ex-vessel prices ($) of Deep 7 BMUS in MHI

Year	**2000**	**2001**	**2002**	**2003**	**2004**	**MHI 5-yr average price**	**Oahu 5-yr avg. price**
‘Ōpakapaka	4.91	4.92	5.30	5.28	5.35	5.15	5.72
Onaga	6.63	6.62	6.46	6.35	6.79	6.57	7.86
Ehu	4.67	4.75	4.97	4.76	4.82	4.80	5.25

[3] This figure can be compared with average ex-vessel returns for small boat fishermen in Hawaii of $42,000 (Hamilton 1997).

Hāpuʻupuʻu	3.74	4.07	4.33	4.42	4.75	4.26	5.56
Kalekale	3.24	3.14	3.43	3.01	3.60	3.28	3.66
Lehi	3.13	2.89	3.07	3.07	3.39	3.11	3.39
Gindai	3.76	3.44	3.65	3.42	3.71	3.60	3.55
Mean Price						4.40	4.99

Source: Kawamoto and Gonzales 2005

X. IMPACTS OF THE PREFERRED ALTERNATIVE ON NATIONAL COSTS AND BENEFITS

In accordance with Executive Order 12866, the following is set forth: (1) This rule is not likely to have an annual effect on the economy of more than $100 million or to adversely affect in a material way the economy, a sector of the economy, productivity, jobs, the environment, public health or safety, or state, local, or tribal governments or communities; (2) This rule is not likely to create any serious inconsistencies or otherwise interfere with any action taken or planned by another agency; (3) This rule is not likely to materially alter the budgetary impact of entitlements, grants, user fees or loan programs or the rights or obligations of recipients thereof; and (4) This rule is not likely to raise novel or policy issues arising out of legal mandates, or the principles set forth in the Executive Order.

As compared to the no action baseline, the implementation of the preferred alternative would end overfishing of Hawaii Archipelago bottomfish while maximizing continued opportunities for sustainable harvests of Deep 7 species and minimizing adverse economic impacts. This action is consistent with the Magnuson-Stevens Fishery Conservation and Management Act.

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APPENDIX 2: 2006 PIFSC Bottomfish Stock Assessment

(Moffitt et al. 2006)

PACIFIC ISLANDS FISHERIES SCIENCE CENTER

Status of the Hawaiian Bottomfish Stocks, 2004

By

Robert B. Moffitt, Donald R. Kobayashi, and Gerard T. DiNardo

May 2006

Administrative Report H-06-01

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PREFACE

Scientists of the Pacific Islands Fisheries Science Center (PIFSC) have assessed the status of deep-slope bottomfish in the Hawaiian Archipelago since the early 1980s. The current report describes the status of bottomfish in 2004 based on an assessment conducted by PIFSC in late 2005. The assessment used the best data and biological information available in 2005, and the same stock assessment methodology was employed as in other recent bottomfish assessments by the PIFSC.

An important objective of PIFSC research is to continuously improve stock assessment methods to take into account new information and more realistic biological parameters. Accordingly, during May 1 – 12, 2006, PIFSC convened the Hawaiian Archipelago Bottomfish Stock Assessment Workshop. The workshop brought together PIFSC scientists and a panel of stock assessment experts from the University of British Columbia. The panel was contracted by PIFSC to critically review the Center's current bottomfish assessment procedures, devise improved methods, use the revised approach to conduct a new bottomfish stock assessment, and recommend steps the Center could take to advance deep-slope bottomfish assessments in the Hawaiian Archipelago. The panel's contract report, including the new stock assessment, is expected later this year. PIFSC will publish the panel's findings when they become available.

INTRODUCTION

There are two distinct bottomfish resources in the Hawaiian Islands: seamount groundfish and deep-slope bottomfish. The seamount resource includes alfonsin, *Beryx splendens*, and armorhead, *Pseudopentaceros wheeleri*. The deep-slope bottomfish resource is made up of several species (Table 1). Both resources are managed under the Bottomfish and Seamount Groundfish Fishery Management Plan (FMP) developed by the Western Pacific Regional Fishery Management Council (Council).

Within the U.S. Exclusive Economic Zone (EEZ), the seamount groundfish resource occurs only on Southeast Hancock Seamount located 1400 nm northwest of Honolulu. The stocks of alfonsin and armorhead on Southeast Hancock are part of a larger resource extending northwest along the Emperor Seamount chain in international waters. A trawl fishery for seamount groundfish was started by Russian and Japanese fleets in the late 1960s, and large catches of armorhead were taken for about 10 years until the fishery crashed (Uchida and Tagami, 1984). The resource has never been harvested by U.S. vessels. Based on Council recommendations, a moratorium on fishing within the U.S. EEZ began in 1986 and continues through the present as no substantial recovery in the resource has been observed.

The Hawaii fishery for deep-slope bottomfish in the Hawaiian Archipelago has been in existence since the turn of the 20th century and quite likely well before then (Haight et al., 1993). Currently, participants in the fishery are a complex mix of subsistence, recreational, and commercial fishermen. The fishery primarily involves seven species of eteline snappers and a grouper caught at depths of 30−150 fathoms by small boats using hook-and-line gear. The fishery has very little bycatch of unwanted finfish, negligible impact to the deep-slope ecosystem (Kelley and Ikehara, in press), and negligible interactions with protected species (Kobayashi and Kawamoto, 1995).

For management purposes, the Hawaiian Archipelago is divided into three management zones (Fig. 1). In the main Hawaiian Islands (MHI), the bottomfish fishery is primarily under State of Hawaii jurisdiction and supports many subsistence, recreational, and commercial fishermen (about 300 commercial fishermen in 2004) In the Northwestern Hawaiian Islands (NWHI), the fishery is primarily under Federal jurisdiction and the fishing area is further divided into two management zones, the Mau Zone and the Ho'omalu Zone, each supporting limited-entry commercial fisheries (four permitted vessels operated in the Ho'omalu Zone and five in the Mau Zone in 2004) and little noncommercial fishing.

In this document we report the status of deep-slope bottomfish stocks in the Hawaiian Archipelago relative to established management metrics (Moffitt and Kobayashi, 2000). The report also describes the data used to assess the stock status, including fishery dependent and biological data. For assessment purposes, the Hawaiian bottomfish stocks are considered a single, archipelago-wide, multispecies complex (Moffitt and Kobayashi, 2000).

DATA SOURCES

Commercial Catch, Effort, and Sales

Most of the data used to assess the Hawaiian bottomfish stocks are derived from commercial catch information collected by the State of Hawaii. Since 1948, the State has required commercial fishermen to report their sales of any fish, including bottomfish species (Table 2). The quality and quantity of the data collected have varied over the years; more complete and better quality data have been collected in recent years. The original intent of the State's data collection system was to record economic information, not to gather data for stock assessment purposes. Data included commercial license number, date, gear type, area fished, species, number of fish sold (by species), weight of fish sold, and sale price. Some confusion exists as to whether the "date" information submitted reflects dates when fish were sold or dates when they were caught (as requested), particularly in the earlier data. Also, information on duration of fishing trips was not requested in the earlier period, so accurate estimation of nominal effort is difficult at best.

In 1984, the National Marine Fisheries Service (NMFS) began interviewing NWHI fishermen and obtained information on the number of days fished on each trip. This information, coupled with the Hawaiian Division of Aquatic Resources (HDAR) sales data, allowed for estimation of bottomfish catch-per-unit-effort (CPUE) in terms of catch per day (Kawamoto and Pooley, 1990). From 1994 onwards, the NWHI fishermen were required to provide a more detailed report to the State including their daily catch of each species, in number of fish, along with an estimated catch weight. This information, along with the more accurate fish weight data obtained from fish dealers, allows for calculations of catch per day in the absence of fisherman interviews. Additional data collected since 1996 on the number of fishing lines used each day has allowed for the calculation of CPUE in terms of catch-per-line hour. Beginning in 2002, similar daily data have been required from MHI commercial fishermen.

In addition to fisheries statistics reported by fishermen, observations on the commercial fishery have been made by employees or contractors of the State of Hawaii and NMFS staff. The State funded a series of charters of bottomfish vessels in 1981−1982. The NMFS Southwest Regional Office placed scientific observers on bottomfish vessels during 1990−1993; since October 2003, the NMFS Pacific Islands Regional Office (PIRO) has placed observers on approximately 25% of commercial bottomfishing trips. Observer data are not routinely used in the stock assessments but have been used to calibrate fishing effort in earlier production modeling analyses.

Noncommercial Catch

Information about noncommercial catch (subsistence and recreational) is scarce and of questionable value. Noncommercial marine fishing activities in Hawaii are not subject to licensing or reporting requirements. It is assumed that noncommercial landings in the NWHI are negligible. This is not true for the MHI. In 1998, the State of Hawaii enacted bottomfish regulations that included a registration requirement for all bottomfishing vessels, including commercial, part-time commercial, and noncommercial boats. The program has registered more than 3500 vessels in the MHI. However, not all of these vessels are used for bottomfishing. Many boat owners registered their vessels to reserve the option to conduct bottomfishing operations. The noncommercial catches of bottomfish vessels remain unreported. However, in late summer 2005, a survey was sent to registered bottomfish vessel owners asking about their bottomfishing activity within the previous year. An analysis of this survey is underway and the results should provide a rough idea of the magnitude of noncommercial bottomfish landings.

Two other programs provide some insight into the MHI noncommercial catch. In the 1980s, the Hawaii Small-Boat Fisheries Survey (Hamm and Lum, 1992) was conducted, and since 2002, the Hawaii Marine Recreational Fishing Survey (HMRFS) has been in operation but has not had complete coverage of the bottomfish fishery in the MHI. Considering that regional and temporal patterns in noncommercial fishing activity are likely, it is not possible to calculate a time series of total bottomfish catch in the archipelago. Any estimates of total catch, or even landings, for the archipelago as a whole remain questionable.

Biological Data

In addition to commercial catch and sales data, certain biological information is used in our stock assessment, including size-at-maturity information reported in the literature (Everson, 1984; Everson, 1992; Everson et al., 1989; Kikkawa, 1984; Sudekum et al., 1991). This information is coupled with the mean catch weight data by species to obtain an estimate of the percentage of the catch made up of immature fish for each species. The literature includes much additional biological data, including information on bottomfish growth, diet, morphometrics, behavior, and other topics, but these data are not directly used in the assessment.

LANDINGS

Total adjusted commercial landings of Bottomfish Management Unit Species (BMUS), as defined in the FMP (WPRFMC, 1986), are shown in Tables 3−6 and Figures 2a and 2b. Results are given for the archipelagic stock as a whole and each of the three management areas separately Corrections were made to the fishermen's catch reports by comparing their landings to corresponding dealer reports, which contain more reliable weights. Further adjustment to the data on the three ulua (jack) species were achieved by allotting the catch of unidentified ulua amongst these species. The ulua adjustment factors were derived from data collected in recent years, for which identifications are generally quite good, and then applied to the entire data series.

Noncommercial landings are unreported in Hawaii as indicated earlier. Hamm and Lum (1992) estimated that the MHI noncommercial bottomfish catch during 1990−1991 was about twice as much as the commercial landings, but they thought that noncommercial catch in the NWHI was negligible. The lack of data on noncommercial catch is a major concern.

In all management zones, reported commercial catches were relatively high in the late 1940s and early 1950s and again in the mid-to-late 1980s. Polovina et al. (1994) showed that the 1980s was a period of high productivity for lobster, seabirds, and other species in Hawaiian waters and attributed these changes to a decadal shift in oceanographic conditions. If similar enhancements also occurred in bottomfish stock productivity, they may have contributed to the increased landings and CPUE fluctuations reported during this period.

CATCH-PER-UNIT-EFFORT (CPUE)

Because the quality and precision of CPUE data have varied so much over the years, such data are provided here in several formats. The longest time series for CPUE are expressed in terms of catch per trip. For this series, the number of trips is inferred from the data on reported dates. In the MHI each reported date is assumed to represent a single trip of unknown duration, but likely to be 1 day. Fishing grounds in the MHI are near ports and markets, allowing fishers to catch and sell fish on a daily basis. For CPUE standardization purposes, MHI trips were screened to include only those from Maui, Lanai, Molokai, and Penguin Banks for which at least 90% of landings were BMUS. Additionally, calculations were restricted to fishers whose annual landings were at least 30% of the median annual landings of the top 10 producers (in aggregated bottomfish weight). This filtering reduced temporal variation in average fishing power caused by the occasional entry and exit of low-producing vessels. Table 7 provides the MHI standardized catch per trip with bootstrapped 95% confidence limits. Point values of CPUE are shown in Figure 3.

For early NWHI data, consecutive dates in a vessel's records most likely represent dates of sale, rather than dates of catch, and such records are aggregated to make a single trip of unknown duration. Fishing grounds in the NWHI zones are distant from ports and markets, resulting in at least a 3-day interval between fishing days on separate trips. Trips to the NWHI are often 1−2 weeks in duration. Table 8 provides Mau Zone catch per trip with bootstrapped 95% confidence limits, and Table 9 provides results for the Ho'omalu Zone. Point values are given in Figure 4.

Catch-per-unit-effort can also be estimated on a per day basis for the NWHI fisheries. Such data have been collected for both NWHI management zones since 1988. The data are derived from a combination of interviews and catch reports (in recent years the catch report data have been sufficient and interviews have not been conducted). Table 10 and Figure 5 show catch-per-day estimates for the Mau and Ho'omalu Zones.

MEAN WEIGHT AND PERCENT IMMATURE IN THE CATCH

Mean weights of bottomfish caught in the MHI and NWHI are computed annually. Prior to 2000, fish-size data were derived from auction lot statistics obtained at the United Fishing Agency auction in Honolulu by HDAR, NMFS, and WPRFMC personnel (Ralston and

Kawamoto, 1985). Since 2000, size data have been obtained from the State of Hawaii Dealer Reports. For each lot of fish sold, these data sets record the number of fish and their aggregate weight. Weight statistics for individual fish are not routinely collected; however, analysis of bottomfish size variation in auction lots indicated that reliable size frequency distributions could be derived from the lot data (Ralston et al. 1986). Table 11 and Figure 6 display the annual mean weights of Hawaii bottomfish caught in the three management zones for the primary species.

Estimates of the percentage of the catch composed of immature fish were calculated in terms of weight and computed from size data aggregated by year and management zone. The size distribution of sold fish was assumed to be representative of all fish caught. Maturity was assumed to be “knife-edge,” and all fish in the same sales lot were assumed to be of equal size (mean weight for the lot). The sizes at maturity for these species were based on the scientific literature (Everson, 1984; Everson, 1992; Everson et al., 1989; Kikkawa, 1984; Sudekum et al., 1991). Estimates of the percentages of catch made up of immature fish are presented in Table 12 and Figure 7.

The average mean weight of bottomfish caught in the MHI is less than in the NWHI, for all species (Table 11, Fig. 6). In exploited fish populations, mean fish size generally declines as fishing mortality increases. The smaller mean size of the BMUS in the MHI indicates that MHI fishing mortality is much greater than in either NWHI zone. The reverse relationship holds for the percentage of immature fish in the exploited stock. This parameter typically increases with fishing pressure, and the average proportion of immature fish has been higher in the MHI than in the NWHI (Table 12, Fig. 7). Prior to 2004, the percentage of the catch consisting of immature fish was used as one of the indicators of stock health with a threshold level of 50%. Particular care is needed when this level is surpassed to ensure that the spawning population remains large enough to support adequate recruitment. In Hawaii, the 50% threshold is exceeded only for onaga, and this is seen to occur both in the MHI, where fishing pressure is intense, and the NWHI, where fishing pressure is relatively light. The threshold is exceeded even for low exploitation levels because onaga has a large size at first maturity (approx. 10 lbs) Thus, for onaga, a close monitoring of the spawning potential ratio (SPR) is required to ensure that the spawning population is not dropping below critical levels.

SPAWNING POTENTIAL RATIO

Prior to 2004, the spawning potential ratio (SPR) was the primary metric for determining the status of the bottomfish stocks and the only one used in defining an overfished condition (WPRFMC, 2004). Other metrics, such as CPUE and the percentage of catch made up of immature fish, were used in determining warning levels only. By FMP definition, when SPR dropped below 0.20 for any BMUS, that species was considered overfished. This definition was superceded in 2004 (see later section in this report).

Although no longer used to judge whether a stock is overfished under the FMP, SPRs are still calculated and monitored for Hawaiian BMUS and incorporated in the control rules as a species-specific, secondary layer of precaution. SPR for each species is calculated as the product of two ratios:

$$SPR = (CPUE_{current} / CPUE_{virgin}) \times (\%\ Mature_{current} / \%\ Mature_{virgin}) \times 100.$$

The CPUE values shown in Tables 7−10 are for the multispecies bottomfish stock as a whole and do not reflect well the abundance of any particular component species. For this reason, additional series of species-specific CPUE values are calculated where possible. In the NWHI, methods to estimate species-specific CPUE values have not yet been developed. Fishing trips in these zones are multiday and a single trip can target a range of species. For the MHI, however, species-specific CPUE values (targeted CPUEs) can be estimated. To calculate targeted CPUEs, we screen the catch data to include only trips on which at least 50% of the catch is of the targeted species and use only these trips to calculate CPUE. Targeted CPUE values for opakapaka, onaga, ehu, and uku were calculated. Targeted trips for other species were either not present or infrequent in the data. Partial CPUE values, computed by dividing the landings for each species by the total effort for the entire complex, were used in the above equation if targeted CPUE values could not be estimated.

SPR contribution values are calculated for each management zone separately, then these are combined into an archipelagic value in an additive fashion using management zone weighting factors (Wt) based on the relative length of the 100-fathom contour within the zone:

$$SPR_{Archipelago} = (SPR_{MHI} \times Wt_{MHI)} + (SPR_{Mau} \times Wt_{Mau}) + (SPR_{Ho'omalu} \times Wt_{Ho'omalu})$$

The positive weighting factors add up to 1.0. Table 13 displays archipelagic estimates of SPR for each of the five major BMUS species: opakapaka, onaga, ehu, uku, and hapu'upu'u.

DYNAMIC PRODUCTION MODEL

For this assessment, a dynamic production model was applied to time series of bottomfish catch and effort data for the three management zones of the Hawaiian Archipelago. In the Ho'omalu Zone and Mau Zone, the analysis involved commercial fishery data (catch-per-day) from vessel logbooks and interview data (1988−2004). In the MHI, only the State of Hawaii commercial catch data for the 1948−2004 period were used.

A simplified three-parameter dynamic production model was fit simultaneously to the three time series of catch data by nonlinear regression. The model used is similar to the one described by Kobayashi (1996). This approach reduces the number of fitted parameters by using outside information for some parameters and incorporating some shared parameters where applicable. It has been shown to be a useful approach for short time series involving geographically separate regions thought to have similar biological dynamics (Polovina, 1989). The basic equation for the dynamic production model is from Hilborn and Walters (1992) with a slight modification to the catch formula which prevents catch from exceeding population size at high levels of exploitation (Dr. Richard B. Deriso, Inter-American Tropical Tuna Commission, pers. comm.):

$$\hat{B}_t = \hat{B}_{t\text{-}1} + r\,\hat{B}_{t\text{-}1}(1 - \frac{\hat{B}_{t\text{-}1}}{k}) - C_{t\text{-}1}$$

$$\hat{C}_t = \hat{B}_t(1 - e^{-qE_t})$$

$$B_{\text{initial}} = \frac{\text{Average of first 3 years CPUE}}{q}$$

where:

t	=	time in units of years,
$\hat{B}_t$	=	modeled biomass at time t in units of pounds,
$\hat{B}_{t\text{-}1}$	=	modeled biomass at time t-1 in units of pounds,
r	=	the intrinsic rate of population increase,
k	=	the population carrying capacity in units of pounds,
$C_{t\text{-}1}$	=	the observed catch at time t-1 in units of pounds,
$\hat{C}_t$	=	the predicted catch at time t in units of pounds,
q	=	the catchability coefficient in units of per day,
E_t	=	the fishing effort at time t in units of days,
B_{initial}	=	the starting biomass for the time series in units of pounds,
CPUE	=	the catch-per-unit-of-effort in units of pounds per day with MHI trips assumed to be 1 day in duration for this application.

For each management zone, zonal maximum sustainable yield (MSY) contribution (ZMC) reference points for the bottomfish fishery are calculated separately, incorporating zone-specific estimates of k as:

$$ZMC = \frac{rk}{4},\quad B_{\text{ZMC}} = \frac{k}{2},\quad E_{\text{ZMC}} = \frac{r}{2q},\quad \text{and}\quad \text{CPUE}_{\text{ZMC}} = \frac{2qk}{4}$$

where:

ZMC	=	the maximum long-term sustainable catch contribution in units of pounds,
B_{ZMC}	=	the population biomass at ZMC in units of pounds,
E_{ZMC}	=	the fishing effort at ZMC in units of days, and
CPUE_{ZMC}	=	the catch-per-unit-of-effort at ZMC in units of pounds per day.

The GRG2 nonlinear least squares algorithm in Excel Solver was used to minimize the sum of squared deviations between C_t and $\hat{C}_t$. The three parameters to be estimated were the intrinsic rate of population increase (*r;* shared by all three regions), the Mau Zone population carrying capacity (*k,* with values for the Ho'omalu Zone and MHI scaled by zone-specific bottomfish habitat multipliers), and an initial value of MHI catchability (*q*). Given the longer history of the MHI fishery (i.e., 50 + years), catchability in the MHI was assumed to follow a four-level step function describing increases in fishing power (skill, technology, etc.) over time (prior to 1967, q = 0.000166; 1967 – 1984, q = 0.000190; 1985 – 1991, q = 0.000238; 1992 – present, q = 0.000285). Catchabilities in the NWHI zones were assumed fixed over time and were estimated from bottomfish depletion studies in the Western Pacific as described in Kobayashi (1996). Results of the analysis are presented in Table 14 and Figure 8.

STOCK STATUS

National Standard 1 of the Sustainable Fisheries Act (SFA) requires that federally managed fish stocks be maintained at levels of abundance that would allow for long-term maximum sustainable yields (MSY). The SFA requires that reference points (thresholds) be defined to determine whether the stock is being "overfished" and whether "overfishing" is occurring. Overfishing is determined to occur when current fishing mortality (F) is higher than the level at which MSY is produced. Similarly, stocks are determined to be overfished when current stock biomass (B) is below the level supporting MSY.

In 2000, Moffitt and Kobayashi (2000) defined new criteria to determine whether a BMUS stock was overfished or whether overfishing was occurring, following the guidelines set forth in National Standard 1 (Restrepo et al., 1998). In 2004, these criteria were accepted by the Secretary of Commerce (Amendment 6 to the FMP). These definitions were applied to the archipelago multispecies bottomfish stock, rather than individual species stocks, under an option allowed by the Sustainable Fisheries Act. Available scientific evidence (from computer simulation and tagging studies) suggests that bottomfish metapopulations are connected via egg/larval stages and potential movement of adults between banks (PIFSC and State of Hawaii, unpublished).

Under the accepted rules, each year the current ratios of F/F_{MSY} and B/B_{MSY} are calculated for the archipelago-wide stock as a whole. Management action is mandated when either of the resulting ratios violates a defined threshold. Together these two ratios determine the status of the archipelagic multispecies stock. As mentioned above, SPR, although not the primary measure of stock status, is also calculated for individual species and evaluated along with the established 20% reference points. SPR criteria provide a second level of precautionary evaluation.

The fitted dynamic production model discussed above is used to establish MSY reference values for biomass (B_{MSY}) and fishing mortality (F_{MSY}). The ratios of current values to these reference values then determine the status of fishing mortality and stock biomass within the control rules:

$$B_{\text{status}} = B_{\text{Current}} / B_{\text{MSY}}$$

and

$$F_{\text{status}} = F_{\text{Current}} / F_{\text{MSY}}$$

Using CPUE as a proxy for *B* and effort (*E*) as a proxy for *F*, the current biomass and fishing mortality metrics for the three management zones were calculated in a similar fashion, substituting the appropriate zonal MSY contribution (ZMC) reference points (Table 15):

$$B\_\text{metric} = \text{CPUE}_{\text{Current}} / \text{CPUE}_{\text{ZMC}}$$

and

$$F\_\text{metric} = E_{\text{Current}} / E_{\text{ZMC}}$$

Archipelago stock status values (Table 16 and Fig. 9) for both biomass and fishing mortality metrics were derived as weighted averages of values for the three management zones:

$$B\_\text{status}_{\text{Archipelago}} = (B\_\text{metric}_{\text{MHI}} \times \text{Wt}_{\text{MHI}}) + (\text{B\_metric}_{\text{Mau}} \times \text{Wt}_{\text{Mau}}) + (\text{B}_{\text{Ho'omalu}} \times \text{Wt}_{\text{Ho'omalu}}) + (\text{B\_metric}_{\text{Ho'omalu}} \times \text{Wt}_{\text{Ho'omalu}})$$

and

$$F\_\text{status}_{\text{Archipelago}} = (F\_\text{metric}_{\text{MHI}} \times \text{Wt}_{\text{MHI}}) + (F\_\text{metric}_{\text{Mau}} \times \text{Wt}_{\text{Mau}}) + (F\_\text{metric}_{\text{Ho'omalu}} \times \text{Wt}_{\text{Ho'omalu}}) + (F\_\text{metric}_{\text{Ho'omalu}} \times \text{Wt}_{\text{Ho'omalu}})$$

Weighting factors (MHI = 0.447, Mau = 0.124, Ho'omalu = 0.429) are based on the relative area of habitat (100-fathom contour) in each of the zones (PIFSC, unpublished).

Biomass and fishing mortality metrics for the three management zones are used as metrics to evaluate alternative management strategies. If the archipelagic stock as a whole is determined to be overfished or experiencing overfishing, area-specific metrics can be evaluated by managers to identify where the problems may arise (MHI, Mau, or Ho'omalu Zones) so that effective management measures can be applied. In the context of the area-specific management analysis, the terms "overfishing" and "overfished" are sometimes used to refer to conditions of excessive fishing pressure and depleted biomass within a management zone; however, as official descriptors of stock status under the Magnuson-Stevens Fishery Conservation and Mangement Act (MSFCMA) they are applied on an archipelago-wide basis only.

The control rule was first applied to the Hawaii bottomfish stock in the 2003 Bottomfish and Seamount Groundfish Annual Report (WPRFMC, 2004) using data through 2002. In the analysis for this more current assessment, we updated the time series to include 2003 and 2004 data for both the dynamic production model reference values and status determinations. Additionally, we used the fitted model to back-calculate (hindcast) control rule criteria for data years 1988–2001 to evaluate changes in biomass and fishing mortality ratios over a longer time span. As can be seen (Table 16), archipelagic biomass and fishing mortality ratios have both declined over this time period. According to the model hindcasts, the biomass ratio has remained above the control rule minimum stock size threshold (MSST) ratio of 0.70 throughout this time span, whereas the fishing mortality ratio, though improving recently, has exceeded the maximum fishing mortality threshold (MFMT) ratio of 1.00 every year since 1988.

The management zone metrics (Table 15) indicate that MHI fishing mortality metrics are well above those of the other two zones and that excessive fishing pressure in the MHI is the major contributor to overfishing in the archipelago. Since the archipelagic fishing mortality ratio exceeds the MFMT value of 1.0, corrective management measures are mandated. The management zone metrics clearly show excessive fishing pressure in the MHI Zone. Assuming management measures were applied solely to the MHI, an iterative computation using the dynamic production model indicates that the F_metric_{MHI}, and hence fishing effort, would have to be reduced from the 2004 level by 24% to bring archipelago-wide fishing mortality down to the MFMT of 1.00. A larger reduction would be needed to support a risk-averse management policy (e.g., choosing a target reference point less than the threshold reference point).

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Table 1. Principal species comprising the deep-slope bottomfish resource.

Common Name	Scientific Name
Onaga	*Etelis coruscans*
Opakapaka	*Pristipomoides filamentosus*
Ehu	*E. carbunculus*
Kalekale	*P. seiboldii*
Gindai	*P. zonatus*
Uku	*Aprion virescens*
Lehi	*Aphareus rutilans*
Yellowtail kalekale	*P. auricilla*
Hapu’upu’u	*Ephinephelus quernus*
Butaguchi	*Pseudocaranx dentex*
White ulua	*Caranx ignobilis*
Black ulua	*C. lugubris*
Kahala	*Seriola dumerili*
Taape	*Lutjanus kasmira*

Table 2. Data needs, sources, availability, and applicability.

Data Needs	Sources	Availability	Applicability
Catch and Effort	State of Hawaii Commercial Catch Reports	1948−present	• Effort determination limited to inferred trips of unknown duration. • Reports commercial landings only. • Accuracy and comprehensiveness of data unknown, but thought to have improved over time.
	NMFS Fisherman Interviews and NWHI Log Books	1984−present	• Provides good data on trip duration allowing calculation of CPUE in terms of pounds per day. • Complete coverage. • Assumes no noncommercial catch in NWHI.
Weight	Catch Reports, Sales Reports and Dealer Data	1948−present	• Catch reports provide data since 1948, but accuracy and comprehensiveness unknown. • Dealer data available since 1980s are accurate, but not comprehensive. • Dealer reports available since 2000 provide complete data.

Table 3. Total reported archipelagic catch of BMUS (in pounds). Data sources are indicated in Table 2.

Year	Opakapaka	Onaga	Ehu	Hapu'upu'u	Uku	Gindai	Kalekale	Taape
1948	231,134	52,793	109,691	85,194	103,386	285	32,596	
1949	257,278	80,113	119,907	70,024	86,872	298	37,054	
1950	235,366	82,014	85,396	81,767	68,564	2,322	33,572	
1951	262,799	56,768	61,441	68,583	49,969	3,833	42,964	
1952	316,519	46,274	57,623	98,892	72,621	3,601	35,785	
1953	233,771	58,925	49,647	77,193	81,234	2,904	38,562	
1954	150,128	67,875	33,745	41,929	68,854	2,730	33,323	
1955	181,367	64,535	39,175	68,281	82,417	5,870	33,930	
1956	155,556	89,548	50,100	44,867	83,753	3,681	35,008	
1957	127,026	61,988	32,385	32,249	101,017	2,270	20,638	
1958	122,157	64,458	24,293	28,512	74,304	2,061	20,191	
1959	88,090	49,745	23,317	31,844	46,173	1,424	21,931	
1960	89,494	40,852	17,977	22,367	45,475	1,078	16,309	
1961	93,171	42,982	12,822	20,526	42,309	694	19,090	
1962	104,425	62,585	23,588	22,957	63,811	889	18,294	
1963	121,118	53,919	28,066	32,718	65,069	2,314	24,325	
1964	105,860	57,543	23,312	24,164	89,896	1,612	16,081	
1965	83,247	65,890	19,856	21,207	50,433	468	14,010	
1966	97,536	69,735	19,587	33,098	58,117	1,019	13,072	
1967	110,149	58,114	16,046	23,396	58,645	664	7,034	
1968	90,817	69,946	22,886	21,135	49,862	757	5,124	
1969	89,489	48,454	16,636	21,207	57,582	1,363	5,648	
1970	52,835	38,191	16,688	40,473	49,276	1,683	4,466	1,116
1971	82,427	47,954	21,865	49,569	49,005	2,063	6,967	2,211
1972	118,135	50,295	30,234	36,916	52,227	1,933	7,108	3,544
1973	132,072	42,670	22,047	50,794	69,206	2,599	6,464	6,081
1974	111,621	40,526	26,803	39,439	82,665	1,544	5,813	6,298
1975	161,558	66,204	31,976	59,808	62,430	1,963	8,862	20,744
1976	121,848	90,602	35,714	58,389	63,383	1,520	9,186	29,523
1977	150,898	67,348	31,687	49,143	72,483	1,772	7,345	36,127
1978	176,635	62,377	35,314	74,494	85,808	3,703	9,800	59,093
1979	205,398	48,782	21,819	64,949	87,921	3,579	8,303	61,687
1980	230,805	34,307	18,363	55,121	74,964	2,358	7,079	61,747
1981	191,079	54,906	22,104	30,979	85,124	1,696	7,265	81,284
1982	201,120	62,664	25,555	45,489	100,992	2,070	10,440	59,284
1983	226,222	103,481	39,159	45,048	140,369	4,148	16,400	62,271
1984	349,897	115,739	37,261	59,342	147,426	4,882	18,447	42,476
1985	303,518	239,535	69,100	98,889	54,731	7,183	28,672	59,600
1986	305,227	239,551	60,273	103,457	106,512	5,251	23,334	53,485
1987	411,623	196,339	54,636	75,141	57,991	4,951	29,833	49,561
1988	352,201	157,079	50,885	33,874	347,767	2,690	12,364	44,401
1989	372,563	165,151	48,074	67,283	213,346	2,975	14,639	43,652
1990	216,404	126,852	54,100	64,560	168,449	6,023	24,431	52,177
1991	217,021	128,654	46,889	66,032	151,033	6,766	25,318	66,698
1992	256,520	87,564	35,692	56,016	131,517	5,770	27,969	67,127
1993	296,283	102,176	33,372	66,650	101,236	7,338	18,650	62,666
1994	323,538	102,015	37,488	79,339	146,180	8,764	27,615	60,194
1995	277,465	123,515	39,993	69,293	136,752	6,613	24,797	71,929
1996	228,644	98,476	47,559	58,067	117,671	9,215	31,483	44,235
1997	257,858	124,742	41,469	72,554	107,475	8,161	29,793	85,506
1998	227,025	110,011	41,807	84,190	116,340	8,594	25,334	74,853
1999	208,920	159,544	37,830	71,901	130,736	6,372	15,818	70,078
2000	206,784	169,342	43,119	41,435	122,867	5,646	20,932	55,058
2001	157,086	129,447	35,394	36,478	113,690	5,174	15,369	47,598
2002	145,918	124,414	27,733	38,008	116,828	5,067	15,173	37,893
2003	132,524	120,000	24,733	46,712	136,084	4,759	11,722	31,046
2004	133,189	155,997	31,912	42,214	150,237	5,315	9,506	42,389

Table 3 (continued). Total reported archipelagic catch of BMUS (in pounds).

Year	Yellowtail Kalekale	Lehi	Kahala	Butaguchi	White Ulua	Black Ulua	Armorhead	Total BMUS
1948		17,216	193,231	152,710	62,720	2,727		1,043,684
1949		6,044	213,479	123,321	50,650	2,202		1,047,242
1950		3,193	155,409	109,007	44,771	1,947		903,327
1951		6,932	166,565	94,703	38,896	1,691		855,144
1952		6,450	176,931	137,637	56,529	2,458		1,011,320
1953		3,500	99,000	175,658	72,145	3,137		895,676
1954		1,941	69,730	123,049	50,538	2,197		646,039
1955		2,120	83,631	103,598	42,549	1,850		709,324
1956		8,879	60,149	55,617	22,843	993		610,994
1957		3,087	70,128	54,125	22,230	967		528,109
1958		3,365	90,012	48,950	20,105	874		499,282
1959		1,179	79,098	30,854	12,672	551		386,878
1960		1,177	86,204	52,912	21,732	945		396,522
1961		1,431	76,607	38,568	15,840	689		364,729
1962		2,048	86,467	39,644	16,282	708		441,698
1963		2,295	105,698	49,935	20,509	892		506,858
1964		989	95,916	60,805	24,974	1,086		502,238
1965		1,382	74,987	42,246	17,351	754		391,832
1966		2,362	99,084	36,268	14,896	648		445,422
1967		2,604	69,494	43,588	17,902	778		408,415
1968		4,014	87,247	213,144	87,541	3,806		656,280
1969		4,722	72,463	53,546	21,992	956		394,058
1970		1,342	70,157	36,262	14,893	648		328,029
1971		2,128	83,361	34,320	14,096	613		396,578
1972		5,056	56,992	24,930	10,239	445		398,054
1973		6,489	66,119	27,135	11,145	485		443,305
1974		4,376	34,122	35,269	14,485	630		403,591
1975		10,558	30,177	58,358	23,969	1,042		537,649
1976		9,540	41,023	55,397	22,753	989		539,867
1977		8,979	57,361	43,770	17,977	782		545,671
1978		10,221	99,095	68,511	28,138	1,223		714,413
1979		16,440	83,662	53,328	21,902	952		678,722
1980		17,247	49,728	89,480	36,751	1,598		679,547
1981		26,197	38,149	56,043	26,105	938		621,869
1982		28,711	73,741	63,627	51,514	925		726,132
1983		23,682	103,920	64,481	40,598	1,069		870,849
1984		21,581	85,017	79,910	45,362	1,167		1,008,507
1985		30,871	40,574	81,196	45,150	2,682		1,061,701
1986		23,056	38,494	104,700	32,098	1,101		1,096,539
1987		37,744	19,933	115,468	33,066	1,910		1,088,196
1988		50,952	42,502	90,682	57,376	1,772		1,244,545
1989		43,622	36,120	127,972	66,486	1,768		1,203,651
1990		21,598	20,347	121,283	35,019	1,485		912,728
1991		12,925	12,262	99,689	26,961	1,100	31	861,379
1992		18,100	10,352	88,133	30,624	778		816,162
1993		10,279	5,658	82,795	16,077	1,350		804,529
1994		11,237	18,843	86,045	21,707	853		923,819
1995		14,716	15,545	82,476	21,244	1,696		886,035
1996	49	9,072	5,761	73,755	27,446	1,369		752,802
1997		12,467	12,156	82,870	17,671	1,297		854,019
1998	25	8,690	22,285	63,763	19,901	1,212	12	804,041
1999	6	9,895	18,905	45,857	11,646	512	11	788,031
2000		11,413	24,597	51,537	11,467	892	8	765,098
2001	5	10,452	14,530	43,431	15,657	670		624,980
2002	7	9,380	12,621	43,661	12,575	1,802		591,080
2003	8	8,864	5,634	25,804	11,340	1,482		560,713
2004	55	6,552	10,386	26,814	11,984	1,374	4	627,927

Table 4. Total reported catch of BMUS in the MHI (in pounds). Data sources are indicated in Table 2.

Year	Opakapaka	Onaga	Ehu	Hapu'upu'u	Uku	Gindai	Kalekale	Taape
1948	120,891	50,637	103,415	23,350	101,573	285	32,244	
1949	133,167	77,630	106,140	29,536	83,918	298	36,432	
1950	122,616	75,398	71,298	14,595	57,898	1,328	31,815	
1951	106,428	53,018	49,699	22,000	45,091	2,621	41,165	
1952	112,980	44,604	53,810	27,525	64,847	2,592	33,392	
1953	112,509	57,361	46,358	19,952	72,418	1,687	38,275	
1954	89,012	67,583	32,324	13,367	61,957	2,003	33,176	
1955	82,152	63,228	36,069	25,912	76,067	3,932	32,312	
1956	137,169	76,025	43,410	19,339	70,761	2,679	34,122	
1957	106,743	59,218	30,157	14,788	96,442	1,754	19,921	
1958	111,356	63,774	22,310	18,333	72,517	1,863	18,951	
1959	62,138	49,745	23,107	15,294	46,040	1,344	21,688	
1960	61,272	33,158	16,962	8,418	45,426	790	15,943	
1961	70,610	42,701	12,370	6,642	42,200	592	19,019	
1962	85,407	62,355	22,893	12,584	63,700	665	17,952	
1963	109,414	53,225	25,282	12,865	63,562	2,040	23,916	
1964	94,121	47,766	20,918	9,391	89,858	1,501	15,862	
1965	81,043	65,040	17,605	10,297	49,485	464	13,978	
1966	92,850	69,634	19,342	13,277	57,849	1,012	13,055	
1967	106,954	58,111	15,606	9,153	58,556	616	6,994	
1968	89,908	69,922	21,984	11,287	49,677	641	5,098	
1969	88,621	48,454	16,517	18,300	57,542	1,319	5,628	
1970	49,658	37,894	13,364	13,651	47,443	856	3,702	1,116
1971	76,388	47,250	17,626	14,746	48,710	930	6,560	2,211
1972	117,367	49,213	20,347	18,994	48,077	1,330	6,222	3,544
1973	130,785	39,811	16,336	13,878	66,875	1,595	5,073	6,081
1974	107,908	38,883	21,015	18,874	77,961	1,142	4,863	6,298
1975	147,755	66,029	30,155	38,140	62,202	1,886	8,478	20,744
1976	111,520	89,518	33,788	28,214	62,165	1,520	9,137	29,523
1977	126,940	67,312	30,446	25,071	68,478	1,658	7,262	36,125
1978	138,931	62,208	34,333	33,271	83,798	3,191	9,713	59,091
1979	170,180	46,271	20,339	23,538	87,128	2,799	8,295	61,687
1980	177,017	33,350	17,660	15,903	74,723	1,893	7,077	61,747
1981	183,953	54,609	21,422	17,271	85,084	1,442	7,255	81,284
1982	188,989	61,771	24,957	23,511	100,929	1,753	10,438	59,277
1983	208,691	103,099	38,870	40,416	132,548	4,006	16,274	62,249
1984	199,194	109,422	33,392	26,095	138,913	3,844	18,179	42,425
1985	174,817	218,614	56,070	29,055	49,307	4,346	25,872	57,145
1986	202,952	167,112	50,312	31,626	104,047	2,695	20,415	53,481
1987	274,929	171,450	46,025	13,232	56,753	2,935	28,589	49,502
1988	320,628	136,708	39,054	13,003	344,426	1,916	11,620	44,379
1989	275,887	158,548	40,581	13,075	208,354	2,092	14,286	43,614
1990	147,357	107,537	34,140	15,165	114,398	3,314	19,051	50,940
1991	134,334	89,015	27,039	14,234	90,367	4,236	19,367	66,690
1992	178,014	71,715	29,461	14,454	88,474	4,248	24,756	67,127
1993	143,673	62,861	23,102	11,313	69,966	3,877	14,906	62,652
1994	179,451	66,188	23,601	13,482	71,821	3,771	21,364	59,755
1995	174,261	73,471	28,574	16,141	62,473	3,896	19,902	71,844
1996	148,730	67,550	28,286	11,466	53,309	3,143	21,788	44,195
1997	145,807	69,145	25,798	14,215	67,976	2,812	21,252	85,491
1998	141,958	58,325	23,728	11,346	61,105	3,346	19,886	74,851
1999	129,155	60,981	19,429	10,106	89,834	2,390	11,190	70,073
2000	149,310	74,531	29,522	16,183	80,036	3,653	16,659	55,041
2001	100,003	54,993	20,911	11,105	57,469	3,127	11,759	47,551
2002	108,917	68,981	17,441	8,411	56,930	2,129	11,451	39,399
2003	115,719	71,560	15,489	10,208	44,254	2,039	9,922	37,895
2004	102,168	85,072	22,178	8,018	67,776	2,104	7,785	43,528

Table 4 (continued). Total reported catch of BMUS in the MHI (in pounds).

Year	Yellowtail Kalekale	Lehi	Kahala	Butaguchi	White Ulua	Black Ulua	Armorhead	Total BMUS
1948		17,183	167,317	33,314	55,116	1,804		707,129
1949		6,044	187,573	25,980	42,982	1,407		731,106
1950		3,175	114,848	21,087	34,886	1,142		550,086
1951		6,925	124,081	15,776	26,100	854		493,758
1952		6,249	97,228	16,396	27,126	888		487,637
1953		3,497	65,640	15,579	25,775	844		459,895
1954		1,926	51,411	11,396	18,853	617		383,625
1955		2,107	49,264	9,365	15,493	507		396,408
1956		8,879	50,626	11,024	18,238	597		472,869
1957		3,064	64,053	11,478	18,990	622		427,229
1958		3,365	86,473	9,981	16,513	541		425,976
1959		1,179	68,808	6,943	11,488	376		308,150
1960		1,177	79,576	8,040	13,302	435		284,500
1961		1,431	73,659	6,149	10,173	333		285,879
1962		2,048	81,620	7,772	12,858	421		370,274
1963		2,295	93,721	8,984	14,864	487		410,654
1964		989	86,113	8,776	14,519	475		390,289
1965		1,382	69,566	7,849	12,986	425		330,120
1966		2,362	92,288	8,903	14,729	482		385,782
1967		2,604	67,308	12,012	19,874	651		358,438
1968		4,014	84,215	66,559	110,118	3,605		517,028
1969		4,722	71,112	11,229	18,578	608		342,630
1970		1,342	57,350	7,444	12,316	403		246,539
1971		2,128	78,178	7,151	11,831	387		314,096
1972		5,056	52,152	7,733	12,795	419		343,249
1973		6,489	58,106	8,501	14,064	460		368,054
1974		4,376	31,762	9,883	16,350	535		339,850
1975		10,558	26,372	15,945	26,379	864		455,507
1976		9,540	36,377	16,455	27,223	891		455,871
1977		8,979	44,763	11,166	18,474	605		447,279
1978		10,219	73,519	15,576	25,770	844		550,464
1979		16,440	65,643	14,162	23,430	767		540,680
1980		17,225	44,415	16,223	26,840	879		494,952
1981		26,187	35,806	13,728	23,193	744		551,978
1982		28,711	72,326	18,105	32,050	863		623,680
1983		23,680	103,734	20,852	46,471	1,035		801,925
1984		21,579	84,945	19,382	47,975	1,008		746,353
1985		30,863	39,967	13,229	25,082	1,400		725,768
1986		23,056	38,405	29,857	32,009	927		756,894
1987		37,744	19,933	11,184	23,153	575		736,004
1988		50,390	42,502	24,270	52,802	1,341		1,083,039
1989		43,600	36,120	31,074	53,510	1,608		922,349
1990		21,285	20,347	20,998	35,124	794		590,450
1991		12,720	11,262	18,018	23,552	572		511,406
1992		17,572	10,352	13,627	25,935	710		546,445
1993		10,218	5,658	10,381	13,844	427		432,877
1994		11,020	11,849	11,601	14,144	544		488,591
1995		14,392	11,345	16,070	19,435	717		512,520
1996		8,839	5,526	9,798	17,028	406		420,063
1997		12,367	12,108	13,519	14,767	603		485,860
1998		8,647	21,805	9,286	15,864	713		450,859
1999		9,859	17,599	6,396	10,588	261		437,861
2000		10,834	22,573	6,954	11,161	306		476,763
2001	5	10,427	13,823	6,254	11,675	368		349,469
2002	1	9,536	11,336	5,306	10,240	623		350,701
2003	0	8,573	4,886	1,663	10,787	1,062		334,058
2004	44	6,673	6,952	1,580	11,429	1,052		366,358

Table 5. Total reported catch of BMUS in the Mau Zone (in pounds). Data sources are indicated in Table 2.

Year	Opakapaka	Onaga	Ehu	Hapu'upu'u	Uku	Gindai	Kalekale	Taape
1948	104,740	2,156	6,123	55,405	1,813	0	352	
1949	124,111	2,483	13,767	40,488	2,954		622	
1950	112,750	6,616	14,098	67,172	10,666	994	1,757	
1951	156,371	3,750	11,742	46,583	4,878	1,212	1,799	
1952	203,539	1,670	3,813	71,367	7,774	1,009	2,393	
1953	121,262	1,564	3,289	57,241	8,816	1,217	287	
1954	61,116	292	1,421	28,562	6,897	727	147	
1955	99,215	1,307	3,106	42,369	6,350	1,938	1,618	
1956	18,387	13,523	6,690	25,528	12,992	1,002	886	
1957	20,283	2,770	2,228	17,461	4,575	516	717	
1958	10,801	684	1,983	10,179	1,787	198	1,240	
1959	25,952		210	16,550	133	80	243	
1960	28,222	7,694	1,015	13,949	49	288	366	
1961	22,561	281	452	13,884	109	102	71	
1962	19,018	230	695	10,373	111	224	342	
1963	11,704	694	2,784	19,853	1,507	274	409	
1964	11,739	9,777	2,394	14,773	38	111	219	
1965	2,204	850	2,251	10,910	948	4	32	
1966	4,686	101	245	19,821	268	7	17	
1967	3,195	3	440	14,243	89	48	40	
1968	909	24	920	9,848	185	116	26	
1969	868		119	2,907	40	44	20	
1970	3,177	297	3,324	26,822	1,833	827	764	
1971	6,039	704	4,239	34,823	295	1,133	407	
1972	768	1,082	9,887	17,922	4,150	603	886	
1973	1,287	2,859	5,711	36,916	2,331	1,004	1,391	
1974	3,713	1,643	5,788	20,565	4,704	402	950	
1975	13,803	175	1,821	21,668	228	77	384	
1976	10,328	1,084	1,926	30,175	1,218		49	
1977	23,958	36	1,241	24,072	4,005	114	83	2
1978	37,704	169	981	41,223	2,010	512	87	2
1979	35,218	2,511	1,480	41,411	793	780	8	
1980	53,788	957	703	39,218	241	465	2	
1981	7,126	297	382	13,708	40	254	10	
1982	12,131	893	598	21,978	63	317	2	7
1983	17,531	382	289	4,632	7,821	142	126	22
1984	150,703	6,317	3,869	33,247	8,513	1,038	268	51
1985	128,701	20,921	13,030	69,834	5,424	2,837	2,800	2,455
1986	102,275	72,439	9,961	71,831	2,465	2,556	2,919	4
1987	136,694	24,889	8,611	61,909	1,238	2,016	1,244	59
1988	31,573	20,371	11,831	20,871	3,341	774	744	22
1989	96,676	6,603	7,493	54,208	4,992	883	353	38
1990	41,633	10,206	19,443	37,340	43,298	2,559	5,143	1,207
1991	12,111	9,171	15,670	16,151	23,287	1,479	5,171	2
1992	19,264	5,769	2,259	8,307	3,999	359	2,269	
1993	22,320	3,684	3,926	11,485	6,600	856	2,449	14
1994	18,845	9,432	7,643	14,365	51,822	2,524	3,141	381
1995	14,094	22,597	6,304	13,770	61,451	1,382	3,071	59
1996	15,632	10,865	12,238	20,166	47,610	3,487	7,729	40
1997	26,586	17,301	4,070	13,838	24,621	1,036	3,985	9
1998	9,524	1,835	3,091	7,517	32,152	613	1,630	2
1999	7,918	3,969	4,231	5,777	27,144	1,109	1,257	5
2000	6,987	3,462	5,159	4,657	13,033	841	2,638	17
2001	4,182	3,824	6,083	4,266	19,086	608	2,016	47
2002	15,402	9,723	6,698	17,103	45,273	1,399	3,097	24
2003	6,372	6,107	3,269	17,376	53,177	885	1,310	1
2004	10,603	9,570	2,491	11,822	46,767	913	869	5

Table 5 (continued). Total reported catch of BMUS in the Mau Zone (in pounds).

Year	Yellowtail Kalekale	Lehi	Kahala	Butaguchi	White Ulua	Black Ulua	Armorhead	Total BMUS
1948		33	23,201	54,672	6,703	1,489		256,687
1949			25,906	39,248	4,812	1,069		255,460
1950		18	40,561	35,691	4,376	972		295,671
1951		7	42,484	53,479	6,557	1,456		330,319
1952		201	79,703	72,256	8,860	1,967		454,552
1953		3	33,360	48,113	5,899	1,310		282,361
1954		15	18,319	30,046	3,684	818		152,044
1955		13	34,367	45,596	5,591	1,241		242,711
1956			9,523	1,747	214	48		90,540
1957		23	6,075	22,937	2,812	625		81,022
1958			3,539	3,055	375	83		33,923
1959			10,290	995	122	27		54,602
1960			6,628	13,811	1,693	376		74,092
1961			2,948	17,327	2,125	472		60,331
1962			4,847	22,646	2,777	617		61,880
1963			11,977	32,009	3,925	872		86,007
1964			9,803	37,142	4,554	1,011		91,561
1965			5,421	25,833	3,167	703		52,324
1966			6,796	12,963	1,589	353		46,847
1967			2,186	9,899	1,214	270		31,626
1968			3,032	14,574	1,787	397		31,818
1969			1,351	27,422	3,362	747		36,880
1970			12,807	19,263	2,362	525		72,001
1971			5,183	17,775	2,179	484		73,262
1972			4,840	1,928	236	52		42,354
1973			8,013	1,738	213	47		61,510
1974			2,360	7,305	896	199		48,524
1975			3,805	13,850	1,698	377		57,887
1976			4,646	7,441	912	203		57,982
1977			12,598	13,816	1,694	376		81,995
1978		2	25,576	27,469	3,368	748		139,851
1979			18,019	12,439	1,525	339		114,523
1980		22	5,313	5,269	646	143		106,768
1981		10	2,343	2,758	3,846	71		30,845
1982			1,415	211	26	6		37,646
1983		2	186	888	842	17		32,880
1984		2	72	9,039	163	38		213,320
1985		8	607	15,289	65	285		262,256
1986			89	10,210	233	156		275,138
1987				9,228	662	110		246,661
1988		562		4,648	64	336		95,137
1989		22		18,819	2,907	44		193,038
1990		295		46,994	340	605		209,063
1991		188	1,000	15,076	216	365		99,887
1992		334		10,666	0	23		53,249
1993		25		25,659	10	447		77,476
1994		141	5,271	36,269	995	259		151,088
1995		229	4,200	25,061	624	844		153,686
1996	49	201	205	25,301	819	872		145,215
1997		47		16,461	503	547		109,004
1998	25	43	480	9,123	238	450		66,723
1999	6	36	1,206	7,229	129	248		60,264
2000		575	2,024	14,397	302	184		54,276
2001	0	25	387	8,628	551	224		49,927
2002	6	26	1,285	10,387	784	1,169		112,376
2003	8	55	986	8,741	21	420		98,728
2004	11		1,518	11,555	140	282		96,547

Table 6. Total reported catch of BMUS in the Ho'omalu Zone (in pounds). Data sources are indicated in Table 2.

Year	Opakapaka	Onaga	Ehu	Hapu'upu'u	Uku	Gindai	Kalekale	Taape
1948	5,503		153	6,439			54	
1949	49,700	60	4,140	15,019	252		177	
1950	23,230	1,563	2,273	12,589	376	303	278	
1951	23,956	77	1,329	10,178	101	155	101	
1952	79,821	927	807	31,700	351	386	1,062	
1953	84,249	1,439	2,408	46,972	6,313	1,003	215	
1954	39,143	119,767	292	19,413	389	507	118	
1955	51,469	309	684	14,139	653	1,345	371	
1956	16,021	2,880	4,403	14,025	47	500	221	
1957	1,693	20	143	1,022	49	31	82	
1958	7,013	684	1,810	7,650		157	1,192	
1959	21,785		161	12,570	66	44	152	
1960	14,735	238	544	9,788	37	202	84	
1961	5,503		37	2,829	12	33	23	
1962								
1963								
1964								
1965	607	609	555	4,196	508	4	3,615	
1966								
1967								
1968								
1969								
1970								
1971								
1972								
1973								
1974								
1975								
1976								
1977	4,300							
1978	3,300			800				
1979	12,918	1,389	18	7,845		91		
1980	48,368	305	316	31,038	205	255		
1981	5,621	250	665	11,820	24	200	10	
1982	12,131	893	595	21,926		317	2	
1983	16,069	362	137	1,328	36	62	22	
1984	122,820	660	1,405	26,950	2,437	888	178	
1985	62,728	13,125	4,963	27,537	318	1,345	1,259	60
1986	91,649	59,419	6,141	53,566	1,323	1,916	1,461	4
1987	120,908	21,632	7,899	55,664	436	1,888	762	
1988	25,953	10,241	3,506	15,081	1,298	445	227	
1989	52,596	4,572	5,994	35,772	635	531	249	30
1990	39,289	10,429	806	18,395	12,653	196	529	
1991	70,137	30,458	4,169	35,624	37,279	1,041	780	
1992	54,605	9,987	3,806	31,821	38,705	1,025	860	
1993	130,105	35,343	6,238	43,837	6,238	2,593	1,238	
1994	124,571	26,144	5,432	51,455	22,526	2,096	1,911	
1995	88,933	27,289	4,785	39,319	12,821	1,237	1,719	
1996	62,784	19,909	6,261	24,318	16,377	2,464	1,708	
1997	85,465	38,296	11,230	44,490	14,853	4,289	3,913	
1998	75,537	49,851	14,988	65,313	23,040	4,501	3,710	
1999	71,841	94,594	14,161	56,018	13,758	2,860	3,201	
2000	50,487	91,354	8,487	20,595	29,824	1,153	1,563	
2001	52,901	70,630	8,372	21,107	36,491	1,362	1,499	0
2002	22,835	47,202	3,831	12,661	14,857	1,545	1,052	0
2003	15,960	48,379	7,579	19,800	41,721	1,982	1,149	0
2004	21,379	62,439	7,426	23,072	35,864	2,368	1,039	0

Table 6 (continued). Total reported catch of BMUS in the Ho'omalu Zone (in pounds).

Year	Yellowtail Kalekale	Lehi	Kahala	Butaguchi	White Ulua	Black Ulua	Armorhead	Total BMUS
1948			2,713	8,363	1,872	0		25,097
1949			12,991	22,746	5,091	60		110,236
1950			4,961	27,032	6,051	36		78,692
1951			5,438	12,337	2,762	19		56,453
1952		174	28,063	50,637	11,335	9		205,271
1953		3	25,204	130,102	29,122	26		327,057
1954		15	14,046	92,558	20,718	14		306,980
1955		13	17,949	59,245	13,261	25		159,463
1956			4,909	28,685	6,421	22		78,133
1957		20	597	4,111	920	4		8,693
1958			2,528	22,600	5,059	9		48,701
1959			7,732	12,405	2,777	6		57,697
1960			4,380	25,770	5,768	2		61,549
1961			744	10,513	2,353	0		22,047
1962				0	0	0		0
1963				0	0	0		0
1964				6,484	1,451	0		7,935
1965			3,615	168	38	0		13,915
1966				0	0	0		0
1967				0	0	0		0
1968				0	0	0		0
1969				0	0	0		0
1970				0	0	0		0
1971				0	0	0		0
1972				0	0	0		0
1973				0	0	0		0
1974				0	0	0		0
1975				0	0	0		0
1976				0	0	0		0
1977			120	0	0	0		4,420
1978				2,318	519	0		6,937
1979				1,928	432	0		24,621
1980		20	4,068	50,120	11,219	1		145,916
1981			1,724	15,570	3,221	16		39,121
1982			1,400	13,782	25,468	114		76,628
1983				4,252	749	10		23,028
1984		2		18,788	3,575	134		177,837
1985			519	34,540	23,511	1,165		171,070
1986				43,431	3,959	163		263,032
1987				77,652	12,494	1,426		300,760
1988				24,806	11,702	205		93,465
1989				38,624	17,656	153		156,813
1990		18		26,288	4,734	193		113,530
1991		17		46,972	6,874	300		233,651
1992		39		38,304	9,253	199		188,604
1993		36		33,189	4,859	607		264,283
1994			1,720	24,011	9,051	110		269,027
1995		22		20,728	4,135	184		201,173
1996		32	30	23,593	11,646	119		169,241
1997		17	48	36,817	5,244	141		244,803
1998				30,257	6,523	124		273,844
1999			100	22,726	2,638	87		281,984
2000		4		21,388	1,624	456		226,935
2001	0	0	320	19,432	5,249	84		217,447
2002	0	11	0	20,319	2,939	78		127,330
2003	0	0	0	14,619	508	51		151,748
2004	0	0	2,017	13,027	549	55	4	169,238

Table 7. MHI (Maui, Lanai, Molokai, and Kahoolawe) BMUS catch per trip (CPUE) with 95% confidence limits (CL). Data sources are indicated in Table 2.

Year	CPUE	Lower 95% CL	Upper 95% CL
1948	614	514	712
1949	713	626	811
1950	677	591	759
1951	621	565	682
1952	577	521	630
1953	645	557	743
1954	887	804	977
1955	755	682	831
1956	784	705	867
1957	789	707	876
1958	533	477	592
1959	519	472	565
1960	630	565	695
1961	496	444	547
1962	491	441	542
1963	518	472	560
1964	619	556	688
1965	503	466	538
1966	536	489	582
1967	602	533	678
1968	478	437	516
1969	480	431	527
1970	433	384	482
1971	433	381	488
1972	514	454	577
1973	421	376	462
1974	329	298	359
1975	430	396	466
1976	485	443	526

Year	CPUE	Lower 95% CL	Upper 95% CL
1977	527	463	591
1978	635	564	720
1979	380	345	418
1980	421	384	461
1981	416	378	464
1982	307	281	335
1983	214	198	233
1984	220	205	236
1985	230	209	253
1986	274	246	310
1987	237	223	251
1988	329	295	368
1989	361	330	395
1990	245	227	262
1991	202	189	215
1992	228	211	245
1993	213	196	230
1994	217	200	235
1995	193	175	210
1996	125	117	134
1997	176	164	188
1998	130	120	141
1999	209	190	228
2000	187	173	201
2001	194	179	210
2002	179	164	195
2003	190	177	204
2004	171	162	181

Table 8. Mau Zone catch per trip (CPUE) with 95% confidence limits (CL).

Year	CPUE	Lower 95% CL	Upper 95% CL
1948	5968	4015	7991
1949	6799	4981	8914
1950	4966	3336	6321
1951	4980	4181	5934
1952	7407	5378	9350
1953	8937	5838	13552
1954	6158	4424	8085
1955	4659	3493	5895
1956	2523	1676	3354
1957	3958	2842	4896
1958	0	0	0
1959	0	0	0
1960	6379	4972	7724
1961	6999	5295	8925
1962	4641	3855	5306
1963	6410	4970	7834
1964	8028	6006	10202
1965	6656	5404	7516
1966	4413	3510	5333
1967	14749	8397	26175
1968	6055	3742	9752
1969	11484	10712	12864
1970	7111	4336	8811
1971	4784	3585	6467
1972	2386	1761	3031
1973	3224	2586	4147
1974	3367	2784	4235
1975	5439	4402	6746
1976	4653	4013	5392
1977	4387	3057	5425
1978	4753	3952	5695
1979	5361	4255	6693
1980	6210	1076	13314
1981	1336	0	0
1982	0	0	0
1983	2242	1612	2871
1984	4308	2908	6266
1985	4239	3606	4820
1986	2206	1483	2983
1987	2889	2249	3529
1988	2136	1856	2386
1989	5412	3589	7210
1990	4454	3875	5135
1991	2413	1841	3297
1992	2092	1647	2714
1993	1992	1670	2354
1994	3748	2349	5294
1995	2460	1907	3059
1996	2823	2326	3414
1997	3294	2759	3911
1998	2518	2025	2948
1999	2926	2273	3689
2000	2654	1662	3743
2001	2066	1461	2698
2002	2496	2001	3042
2003	3086	2475	3816
2004	2953	2509	3439

Table 9. Ho'omalu Zone catch per trip (CPUE) with 95% confidence limits (CL).

Year	CPUE	Lower 95% CL	Upper 95% CL
1948	14635	0	0
1949	4614	0	0
1950	6072	5430	6837
1951	8228	0	0
1952	4766	2658	6901
1953	7627	6238	9581
1954	8613	7194	10075
1955	9336	7596	10920
1956	5202	0	0
1957	1535	0	0
1958	6254	5182	7033
1959	5897	5055	6739
1960	8139	7713	8616
1961	7978	0	0
1962	0	0	0
1963	0	0	0
1964	8390	0	0
1965	0	0	0
1966	0	0	0
1967	0	0	0
1968	0	0	0
1969	0	0	0
1970	0	0	0
1971	0	0	0
1972	0	0	0
1973	0	0	0
1974	0	0	0
1975	0	0	0
1976	0	0	0
1977	4000	0	0
1978	3550	0	0
1979	4951	3882	6318
1980	6687	4052	8840
1981	8167	3153	12302
1982	7953	4510	11395
1983	3025	2590	3378
1984	4085	3643	4592
1985	5909	4418	7005
1986	5301	4537	6300
1987	8187	6720	9412
1988	4702	3799	5588
1989	5328	3989	7160
1990	4793	3850	5656
1991	5928	5105	6714
1992	7388	6189	9231
1993	8040	7137	9054
1994	4651	3434	5790
1995	5544	4158	7164
1996	5870	4918	6943
1997	5234	4379	6053
1998	5198	4580	5876
1999	4606	4107	5158
2000	5212	4541	5818
2001	5300	4710	5880
2002	4651	4149	5150
2003	4483	3888	5057
2004	4272	3763	4814

Table 10. NWHI CPUE (pounds/day).

Year	Mau Zone	Ho'omalu Zone
1988	322	866
1989	677	808
1990	573	675
1991	333	671
1992	239	639
1993	267	723
1994	353	629
1995	306	582
1996	298	563
1997	429	574
1998	364	527
1999	337	534
2000	260	601
2001	283	543
2002	438	412
2003	481	488
2004	448	438

Table 11. Mean body weight (lbs) of Hawaiian bottomfish by species and management zone. Data sources are indicated in Table 2.

Opakapaka

Year	MHI	Mau	Ho'omalu
1988	3.9	10.3	10.0
1989	4.4	8.9	11.1
1990	5.1	7.1	9.3
1991	4.6	7.6	9.1
1992	4.5	6.7	8.5
1993	3.6	6.9	8.1
1994	3.9	7.5	8.7
1995	3.6	8.2	8.7
1996	3.6	8.6	8.0
1997	4.0	9.2	7.8
1998	3.3	8.7	8.0
1999	3.4	8.9	7.6
2000	3.8	8.3	8.0
2001	3.6	8.3	8.5
2002	3.8	10.8	8.8
2003	3.8	10.1	9.3
2004	3.5	6.4	9.1
Average	3.9	8.4	8.7

Ehu

Year	MHI	Mau	Ho'omalu
1988	1.7	3.8	4.5
1989	1.6	4.1	4.3
1990	1.6	3.9	4.8
1991	1.8	3.2	3.8
1992	1.7	4.1	3.9
1993	1.6	3.2	3.5
1994	1.6	2.7	3.5
1995	1.5	3.3	3.3
1996	1.7	3.0	3.4
1997	1.4	3.1	3.2
1998	2.0	3.8	3.5
1999	2.0	3.6	3.6
2000	1.8	3.3	4.3
2001	1.7	3.0	3.8
2002	1.8	3.7	3.0
2003	1.9	3.4	3.5
2004	2.2	2.6	3.6
Average	1.7	3.4	3.7

Onaga

Year	MHI	Mau	Ho'omalu
1988	5.8	11.0	10.6
1989	4.6	8.1	9.1
1990	4.9	10.2	10.3
1991	5.0	12.0	11.4
1992	5.3	12.7	9.9
1993	4.9	10.8	10.9
1994	4.1	11.9	10.0
1995	4.4	12.7	7.2
1996	3.7	12.9	9.1
1997	3.9	13.7	7.6
1998	3.9	5.4	7.7
1999	4.1	13.6	9.7
2000	4.1	7.9	8.4
2001	5.3	8.6	8.5
2002	4.9	11.4	8.4
2003	5.3	9.9	9.0
2004	5.5	8.8	9.2
Average	4.7	10.7	9.2

Uku

Year	MHI	Mau	Ho'omalu
1988	8.9	15.7	14.7
1989	8.9	14.2	15.5
1990	8.8	12.1	13.3
1991	9.7	13.6	13.4
1992	9.5	13.0	10.6
1993	9.5	12.2	10.7
1994	8.6	11.9	11.0
1995	8.6	11.3	10.3
1996	8.2	12.0	11.9
1997	8.3	12.6	10.3
1998	8.8	13.6	11.2
1999	8.3	11.5	10.1
2000	7.3	10.9	8.5
2001	8.0	11.0	9.7
2002	8.4	10.4	8.9
2003	8.6	10.6	10.7
2004	8.4	10.5	10.8
Average	8.6	12.2	11.3

Table 11 (continued). Mean body weight of Hawaiian bottomfish.

Hapu'upu'u

Year	MHI	Mau	Ho'omalu
1988	12.8	10.0	14.7
1989	12.7	14.2	12.9
1990	10.7	12.9	15.6
1991	14.6	12.8	15.4
1992	12.4	13.7	14.0
1993	7.8	12.5	13.0
1994	9.7	11.6	13.6
1995	7.1	11.8	14.0
1996	7.9	13.5	14.4
1997	8.9	13.0	14.0
1998	8.1	12.7	14.1
1999	8.4	12.7	14.4
2000	7.5	12.6	14.4
2001	11.2	13.2	15.2
2002	9.4	13.1	13.7
2003	10.2	11.7	15.0
2004	10.3	12.7	13.2
Average	10.0	12.6	14.2

Table 12. Percent of Hawaiian bottomfish catch (in weight) made up of immature fish. Data sources are indicated in Table 2.

Opakapaka

Year	MHI	Mau	Ho'omalu
1988	23.8	0.2	0.0
1989	15.1	0.0	0.0
1990	8.6	4.4	0.2
1991	12.3	5.4	2.0
1992	14.2	2.2	0.8
1993	25.8	1.4	0.1
1994	23.3	3.0	0.1
1995	26.0	2.1	0.2
1996	25.7	0.5	0.9
1997	19.0	0.4	0.9
1998	32.9	0.2	0.5
1999	26.3	0.3	0.7
2000	21.5	0.0	0.4
2001	23.7	1.7	0.2
2002	19.6	0.2	1.2
2003	20.7	0.8	0.4
2004	27.6	8.1	0.3
Average	21.5	1.8	0.5

Ehu

Year	MHI	Mau	Ho'omalu
1988	13.0	0.0	0.0
1989	14.0	0.1	0.0
1990	14.9	0.1	0.0
1991	8.3	0.5	0.0
1992	9.3	0.0	0.1
1993	8.6	0.2	0.0
1994	12.1	2.1	0.3
1995	13.0	0.6	0.8
1996	9.4	0.1	0.6
1997	14.6	0.1	0.8
1998	4.5	0.0	0.4
1999	5.7	0.0	0.2
2000	7.2	0.0	0.1
2001	10.0	0.5	0.2
2002	8.3	0.1	0.0
2003	7.8	0.0	0.2
2004	4.0	2.9	0.1
Average	9.7	0.4	0.2

Onaga

Year	MHI	Mau	Ho'omalu
1988	54.5	25.4	23.9
1989	71.3	47.2	42.6
1990	71.9	35.8	39.9
1991	75.6	24.6	27.9
1992	73.1	22.4	44.1
1993	66.1	18.9	31.9
1994	68.5	11.5	28.9
1995	73.7	11.9	44.1
1996	80.5	8.6	33.3
1997	80.9	8.0	63.4
1998	77.6	54.3	57.3
1999	82.5	7.7	9.7
2000	83.6	48.9	48.5
2001	88.3	44.5	47.9
2002	85.1	18.0	51.1
2003	77.6	28.0	49.0
2004	74.4	29.7	43.0
Average	75.6	26.2	40.4

Uku

Year	MHI	Mau	Ho'omalu
1988	1.0	0.0	0.0
1989	8.0	0.0	0.0
1990	1.4	0.1	0.0
1991	0.5	0.1	0.0
1992	0.3	0.0	0.0
1993	0.7	0.1	0.0
1994	0.8	0.1	0.0
1995	0.9	0.1	0.1
1996	1.5	0.0	0.0
1997	2.5	0.2	0.0
1998	1.3	0.0	0.0
1999	0.6	0.2	0.1
2000	1.7	0.1	0.1
2001	3.4	0.0	0.0
2002	0.6	0.2	0.0
2003	0.7	0.0	0.0
2004	2.2	0.0	0.0
Average	1.7	0.1	0.0

Table 12 (continued). Percent of Hawaiian bottomfish catch (in weight) made up of immature fish. Data sources are indicated in Table 2.

Hapu'upu'u

Year	MHI	Mau	Ho'omalu
1988	12.4	24.9	14.7
1989	10.6	9.5	12.6
1990	15.8	7.8	7.0
1991	6.0	9.3	6.3
1992	10.5	7.0	6.2
1993	32.1	9.0	8.5
1994	16.9	12.8	9.9
1995	39.1	13.6	9.5
1996	35.0	10.5	8.3
1997	26.1	11.2	9.4
1998	31.9	14.3	7.9
1999	28.8	10.6	6.6
2000	28.5	11.7	7.8
2001	15.4	9.9	5.6
2002	20.8	10.4	9.0
2003	16.4	14.5	6.8
2004	18.1	12.0	11.5
Average	21.4	11.7	8.7

Table 13. Archipelagic SPR.

Year	Opakapaka	Onaga	Ehu	Uku	Hapu'upu'u
1986	51	53	41	58	55
1987	69	61	61	65	71
1988	49	42	37	62	56
1989	69	38	51	68	70
1990	57	36	44	52	57
1991	57	42	44	53	58
1992	68	41	51	61	67
1993	67	53	54	73	65
1994	53	39	38	52	51
1995	54	33	41	56	48
1996	52	39	43	57	49
1997	52	25	42	51	49
1998	47	22	38	50	44
1999	46	34	37	55	47
2000	52	27	39	52	49
2001	51	26	40	48	51
2002	47	26	37	45	45
2003	48	28	36	42	47
2004	43	28	36	42	44

Table 14. Dynamic production model specifications for the current stock assessment.

Archipelagic Reference Values for Dynamic Production Model Parameters	
Model Parameter	**Reference Value**
Carrying Capacity (*k*) [lbs]	7,131,473
B_{MSY} [lbs]	3,565,736
MSY [lbs]	811,225

Zonal Model Outputs and Metrics			
Model Output/Metric	**MHI**	**Mau**	**Ho'omalu**
Catchability (*q*) [per day]	Period / *q* value < 1961: 0.000166 1961–1984: 0.000190 1985–1991: 0.000238 1992–present: 0.000285	0.000991	0.000262
Intrinsic Rate of Population Increase (*r*)	0.455011	0.455011	0.455011
Zonal Carrying Capacity Contribution [lbs]	3,186,215	882,608	3,062,650
Zonal MSY Contribution (ZMC) [lbs]	362,441	100,399	348,385
Biomass at ZMC [lbs]	1,593,107	441,304	1,531,325
$CPUE_{ZMC}$ [lbs per day]	405	437	400
E_{ZMC} [days]	895	230	870
Zonal Weighting Factors (proportion of archipelagic 100 fathom contour)	0.447	0.124	0.429

Table 15. Biomass and fishing mortality metrics ($B\_metric_{<zone>}$ and $F\_metric_{<zone>}$) for the Hawaiian bottomfish management zones. Estimates in shaded area are hindcasts for the period before the biomass and fishing Mortality Control Rule was adopted. If $B\_metric_{<zone>} < 0.7$ localized depletion has occurred; if $F\_metric_{<zone>} > 1.0$ excessive fishing pressure is occurring.

	Biomass Metric			Fishing Mortality Metric		
Year	MHI	Mau	Ho'omalu	MHI	Mau	Ho'omalu
1988	0.81	0.74	2.16	3.53	0.54	0.78
1989	0.89	1.55	2.02	2.72	0.76	0.26
1990	0.60	1.31	1.69	2.46	1.89	0.29
1991	0.50	0.76	1.68	2.46	1.35	0.49
1992	0.56	0.55	1.60	2.35	1.29	0.64
1993	0.53	0.61	1.81	1.94	1.60	0.46
1994	0.54	0.81	1.57	2.20	1.97	0.52
1995	0.48	0.70	1.45	2.55	2.37	0.40
1996	0.31	0.68	1.41	3.36	1.94	0.36
1997	0.43	0.98	1.43	2.54	1.07	0.48
1998	0.32	0.83	1.32	3.23	0.79	0.58
1999	0.52	0.77	1.33	1.97	0.70	0.58
2000	0.46	0.59	1.50	2.52	0.82	0.41
2001	0.48	0.65	1.36	1.74	0.77	0.50
2002	0.44	1.00	1.03	1.95	1.07	0.34
2003	0.47	1.10	1.22	1.74	0.86	0.35
2004	0.42	1.02	1.09	2.11	0.88	0.40

Table 16. Biomass and fishing mortality stock status values for bottomfish in the Hawaiian Archipelago are used to determine stock status under the current Control Rule. Estimates in shaded area are hindcasts for the period before the Control Rule was adopted. If $B_{status} < 0.7$ the stock is overfished; if $F_{status} > 1.0$ overfishing is occurring.

Year	B_{status}	F_{status}
1988	1.38	1.98
1989	1.46	1.42
1990	1.16	1.46
1991	1.04	1.48
1992	1.00	1.48
1993	1.09	1.26
1994	1.01	1.45
1995	0.92	1.61
1996	0.83	1.90
1997	0.93	1.48
1998	0.81	1.79
1999	0.90	1.21
2000	0.92	1.40
2001	0.88	1.09
2002	0.76	1.15
2003	0.87	1.03
2004	0.79	1.22

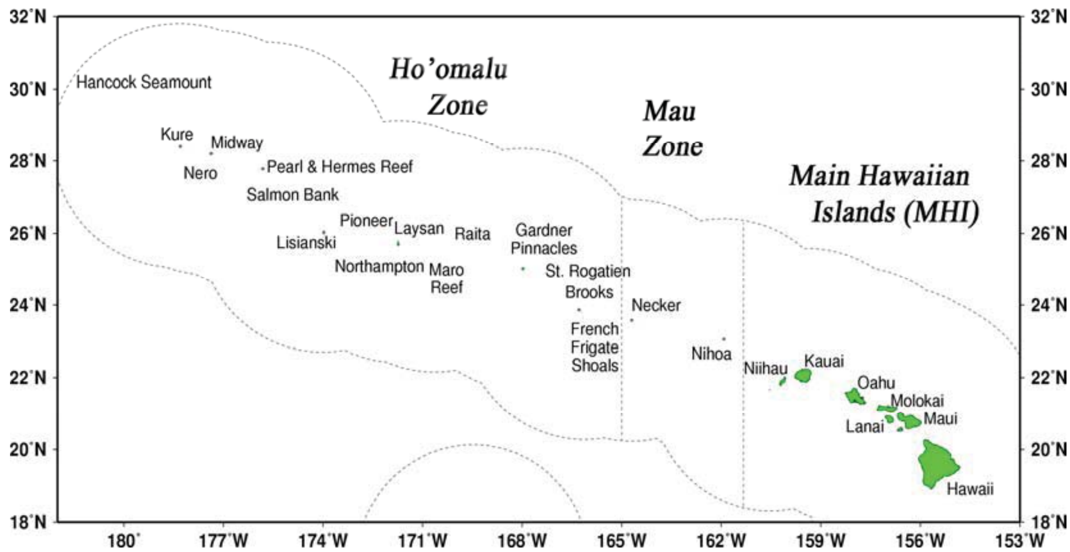


Figure 1. Map of the Hawaiian Archipelago with bottomfish management zones.

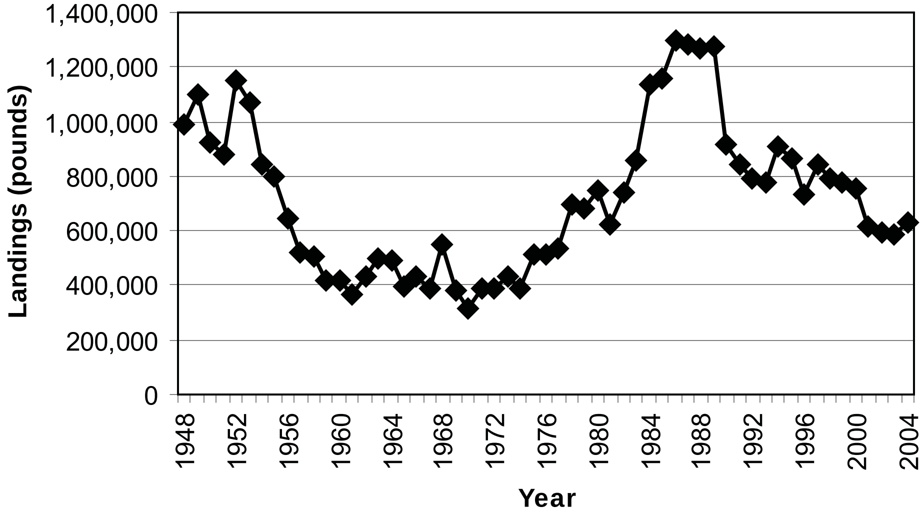


Figure 2a. Total adjusted BMUS landings for the Hawaiian Archipelago.

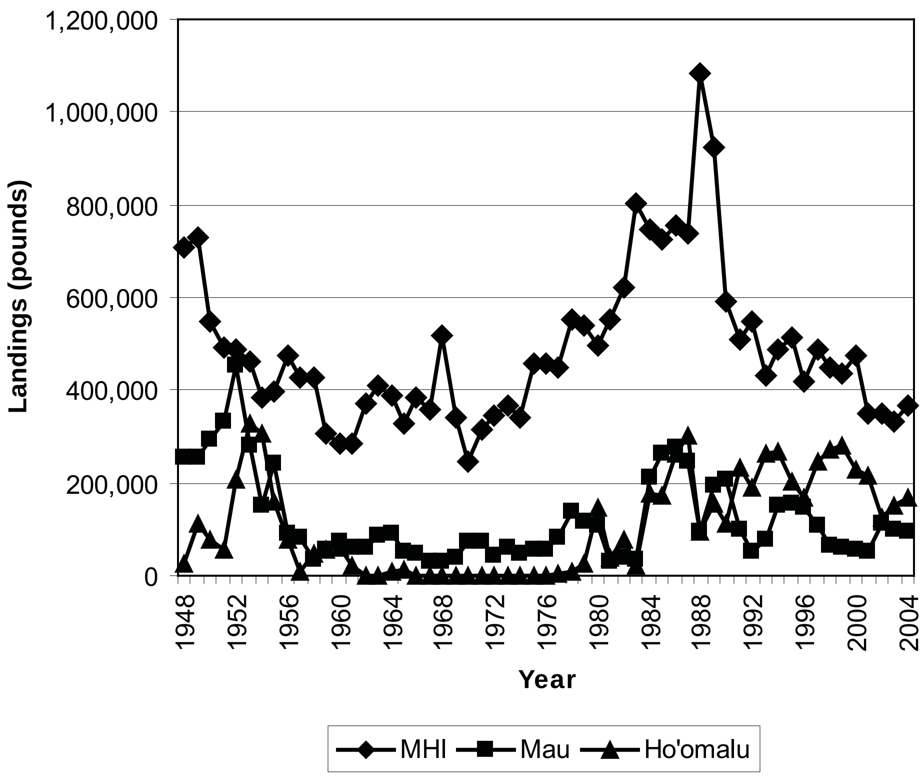


Figure 2b. Total adjusted BMUS landings by management zone.

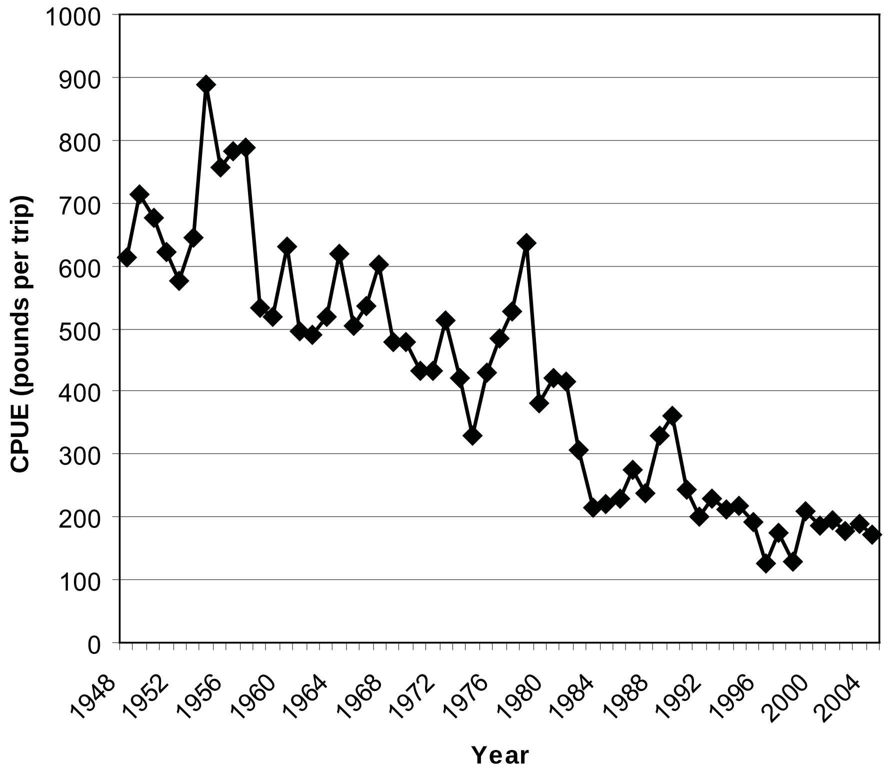


Figure 3. MHI catch per trip (CPUE) by year.

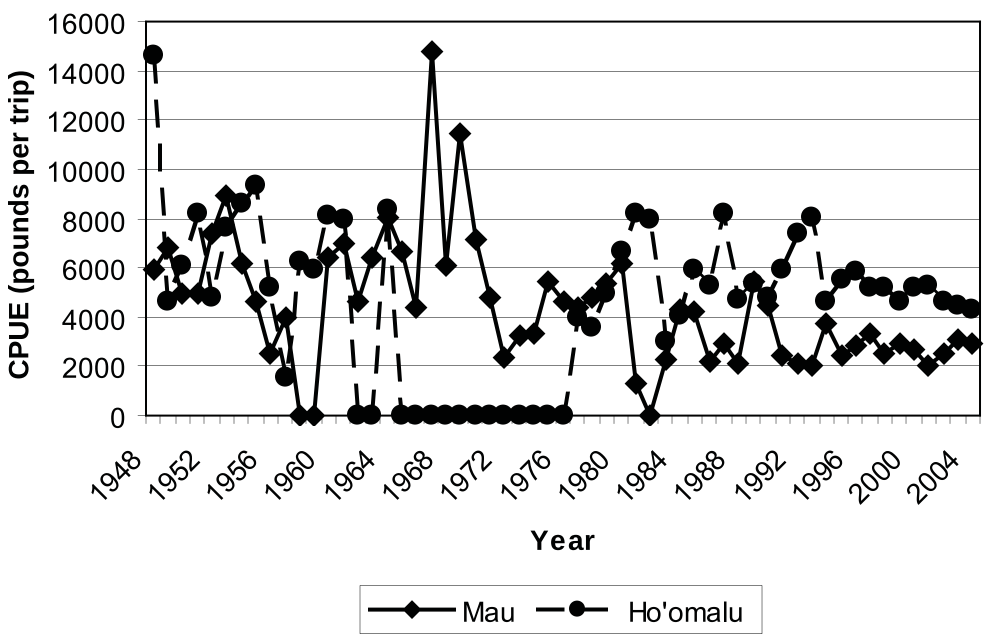


Figure 4. NWHI catch per trip (CPUE) by year.

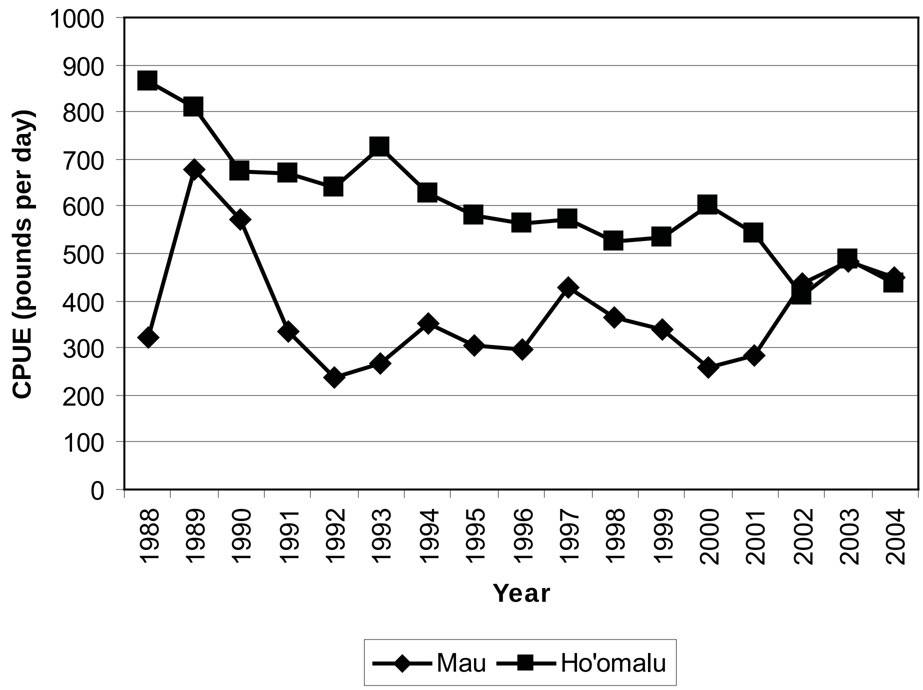


Figure 5. NWHI catch per day (CPUE) by year

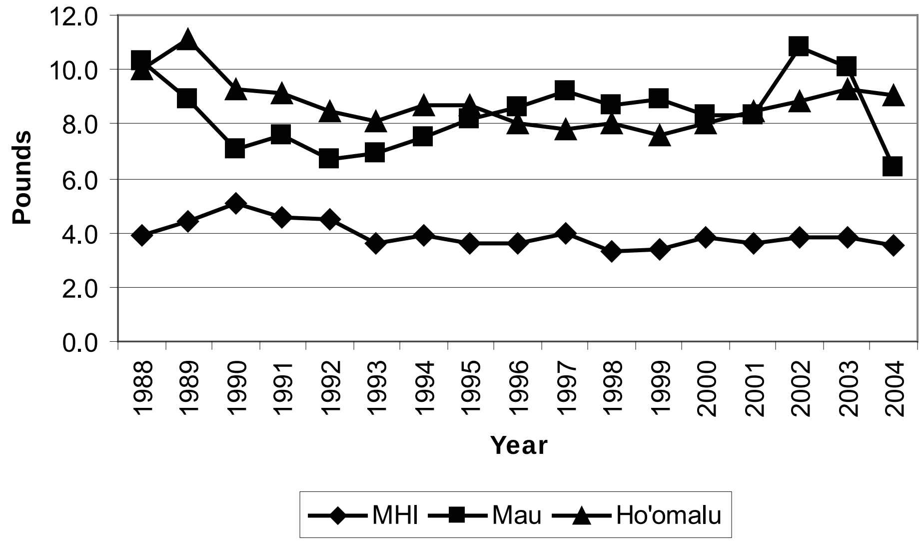


Figure 6a. Mean body weight by year and management zone — OPAKAPAKA.

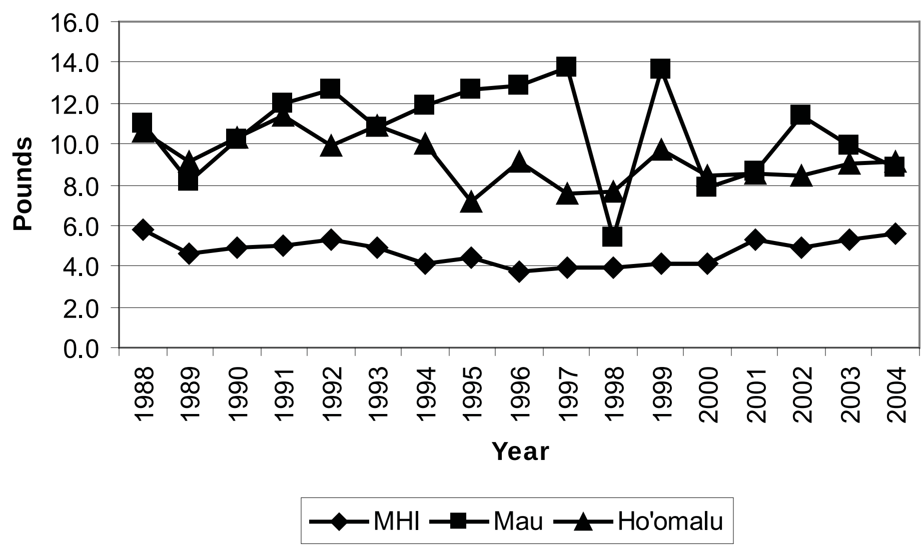


Figure 6b. Mean body weight by year and management zone — ONAGA.

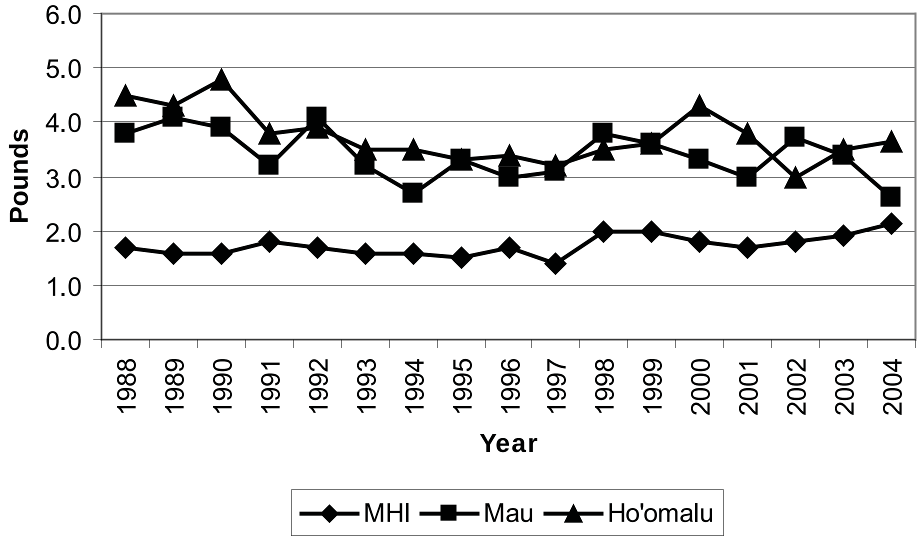


Figure 6c. Mean body weight by year and management zone — EHU.

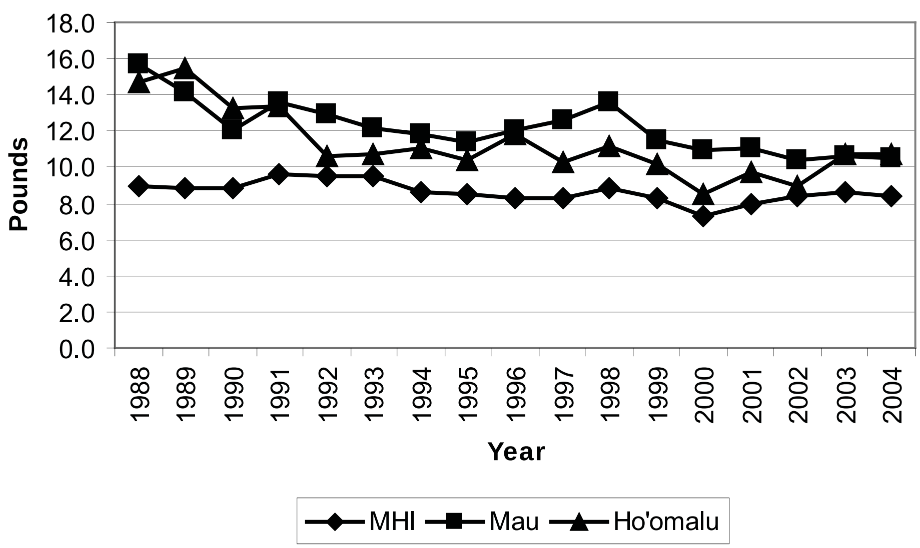


Figure 6d. Mean body weight by year and management zone — UKU.

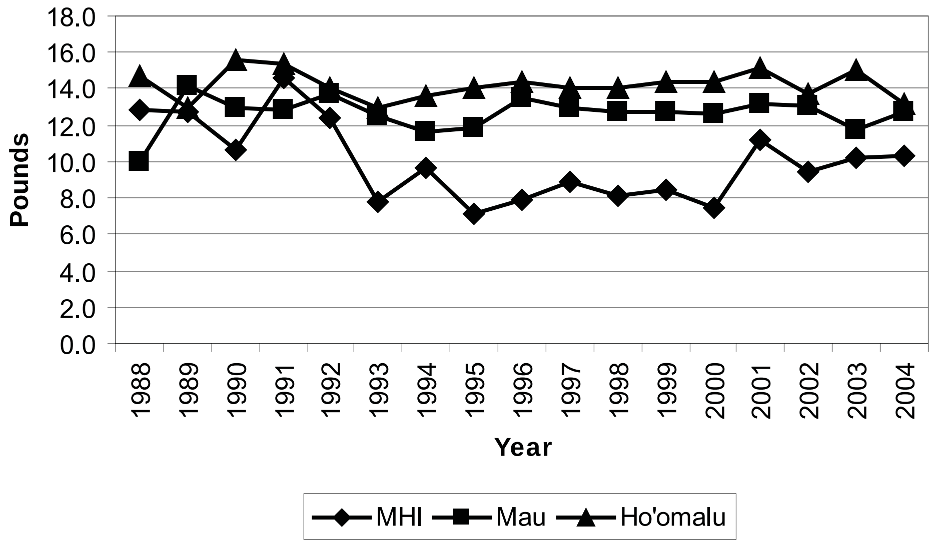


Figure 6e. Mean body weight by year and management zone — HAPU’UPU’U.

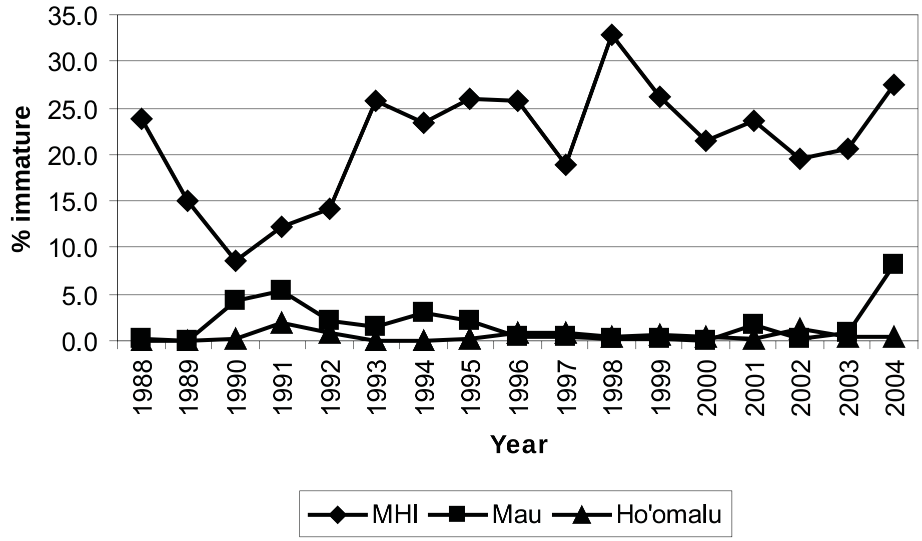


Figure 7a. Percent of catch (in weight) made up of immature fish — OPAKAPAKA.

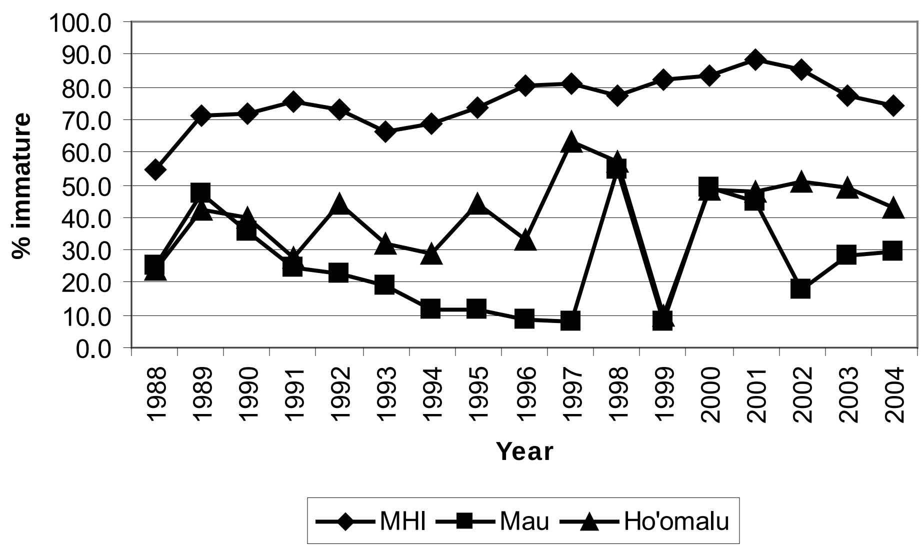


Figure 7b. Percent of catch (in weight) made up of immature fish — ONAGA.

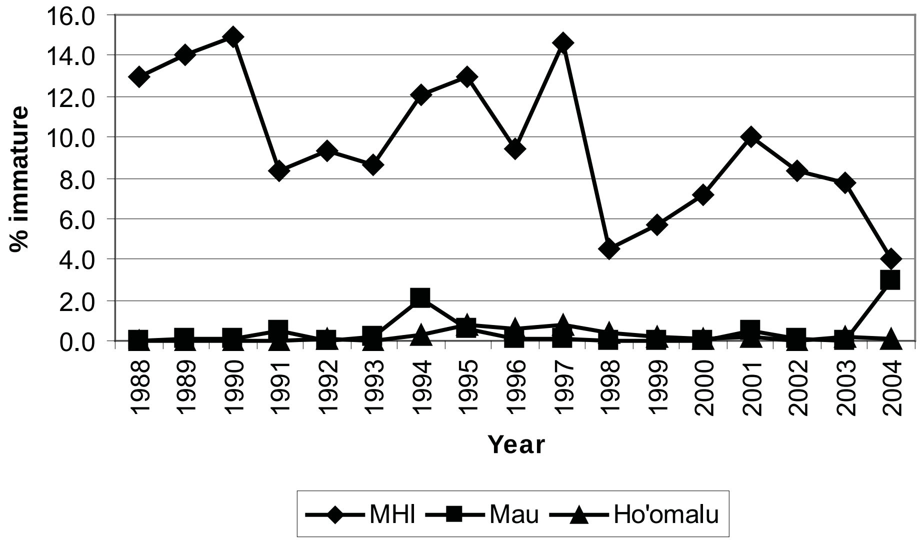


Figure 7c. Percent of catch (in weight) made up of immature fish — EHU.

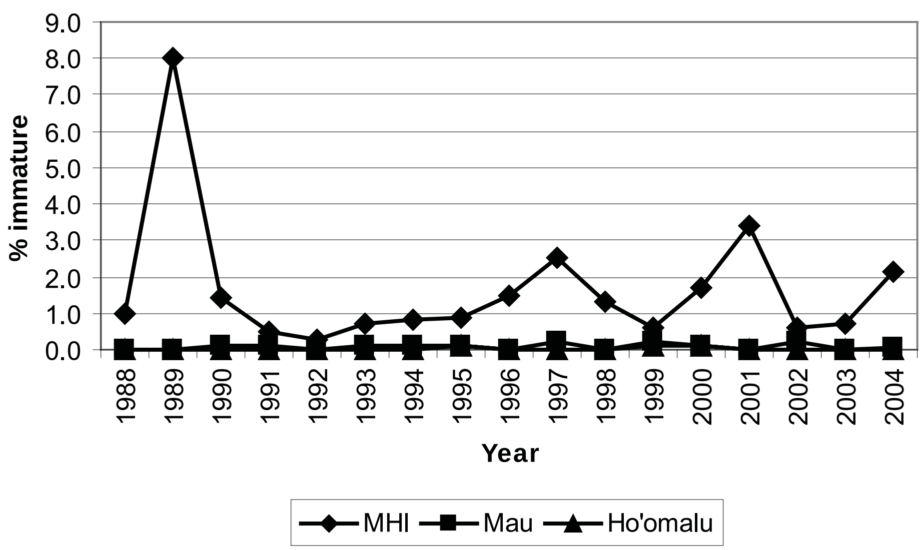


Figure 7d. Percent of catch (in weight) made up of immature fish — UKU.

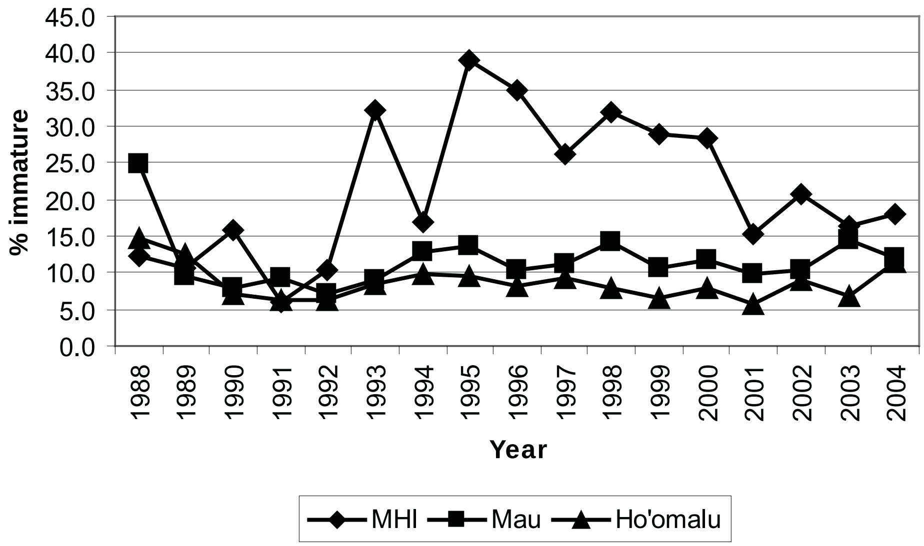


Figure 7e. Percent of catch (in weight) made up of immature fish — HAPU'UPU'U.

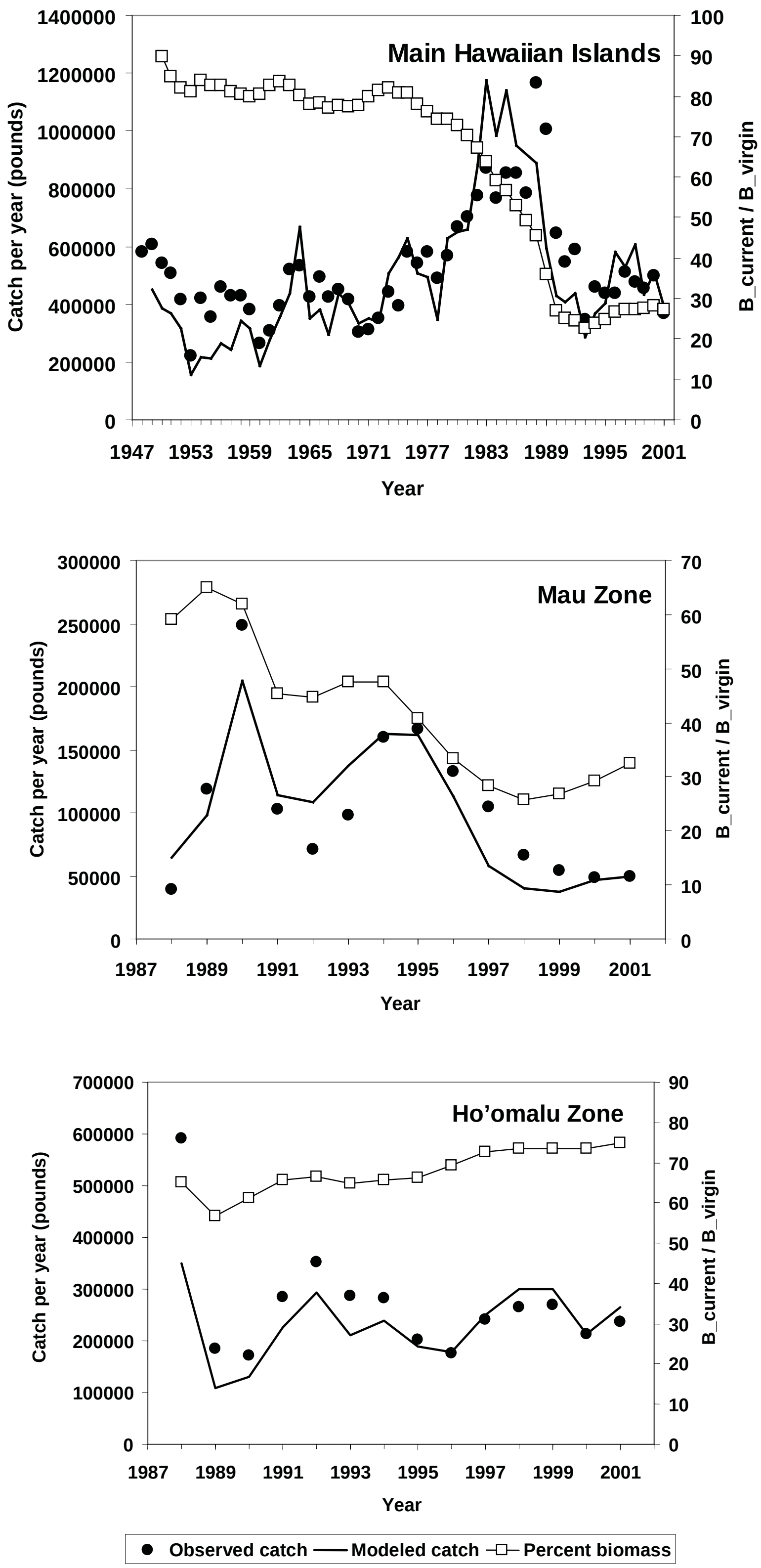


Figure 8. Trajectories of observed catch, modeled catch, and modeled percent of virgin (initial) biomass for aggregate bottomfish stocks in the Hawaiian Archipelago bottomfish management zones.

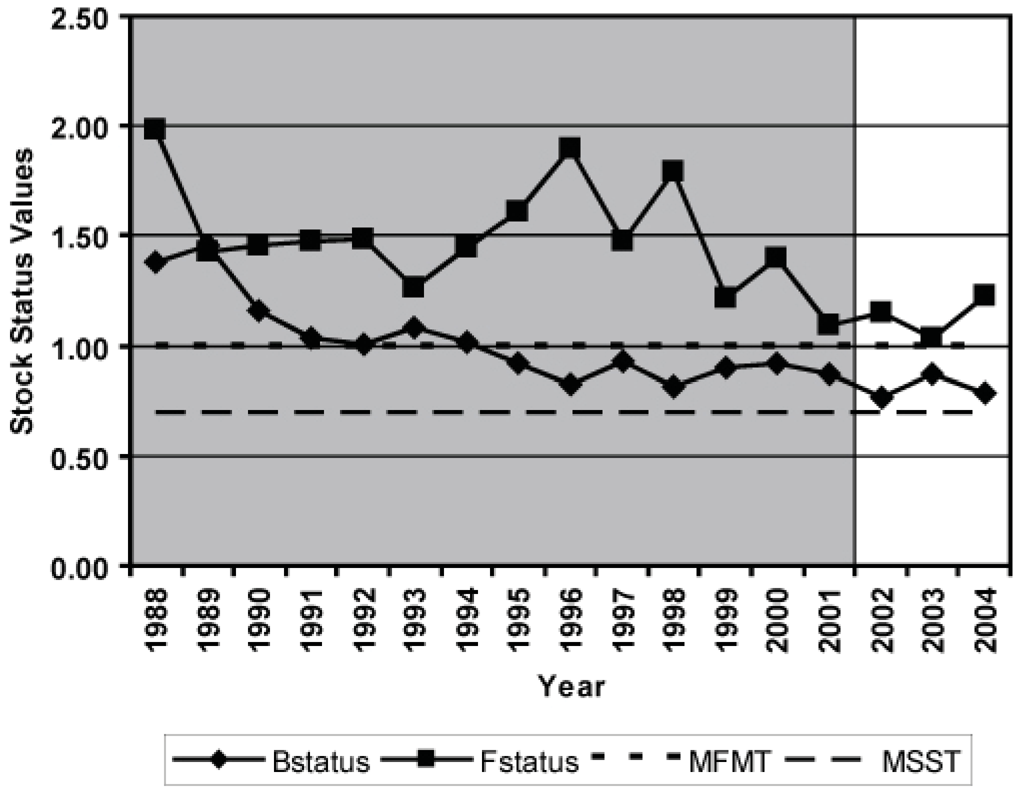


Figure 9. Trajectories of biomass and fishing mortality stock status values relative to established reference points for Hawaiian Archipelago bottomfish. Values in shaded areas are for time period before adoption of current Control Rule. Heavy dotted line is MFMT (1.0) and heavy dashed line is MSST (0.7).

APPENDIX 3: MAPS OF HDAR'S BRFAS

Figure A: Previous and Current BRFAs around Kauai, Niihau, and Kaula Rock.

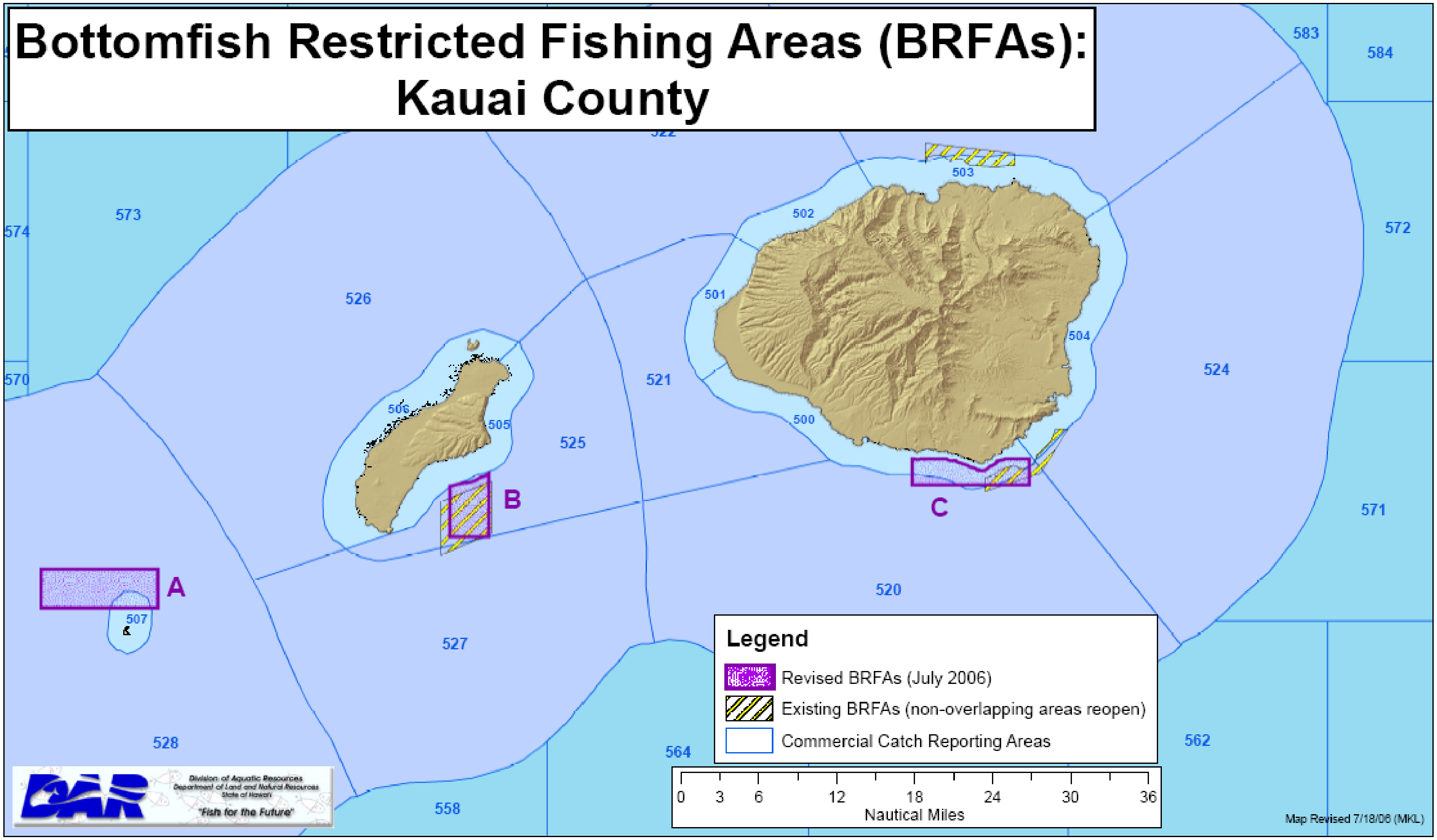


Figure B: Previous and Current BRFAs around Oahu.

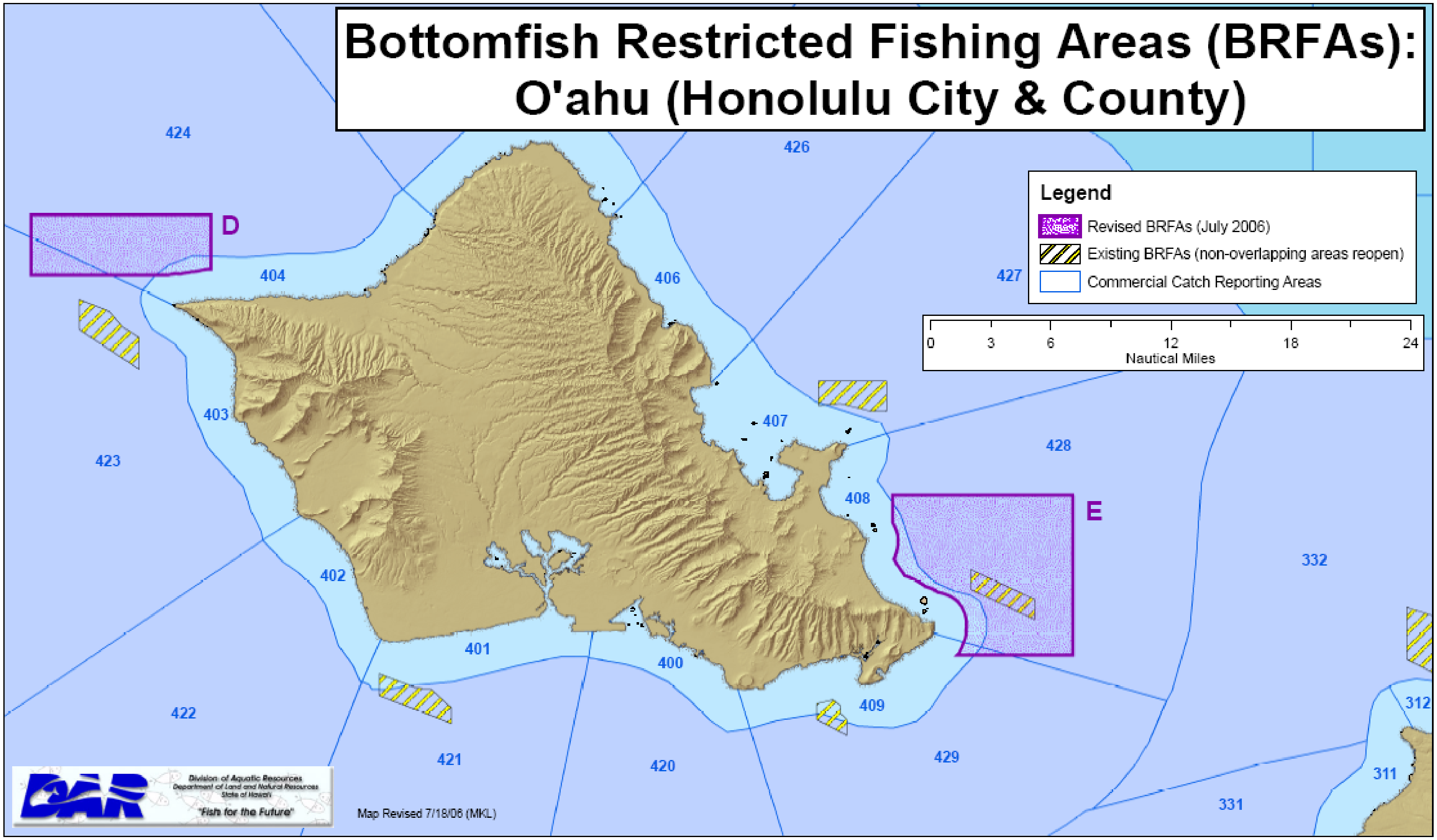


Figure C: Previous and Current BRFAs around Penguin Bank, Molokai, and Maui.

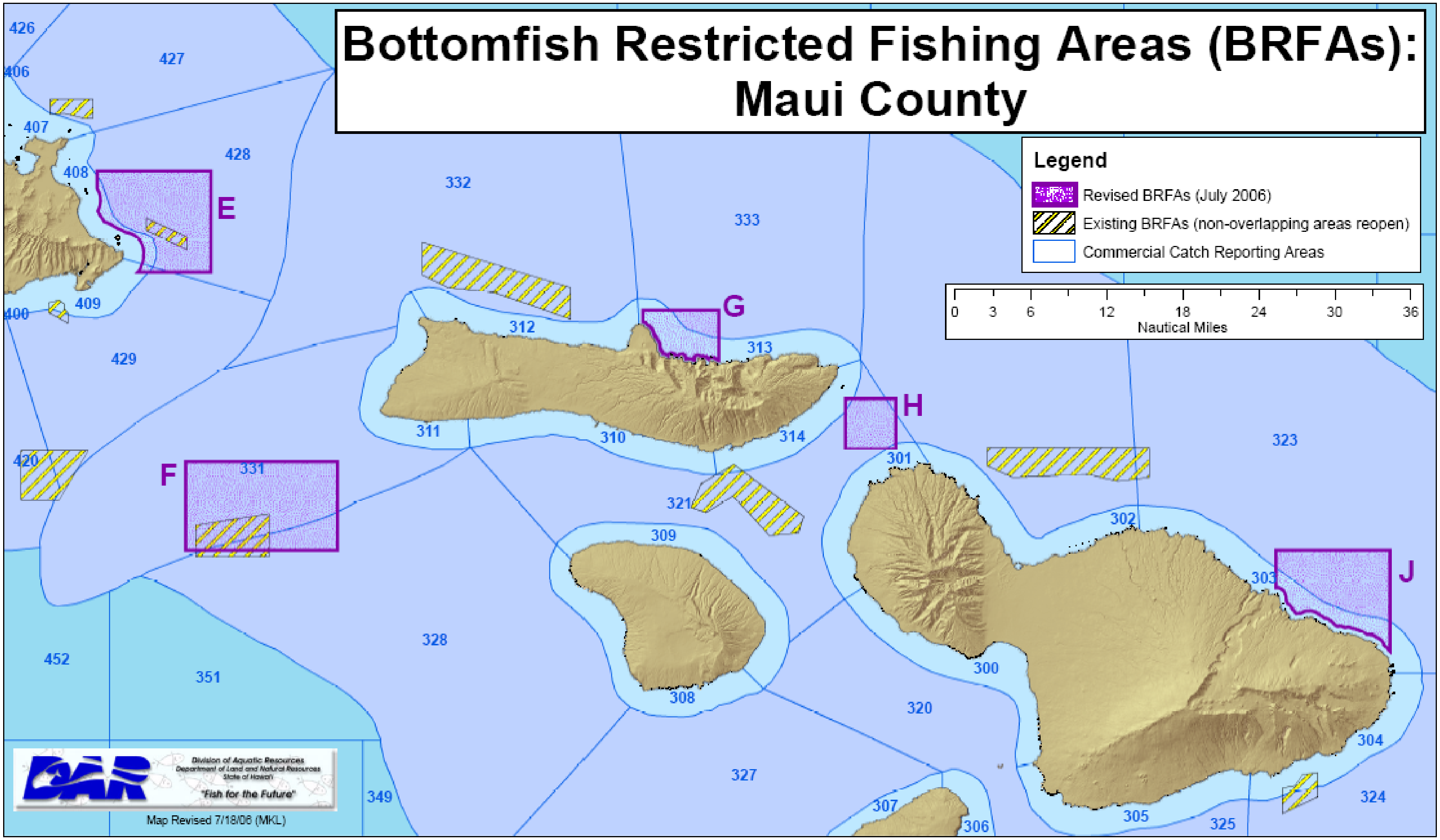
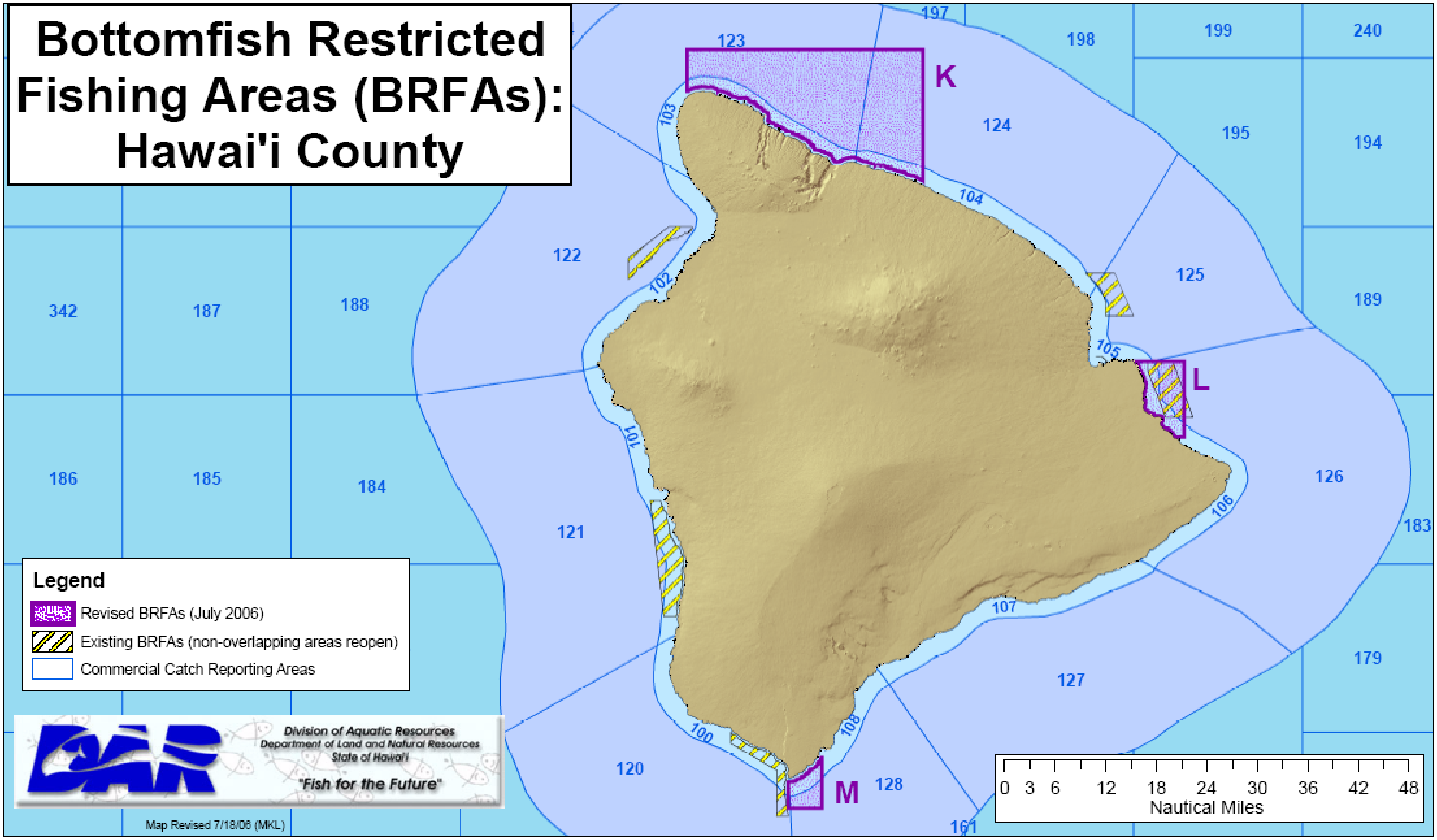


Figure D: Previous and Current BRFAs around Hawaii Island.



APPENDIX 4: COMMENTS RECEIVED ON THE 2007 DSEIS AND 2006 DSEISAND AGENCY RESPONSES

This section presents a summary of the public comments, and responses to those comments received on the Draft Amendment 14 to the "Fishery Management Plan for Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region Including a Revised Draft Supplemental Environmental Impact Statement, A Regulatory Impact Review and an Initial Regulatory Flexibility Analysis," dated June 27, 2007[36]. A total of 3 comment letters was received.

Table 3--1: Public Comments and Agency Responses from 2007 DSEIS

Public Comments and Agency Responses from 2007 DSEIS				
Com. No.	**Source, Date, Commenter & Affiliation**	**Issue No.**	**Comment**	**Response**
1	Letter, public comment period; August 24, 2007; Nova Blazej, Manager, Environmental Review Office; U.S. EPA	1. EPA Review Rating	The EPA rated the revised DEIS as Environmental Concerns – Insufficient Information (EC-2) based on the fact that the revised DSEIS identifies barotraumas mortality from regulatory discards and high-grading as a concern for any TAC approach, but it is unclear whether the preferred alternative includes all practicable measure to reduce this impact. Revised DEIS should provide additional information to clearly identify how each alternative contributes to barotraumas mortality. The EPA suggested including in the impact comparison table the risk of high-grading and barotrauma mortality. The EPA recommended that measures to	The FEIS has been revised to include additional information on the potential for unrecorded fishing mortality due to high-grading or regulatory discards. The potential for such impacts were included in the impact comparison table (Table 1; page xvii) for each alternative as well as Chapter 4. Generally, all alternatives that involve counting the number of fish caught (e.g. TAC or bag limits) could involve high-grading that results in unrecorded bottomfish mortality. Although the extent of such mortality is unknown, it is not believed to be significant. If in the future, reliable information becomes available that suggests high-grading is a significant problem for management of the fishery, the Council will consider appropriate management measures.

Public Comments and Agency Responses from 2007 DSEIS				
Com. No.	**Source, Date, Commenter & Affiliation**	**Issue No.**	**Comment**	**Response**
			minimize barotrauma mortality be included in the TAC alternatives.	Regulatory discards, under a closed season or TAC management regime for which the fishery is closed, are not expected to be significant because deep bottomfish fishing methods employing baited hooks and handlines are fished at depths specific to targeting the deep-seven bottomfish species. In other words, it is difficult to catch deep-seven bottomfish species using other types of allowed fishing gears. The FEIS has also been revised to describe education and outreach activities conducted by the WPFMC, NMFS, and the State of Hawaii that include pamphlets and demonstrations on various techniques to reduce barotrauma on deep-water bottomfish.
2	Nova Blazjez, EPA Letter of August 24, 2007	2. State's concurrence or position	The FEIS should include information about the State's concurrence with action alternatives which is required for their implementation	No revision necessary. Table 1 as well as Section 2.2 describe the action alternatives and identify that each alternative requires parallel Federal and State regulations to achieve effective implementation. The State is currently assembling legislative and administrative rule packages that would allow consistent State/Federal regulations.
3	Nova Blazjez, EPA Letter of August 24, 2007	3. Accuracy of non-commercial data	In the FEIS, discuss the expected accuracy of data received from noncommercial fishermen. Discuss and consider the benefits of keeping the bag limit unchanged so that there are no incentives to underreport this first year of catch data. Identify other options to ensure quality data collection of	Text was added to the FEIS stating that eliminating the non-commercial bag limit is dependent on the quality of non-commercial catch data provided by fishermen to the State and NMFS so that an appropriate non-commercial TAC may be selected by the Council. Non-commercial data provided to

Public Comments and Agency Responses from 2007 DSEIS				
Com. No.	**Source, Date, Commenter & Affiliation**	**Issue No.**	**Comment**	**Response**
			the non-commercial catch. EPA recommends that the quality of the non-commercial data be considered when selecting an alternative for implementation.	the State and NMFS will be analyzed and assessed for accuracy and compliance, and as appropriate may be applied in determining a non-commercial TAC limit. The Council and NMFS are aware of data shortcomings when implementing a new fishery information collection program. However, the Council and NMFS recognize the importance of assessing non-commercial catch data within future bottomfish stock assessments, so as to get a better estimate on total fisheries removals from the system. Continued education and outreach efforts, as well as enforcement activities by State and Federal agencies, are recognized by the Council and NMFS as key components for the success of the proposed action.
4	Nova Blazjez, EPA Letter of August 24, 2007	4. Reduction of non-commercial fishing mortality.	In the FEIS, explain how it was determined that the initial phases of the preferred alternative will be effective in reaching 24% reduction in fishing effort for the non-commercial catch. The stock assessment (p. 10) indicates that a larger reduction in fishing effort than 24% would be needed to support a risk-averse management policy. If there is insufficient reason to expect the bag limit changes will result in a 24% reduction in non-commercial catch, or if the bag-limit changes are not implemented, EPA recommends a larger reduction in fishing effort to achieve the purpose and need.	No changes necessary. Historically, the status of Hawaii's bottomfish stocks have only been assessed using commercial catch data. A 24% reduction in commercial fishing mortality will end overfishing based on the 2006 stock assessment, which relies on 2004 commercial catch data. Non-commercial bag limits are not proposed to be implemented to reduce non-commercial catch by 24%, but rather to control non-commercial harvests at reasonable levels while the State and NMFS obtain accurate non-commercial catch and effort information through required non-commercial permits and reporting. The Council and NMFS must have accurate non-commercial catch data to determine the level of

Public Comments and Agency Responses from 2007 DSEIS				
Com. No.	**Source, Date, Commenter & Affiliation**	**Issue No.**	**Comment**	**Response**
				fishing mortality attributed to the non-commercial sector of the fishery and to help understand fishing mortality.
5	Nova Blazjez, EPA Letter of August 24, 2007	5. Spawning periods	In the FEIS, discuss what benefits are expected from avoiding fishing during the peak spawning periods. If substantial benefits are probable, EPA recommends beginning the 2008 season October lst to avoid fishing during an additional month of peak spawning.	No change necessary. The FEIS states that prohibiting fishing during peak spawning periods reduces fishing mortality of spawning bottomfish potentially leading to an increase in the spawning stock biomass. Temporal closures during peak spawning ensure that fish get an opportunity to spawn as well as are protected from fishing when spawning activity results in dense aggregations that are targeted by fishermen. Under the proposed action, prohibiting fishing during bottomfish peak spawning periods is ancillary to reducing fishing mortality through temporal closures and TAC limits.
6	Nova Blazjez, EPA Letter of August 24, 2007	6. MSRA, ACLs and alternatives considered	In the FEIS, clarify whether the reauthorized MSA eliminates the consideration of Alternative 2. If Alternative 2 would be consistent with the requirements of the reauthorized MSA, we request additional information as to why this alternative is not preferred.	No changes necessary. As stated in the FEIS Summary and Chapter 1, a four month seasonal closure (May-August) was primarily preferred by the Council in 2006 to eliminate bottomfish overfishing. However, this measure was not supported by the State of Hawaii (State) and consistent State/Federal regulations would be required for the seasonal closure to be effective. The MSRA does not preclude management of fisheries using seasonal closures under Alternative 2, however, the MSRA does require the Council and NMFS to set ACLs to eliminate overfishing. In choosing the preferred alternative, the Council,

Public Comments and Agency Responses from 2007 DSEIS				
Com. No.	**Source, Date, Commenter & Affiliation**	**Issue No.**	**Comment**	**Response**
				NMFS, and the State have selected a hybrid approach that incorporates seasonal closures in the first two years of implementation and then relies on strict regulation under an annual TAC management system for subsequent years.
7	Nova Blazjez, EPA Letter of August 24, 2007	7. Climate change and its cumulative impact on bottomfish productivity	In the FEIS, discuss how the effects of climate change will cumulatively impact present bottomfish productivity and how this might affect the success of the evaluated alternatives. If significant effects are identified, NMFS and the Council should factor these into the selected alternative, such as utilizing a larger reduction in fishing effort for a more risk-averse management policy.	No changes necessary. The potential effects of climate change on bottomfish productivity are not well understood, but such changes likely occur on spatial and temporal scales that is outside of the scope of the current action to implement immediate measures to prevent overfishing. Section 3.1 mentions that climate change events such as PDO and El Nino have the potential to affect bottomfish productivity, however, such effects are not well understood for the MHI. If such information becomes available, fishery managers and scientists will need to be aware of (e.g., nutrient cycles that can affect food webs, changes in oceanographic currents and processes; and potential chemical changes. The Council is currently reorganizing its species-based Fishery Management Plans to place-based Fishery Ecosystem Plans that in time will allow for better consideration of ecosystem variation related to climate change as well as appropriate management consideration of such impacts.

Public Comments and Agency Responses from 2007 DSEIS

Com. No.	Source, Date, Commenter & Affiliation	Issue No.	Comment	Response
8	Letter, public comment period; September 7, 2007 (extension requested and granted); Dan A. Polhemus, Administrator, State of Hawaii Dept. Land and Natural Resources, (DLNR) Division of Aquatic Resources (DAR)	1. Previous comments remain valid.	This draft incorporated some of DLNR's previous comments. Previous letter is enclosed. Those comments remain valid.	Previous comments made by DLNR were incorporated as appropriate.
9	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	2. Joint management needs to be mentioned and negative tone regarding State's fisheries data.	Document lacks acknowledgement of the State of Hawaii's (State) cooperative and joint management of the fishery. Negative tone when referring to the State's fishery data, data quality, and data collection system.	The FEIS (Summary, Chapter 1) has been revised to describe the State's management authority and responsibility to manage the bottomfish fishery in its jurisdiction. The Council and NMFS recognize the State as a close partner in the efforts to effectively manage Hawaii's bottomfish fishery. The perceived negative tone was unintentional and the EIS was revised to address the issue. Section 3.4.3.2.2 of the FEIS explains the limitations of data and explains that the existing data represent the best available information.
10	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	3. State data best available information and used by PIFSC for stock assessments	The document fails to mention that the fisheries data the Science Center used to conduct the assessments is the State's commercial fisheries data, the same data that is criticized elsewhere.	Section 3.4.3.2.2 of the FEIS was revised to acknowledge that the commercial bottomfish fishery data collected by the State is used by the PIFC to assess the fishery.

Public Comments and Agency Responses from 2007 DSEIS				
Com. No.	**Source, Date, Commenter & Affiliation**	**Issue No.**	**Comment**	**Response**
11	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	4. Difference between State and Federal legislative processes should be noted.	The document criticizes the State's ability to complete regulatory work in a timely manner due to legislative and administrative rule change requirements. The State and Federal processes are different and should not be considered comparable.	The FEIS was revised to clarify that the two processes are different and that the State may require more time to develop and implement regulatory changes.
12	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	5. Contribution of State's BRFAs in addressing overfishing.	The State of Hawaii established Bottomfish Restricted Fishing Areas (BRFAs) in 1998. These were revised in 2007. The document reflects the revision but the alternatives do not discuss what impacts the revised BRFAs might have. The Draft does not analyze how the State's BRFAs are contributing to the reduction in overfishing. The document should analyze the State's contribution toward decreasing the take/harvest of bottomfish.	Multiple sections of the FEIS were revised to clarify that the State modified its BRFAs in 2007 based on new bottomfish habitat mapping data and that Parke (2007) concluded that the State's twelve new BRFAs include a two percent increase in area defined suitable bottomfish habitat over the previous 19 BRFAs. Parke (2007) assumes a direct relationship between suitable habitat and bottomfish catch, suggesting that the State's new BRFAs would reduce bottomfish fishing mortality by two percent over the 2004 baseline.
13	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	6. Effect of revised State BRFAs on TAC limits.	Alternative 3 (the fleet-wide Total Allowable Catch) might be affected because of the presence of the revised BRFAs. Some of the other alternatives are variations on the closed season/TAC option and none discuss effects of the revised BRFAs.	No revision necessary. We understand the State's comments to mean that because the State recently closed certain areas to bottomfishing, the fleet-wide TAC could potentially be increased because the closure of waters in the BRFAs may contribute to a reduction in bottomfish mortality. As stated in response 8, the new BRFAs contain a two percent increase in suitable habitat and would provide a two percent reduction in bottomfish mortality over the 2004 baseline.
11	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	8. The State provided estimates of the	The State provided estimates of the effects of the revised BRFA. The contribution from the State	No revision necessary. The State conducted an analysis which estimated the percent reduction of

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Com. No.	**Source, Date, Commenter & Affiliation**	**Issue No.**	**Comment**	**Response**
		effects of the revised BRFAs and those estimates were not addressed.	was not included in the analysis.	fishing mortality from the new BRFAs, however, NMFS did not concur with the State's findings. Parke (2007) concluded that the new BRFAs contain a two percent increase in suitable habitat over the 2004 baseline and assuming a direct relationship between habitat and bottomfish catch, the BRFAs would only provide a two percent reduction in bottomfish mortality.
12	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	9. Impacts of the Federal management on State budgets	The document does not address the impacts the management actions by the Federal agencies may have on the State's ability to cooperatively manage the fishery. Examples include regulatory changes at the Legislative and Departmental levels. Some changes require additional State funds to implement.	Several sections of the FEIS were revised to clarify that complementary regulations would likely require State legislative and/or administrative rule changes that may require additional funding to implement.
13	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	10. Non-commercial bag limit.	The State DLNR reports that the State and Federal perspective on the non-commercial bag limit is different. The document contains references to a consistent non-commercial bag limit, however, the only non-commercial bag limit for Bottomfish currently exists for State waters. The State reports that the Council has not developed or adopted a non-commercial bag limit for bottomfish in Federal waters. Therefore, the State recommends that the document should clarify that when "TAC is phased in, the non-commercial bag limits for bottomfish in Federal waters will be dropped."	No revision necessary. Implementation of Federal non-commercial bag limits is a component of the proposed action and was intended to facilitate consistency between State and Federal regulations. However, the Council's recommendation is to have the bag limits apply to all deep-seven species instead of only onaga and ehu as is currently regulated by State. To facilitate enforcement, the bag limit should apply to both State and Federal waters. Text was added to the FEIS stating that eliminating the non-commercial bag limit would be dependent on the quality of non-commercial catch data provided by fishermen to the State and NMFS so that an appropriate non-commercial portion of

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Com. No.	**Source, Date, Commenter & Affiliation**	**Issue No.**	**Comment**	**Response**
				the overall TAC may be selected by the Council.
14	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	11. Accuracy with respect to non-commercial catch reporting	The State suggested that the document should address the issue of non-commercial fishers potentially underreporting their catch. This topic should be addressed in the section that discusses catch reporting. DLNR pointed out there could be a lack of motivation on the part of the non-commercial fishers to accurately report catch – first, because the fishers may not understand the need to accurately report catch so the fishery can be better managed, and because accurate catch reports will result in total allowable catches (TACs) being reached more quickly than would occur if catches were to be underreported. The main issue is the State questions the use of suspect and unverifiable data to determine and monitor TACs. The DLNR argues that the commercial data is more accurate because it can be verified against commercial fish dealer data. The data can be used as a basis for managing the total fishery. Extrapolation using this data is better than using potentially bad data.	The following text was added to Section 4.0 of the FEIS: "It is recognized that both commercial and non-commercial reporting could be hampered by a general lack of motivation on behalf of non-commercial fishery participants because of lack of understanding as well as their knowledge that reporting may lead to TACs being reached more quickly. The WPFMC and NMFS would continue to work on education and outreach efforts to engage non-commercial fishery participants and help them understand the importance of providing accurate fishing information." As is the case with many reporting systems in the Western Pacific Region, the validity of the non-commercial catch reports will be difficult to confirm. However the ongoing Hawaii Marine Recreational Statistics Survey will provide a second data stream which may be compared to the catch reports. In addition, enforcement activities are expected to include dockside spot checks and interviews which may then be compared to filed catch reports. Program implementation calls for monitoring permit and reporting compliance as well as penalties for non-compliance. The commetor's suggestion to extrapolate from commercial and dealer data to assist in monitoring

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Com. No.	**Source, Date, Commenter & Affiliation**	**Issue No.**	**Comment**	**Response**
				the entire fishery is good one and may likely be pursued. Because of the potentially significant amounts of catch by non-commercial fishers, non-commercial fish catch data will provide important information to fishery managers.
15	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	12. Typographical errors	Typographical errors remain in the Draft EIS.	Typographical errors were corrected in the FEIS.
16	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	13. p. 111-iv. Seasonal vs. area-based closures.	DLNR requests clarification for why closures of middle and penguin banks would be less effective because the NWHI fishery is being phased out. Similarly, DLNR believed there was no explanation of why the proposed management measures offer a better alternative. The State DLNR believes that the phased closure of NWHI as a source of bottomfish makes it <u>more</u> important to <u>not</u> have seasonal closures in the MHI so that there will be a year-round supply of locally caught bottomfish. The State believes area-based closures would provide a year round supply of locally caught bottomfish.	The FEIS (Summary) was revised to state that the 2006 Draft Amendment 14 that would close Penguin and Middle Bank was reconsidered because, inter alia, after the 2011 NWHI bottomfish fishery closure, experienced NWHI commercial bottomfish vessel operators will either begin fishing in the MHI or discontinue fishing for bottomfish. The statement does not intend to signify that area closures would be less effective after the NWHI bottomfish closure, but simply identifies a changing fishery management landscape that was not considered in the 2006 Draft Amendment 14. The Summary of the FEIS includes a section on reasons for choosing the preferred alternative. The State is correct in assuming that area closures would provide a year around supply of local bottomfish, however, the Council did not recommend the implementation of area closures because they alone would not eliminate overfishing in the MHI bottomfish fishery, and thus the proposed area

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Com. No.	**Source, Date, Commenter & Affiliation**	**Issue No.**	**Comment**	**Response**
				closures would not be consistent with Federal law.
17	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	14. p. ix. The last bullet	Check accuracy of the Parke study defining bottomfish as being 100-400 fa. Is the 400 in meters? If so, change 100 fa to 60 fa.	The FEIS was revised to say 100-400 meters in regards to the Parke (2007) study.
18	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	15. p. xii Last paragraph: clarification about fishing mortality	The DLNR offers that the 25 percent reduction of fishing mortality would only be the case if there is no temporal redistribution of fishing effort.	Page xii of the EIS was revised to clarify that the seasonal closure is anticipated to reduce fishing mortality by 25 percent if significant temporal redistribution of fishing effort does not occur. Note that the ability of fishery participants to make up “lost” fishing effort during the open season is limited by weather conditions, vessel size, available fishing days (see Section 4.2.1 of the FEIS).
19	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	16. p. xii-xiii “pre-emption” word	The State believes that the sentence brings up the idea of a fishery “pre-emption” – using the words “some mechanism” in place of “pre-emption.” The State’s previous issue with respect to preemption was not addressed.	No revision necessary. Pre-emption is an explicit mechanism outlined in the MSRA to achieve consistent Federal and State fishery regulations. At this point in time, State bottomfish regulations have been determined to be consistent with the Bottomfish FMP.
20	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	17. p xiii Clarification about the term of the open period.	The State objected to the use of the word “ensure” on the basis that the opening date doesn’t ensure the fishery will still be opened – it just makes it more likely. The State provided input that with a solid derby fishing effort or a reduced TAC in the future, the TAC could be reached before the holidays are done.	The FEIS has been revised to replace the word “ensure” with “which makes it more likely.”

Public Comments and Agency Responses from 2007 DSEIS				
Com. No.	**Source, Date, Commenter & Affiliation**	**Issue No.**	**Comment**	**Response**
21	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	18. p. xiii Alternative 5 vs. Alternative 6.	The State found that the difference between alternatives 5 and 6 was unclear. The State requested clarification about the true differences between the alternatives: How would IFQ be determined in Alt. 5? How are fishery participants determined in Alt 6? Is the only difference that participants in Alt. 6 get stamps?	No revision necessary. See Section 2.2 of the FEIS which provides distinction between Alternatives 5 and 6. The main difference is that Alternative 5 would implement a limited entry program for commercial bottomfishers that would limit commercial participation to qualified participants, whereas, Alternative 6 would implement and assign IFQs to all commercial participants with any documented history in the fishery. Depending on the qualification threshold used, Alternative 5 could result in less commercial fishery participants than Alternative 6.
22	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	19. p. xiv Consideration of impacts of limited entry regulations on entry into non-commercial fishing	If a commercial fisher were to use all the bottomfish stamps issued, would that fisher have to stop fishing? Would this fisher be prevented from fishing non-commercially? The State warns that this issue would come up in the future if limited entry is implemented.	No revision necessary. Section 2.2.6 of the FEIS, which describes Alternative 6, states that once a commercial fisherman had landed his respective IFQ, i.e. all his stamps are used, that participant would be prohibited from fishing for or possessing any deep-seven bottomfish until the following years. This includes both commercial and non-commercial fishing.
23	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	20. p xv Elimination of non-commercial bag limits	Paragraph 2 states that non-commercial bag limits would be dropped during the 2008 -09 season. This differs from the State's perspective.	No revision necessary. Although the preferred alternative indicates that the non-commercial bag limits would be dropped in September 2008 (phase 4), text was added to the FEIS stating that eliminating the non-commercial bag limit is dependent on the quality of non-commercial catch data provided by fishermen to the State and NMFS so that an appropriate non-commercial TAC may be selected by the Council.

Public Comments and Agency Responses from 2007 DSEIS				
Com. No.	**Source, Date, Commenter & Affiliation**	**Issue No.**	**Comment**	**Response**
24	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	21. p xvi Effects of the alternatives on reproduction and effectiveness of TAC management to improve the survival of spawners.	The chart states that Alternative 7 prevents fishing during peak spawning, but TAC-based fisheries do not. If the peak spawning period is taken to mean the summer months, Alt 7 only does that more effectively than the other options until it goes to a TAC in 2009.	It is correct that Alternative 7 includes seasonal closures only in the first two years of implementation. Table 1 in FEIS has been revised to clarify that protection of spawning species would occur during these first two years of implementation. However, because the fishing year will being in September of each future year, it is likely that the TAC will be reached (and the fishery closed) prior or during the peak spawning months.
25	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	23. Fishing year start date Alt 7, p. xvii	For the start of fishing year, under Alt 7, a single start date is listed when it [actually] is different in ’07 and ’08.	Page xvii of the FEIS was revised to include the September 1 start date for fishing years 2008 and beyond.
26	D.A. Polhemus, State DLNR/DAR, Letter Sept. 7, 2007	24. p. xviii. Benefit of closed seasons during peak spawning.	DAR states that protecting species during their spawning period only affords them particular benefits if they are more vulnerable to capture during this time.	No revision necessary. The Council and NMFS believe that bottomfish stocks are vulnerable during spawning periods because bottomfish form dense aggregations that are targeted by fishermen.
28	Letter, public comment period; August 24, 2007; Patricia S. Port, Regional Environmental Officer; U.S. Dept. of Interior, Office of Environmental Policy and Compliance	1. No comment	Reviewed document. No comments are offered.	Review and lack of comments are noted.

Comments received at the public hearings described in Section 1.7 and those received in writing during the 2006 DSEIS public comment period are compiled in the matrix below. These public comments pertain to the 2006 DSEIS (April 14, 2006; 71 FR 19505). The 2006 DSEIS was not finalized but many of the following comments have been taken into consideration with the development of the 2007 revised DSEIS and the 2007 Final SEIS. Some of the comments are no longer relevant, considering the 2006 stock assessment data and interim Council recommendations. Overall, in preparation of the Final SEIS, public comments from all public hearings were taken into consideration.

Table 3-2: Public Comments and Agency Responses from 2006 DSEIS

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
1a	Maui Public Hearing May 18, 2006	Jerry Stowell	Compared to the Northwestern Hawaiian Islands (NWHI), the [stocks] in the Main Hawaiian Islands (MHI) are in bad shape. We can't depend on the State to manage these fisheries properly.	**August 2006:** In 1998, the State of Hawaii (State) implemented Bottomfish Restricted Fishing Areas (BRFAs) with the intention of protecting important bottomfish spawning areas. In 2006, the State revised these areas to reflect better information on bottomfish habitat around the MHI. The State also has implemented onaga and ehu bag limits for non-commercial fishermen. Challenges to effective management of bottomfish stocks in State waters include: (1) limited enforcement resources, and (2) the absence of any requirement for non-commercial fishermen to report fishing effort or bottomfish landings.
1b			A 15 percent effort reduction is not enough. A 25 to 30 percent reduction in effort would be better, because there will be "slippage." If we go for 25 percent, we'll be lucky to get 15 percent. The preferred alternative should be tougher.	**August 2006:** In order to end overfishing, all the action alternatives are estimated to reduce fishing effort. The Preferred Alternative is estimated to reduce fishing effort in the MHI by 15 percent. In addition, the monument designation for the NWHI will eliminate NWHI commercial bottomfish fishing in June 2011. Consequently, despite potential "slippage" due to effort shifting, it is likely that the Preferred Alternative will still reduce MHI effort by 15 percent or more.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
2a	Oahu Public Hearing May 25, 2006	John Kamikawa	Stocks are not really depleted. Many variables such as weather and currents influence catch. Smaller boats can fish on fewer days because of the weather.	**August 2006:** Based on historical and scientific information, populations in the MHI are considered locally depleted due to excessive fishing effort. To end overfishing in the Hawaiian Archipelago, all action alternatives focused on decreasing fishing effort in the MHI, thus reducing the mortality on the Hawaiian Archipelago bottomfish stock. The impacts of all the alternatives are discussed in detail in the DSEIS. This discussion includes the impacts on fishermen with large and small boats.
3a	Oahu Public Hearing May 25, 2006	William Chang (with a petition signed by 7 individuals)	Supports annual seasonal closures for the seven major species of deep bottomfish in the MHI. Statewide, fishermen overwhelmingly support a summer closure and do not support area closures by the State or NMFS. Very disappointed with State's refusal to work with Federal fishery agencies.	**August 2006:** The commenter's support of Alternative 3, seasonal closure, is noted. Please refer to the enforcement issues for this Alternative are discussed in Section 4.3.8. The Council primarily preferred a seasonal closure in the MHI as a means to end overfishing. However, enforcement of a seasonal closure in the MHI is only a practical if both State and Federal waters are closed, which is not possible at this time. Without State cooperation, a seasonal closure would be essentially unenforceable.
3b			Closure of Penguin Bank will unfairly impact the Oahu-based bottomfish fishermen, marketers and restaurants.	**August 2006:** Bottomfish habitat in those Federal waters over which NOAA Fisheries has jurisdiction around the MHI is primarily limited to three areas: Middle Bank, Penguin Bank and a small section of the Maui-Lanai-Molokai Complex. The majority of the fishing effort in Federal waters takes place on Penguin Bank. To end overfishing through Federal action, the closure of Penguin Bank is preferred. It is recognized in the DSEIS (see Sections 4.2.5 and Section 4.2.6) that closing Penguin Bank will have disproportionate impacts on Oahu fishermen and the Oahu fishing community. However, it is the only alternative available within Federal jurisdiction.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
3c			Although closure of Penguin Bank will likely reduce fishing effort, there is no scientific proof that area closures work to rebuild stocks for highly mobile bottomfish, especially opakapaka and onaga.	**August 2006:** Area closures aim to reduce fishing effort on the Deep 7 complex, which is an indicator for reduction of fishing mortality of individual species (such as opakapaka and onaga). The proposed Federal action is to end overfishing by reducing fishing mortality on the Hawaiian Archipelago bottomfish stock. The purpose and need of this Federal action is to reduce fishing mortality, and can be met by reducing fishing effort. Rebuilding the Hawaiian Archipelago bottomfish stock is not required as the stock is not considered "overfished" at this time, but reducing fishing effort is necessary because "overfishing" is occurring.
4a	Oahu Public Hearing May 25, 2006	Leonard K. Yamada, Aiea Boat Club	Penguin Bank is 85 percent of the area available to Oahu fishermen. Closure there will result in relocation of effort to two major shelves on Oahu.	**August 2006:** The extent of effort that will be shifted to other Oahu bottomfish grounds is unknown at this time. However, any effort shift as the result of the proposed Federal action will be monitored through the various State and Federal fisheries monitoring programs. Any information on actual effort shifts will be used by the Council in recommending future modifications to the proposed Federal action if needed.
4b			An ITQ (individual transferable quota) based on a single year may not be representative of an individual's typical effort because of weather, boat problems, etc.	**August 2006:** Management by ITQ is discussed in the DSEIS, but was not selected as the Preferred Alternative. With an ITQ approach, a method to estimate an individual's typical annual catch would be needed. It is recognized that it would be difficult to develop an equitable method for catch allocation under this alternative (see Section 4.4.5).
4c			Seasonal and area closures can be problematic. Small boats can only fish the south side [Penguin Bank] in calm weather which is more likely during winter Kona periods. In summer only larger boats fish the banks.	**August 2006:** A seasonal closure (Alternative 3) is not the Preferred Alternative. The Preferred Alternative (Alternative 2a), which includes closure of Penguin Bank, would impact both large and small boat fishermen. However, it is understood that small boat fishermen are more constrained by weather conditions than are large boat fishermen.
4d			Alternative 3, closure during the summer months would have the least impact.	See Response 3a.

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
4e			"Overfishing" is based on CPUE, but that doesn't consider standing stock or fishermen entering and old-timers leaving the fishery. If you actually go out there, the stocks are healthy.	**August 2006:** The proposed Federal action is to end overfishing by reducing fishing mortality on the Hawaiian Archipelago bottomfish stock. Please refer to the discussion of "overfishing" and "overfished" terms in the Summary section, pp. vi–viii. Fishing effort is used as an indicator of fishing mortality. CPUE is used as an indictor for biomass. Currently, the Hawaiian Archipelago bottomfish stock biomass, as determined by using CPUE, indicates that this stock is not at the point of being "overfished", but is experiencing the condition of "overfishing". Rebuilding the Hawaiian Archipelago bottomfish stock is not required as the stock is not considered "overfished" at this time.
5a	Oahu Public Hearing May 25, 2006	Dennis Kamikawa	Against closure of Penguin and Middle Banks. Agrees with comments of Mr. Yamada and Mr. Chang.	See Responses 3a and 4a.
6a	Oahu Public hearing May 25, 2006	Linda Paul	Why is the [Council] giving the State an ultimatum that if it doesn't agree to Alternative 3 then Alternative 2a will be implemented? Why is this [the Council's] second choice?	**August 2006:** Once the Secretary of Commerce, though the National Marine Fisheries Service (NMFS, also known as NOAA Fisheries), notifies the Council that overfishing is occurring, the Council is required by the Magnuson-Stevens Act (MSA) to take action within one year of that notification to end overfishing. One way to end overfishing is to work cooperatively with the State to implement a closed season in both State and Federal waters (Alternative 2a). The state was not given an ultimatum by the Council. The State was offered the opportunity to work cooperatively with the Council to end overfishing working within the timeframe required under the MSA. The State, however, elected to proceed with unilaterally revising its BRFAs rather than implement a coordinated closed season. Given the State's decision, Alternative 2a became the Council's recommended Preferred Alternative. Because Penguin and Middle Banks are primarily in Federal waters, their closure (Alternative 2a) can be implemented without the need for parallel State regulations.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
7a	Oahu Public Hearing May 25, 2006	Glenn Kuwabara	Supports annual seasonal closures for the seven major species of deep bottomfish in the MHI. Statewide, fishermen overwhelmingly support a summer closure and do not support area closures by the State or NMFS. Very disappointed with State's refusal to work with Federal fishery agencies.	**August 2006:** Commenter's support of seasonal closure (Alternative 3), is noted. See Response 3a.
7b			Closure of Penguin Bank will unfairly impact the Oahu-based bottomfish fishermen, marketers and restaurants.	See Response 3b.
7c			Although closure of Penguin Bank will likely reduce fishing effort, there is no scientific proof that area closures work to rebuild stocks for highly mobile bottomfish, especially opakapaka and onaga.	See Response 3c.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
8a	email April 9, 2006	C.C. Cowpland	Close NWHI and MHI for Deep 7 to commercial and recreational fishing for five years. Open for one year, requiring catch reports from all. Then close both areas for four years. Then open and require catch reports. Compare the sets of catch reports to see where closures have been effective. If improvements are equal then open fishing. If any of Deep 7 show a drop, close taking of those fish for at least another three years and repeat the process.	**August 2006:** The commenter suggests an adaptive management approach. The Preferred Alternative is also a form of adaptive management, because its results will be monitored annually and regulatory modifications, through the Council's public process, will be made as appropriate. As documented in the DSEIS, the Preferred Alternative balances the short term potential negative impacts to individuals and communities with the potential positive long term impacts to bottomfish stocks, fishery participants, and fishery communities (see Section 4.2.6).
9a	email April 15, 2006	L. Neil Frazer	None of the alternatives are acceptable. A responsible course of action would be: 1) close NWHI to all fishing to: (a) retain an “ecological blueprint of a functioning Hawaii marine ecosystem;	**August 2006:** Although the assessment of the bottomfish stock is considered on an Hawaiian Archipelago-wide basis, the origin of the overfishing is primarily in the MHI, not in the NWHI. Fishing effort is used as an indicator of fishing mortality. Therefore, the alternatives analyzed in detail in the DSEIS propose to end overfishing by reducing fishing effort by at least 15% in the MHI. The recent proclamation regarding the NWHI Marine National Monument will close all NWHI fisheries within five years.
9b			(b) monitor the health of the ocean;	**August 2006:** The Preferred Alternative includes monitoring of fishing effort, landings, and the status of bottomfish stocks using both fishery-dependent and fishery-independent data. NOAA Fisheries also maintains a variety of ocean monitoring systems including coral reef and oceanographic monitoring programs.
9c			(c) facilitate research; and	**August 2006:** Currently, Hawaii’s bottomfish fisheries are the focus of several private, State, and Federal research programs. Research in the NWHI, in many cases, is assisted by the information obtained through the bottomfish commercial fishery.

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
9d			(d) permit natural repopulation around the MHI.	**August 2006:** Genetic studies indicate that there is one population within the Hawaiian Archipelago, the MHI and the NWHI. Because research to date suggests that the predominant direction of larval transport is from the MHI to the NWHI, the impact on the MHI of closing the NWHI is not clear.
9e			2) around MHI, implement ITQs with TAC set by fishermen, scientists, government and environmental organizations.	**August 2006:** Using ITQs as a means to end overfishing was analyzed by the DSEIS (see Section 4.4) but was not selected as the Preferred Alternative. ITQs are administratively work-intensive and require extensive enforcement interagency cooperation. If an ITQ alternative becomes appropriate in the future, ITQ and TAC levels would be recommended through the Council's public process, in which fishermen, scientists, environmental organizations, State and Federal agencies actively participate.
9f			ITQs should be structured so that ITQ holders have property rights to sue the State or Counties for practices destructive to marine ecosystems.	**August 2006:** If an ITQ alternative becomes appropriate in the future, ITQ levels would be recommended through the Council's public process, in which fishermen, scientists, environmental organizations, State and Federal agencies actively participate. There are current regulations that protect the marine ecosystem. State and Federal agencies may be sued for failure to implement or enforce regulations for which they are responsible. Fishery participants may be prosecuted if they violate State or Federal environmental protection laws.
10a	email April 25, 2006	Toni Siegrist	Thanks for protecting fish from overfishing.	Comment noted.
11a	email May 5, 2006	Guy T. Ogata	Supports Alternative 2 because fish at auction or market are getting smaller and smaller.	**August 2006:** Mean weights for individual fish are declining, which is expected in populations exposed to fishing; however, mean weights in the NWHI remain significantly higher than those in the MHI, indicating that the MHI is the area where more intensive fishing is occurring.
12a	email May 26, 2006	Leimana DaMate	Permanent area closures directly conflict with Native Hawaiian practices.	**August 2006:** The potential cultural impacts of the various alternatives are analyzed in the DSEIS (see Section 4.1.7, Section 4.2.7, Section 4.3.7, Section 4.4.7, and Section 4.5.7), but seasonal (non-permanent) closures will not be effective in ending overfishing unless both State and Federal waters are included (see Response 3a).

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
12b			Permanent area closures disproportionately affect communities.	**August 2006:** The potential impacts to the communities are analyzed in the DSEIS (see Section 4.2.6). The DSEIS acknowledged that the communities of Oahu and Kauai will be disproportionately affected by the Preferred Alternative, however, it is the only alternative available within Federal jurisdiction.
12c			Permanent area closures are hard to enforce.	**August 2006:** The DSEIS recognizes that multiple, small area closures, such as proposed in Alternative 2b are difficult to enforce. However, the Preferred Alternative (Alternative 2a) would close relatively large and easily defined areas. These closed areas will be enforced by a combination of at-sea surface vessel and aerial U.S. Coast Guard (USCG) and NOAA monitoring and dockside enforcement.
12d			The benefits of permanent area closures are hard to monitor because fish move.	**August 2006:** The proposed Federal action is to end overfishing by reducing fishing mortality on the Hawaiian Archipelago bottomfish stock. Fishing effort is used as an indicator of fishing mortality. As analyzed in the DSEIS, it is estimated that the Preferred Alternative will reduce fishing effort in the MHI enough to end overfishing of the Hawaiian Archipelago stock. The State and Federal monitoring programs will provide information on the catch, catch rates and fishing effort throughout the Hawaiian Archipelago. This information will assist the Council and NMFS in determining the impacts of the proposed Federal action on the bottomfish stock.
12e			Supports Alternative 3.	Comment noted (see Response 3a).
13a	fax May 26, 2006	Petition signed by 29 individuals	Supports annual seasonal closures for the seven major species of deep bottomfish in the MHI. Statewide, fishermen overwhelmingly support a summer closure and do not support area closures by the State or NMFS. Very disappointed with State's refusal to work with Federal fishery agencies.	See Response 3a.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
13b			Closure of Penguin Bank will unfairly impact the Oahu-based bottomfish fishermen, marketers and restaurants.	See Response 3b.
13c			Although closure of Penguin Bank will likely reduce fishing effort, there is no scientific proof that area closures work to rebuild stocks for highly mobile bottomfish, especially opakapaka and onaga.	See Response 3c.
14a	email May 29, 2006	Brett Hartl	Supports Alternative 5a. No evidence in any U.S. fishery that area or seasonal closures are effective in replenishing overfished resources.	See Response 3c.
14b			The best managed fisheries in the U.S. use Individual Fishing Quotas (IFQs).	**August 2006:** Using IFQs as a means to end overfishing was analyzed in the DSEIS but was not selected as the Preferred Alternative (see Section 4.4). Like ITQs (see Response 9e above), IFQs are administratively work-intensive and require extensive enforcement interagency cooperation. If an IFQ alternative becomes appropriate in the future, IFQs would be recommended through the Council's public process, in which fishermen, scientists, environmental organizations, State and Federal agencies actively participate.
14c			Alternative 3 will be difficult to enforce and ineffective at preserving bottomfish resources in the MHI.	**August 2006:** As noted earlier, the Hawaiian Archipelago bottomfish stock is not considered "overfished" at this time. The proposed Federal action is to end overfishing by reducing fishing mortality on the Hawaiian Archipelago bottomfish stock. Fishing effort is used as an indicator of fishing mortality. However, local populations in the MHI are considered depleted due to excessive localized fishing effort. To end overfishing, all action alternatives focus on decreasing fishing effort in the MHI, to reduce the mortality on the Hawaiian Archipelago bottomfish stock.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
15a	email and fax May 29, 2006	Mark Collins (with a petition signed by 158 individuals)	Supports Alternative 3.	**August 2006:** Commenter's support of Alternative 3 is noted (see Response 3a).
15b			Opposes Alternative 2b because: 1. expansion of BRFAs is unjustified because no evidence they have had or will have any positive effects on bottomfish resources	**August 2006:** The proposed Federal action is to end overfishing by reducing fishing mortality on the Hawaiian Archipelago bottomfish stock. Fishing effort is used as an indicator of fishing mortality. Alternative 2b (revision of the BRFAs) was discussed in the SEIS but was not selected as the Preferred Alternative.
15c			2. BRFAs disproportionately penalize fishermen/communities in rural areas adjacent to BRFAs	**August 2006:** The impacts to fishermen and the communities of the BRFAs are analyzed in the DSEIS. The DSEIS acknowledged that Alternative 2b would disproportionately impact fishermen and communities using those areas (see Section 4.2.5 and Section 4.2.6).
15d			3. Many BRFAs would force fishermen to travel further increasing safety risks	See Response 15c.
15e			4. BRFAs are difficult to enforce	**August 2006:** The DSEIS recognizes that multiple, small closed areas are more difficult to enforce (see Section 4.2.8). The Preferred Alternative would close relatively large and easily defined areas. These larger areas will be enforced by a combination of at-sea surface vessel and aerial USCG patrol monitoring and dockside enforcement.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
15f			5. BRFAs conflict with Hawaiian rights	**August 2006:** A 1990 study[37] by the Council and the State of Hawaii, Office of Hawaiian Affairs (OHA). examined the issue of Native Hawaiian fishing rights, and concluded that "[i]t is possible for a fishery management plan… to establish a system of limiting access to a fishery… to certain fishermen, including indigenous native American fishermen, if… the WPRFMC [Council]… [has] taken into account the following criteria: present participation in the fishery; historical fishing practices in, and dependence on the fishery; the economics of the fishery; the cultural and social framework relevant to the fishery; and any other relevant considerations." Subsequently, the Council developed a system of preferential rights for Native Hawaiian fishermen in the limited-entry NWHI bottomfish fishery. The Preferred Alternative, however, does not involve access limitation. Alternative 2b (revision of the BRFAs) was discussed in the DEIS but was not selected as the Preferred Alternative.
15g			6. Many of the State's BRFAs are located where no overfishing is taking place.	**August 2006:** As shown in Table 3, Alternative 2b (revision of BRFAs) was discussed in the DEIS but was not selected as the Preferred Alternative. Alternative 2a is preferred in part because it does not rely on coordination with State BRFAs.
16a	fax 5/29/06	Antoinette Lee	Supports Alternative 3.	Comment noted. (see Response 3a).
16b			Many proposed areas are mainly used by Hawaiian fishermen.	**August 2006:** The impacts to Hawaiian fishermen are analyzed in the DSEIS (see Section 4.2.7). The Preferred Alternative, Alternative 2a, the closure of Penguin and Middle Banks, will primarily impact bottomfish fishermen from the islands of Oahu and Kauai, some of whom may be Native Hawaiian, but the majority of whom are not.

[37] Iversen, R.T.B., T. Dye and L.M. Paul. 1990. Native Fishing Rights (Phase 1, the Northwestern Hawaiian Islands; Phase 2, Main Hawaiian Islands and the Northwestern Hawaiian Islands). Prepared for the Western Pacific Regional Fishery Management Council with the assistance of the State of Hawaii Office of Hawaiian Affairs, Honolulu.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
16c			Permanently closed areas are not in keeping with Hawaiian tradition.	**August 2006:** A seasonal closure was primarily preferred in the MHI as a means to end overfishing. However, a seasonal closure in the MHI is only a practical means to end overfishing if both State and Federal waters are closed. Bottomfish habitat in Federal waters around the MHI is primarily limited to three areas: Middle Bank, Penguin Bank and a small section of the Maui-Lanai-Molokai Complex. The majority of the fishing effort in Federal waters takes place on Penguin Bank. To end overfishing by closing just areas within Federal waters, the closure of Penguin Bank is necessary. The DSEIS recognizes that this alternative disproportionately impacts Oahu fishermen and communities (see Section 4.2.5 and Section 4.2.6). Also, please see Responses 3a and 3b.
17a	email May 30, 2006	Patricia Port U.S. Dept. of the Interior	Both area and seasonal closures have potential to achieve desired reduction in fishing mortality.	Comment noted.
17b			Either the State or [Council] area closures would achieve the goal of reducing fish mortality by at least 15 percent.	Comment noted.
17c			Recommend USCG and NOAA OLE work closely with State of Hawaii to ensure adequate enforcement.	Comment noted.
18a	email and fax May 30, 2006	Dennis Heinemann The Ocean Conservancy	The DSEIS does not consider all relevant alternatives.	**August 2006:** The DSEIS examines a full range of reasonable alternatives, as discussed in Chapter 2.
18b			Documentation of and support for the preferred alternative is incomplete.	**August 2006:** Documentation and support of the preferred alternative is based on the best available science to date.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
18c			The scientific basis for assessment of bottomfish stock and response to its status designation is flawed.	**August 2006:** The best available scientific information is used throughout the analysis. The bottomfish status designations are derived on a Hawaiian Archipelago-wide stock basis. The Preferred Alternative most effectively satisfies the purpose of and need for the Federal action, which is to end overfishing.
18d			The scientific basis for assessment of bottomfish stock and response to its status designation fails to take into account significant sources of uncertainty.	**August 2006:** The DSEIS includes discussion of the uncertainties associated with the bottomfish fishery. The DSEIS acknowledges the following uncertainties: 1) extent of potential effort shifting in space or time; 2) recreational catch and effort; 3) validity of Hawaii Division of Aquatic Resources (HDAR) data for catch, effort and location; 4) effects of existing BRFAs; 5) market reactions to a reduction in locally caught Deep 7 species; 6) fisherman's response to market reactions by shifting targets; 7) standardized CPUEs as "highliners" leave the fishery; 8) stock conditions in the absence of a formal stock assessment; 9) lack of fishery-independent data; 10) effects of anthropogenic factors (e.g., sedimentation) on bottomfish habitat; 11) effects of taape competition or predation on other bottomfish management unit species (BMUS); 12) changes in carrying capacity due to regime shifts; 13) potential increase in bottomfish fishing effort by former trollers due to increased fuel prices; 14) amount of bottomfish fishing effort to be permitted in the NWHI; 15) basic biological data on BMUS; 16) potential "spill-over" effects from closed areas to open areas; and 17) the lack of appropriate multi-species assessment model that can provide precautionary reference points for management of mixed stock assemblages.
18e			The scientific basis for assessment of bottomfish stock and response to its status designation is not compliant with MSA.	**August 2006:** The National Standard Guidelines (50 CFR §600.305 *et. seq.*) for National Standard 1 were used to develop control rules for the bottomfish fishery, which were approved by the Secretary of Commerce. The proposed Federal action is an appropriate response, given the status and designation of the bottomfish stock, based on these control rules.
18f			The DSEIS does not provide sufficient information to enable a full evaluation of the document.	Please see Responses 18b, c, and d.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
18g			There is a clear NEPA violation in how the bottom fishing analysis was done in the absence of complete information and no mention that this omission was the result of exorbitant or insurmountable costs.	**August 2006:** The best available scientific information is used throughout the analysis in the DSEIS. However, as is the case for most fisheries, information is incomplete. For example, there is no requirement for recreational fishermen in Hawaii to report catch or effort. These data do not exist and this is pointed out in numerous places in the DSEIS. Section 3.4.7 presents the derivation of two independent estimates of non-commercial and commercial effort in the MHI bottomfish fishery.
18h			The alternatives conflict with the State's refuge in the NWHI.	**August 2006:** None of the alternatives considered in detail involve bottomfish fishing in State waters in the NWHI. There is no conflict with the State's refuge in the NWHI.
18i			Should have considered an alternative that involved closing the NWHI.	**August 2006:** The proposed Federal action is to end overfishing by reducing fishing mortality on the Hawaiian Archipelago bottomfish stock. Fishing effort is used as an indicator of fishing mortality. Although the bottomfish stock is considered on a Hawaiian Archipelago-wide basis, the origin of the overfishing is primarily in the MHI, not in the NWHI, where fisheries will be closed by June 2011. Therefore, the alternatives analyzed in detail in the DSEIS propose to end overfishing by reducing effort in the MHI. It is estimated that the Preferred Alternative will reduce fishing effort in the MHI enough to end overfishing of the Hawaiian Archipelago stock. An alternative to close the NWHI was considered in the DSEIS, but not subjected to detailed analysis because it was determined that it would not effectively address the underlying cause of the overfishing, that is, excessive fishing effort in the MHI.
18j			Mau Zone has experienced excessive fishing pressure.	**August 2006:** The Mau Zone, one of the two zones within the NWHI, had experienced excessive fishing pressure prior to 1997. After implementation of a limited entry program, in 1997, effort has exceeded MFMT (which defines "overfishing") only once, in 2002. Section 1.3 of the DSEIS describe the 2002 and 2003 F ratios of the different sub-areas and their weighted factors (habitat). The bottomfish complex is assessed on an archipelagic basis and at this time the MHI is the primary source of excessive fishing pressure.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
18k			There is a history of overfishing in the NWHI.	**August 2006:** The historical situation in the Mau Zone is described in the Response 18j. In the Hoomalu Zone, the other zone within the NWHI, has never exceeded the threshold value of 1.0. Since 1988 the fishery has not exceeded 0.7. In recent years it has averaged 0.4. See the appendicies for a summary of Hawaii's bottomfish and seamount groundfish stocks.
18l			There is species-specific evidence of depletion in the NWHI.	**August 2006:** The proposed Federal action is to end overfishing by reducing fishing mortality of the Hawaiian Archipelago bottomfish stock. The deep slope bottomfish are managed as an archipelago-wide species complex.
18m			There is evidence of a "weak-stock" effect in the NWHI for opakapaka and hapuupuu.	**August 2006:** The deep slope bottomfish are managed as an archipelago-wide species complex.
18n			Environmental and socio-economic impacts of a NWHI closure not adequately considered.	**August 2006:** The closure of the NWHI was not evaluated in detail because it was not considered to have the potential to efficiently address the overfishing (see Section 2.1.5). See Response 18i.
18o			Alternative 3 is unlikely to achieve 15 percent reduction in effort.	**August 2006:** In order to end overfishing, all the action alternatives, including Alternative 3, are estimated to reduce fishing effort by 15 percent or more. Estimates for the fishing effort reduction for Alternative 3 can be found in Section 4.3.1 of the DSEIS.
18p			Environmental or socioeconomic impacts of Alternative 3 are not fully considered.	**August 2006:** Potential environmental or socioeconomic impacts of all of the alternatives have been disclosed in sufficient detail for informed decision-making. Potential environmental and socioeconomic impacts for Alternative 3 can be found on pages 154-158 of the DSEIS.
18q			No justification or explanation of how the 15 percent target effort reduction was arrived at.	**August 2006:** The 15 percent effort reduction target was derived by the Council's Bottomfish Planning team, which includes scientists from the Pacific Islands Fishery Science Center (PIFSC).

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
18r			Seasonal closure would only be for Deep 7, but overfishing is based on all BMUS. Deep 7 catch in May-August in the MHI is only 10 percent of total.	**August 2006:** The seasonal closure is limited to the Deep 7 species. The Deep 7 species represent the major component of the catch, and target of the fishery. While other species are also caught they represent a smaller proportion of the total catch. Also, the choice of the Deep 7 species would impart congruency between the WPRFMC and State of Hawaii plans to combat overfishing. The choice of the May-August time frame was made by the Council based on socioeconomic and biological factors.
18s			Arguments for only including Deep 7 are unconvincing.	**August 2006:** The Deep 7 species are linked by habitat, market desirability, and fishing gear. Other bottomfish management unit species (BMUS) snappers are either relatively rarely caught, less desirable in the market (taape), or targeted with different gear (uku). The jacks are both less desirable in the market and are also targeted with several other types of gear. The rationale may be found in Section 2.1.1, beginning on page 11 of the DSEIS.
18t			There is no analysis of the potential impact of targeting non-Deep 7 species.	**August 2006:** Section 2.1.1 of the DSEIS (beginning on page 11) explains that targeting non-Deep 7 species will not obstruct the proposed Federal action to end overfishing by reducing fishing effort by 15 percent or more.
18u			There is no analysis of potential bycatch of Deep 7 species.	**August 2006:** There are four non-Deep 7 snappers that could be targeted. Two of these, yellowtail snapper and yelloweye snapper, are a minor component of deep slope landings. The catch rates for these species would not support a commercial enterprise, and the exorbitant effort required to fish these species in an area closed to Deep 7 takes would be a significant deterrent to commercial or recreational fishermen. It would be easier for the fishermen and more productive to fish in an open area and retain the more valuable Deep 7 species. The third snapper, taape, is usually not targeted due to its relatively low commercial value. The fourth snapper, uku is targeted with different gear at much shallower depths where bycatch of Deep 7 species is highly unlikely. Deep bottomfish fishing for ulua or kahala could result in Deep 7 bycatch, but it seems more likely that open areas where the more valuable Deep 7 species could be retained would be more likely fished. This explanation has been added to Sections 4.2.2, 4.3.2, 4.4.2, and 4.5.2.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
18v			There is no analysis of the potential impact of the preferred alternative on NWHI.	**August 2006:** Although the bottomfish stock is considered on a Hawaiian Archipelago-wide basis, the origin of the overfishing is primarily in the MHI, not in the NWHI. Fishing effort is used as an indicator of fishing mortality. Therefore, the alternatives analyzed in detail in the DSEIS propose to end overfishing by reducing effort in the MHI. The impacts of the Preferred Alternative will primary occur in the MHI. However, the proposed Federal action will indirectly benefit the stock throughout the archipelago.
18w			The scientific basis for assessment of the bottomfish complex is weak and subject to considerable uncertainty.	**August 2006:** As for most fisheries, the DSEIS acknowledges that uncertainty exists (see Response 18d). The best available scientific information is used throughout the analysis in the DSEIS. However, it is acknowledged that a review of the bottomfish stock assessment method is ongoing, but not yet completed by NMFS. The information available at the time was presented to the Council's Scientific and Statistical Committee and the Bottomfish Plan Team in approximately 1998, and consensus was reached over this issue. The issue of archipelagic connectivity is far from resolved but some aspects of this will be clarified in a document being prepared titled "Marine connectivity patterns within and around the Hawaiian Archipelago" by Donald Kobayashi intended for peer-reviewed literature this year. This document examines source-sink dynamics throughout the archipelago using high-resolution ocean model data to simulate larval transport dynamics.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
18x			The dynamic surplus model has flaws which raise questions about accuracy of reference points and management options based on those points.	**August 2006:** The reviewer made 5 main points: 1) incompatible q's, 2) lack of data contrast, 3) biased weighting, 4) recreational fishery, and 5) disagreement in trend. NMFS disagrees with all points. Concerning 1), the use of a parameterization which prevents the exploitation rate from exceeding 1 is desirable since catch cannot exceed the population size. The externally estimated q's represent the best-available data. Alternatively the q's could be estimated within the production model along with the other parameters but this has been attempted and does not work. Concerning 2), the production model has been examined with respect to uncertainty by several different approaches, most recently by bootstrapping following the methodology of Prager with his ASPIC model (User's Manual for ASPIC: A Stock-Production Model Incorporating Covariates, Program Version 3.82, Michael H. Prager, National Marine Fisheries Service, Miami Laboratory Document MIA–92/93–55, Fifth Edition, June, 2000). Confidence intervals about all parameters and reference points have been available for several years and they were omitted from the cited document only because that report was intended for the layperson. Even the 1996 report on a production model for Hawaii bottomfish incorporated uncertainty. Concerning 3), the simultaneous fitting procedure incorporated a weighting scheme to equally weight the 3 zones in the estimation, not perfect by any means but our best attempt to prevent one zone from monopolizing the fit. Concerning 4), this is a good point but does not necessarily invalidate the findings. NMFS has weighed the pros and cons of arbitrarily expanding the observed catch and effort and decided the best approach is to just use the data as it stands. This was decided in conjunction with Plan Team and the Council's Scientific and Statistical Committee (SSC) advice. Concerning 5), this is an interesting observation. However, uncertainty in both the CPUE time series and the predicted biomass trajectories may be useful to examine before claiming significant inconsistency.
18y			The assumption of a single unit complex is unwarranted.	**August 2006:** It would be administratively untenable to maintain separate fishery Management Plans (FMPs) for the 17 bottomfish MUS. The primary target species of the deep water bottomfish fishery are snappers of two genera. These two genera occupy the same habitat, are caught with the same gear, and are relatively interchangeable in the marketplace.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
18z			The baseline biomass may not represent unfished biomass and implications for management should be considered.	**August 2006:** The established biomass baseline is based on the best available scientific information. While fishing did occur prior to the 1940s it was generally small-scale and limited to the MHI. Fishery statistics were not routinely collected prior to the 1940s and available data (if any) are insufficient to compute meaningful baseline metrics. The post-World War II era marked the routine collection of commercial fishery statistics in Hawaii. Thus, the established 1948-50 baseline period represents the first time data were available. It is important to note that prior to the baseline period of 1948-50, fishing was suspended in Hawaii for at least 6 years because of the war. During this closed period the effects of prior removals would have been mitigated and the biomass returned to near pristine conditions.
18aa			The lack of information on recreational take has not been taken into account in estimation of the 15 percent target, or in the potential for environmental and/or socioeconomic impacts.	**August 2006:** The lack of recreational effort and catch data is discussed throughout the DSEIS. For most alternatives, the effort reduction will impact both commercial and recreational fishermen.
18bb			Regarding the surplus production model…was the effect of removing the NWHI series assessed with sensitivity runs?	**August 2006:** The current archipelago-wide assessment is based on a weighted combination of the MHI and NWHI metrics. Examining the results of the MHI component alone provides insight into the sensitivity of removing the NWHI statistics from the analysis. These values (MHI alone) are included in the DSEIS and indicate that the MHI are severely overfished and overfishing is rampant.
18cc			No optimum yield (OY) targets have been established. Fishing mortality at maximum sustainable yield (F_{MSY}) has been treated as a target rather than a limit.	**August 2006:** MSY is an upper limit for OY. In calculating OY, relevant economic, social, or ecological factors are used. The Council is considering but has not yet recommended an OY target for the bottomfish fishery.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
18dd			The DSEIS makes numerous misrepresentations of data and frequently provides insufficient information, including: 1) Derivation of 15 percent effort reduction target; 2) Support for complex as a single unit; 3) most recent catch and effort data. Other unsupported statements: 4) no change to fishing mortality metrics in NWHI in 2004; 5) no need to manage taape; 6) data to quantify effort relocation to MHI if NWHI closed.	**August 2006:** 1) Derivation of the 15 percent effort reduction target has been explained (see Section 1.3). 2) See response 18y. 3) The most recent data are presented in DSEIS Tables 20 through 30. 4) The action alternatives analyzed in detail are not intended to restrict effort in the NWHI. 5) Taape is a prolific introduced species of limited commercial value. The taape populations have increased in size and its range steadily increased throughout the Hawaiian Archipelago since its introduction. There is no need to limit taape harvest at this time. 6) It is uncertain how NWHI limited access permit holders will react following a complete closure of the NWHI bottomfish fishery. Fishery monitoring programs will be in place to react to any possible effort shifts.
19a	fax May 30, 2006	Dan Polemus State of Hawaii, Department of Land and Natural Resources (DLNR), Division of Aquatic Resources (DAR)	The DSEIS is biased towards the seasonal closure alternative and critical of the State's area closure alternative.	**August 2006:** NMFS and the Council favored the seasonal closure alternative, based in part on public comments at the scoping and informational meetings held throughout the State. The seasonal closure alternative, Alternative 2a offers easier enforcement and administration. In contrast, the Alternative 2b, the revised BRFAs alternative, is more difficult to enforce and more questionable in its impacts in regard to effort reduction. .
19b			There is no discussion of how recreational reporting will be funded or implemented.	**August 2006:** Details of recreational reporting have yet to be worked out among the respective parties. Interagency cooperation will be necessary. Implementation will be specified in proposed rules to be issued for public comment.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
19c			No option [alternative?] describes how its effectiveness will be assessed or monitored. So all are on weak ground in terms of assessment, implementation, enforcement or likelihood of success.	**August 2006:** All of the action alternatives contain a provision for recreational catch and effort monitoring, which will alleviate deficiencies in the present data set. The commercial bottomfish fishery will continue to be monitored through catch and effort data, but additional fishery-independent data will also be collected. Based on this information, as it becomes available, the management regime may be modified as necessary.
19d			We are unaware of scientific evidence that seasons are more effective than area closures in preventing over-fishing in any tropical fishery.	**August 2006:** It is difficult to generalize about broad management approaches when there are so many variables that make each application unique. In the present case, selection of the Preferred Alternative was driven by numerous considerations; including it is the only action alternative not requiring complementary State regulations.
19e			Page xiii, Alternative 2: Area Closures – Section does not acknowledge that closure of federal waters under Alternative 2a would require enforcement, as noted for Alternative 2b.	**August 2006:** Enforcement of any of the alternatives will be a challenge. An acknowledgement of this difficulty has been added.
19f			Alternative 2a is not analyzed at the same level as Alternative 2b, and consequently we cannot determine if it will meet the 15 percent fishing mortality reduction as claimed. There is no calculation or other analysis to describe how the federal area closure accounts for the fact that no habitats are equal.	**August 2006:** The estimated effort reduction with the implementation of Alternative 2a is based on historical catch records for Penguin and Middle Banks and is explained in Section 4.2 and graphically illustrated (Figure 30) in the DSEIS. The relative quality of habitat is not important for this alternative to achieve the desired effort reduction.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
19g			The summary of Alternative 2b emphasizes its potential negative impacts and downplays its potential positive impacts. A more balanced summary would be more objective.	**August 2006:** The summary of Alternative 2b notes that enforcement of the existing BRFAs has been inadequate (page ix), as acknowledged by the State and mentioned at public meetings. The summary notes how enforcement will be improved by Alternative 2b. This is a balanced and objective description.
19h			Page xiv, second paragraph: The sentence starting with “Although area closures…” should be removed. To claim that area closures have more uncertainty than any other alternative is not substantiated by fact.	The sentence has been removed.
19i			The document implies that the state is claiming spillover will occur from the BRFAs. Such effects were not factored into any of our analyses.	**August 2006:** There was no intention to imply that the State is claiming a spillover effect from the BRFAs. The sentence has been reworded to more clearly indicate uncertainty about whether there would be such an effect.
19j			…should not assume that there will be more effort displacement from the BRFAs than from seasonal closures.	**August 2006:** It is logical that effort displacement will be more likely from closed areas than from closed seasons. There are only so many days an individual has available to fish, given other commitments and weather. In contrast, when fishing time is available, the area the fishermen may select to go fishing can be adjusted.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
19k			Alternative 2b section does not acknowledge that (a) Alternative 2a has not been analyzed to the same level that the state analyzed the BRFAs; (b) the state has spent considerable time and expense to improve BRFA design; (c) area closures could potentially provide greater biological benefits than a seasonal closure because some fish would be protected year-round; and (d) the state has attempted to lessen BRFA impacts on fishermen and communities by conducting public meetings and adapting measures to address public input.	**August 2006:** In regards to (a) Alternative 2a is simpler that Alternative 2b because it has only two closed areas versus the 12 closed areas proposed in Alternative 2b. The approach to estimating effort reduction was similar, based on percentage of effort reported from the areas to be closed. Because of the existing reporting grid structure, calculating these values for the two large banks requires fewer assumptions than for the 12 BRFA areas. (b) The current 19 BRFAs were positioned without accurate information on the quality of the bottomfish habitat. The revised 12 BRFAs will be improved over the current BRFAs in that regard. Their rectilinear shapes will also more readily allow enforcement. However, there is no information on the effectiveness of the current BRFAs. (c) If fish stayed within a closed area and if there were no poaching, some fish would be protected year-round. However, fish move and poaching occurs. A summertime seasonal closure would be a more pragmatic solution and would protect fish while spawning. (d) To date, the State's response to public comment has been to modify the locations of some BRFAs, but not to reconsider the approach. The overwhelming majority of opinion from the Public Hearings on the DSEIS favored a closed season.
19l			Page xiv, Alternative 3: Seasonal Closure – narrative emphasizes potential positive impacts and downplays potential negative impacts. A more balanced summary would be more objective.	**August 2006:** The summary of Alternative 3 explains that its potential negative impacts could be mitigated by the annual seasonality of Hawaii's fisheries. In summer, when Alternative 3 would close the bottomfish fishery, there would be seasonal opportunities to participate in other fisheries, including those for coastal pelagics and tunas. It also identifies that full-time commercial bottomfish fishermen would be the group most affected by that alternative.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
19m			Page xiv, Alternative 3: Seasonal Closure – section identifies that the seasonal closure would have the largest impact on the full-time commercial bottomfish fishermen but does not discuss ways that this impact could be reduced.	**August 2006:** That would be an unavoidable impact of Alternative 3. However, considering that fishermen are typically resilient and adaptable, it could be expected that some would mitigate the impact by participation in other, open fisheries, including those for coastal pelagics and tunas. This possibility was discussed on page xv of the DSEIS.
19n			Page xiv, Alternative 3: Seasonal Closure – section seems to contradict previous section with respect to availability of federal enforcement resources.	**August 2006:** The apparent contradiction has been rectified.
19o			Page xiv, Alternative 3: Seasonal Closure – section fails to mention that federal enforcement would be provided at neither the shore-side nor the fish markets. Implies federal enforcement would be provided for seasonal closure but not area closure. Should correct and state federal enforcement would be insufficient for all alternatives.	**August 2006:** NOAA and USCG have provided additional information on their ability to enforce provisions of each alternative. Corrections to the text have been made.
19p			Page 2, Table 2 – Genus for kahala is incorrectly spelled.	Spelling has been corrected.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
19q			Page 18, 1st paragraph – Clarify that the annual registration and reporting requirements would be federal not state, and whether complementary state laws would also be required.	**August 2006:** The proposed registration would be a Federal requirement, but to be truly effective, it will require State cooperation. The paragraph has been clarified.
19r			Page 18, last paragraph, 2nd sentence starting with "Enforcement of the existing BRFAs…" should be deleted as it implies that the Division of Conservation and Resource Enforcement (DOCARE) was expected to be the sole enforcement presence and any deficiency was their responsibility.	The sentence has been deleted.
19s			Page 27, Table 4 – should there be checks in Alternatives 2a and 2b in the "Requires fishermen to report" column?	**August 2006:** The intent was to show that IFQs would require reporting by trip. The row has been deleted to avoid confusion.
19t			Page 73, Tables 20 and 21 – Check that none of the figures are derived from less than three fishermen as that would violate confidentiality restrictions.	**August 2006:** Although all tables were generated from statistics submitted by the entire fishery, some of the lesser amounts in some tables contained numbers reported by fewer than three fishermen. Therefore, by the strict interpretation of the definition of confidentiality, these data are 'confidential' and therefore have been replaced in the final document with asterisks and a footnote to explain the deletion.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
19u			Page 151, Section 4.2.5 Fishery Sectors, paragraph 3 starting with “Alternative 2b…” – It should be noted that the State modified the proposed BRFAs in an effort not to force small boat fishermen to travel farther.	**August 2006:** A note has been added that the State modified the BRFAs (in 2006) in an effort not to force small boat fishermen to travel farther.
19v			Page 152, Section 4.2.6 Fishing Communities, 2nd paragraph, 2nd sentence starting with “For example…” Molokai fishermen stated two of the three Molokai BRFAs are fished by Oahu and Maui fishermen rather than Molokai fishermen. The sentence is based on a false assumption that only Molokai fishermen fish around Molokai.	The sentence has been deleted.
19w			Page 153, Section 4.2.7 native Hawaiian Community, last paragraph – Should be noted that the State modified the proposed BRFAs to recognize and respect local community values.	**August 2006:** Text has been added to state that the State modified the BRFAs to recognize and respect local community values.
19x			Page 154, Section 4.2.8 Administration, 2nd paragraph – Should be noted that USCG would not be able to enforce Alternative 2a either.	**August 2006:** NOAA and USCG have provided additional information on their ability to enforce provisions of each alternative. This information has been added.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
19y			Page 157, Section 4.3.6 Fishing Communities, 1st paragraph – Conflicting statements regarding negative impacts of Alternative 3 and maintenance of benefits.	Text has been clarified.
19z			Page 158, Section 4.3.8 Administration – Should be noted that there would not be USCG enforcement of shore-based regulations for the seasonal closure.	**August 2006:** Text has been revised to note that enforcement of shore-based regulations for the seasonal closure would have to be done by the State.
19aa			Section 4.2 – No discussion of potential impacts of imports and their effect on markets with this alternative.	**August 2006:** A discussion of this potential impact has been added to Section 4.2.5.
19bb			Page 175, Section 4.6 regional Economy – No discussion of how impacts would be mitigated.	**August 2006:** Paragraph 3, page 175 of the DSEIS discusses how fishermen might adjust target species and fishing patterns, but how individuals will compensate will obviously vary.
19cc			Page 200, Potential Impacts to Fishing Sectors – It is an exaggeration to imply that Alternative 2b would prevent access to traditional grounds.	**August 2006:** The sentence in question in the DSEIS reads "if" fishermen are displaced. At this time, it is unclear whether or not fishermen are being displaced.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
19dd			Page 202, Potential Impacts to Fishing Communities – It is an exaggeration to imply that Alternative 2b would prevent access to traditional grounds. Incorrect to state that a closed season would have no significant impacts.	**August 2006:** If the final BRFAs close traditional grounds there **may** be a negative impact on fishing communities. However, the statement regarding no significant impacts has been reworded.
19ee			Text does not correspond well to Plan Team Handbook table dated February 2, 2006.	The referenced document has been superseded.
19ff			Page vii and viii – Alternative 2 omitted from table. Which Federal office will implement the management measures? Measures do not conform to those currently in effect by the State. State has no authority to require recreational catch reporting and no resources to implement and monitor activities associated with quotas.	**August 2006:** The table has been corrected. Management measures will be implemented by NMFS. Implementation of recreational catch reporting by the State will require legislative action.
19gg			Include fathoms in parenthesis after meters?	**August 2006:** Conversions have been added.
19hh			How were public comments and feedback incorporated into the alternatives?	**August 2006:** Public comments from the scoping and informational meetings were incorporated into the formulation of the alternatives and analyses of their impacts.
19ii			Existing BRFAs are not being abolished; some areas will remain closed.	**August 2006:** Clarification has been made throughout.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
19jj			When will rules for federal portions of BRFAs be presented?	**August 2006:** There will be no Council-initiated federal rules for overlaying areas of BRFAs that extend into the EEZ.
20a	fax May 30, 2006	Karen Vitulano United States Environmental Protection Agency (USEPA)	Because of a lack of data, the DSEIS contains substantial uncertainties regarding the consequences of project alternatives. We recommend an adaptive management approach be pursued and a more conservative mortality reduction target be established.	**August 2006:** The approach to bottomfish fisheries management is an adaptive one. Monitoring of fishery-dependent and fishery-independent data will reveal the efficacy of the chosen alternative. Under the Preferred Alternative, the targeted 15 percent or more effort reduction is based on reduction of effort by commercial fishermen in Federal waters, however, recreational fishermen will also be affected and their effort in Federal waters will also be reduced by an unknown amount. The Preferred Alternative will also be complemented by the State's revised BRFAs that are also projected to reduce effort. Finally, it is anticipated that with the recent creation of the NWHI Monument, commercial bottomfish fishing will not be permitted in the NWHI after five years. While some amount of effort will likely be redirected to open areas, it is estimated that the combined influences of all of the above measures will easily meet the effort reduction target.
20b			Describe how each alternative will meet the 15 percent reduction and indicate the assumptions and levels of uncertainty for each.	**August 2006:** Alternative 1, No Action, involves no Federal action, but implementation of the State's modified BRFAs is assumed to proceed. Although this process is ongoing, the State's revised BRFAs are expected to reduce effort. Alternative 2a, closure of Penguin and Middle Banks, is estimated to reduce effort by more than 15 percent based on the percentage of MHI landings of Deep 7 species from these two banks. The 2004 percentage was 19 percent and the 1990-2004 average was 16.7 percent. (See pages 69-70 of the DSEIS.) The major assumption is that effort will not be redirected to other areas. However, other concomitant efforts (State BRFAs, NWHI effort reductions - see Comment 20a) will also reduce effort. Uncertainties include the following: 1) the amount of effort that would be shifted to open areas (see Section 4.2.1, page 147), 2) impacts on recreational effort and catch, 3) validity of the HDAR data set with respect to reported locations, catches, and effort (see Section 4.2.1, page 148), and 4) amount of effort that may be shifted into bottomfish fishing from troll fishing due to high fuel prices (see Section 4.8.4, page 190). **August 2006:** Alternative 2b, overlaying Federal closures on the State's BRFAs, is

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
				expected to cumulatively result in about a 15% effort reduction based on the analysis presented in Appendix 3 of the DSEIS. The 2004 MHI landings of Deep 7 species were used and several assumptions were made to estimate the percentages of landings from the BRFA areas (see apendicies). These assumptions are as follows: 1) commercial data represent non-commercial catch and effort, 2) effort reduction will be proportional to the net change in Essential Fish Habitat (EFH) area between the old and new BRFAs, 3) accurate adjustments were made for targeted fishing areas within the old BRFAs and how fishermen reported catch location, and 4) the total MHI effort equals the sum of individual area effort. Uncertainties for Alternative 2b include the following: 1) how much effort will shift to open areas (see Section4.2.1, page 149), 2) effects on recreational effort (see Section 4.2.5, page 151), 3) validity of the HDAR data set (see Section 3.4.3.2.2, page 56), 4) effects of the existing BRFAs(see Section4.2.1, page 149), and 5) amount of effort that may be shifted into bottomfish fishing from troll fishing due to high fuel prices (see Section 4.8.4, page 190). Alternative 3, the seasonal closure, based its projected 17 percent effort reduction on the percentage of MHI landings of Deep 7 species during the closed months. (See Figure 33 on page 155 of the DSEIS.) The major assumption was parallel regulations by the State (see Section 4.3, page 154). Uncertainties include the following: 1) how much effort will be shifted in time (see Section 4.3.1, page 154), 2) effects on recreational effort (see Section 4.3.5, page 157), and 3) validity of the HDAR data set (see Section 3.4.3.2.2, page 56). Alternative 4a, the fleet-wide commercial Total Allowable Catch (TAC), was based on permitting 85 percent of the 2003 Deep 7 commercial landings from the MHI. The major assumption is parallel State regulations (see Section 4.4, page 159). Uncertainties include the following: 1) recreational effort (see Section 4.4.1, page 160), 2) extent of high grading (see Section 4.4.1, page 160), and 3) extent of fishing to preserve quota (see Section 4.4.1, page 160),

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
				Alternative 4b, IFQs for MHI commercial fishermen, was also based on permitting 85 percent of the 2003 Deep 7 commercial landings from the MHI. Uncertainties are identical to those of Alternative 4a. Alternative 5a, seasonal closure and IFQs, used an expanded (May-September) closure to project a 58,973 lb decrease in landings and equate that to a 25.25 percent effort reduction. A 15 percent effort reduction would equate to a landings reduction of 35,027 lb, and consequently, 23,946 lb would be available for IFQs. Assumptions include the following: 1) parallel State regulations (see Section 4.5, page 166), 2) real time analysis of landings data (see Section 4.5.8, page 175), and 3) dealer cooperation in collection of stamps (see Section 4.5, page 166). Uncertainties include the following: 1) recreational effort (see Section 4.5.1, page 168), 2) validity of the HDAR data (see Section 3.4.3.2.2, page 56), and 3) amount of effort that may be shifted into bottomfish fishing from troll fishing due to high fuel prices (see Section 4.8.4, page 190). Alternative 5b, seasonal closure with closure of the southern quarter of Penguin Bank, derives its 15 percent effort reduction from the combination of a reduced, June through August, closure that represents an 11 percent effort reduction with a 4 percent contribution from the area closure. The latter is based on 1998–2004 data showing that 16 percent of the MHI Deep 7 catch is from Penguin Bank. The major assumption is again parallel State regulations (see Section 4.5, page 166). Uncertainties include the following: 1) extent of time shifting (see Section 4.5.1, page 168), 2) extent of area shifting (see Section 4.5.1, page 168), 3) recreational effort (see Section 4.5.1, page 169), 4) validity of the HDAR data (see Section 3.4.3.2.2, page 56), and 5) amount of effort that may be shifted into bottomfish fishing from troll fishing due to high fuel prices (see Section 4.8.4, page 190).
20c			A seasonal summer closure should remain an option as an add-on to the proposed area closure.	**August 2006:** The current action does not foreclose the possibility of a seasonal closure at some future time, but for a closure to be effective in effort reduction, would require a parallel State regulation.

Public Comments and Agency Responses from 2006 DSEIS

Comment Number	Source of Comment & Date Received	Commenter and Affiliation (if any)	Comment	Responses from August 2006
20d			Include mitigation measures for Hawaiian Monk Seals in the MHI. Fishermen should commit to fish retention and observers.	**August 2006:** There is an extensive evaluation of potential impacts of the bottomfish fishery on Hawaiian monk seals in the Bottomfish FEIS (70 FR 35275). A recent Biological Opinion found that the commercial bottomfish fishery does not jeopardize the continued existence of the monk seals. The Preferred Alternative is consistent with that Biological Opinion. Commercial fishermen in the NWHI have voluntarily agreed to retain bycatch when seals are present and observers are deployed in that fishery. The current Federal regulation does not require a federal license or permit for MHI commercial fishermen, and there is no mechanism to require observers. However, like in the NWHI, NMFS may ask MHI commercial fisherman to voluntarily retain bycatch when seals are present. However, NMFS has limited leverage with MHI recreational fishermen .Deployment of observers on MHI commercial and recreational vessels, which are often quite small, is not feasible. Most MHI bottomfish boat owners do not have the facilities, safety equipment, or insurance necessary to accommodate observers.

APPENDIX 5: ALTERNATIVE 7 OPTIONS PAPER

WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

OUTSTANDING ISSUES REGARDING MEASURES TO END OVERFISHING OF BOTTOMFISH IN THE HAWAII ARCHIPELAGO MAY 23, 2007

Several issues related to the implementation of the Council's existing recommendations under Alternative 7 have not been addressed in detail by the Council. These are described below and a range of potential alternatives for each issue is presented.

ISSUE 1. Requiring Federal non-commercial permits in State waters
The first implementation issue is the mechanism by which the Council's recommendation to require Federal permits and catch reports for all Hawaii-based non-commercial fishermen (those who do not sell a single fish of any species during the year) who fish for BMUS in the MHI can be best implemented. The motivation for this recommendation was to collect and make available to fishery scientists and managers comprehensive and timely catch and effort data from all fishery participants, given the lack of State requirements for non-commercial fishing permits or catch reporting and the fact that surveys to date have not yielded reliable catch or effort estimates. Although the Hawaii DLNR supported this measure some questions remain as to the mechanism for its implementation.

ISSUE 2. Requirements for non-commercial permits and reporting
The second implementation issue also concerns the Council's recommendation for Federal permits and reporting requirements. In this instance the questions are related to who should be required (and able) to get permits and who should be required (and able) to submit catch reports. The Council's objective is to ensure that complete information on non-commercial catches by fishermen who target or retain BMUS is collected and made available to scientists and managers in an efficient and timely manner. In addition, the Council is sensitive to comments from many fishery participants that requiring only one catch report per vessel trip (usually filled out and signed by the vessel operator and strongly preferred by scientists) precludes other crew members from documenting their participation in the fishery. This concerns fishermen who are aware of the potential for individual fishing quotas to be implemented at some point, and they aware that such quotas are normally based on documented fishery participation. A related concern is the implication of fishermen who already hold CMLs issued by HDAR, and who are already required to report all of their catch and effort to HDAR for the entire year, participating on non-commercial bottomfish fishing trips. In this instance these CML holders would theoretically

report their catch and effort on HDAR's commercial catch report, while the catch and effort of the remaining non-commercial trip participants would be reported on Federal non-commercial catch reports. This outcome should be prevented as it would confound both the existing commercial data, as well as any new non-commercial data. It would split the trip's effort and catch apart, thus creating an appearance of reduced CPUE rates, and it would also report some effort and catch from a non-commercial bottomfishing trip on HDAR's commercial catch report.

ISSUE 3. Type of fishing trips to be reported
The third issue is that of determining which non-commercial fishing trips must be reported. The Council has recommended that information on non-commercial catches of all species on trips targeting or catching BMUS be collected. However because vessel operators often take a variety of trips during the year (e.g. for pelagic and bottomfish species), it may be simpler and preferable to require reporting of all trips by non-commercial vessels that have Federal non-commercial bottomfishing permits.

ISSUE 4. Reporting of fishing locations
The fourth unresolved implementation issue is the question of how fishing locations should be reported on commercial and non-commercial catch reports. Fishery scientists and managers have asked for detailed information, and the Council has recommended the reporting of catch locations by latitude and longitude to the nearest minute. However the Council did not provide details on this recommendation. For example it was left unspecified whether the location should be reported for each and every fishing attempt, or the location where most of the fish were caught, or only each new fishing location, or whether some other system should be used.

ISSUE 5. Implementing non-commercial bag limits in Federal waters
The fifth issue is the need for non-commercial bag limits for Federal waters. To date the Council has recommended that the non-commercial State's bag limits be revised to encompass all Deep 7 species (i.e. a limit of five fish of the Deep 7 species per person per trip). Since the Council's 137th meeting, enforcement officials have indicated that their efforts would be enhanced if these bag limits also apply within Federal waters.

ISSUE 6. TAC management
The last issue is the method by which Alternative 7's recommended TACs will be managed; specifically how one year's TAC overage or underage will be incorporated into the next year's TAC. Because each year's fishery data is not available until the end of the fishing year, scientists generally are unable to include it in the next year's stock assessment or TAC calculation as these analyses need to be completed prior to the beginning of the next fishing year. Thus the impacts of a TAC overage resulting from a late fishery closure (i.e. the TAC is exceeded because the fishery was not closed in time due to a lack of real time reporting or other reasons) or TAC underage resulting from a premature fishery closure (i.e. the TAC is not met because the fishery was closed prematurely due to a lack of real time reporting or other reasons) need to be explicitly considered in the calculation of the next year's TAC.

Issue 1 – Federal Non-commercial Permits and Reporting Requirements in State Waters

Alternative 1A: No action

Under this alternative the Council would take no further action to modify its recommendation.

Alternative 1B: Federal Requirements with State Cooperation.
Under this alternative the Hawaii DLNR would implement complementary State regulations to require that fishing operations that fish for or retain BMUS in State waters at any time during the year be subject to Federal permit and reporting requirements.

Alternative 1C: Federal Requirements for EEZ Fishing, with Comprehensive Federal Catch Reports
Under this alternative, non-commercial fishing operations that fish for or retain BMUS in EEZ waters around the MHI at any time during the year would be required to have Federal permits and to follow all MHI bottomfishing Federal regulations wherever they fish. This would include reporting all their catch and effort on Federal catch reports (including fishing in State waters) and is similar to the approach used in Atlantic fisheries for highly migratory species fisheries.

Alternative 1D: Federal Requirement via Preemption
Under this alternative the Council would request that Federal permits and catch reports for all non-commercial fishing operations that fish for or retain BMUS in State waters around the MHI at any time during the year be required by NMFS using the preemption process as described in the Code of Federal Regulations (50 CFR Subpart G).

Issue 2 – Non-commercial Bottomfishing Permit Requirements

Alternative 2A: No action
Under this alternative the Council would take no further action to modify its recommendation.

Alternative 2B: Require and Allow only Vessel Owners to Have Non-commercial Permits
Under this alternative only the owners of non-commercial vessels used to target or retain BMUS would be required and allowed to have Federal permits. Permits would be registered to the vessel and vessel owners would also be responsible for ensuring that Federal catch reports for their vessel were correctly completed within 24 hours after each fishing trip and transmitted to NMFS within 72 hours after each fishing trip.

Alternative 2C: Require only Vessel Owners to Have Non-commercial Permits but Allow Other Participants to Voluntarily Obtain Non-commercial Permits
Under this alternative only vessel owners would be required to have Federal permits and these permits would be registered to their vessel and they would be responsible for ensuring that Federal catch reports for their vessel were correctly completed within 24 hours after each fishing trip and transmitted to NMFS within 72 hours after each fishing trip. However other fishery participants (i.e. crew members, non-owner operators) would also be allowed to obtain Federal permits and indicate their participation in each fishing trip by providing their permit number and name on the trip catch report. If desired each permitted participant could also indicate their portion (percent) of the total trip catch, if no percentages were indicated it would be assumed that each permitted participant listed caught an equal portion of the total trip catch.

Alternative 2D: Require Vessel Owners and at Least One Person on each Trip to Have Non-commercial Permits, Allow Other Participants to Voluntarily Obtain Permits
Under this alternative vessel owners would be required to have Federal permits and these permits would be registered to their vessel. In addition, at least one person (termed the vessel "operator") on each fishing trip taken by that vessel would be required to have a Federal permit. Under this alternative both vessel owners and vessel operators would also be responsible for ensuring that Federal catch reports were correctly completed within 24 hours after each fishing trip and transmitted to NMFS within 72 hours after each fishing trip. This alternative would also allow other fishery participants (i.e. crew members, non-owner operators) to obtain Federal permits and indicate their participation in each fishing trip by providing their permit number and signature on the trip catch report. If desired each permitted participant could also indicate their portion (percent) of the total trip catch, if no percentages were indicated it would be assumed that each permitted participant listed caught an equal portion of the total trip catch.

Alternative 2E: Require all Non-commercial Participants to Have Non-commercial Permits

Under this alternative each and every non-commercial fishery participant would be required to have a Federal permit. Vessel operators and owners would be responsible for ensuring that Federal catch reports were correctly completed within 24 hours after each fishing trip and transmitted to NMFS within 72 hours after each fishing trip. If desired each participant could also indicate their portion (percent) of the total trip catch, if no percentages were indicated it would be assumed that each participant listed caught an equal portion of the total trip catch.

Issue 3 – Non-Commercial Trip Reporting Requirements

Alternative 3A: No action
Under this alternative the Council would take no further action to modify its recommendation.

Alternative 3B: Require Reporting of All Trips by Permitted Vessels
Under this alternative catches of all species on all trips by permitted vessels would be subject to Federal reporting requirements.

Issue 4 – Reporting of Fishing Locations

Alternative 4A: No action
Under this alternative the Council would take no further action to modify its recommendation.

Alternative 4B: Require Reporting of the Latitude and Longitude Where Most of the BMUS were Caught
Under this alternative the location of all catch and effort would be reported as the latitude and longitude (to the nearest minute) where most of the fish were caught.

Alternative 4C: Require Reporting of Latitude and Longitude of each New Fishing Location Following a Transit
Under this alternative catch and effort would be reported by the latitude and longitude (to the nearest minute) of each new fishing location following a transit.

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Alternative 4D: Require Reporting of the Latitude and Longitude of Each Fishing Location
Under this alternative catch and effort would be reported by latitude and longitude (to the nearest degree).

Issue 5 – Federal Non-commercial Bag Limits

Alternative 5A: No action
Under this alternative the Council would take no further action to modify its recommendation.

Alternative 5B: Implement Non-commercial Bag Limits in Federal Waters
Under this alternative a Federal non-commercial bag limit of no more than five Deep 7 fish (all species combined) per person, per day, would be implemented for Federal waters around the MHI.

Issue 6 – TAC management

Alternative 6A: No action
Under this alternative the Council would take no further action to modify its recommendation.

Alternative 6B: Do not Explicitly Consider TAC Overages or Underages
Under this alternative TAC overages and underages would not be explicitly considered in the determination of future TACs but would instead be implicitly considered via the results of stock assessments undertaken in future years.

Alternative 6C: Subtract or Add TAC Overages or Underages from the Following Year's TAC
Under this alternative any TAC overage or underage would be subtracted or added respectively to the TAC calculated for the following year. For example, if the TAC was exceeded by 2,000 lb in one year, the next year's calculated TAC would be reduced by 2,000 lb. Similarly, if the TAC was not met by 2,000 lb one year the next year's calculated TAC would be increased by 2,000 lb.

CHAPTER 4:

Impacts of Alternatives for Outstanding Issues

As discussed in Section 2.2.7, six issues remain unresolved regarding the implementation of Alternative 7 and several alternatives have been drafted for each issue. This section presents the expected impacts of each of those alternatives on the environment.

ISSUE 1: Impacts of Alternatives for Federal Non-commercial Permits and Reporting Requirements in State Waters

Alternative 1A: No action
Taking no action would not clarify the mechanism by which the Council's current recommendation to require Federal permits and catch reporting for all Hawaii-based non-commercial fishing operations that fish for or retain BMUS in the MHI can or should be implemented. The outcome of this alternative is unclear as NMFS and NOAA officials have not yet provided final guidance on the types of appropriate mechanisms. It is possible that the Council's current recommendation would be implemented by NMFS, however it is also possible that this recommendation would be disapproved for fishermen who fish solely in State waters due to a lack of legal mechanism. If approved, the impacts would be as described above for Alternative 7. If unapproved, fishery and stock assessments, as well as the calculation and tracking of the non-commercial portion of the TAC (in 2008 and beyond) would be extremely difficult as the only non-commercial information available would be that from fishing in EEZ waters. This could result in continued overfishing of the bottomfish complex and in time these stocks could reach an overfished condition.

Alternative 1B: Federal requirements with State cooperation.
Under this alternative the Council's current recommendation would be implemented via complementary State regulations and Federal permits and catch reporting would be required for all Hawaii-based non-commercial fishing operations that fish for or retain BMUS in either State or EEZ waters around the MHI at any time during the year. This would make available to fishery scientists and managers comprehensive and timely catch and effort data from all fishery sectors. Such information would greatly improve fishery and stock assessments and would provide the necessary information for the calculation and tracking of the non-commercial portion of the TAC. The implementation of electronic, web-based, or telephone reporting options would reduce the burden of this requirement on fishery participants. As compared to the no action alternative, this alternative would have a positive impact on target stocks as it would allow comprehensive management and monitoring in both State and Federal waters. The requirement for Federal permits and reporting in State waters would increase NMFS' administrative and enforcement burden as compared to the no action alternative.

Alternative 1C: Federal requirement for EEZ fishing, with comprehensive Federal catch reports
This alternative would provide comprehensive catch and effort information from non-commercial fishing operations that fish for BMUS in EEZ waters around the MHI at any time during the year, but would not allow the collection of fishing information from non-commercial operations that fish for BMUS solely in State waters. Given this regulatory discrepancy between State and Federal waters, it could also result in some fishermen evading the Federal requirements by deliberately and incorrectly asserting that they fish solely in State waters. In either case, fishery scientists and managers would not have comprehensive non-commercial fishing data and it would be extremely difficult to assess the fishery or its stocks, or to calculate or track the non-commercial portion of the TAC. This could result in continued overfishing of the bottomfish complex and in time these stocks could reach an overfished condition. The requirement for Federal permits and reporting would increase NMFS' administrative and enforcement burden as compared to the no action alternative, although it would be slightly less than under Alternative 1B as those fishermen who fish solely in State waters would be exempt.

Alternative 1D: Federal requirement via preemption

Under this alternative Federal permits and catch reports for all non-commercial fishing operations that fish for BMUS in the MHI would be required using the preemption process as described in the Code of Federal Regulations (50 CFR Subpart G). This would make available to fishery scientists and managers comprehensive and timely catch and effort data from all fishery sectors. Such information would greatly improve fishery and stock assessments, and would provide the necessary information for the calculation and tracking of the non-commercial portion of the TAC. This alternative would have a positive impact on target stocks as it would allow comprehensive management and monitoring in both State and Federal waters. The requirement for Federal permits and reporting would increase NMFS' administrative and enforcement burden in the same manner described for Alternative 1B.

ISSUE 2: Impacts of Alternatives for Non-commercial Permit Requirements

Alternative 2A: No action

Taking no action would not clarify the Council's current recommendation to require Federal permits for all non-commercial fishing operations that fish for or retain BMUS in the MHI. In particular it would not clarify which individuals should be required to obtain non-commercial permits, who should be held responsible for completing and transmitting catch reports to NMFS in a timely manner, and how fishery participants desiring to record their catch history should do so given the preference of fishery scientists to receive only one catch report per vessel trip. Under this alternative these decisions would be made by Council staff, in consultation with NMFS, and would be transmitted to NMFS as part of the draft regulations for this action.

Alternative 2B: Require and allow only vessel owners to have non-commercial permits

Under this alternative vessel owners would be the only party responsible for ensuring that non-commercial fishing operations were properly permitted and that catch reports were correctly completed and transmitted to NMFS. A 1995-1996 intercept survey of the operators of 569 Hawaii-based non-longline fishing vessels found that 17 percent were being operated by someone other than the vessel owner when surveyed (Hamilton and Huffman 1997). This may result in some difficulties for owners in providing complete and accurate catch information for trips in which they did not participate. Depending on the extent of these difficulties, inaccurate catch and effort information could be reported and used by fishery scientists and managers, thus confounding fishery and stock assessments, and management measures. It would also likely result in some instances of enforcement officers intercepting vessels with no responsible party onboard, thus potentially complicating enforcement activities. Under this alternative fishery participants who do not own vessels would not have any mechanism by which to officially record their participation and this would potentially result in their not being granted access rights if the fishery eventually becomes a limited access fishery, or not being granted quota share if the fishery is eventually managed under individual fishing quotas. This alternative would have the least administrative burden on NMFS and on fishery participants as compared to the other action alternatives. Based on the results of HDAR's 2006 mail survey of registered deepwater bottomfish boat owners, 62 percent of respondents were self-identified as recreational participants. Applying this percentage to the total number of registered deepwater bottomfish boat owners (3,180, see Table 40) yields 1,972 registered bottomfish vessels used for non-commercial fishing. This would be considered as the upper bound for this group as only 38 percent of all survey respondents reported actively fishing for deepwater bottomfish in the previous year and fourteen percent of respondents reported that they had had never gone deepwater bottomfish fishing, they had apparently only registered to ensure that they could if they wanted to. Applying the 38 percent active fishing rate to the total results in 750 active non-commercial deepwater bottomfish fishing vessels. There is less information available on the number of non-commercial shallow-water bottomfish fishing vessels as there are no permit, reporting, or registration requirements for this group and they were not included in HDAR's survey. However examination of HDAR's survey results for commercial deepwater bottomfish fishing vessels yields 459 active vessels (3,180 registered vessels * 38 percent commercial * 38 percent active) and this corresponds fairly well to the 2000-2003 numbers of commercial vessels reporting landings of any BMUS which ranged from 495 to 325 (Table 11). This result implies that the number of active registered deepwater bottomfish vessels is roughly equal to the total number of vessels targeting any BMUS. If this is the case, it can be concluded that the 750 active non-commercial registered deepwater bottomfishing vessels includes the majority of shallow-water non-commercial bottomfishing vessels and that the total number of non-commercial bottomfish (both deep and shallow) vessel owners that would be required to obtain permits and complete catch reports under this alternative would be 750. It is unknown how many inactive owners would obtain permits to ensure their future participation

Alternative 2C: Require only vessel owners to have non-commercial permits but allow other participants to voluntarily obtain permits

Under this alternative vessel owners would again be the only party responsible for ensuring that non-commercial fishing operations were properly permitted and that catch reports were correctly completed and transmitted to NMFS. The impacts of this on the accuracy of catch reporting and the potential for enforcement problems could be similar to those described for Alternative 2B. This alternative would increase the administrative burden on NMFS as compared to Alternative 2B as it would likely result in the issuance of additional permits and it would require the input of data regarding catches by these additional permit holders. However this alternative would provide fishery participants who do not own vessels a mechanism by which to officially record their participation. This would facilitate their being granted access rights if the fishery eventually becomes a limited access fishery, or being granted quota share if the fishery is eventually managed under individual fishing quotas. In addition, the interest of permitted non-owners in ensuring the timely transmittal of accurate catch reports to NMFS may overcome the data problems described for vessel owners, fishery scientists and fishery managers under Alternative 2B. As described for Alternative 2B, based on available information it is estimated that 750 bottomfish vessel owners would be required to obtain non-commercial permits and complete catch reports under this alternative. It is unknown how many inactive vessel owners or additional participants would also apply for permits, or how many additional participants would seek to have their catches recorded.

Alternative 2D: Require vessel owners and at least one person on each trip to have non-commercial permits, allow other participants to voluntarily obtain permits

Under this alternative vessel “operators” as well as owners would both be responsible for ensuring that non-commercial fishing operations were properly permitted and that catch reports were correctly completed and transmitted to NMFS. This would be expected increase the accuracy of catch reports and potentially facilitate effective enforcement activities as a responsible party would be required to be present on each fishing trip. This alternative would provide fishery participants who do not own vessels a mechanism by which to officially record their participation. This would facilitate their being granted access rights if the fishery eventually becomes a limited access fishery, or being granted quota share if the fishery is eventually managed under individual fishing quotas. However, this alternative would increase the administrative burden on NMFS as compared to Alternatives 2B and 2C as it would result in the issuance of additional permits and it would require the input of data regarding catches by additional permit holders. As described for Alternative 2B, based on available information it is estimated that 750 bottomfish vessel owners would be required to obtain non-commercial permits under this alternative. Assuming that 17 percent of trips are taken on vessels operated by someone other than the owner (Hamilton and Huffman 1997) yields a rough estimate of up to 878 owners and operators (750 * 1.17) of deepwater bottomfish vessels that would be required to obtain non-commercial permits under this alternative. It is unknown how many inactive vessel owners or additional participants would also apply for permits, or how many additional participants would seek to have their catches recorded.

Alternative 2E: Require all non-commercial participants to have non-commercial permits
Under this alternative each and every non-commercial fishery participant would be required to have a Federal permit. Vessel operators and owners would be responsible for ensuring that catch reports were correctly completed and transmitted to NMFS. As for Alternative 2D, this would endure that a responsible party was present on each fishing trip. It would also provide fishery participants who do not own vessels a mechanism by which to officially record their participation. This would facilitate their being granted access rights if the fishery eventually becomes a limited access fishery, or being granted quota share if the fishery is eventually managed under individual fishing quotas. Requiring that every participant have a Federal permit would provide a comprehensive list of potential participants; although not all will necessarily be active. This would meet the requirements of the reauthorized MSA to establish a registry of all recreational fishery participants and would allow for the wide distribution of relevant fishery or regulatory information. These permits could also be made a pre-requisite for non-commercial bag limits. This alternative would have the largest burden of all alternatives on fishery participants and administrators. As described for Alternative 2B, based on available information it is estimated that there are 750 active non-commercial bottomfish fishing vessels. Assuming that each vessel carries an average of 2.6 participants per trip (Hamilton and Huffman 1997, Table G5), this gives a rough estimate of 1,950 non-commercial deepwater bottomfishing participants who would each be required to obtain permits under this alternative. This is considered the upper bound for active participants as some participants may fish on more than one vessel during the year. It is unknown how many inactive participants would also apply for permits under this alternative.

ISSUE 3. Impacts of Alternatives for Trip Reporting Requirements

Alternative 3A: No action
Under this alternative the Council would take no further action to modify its recommendation and catches of all species on all trips by permitted vessels that target or retain any BMUS would be subject to Federal reporting requirements. This would provide information on non-commercial catches of these species and would be expected to improve fishery and stock assessments. The degree of improvement would depend in part on whether trip reports were required in both State and Federal waters, as discussed under Issue 1.

Alternative 3B: Require Reporting of All Trips by Permitted Vessels
As compared to the no action alternative, the requirement for all catches of all species on all trips by permitted vessels to be reported under this alternative would provide comprehensive information on the fishing activities of these vessels. This would provide information on non-commercial catches of BMUS and would be expected to improve fishery and stock assessments. The degree of improvement would depend in part on whether trip reports were required in both State and Federal waters, as discussed under Issue 1. This alternative would also provide partial information on non-commercial trips targeting non-BMUS (information would be incomplete as non-commercial vessels that don't target BMUS at any time during the year would not be required to report). This alternative would increase the administrative burden on NMFS as compared to Alternative 3A as additional catch reports would have to be entered and processed. However it would reduce the potential for confusion among non-commercial fishery participants regarding which trips were required to be reported. Assuming that each of 750 vessels takes an average total of 14 trips per year (including both bottomfishing and other fishing trips; HDAR 2006), there would be 10,500 new catch reports per year to process. The use of vessel-based electronic reporting or recording devices would mitigate the administrative burden if they allow for the electronic submission of catch reports which would not have to be key punched by NMFS staff.

ISSUE 4. Impacts of Alternatives for Reporting of Fishing Locations

Alternative 4A: No action
Under this alternative the Council's recommendation to require the reporting of catch locations by latitude and longitude to the nearest minute would not be clarified. Under this alternative these decisions would be made by Council staff, in consultation with NMFS, and would be transmitted to NMFS as part of the draft regulations for this action.

Alternative 4B: Require Reporting of the Latitude and Longitude Where Most of the BMUS were Caught
This alternative would provide only location for the catch and effort for each non-commercial bottomfishing trip. This would have the least burden on fishery participants but would also provide the least information to fishery scientists and managers for fishery and stock assessments as well as for future management decisions. This level of detail may be sufficient for assessments and management under a TAC system but it would likely be insufficient for area-based management such as area closures or island-based TACs.

Alternative 4C: Require Reporting of Latitude and Longitude of each New Fishing Location Following a Transit

This alternative would provide relatively detailed spatial information regarding non-commercial bottomfish fishing catch and effort that would enhance fishery and stock assessments and potentially allow for future area-based management measures. However it would complicate reporting requirements for fishery participants who fish at several locations as they would likely have to either fill out their catch reports during the fishing trip, or somehow record their catch and effort at each location for later reference when they fill out their trip report on land. In the worst case scenario, no such real time records would be kept and recall problems would result in inaccurate catch reports. The use of vessel-based electronic reporting or recording devices would mitigate this burden if they allow for the easy entry and/or transmission of fishing locations, effort and catches while at sea. Clear definitions for "new fishing location" and/or "transit" would need to be developed under this alternative to avoid confusion as to precisely which locations were required to be reported.

Alternative 4D: Require Reporting of the Latitude and Longitude of Each Fishing Location

As compared to Alternative 4C, this alternative would provide highly detailed spatial information that would further enhance fishery and stock assessments and allow for a wide variety of future area-based management measures. However it would increase the reporting burden on fishery participants as they would definitely have to either fill out their catch reports during the fishing trip, or somehow record their catch and effort at each location for later reference when they fill out their trip report on land. In the worst case scenario, no such real time records would be kept and recall problems would result in inaccurate catch reports. The use of vessel-based electronic reporting or recording devices would solve this problem and mitigate the reporting burden if they allow for the easy entry and/or transmission of fishing locations, effort and catches while at sea.

ISSUE 5. Impacts of Alternative for Federal Non-commercial Bag Limits

Alternative 5A: No action

Taking no action would allow non-commercial fishermen to exceed the State's bag limit while in Federal waters. Although State law would continue to require that excess fish be discarded prior to entering State waters, some fishermen may be willing to retain them on the chance that they would not be intercepted in State waters or shoreside by enforcement personnel. This alternative would not provide the maximum enforcement capability to ensure that non-commercial bag limits are not exceeded and, depending on the levels of violations and associated State enforcement, could result in continued overfishing.

Alternative 5B: Implement complementary Federal regulations

The implementation of complementary Federal non-commercial bag limit regulations would allow enforcement of the non-commercial bag limit in EEZ waters. This would enhance current enforcement capabilities and provide the maximum assurance that non-commercial bag limits were not being exceeded.

ISSUE 6: Impacts of Alternatives for TAC management

Alternative 6A: No action
Under this alternative the Council would take no further action to modify its recommendation regarding the management of Alternative 7's TACs and regulatory decisions regarding TAC management would be made by Council staff, in consultation with NMFS and transmitted to NMFS as part of the draft regulations for this action.

Alternative 6B: Do not Explicitly Consider TAC Overages or Underages
This alternative would rely on the incorporation of each year's fishing data into future stock assessments and TAC calculations to ensure that overfishing does not occur. The lag between the end of the each fishing year and incorporation of its fishing data into a new stock assessment or TAC calculation is unknown but based on experience to date is likely to be at least two years. This could result in continued overfishing, followed by the fishery going into an overfished condition as biomass was reduced.

Alternative 6C: Subtract or Add TAC Overages or Underages from the Following Year's TAC
Under this alternative any TAC overage or underage would be subtracted or added respectively to the TAC calculated for the following year. Subtracting TAC overages from the next year's calculated TAC is expected to prevent overfishing by ensuring that necessary fishing mortality reductions are achieved over a short time period rather than be allowed to continue relatively unchecked as under Alternative 6B. Adding TAC underages to the next year's calculated TAC should not result in overfishing as catches will remain within the overall TAC over a short time period. In addition this alternative would be expected to provide a sense of equity to fishery participants (as opposed to not crediting underages to the next year) that could improve compliance and data reporting.