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Errata

Environmental Assessment for the Implementation of the Decisions of the Fifth Regular Annual Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean:

Fishing Restrictions and Observer Requirements in Purse Seine Fisheries for 2009-2011 and Turtle Mitigation Requirements in Purse Seine Fisheries

and

Bigeye Tuna Catch Limits in Longline Fisheries in 2009, 2010, and 2011

The National Marine Fisheries Service (NMFS) issued the proposed rule, "Fishing Restrictions and Observer Requirements in Purse Seine Fisheries for 2009-2011 and Turtle Mitigation Requirements in Purse Seine Fisheries," for public review and comment on June 1, 2009. The Environmental Assessment (EA) was made available simultaneously in draft form. The comment period closed on June 22, 2009, and two comment letters were received. One of the comment letters did not address the EA. The other comment letter contained substantive comments pertaining to the EA, which have been addressed in the preamble to the final rule.[1]

NMFS has identified several matters in the EA that require clarification. These matters are presented below and have been modified in the attached EA:

1. The first part of the title of the EA is changed to "Environmental Assessment for the Implementation of the Decisions of the Fifth Regular Annual Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean."
2. The correct citation on page 18 of the EA for The Western and Central Pacific Fisheries Convention Implementation Act is 16 U.S.C. § 6901 <u>et seq</u>.

[1] The Environmental Assessment also includes analysis of another action, "Bigeye Tuna Catch Limits in Longline Fisheries in 2009, 2010, and 2011," which is part of a separate rulemaking.

3. Table 8 of the EA is updated to reflect the April 6, 2009, version of the Western Pacific Regional Fishery Management Council's 2007 Annual Report, and reads as presented below. The updates to the table are few and minor and do not affect the EA's analyses or conclusions.

Table 1 Performance of the Hawaii longline fishery, 1996-2007

Year	Active vessels	Trips	Tuna-directed trips	Swordfish-directed trips	Hooks set (million)	Total catch (mt)	Bigeye tuna catch (mt)	Sword-fish catch (mt)	Yellow-fin tuna catch (mt)	Ex-vessel revenue ($ mill., inf-adj to 2007 dollars)
1996	103	1,100	657	92	14.4	9,781	1,787	2,502	630	54.9
1997	105	1,125	745	78	15.6	12,320	2,449	2,881	1,141	64.0
1998	114	1,140	760	84	17.4	12,998	3,226	3,263	722	59.6
1999	119	1,137	776	65	19.1	12,872	2,719	3,100	473	60.0
2000	125	1,103	814	37	20.3	10,789	2,647	2,815	1,205	61.3
2001	101	1,034	987	4	22.4	7,167	2,356	235	1,033	40.0
2002	100	1,163	1,163	0	27.0	7,888	4,388	309	560	45.7
2003	110	1,215	1,215	0	29.9	8,008	3,593	137	823	45.9
2004	125	1,338	1,332	6	32.0	8,380	4,325	249	707	47.7
2005	124	1,496	1,397	99	35.0	10,578	4,979	1,600	735	64.4
2006	127	1,401	1,341	60	35.3	9,762	4,429	1,167	962	57.0
2007	129	1,462	1,381	81	40.2	11,208	5,779	1,715	846	62.7
5 year average	123	1,382	1,333	49	34.5	9,587	4,621	974	815	55.5

Source: Western Pacific Regional Fishery Management Council. 2009. Pelagic fisheries of the western Pacific region: 2007 annual report (updated April 6, 2009). Honolulu, Western Pacific Regional Fishery Management Council.

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and

Bigeye Tuna Catch Limits in Longline Fisheries in 2009, 2010, and 2011

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LIST OF ABBREVIATIONS AND ACRONYMS

Abbreviations and acronyms

CCM	Commission Members, Cooperating Non-Members, and Participating Territories
CEQ	Council on Environmental Quality
CI	Confidence Interval
CL	Catch Limit
CMM	Conservation and Management Measures
CNMI	Commonwealth of the Northern Mariana Islands
CNP	Central North Pacific Ocean
Convention	Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean
Convention Area	Area of Application of the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean
CPUE	Catch per Unit of Effort
CV	Corrected Value
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EL	Effort Limits
ENSO	El Niño – Southern Oscillation
EPO	Eastern Pacific Ocean
ESA	Endangered Species Act
F	Fishing Mortality Rate
FAD	Fish Aggregating Device
FEIS	Final Environmental Impact Statement
FFA	Forum Fisheries Agency
FMP	Fishery Management Plan
FSM	Federated States of Micronesia
FSM Arrangement	1994 Federated States of Micronesia Arrangement for Regional Fisheries Access
HAPC	Habitat Areas of Particular Concern
HMS	Highly Migratory Species
HSFCA	High Seas Fishing Compliance Act of 1995
IATTC	Inter-American Tropical Tuna Commission

IRFA	Initial Regulatory Flexibility Analysis
ISC	International Scientific Committee for Tunas and Tuna-like Species in the North Pacific Ocean
IUCN	International Union for the Conservation of Nature
IWC	International Whaling Commission
MARWG	Marlin Working Group
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum Sustainable Yield
mt	Metric Tons
MUS	Management Unit Species
Nauru Agreement	Nauru Agreement Concerning Cooperation in the Management of Fisheries of Common Interest
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NWR	National Wildlife Refuge
NWSAA	National Wildlife System Administration Act of 1966
OFP	Oceanic Fisheries Program
PacFin	Pacific Coast Fisheries Information Network
Palau Arrangement	1992 Palau Arrangement for the Management of the Western Pacific Purse Seine Fishery
PFMC	Pacific Fishery Management Council
PIC	Pacific Island Countries
PMUS	Pelagic Management Unit Species
PNA	Parties to the Nauru Agreement
PRIA	Pacific Remote Island Areas
RIR	Regulatory Impact Review
ROP	Regional Observer Program
SEIS	Supplemental Environmental Impact Statement
SFPA	Shark Finning Prohibition Act of 2000
SPC	Secretariat of the Pacific Community
SPTA	South Pacific Tuna Act of 1988
SPTT	South Pacific Tuna Treaty (formally, the Treaty on Fisheries between the Governments of Certain Pacific Island States and the Government of the United States of America)
SST	Sea Surface Temperature

USFWS	United States Fish and Wildlife Service
VDS	Vessel Day Scheme
VMS	Vessel Monitoring System
WCPFC	Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, also known as the Western and Central Pacific Fisheries Commission
WCPFCIA	Western and Central Pacific Fisheries Convention Implementation Act
WCPO	Western and Central Pacific Ocean
WPFMC	Western Pacific Fishery Management Council

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Chapter 1

Chapter 1 Introduction and Purpose and Need

This Environmental Assessment (EA) has been prepared pursuant to the provisions of the National Environmental Policy Act (NEPA; 42 U.S.C. § 4321, et seq.) and related authorities, such as the Council on Environmental Quality's (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500-1508) and the National Oceanic and Atmospheric Administration's (NOAA) Environmental Review Procedures for Implementing NEPA (NAO 216-6).

The National Marine Fisheries Service (NMFS) is issuing two proposed rules to implement certain decisions made by the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPFC) at its Fifth Regular Session, in Busan, Republic of Korea, in December 2008. One rule would implement specific management measures for the U.S. purse seine fleet operating in the western and central Pacific Ocean (WCPO). The other rule would implement a specific catch limit established by the WCPFC for bigeye tuna for the U.S. longline fleets in the WCPO. This EA assesses the potential environmental impacts on the human environment that could result from implementation of either or both of the rules.

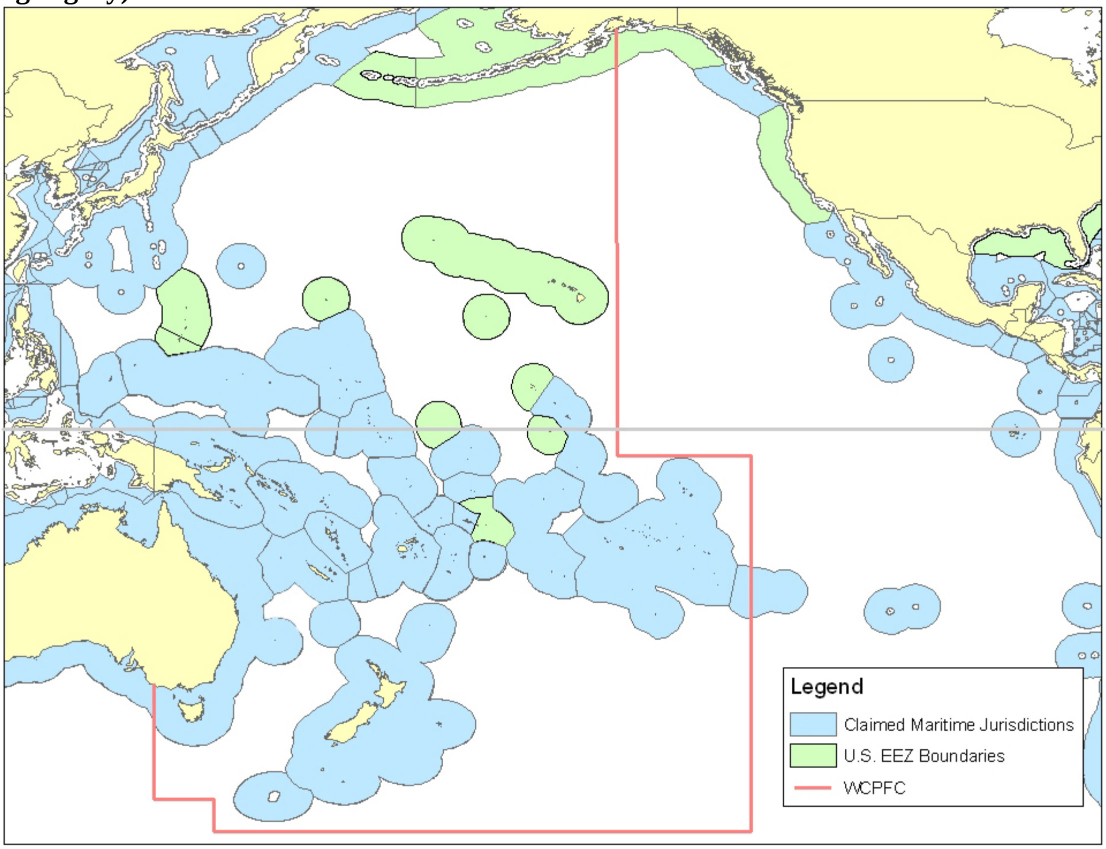
The CEQ's regulations at 40 CFR § 1508.25(a)(3) state that agencies may analyze similar actions (e.g., actions that have common timing or geography) in the same NEPA document, although they are not required to do so. The two rules described above are separate actions and have been distinguished as such throughout this document. However, both rules stem from the same WCPFC decisions and share common objectives, as well as common timing and geography. Thus, in order to implement the immediately necessary provisions of the recent WCPFC decisions in an efficient manner, NMFS has prepared one EA document for the two proposed rules.

1.1 Background

The United States ratified the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (Convention) in 2007. The Convention was opened for signature in Honolulu on September 5, 2000, and entered into force in June 2004; the Convention entered into force for the United States in 2007. The full text of the Convention is available at: http://www.wcpfc.int/convention.htm. The area of application of the Convention (Convention Area) is shown in Figure 1. The Convention text indicates that the agreement is focused on highly migratory species (HMS) and fish stocks within the Convention Area (see the Convention text for the specific HMS covered).[1] The Convention also provides for the conservation and management of non-target, associated, and dependent species.

[1] Though not stated in the Convention text, it has also been agreed that bluefin tuna that are found in the Convention Area will continue to be solely managed by the Commission for the Conservation of Southern Bluefin tuna.

Figure 1 The Convention Area: high seas (in white); U.S. Exclusive Economic Zone (EEZ) (in green); and foreign jurisdictions ("claimed maritime jurisdictions," in blue); Equator (in light gray)



Source: NMFS unpublished data.

The WCPFC, established under the Convention, is comprised of the Members, including Contracting Parties to the Convention and fishing entities that have agreed to be bound by the regime established by the Convention. Other entities that participate in the WCPFC include Participating Territories and Cooperating Non-Members. Participating Territories participate with the authorization of the Contracting Parties with responsibility for the conduct of their foreign affairs. Cooperating Non-Members are identified by the WCPFC on a yearly basis. In accepting Cooperating Non-Member status, such States agree to implement the decisions of the WCPFC in the same manner as Members.

The current Members of the WCPFC are Australia, Canada, China, Chinese Taipei (Taiwan), Cook Islands, European Community, Federated States of Micronesia (FSM), Fiji, France (extends to French Polynesia, New Caledonia, and Wallis and Futuna), Japan, Kiribati, Korea, Marshall Islands, Nauru, New Zealand (extends to Tokelau), Niue, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Tonga, Tuvalu, United States (extends to the Territory of American Samoa, the Commonwealth of the Northern Mariana Islands (CNMI), and the Territory of Guam), and Vanuatu. The current Participating Territories are French Polynesia, New Caledonia and Wallis and Futuna (affiliated with France); Tokelau (affiliated with New Zealand); and the Territory of

American Samoa, the CNMI, and the Territory of Guam (affiliated with the United States of America). The Cooperating Non-Members for 2009 are Belize, El Salvador, Indonesia, Mexico, and Senegal.

The WCPFC – among other things – adopts Conservation and Management Measures (CMMs) for Commission Members, Cooperating Non-Members, and Participating Territories (CCM) of the WCPFC to implement through their respective national laws and procedures. The Western and Central Pacific Fisheries Convention Implementation Act (WCPFCIA; Pub. L. 109-479, Sec 501, et seq., and codified at 16 U.S.C. § 6901 et seq.) authorizes the Secretary of Commerce, in consultation with the Secretary of State and the Secretary of the Department in which the Coast Guard is operating, to develop such regulations as are needed to carry out the obligations of the United States under the Convention. The authority to promulgate regulations to implement the provisions of the Convention and WCPFC decisions, such as regulations to implement CMMs, has been delegated by the Secretary of Commerce to NMFS.

The WCPFC adopted six CMMs at its Fifth Regular Session, in Busan, Republic of Korea, in December 2008, related to living marine resource conservation and management. Two of the CMMs contain provisions that require implementation by the United States.[2] Conservation and Management Measure for Bigeye and Yellowfin Tuna in the Western and Central Pacific Ocean (CMM 2008-01), sets forth specific provisions to reduce fishing mortality on WCPO bigeye tuna and control fishing mortality on WCPO yellowfin tuna. The provisions are based on an objective to achieve a 30% reduction in fishing mortality on WCPO bigeye tuna[3] and a reduction in the risk of overfishing WCPO yellowfin tuna in a three-year period, commencing in 2009. With respect to bigeye tuna, the CMM is based in part on the finding by the WCPFC Scientific Committee that the stock of bigeye tuna in the WCPO is experiencing a fishing mortality rate greater than the rate associated with maximum sustainable yield (MSY). With respect to yellowfin tuna, the CMM is based on the finding by the WCPFC Scientific Committee that the stock of yellowfin tuna in the WCPO is being fished at capacity. The Convention calls for the WCPFC to adopt measures designed to maintain or restore stocks at levels capable of producing MSY, as qualified by relevant environmental and economic factors. Accordingly, CMM 2008-01 has the stated objective of reducing, over the period 2009-2011, the fishing mortality rate for bigeye tuna in the WCPO by at least 30% from the annual average during the period 2001-2004 or 2004 and ensuring that there is no increase in fishing mortality for yellowfin tuna beyond the annual average during the period 2001-2004 or 2004. Conservation and Management of Sea Turtles

[2] Copies of these and previously adopted measures are available on the WCPFC's website at http://www.wcpfc.int/.

[3] As discussed in Chapter 3, Sections 3.4 and 3.4.1, the stock structure of bigeye tuna in the Pacific Ocean is not well known. The WCPFC has to date treated bigeye tuna in the WCPO as a single and entire stock, both in terms of stock assessments and management decisions. The WCPFC decisions and this proposed action, consequently, deal with bigeye tuna in the WCPO, and the term "WCPO bigeye tuna" is used throughout this document to refer to that stock. The same is true with WCPO yellowfin tuna.

(CMM 2008-03), sets forth specific provisions to reduce sea turtle mortality from fishing operations in the Convention Area.[4]

Section 1.2 of this EA provides a general description of the proposed rule for the U.S. WCPO purse seine fleet (hereafter "U.S. Purse Seine Rule") and the specific CMM provisions to be implemented in the rule, and sets forth the purpose of and need for the rule.

Section 1.3 of this EA provides a general description of the proposed rule to implement a specific catch limit established by the WCPFC for bigeye tuna for the U.S. longline fleets in the WCPO (hereafter "U.S. Longline Rule"), and sets forth the purpose of and need for the rule.

1.2. The U.S. Purse Seine Rule

The U.S. Purse Seine Rule would implement six provisions set forth in CMM 2008-01 and CMM 2008-03 for the U.S. purse seine fishery operating in the Convention Area. These provisions are described below.

1.2.1 Provision 1: Fishing Effort Limit

Paragraph 10 of CMM 2008-01 requires the United States to impose a cap on the number of U.S. purse seine fishing days (purse seine fishing effort) that may be spent by U.S. purse seine vessels on the high seas in the Convention Area. The fishing effort is not to exceed the 2004 level or the average of the levels in 2001-2004. Paragraphs 12 and 18 of CMM 2008-01 require the United States to take measures to reduce purse seine fishing mortality on bigeye tuna in the U.S. Exclusive Economic Zone (EEZ) in a way that is compatible with certain measures that the Parties to the Nauru Agreement (PNA)[5] are to implement within their respective areas of national jurisdiction (as prescribed in Paragraphs 11 and 17 of the CMM), which include limits on fishing days.

The U.S. Purse Seine Rule would implement this provision by establishing a limit on the number of fishing days per year that may be spent by the U.S. purse seine fleet on the high seas and in areas of U.S. jurisdiction (including the U.S. EEZ) within the Convention Area.

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[4]Although the provisions include requirements for both the purse seine and longline fisheries, the United States is already in full compliance with the requirements for the longline fisheries through existing regulations at 50 CFR Parts 660 (for west coast-based longline vessels) and 665 (for western Pacific-based longline vessels), so only the provisions applicable to the U.S. WCPO purse seine fishery need be implemented at this time.

[5] PNA member countries are Palau, Nauru, Federated States of Micronesia, Solomon Islands, Marshall Islands, Kiribati, Tuvalu, and Papua New Guinea.

1.2.2 Provision 2: Use of Fish Aggregating Devices

Paragraphs 12 and 18 of CMM 2008-01 place the responsibility on the United States to take measures to reduce purse seine fishing mortality on bigeye tuna in the U.S. EEZ, in a way that is compatible with the measures that the PNA adopt within their respective areas of national jurisdiction (as prescribed in Paragraphs 11 and 17 of the CMM). Paragraphs 13 and 19 of CMM 2008-01 call for the United States to implement prohibitions on deploying, servicing, or fishing on schools associated with Fish Aggregating Devices (FADs) on the high seas for purse seine vessels during August and September in 2009 and during July through September in 2010 and 2011. Paragraphs 13 and 19 prescribe that the United States should allow vessels to fish during these periods only if they have approved observers on board to monitor that no fishing on FADs takes place.

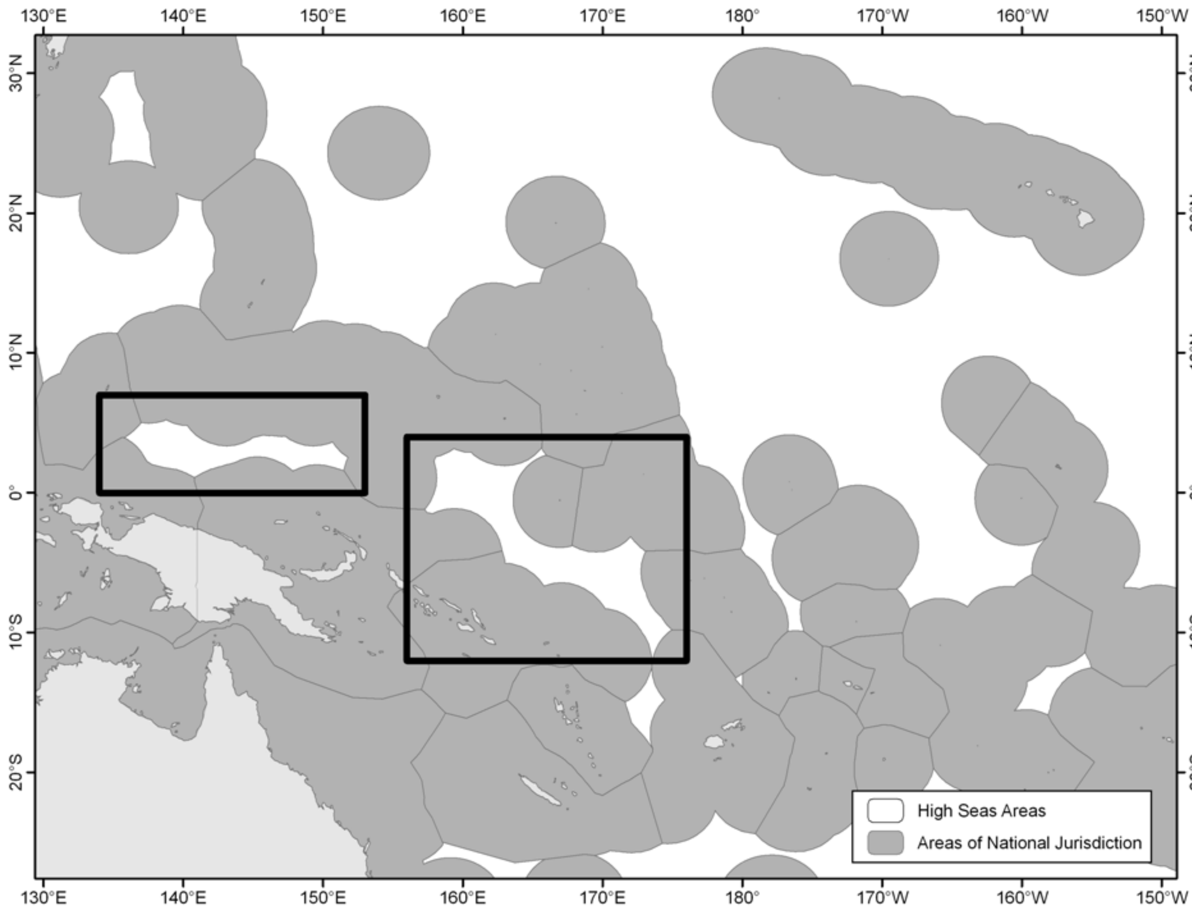
The U.S. Purse Seine Rule would implement this provision by establishing periods during which deploying, servicing,[6] or fishing on schools associated with FADs would be prohibited on the high seas and in the U.S. EEZ (August and September in 2009 and July through September in 2010 and 2011) (FAD prohibition period).

1.2.3 Provision 3: Closed Areas

Paragraph 22 of CMM 2008-01 specifies two areas of the high seas in which fishing by purse seine vessels would be prohibited from January 1, 2010 through 2011, unless the WCPFC decides otherwise at its regular annual session in December 2009. These areas are shown in Figure 2.

[6] The prohibition would include servicing electronics associated with FADs.

Figure 2 Proposed high seas closed areas. (Areas of high seas are indicated in white; areas of national jurisdiction, including territorial seas, archipelagic waters, and exclusive economic zones, are indicated in dark shading. Approximate areas that would be closed to purse seine fishing are all high seas areas within the two rectangles bounded by the bold black lines. This map displays indicative maritime boundaries only.)



The U.S. Purse Seine Rule would implement this provision by closing the two areas to fishing by U.S. purse seine vessels, effective January 1, 2010 through 2011, subject to the WCPFC deciding otherwise at its regular annual session in December 2009.

1.2.4 Provision 4: Catch Retention

Paragraph 27 of CMM 2008-01 requires the United States to ensure that owners and operators of U.S. purse seine vessels retain 100% of their catch of skipjack tuna, bigeye tuna, and yellowfin tuna, up to the point of first landing or transshipment, effective January 1, 2010 through the end of 2011. Exceptions would be provided for fish that are unfit for human consumption for reasons other than their size, for the last set of the trip if there is insufficient well space to accommodate the entire catch, and for cases of serious malfunction of equipment that makes fish in the wells unsafe for human consumption.

The provision is contingent on the WCPFC Regional Observer Program (ROP) developing to the point of being able to provide 100% observer coverage. The stated purpose of this provision is to create a disincentive to the capture of small fish and to encourage the development of technologies and fishing strategies designed to avoid the capture of small bigeye tuna and yellowfin tuna.

The U.S. Purse Seine Rule would implement this provision by prohibiting the discard of bigeye tuna, yellowfin tuna, or skipjack tuna from a U.S. purse seine vessel at sea within the Convention Area, subject to the exceptions and observer coverage requirement described above.

1.2.5 Provision 5: Observer Coverage

Paragraph 13 of CMM 2008-01 prescribes that the United States require U.S. purse seine vessels to carry observers during the FAD prohibition period in 2009 when fishing on the high seas, and starting in 2010, on all trips. Paragraph 12 prescribes that the United States require U.S. purse seine vessels to take measures to reduce purse seine fishing mortality on bigeye tuna in the U.S. EEZ in a way that is compatible with the measures that the PNA adopt within their respective areas of national jurisdiction (as prescribed in Paragraphs 11 and 17 of the CMM), which includes observer coverage during the FAD prohibition period in 2009. Paragraph 28 of CMM 2008-01 prescribes that the United States require U.S. purse seine vessels to carry an observer from the WCPFC's ROP on all trips, effective January 1, 2010.

The U.S. Purse Seine Rule would implement this provision by requiring observer coverage for all U.S. purse seine vessels during the FAD prohibition period in 2009 and, effective January 1, 2010 until the end of 2011, for all trips.

1.2.6 Provision 6: Sea Turtle Take Mitigation Requirements

Paragraphs 4 and 5 of CMM 2008-03 prescribe that the United States require U.S. purse seine vessels to take specific sea turtle interaction mitigation requirements. These mitigation requirements include specific requirements for the resuscitation of captured sea turtles, for carrying dip nets on board to handle sea turtles, and for taking measures to release turtles that are encountered in fishing gear.

The U.S. Purse Seine rule would implement this provision by requiring U.S. purse seine vessels to carry specific equipment and use specific measures to disentangle, handle, and release sea turtles that are encountered in fishing gear.

1.2.7 Purpose and Need

The purpose of the U.S. Purse Seine Rule is for NMFS to implement the applicable provisions of CMM 2008-01 and CMM 2008-03 for the U.S. WCPO purse seine fishery in order to reduce fishing mortality on WCPO bigeye tuna, control fishing mortality on WCPO yellowfin tuna, and mitigate fisheries interactions with sea turtles. The need for the rule is to satisfy the international obligations of the United States as a Contracting Party to the Convention, pursuant to the authority of the WCPFCIA.

1.3 U.S. Longline Rule

The U.S. Longline Rule would ensure NMFS' timely implementation of the annual catch limit (CL) for bigeye tuna established by the WCPFC for the U.S. longline fleets for each of the years 2009 through 2011. As prescribed by Paragraph 33 of CMM 2008-01 for 2009, the limit would be equal to the amount landed by the Hawaii and west coast longline fleets in 2004, less 10%.[7] The amount landed in 2004, which is specified in CMM 2008-01, based on information provided by the United States to the WCPFC, was 4,181 metric tons (mt). Consequently, the calculated reduction (less 10%) results in a 2009-2011 annual 3,763 mt limit. The limit does not apply to Participating Territories or small island developing States that are undertaking responsible development of their domestic fisheries. Thus, the proposed rule would not apply to the longline fisheries of the Territory of American Samoa, the Territory of Guam, or the CNMI. Pursuant to Paragraph 35 of CMM 2008-01, this limit continues in effect for the years 2010 and 2011.[8]

The U.S. longline fleets operating in the WCPO[9] generally are regulated through the Fishery Management Plan (FMP) for the Pelagic Fisheries of the Western Pacific Region developed by the Western Pacific Fishery Management Council (WPFMC) and the FMP for U.S. West Coast Fisheries for HMS developed by the Pacific Fishery Management Council (PFMC), pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSA; 16 U.S.C. § 1801, et seq.). As stated above, the WCPFCIA authorizes NMFS (on behalf of the Secretary of Commerce) to promulgate such regulations as are needed to implement the decisions of the WCPFC. The regulations may, in cases where the Secretary of Commerce has discretion in implementing the decisions of the WCPFC, and where the regulations would govern fisheries under the authority of a Regional Fishery Management Council, be developed in accordance with the procedures established by the MSA to the extent practicable within the implementation schedule of the WCPFC. Accordingly, the MSA process could potentially serve to implement certain provisions of CMM 2008-01 that apply to the U.S. longline fisheries. This process involves the development of management recommendations by the WPFMC and PFMC, which are then subject to the approval of, and implementation by, NMFS. The process also involves formal time periods for

[7] See Chapter 2, Section 2.1.1.1 for an explanation of the United States' use of landings of bigeye tuna as a proxy for catches.

[8] The limits in CMM 2008-01 are prescribed relative to catches made during specified baseline periods, which for the United States is 2004. For fleets of WCPFC Members with bigeye tuna catch baselines of less than 5,000 mt and that land exclusively fresh fish, the specified limit is the baseline level less 10%, and is the same for each of the years 2009, 2010, and 2011.

[9] During the course of a normal year, these fleets also operate in the eastern tropical Pacific Ocean.

deliberation by the WPFMC and PFMC and subsequent review, approval, and implementation by the Secretary of Commerce through NMFS.

To comply with the international obligations of the United States, NMFS is issuing a proposed rule under the WCPFCIA pertaining to the U.S. longline fleets for the discrete and limited purpose of implementing the catch limit. Based on the longline fleet's fishing patterns in recent years, the limit could be reached or exceeded in the third quarter of 2009. By letter dated February 18, 2009, NMFS notified the WPFMC of its intent to implement the catch limit under the WCPFCIA, and has suggested that the WPFMC may wish to evaluate and recommend additional management measures under the MSA process, to the extent deemed necessary to efficiently carry out the established catch limit.

1.3.1 Purpose and Need

The purpose of the proposed rule for the U.S. longline fleets operating in the Convention Area is for NMFS to ensure the timely implementation of the United States of the bigeye tuna catch limit established by the WCPFC in 2008-01. The need for the rule is to satisfy the international obligations of the United States as a Contracting Party to the Convention, pursuant to the WCPFCIA, and to make effective a CMM provision that requires immediate implementation.

1.4 Organization of This Document

The following is a brief description of the remaining chapters of this EA:

Chapter 2 provides detailed discussion of the Proposed Action, with separate discussions of the U.S. Purse Seine Rule, and the U.S. Longline Rule, and the alternative methods of implementing each of the proposed rules studied in depth in this EA. The chapter also discusses the No-Action Alternative baseline for each rule and the alternatives initially considered but excluded from detailed analysis.

Chapter 3 describes the U.S. purse seine and U.S. longline fisheries and the physical environment and biological resources that could be affected by the implementation of each of the proposed rules under any of the alternatives assessed in depth.

Chapter 4 analyzes the direct and indirect environmental consequences that could be caused by the implementation of each of the proposed rules under any of the alternatives assessed in depth, as well as the No-Action Alternative baseline for each rule.

Chapter 5 analyzes the potential cumulative impacts that could result from the implementation of the two proposed rules under any of the alternatives assessed in depth.

Chapter 6 compares the alternatives assessed for the implementation of each rule.

Chapter 2

Chapter 2 Proposed Action and Alternatives

In an environmental review document, agencies must assess the environmental impacts of a proposal and the reasonable and feasible alternatives to the proposal in comparative form. The purpose of this comparison of alternatives is to provide the decisionmaker and the public with a clear basis for choosing among the alternatives.[10]

Section 2.1 of this chapter provides a description of the Proposed Action analyzed in this EA, which includes two distinct proposed rules. This section describes the alternatives for each rule considered in detail, including the No-Action Alternative, which represents the baseline, or existing conditions. Section 2.2 discusses the alternatives initially considered but eliminated from detailed analysis for each rule. Chapter 3 presents detailed information about the affected environment that could be affected by any of the alternatives analyzed in depth, and Chapters 4 and 5 discuss the potential environmental impacts that could result from implementation of the proposed rules under any of the alternatives; Chapter 4 provides an analysis of potential direct and indirect impacts and Chapter 5 presents the cumulative impacts analysis. Chapter 6 compares the alternatives for each rule, as well as the No-Action Alternative for each rule, and summarizes the conclusions of NMFS regarding environmental impacts to provide the decisionmaker and the public a clear basis for choosing among the alternatives.

2.1 Proposed Action

The Proposed Action includes the implementation of two proposed rules. One of the rules applies to the management of the U.S. purse seine fleet in the WCPO. The rule for the U.S. WCPO purse seine fishery includes six specific provisions that are described in Section 2.1.1 (hereafter, "U.S. Purse Seine Rule"). The alternatives considered in detail for this rule are described in Section 2.1.1.2.

The other rule would ensure the timely implementation of the WCPO bigeye tuna catch limit established by the WCPFC. The rule that would implement this bigeye tuna catch limit would apply to the U.S. longline fleets operating in the Convention Area (hereafter, "U.S. Longline Rule"). The U.S. Longline Rule is described in Section 2.1.2.

2.1.1 U.S. Purse Seine Rule

The U.S. Purse Seine Rule would include six provisions: (1) limits on fishing effort, measured in terms of fishing days, on the high seas and the U.S. EEZ for the years 2009-2011; (2) periods during which fishing on schools in association with FADs would be prohibited on the high seas and in the U.S. EEZ (August and September in 2009 and July through September in 2010 and 2011) (FAD prohibition period); (3) specific areas of high seas in which fishing would be prohibited during 2010-2011; (4) effective in 2010 and until the end of 2011, a requirement to retain 100% of the catch of skipjack tuna,

[10] See the CEQ's Regulations for Implementing the Procedural Provisions of NEPA at 40 CFR §1502.14.

yellowfin tuna, and bigeye tuna, up to the first point of landing or transshipment; (5) a requirement to carry observers during the FAD prohibition period in 2009, and starting in 2010 until the end of 2011, on all trips; and (6) a requirement to implement sea turtle interaction mitigation requirements to be effective indefinitely.

Section 2.1.1.2 of this EA describes the reasonable and feasible alternatives, which are analyzed in depth in this EA, for implementing the provisions of the U.S. Purse Seine Rule. Alternative A is the No-Action Alternative. Alternative B sets forth the middle ground variation to the fishing effort limit provision (i.e., neither the most restrictive nor the least restrictive) and the manner in which the other five provisions would be implemented under the proposed rule. Alternatives C, D, and E are variations to the fishing effort limit provision; NMFS has not identified reasonable and feasible alternatives for the other five provisions. Below is a description of NMFS' development of the fishing effort limit alternatives.

2.1.1.1 Fishing Effort Limit Alternatives

As explained in Chapter 1 of this EA, the U.S. Purse Seine Rule would be promulgated under the authority of the WCPFCIA, which enables NMFS to implement decisions made by the WCPFC. The fishing activities of U.S. WCPO purse seine vessels are also governed by the Treaty on Fisheries between the Governments of certain Pacific Islands States and the Government of the United States of America (South Pacific Tuna Treaty or SPTT). The SPTT manages access of U.S. purse seine vessels to the EEZs of Pacific Island Countries (PIC) and provides for technical assistance in the area of fisheries development. The SPTT is implemented domestically by regulations (50 CFR §§ 300.30-300.46) issued under authority of the South Pacific Tuna Act of 1988 (SPTA; 16 U.S.C. §§ 973-973r).

Although not directly applicable to the U.S. purse seine fleet, there are other regional agreements in place that are relevant to this action because they either govern the activities of purse seine vessels of other nations in the Convention Area or set what are referred to as harmonized terms and conditions for access into the areas under national jurisdiction of the PIC. Key among these is the 1992 Palau Arrangement for the Management of the Western Pacific Purse Seine Fishery (Palau Arrangement).[11] This agreement exists within the framework of the Nauru Agreement Concerning Cooperation in the Management of Fisheries of Common Interest (Nauru Agreement), the members of which are collectively known as the Parties to the Nauru Agreement, or the PNA. The United States is not a party to the Nauru Agreement nor has it been a party to any of the decisions or negotiations of this sub-regional body.[12]

[11] Other regional agreements include the Niue Treaty and the PNA FSM Arrangement (another sub-regional instrument that allows reciprocal access by PIC-based purse seine vessels). These agreements as well as the actions of the Pacific Islands Forum Fisheries Agency's (FFA) Forum Fisheries Committee do at times have impacts on the actions of U.S. purse seine vessels operating in the EEZs of the PIC.

[12] The PNA has to date been administratively backstopped by the Pacific Islands Forum Fisheries Agency, located in Honiara, Solomon Islands.

CMM 2008-01 refers to certain actions being taken by the PNA, and directs other non-CCMs to implement measures that are "compatible" with the PNA measures. For that reason, the Palau Arrangement and the Vessel Day Scheme (VDS)[13] are discussed at some length here.

The Palau Arrangement originally limited the number of purse seiners that can be licensed to fish in the EEZs of the parties to the Arrangement—the fundamental metric for effort under that agreement was vessel numbers or licenses. Licenses which were typically granted under bi-lateral access arrangements with PNA members were allocated (essentially on a first come first served basis) and until the end of the 1990s there were never more requests than the agreed upon cap (at that time 205 vessels). Although there was no direct nexus between the Palau Arrangement and the SPTT, the PNAs always accounted for the number of licenses allowed and used by U.S. vessels wishing to operate under the SPTT.

For reasons beyond the scope of this analysis, circa 2005 the PNA decided to move off the vessel license (effort) metric and move to a vessel or fishing day scheme (ergo VDS). The PNA established the VDS to cap the number of fishing days in the EEZs of the PNA and to provide for the allocation of the cap among the PNA (for specifics see Attachment C to CMM 2008-01). The PNA VDS specifies rolling three-year management periods. The rolling three-year management periods function by having the limit on the number of fishing days[14] set for each of the years in the initial three-year management period. In theory, before the end of the first year, the fishing limit is then to be set for the fourth year, before the end of the second year, the fishing limit is set for the fifth year, etc., so that the maximum allowable fishing days are always established for three years in advance. According to the arrangement, the set number of total fishing days available is partitioned among the PNA. Like the Palau Arrangement's limit on vessel numbers, the U.S. purse seine fleet is not in any way limited or governed by the VDS. However, the total number of fishing days allocated to the PNA and managed under VDS includes pools reserved for the purse seine fleets governed under the SPTT, as well as the FSM Arrangement.[15] To date the portion allocated to the U.S. Treaty have been taken off the top of the PNA's VDS pool and country allocations have occurred thereafter. Transfer of a set number of fishing days between management years by individual PNA members is allowed (up to 100% of the days from another year in the same three-year management

[13] Technically the Vessel Day Scheme – which can be found as Attachment C to WCPFC CMM 2008-01 is an amendment to the Palau Arrangement, one of the instruments agreed to by the PNA.

[14] The VDS defines fishing day as any calendar day, or part of calendar day, during which a purse seine vessel is outside of a port, except when the vessel is not undertaking fishing activities (i.e., when all fishing gear is stowed) (see Attachment C to CMM 2008-01).

[15] The FFA has requested that the United States engage in discussions with those subset of nations that are both FFA members and PNA members to determine if the U.S. purse seine fishery could be included in the VDS. Those discussions, which include the U.S. Department of State, are on-going as of this writing.

period; up to 30% of the days from the final year of the preceding management period).[16] Allocated fishing days may also be transferred, within specified limits, among PNA. In theory, this approach provides the flexibility to take into consideration variations in fishing effort and fishing patterns that occur in different years, while meeting the objective of implementing definite limits on the number of allowable fishing days.

The U.S. Purse Seine Rule would establish limits on the number of fishing days[17] that may be spent on the high seas and in the U.S. EEZ. Under Alternative B, the fishing effort limit provision has been designed to be especially similar to the PNA VDS.

Paragraph 10 of the WCPFC's CMM 2008-01 gives the United States the choice of using the 2004 level or the average 2001-2004 level as the baseline for the fishing effort limit on the high seas. Paragraphs 12 and 18 of CMM 2008-01 require the United States to take measures to reduce purse seine fishing mortality on bigeye tuna in the U.S. EEZ, in a way that is compatible with certain measures that the PNA adopt within their respective areas of national jurisdiction (as prescribed in Paragraphs 11 and 17 of the CMM), including the VDS, which establishes fishing effort in 2004 as the limit.

Paragraph 7 of CMM 2008-01 provides that determinations of effort levels for the purpose of implementing the CMM shall include fishing rights under existing regional fisheries arrangements or agreements that were registered with the WCPFC by December 2006 in accordance with CMM 2005-01, Conservation and Management Measure for Bigeye and Yellowfin Tuna in the Western and Central Pacific Ocean, provided that the number of licenses authorized under such arrangements does not increase. The SPTT is such an agreement, and the United States has registered the SPTT with the WCPFC in accordance with CMM 2005-01. As stated above, the number of licenses allowed under the SPTT is 45, five of which are reserved for vessels engaged in joint ventures with Pacific Island Parties to the SPTT, and these numbers have not increased. The licensing requirements of the SPTT do not apply to the U.S. EEZ, but the area of application of the SPTT does include portions of the U.S. EEZ. Since the inception of the SPTT, all U.S. purse seine vessels that have been used to fish in the U.S. EEZ in the WCPO have been licensed under the SPTT. In other words, the set of vessels used to fish in the U.S. EEZ in the WCPO has been identical to the set of vessels used to fish on the high seas and in foreign EEZs in the WCPO under the terms of the SPTT, and consequently, all such vessels have been effectively managed as part of the SPTT-governed U.S. purse seine fleet. For these reasons, the number of non-joint venture licenses authorized under the SPTT, 40, is used as the basis for the proposed fishing effort limits for both the high seas and the U.S. EEZ within the Convention Area.

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[16] Because the total number of allowable fishing days is divided among the PNA, the percentages regarding the transfer of fishing days refer to the transfer allowed for each PNA (e.g., one party can transfer 100% of its fishing days between years in a management period) (see Attachment C to CMM 2008-01).

[17] A fishing day would be defined to mean any day in which a fishing vessel of the United States that is equipped with purse seine gear searches for fish, deploys a FAD, services a FAD, or sets a purse seine, with the exception of setting a purse seine solely for the purpose of testing or cleaning the gear and resulting in no catch.

This baseline of 40 vessels is used to derive the proposed fishing effort limits, expressed in terms of fishing days, by determining the average number of fishing days spent per vessel in the appropriate baseline period, and multiplying that number by 40 vessels. The numbers of days fished during the baseline periods were determined from the best available historical operational data from the U.S. purse seine fleet, as reported on regional purse seine logsheets. For both the high seas and the U.S. EEZ within the Convention Area, average fishing effort per vessel was greater in 2004 than during 2001-2004, so the 2004 levels are used for both areas. For the high seas in the Convention Area, the estimated average number of fishing days spent per vessel during 2004 (when 21 vessels were active in that area) was 50.76. For the U.S. EEZ in the Convention Area, the estimated average number of fishing days spent per vessel during 2004 (when 20 vessels were active in that area) was 13.95. Therefore, the proposed limit would be 2,030 fishing days per year (but not necessarily applied on an annual basis) for the high seas and 558 fishing days per year for the U.S. EEZ, or a total of 2,588 fishing days per year. If any vessels enter the fishery with any of the five licenses reserved for vessels engaged in joint ventures with the Pacific Island Parties to the SPTT, the limit may be adjusted accordingly.

NMFS identified various methods for implementing the fishing day effort limits. First, the effort limits could be distributed by: (1) allocating the effort limits among vessels (i.e., each vessel would be allocated a specific portion of the overall effort limit based on some established criteria); or (2) having no allocation of the effort limits, so all vessels would effectively compete for the available fishing days under a single fleet-wide – Olympic style – limit. Second, the effort limits could be applied by: (1) having a single combined effort limit that applies to both of the applicable areas (high seas and U.S. EEZ); or (2) separate effort limits for the high seas and U.S. EEZ. Third, the effort limits also could be set in several alternative temporal terms: (1) on an annual basis, or (2) a multiple-year basis. In either case, but particularly the former, they could be set for the calendar year or be put on some other "limit-year" schedule – given the SPTT is managed on licensing periods that run from June 15th to June 14th of the following year. The effort limits also could be implemented so that days could be borrowed from the limits of past and future years or licensing periods, or they could be fixed so that no borrowing could take place. NMFS has analyzed four different variations of the fishing effort limits in this EA that represent a reasonable range of alternatives for the purposes of a NEPA analysis.

2.1.1.2 Alternatives for the U.S. Purse Seine Rule Considered in Detail

The alternatives for the purse seine fishery rule are designated by letter (see Table 1) and are described in detail below.

Table 1 Alternatives for the U.S. Purse Seine Rule

Purse Seine								
				Alternatives				
Provisions				A	B	C	D	E
Effort limits (EL) for 2009-2011	a. EL distributed by:	1. Allocate EL among vessels				X		
		2. No allocation of EL			X		X	X
	b. EL applied by:	1. Single combined EL applied to both areas (HS and U.S. EEZ)			X	X		X
		2. Separate EL for the HS and U.S. EEZ					X	
	c. EL temporal terms:	1. Annual basis Start dates:	- January 1		X	X		
			- Beginning of license year (June 15)				X	
			-Multi-year					X
FAD prohibition for 2009-2011					X	X	X	X
High seas area closures for 2010-2011					X	X	X	X
Catch retention for 2010-2011					X	X	X	X
Observer coverage for 2009-2011					X	X	X	X
Sea turtle interaction mitigation requirements (indefinite)					X	X	X	X

2.1.1.2.1 Alternative A: The No-Action Alternative to the U.S. Purse Seine Rule

Alternative A, the No-Action Alternative to the U.S. Purse Seine Rule, would cause no changes to "the status quo" and would result in conditions that are treated as the baseline for the purposes of assessing the impacts of the other alternatives. The inclusion of the No-Action Alternative serves the important function of facilitating comparison of the effects of the action alternatives and is a required part of a NEPA document.[18]

[18] It is important that analysis of a no-action alternative not be interpreted as a lack of commitment on the part of the United States to fulfill its obligations. In this case, where the United States has an international obligation to implement the decisions of the WCPFC, the no-action alternative might not be realistic or reasonable as it would fail to meet the purpose and need for the action. However, NEPA regulations require the analysis of the no-action alternative, and the analysis provides a baseline even where an agency is under a legislative command to act (40 CFR § 1502.14(d)).

Under Alternative A, the U.S. WCPO purse seine fishery would continue to be managed under the existing laws and regulations, which are described in Chapter 3, Section 3.2.2. In effect up to 40 vessels licensed by the FFA under the SPTT would continue to fish in the manner in which operations have occurred for the past 21 years. The United States would continue to manage the fishery under a license metric as opposed to the fishing days metric now called for under the fishing effort limit provision in CMM 2008-01.

2.1.1.2.2 Alternative B: Action Alternative for the U.S. Purse Seine Rule

Under Alternative B, the U.S. WCPO purse seine fishery would be subject to six new management provisions, as detailed below.

2.1.1.2.2.1 Fishing Effort Limit

Under Alternative B, for the fishing effort limit to be applied to the years 2009-2011, there would be one combined effort limit for the high seas and the U.S. EEZ[19] and the effort limit would be allocated on a competitive basis, meaning an “Olympic” style allocation whereby fishing days are available until the cap is reached. To accommodate the need for operational flexibility in the event of inter-annual variability in the spatial and temporal distribution of optimal fishing grounds and times, Alternative B would implement the fishing effort limit on three different time scales: First, there would be a limit of 7,764 fishing days (3 times the base of 2,588) for the entire three-year 2009-2011 period. Second, there would be a limit of 6,470 fishing days (2.5 times the base of 2,588) for each of the two-year periods 2009-2010 and 2010-2011. Third, there would be a limit of 3,882 fishing days (1.5 times the base of 2,588) for each of the one-year periods 2009, 2010, and 2011. Once NMFS determines during any of those time periods that, based on information collected in vessel logbooks and other sources, the limit is expected to be reached on a specific future date, NMFS would issue a notice in the Federal Register announcing the closure of the purse seine fishery in the Convention Area on the high seas and in areas of U.S. jurisdiction starting on that date. NMFS would publish the notice at least seven calendar days before the effective date of the restrictions to provide fishermen with advance notice. Upon closure of the fishery, it would be prohibited to use a U.S. purse seine vessel to fish in the Convention Area on the high seas or in areas of U.S. jurisdiction through the end of the calendar year. This approach would allow greater fishing effort in any given year than would be allowed under a strictly annual limit, yet ensure that total fishing effort over the three-year period does not exceed the WCPFC-mandated limit for that period.

[19] In accordance with CMM 2008-01, the area of application of the effort limit would be the Convention Area between 20° N and 20° S.

2.1.1.2.2.2 Use of Fish Aggregating Devices

Under Alternative B, there would be established periods in each of the years 2009 through 2011 during which it would be prohibited to fish on schools in association with FADs or to deploy, service, or otherwise use FADs in association with purse seine fishing. In 2009, the FAD prohibition period would be August 1 through September 30. In 2010 and 2011, it would be July 1 through September 30.

2.1.1.2.2.3 Closed Areas

Under Alternative B, two areas would be closed to fishing by U.S. purse seine vessels, effective January 1, 2010 through 2011. The areas would be the two areas of high seas within the Convention Area that are depicted on the map in Figure 2 in Chapter 1 of this EA. In CMM 2008-01, the WCPFC has reserved the option of reversing its adoption of the closed areas at its regular annual session in December 2009. If such a decision occurs, NMFS will take appropriate action to rescind any closed areas that are established by regulation.

2.1.1.2.2.4 Catch Retention

Under Alternative B, the proposed rule would prohibit discarding bigeye tuna, yellowfin tuna, or skipjack tuna from a U.S. purse seine vessel at sea within the Convention Area. Exceptions would be provided for fish that are unfit for human consumption (including but not limited to fish that are spoiled, pulverized, severed, or partially consumed at the time they are brought on board), for the last set of the trip if there is insufficient well space to accommodate the entire catch, and for cases of serious malfunction of equipment. This element of the proposed rule would become effective only upon NMFS' determination that an adequate number of WCPFC-approved observers are available for the purse seine vessels of all WCPFC CCMs as necessary to ensure compliance by such vessels with the catch retention requirement, and in any case no earlier than January 1, 2010. Once it makes that determination, NMFS would announce the effective date of the requirement in a notice published in the Federal Register. The requirement would then remain in effect through December 31, 2011.

2.1.1.2.2.5 Observer Coverage

Under Alternative B, the proposed rule would require that U.S. purse seine vessels carry observers deployed as part of the WCPFC's ROP or deployed by NMFS on all trips in the Convention Area during August 1 through September 30, 2009 (the FAD prohibition period). It also would require, effective January 1, 2010, that U.S. purse seine vessels carry WCPFC-approved observers on all trips in the Convention Area until the end of 2011. These observer requirements would not apply to trips that take place exclusively within areas under the jurisdiction of the United States, including the U.S. EEZ and U.S. territorial sea, or any other single nation.[20]

[20] If the Regional Administrator has determined that an observer is not available for the fishing trip and a written copy of the Regional Administrator's determination, which must include the approximate start date

2.1.1.2.2.6 Sea Turtle Take Mitigation Requirements

Under Alternative B, the proposed rule would require that owners and operators of U.S. purse seine vessels operating in the Convention Area carry specific equipment and use specific measures to disentangle, handle, and release sea turtles that are encountered in fishing gear, including purse seines and FADs. The required equipment would be a dip net with specified minimum design standards. The required measures would include: immediately releasing sea turtles that are observed enclosed in purse seines; disentangling sea turtles that are observed entangled in purse seines or FADs; stopping net roll until a sea turtle is disentangled from a purse seine; resuscitating sea turtles that appear dead or comatose; and releasing sea turtles back to the ocean in a specified manner. These measures would be effective indefinitely.

2.1.1.2.3 Alternative C: Allocation of Fishing Effort Limit

Under Alternative C, for the U.S. purse seine vessels fishing in the U.S. EEZ and high seas in the Convention Area, the effort limit would be allocated among different individual vessels in some manner.[21] All other provisions would be identical to Alternative B.

2.1.1.2.4 Alternative D: Most Restrictive Variation for Fishing Effort Limit Provision

Under Alternative D, for the U.S. purse seine vessels fishing in the Convention Area, the effort limit would be implemented on a single year basis, coinciding with the license year, no fishing days could be transferred from other years, and there would be separate non-allocated effort limits for the high seas and U.S. EEZ. All other provisions would be identical to Alternative B.

2.1.1.2.5 Alternative E: Least Restrictive Variation for Fishing Effort Limit Provision

Under Alternative E, for the U.S. purse seine vessels fishing in the Convention Area, the effort limit would be implemented on a three-year combined basis, with one limit set for the high seas and U.S. EEZ for the entire three-year period that the effort limit would be in effect. All other provisions would be identical to Alternative B.

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of the fishing trip and the port of departure, is carried on board the fishing vessel during the entirety of the fishing trip, the vessel may conduct fishing activities without an observer on board.

[21] Analysis of specific methods of allocating the fixed number of available fishing days is not part of this EA. The specific method of individual vessel allocation would not change the analysis or conclusions regarding potential environmental impacts set forth in Chapters 4 and 5.

2.1.2 U.S. Longline Rule

The U.S. Longline Rule would ensure the compliance of the United States with the established bigeye tuna catch limit for the relevant U.S. longline fleets. Section 2.1.2.1 describes the alternatives considered in depth for this rule. The alternatives have been designated by number.

2.1.2.1 Alternatives for the U.S. Longline Rule Considered in Detail

This section describes the alternatives for promulgating the U.S. Longline Rule considered in detail in this EA. The alternatives for the U.S. Longline Rule are designated by number (see Table 2).

Table 2 Alternatives for the U.S. Longline Rule

Longline					
		Alternatives			
Provisions		1	2	3	4
Catch limit (CL)	a. Prohibit deep-set longlining and prohibit retention, landing, and transshipping of bigeye tuna on and by all longline vessels after reaching CL in any of the calendar years 2009-2011.		X		
	b. Prohibit retaining, landing, and transshipping bigeye tuna after reaching CL in any of the calendar years 2009-2011 (both deep-setting and shallow-setting would be allowed to continue).			X	
	b. Prohibit deep-set and shallow-set longlining and prohibit retention, landing, and transshipping of bigeye tuna on and by all longline vessels after reaching CL in any of the calendar years 2009-2011.				X

2.1.2.2 Alternative 1: The No-Action Alternative to the U.S. Longline Bigeye Tuna Catch Limit Rule

Under Alternative 1, the catch limit for WCPO bigeye tuna established by the WCPFC for the U.S. longline fishery would not be implemented immediately and U.S. longline fleets operating in the Convention Area could continue targeting and landing bigeye tuna after the amount specified in CMM 2008-01 has been landed in any of the years 2009-2011. The fleet would continue to operate under the FMPs with limited entry and a variety of other regulatory measures currently in place (observers, reporting, Vessel Monitoring System (VMS), endangered species mitigation, etc.).

2.1.2.3 Alternative 2: Closure of the Deep-Set Sector

Under Alternative 2, the rule to ensure NMFS' timely implementation of the bigeye tuna catch limit established by the WCPFC for applicable U.S. longline fleets would prohibit deep-set fishing operations (which target tunas) after a landings limit of 3,763 metric tons has been reached in any of the calendar years 2009 through 2011, as well as prohibit the retention on board and landing of bigeye tuna by longline vessels (e.g., by vessels engaged in shallow-setting).[22]

The bigeye tuna limits established in CMM 2008-01 are termed "catch" limits. However, the baseline amount of bigeye tuna specified for the United States in the CMM, from which the limit is derived, is from information provided to the WCPFC by the United States. That information, as for other CCMs, is expressed in terms of landings of bigeye tuna, not catch. Accordingly, the proposed rule would establish a limit on landings (as a proxy for catches) of bigeye tuna. The limit would have the purpose of reducing fishing mortality of WCPO bigeye tuna.

Once NMFS determines in any of the years 2009, 2010, or 2011 that the limit is expected to be reached by a specific future date in that year, NMFS would publish a notice in the Federal Register announcing that the fishery will be closed on that specific date and will remain closed until the end of the calendar year. NMFS would publish the notice at least seven calendar days before the effective date of the restrictions to provide fishermen advance notice of the restrictions. NMFS would also endeavor to make publicly available, such as on a web site, regularly updated estimates and/or projections of bigeye tuna landings in order to help fishermen plan for a possible fishery closure.

Starting on the closure date and extending through the last day of that calendar year, it would be prohibited to use a U.S. fishing vessel to deploy longline gear in the Convention Area, to retain on board bigeye tuna or yellowfin tuna captured by longline gear in the Convention Area, or to land or transship bigeye tuna or yellowfin tuna captured by longline gear in the Convention Area, with the following exceptions:

First, any bigeye tuna or yellowfin tuna already on board a fishing vessel upon the start of the closure may be retained on board, transshipped, and/or landed, provided that it is landed within 14 days after the start of the closure. In the case of a vessel that has declared to NMFS pursuant to 50 CFR 665.23(a) that the current trip type is shallow-setting, the 14-day limit would be waived, but the number of bigeye tuna or yellowfin tuna retained on board, transshipped, or landed could not exceed the number on board the vessel upon the start of the closure, as recorded by the NMFS observer on board the vessel.

[22] As discussed in more detail in Chapter 3, Section 3.3, the deep-set component of the longline fishery targets tuna species at depths ranging from 100 to 300 meters; the shallow-set component targets swordfish at depths less than 100 meters.

Second, any bigeye tuna or yellowfin tuna captured by longline gear could be retained on board, transshipped, or landed, if it is landed in the Territory of American Samoa, the Territory of Guam, or the CNMI, provided that it was not caught in the portion of the U.S. EEZ surrounding the Hawaiian Archipelago and that it is landed by a U.S. fishing vessel operated in compliance with a valid permit issued under the FMP for the Pelagic Fisheries of the Western Pacific Region (Pelagics FMP) or the FMP for U.S. West Coast Fisheries for HMS (West Coast HMS FMP).

Third, vessels could continue to deploy longline gear in a shallow-set manner to target swordfish, provided that no bigeye tuna are landed or retained on board.

The purpose of the prohibitions with respect to yellowfin tuna would be to prevent vessels from targeting yellowfin tuna during the closure, which could potentially result in a large number of unutilized bigeye tuna mortalities, which would undermine the objective of the closure.

These restrictions would not apply to bigeye tuna caught by longline gear outside the Convention Area, such as in the eastern Pacific Ocean (EPO). However, to ensure compliance with the restrictions in the Convention Area, NMFS would prohibit vessels from fishing with longline gear in areas both within and outside the Convention Area during the same fishing trip.

2.1.2.4 Alternative 3: Prohibition on Retention, Landing, or Transshipping of Bigeye Tuna

Under Alternative 3, in order to ensure the timely implementation of the United States with the WCPO bigeye tuna catch limit for the U.S. longline fleets established by the WCPFC, vessels would be prohibited from retaining on board, landing or transshipping any catch of bigeye tuna in the limit's area of application, once the limit has been reached for the calendar year. However, any bigeye tuna already on board a vessel at the time of the closure may be retained on board and landed and any bigeye tuna could be retained on board, transshipped, or landed in the Territory of American Samoa, the Territory of Guam, or the CNMI, provided that it was not caught in the portion of the U.S. EEZ surrounding the Hawaiian Archipelago and that it is landed by a U.S. fishing vessel operated in compliance with a valid permit issued under the Pelagics FMP or West Coast HMS FMP. In other words, it would differ from Alternative 2 only in that fishing vessels would be allowed to continue deep-set longlining in the affected area after the limit is reached, provided that no bigeye tuna are retained or landed. As for Alternative 2, these restrictions would not apply to bigeye tuna caught by longline gear outside the Convention Area, such as in the EPO. However, to ensure compliance with the restrictions in the Convention Area, NMFS would prohibit vessels from fishing with longline gear in areas both within and outside the Convention Area during the same fishing trip.

2.1.2.5 Alternative 4: Closure of the Deep-Set and Shallow-Set Sectors

Under Alternative 4, in order to ensure the timely implementation of the WCPO bigeye tuna catch limit for the U.S. longline fishery established by the WCPFC, both the shallow-set and deep-set components would be closed once the limit has been reached for the calendar year (i.e., no U.S. vessels would be allowed to conduct longline fishing operations in the Convention Area). However, any bigeye tuna already on board a vessel at the time of the closure may be retained on board and landed and any bigeye tuna could be retained on board, transshipped, or landed in the Territory of American Samoa, the Territory of Guam, or the CNMI, provided that it was not caught in the portion of the U.S. EEZ surrounding the Hawaiian Archipelago and that it is landed by a U.S. fishing vessel operated in compliance with a valid permit issued under the Pelagics FMP or West Coast HMS FMP. As for Alternatives 2 and 3, these restrictions would not apply to bigeye tuna caught by longline gear outside the Convention Area, such as in the EPO. However, to ensure compliance with the restrictions in the Convention Area, NMFS would prohibit vessels from fishing with longline gear in areas both within and outside the Convention Area during the same fishing trip.

2.2 Alternatives Initially Considered But Excluded From Detailed Analysis

NMFS initially considered two alternatives to the FAD prohibition period provision for the U.S. Purse Seine Rule that have been excluded from detailed analysis. These alternatives are described in Sections 2.2.1 and 2.2.2 below.

NMFS also initially considered alternative methods of implementing the WCPO bigeye tuna catch limit for the U.S. longline fleets. These alternatives are discussed in Section 2.2.3 below.

2.2.1 U.S. Purse Seine Rule: Purse Seine Catch Limit Alternative

Paragraphs 15 and 16 of CMM 2008-01 set forth an alternative to the high seas FAD prohibition period described above that CCMs may use, provided that they meet certain conditions. Under this alternative, instead of the FAD prohibition period on the high seas, the United States would take measures to reduce the catch of WCPO bigeye tuna by the U.S. purse seine fishery by a minimum of 10% relative to the average amount caught in the period between 2001-2004. In order to qualify for this alternative, the WCPFC would have had to have identified the United States in advance as having demonstrated a functioning capacity to implement such measures in an effective and transparent manner. Once identified as having met the requirements for implementing this alternative, the United States would have had to submit the details of implementing this alternative to the WCPFC by January 31, 2009. The United States was not identified in advance by the WCPFC as meeting the requirements, and the January 31, 2009 deadline has passed. As a result, this alternative is no longer feasible for NMFS to implement, and is being excluded from detailed consideration in this EA.

2.2.2 U.S. Purse Seine Rule: Different FAD Prohibition Periods for the High Seas and U.S. EEZ

Paragraphs 13 and 19 of CMM 2008-01, specify particular FAD prohibition periods during which members' purse seine vessels only would be able to fish on the high seas with an approved observer on board. Paragraphs 11 and 17 specify the same for the EEZs of PNA members. Paragraphs 12 and 18 of CMM 2008-01 require the United States to take measures to reduce purse seine fishing mortality on bigeye tuna in the U.S. EEZ in a way that is compatible with the measures that PNA members adopt within their respective areas of national jurisdiction, but they do not specify particular FAD prohibition periods or requirements. Accordingly, NMFS initially considered implementing different requirements for the U.S. EEZ than the FAD prohibition periods that are mandated for the U.S. purse seine vessels on the high seas. For example, the prohibition periods could be different in the U.S. EEZ than on the high seas, or alternative management tools could be adopted, provided that they serve to reduce fishing mortality on bigeye tuna in a manner compatible with the tools used in the PNA members' EEZs. However, because vessels may typically fish in the high seas, U.S. EEZ and PIC EEZs during each trip, NMFS concluded that implementing and enforcing different requirements for the two areas would not be reasonable or feasible (e.g., vessels fishing in the U.S. EEZ without an observer would have to return to port to bring on board an observer before returning to fish on the high seas). Consequently, this alternative was not considered in detail.

2.2.3 U.S. Longline Rule: Excluded Alternatives

NMFS considered alternative methods of implementing the WCPO bigeye tuna catch limit, such as time and/or area closures, other limitations on fishing effort, allocation of the catch limit among vessels, and non-calendar-year catch limits. These alternatives would require detailed consideration of many factors, ideally including the national standards established under the MSA and the objectives set forth in the relevant FMPs. Thus, they would be more appropriately considered and developed through the MSA process, such as through amendments to the FMP for the Pelagic Fisheries of the Western Pacific Region and/or the FMP for U.S. West Coast Fisheries for HMS and were not considered in detail in this document.

Chapter 3

Chapter 3 Affected Environment

This chapter describes the physical and biological environment affected by the U.S. purse seine and longline fisheries in the WCPO, focusing on the resources that would be affected by the implementation of the two proposed rules described in Chapter 2. The chapter is divided as follows: (1) physical environment; (2) description of the U.S. WCPO purse seine fleet; (3) description of the Hawaii and west coast longline fleets that would be affected by the implementation of the bigeye catch limit; (4) bigeye and yellowfin tuna and the principal target stocks associated with the purse seine and longline fisheries; (5) other biological resources; and (6) protected resources.

Specific sections of this chapter (Sections 3.1, 3.2, 3.3, 3.3.2, 3.4, 3.5.3, 3.5.4, and 3.6) build upon the information presented in the 2001 Western Pacific Pelagics Final Environmental Impact Statement (FEIS) (NMFS 2001b), 2004 Western Pacific Pelagics Supplemental Environmental Impact Statement (SEIS) (WPRFMC 2005), 2005 Western Pacific Seabird – Squid FEIS (NMFS 2005a), 2004 South Pacific Albacore Troll EA (NMFS 2004a), 2004 SPTT Extension EA (NMFS 2004b) and the 2003 West Coast HMS Environmental Impact Statement (EIS) (PFMC 2003).

3.1 Physical Environment of the WCPO

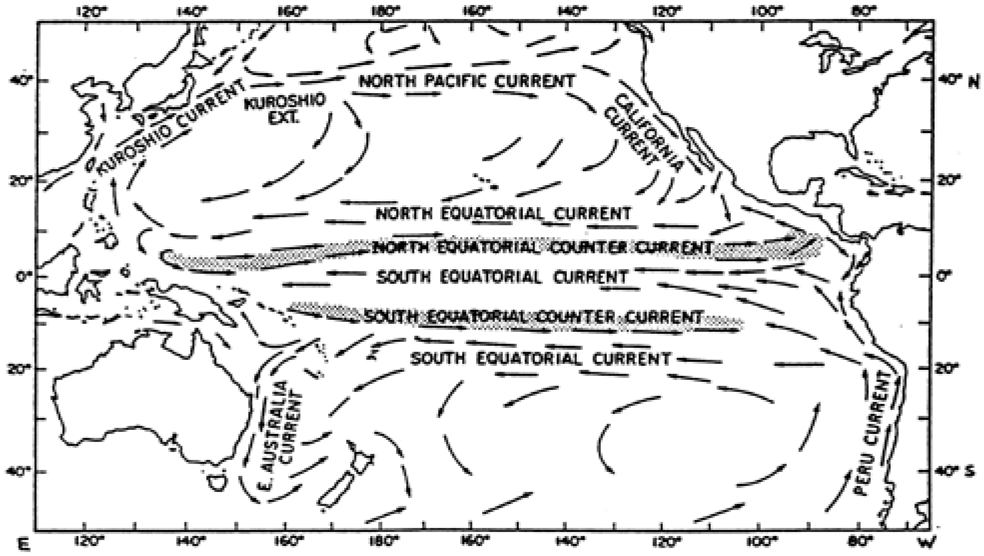
The physical reach of the Western and Central Pacific Fisheries Convention, or the Convention Area of application (as shown in Figure 1 in Chapter 1), comprises all waters of the Pacific Ocean bounded to the south and to the east by the following line: from the south coast of Australia due south along the 141° meridian of east longitude to its intersection with the 55° parallel of south latitude; thence due east along the 55° parallel of south latitude to its intersection with the 150° meridian of east longitude; thence due south along the 150° meridian of east longitude to its intersection with the 60° parallel of south latitude; thence due east along the 60° parallel of south latitude to its intersection with the 130° meridian of west longitude; thence due north along the 130° meridian of west longitude to its intersection with the 4° parallel of south latitude; thence due west along the 4° parallel of south latitude to its intersection with the 150° meridian of west longitude; thence due north along the 150° meridian of west longitude.

Below is a description of the specific physical environment in which the WCPO purse seine and longline fisheries occur and how physical features of the pelagic environment, as well as the distribution of HMS, influence the fisheries.

3.1.1 Oceanography

Figure 3 illustrates the two main subtropical gyres (the North Pacific subtropical gyre in the northern hemisphere and the South Pacific subtropical gyre in the southern hemisphere) and the other major Pacific Ocean currents.

Figure 3 The dominant ocean current systems in the Pacific Ocean



Source: http://www.fao.org/DOCREP/005/T1817E/T1817E01.htm

Subtropical gyres rotate clockwise in the northern hemisphere and counter clockwise in the southern hemisphere in response to trade and westerly wind forces. Due to this, the central Pacific Ocean (~20° N latitude-20° S latitude) experiences weak mean currents flowing from east to west, while the northern and southern portions of the Pacific Ocean experience a weak mean current flowing from west to east. Embedded in the mean flow are numerous mesoscale eddies ("Mesoscale eddies are turbulent or spinning flows on scales of a few hundred kilometers" (Stewart 2005)) created from wind and current interactions with the ocean's bathymetry. These eddies, which can rotate either clockwise or counter clockwise, typically have important biological impacts.

Ocean eddies create vertical fluxes, with regions of divergence (upwelling) where the thermocline shoals and deep nutrients are pumped into surface waters enhancing phytoplankton production, and also regions of convergence (downwelling) where the thermocline deepens. The edges of eddies, where the mixing is greatest, are often targeted by fishermen as these are areas of high biological productivity.

The subtropical frontal zones, consisting of several convergent fronts, lie between latitudes 25°- 40° N and S, and are often referred to as the Transition Zones. Transition zones are areas of ocean water bounded to the north and south by large-scale surface currents originating from subartic and subtropical locations (Polovina, Howell, Kobayashi et al. 2001). These zones also provide important habitat for pelagic fish and thus, are targeted by fishers.

Variability within the ocean–atmosphere system results in changes in winds, rainfall, currents, water column mixing, and sea-level heights, which can have profound effects on regional climates as well as on the abundance and distribution of marine organisms. In the tropical Pacific there is a limited seasonal variation, yet there is a strong interannual variability which in turn affects the entire Pacific Ocean (Langley, Williams, Lehodey et al. 2004).

The scientific community has become increasingly aware of the occurrence and importance of long-term (decadal-scale) oceanographic cycles and of their relationship to cycles in the population sizes of some species of fish (Chavez, Ryan, Lluch-Cota et al. 2003). These naturally occurring cycles can either mitigate or accentuate the impact of fishing mortality on all species, especially those targeted in HMS fisheries. El Niño Southern Oscillation (ENSO)[23] events, including meso-scale events, such as El Niño and La Niña, and shorter term phenomena such as cyclonic eddies near the Hawaiian Islands (Seki, Lumpkin, and Flament 2002), impact the recruitment and fishing vulnerability of highly migratory species. ENSO events can cause considerable interannual physical and biological variation. During an El Niño, the normal easterly trade winds weaken, resulting in a weakening of the westward equatorial surface current and a deepening of the thermocline in the central and eastern equatorial Pacific. In turn, the eastward-flowing countercurrent tends to dominate circulation, bringing warm, low-salinity, and low-nutrient water to the eastern margins of the Pacific Ocean. As the easterly trade winds are reduced, the normal nutrient-rich upwelling system does not occur, leaving warm surface water pooled in the EPO.

El Niño affects the ecosystem dynamics in the equatorial and subtropical Pacific by considerable warming of the upper ocean layer, rising of the thermocline in the western Pacific and lowering in the east, strong variations in the intensity of ocean currents, low trade winds with frequent westerlies, high precipitation at the dateline, and drought in the western Pacific (Sturman and McGowan 1999). El Niño events have the ability to exercise a strong influence on the abundance and distribution of organisms within marine ecosystems. The deepening of the mixed layer depth that occurs with an El Niño may typically be manifested by a discernable increase in purse seine catch per unit of effort (CPUE) of yellowfin tuna in the central/western regions of the Pacific. This is normally seen after a 2-3 month delay and occurs in the eastern portion of the WCPO in the vicinity of Kiribati and the U.S. EEZ of the central Pacific (Howland, Baker, Jarvis etc.). During a strong El Niño, the purse seine fishery for skipjack tuna shifts over 1,000 kilometers from the western to the central equatorial Pacific in response to physical and biological impacts (Lehodey, Bertignac, Hampton et al. 1997). The major change is a

[23] ENSO events include the full range of variation observed between El Niño and La Niña events. El Niño is characterized by a large-scale weakening of the tradewinds and warming of the surface layers in the eastern and central equatorial Pacific. El Niño events occur irregularly at intervals of 2–7 years, although the average is about once every 3–4 years. These events typically last 12–18 months, and are accompanied by swings in the Southern Oscillation, an interannual "see-saw" in tropical sea level pressure between the eastern and western hemispheres. During El Niño, unusually high atmospheric sea level pressures develop in the western tropical Pacific and Indian Ocean regions, and unusually low sea level pressures develop in the southeastern tropical Pacific. Southern Oscillation tendencies for unusually low pressures west of the dateline and high pressures east of the dateline have also been linked to periods of anomalously cold equatorial Pacific sea surface temperatures sometimes referred to as La Niña (NMFS 2004b).

horizontal extension or contraction of the skipjack tuna habitat during El Niño and La Niña phases respectively. Strong El Niño events also may show a positive effect on bigeye tuna CPUE in these regions for the longline fleets.

A La Niña event exhibits the opposite conditions: cooler than normal sea-surface temperatures in the central and eastern tropical Pacific Ocean. These may have larger impacts on global weather patterns. For the purse seine fishery the contraction of the warm pool tends to shift fishing to the western portion of the WCPO in the vicinity of Papua New Guinea (PNG) and FSM, or away from the U.S. EEZ and those areas to the north of American Samoa.

Physical and biological oceanographic changes have also been observed on decadal time scales. These low frequency changes, termed regime shifts, can impact the entire ocean basin. Recent regime shifts in the North Pacific have occurred in 1976 and 1989, with both physical and biological (including fishery) impacts (Polovina, Mitchum, and Evans 1995; Polovina 1996). These impacts can lead to potential impacts on the tropical Pacific fisheries for tunas such as the extension of present fisheries to higher latitudes, a decrease in productivity, mainly in the eastern Pacific, increasing variability in the catches, changes in species composition of the catch, and increasing fishing pressure, particularly on bigeye and yellowfin tuna (The World Bank 2000).

3.1.2 Climate Change

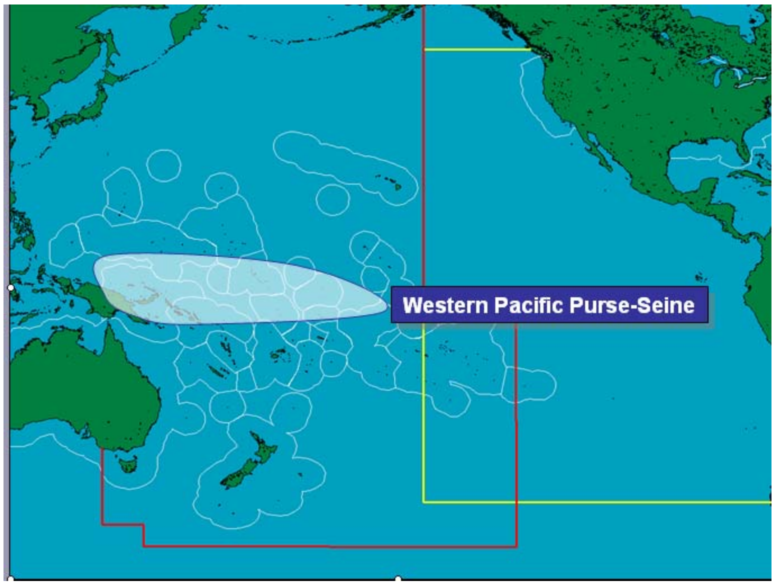
Climate change can affect the marine environment by impacting the established hydrologic cycle (a change in precipitation and evaporation rates) (Roessig, Woodley, Cech et al. 2004). Climate change has been associated with other effects to the marine environment, including rising water temperatures, as well as related changes in ice cover, salinity, oxygen levels, and circulation (Intergovernmental Panel on Climate Change 2007). These effects are leading to shifts in the range of species, changes in algal, plankton, and fish abundance (Solomon, Quin, Manning et al. 2007), and causing damage to coral reefs (Scavia, Field, Boesch et al. 2002). Climate change is also increasing the incidence of disease in aquatic organisms (Roessig, Woodley, Cech et al. 2004). Studies on plankton ecosystems, demonstrate that climate change is affecting phytoplankton, copepod herbivores, and zooplankton carnivores, which cause affects to ecosystem services, such as oxygen production, carbon sequestration, and biogeochemical cycling (Richardson, Jackson, Ducklow et al. 2004). These studies concluded that fish, seabirds, and marine mammals will need to adapt to a changing spatial distribution of primary and secondary production within pelagic marine ecosystems (Richardson, Jackson, Ducklow et al. 2004).

Studies conducted by Perry, Low, Ellis et al. (2005) indicate that climate change is impacting marine fish distributions, which in turn may have important ecological impacts on fish as well as important impacts on commercial fisheries. How climate change can impact commercial fisheries include: (1) increases in ocean stratification leading to less primary production, which in turn leads to less overall energy for fish production; (2) decreases in spawning habitat from shifts in areas of well-mixed water zones leading to decreased stock sizes; and (3) changes in currents that may lead to changes in larval dispersals and retention, which could lead to decreases in stock sizes (Roessig, Woodley, Cech et al. 2004).

3.2 U.S. WCPO Purse Seine Fishery

Vessels of the U.S. purse seine fishery engage in targeting skipjack and to a lesser extent yellowfin tuna throughout the equatorial regions of the Convention Area. The U.S. WCPO purse seine fleet operates mostly in the EEZs of PIC between 10° north and 10° south latitude within the Convention Area (Figure 4).

Figure 4 The general operational area of the U.S. WCPO purse seine fishery (indicative only, in light blue). The red line demarks the Convention Area with the yellow line depicting the as yet to be implemented Antigua Convention. (The Antigua Convention would modify the existing agreement that establishes the Inter-American Tropical Tuna Commission, which generally exercises competence over HMS Fisheries in the Eastern Pacific Ocean).



Source: NMFS unpublished data.

3.2.1 Fleet Characteristics

Gillett, McCoy, and Itano (2002) provide a detailed description of the development and expansion of the U.S. WCPO purse seine fleet. The U.S. fleet developed a year-round fishery along the equator, generally within a rectangular area bounded by 10° N-10° S and 135° E-170° E, and encompassing the EEZs of Palau, FSM, PNG, Solomon Islands, Nauru, Marshall Islands, and the Gilbert Islands group of Kiribati. Fishing grounds continued to expand eastward throughout the 1980s, eventually encompassing the Phoenix and Line Islands (Kiribati); the U.S. possessions of Howland, Baker, and Jarvis; Tokelau; and the high seas between these EEZ areas. U.S. purse seiners typically target skipjack and yellowfin tuna found in association with drifting logs/flotsam or FADs and also unassociated free-swimming schools of tuna (“school sets”). The relative proportion of the different set types has varied considerably over time as oceanographic conditions and technology have changed.

Purse seiners are one of the most complex fishing vessels in terms of both technology and machinery. Hydraulic systems on large “super seiners,” require more than 1,600 meters of piping, and are equipped with at least four auxiliary engines in addition to the main propulsion engine (or engines). The purse seine technique for catching tuna involves employing a net that is set vertically in the water, with floats attached to the upper edge and chains for weight on the lower edge. A series of rings is attached to the lower edge of the net, and a pursing cable passes through the rings, enabling a winch on board the vessel to draw the net closed on the bottom. Purse seine nets can be up to 1,600 meters or more in length and 150 meters in depth. When the net is deployed from the purse seine vessel, a large skiff carrying the end of the net is released from the stern of the fishing vessel. The purse seine vessel encloses the school of tuna, keeping it in visual contact if on the surface, or using sonar if below the surface, and then retrieves most of the net onto the vessel. The fish are confined in the "sack" portion of the net, which consists of finer mesh webbing that prohibits their escape. The catch is removed from the sack onto the vessel with large "scoops" holding one metric ton or more, and then is placed in brine tanks for freezing and later storage. Joseph (2002) and NMFS (2004b) provide a detailed description of tuna purse seining and the fleets involved in the Pacific Ocean fisheries.

3.2.2 Management of the U.S. Purse Seine Fleet in the WCPO

The fishing activities of U.S. WCPO purse seine vessels are governed by the SPTT. The SPTT manages access of U.S. purse seine vessels to the EEZs of PIC and provides for technical assistance in the area of fisheries development. The SPTT is implemented domestically by regulations (50 CFR §§ 300.30-300.46) issued under authority of the SPTA. The High Seas Fishing and Compliance Act of 1995 (HSFCA; 16 U.S.C. § 5501, et seq.) also regulates this fishery. The main fishery management regulations established under the SPTA and HSFCA are:

- All U.S. vessels that fish (as defined under 50 CFR § 300.2) on the high seas are required to have a permit in accordance with the HSFCA;

- A U.S. purse seine vessels operating in the WCPO must have a license issued by the Pacific Islands FFA as Treaty Administrator on behalf of the Pacific Island Parties to the SPTT. The SPTT and implementing regulations provide for the availability of 45 licenses, five of which are only available to fishing vessels engaged in joint venture arrangements with the Pacific Islands Parties. No joint venture licenses have ever been issued.

- Within the SPTT Area there are several types of designated geographical areas, as described below:

    1. The **Treaty Area** which is about 10 million square miles in size.

    2. The **Licensing Area** where a license is required in order to fish.

    3. **Closed Areas** are those in which U.S. purse seine vessels are not allowed to fish.

    4. **Limited Areas** are areas in which fishing effort by U.S. purse seine vessels is limited.

- U.S. purse seine vessels are prohibited from transshipping fish at sea unless a PIC specifically authorizes this activity;

- A U.S. purse seine vessel cannot be used for directed fishing for southern bluefin tuna *(Thunnus maccoyii)* or for fishing for any kinds of fish other than tunas, except fish that may be caught incidentally;

- Holders of vessel licenses are required to submit both written and electronic reports on their fishing activities in the Treaty Area to NMFS;

- Vessels must carry observers with the SPTT providing for a target coverage of 20% (in terms of trips);

- U.S. purse seine vessels are required to carry and operate mobile transmitting units to provide position information to the VMS administrator by the FFA and by NMFS;

- Vessels are required to be identified in accordance with the 1989 United Nations Food and Agriculture Organization standard specifications for the marking and identification of fishing vessels, which requires that the vessel's international radio call sign be marked on the hull and deck.

Pursuant to the terms of the SPTT, typically at least twenty percent of trips by the U.S. WCPO purse seine fleet currently carry observers (see SPTT, Annex I, Part 7). Observers can provide useful information that is independent of vessel operators and is obtained during actual fishing operations. Data typically collected by observers include catch composition by species, effort, location, environmental conditions, gear type, and information on bycatch. FFA-deployed observers on U.S. WCPO purse seine vessels collect detailed information on bycatch and discards in the WCPO purse seine fishery and these data are routinely used to provide estimates of total bycatch and discards and the extent of interaction with species of special interest (e.g., marine mammals and turtles) (Secretariat of the Pacific Community (SPC) 2009b).

As discussed in Chapter 1 of this EA, the U.S. WCPO purse seine fishery is also governed by the Convention, pursuant to the authority of the WCPFCIA.

3.2.3 Participation, Effort, and Catch

The U.S. purse seine fleet spends about 30% of its effort in the U.S. EEZ and on the high seas and the remainder in the EEZs of PIC (unpublished NMFS data). The U.S. WCPO purse seine fleet spent, from 1997 through 2007, about 8% of its effort in the U.S. EEZ, 23% on the high seas, and the remainder in the EEZs of PIC (unpublished NMFS data). The percentages for any given year during that period ranged from 5% to 21% for the U.S. EEZ, 18% to 30% for the high seas, and 60% to 78% for the EEZs of PIC. Figure 5 shows approximate effort data from 1997 through 2007 for the U.S. WCPO purse seine fleet (unpublished NMFS data) and Table 3 shows the effort data for the high seas, U.S. EEZ, and PIC EEZ regions for each of those years (unpublished NMFS data).

Figure 5 U.S. WCPO purse seine fleet fishing effort, 1997-2007

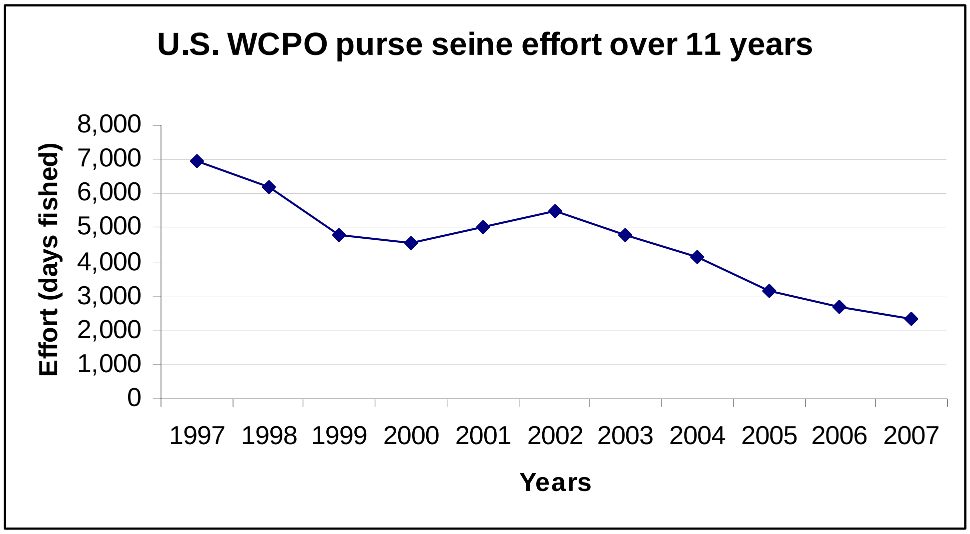


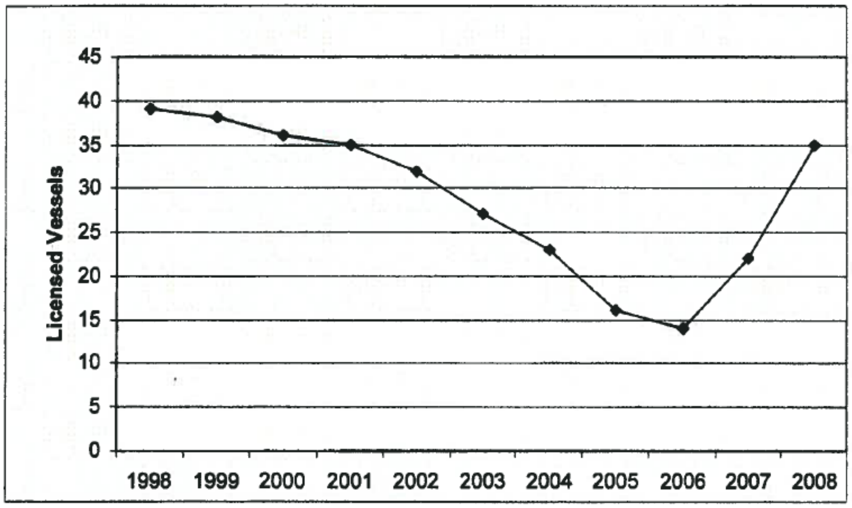
Table 3 U.S. WCPO purse seine fleet fishing effort (1997-2007)

Year	U.S. EEZ Effort	U.S. % days	High seas Effort	High Seas % days	PIC Effort	PIC % days	Total Effort
1997	1448.18	20.79	1350.96	19.4	4165.64	59.80	6964.79
1998	465.89	7.55	1604.35	25.99	4102.58	66.46	6172.82
1999	225.00	4.7	1214.67	25.37	3348.33	69.94	4787.99
2000	122.00	2.67	894.58	19.57	3553.32	77.75	4569.91
2001	343.49	6.87	956.99	19.15	3697.34	74.00	4997.82
2002	433.73	7.88	1326.02	24.11	3741.02	68.01	5500.77
2003	219.83	4.62	874.91	18.38	3667.15	77.02	4761.88
2004	278.50	6.76	1065.75	25.87	2776.72	67.37	4120.97
2005	129.33	4.09	859.07	27.2	2170.52	68.71	3158.92
2006	180.49	6.76	568.66	21.29	1921.81	71.95	2670.97
2007	88.50	3.76	705.41	30.01	1557.08	66.24	2350.98
Total							50057.82
AVG.	357.72	6.95	1038.31	23.30363636	3154.68	69.75	4550.71

Source: NMFS unpublished data.

The number of vessels in the U.S. WCPO purse seine fishery gradually decreased from the late 1990s until 2006, and then began to increase. By the end of 2008 the U.S. WCPO purse seine fleet included 36 vessels, and as of April 2009, it included 39. Figure 6 below shows the number of licensed vessels in the fleet from 1998 to 2008.

Figure 6 Number of U.S.-flagged purse seine vessels licensed under the SPTT from 1998 to 2008



Source: United States Coast Guard and NMFS 2009.

Based on preliminary estimates, the fleet landed approximately 204,019 metric tons of tuna in 2008 (SPC 2009a). Skipjack tuna generally account for 70–85% of the purse seine catch, yellowfin tuna generally account for 15–30%, and bigeye tuna account for only a small proportion (SPC 2009a). Since 2000, most fleets reduced the use of drifting FADs showing a decrease in bigeye tuna catches (SPC 2009a). Table 4 shows the 2007 and 2008 tuna landings of the fleet by species and port.

Table 4 Tuna landings by U.S. WCPO purse seine vessels by species and port, 2007-2008

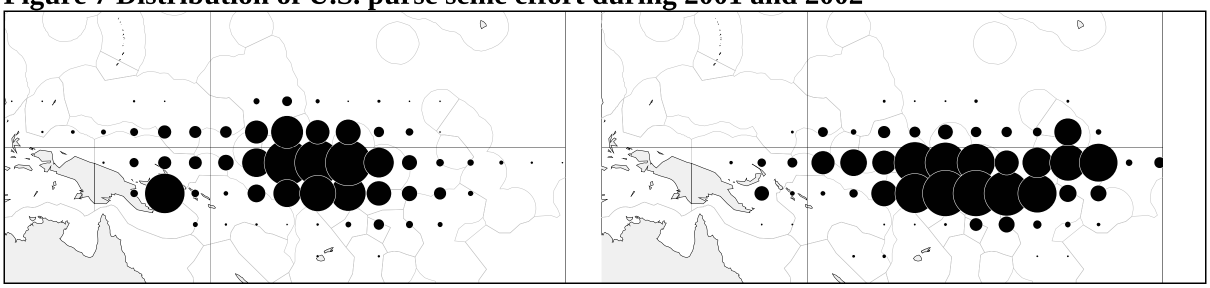
2008	**Tuna Landings* (metric tons)**			
Landing Port	**Skipjack**	**YF and BE**	**Total**	**%**
U.S. Ports				
Pago Pago, American Samoa	63,585	10,495	74,080	42%
Foreign Ports	**Skipjack**	**YF and BE**	**Total**	**%**
Honiara, Solomon Islands	62,02	1,128	7,330	4%
Pohnpei, Federated States of Micronesia	18,125	5,898	24,023	14%
Majuro, Republic of the Marshall Islands	28,904	12,833	43,089	24%
Rabaul, Papua New Guinea	15,050	1,787	16,837	10%
Noro, Solomon Islands	310	130	440	0.3%
Tarawa, Republic of Kiribati	3,440	1,155	4,595	3%
Wewak, Papua New Guinea	3,400	845	4,245	2%
Bangkok, Thailand	-	-	1,675[1]	1%
Total	139,016	34,271	176,313	
2007	**Tuna Landings* (metric tons)**			
Landing Port	**Skipjack**	**YF and BE**	**Total**	**%**
U.S. Ports				
Pago Pago, American Samoa	43,335	8,821	52,156	75%
Foreign Ports	**Skipjack**	**YF and BE**	**Total**	**%**
Honiara, Solomon Islands	2,875	546	3,421	5%
Pohnpei, Federated States of Micronesia	3,836	641	4,477	6%
Majuro, Republic of the Marshall Islands	7,659	347	8,006	12%
Rabaul, Papua New Guinea	626	161	787	1%
Noro, Solomon Islands	337	74	411	1%
Total	58,668	10,590	69,258	

Source: United States Coast Guard and NMFS 2009.
*2008 landings based on reports received as of 12 December 2008.
[1] Reported as a mix of yellowfin and skipjack tuna.

Purse seine fishing effort in the WCPO is not characterized by any marked or documented seasonal patterns (vessel operators may view this otherwise). The spatial distribution of fishing effort is, however, strongly influenced by the (irregular) cycles associated with ENSO events, revealing strong temporal variation on the scale of years and decades. The distribution of catch by the WCPO purse seine fishery is strongly influenced by ENSO events, traditionally shifting east of 160° E during El Niño events and west of 160° E during La Niña periods. El Niño–related eastward shifts of nearly 4,000 kilometers have been noted during periods of only six months. Lehodey, Bertignac, Hampton et al. (1997) and Lehodey, Andre, Bertignac et al. (1998) suggests that skipjack abundance is linked to east–west movements of warm water and an associated frontal region of high productivity and tuna forage. El Niño conditions also produce unusual westerly winds and surface drift in the WCPO that transport drifting debris further eastward than usual. The result is that during these El Niño events log-associated purse seining also increases purse seine effort in the eastern portion of the fishery (Williams 2003).

Figure 7 indicates U.S. purse seine effort during a transitional year between an El Niño and La Niña period (2001) and an El Niño period (2002). Effort in strong La Niña conditions normally shifts west of the vertical line indicating 160° E longitude.

Figure 7 Distribution of U.S. purse seine effort during 2001 and 2002



(The largest circle size indicates ≥ 360 days fishing or searching.)

Source: Williams 2003.

3.2.4 FADs

Fish aggregating devices, or FADs, are man-made devices or natural floating objects, anchored or not, capable of aggregating fish. FAD sets tend to catch higher proportions of skipjack and juvenile bigeye tuna respective to the total catch of each species (Hampton, Kleiber, and Langley 2006). Fishing on drifting FADs has also shown decreases in average size of target catch, increases in catches of bigeye, and increases in bycatch (Gillet, McCoy, and Itano 2002) when compared to unassociated sets. FAD sets also show a more varied composition of catch.

As shown in Table 5, the WCPO purse seine fleet catches mostly skipjack and yellowfin tuna. Based on data compiled by SPC (SPC 2009a), associated (log and drifting FAD) sets generally yield higher catch rates (mt/day) for skipjack tuna than unassociated sets. Data from SPC also indicates that unassociated sets generally yield a higher catch rate for yellowfin tuna than associated sets. This may be explained from the occurrence of unassociated sets in the more eastern areas of the Convention Area containing “pure” schools of large, adult yellowfin, which account for a larger catch (by weight) than the (mostly) juvenile yellowfin encountered in associated sets (SPC 2009a). Table 5 shows the breakdown of catch by set type for the U.S. purse seine fleet between the years 2003-2008.

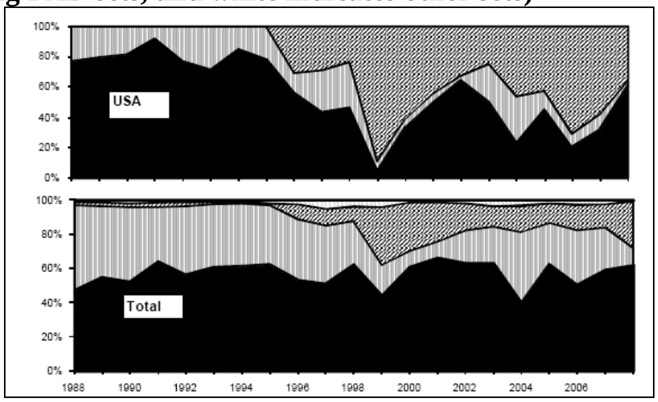
Table 5 Annual U.S. WCPO purse seine catch estimates in metric tons by set type (unassociated and associated), 2003-2008 (data for 2008 are preliminary)

Year	Skipjack		Yellowfin		Bigeye		Totals
	Unass.	Ass.	Unass.	Ass.	Unass.	Ass.	
2003	24,848	39,248	12,773	8,331	143	2,166	87,509
2004	8,660	44,843	1,943	10,404	89	3,538	69,477
2005	24,619	36,968	8,483	11,650	481	3,969	86,170
2006	4,825	52,949	1,927	6,213	118	2,413	68,445
2007	13,195	58,174	2,272	5,767	103	1,926	81,437
2008	44,535	69,994	16,032	7,083	16	2,037	139,697
Total	120,682	302,176	43,430	49,448	950	16,049	532,735
6 year average	20,114	50,362	7,2380	8,241	158	2,674	88,790

Source: SPC 2009a.

As indicated in Figure 8, over the last ten years, FADs, or associated sets, have been responsible for more than 90% of all sets made by the fleet in some years, and less than 40% in other years. There are many factors that cause this variability, not all of which are fully understood (i.e., other than by the purse seine vessel operators themselves). However, some general determinates can be postulated: FADs provide a guaranteed location of fish (assuming they are marked with the appropriate electronic equipment) although the magnitude (metric tons) of the schools associated with FADs can vary considerably. Therefore in times of high relative fuel prices FADs provide a risk-adverse option for vessel operators. FADs provide a source of fish that may or may not be economic to operators – especially those that offload to canneries. Small skipjack along with juvenile yellowfin and bigeye tuna are very often associated with FADs or floating objects – however, not all fleets or operators can find markets for “small fish”. But in times of high fish demand when canneries are not rejecting fish based on size, FAD fishing presents an attractive scenario for many operators. Although skipjack is the main target of the WCPO fishery, yellowfin tuna can provide an important component to vessel profitability given there is typically a premium paid for larger yellowfin—these large yellowfin are typically found in unassociated schools. Operators may be willing to search for these unassociated schools if fuel price is reasonable and fish can be found. However, if no school fish are available operators will fall back to the less risky or more assured FAD fishing. FADs provide some degree or certainty for an activity steeped in guesswork, risk, and probability.

Figure 8 Time series showing the percentages of total sets by school type for the U.S. purse seine fleet and for the major purse seine fleets operating in the WCPO from 1988 to 2008 (2008 data provisional) (black indicates unassociated sets, striped indicates log sets, dark gray indicate drifting FAD sets, and white indicates other sets)



Source: SPC 2009a.

3.2.5 Economics

The fish caught by the U.S. WCPO purse seine fleet are frozen on board and either delivered directly to canneries or transshipped to carriers that deliver them to canneries. Deliveries are made to canneries in both the United States (Pago Pago, American Samoa) and other nations, and those canneries take deliveries from both U.S. vessels and vessels of other nations. The canned product then enters global markets.

Costs and revenue estimates on a per vessel basis for the U.S. WCPO purse seine fleet in 1998 based out of American Samoa are summarized in Table 6. The 1998 gross revenue per vessel of $4.7 million given in that table is equal to about $6.1 million in 2009 dollars (Consumer Price Index, http://www.bls.gov/CPI/). Detailed cost and revenue data for the years since 1998 are not available.

Table 6 Per vessel economics of the U.S. purse seine fleet based in American Samoa in 1998 (1998 dollars)

Component	Annual Value (1000 $U.S.)	% of Total Costs
Gross Revenue	$4,700	—
Fixed Costs	$2,557	57
Variable Costs	$1,921	43
Labor Costs	$1,055	24
Fuel	$700	16
Total Costs	$4,478	100
Net Revenue / Income	$222	—

Source: McCoy and Gillet 1998.

In 2008, average gross registered tonnage among the vessels in the fleet was 1,518 and average vessel length was 71 meters (U.S. Coast Guard vessel documentation data). Vessels in the U.S. fleet can carry approximately 1,000-2000 mt (U.S. Coast Guard Vessel Documentation Database), depending on the mix and sizes of species in the catch.

The U.S. WCPO purse seine fleet generally operates out of Pago Pago, American Samoa. Table 4 shows the landings of the purse seine fleet by port. Currently, there is another operational business model emerging. Rather than landing most catch at Pago Pago, some vessels that have recently entered the fleet are transshipping most of their catch at various ports in the region.

3.3 U.S. Western Pacific Longline Fisheries

The U.S. longline fishery in the Pacific Ocean includes three distinct fleets (Hawaii, American Samoa, and the west coast longline fleets), which are differentiated by their geographic location. During the last few years, there has been a small number of vessels with permits for longline fishing based out of Guam or the CNMI. Below is a detailed description of the Hawaii and west coast longline fleets, which would be impacted by the proposed rule.[24]

Longline fishing gear consists of a main line strung horizontally across 1-100 kilometers (< 1-62 miles) of ocean, supported at regular intervals by vertical float lines connected to surface floats. Descending from the main line are branch lines, each ending in a single, baited hook. The main line droops in a curve from one float line to the next and bears some number (2-25) of branch lines between floats. Fishing depth is determined by the length of the floatlines and branchlines, and the amount of sag in the main line between floats. The depth of hooks affects their efficiency at catching different species (Boggs 1992; Hanamoto 1987; Suzuki, Warashina, and Kishida 1977). Retrieval requires seven to ten hours. Generally, longline gear targeting tuna is set in the morning at approximate depths ranging between 100-300 meters, and hauled in the evening. Longline gear targeting swordfish is set at sunset at depths less than 100 meters and hauled at sunrise.

[24] There have been very few active west coast-based longline vessels and no activity by such vessels in the Convention Area during the last few years. Based on that history, the proposed rule is expected to have virtually no impacts on west coast-based vessels.

3.3.1 Hawaii Longline Fleet

3.3.1.1 Fleet Characteristics

The Hawaii-based limited entry longline fishery has the largest U.S. longline fleet operating in the Convention Area. The fleet has historically operated, and continues to operate, in two distinct modes based on gear deployment: deep-set longline by vessels that target primarily bigeye tuna and shallow-set longline by those that target swordfish. Fishing effort is mainly exercised to the north and south of the Hawaiian Islands between the Equator and 40° N and longitudes 140° and 180° W. However, the majority of deep-set fishing occurs south of 20° N. Most fishing occurs in the U.S. EEZ around Hawaii, Palmyra, Kingman, Johnston and Jarvis Islands, and in adjacent high seas waters.

3.3.1.2 Management

The Hawaii-based longline fishery is managed through the FMP for the Pelagic Fisheries of the Western Pacific Region developed by the WPFMC pursuant to the MSA. The primary regulations implementing the FMP, as set forth at 50 CFR Part 665, are summarized in Table 7. The HSFCA and the WCPFCIA also regulate this fishery.

The regulations limiting sea turtle interactions (the numbers of physical interactions that occur each calendar year between leatherback and loggerhead sea turtles and vessels registered for use under Hawaii longline limited access permits while shallow-setting) with the longline fishery set the annual limit for leatherback sea turtles (*Dermochelys coriacea*) at sixteen and the annual limit for loggerhead sea turtles (*Caretta caretta*) at seventeen. Once the limit is reached, the shallow-set component of the longline fishery is closed (50 CFR §665.33).

Table 7 Requirements for the Hawaii-based longline fleet

<table>
<tr><th colspan="2">Both Shallow-Set and Deep-Set Longline Requirements</th></tr>
<tr><td colspan="2">• Carry on board a Hawaii Longline Limited Access Permit established under 50 CFR § 665.21 for Pelagic Fisheries of the Western Pacific Region. There are 164 transferable permits;
• A maximum vessel length of 101 feet is permitted;
• All U.S. vessels that fish on the high seas are required to have a permit issued by NMFS in accordance with the HSFCA. Permits are valid for five years and require that vessels fish on the high seas in accordance with international conservation and management measures recognized by the United States;
• Complete a NMFS Daily Longline Fishing Log sheet for each set after each fishing day;
• Carry NMFS-owned and operated VMS units;
• If engaging in shallow-setting, possess a valid shallow-set certificate (of which no more than 2,120 are issued each year) for each shallow-set made;
• Carry a NMFS observer, if requested by the Pacific Islands Regional Office;
• Follow sea turtle mitigation techniques and requirements;
• Cease fishing if fishery is closed as a result of reaching sea turtle interaction limit (17 per year for loggerhead and 16 per year for leatherback); and
• Seabird mitigation techniques: When deep-setting or shallow-setting north of 23° N latitude or shallow-setting south of 23° N latitude, owners and operators of vessels registered for use under a Hawaii Longline Limited Access Permit, must either:
1. side-set according to 50 CFR § 665.35 (a)(1);
2. or fish in accordance with 50 CFR § 665.35 (a)(2).</td></tr>
<tr><th>(a)(1). Side setting</th><th>(a)(2). Alternative to side setting</th></tr>
<tr><td>• Mainline must be at least 1 meter forward from the stern of the vessel;
• Mainline and branch lines must be set from the port or the starboard side of the vessel;
• If a shooter is used it must be mounted at least 1 meter forward from the stern of the vessel;
• Branch lines must have weights with a minimum of 45 grams;
• 1 weight must be connected to each branch line within 1 meter of each hook;
• If seabirds are present, gear must be deployed so that baited hooks remain submerged; and
• A bird curtain must be deployed.</td><td>• Discharge fish and offal on the opposite side of the vessel where the longline gear is being set or hauled when seabirds are present;
• Retain sufficient fish, offal, and bait for the purpose of strategically discharging it;
• Remove all hooks from fish, offal, or spent bait;
• Remove the bill and liver of any swordfish that is caught, sever its head, and cut it down the middle;
• Use completely thawed bait, dyed blue;
• Maintain a minimum of 2 cans of blue dye on board the vessel; and
• Follow the requirements for deep-setting and shallow-setting below (a and b).</td></tr>
<tr><th>a. Deep-Setting North of 23°</th><th>b. Shallow-Setting</th></tr>
<tr><td>• Employ a line shooter; and
• Attach a weight of at least 45 grams to each branch line within 1meter of the hook.</td><td>• Deploy gear at least 1 hour after local sunset and complete deployment no later than local sunrise, using the minimum vessel lights; and
• Follow short-tailed albatross handling techniques.</td></tr>
</table>

3.3.1.3 Catch and Effort

The recent characteristics and performance of the Hawaii-based longline fleet are summarized in Table 8.

The rapid growth of the fishery in the 1990s and the effects of the closure of the shallow-set component of the fishery from 2001-2004 are clearly seen. Also evident is the reduction in shark bycatch brought about by the combined effects of the prohibition of shallow-setting in 2001 and passage of the Shark Finning Prohibition Act of 2000 (SFPA) (Pub. L. No. 106-557).

In April 2004, NMFS reopened the swordfish-targeting segment (shallow-set) of the Hawaii longline fishery under new federal rules. In 2005, 2007, and 2008, 76%, 76%, and 77%, respectively, of the available shallow-set certificates were used.

Table 8 Performance of the Hawaii longline fishery, 1996-2007

Year	Active vessels	Trips	Tuna-directed trips	Swordfish-directed trips	Hooks set (million)	Total catch (mt)	Bigeye tuna catch (mt)	Sword-fish catch (mt)	Yellow-fin tuna catch (mt)	Ex-vessel revenue ($ mill., inf-adj to 2007 dollars)
1996	103	1,100	657	92	14.4	9,781	1,787	2,502	630	54.9
1997	105	1,125	745	78	15.6	12,320	2,449	2,881	1,141	64.0
1998	114	1,140	760	84	17.4	12,998	3,226	3,263	722	59.6
1999	119	1,137	776	65	19.1	12,872	2,719	3,100	473	60.0
2000	125	1,103	814	37	20.3	10,789	2,647	2,815	1,205	61.3
2001	101	1,034	987	4	22.4	7,167	2,356	235	1,033	40.0
2002	100	1,163	1,163	0	27.0	7,888	4,388	309	560	45.7
2003	110	1,215	1,215	0	29.9	8,008	3,593	137	823	45.9
2004	125	1,338	1,332	6	32.0	8,380	4,325	249	707	47.7
2005	124	1,496	1,397	99	35.0	10,578	4,979	1,600	735	64.4
2006	127	1,401	1,341	60	35.3	9,762	4,429	1,167	962	57.0
2007	129	1,462	1,381	81	40.2	11,208	5,779	1,715	846	62.7
5 year average	123	1,382	1,333	49	34.5	9,587	4,621	974	815	55.5

Source: WPRFMC 2009.

3.3.1.4 Economics

In 2009, the U.S. Hawaii-based longline fleet consisted of 131 permitted (under the FMP) vessels.[25] Out of the 131 permitted vessels, 117 also had a high seas fishing permit (issued under the HSFCA). Vessels range from 16 meters to 25 meters in length and can carry an average of 98 mt. Crew size ranges from four to six. The maximum duration of a fishing trip for vessels targeting tuna for the fresh fish market in Hawaii is three weeks. Some of the newer vessels in the fleet are larger and have onboard ice systems, allowing for greater range than in the past.

[25] Data as of April 2009.

In recent years, Hawaii's commercial pelagic fisheries have been greatly affected by a series of court decisions that led to the adoption of certain federal regulatory measures. In 2001, the total catch and ex-vessel value decreased by about 3,747 mt and $20.1 million, respectively, primarily as a result of the implementation of court-ordered measures that eliminated the swordfish portion of the Hawaii longline fishery (Table 8). Swordfish, the largest component of the landings by volume in 2000, was a negligible component of the fishery from 2001 until the reopening of the swordfish shallow-set fishery in 2004. For these reasons, the period prior to 2005 is probably not a good indication of future fishing activity. Consequently, the analysis in Chapter 4 focuses on fishing patterns and performance from 2005 through 2008.

In 2006 the ex-vessel value for the landings (9,775 metric tons) of the entire Hawaii-based longline fleet was approximately $54 million, for an average gross revenue per vessel of about $403,000, 2005-2007 average $444,000 (Table 8).

3.3.2 West Coast Longline Fishery

3.3.2.1 Fleet Characteristics

Longline vessels based on the U.S. west coast fish primarily in the EPO, but they could conceivably also fish in the Convention Area. There have been very few active west coast-based longline vessels and no activity by such vessels in the Convention Area during the last few years. Given the distance from their home ports, however, such trips would be uncommon.

3.3.2.2 Management

Longline vessels based on the U.S. west coast are managed under the FMP for U.S. West Coast Fisheries for HMS developed by the PFMC pursuant to the MSA. The FMP prohibits all pelagic longline fishing inside the west coast U.S. EEZ as well as shallow-set longline fishing in the adjacent high seas areas, including west of 150° W. Longline vessels operating on the high seas outside the EEZ are subject to the following controls set forth at 50 CFR Part 660:

1. Line clippers, dip nets, and bolt cutters meeting NMFS' specifications must be carried aboard each vessel for releasing turtles (specifications vary by vessel size);

2. A vessel may not use longline gear to fish for or target swordfish north of the equator; landing or possession of more than ten swordfish per trip is prohibited;

3. The length of each float line possessed and used to suspend the main longline beneath a float must be longer than 20 meters (65.6 feet or 10.9 fathoms);

4 From April 1 through May 31, a vessel may not use longline gear in waters bounded by 0° latitude and 15° N latitude, and 145° W longitude and 180° W longitude;

5 No light stick may be possessed on board a vessel;

6 When a longline is deployed, no fewer than 15 branch lines may be set between any two floats;

7 Longline gear must be deployed such that the deepest point of the main longline between any two floats is at a depth greater than 100 meters below the sea surface;

8 While fishing for management unit species north of 23° N latitude, a vessel must:

1. Maintain a minimum of two cans containing blue dye on board the vessel during a fishing trip;
2. Use completely thawed bait to fish for Pacific pelagic management unit species (PMUS);
3. Use only bait that is dyed blue of an intensity level specified by a color quality control card issued by NMFS;
4. Retain sufficient quantities of offal for the purpose of discharging the offal strategically in an appropriate manner;
5. Remove all hooks from offal prior to discharging the offal;
6. Discharge fish, fish parts, or spent bait while setting or hauling longline gear on the opposite side of the vessel from where the longline is being set or hauled;
7. Use a line-setting machine or line-shooter to set the main longline;
8. Attach a weight of at least 45 grams to each branch line within one meter of the hook; and
9. Remove the bill and liver of any swordfish that is incidentally caught, sever its head from the trunk and cut it in half vertically, and periodically discharge the butchered heads and livers overboard on the opposite side of the vessel from which the longline is being set or hauled.

- All U.S. vessels that fish on the high seas are required to have a permit issued by NMFS in accordance with the HSFCA. Permits are valid for five years and require that vessels fish on the high seas in accordance with international conservation and management measures recognized by the United States.

- Other management measures include requirements for the proper release and handling of turtles and seabirds, the requirement for vessel operators to attend a protected species workshop each year, and the requirement for VMS.

3.3.2.3 Catch and Effort

In 2002, 21 longline vessels actively fished, deploying nearly one million hooks. According to D. Peterson, (NMFS, oral communication; December 2003), effort for 2003 was similar, with 21 vessels actively fishing, based on high seas logbook data, Pacific Coast Fisheries Information Network (PacFin) landings, and observer contractor fishing effort determinations. Table 9 and Table 10 provide information on the status of the fishery from 2000 to 2004.

Table 9 Western Pacific longline logbook summary for 2000 through 2002

Year	2000	2001	2002
# vessels	44	39	21
# trips	137	128	91
# sets	2,104	1,937	1,294
# hooks	1,608,593	1,443,029	948,657

Source: http://www.NOAA Fisheries.hawaii.edu/fmpi/fmep/hilong/westcoast.html.

Table 10 Vessels, landings (round metric tons), and ex-vessel revenue for swordfish in California by the pelagic longline fishery, 1999-2004

Year[26]	Vessels (number)	Landings (metric tons)	Ex-vessel* (U.S. dollar)
1999	42	1,335	7,214,730
2000	54	1,916	11,929,721
2001	40	1,767	9,520,343
2002	23	1,322	6,051,277
2003	30	1,812	8,548,125
2004	24	935	4,671,000

*Ex-vessel revenues are nominal values (not adjusted for inflation). Additional processing information: landings data reported without an accompanying gear code was excluded from the analysis if a correction could not be made.
Source: PFMC 2005.

[26] As of 2005, due to the low numbers in fleet size, data (landings and ex-vessel numbers) collected are confidential.

3.3.2.4 Economics

Estimates of ex-vessel revenues in the west coast longline fishery since 2005, which would be indicative of current conditions, are confidential and may not be publicly disclosed because of the small number of vessels in the fishery (PFMC 2008).

3.4 Bigeye, Yellowfin Tuna, and Principal Target Species

Table 11 summarizes the current status of the main fish stocks targeted by the U.S. purse seine and longline vessels fishing in the Convention Area. The table expresses overfishing and overfished status in terms of the status determination criteria specified in the relevant FMPs, as required by the MSA; they are as reported in the Report on the Status of U.S. Fisheries for 2008 (NMFS 2009; quarterly updates for certain stocks are available at www.nmfs.noaa.gov/sfa/statusoffisheries/SOSmain.htm). Under MSA, NMFS and the regional fishery management councils are required to set overfished and overfishing thresholds for individual stocks.

Table 11 Stock status summary of select highly migratory fish stocks in the Pacific Ocean for 2008 [27]

Species	Stock	Overfishing?	Overfished?
Bigeye tuna (*Thunnus obesus)*	Pacific	**Yes**	No
Skipjack tuna *(Katsuwonus pelamis)*	western central Pacific	No	No
	eastern tropical Pacific	No	No
Yellowfin tuna (*Thunnus albacares)*	western central Pacific	No	No
	eastern Pacific	**Yes**	No
Swordfish *(Xiphias gladius)*	North Pacific	No	No

Source: NMFS 2009.

As shown in Table 11 above, using the MSA stock status determination criteria, overfishing is occurring on bigeye tuna throughout the Pacific but the bigeye tuna stock is not overfished. Langley, Hampton, Kleiber et al., (2008) conclude that biomass has been sustained due to above-average recruitment since about 1990, with exceptionally high recruitment during 1995−2005 and with peak in recruitment in 2000. In recent years,

[27] A stock that is subject to overfishing means that fishing is occurring at a rate or level that jeopardizes the capacity of a stock to produce MSY, the largest long term average catch or yield that can be taken from a stock under prevailing ecological and environmental conditions on a continuing basis. Overfishing is considered to be occurring if the fishing mortality rate is found to have been greater than the maximum fishing mortality threshold for at least one year. The maximum fishing mortality threshold can be set at a single number (a fishing mortality rate) or as a function of spawning biomass or other measure of reproductive potential. A stock that is overfished is one whose size is sufficiently small that a change in management practices is required in order to achieve an appropriate level and rate of rebuilding. The stock is considered to be overfished if the stock size falls below the minimum stock size threshold at any time. The minimum stock size threshold should equal one-half the maximum MSY stock size or the minimum stock size at which rebuilding to the MSY level would be expected to occur within ten years if the stock or stock complex were exploited at the maximum fishing mortality threshold (50 CFR § 600.310(d)).

bigeye tuna recruitment is estimated to have declined to approximately the long-term average. As shown in Table 14, the WCPO yellowfin stock in the WCPO is not in an overfished state. Overfishing is taking place to the yellowfin tuna stock (Table 14) in the EPO. It is estimated to be near or at full exploitation.

The following description and sections 3.4.1, 3.4.3, and 3.5.3 include information described at the NMFS Fish Watch database (http://www.nmfs.noaa.gov/fishwatch/). Bigeye and yellowfin tuna are highly migratory pelagic species, of or pertaining to the open seas or oceans, and are closely associated with their physical and chemical environment. Suitable physical environment for these species depends on gradients in temperature, oxygen, or salinity, all of which are influenced by oceanic conditions on various scales.

Geographic distribution varies with seasonal changes in ocean temperature. Yellowfin tuna prefer warm surface layers, where the water is well mixed by surface winds and is relatively uniform in temperature and salinity. The surface layer generally occurs from the surface of the ocean to a depth of around 50-200 meters or less, depending on location (e.g., 0 to 150 meters in the central Pacific). Bigeye tuna prefer cooler, more temperate waters, often meaning higher latitudes or greater depths. Preferred water temperature often varies with the size and maturity of pelagic fish. Adults usually have a wider temperature tolerance than sub-adults. Thus, during spawning, adults usually move to warmer waters, the preferred habitat of their larval and juvenile stages.

Large-scale oceanographic events, such as El Niño, change the characteristics of water temperature and productivity. These events have effects on the habitat range and movements of pelagic species. Tuna are commonly most concentrated near islands and seamounts that create divergences and convergences that concentrate forage species, also near upwelling zones along ocean current boundaries, and along gradients in temperature, oxygen, and salinity.

Migration patterns of both bigeye and yellowfin stocks in the Pacific Ocean are slowly being better understood and categorized, due in part to extensive tag-and-release projects for many of the species. These species appear to roam extensively within a broad expanse of the Pacific centered on the equator. Although tagging and genetic studies have shown that some interchange does occur, it appears that short life spans and rapid growth rates restrict large-scale interchange and genetic mixing of eastern, central, and far-western Pacific stocks of yellowfin tuna. Yellowfin tuna have large population sizes. Ely, Vinas, Alvarado Bremer et al. (2005) concluded that the genetic drift for both bigeye tuna and yellowfin tuna should be slower than for other tuna species. Morphometric studies of yellowfin tuna also support the hypothesis that populations from the eastern and western Pacific derive from relatively distinct sub-stocks in the Pacific. The stock structure of bigeye tuna in the Pacific is poorly understood, but a single Pacific-wide population is assumed. The movement of bigeye, cooler-water tuna, is more predictable and defined, with tagging studies documenting regular and well-defined seasonal movement patterns relating to specific feeding and spawning grounds.

In the ocean, light and temperature diminish rapidly with increasing depth, especially in the region of the thermocline. Many pelagic fish make vertical migrations through the water column. They tend to inhabit surface waters at night and deeper waters during the day, but several species make extensive vertical migrations between surface and deeper waters throughout the day. Certain species, such as bigeye tuna, are more vulnerable to fishing when they are concentrated near the surface at night. Bigeye tuna may visit the surface during the night, but generally, longline catches of this fish are highest when hooks are set in deeper, cooler waters just above the thermocline (275-550 meters). Bigeye tuna appear to prey on deep sound scattering layer organisms thus following the diel vertical movements of these organisms.

The following sections provide more detailed information on bigeye and yellowfin tuna and their relationships with other marine species.

3.4.1 Bigeye Tuna (*Thunnus obesus*)

Several studies on the taxonomy, biology, population dynamics, and exploitation of bigeye tuna have been carried out, including comprehensive reviews by Collette and Nauen (1983), and Whitelaw and Unnithan (1997). Miyabe (1994) and Miyabe and Bayliff (1998) reviewed the biology and fisheries for bigeye tuna in the Pacific Ocean.

The species is a mixture between a tropical and temperate water tuna, characterized by equatorial spawning, high fecundity, and rapid growth during the juvenile stage with movements between temperate and tropical waters during its life cycle.

Bigeye tuna are trans-Pacific in distribution, occupying epipelagic and mesopelagic waters of the Indian, Pacific, and Atlantic Oceans. The distribution of the species within the Pacific stretches between northern Japan and the north island of New Zealand in the western Pacific and from 40° N to 30° S in the eastern Pacific (Calkins 1980). Molecular analyses indicate that a single stock exists for Pacific bigeye tuna (Grewe and Hampton 1998). Large, mature-sized bigeye tuna are sought by sub-surface fisheries, primarily longline fleets. Smaller, juvenile fish are taken in many surface fisheries, either as a targeted catch or as a bycatch with other tuna species (Miyabe and Bayliff 1998). Large numbers are taken by purse seiners fishing on drifting objects in equatorial waters. The known depth (and therefore, temperature) range of bigeye tuna is expanding as more data are acquired from sonic tracking and electronic (archival) tagging experiments. Bigeye tuna generally inhabit greater depths, cooler waters, and areas of lower dissolved oxygen, occupying depth strata at or below the "thermocline" at water temperatures of 15° C or lower. Basic environmental conditions favorable for survival include clean, clear oceanic waters between 13° C and 29° C. Hanamoto (1987) estimated optimum bigeye habitat to exist in water temperatures between 10° to 15° C at salinities ranging between 34.5‰ to 35.5‰ where dissolved oxygen concentrations remain above 1 ml/l. He further suggested that bigeye range from the surface layers to depths of 600 meters. However, evidence from archival tagging studies indicates that greater depths and much lower ambient temperatures can be tolerated by the species. Juvenile bigeye occupy an ecological niche similar to juvenile yellowfin of a similar size.

There have been far fewer bigeye tuna tagged in the Pacific in comparison to skipjack and yellowfin tunas. Miyabe and Bayliff (1998) present summary information of some long distance movements of tagged bigeye tuna in the Pacific. Hampton, Bigelow, and Labelle (1998) describe 8,000 bigeye tuna releases made in the western Pacific during 1990-1992. Most of the fish were recaptured close to the point of release; approximately 25% had moved more than 200 nautical miles, and more than 5% had moved more than 1,000 nautical miles. SPC has been tagging tuna on and off since the 1970s. Currently they are in Phase II of a tagging program focusing on tagging tuna from more western Pacific waters, such as PNG where Phase I took place, to more eastern Pacific waters (http://www.spc.int/oceanfish/Html/TAG/index.htm, April 2009). Their goal is to target 100,000 tuna for this project. Bigeye tuna are clearly capable of large-scale movements.

Feeding is opportunistic at all life stages, with prey items consisting primarily of crustaceans, cephalopods, and fish (Calkins 1980). There is significant evidence that bigeye feed at greater depths than yellowfin tuna, utilizing higher proportions of cephalopods and mesopelagic fishes in their diet thus reducing niche competition (Whitelaw and Unnithan 1997). Spawning spans broad areas of the Pacific and occurs throughout the year in tropical waters and seasonally at higher latitudes at water temperatures above 23° or 24° C (Kume 1967). Bigeye are serial spawners, capable of repeated spawning at near daily intervals with batch fecundities of millions of ova per spawning event (Nikaido, Miyabe, and Ueyanagi 1991). Sex ratio is commonly accepted to be essentially 1:1 until a length greater than 150 centimeters after which the proportion of males increases. Alverson and Peterson (1963) state that juvenile bigeye less than 100 centimeters generally feed at the surface during daylight, usually near continental land masses, islands, seamounts, banks, or floating objects.

Bigeye tuna, especially during the juvenile stages, aggregate strongly to drifting or anchored objects, large marine animals, and regions of elevated productivity, such as near seamounts and areas of upwelling (Calkins 1980; Hampton and Bailey 1993; Holland, Kleiber, and Kajiura 1999). Major fisheries for bigeye tuna exploit aggregation effects either by targeting biologically productive areas (deep and shallow seamount and ridge features) or by utilizing artificial fish aggregation devices to aggregate commercial concentrations of bigeye tuna. Juvenile and pre-adult bigeye of 35 centimeters to approximately 99 centimeters are regularly taken as a bycatch in the eastern and western Pacific purse-seine fisheries, usually on sets made in association with floating objects (Hampton and Bailey 1993). Juvenile bigeye tuna form mono-specific schools at or near the surface with similar-sized fish or may be mixed with skipjack and/or juvenile yellowfin tuna (Calkins 1980; Holland, Kleiber, and Kajiura 1999). Juvenile and adult bigeye tuna are also known to aggregate near seamounts and submarine ridge features where they are exploited by pole-and-line, handline, and purse seine fisheries (Fonteneau 1991; Holland, Kleiber, and Kajiura 1999).

Small bigeye are caught on the surface by purse seines, while larger fish are caught deeper using longline gear (Gillet and Langley 2007). In the western Pacific, the fishery is diverse, occurring in the waters of a number of island nations as well as the high seas and carried out by both small domestic fleets and distant water fleets from developed nations.

3.4.2 Yellowfin Tuna (*Thunnus albacares*)

Several studies on the taxonomy, biology, population dynamics, and exploitation of yellowfin tuna exist, including comprehensive reviews by Collette and Nauen (1983) and Suzuki (1994).

This is a tropical tuna characterized by a rapid growth rate and fast development to maturity. Estimates of length at maturity for central and western Pacific yellowfin tuna vary widely with some studies supporting an advanced maturity schedule for yellowfin tuna in coastal or archipelagic waters (Cole 1980). However, most estimates suggest that the majority of yellowfin tuna reach maturity between two and three years of age on the basis of length-age estimates for the species. Longevity for the species may not be explicitly defined, but a maximum age of six to seven years is commonly used in stock assessment. Itano (2000) notes from a large data set from the western tropical Pacific that 50% of yellowfin tuna sampled from purse seine and longline gear at 105 centimeters were histologically classified as mature and predicts a length at 50% maturity of 104.6 centimeters. Under appropriate conditions, yellowfin tuna exhibit high spawning frequency and fecundity (Cole 1980). Spawning occurs in broad areas of the Pacific. Spawning fish require surface salinity and temperature that remain above 24° C (Itano 2000). This means that spawning can occur throughout the year in tropical waters and seasonally at higher latitudes in areas such as Hawaii (Suzuki 1994).

Yellowfin tuna are trans-Pacific in distribution, occupying the surface waters of all warm oceans, and form the basis of large surface and sub-surface fisheries. The adult distribution in the Pacific lies roughly within latitudes 40° N to 40° S as indicated by catch records of the Japanese purse seine and longline fishery (Suzuki, Tomlinson, and Honma 1978). Blackburn (1965) suggests the range of yellowfin tuna distribution is bounded by water temperatures between 18° C and 31° C with commercial concentrations occurring between 20° C and 30° C. Although the species preferentially occupies the surface mixed layer above the thermocline, archival tagging has revealed dives to depths in excess of 1,000 meters with water temperature of 5.8° C (Dagorn, Holland, and Hallier 2006).

Although tag and recapture programs have documented that yellowfin tuna are clearly capable of large-scale movements, most recaptures occur within a short distance of release. Sibert and Hampton (2003) applied an advection-diffusion model to yellowfin tuna tagging data and determined a median lifetime displacement of 375 miles. Yellowfin tuna are known to aggregate around drifting flotsam, anchored buoys, and large marine animals (Hampton and Bailey 1993). Adult yellowfin tuna also aggregate in regions of elevated productivity, high zooplankton density (e.g., seamounts), and regions of upwelling and convergence. This association has presumably evolved to capitalize on the elevated forage available (Cole 1980; Suzuki 1994). Major fisheries for yellowfin tuna exploit aggregation effects either by utilizing artificial FADs or by targeting areas with vulnerable concentrations of tuna.

Some genetic analyses suggest that there may be several semi-independent yellowfin tuna stocks in the Pacific Ocean including possible eastern and western stocks, which may diverge around 150° EW (Grewe and Hampton 1998; Itano 2000). Other analyses have failed to distinguish the presence of geographically distinct populations (Appleyard, Grewe, Innes et al. 2001). Tagging studies have shown individual animals are capable of large east west movements that would suggest considerable pan-Pacific mixing of the stock.

Purse seining and longlining are the main gear employed in catching yellowfin tuna. Small yellowfin tuna may be caught on the surface by purse seine vessels, while larger fish are typically caught deeper using longline gear (Gillet and Langley 2007). In the western Pacific, the fishery is diverse, occurring in the waters of a number of island nations and on the high seas and carried out by both small domestic fleets and distant water fleets from developed nations.

3.4.3 Other Principal Target Stocks

3.4.3.1 Skipjack Tuna (*Katsuwonus pelamis*)

Skipjack tuna are concentrated mostly in tropical waters; though they also seasonally expand into subtropical waters in both the north and south Pacific. The main characteristics of skipjack tuna are fast growth, early maturity, high fecundity, year-round spawning over broad tropical regions, a relatively short life span compared to bigeye, albacore, and bluefin tunas, high and variable recruitment and few age classes on which the fishery depends. In describing the attributes of the species, Joseph (2002) states:

> These characteristics, together with their wide distribution, results in a huge biomass of fish, and very high levels of potential production. Ever since the beginning of heavy commercial exploitation in the early 1970s, the consensus among scientists had been that the populations of skipjack in all oceans of the world were lightly exploited and capable of sustaining much higher catches. This has been borne out by the fact that annual (global) catches increased from approximately 400,000 tons in 1970 to approximately 1.9 million tons in 1998. They remained near that level during 1999 and 2000.

In 2002, the estimated skipjack catch in the WCPO exceeded 1.3 million metric tons, the highest catch on record. The bulk of the skipjack catch in the WCPO is taken in equatorial waters and accounted for 67% of total landings of the four major market species in the region (Williams 2003). The high 2002 catch follows high catch levels of around 1.2 million metric tons for the period 1997-2001. During 2002, purse seine gear accounted for 73% of landings.

Nominal purse seine CPUE trends are generally upward, reaching a record mean rate of 30 mt per day in 2002 (Williams 2003). Increased efficiency associated with the use of FAD technology and increases in vessel efficiency are believed to be contributing factors (Coan and Itano 2003; Itano 2003). CPUE (standardized) trends for the Japanese high seas pole-and-line fleet show no change. The bulk of the catch consists of 50–60 centimeter fork length fish taken by purse seine gear.

Genetic studies of the Pacific population of skipjack suggest that some mixing of fish occurs across the Pacific Ocean, but for management purposes, the stocks in the western Pacific have been considered by most scientists to be independent of those in the eastern Pacific. Tagging data showing limited movement of skipjack from the eastern Pacific to the western Pacific support the same conclusion (Joseph 2002). Recent research suggests that fast-growing, short-lived species like skipjack and yellowfin may have median lifetime displacements on the order of 644–805 kilometers, supporting the idea of "regional fidelity" (Sibert and Hampton 2003). The possibility of restricted movements of skipjack in the WCPO suggests the possibility for local depletion despite the large total biomass.

Historically, bait boats (pole-and-line) were the main gear used in catching skipjack tuna but since the 1950s, purse seiners have come to dominate the fishery. Some skipjack tuna are also caught incidentally by longliners, particularly those using shallow gear. In the WCPO, fishing for skipjack tuna occurs in the waters of a number of island nations and is carried out by both small domestic fleets and distant water fleets from developed nations. Fishing effort is concentrated in the waters around Micronesia and northern Melanesia.

3.4.3.2 Swordfish (*Xiphias gladius*)

The biology of swordfish is covered in some detail by prior analysis by NMFS (2005a). Ward and Elscot (2000) also authored an extensive review of the biology of swordfish and status of swordfish fisheries around the world.

Information on the age and growth of swordfish is the subject of intense study, and findings have been somewhat contradictory. Age studies based on otolith analysis and other methods (length, frequency, vertebrae, fin rays, inter alia) are reviewed by Ehrhardt, Robbins, and Arocha (1996). Wilson and Dean (1983) estimated a maximum age of nine years for males and 15 years for females from otolith analysis. Larvae and juveniles occur in warmer tropical and subtropical regions where spawning also occurs. Swordfish have separate sexes with no apparent sexual dimorphism, although females attain a larger size. Fertilization is external and the fish are believed to spawn close to the surface. Maturity is thought to occur at about five years of age, a size of 140-180 centimeters (eye to fork length) and there is some evidence for the pairing of spawning adults as the fish apparently do not school (Palko, Beardsley, and Richards 1981).

Swordfish are worldwide in distribution in all tropical, subtropical, and temperate seas, ranging from around 50° N to 50° S (Nakamura 1985). Swordfish are found in waters with a wide range of Sea Surface Temperatures (SSTs), from 5°-27° C, but are normally found in areas with SSTs above 13° C (Nakamura 1985). Archival tagging experiments indicate that they spend prolonged periods in deep, cooler water and can therefore tolerate water temperatures that are considerably cooler than at the surface (Takahashi, Okamura, Yokawa et al. 2003). Studies have noted a general pattern of remaining at depth, sometimes near the bottom, during the day and rising near the surface during the night in what is believed to be a foraging strategy. Oceanographic features such as frontal boundaries that tend to concentrate forage species (especially cephalopods) apparently have a significant influence on adult swordfish distributions in the North Pacific. Swordfish are relatively abundant near boundary zones where sharp gradients of temperature and salinity exist (Palko, Beardsley, and Richards 1981).

3.5 Biological Environment

This section describes the other primary biological resources in the Convention Area. The discussion of trophic levels and trophic dynamics provides more detail on bigeye and yellowfin tuna than other species, since they are the focus of the two proposed rules being assessed in this EA.

3.5.1 Trophic Levels

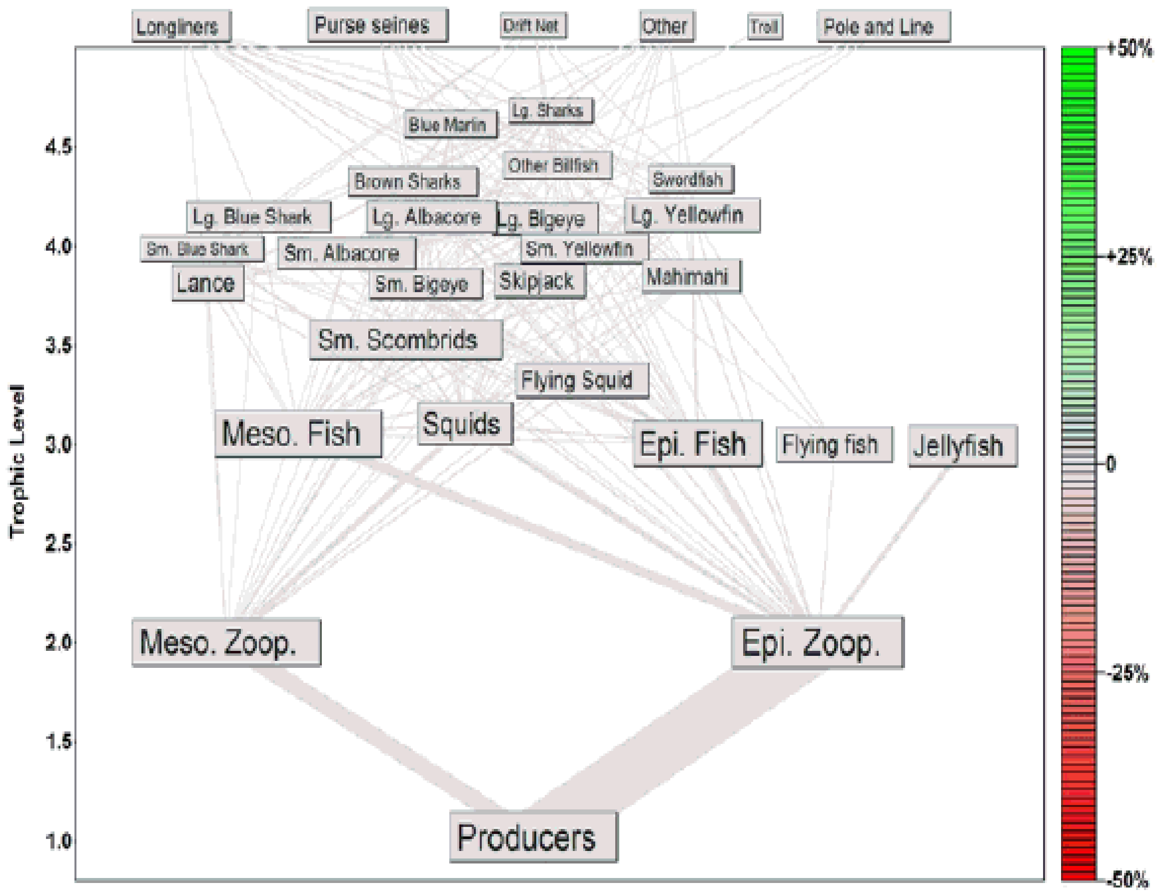
The following description of a marine fisheries food web is taken from Begon, Townsend, and Harper 2006, and Nybakken 1997. Primary producers such as diatoms, dinoflagellates, coccolithophores, and cyanobacteria, are organisms that utilize solar energy to convert carbon dioxide into oxygen. Primary producers are considered the first trophic (or eating) level. The next trophic level includes the zooplankton; animal planktonic forms such as copepods and larval stages of fish. These microorganisms drift through the water column grazing on phytoplankton (plant planktonic forms) and are referred to as “grazers”. Copepods are the most abundant zooplankton and make up most of the animal biomass in the ocean. The third trophic level is made up of the molluscan bivalves, amphipods, and larval forms of fish and crustaceans. Small bait fish make up the next trophic level. These include small fish such as sardines which in turn are eaten by big fish, the next trophic level. This level is made up of dominant predators, species that tend to migrate from coastal to deep ocean waters. They are also prey to the apex predators, species at the top trophic level. Species at this trophic level include tunas, billfish, and sharks. Dominant predators as well as apex predators are opportunistic feeders eating anything they encounter. All organic matter falls back to the bottom of the ocean where bottom feeders utilize the dead matter (energy) making the entire food web a cycle. Both biotic and abiotic factors interplay amongst each other to create this cycle. Figure 9 depicts two food chains from the central North Pacific Ocean.

Organisms at the top of the food web tend to be larger and less abundant. This is mainly due to the amount of energy it takes to get to the top of a food web. Marine food webs are highly connected because of the openness of marine ecosystems, lack of specialists, long life-spans, and large size changes across the life histories of many marine species (Link 2002). Few examples of marine food webs exist. Those that exist show limitations such as low numbers of species, high level of species aggregation, a limited spatiotemporal extent of study, and a low probability of detecting species richness and the number of species interactions or links (Link 2002).

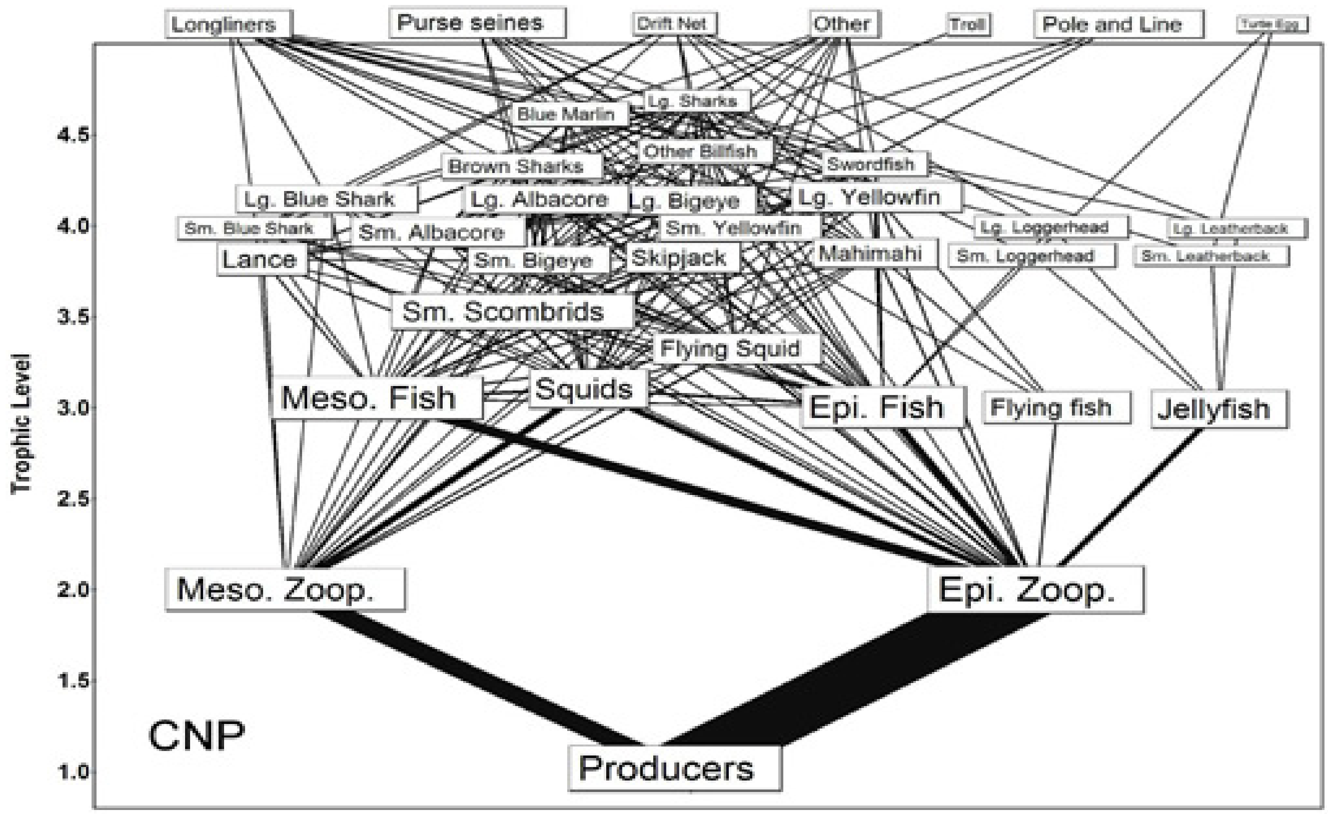
Being top predators, tuna begin at the bottom of the food chain and make their way up. Although thousands of eggs are released by adult tunas only a few make it to the top trophic level. During spawning, bigeye tunas' buoyant eggs are released and float at the surface where they become part of the zooplankton and food for the many organisms and small fish feeding in the equatorial surface waters. Larval bigeye tuna begin feeding on the same zooplankton that they are a part of. Fully formed juveniles begin eating small fish, crustaceans, and squid. These juveniles also begin to move north and south of equatorial waters and are often preyed upon by larger tunas and billfish. Larval and juvenile bigeye tuna are also eaten by other fish, seabirds, porpoises, and other animals. After about one year, the adult bigeye tuna is an opportunistic predator with a highly varied diet of fish, crustaceans, and squid. It is also now prey to larger tunas and billfish. The main predators of bigeye tuna are large billfish and toothed whales.

Trophic level ascension through the food chain for yellowfin tuna is practically the same as for bigeye tuna. Yellowfin tuna feed opportunistically at all life stages. Larval and juvenile yellowfin tuna are eaten by other fish, seabirds, porpoises, and other animals such as marine mammals and sharks that eat adult tunas. Large yellowfin tunas prey on crustaceans, large squid, and fish species. There is a high degree of cannibalism on juvenile yellowfin tunas among large yellowfin tuna in certain parts of the oceans.

Figure 9 Trophic levels in the central North Pacific Ocean



Source: Hinke, Kaplan, Aydin et al., 2004.



Source: Hinke, Kaplan, Aydin et al., 2004.

3.5.2 Trophic Dynamics

Understanding an ecosystem implies understanding its food web and the exchanges between the different trophic levels in the food chain. Food webs show the dynamics of biomass production and partitioning in an ecosystem. Even minor changes in abiotic factors can cause changes in the spatial distribution of primary and secondary pelagic production (Richardson, Jackson, Ducklow et al. 2004). These changes can be increases in sea surface temperatures which may lead to increases in phytoplankton abundance or decreases in phytoplankton abundance in cooler regions (Richardson, Jackson, Ducklow et al. 2004). Removing tuna by commercial fisheries or other changes in biotic factors implies possible positive effects on mid-trophic level species because competition by top predators is eliminated so more mid-trophic level species will survive (Halpern, Cottenie, and Broitman et al. 2006).

Bigeye and yellowfin tuna make up the predator trophic level; both are top-level predator stocks. Distinct energy pathways support different tuna species (Hinke, Kaplan, Aydin et al. 2004). Based on this theory models show that removing top predators such as tunas lower the biomass at the upper trophic levels and that indirectly this increases the biomass of intermediate and lower trophic level animals (Hinke, Kaplan, Aydin et al. 2004). Bigeye and yellowfin tuna are opportunistic feeders and may pose a problem when analyzing significant trophic impacts (Cox, Essington, Kitchell et al. 2002). Trophic status studies show that biomass of both bigeye and yellowfin stocks have declined to MSY-associated levels. Ecosystem impacts from these declines are unknown, yet fishing all species in an ecosystem at mortality rates yielding single-species MSY may lead to the erosion of trophic structure and have negative effects on recruitment (Sibert, Hampton, Kleiber et al. 2006). Disturbing the balance of any ecosystem leads to potential shifts in the ecosystem. For example, an increase in water temperature can cause shifts in vertical and horizontal distributions, which in turn depend greatly on trophic and hydrologic conditions (Perry, Low, Ellis et al. 2005).

The effects of fisheries on entire food webs remain uncertain. Figure 9 shows fishery-specific food webs. When there is an overlap in the primary forage trophic level, such as when multiple fisheries act on specific top predator tunas, this causes a concentration of indirect effects on the same set of forage groups (Hinke**,** Kaplan, Aydin et al. 2004). Hinke**,** Kaplan, Aydin et al., (2004) concluded that the primary food webs for individual fisheries were relatively simple. Ecosystem analysis is difficult because the ecological interactions among a broad group of species are not always known. Because each stock has a unique recruitment history, the variability in biomass over time and among stocks is not all attributed entirely to fishing (Sibert, Hampton, Kleiber et al. 2006). Cox, Essington, Kitchell et al., (2002) also found that it was possible that declines in top predators could result in an increase in smaller tunas that constitute prey for the larger tunas. Predation as a component of natural mortality is still unclear, as are the effects of fishing mortality on predation rates and abundance (Cox, Essington, Kitchell et al. 2002).

Understanding the relative importance of top-down (consumer-driven) versus bottom-up (resource-driven) control of food webs and whether ecosystem trophic dynamics are driven more by predation or primary production is another focus of ecological studies (Richardson, Jackson, Ducklow et al. 2004; Ware and Thomson 2005; Halpern, Cottenie, and Broitman 2006). The form and strength of the linkages between trophic levels is important (Richardson, Jackson, Ducklow et al. 2004). Fishing alters community structure at all trophic levels as well as the links to other community members (Katz, Zabel, Harvey et al. 2003). Although overfished stocks may recover communities that have changed may take a long time or may never recover (Katz, Zabel, Harvey et al. 2003). Halpern, Cottenie, and Broitman (2006) concluded that if anthropogenic sources continue as they are, removing top predators may cause large ecosystems to become controlled by bottom-up rather than top-down factors.

Reducing population biomass may lead to the collapse of oceanic food chains (Sibert, Hampton, Kleiber et al. 2006). Purse seine gear has been more strongly felt at the higher trophic levels than at the lower ones, yet the purse seine fleet may also affect the lower trophic levels (Hinke, Kaplan, Aydin et al. 2004). Hinke, Kaplan, Aydin et al., (2004) found that the aggregate effect of purse seine fishing in the central North Pacific Ocean (CNP) showed a shift in the distribution of biomass from upper level predators to their prey. Their models of the effects of purse seining in the CNP show primarily indirect effects on lower trophic levels. Similar changes in the overall structure of the food webs can be seen from pelagic tuna fisheries in the eastern tropical Pacific Ocean by the purse seine fleets as compared to the CNP findings analyzed by Hinke, Kaplan, Aydin et al. (2004).

Hinke, Kaplan, Aydin et al. (2004) found that the aggregate effect of longline fishing in the CNP showed a shift in the distribution of biomass from upper level predators to their prey. Their models of the effects of longlining in the CNP indicated that the effects of longlining were direct and strongest at the upper trophic levels. Similar changes in the overall structure of the food webs can be seen from pelagic tuna fisheries in the eastern tropical Pacific Ocean as compared to the CNP findings analyzed by Hinke, Kaplan, Aydin et al. (2004).

Currently the SPC is conducting a food web study of the WCPO tuna ecosystem. The study aims to provide an initial characterization of the western Pacific, warm pool, large marine ecosystem, focusing primarily on the trophic relationship among major components (http://www.spc.int/oceanfish/Html/TEB/EcoSystem/foodweb.htm).

3.5.3 Secondary Target Stocks

Secondary stock species composition in purse-seine and longline fisheries depends on the structure, behavior, and spatial organization of surface multispecies aggregations (Romanov 2002). The main species of secondary stocks caught in these two fisheries are described below.

Albacore Tuna (*Thunnus alalunga*)

Although not targeted by the U.S. longline fleets operating in the WCPO, it should be noted that longlining is one of the main fishing methods that target albacore tuna. Longliners catch larger fish at lower latitudes (Gillet and Langley 2007). Table 12 shows the current stock status of albacore.

Table 12 Stock status summary for 2008[28]

Albacore (*Thunnus alalunga)*	North Pacific	Unknown	Unknown
	South Pacific	No	No

Source: NMFS 2009.

The primary source used in the following description of the species is Collette and Nauen (1983). Other reviews include Bartoo and Foreman (1994) and Murray (1994).

Information suggests that separate northern and southern stocks of albacore, with separate spawning areas and seasons exist in the Pacific. Temperature plays a large role in the distribution of the species. In the North Pacific, albacore are distributed in a swath centered on 35° N and range as far as 50° N at the western end of their range. In the central South Pacific (150° E to 120° W) they are concentrated between 10° S and 30° S; in the west they may be found as far south as 50º S. They are absent from the equatorial eastern Pacific. Albacore are both surface-dwelling and deep-swimming. Deep-swimming albacore tuna are generally more concentrated in the western Pacific but with eastward extensions along 30° N and 10° S (Foreman 1980). The 15.6° to 19.4° C SST isotherms mark the limits of abundant distribution although deep-swimming albacore tuna have been found in waters between 13.5° and 25.2° C (Saito 1973). Laurs and Lynn (1991) describe North Pacific albacore tuna distribution in terms of the North Pacific Transition Zone, which lies between the cold, low salinity waters north of the sub-arctic front and the warm, high salinity waters south of the sub-tropical front. This band of water, roughly between 40° and 30-35° N (the zone is not a stable feature) also helps to determine migration routes. Albacore are found to a depth of at least 38 meters and will move into water as cold as 9° C at depths of 200 meters.

Albacore follow complex migration patterns that differ between the North and South Pacific stocks. Most migration is undertaken by pre-adults, two to five years old. A further sub-division of the northern stock, each with separate migration, is also suggested. Generally speaking, a given year class migrates east to west and then east again in a band between 30° N and 45° N, leaving the northeast Pacific in September-October, reaching waters off Japan the following summer and returning to the east in the summer of the following year. In the South Pacific Ocean, mature albacore spawn in tropical and sub-tropical waters between about 10° S and 25° S during the austral summer. Spawning success appears to be related to the prevailing oceanographic conditions with stronger recruitment occurring during La Niña conditions (i.e., positive Southern Oscillation Index) (Langley 2006). Juvenile albacore recruit to surface fisheries in New Zealand coastal waters and in the vicinity of the sub-tropical convergence zone (about 40° S) in the central Pacific about one year later, at a size of 45-50 centimeters (Fork Length).

Albacore are noted for their tendency to concentrate along thermal fronts, particularly the Kuroshio front east of Japan and the North Pacific Transition Zone. Laurs and Lynn (1991) note that they tend to aggregate on the warm side of upwelling fronts. Near continental areas they prefer warm, clear oceanic waters adjacent to fronts with cool turbid coastal water masses. Further offshore, fishing success correlates with biological productivity.

Pacific blue marlin (*Makaira mazara*). As shown in the most recent analysis of the Pacific-wide stock using a MULTIFAN-CL model are close to fully exploited (e.g. biomass is at the MSY level) and that this has been the case for the past 30 years, even in the face of increasing longline effort (Kleiber and Yokawa 2002). Several previous analyses had made similar determination of a stable stock at or close to MSY.

Pacific striped marlin (*Tetrapturus audax*). Results from an assessment were presented by the Marlin Working Group (MARWG) to the 2007 International Scientific Committee for Tunas and Tuna-like Species in the North Pacific Ocean (ISC) plenary meeting. Three biomass dynamics models were used. Difficulties in obtaining the necessary fishery data were highlighted. Substantial uncertainties in the results of the various model runs were noted. The MARWG noted that if fishing mortality (*F*) 20-40% were an appropriate reference point, then the stock is experiencing excessive fishing mortality; and if the recent (2001-2003) fishing mortality (*F*9%) rate were to continue, projections indicate that both the spawning population and yield would decline below the initial (2004) levels over the next three years. If harvest rates correspond to *F*20% or *F*40%, then both biomass and yield would increase over the next three years to levels above the beginning levels. The ISC offered the following conservation advice (ISC 2007):

> While further guidance from the management authority is necessary, including guidance on reference points and the desirable degree of reduction, the fishing mortality rate of striped marlin (which can be converted into effort or catch in management) should be reduced from the current level (2003 or before), taking into consideration various factors associated with this species and its fishery. Until appropriate measures in this regard are taken, the fishing mortality rate should not be increased.

No Pacific-wide assessment has been completed; however analysis of the EPO data suggests that the stock(s) in that region are in good condition (Inter-American Tropical Tuna Commission (IATTC) 2005).

Dolphinfish (*Coryphaena hippurus*) population is considered to be healthy. There are no current reliable estimates of biomass, but life history studies suggest the species may be able to withstand a relatively high rate of exploitation.

Pacific wahoo (*Acanthocybium solanderi*) population levels are estimated to be high, but no information is available as to whether overfishing is occurring or not.

3.5.4 Other Secondary Species

Other secondary species caught in the purse seine fishery include rainbow runner, manta rays, wahoo, barracuda, mackerel scad, and oceanic triggerfish (SPC 2009b).

Table 13 identifies the amounts of fish, by species, discarded by the U.S. WCPO purse seine fleet as reported by observers from 1997 to 2001.

Table 13 Amount and composition of discards by the U.S. purse seine fishery as reported by observer data, 2007-2008 (2008 data is preliminary)

Species	2007			2008		
	Metric Tons	MT/set	% Discarded	Metric Tons	MT/set	% Discarded
Skipjack	16,112.3	38.6	8.8	18,594.3	22.3	1.2
Yellowfin	2,238.2	5.4	6.4	2,410.2	2.9	0.9
Bigeye	889.1	2.1	10.2	496.4	0.6	4.4
Other Species	143.8	0.3	93.7	102.6	0.1	62.4

Breakdown of other species by species type				
	Metric Tons	% Discarded	Metric Tons	% Discarded
-Black marlin	3.01	70.9	2.93	80.3
-Blue marlin	3.22	40.2	6.27	86.3
-Sailfish (Indo-Pacific)	0.07	0	0.12	24.2
-Short-billed spearfish	0.08	100.0	0.03	0
-Striped marlin	1.12	95.5	0.47	99.8
-Blue shark	0.54	100.0	0.01	100.0
-Galapagos shark	0	100.0	-	-
-Hammerhead sharks	-	-	-	-
-Manta rays (unidentified)	0.54	100.0	1.05	90.2
-Oceanic whitetip shark	0.21	100.0	1.62	99.8
-Pelagic sting-ray	0.21	100.0	6.19	98.5
-Silky shark	8.73	100.0	6.19	98.5
-Thresher sharks NEI*	-	-	0.36	100.0
-Albacore	0.04	0	0.50	0
-Bullet tuna	-	-	0.11	100.0
-Frigate and bullet tunas	0.21	100.0	-	-
-Frigate tuna	0.05	2.0	0.10	0
-Kawakawa	0.09	100.0	-	-
-Slender tuna	0	0	-	-
-Wahoo	3.06	42.8	3.01	34.5
Amberjack/giant yellowtail	0.01	0	-	-
-Barracudas (unidentified)	0.29	28.1	0.28	16.8
-Batfishes	3.08	96.5	0	100.0
-Bigeye trevally	0.03	0	-	-
-Black triggerfish	-	-	-	-
-Drummer (blue chub)	0.10	16.8	0.01	100.0
-Filefish (scribbled leatherjacket)	0.13	100.0	-	-
-Filefish (unicorn leatherjacket)	0.18	100.0	-	-
-Filefishes	0.02	47.1	0.01	100.0
-Golden trevally	-	-	-	-
-Great barracuda	0.20	67.5	0.35	66.3

Species	Metric Tons	% Discarded	Metric Tons	% Discarded
-Greater Amberjack	0.16	12.5	-	-
-Mackerel scad/saba	19.35	99.0	2.39	59.6
-Mahi mahi	2.96	61.0	12.79	31.6
-Ocean sunfish	-	-	0.07	100.0
-Ocean triggerfish (spotted)	0.36	100.0	0.44	96.6
-Ocean triggerfish (unidentified)	15.57	98.1	1.46	68.7
-Pomfrets and ocean breams	0.05	2.0	-	-
-Rainbow runner	78.63	97.8	36.65	35.8
-Atlantic pomfret	-	-	0	100.0
-Rays	0.36	100.0	-	-
-Squids	-	-	0	100.0
-Trevallies	0.09	16.9	0	100.0
-Triple-tail	0	100.0	-	-
-Unspecified	1.33	85.2	2.41	93.6

*NEI stands for not elsewhere indicated.
Source: SPC 2009b.

Observer data from 1994-2001 indicated that the Hawaii longline fleet discarded about 40% of its total catch. The percentage of the secondary species that were discarded were as follows: approximately 13% for tunas, 15% for billfish, 63% for sharks, 32% for other Pelagic Management Unit Species (MUS), and 97% for non-MUS (1994-2001 data from the NMFS Hawaii longline observer program) (NMFS 2004d).

3.6 Protected Resources

The following sections include information regarding threatened and endangered species, Essential Fish Habitat (EFH) established pursuant to the MSA, National Wildlife Refuges (NWRs) and Monuments. Table 14 includes all species listed under the U.S. Endangered Species Act (ESA) in the Convention Area also indicating their status assigned by the International Union for the Conservation of Nature (IUCN). NMFS has jurisdiction over all the species listed except for the Dugong (*Dugong dugon),* Short-tailed albatross (*Phoebastria albatrus*), and Newell's shearwater (*Puffinus auricularis newelli*). The U.S. Fish and Wildlife Service (USFWS) has jurisdiction over these three species.

Table 14 Listing status of species in the WCPO listed as endangered or threatened under the U.S. Endangered Species Act and their listing status under The IUCN Red List

Scientific name	Common name	ESA[1]	IUCN[2]
Balaenoptera musculus	Blue whale	Endangered	Endangered
Balaena mysticetus	Bowhead whale	Endangered	Least concern
Balaenoptera physalus	Fin whale	Endangered	Endangered
Megaptera novaeangliae	Humpback whale	Endangered	Least concern
Eubalaena japonica	North Pacific right whale	Endangered	Endangered
Balaenoptera borealis	Sei whale	Endangered	Endangered
Physeter macrocephalus	Sperm whale	Endangered	Vulnerable
Eubalaena australis	Southern right whale	Endangered	Least concern
Monachus schauinslandi	Hawaiian monk seal	Endangered	Critically endangered
Eumetopias jubatus	Steller sea lion		
	western stock	Endangered	
Dugong dugon	Dugong	Endangered	Vulnerable
Phoebastria albatrus	Short-tailed albatross	Endangered	Vulnerable
Puffinus auricularis newelli	Newell's shearwater	Threatened	Endangered
Dermochelys coriacea	Leatherback turtle	Endangered	Critically Endangered
Caretta caretta	Loggerhead turtle	Threatened	Endangered
Chelonia mydas	Green turtle	Threatened	Endangered
Lepidochelys olivacea	Olive Ridley turtle	Threatened	Vulnerable
Eretmochelys imbricata	Hawksbill turtle	Endangered	Critically Endangered

1. Codes for the U.S. ESA - http://www.nmfs.noaa.gov/pr/species/esa.htm, 2008.
2. Codes for the IUCN http://www.iucnredlist.org/search, 2008.

3.6.1 Threatened and Endangered Species

3.6.1.1 Sea Turtles

There are five species of endangered or threatened sea turtles found in the WCPO, the leatherback turtle (*Dermochelys coriacea),* the loggerhead turtle (*Caretta caretta*), the green turtle (*Chelonia mydas*), the olive ridley turtle (*Lepidochelys olivacea*), and the hawksbill turtle (*Eretmochelys imbricata)*. This section summarizes the biology and population status of the listed species. Sea turtle interactions with fisheries are covered from a regional perspective.

Table 15 Listing status of sea turtles in the WCPO and their listing status under The IUCN Red List

Species	ESA[1]	IUCN[2]
Leatherback turtle (*Dermochelys coriacea*)	Endangered	Critically Endangered
Loggerhead turtle (*Caretta caretta*)	Threatened	Endangered
Green turtle (*Chelonia mydas*)	Threatened	Endangered
Olive Ridley turtle (*Lepidochelys olivacea*)	Threatened	Vulnerable
Hawksbill turtle (*Eretmochelys imbricata*)	Endangered	Critically Endangered

1. Codes for the U.S. ESA- http://www.nmfs.noaa.gov/pr/species/esa.htm, 2009.
2. Codes for the IUCN- http://www.iucnredlist.org/search, 2009.

3.6.1.1.1 *Leatherback Turtle (Dermochelys coriacea)*

Leatherback turtles are widely distributed throughout the oceans of the world; however, populations have been severely reduced. In 2004, the total Pacific population was estimated at approximately 160,000 leatherbacks (Lewison, Freeman, and Crowder 2004). A 1996 publication estimated the global population of nesting female leatherbacks at 26,200 to 42,900 (Spotila, Dunham, Leslie et al. 1996). The Red List 2000 of the IUCN has classified the leatherback as “critically endangered” due to “an observed, estimated, inferred or suspected reduction of at least 80% over three generations” based on direct observation, an index of abundance appropriate for the taxon, and actual or potential levels of exploitation.

Primary threats to the species are the incidental killing of turtles by coastal and high seas fishing and to a lesser extent the killing of nesting females, collection of eggs at the nesting beaches, and degradation of habitat (Eckert and Sarti 1997; NMFS 1998a; Wetherall, Balazs, Tokunaga et al. 1993).

There are no nesting populations of the leatherback turtle in areas under U.S. jurisdiction in the Pacific Ocean; however, there are important foraging areas off the west coast of the continental United States and on the high seas near the Hawaiian Islands. In other leatherback nesting areas, such as PNG, Indonesia, and the Solomon Islands, there have been no systematic, consistent nesting surveys, so it is difficult to assess the status and trends of leatherback turtles at these beaches. In all areas where leatherback nesting has been documented, current nesting populations are reported by scientists, government officials, and local observers to be well below abundance levels of several decades ago.

Leatherbacks are highly migratory, exploiting convergence zones and upwelling areas in the open ocean, along continental margins, and in archipelagic waters (Eckert and Sarti 1997). In a single year, a leatherback may swim more than 10,000 kilometers (Eckert and Sarti 1997). Satellite telemetry studies indicate that adult leatherback turtles follow bathymetric contours over their long pelagic migrations and typically feed on cnidarians (jellyfish and siphonophores) and tunicates (pyrosomas and salps) (NMFS 1998a). Females are believed to migrate long distances between foraging and breeding grounds, at intervals of typically two to four years (Spotila, Reina, Steyermark et al. 2000). The mean renesting interval of females on Playa Grande, Costa Rica, is 3.7 years, while in

Mexico, three years was the typical reported interval (WPFMC, NMFS, and WorldFish Center 2004).

3.6.1.1.2 *Loggerhead Turtle (Caretta caretta)*

Loggerhead turtles are a cosmopolitan species inhabiting continental shelves, bays, estuaries, and lagoons in temperate, subtropical, and tropical waters. Primary threats to the species include direct take, incidental capture in various fisheries, and the alteration and destruction of its habitat. In general, during the last 50 years, North Pacific loggerhead nesting populations have declined 50-90% (Kamezaki, Matsuzawa, Abe et al. 2003). From nesting data collected by the Sea Turtle Association of Japan since 1990, the latest estimates of the number of nesting females in almost all of the rookeries are as follows: 1998-2,479 nests; 1999-2,255 nests; 2000-2,589 nests.[28] In 2005 a total of 5,167 loggerhead nests were recorded on 252 Japanese beaches (Matsuzawa 2005).

For their first years of life, loggerheads forage in open ocean pelagic habitats. Both juvenile and sub-adult loggerheads feed on pelagic crustaceans, mollusks, fish, and algae. Other common components include fish eggs, amphipods, and plastics (Parker, Cooke, and Balazs 2002). There are very few records of loggerheads nesting on any of the many islands of the central Pacific Ocean; the species is considered rare or vagrant on islands in this region (NMFS 1998a). Pacific populations of loggerhead turtles found in U.S. jurisdictions are thought to originate from Japanese nesting areas (NMFS 1998a).

The most significant population of loggerhead sea turtles in the southern Pacific Ocean is found nesting off eastern Australia. Approximately 300 females nest annually in Queensland, mainly on offshore islands; Capricorn-Bunker Islands, Sandy Cape, and Swains Head (Dobbs 2001). Wreck Rock Beach supports one of the top five breeding sites for the loggerhead for eastern Australia (Limpus and Limpus 2003). Results from the Wreck Rock Turtle Monitoring Project for 2005-2006 indicated the nesting population of loggerhead turtles to have stabilized since the 1970s (McLachlan, McLachlan, McLachlan et al. 2006). During the monitoring period of the project for the nesting season 62 loggerhead turtles were recorded (McLachlan, McLachlan, McLachlan et al. 2006).

In southern Great Barrier Reef waters, nesting loggerheads have declined approximately 8% per year since the mid-1980s (Heron Island), while the foraging ground population has declined 3% and comprised less than 40 adults by 1992. Researchers attribute the declines to recruitment failure due to fox predation of eggs in the 1960s and mortality of pelagic juveniles from incidental capture in longline fisheries since the 1970s (Chaloupka and Limpus 2001). The transition from hatchling to young juvenile occurs in the open sea. Evidence is accumulating that this part of the loggerhead life cycle may involve trans-Pacific developmental migration (Bowen, Breu-Grobois, Balazs et al. 1995).

[28] In the 2001, 2002, and 2003 nesting seasons, a total of 3,122, 4,035, and 4,519 loggerhead nests, respectively, were recorded on Japanese beaches (Matsuzawa 2005).

3.6.1.1.3 *Green Turtle (Chelonia mydas)*

Green turtles are found throughout the world, occurring primarily in tropical, and to a lesser extent, subtropical waters. In the Pacific, the only major (greater than 2,000 nesting females) populations of green turtles occur in Australia and Malaysia. Smaller colonies occur in the insular Pacific islands of Polynesia, Micronesia, and Melanesia (Wetherall, Balazs, Tokunaga et al. 1993) and on six small sand islands at French Frigate Shoals, a long atoll situated in the middle of the Hawaiian archipelago (Balazs, Pooley, and Murakawa 1995). Green turtles are thought to be declining throughout the Pacific Ocean, with the exception of Hawaii, as a direct consequence of a historical combination of overexploitation and habitat loss (Eckert 1993; Seminoff 2002). Using a conservative approach, Seminoff (2002) estimates that the global green turtle population has declined by 34% to 58% over the last three generations (approximately 150 years). Actual declines may be closer to 70% - 80%. The degree of population change is not consistent among all index nesting beaches or among all regions. Some nesting populations are stable or increasing (Balazs and Chaloupka 2004; Chaloupka and Limpus 2001; Troeng and Rankin 2005). However, other populations or nesting stocks have markedly declined. Because many of the threats that have led to these declines have not yet ceased, it is evident that green turtles face a measurable risk of extinction (Troeng and Rankin 2005). Causes for this decline include harvest of eggs, sub-adults, and adults, incidental capture by fisheries, loss of habitat, and disease. Severe over harvests have resulted in modern times from a number of factors: (1) the loss of traditional restrictions limiting the number of turtles taken by island residents; (2) modernized hunting gear; (3) easier boat access to remote islands; (4) extensive commercial exploitation of turtle products for both domestic and international markets; (5) loss of the spiritual significance of turtles; (6) inadequate regulations; and (7) lack of enforcement (NMFS 1998b).

Most green turtles appear to have a nearly exclusive herbivorous diet, consisting primarily of sea grass and algae (Hirth 1997; Wetherall, Balazs, Tokunaga et al. 1993). Green sea turtles are known to live in pelagic habitats as post hatchlings/juveniles, feeding at or near the ocean surface. The non-breeding range of green turtles is generally tropical, and can extend thousands of miles from shore in certain regions. Hawaiian green turtles monitored through satellite transmitters traveled more than 1,100 kilometers from their nesting beach at French Frigate Shoals, south and southwest against prevailing currents to numerous distant foraging grounds within the 2,400 kilometers span of the archipelago (Balazs 1994; Balazs, Craig, Winton et al. 1994; Balazs, Katahira, and Ellis 1996). Three green turtles outfitted with satellite transmitters on Rose Atoll (the easternmost island of the Samoan Archipelago) traveled on a southwesterly course to Fiji, approximately 1,500 kilometers distance (Balazs, Craig, Winton et al. 1994). In 2007, a number of satellite tracking projects are underway throughout the Pacific Ocean, to learn more on green turtle migratory routes between nesting and feeding areas.

3.6.1.1.4 *Olive Ridley Turtle (Lepidochelys olivacea)*

The olive ridley is one of the smallest living sea turtles and is regarded as the most abundant sea turtle in the world. Olive ridley turtles occur throughout the world, primarily in tropical and sub-tropical waters. In the western Pacific Ocean, olive ridleys are not as well documented as in the EPO, nor do they appear to be recovering as well.

Olive ridley turtles lead a primarily pelagic existence (Plotkin, Bales, and Owens 1993), migrating throughout the Pacific Ocean, from their nesting grounds in Mexico and Central America to the North Pacific Ocean. While olive ridleys generally have a tropical range, with a distribution from Baja California, Mexico to Chile (Silva-Batiz, Godinez-Dominquez, and Trejo-Robles 1995), individuals do occasionally venture north, some as far as the Gulf of Alaska (Hodge and Wing 2000). Surprisingly little is known of their oceanic distribution and critical foraging areas, despite being the most populous of Pacific sea turtles. It is possible that young turtles move offshore and occupy areas of surface-current convergences to find food and shelter among aggregated floating objects until they are large enough to recruit to the nearshore benthic feeding grounds of the adults, similar to the juvenile loggerheads mentioned previously.

3.6.1.1.5 *Hawksbill Turtle (Eretmochelys imbricata)*

Hawksbill turtles are circumtropical in distribution, generally occurring from latitudes 30° N to 30° S within the Atlantic, Pacific, and Indian Oceans, and associated bodies of water (NMFS 1998a). Anecdotal reports from throughout the Pacific Ocean indicate that the current population is well below historical levels. In the Pacific Ocean, this species is rapidly approaching extinction primarily due to the harvesting of the species for its meat, eggs, and shell, as well as the destruction of nesting habitat by human occupation, disruption, and increased tourism (Meylan and Donnelly 1999; NMFS 2001a).

There is limited information on the biology of hawksbills, probably because they are sparsely distributed throughout their range and they nest in very isolated locations (Eckert 1993). Hawksbills have a relatively unique diet of sponges (Meylan 1985; 1988). As a hawksbill turtle grows from a juvenile to an adult, data suggest that the turtle switches foraging behaviors from pelagic surface feeding to benthic reef feeding (Limpus 1992). While data are somewhat limited on diet in the Pacific Ocean, it is well documented in the Caribbean where hawksbill turtles are selective spongivores, preferring particular sponge species over others (Van Dam and Diez 1997). As with other sea turtles, hawksbills will make long reproductive migrations between foraging and nesting areas but otherwise they remain within coastal reef habitats (Meylan and Donnelly 1999).

3.6.1.1.6 *Sea Turtle Fisheries Interactions*

3.6.1.1.6.1 Purse Seine Fishery

Sets associated with logs, anchored FADs, and whales result in higher than expected interaction rates (Molony 2005). In general, sets on floating objects are more likely to catch turtles than sets on unassociated schools of tuna. Unpublished observer data from the FFA held at SPC covering the five year period 1997-2002 for 6,058 sets (25% of all sets during the period) by U.S. purse seine vessels fishing in the WCPO show three interactions with sea turtles. None of the three turtles was identified as to species, and all were released (Molony 2005).

3.6.1.1.6.2 Longline Fishery

Brogan (2002) provides a preliminary estimate of 2,182 marine turtle encounters per year in the western tropical Pacific longline fishery, of which an estimated 500-600 are expected to result in mortality. This estimate is expected to have wide confidence intervals (CIs) since observer coverage is <1%.

Molony estimated the sea turtle annual catch by all WCPO longline fisheries (tropical shallow longline, tropical deep longline, and temperate albacore longline) to be 4,031 in 2004 with an approximate 95% CI. Mortality rates for the three combined longline fisheries were 1,000 sea turtles in 2004.

Table 16 displays the sea turtle interactions for the U.S. Hawaii-based deep-set and shallow-set longline fisheries for 2008. There were a total of five sea turtle interactions in the shallow-set longline fishery (100% observed) and four interactions in the deep-set longline fishery (21.7% observed).

Table 16 Observed sea turtle interactions with the Hawaii-based deep-set and shallow-set longline fisheries, 2008

Sea turtle		**Sector**	**Interactions (all released)**		
			Injured	Unknown	Dead
Green turtle	*Chelonia mydas*	Shallow-set	1		
Leatherback turtle	*Dermochelys coriacea*		2		
Olive Ridley turtle	*Lepidochelys olivacea*		2		
Olive Ridley turtle	*Lepidochelys olivacea*	Deep-set			3
Leatherback turtle	*Dermochelys coriacea*		1		

Source: http://swr.nmfs.noaa.gov/pir/qreports/qreports.htm.

3.6.1.2 Marine Mammals

This section identifies the marine mammals listed as endangered or threatened under the ESA found in the WCPO and summarizes the biology and population status of the species most likely to be affected by the U.S. purse seine and longline fisheries. Interactions with fisheries are covered from a regional perspective. In addition, because all marine mammals are protected pursuant to the Marine Mammal Protection Act (MMPA; 16 U.S.C. § 1361, et seq.), the non-endangered and non-threatened marine mammals found in the WCPO are listed in Table 18.

3.6.1.2.1 *Endangered or threatened marine mammals found in the WCPO*

Endangered or threatened marine mammals in the WCPO (Table 17) include eight cetaceans, two pinnipeds, and the dugong (*Dugong dugon*).

Table 17 Listing status of marine mammals in the WCPO listed as endangered or threatened under the U.S. Endangered Species Act and their listing status under the IUCN Red List

Scientific name	Common name	ESA[1]	IUCN[2]
Balaenoptera musculus	Blue whale	Endangered	Endangered
Balaena mysticetus	Bowhead whale	Endangered	Least concern
Balaenoptera physalus	Fin whale	Endangered	Endangered
Megaptera novaeangliae	Humpback whale	Endangered	Least concern
Eubalaena japonica	North Pacific right whale	Endangered	Endangered
Balaenoptera borealis	Sei whale	Endangered	Endangered
Physeter macrocephalus	Sperm whale	Endangered	Vulnerable
Eubalaena australis	Southern right whale	Endangered	Least concern
Monachus schauinslandi	Hawaiian monk seal	Endangered	Critically endangered
Eumetopias jubatus	Steller sea lion		
	western stock	Endangered	
Dugong dugon	Dugong	Endangered	Vulnerable

1. Codes for the U.S. ESA - http://www.nmfs.noaa.gov/pr/species/esa.htm, 2008.
2. Codes for the IUCN - http://www.iucnredlist.org/search, 2008.

The listed (endangered or threatened) marine mammals most likely to be affected by the U.S. purse seine and longline fleets in the WCPO include the blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), sei whale (*Balaenoptera borealis*), and the sperm whale (*Physeter macrocephalus*). The following sections summarize the biology, population status, and fishery interactions of these five species.

3.6.1.2.1.1 Blue Whale (*Balaenoptera musculus*)

Blue whales are found in tropical to polar waters. The population structure of blue whales remains unknown. The distribution of blue whales has been linked to their nutritional requirements. Migration patterns are assumed for blue whales from known summer feeding areas in high latitudes to unknown, speculative winter breeding grounds (Perry, Demaster, and Silber 1999). Data indicate that some summer feeding takes place at low latitudes in upwelling-modified waters (Reilly and Thayer 1990) and that some whales remain year-round at either low or high latitudes (Barlow 1994; Clark, Tasker, Ferguson et al. 1997; Yochem and Leatherwood 1985). Reproductive activities occur primarily in winter (Yochem and Leatherwood 1985).

Uncertainty surrounds estimates of blue whale abundance in the North Pacific Ocean. Barlow (1994) estimated the North Pacific population of blue whales between 1,400 and 1,900. From ship line-transect surveys, Barlow (2003a; 2003b) estimated 1,400 blue whales for the eastern tropical Pacific. No data are available to estimate population size for any other North Pacific blue whale population, including the putative central stock that apparently summered along the Aleutians and wintered north of Hawaii. Therefore, no estimate of population abundance is available for the western Pacific blue whale stock. No data are available on current population trends. Critical habitat has not been designated for this species.

3.6.1.2.1.2 Fin Whale (*Balaenoptera physalus*)

Fin whales are found throughout all oceans and seas of the world from tropical to polar latitudes (Forney, Barlow, Muto et al. 2000). The population structure of fin whales remains unknown. The International Whaling Commission (IWC) recognized two management stocks in the North Pacific and six stock areas in the Southern Hemisphere, although the data in this region is insufficient (Barlow 1997; Hill and Demaster 1999). Most migrate seasonally from high latitude feeding areas in summer to low latitude breeding and calving areas in winter.

Although the population in the North Pacific is expected to have grown since receiving protected status in 1976, the possible effects of continued unauthorized take and incidental ship strikes and gillnet mortality make this uncertain (Baretta and Hunt 1994). Based on the available information, it is feasible that the North Pacific population as a whole has failed to increase significantly over the past 20 years. The only contrary evidence comes from investigators conducting seabird surveys around the Pribilof Islands in 1975-1978 and 1987-1989. These investigators observed more fin whales in the second survey and suggested they were more abundant in the survey area (Moore, Waite, Mazzuca et al. 2000). Pauly, Trites, Capuli et al. (1998) conducted surveys for whales in the central Bering Sea in 1999 and tentatively estimated the fin whale population was about 4,951 animals (95% CI: 2,833-8,653). The current status and trend of the fin whale population in the Pacific is largely unknown. Critical habitat has not been designated for fin whales.

3.6.1.2.1.3 Humpback Whale (*Megaptera novaeangliae*)

Humpback whales worldwide are divided into northern and southern ocean populations. In the Pacific, genetic analysis studies demonstrate some gene flow (either past or present) between the northern and southern hemispheres (Vang 2002). Humpback whales typically migrate between tropical/sub-tropical and temperate/polar latitudes. The whales occupy tropical areas favoring shallow nearshore waters of usually 200 meters or less during winter months when they are breeding and calving, and polar areas during the spring, summer, and fall, when they are feeding (Balcomb1987; Vang 2002). Recent studies on South Pacific humpback whales confirm migratory links between breeding grounds and feeding areas (Olavarria, Scott Baker, Garrigue et al. 2007). Whales spend the austral summer feeding around five main areas in the Southern Ocean and migrate to low latitude breeding grounds in winter (Olavarria, Scott Baker, Garrigue et al. 2007).

There is no precise estimate of the Pacific humpback whale population. The CNP stock appears to have increased in abundance between the early 1980s and early 1990s; however, the status of this stock relative to its optimum sustainable population size is unknown (Mobley, Spitz, Grotefendt et al. 2001). Mizroch, Herman, Straley et al. (2004) estimated an annual increase of 7% for 1993-2000 using data from aerial surveys that were conducted in a consistent manner for several years across the main Hawaiian Islands and were developed specifically to estimate a trend for the central Pacific stock. The humpback whale population in the North Pacific Ocean basin is estimated to contain at least 10,000 individuals (95% CIs not yet available) (IWC 2007). The Southern Hemisphere population that can be found south of 60° S in the summer feeding season is on the order of 10,000 individuals (Brownell, Kasuya, Perrin et al. 2000). Critical habitat has not been designated for this species, but some protections are afforded by the Humpback Whale National Marine Sanctuary while the whales are in their winter grounds in Hawaii.

No strandings or sightings of entangled humpback whales of the North Pacific stock were reported between 1999 and 2003 (Angliss and Outlaw 2005). The estimated annual mortality rate of the central North Pacific stock, incidental to commercial fisheries is 0.49 whales per year (Angliss and Outlaw 2005). However, this estimate is considered a minimum because there are no data on fishery-related mortalities in Japanese, Russian, or international waters.

3.6.1.2.1.4 Sei Whale (*Balaenoptera borealis*)

The IWC's Scientific Committee groups all of the sei whales in the entire North Pacific Ocean into one population (Masaki 1976; 1977). However, some mark-recapture, catch distribution, and morphological research indicated that more than one population exists: one between 175° W and 155° W longitude, and another east of 155° W longitude (Masaki 1976; 1977). During the winter, sei whales are found from 20°-23° N and during the summer from 35°-50° N (Horwood 1987). Horwood (1987) reported that 75-85% of the total North Pacific population of sei whales resides east of 180°. In the southern Pacific most observations have been south of 30° S (Reeves, Clapham, Brownell et al. 1998). Sei whales are distributed far out to sea in temperate regions of the world and do not appear to be associated with coastal features. There is still insufficient information to accurately determine population structure, but from a conservation perspective it may be risky to assume panmixia in the entire North Pacific. Rice (1977) suggested that the diverse diet of sei whales may allow them greater opportunity to take advantage of variable prey resources, but may also increase their potential for competition with commercial fisheries.

Current abundance or trends are not known for sei whales in the North Pacific. There have been no direct estimates of sei whale abundance in the entire North Pacific based on sighting surveys. Whales identified as either Bryde's or sei whales were sighted 12 times in nine 5° × 5° survey blocks in the southwestern portion of the eastern tropical Pacific during 1986-1996 summer and fall research vessel surveys (Rice 1989). Densities were 0.1–1.1/1000 km^2. A 2002 shipboard line-transect survey of the entire Hawaiian Islands

EEZ resulted in a summer/fall abundance estimate of 77 (Corrected Value (CV) = 1.06) sei whales (Barlow 2003a). This is currently the best available abundance estimate for this stock, but the majority of sei whales would be expected to be at higher latitudes in their feeding grounds at this time of year. Critical habitat has not been designated for sei whales.

There have been no reported entanglements or other interactions between sei whales and commercial fishing activities.

3.6.1.2.1.5 Sperm Whale (*Physeter macrocephalus*)

Sperm whales are found in tropical to polar waters throughout the world (Whitehead 2002). Their distribution is dependent on their food source and suitable conditions for breeding, and varies with the sex and age composition of the group. Sperm whale migrations are not as predictable or well understood as migrations of most baleen whales. In some mid-latitudes, there seems to be a general trend to migrate north and south depending on the seasons. However, in most areas there appears to be no obvious seasonal migration.

Best estimates for the South Pacific came from Abernathy and Siniff (1998), who used published assessments of sperm whale population sizes and corrected values. In that analysis, sperm whale population size estimates are 12,069 (CV = 0.17) for the Antarctic (south of 60° S), 76 (CV = 0.57) for Hawaii, and 26,053 (CV = 0.24) for the eastern tropical Pacific. There are no abundance estimates available for the remainder of the South Pacific Ocean. Critical habitat has not been designated for sperm whales.

The sperm whale is the only ESA-listed marine mammal species that could be involved in depredation and bait removal. Reports of incidences of depredation and bait removal by all marine mammals have been increasing in the WCPO region (Lawson 2001). The available data is too poor to determine the extent to which sperm whales might be involved.

3.6.1.2.2 *Non-listed marine mammals found in the WCPO*

Table 18 identifies the marine mammal species found in the WCPO, but not listed under the ESA (Donoghue, Reeves, and Stone 2003).

Table 18 Non-ESA listed marine mammals that occur in the WCPO

Species name	Common name
Balaenoptera acutorostrata	Minke whale
Balaenoptera bonaerensis	Antarctic minke whale
Balaenoptera edeni	Bryde's whale
Berardius arnuxii	Arnoux's beaked whale
Caperea marginata	Pygme right whale
Delphinus delphis	Short-beaked common dolphin
Eschrichtius robustus	Gray whale
Feresa attenuata	Pygme killer whale
Globicephala macrorhynchus	Short-finned pilot whale
Globicephala melas	Long-finned pilot whale
Grampus griseus	Risso's dolphin
Hyperoodon planifrons	Southern bottlenose whale
Indopacetus pacificus	Longman's beaked whale
Kogia breviceps	Pygme sperm whale
Kogia sima	Dwarf sperm whale
Lagenodelphis hosei	Fraser's dolphin
Lagenorhynchus cruciger	Hourglass dolphin
Lagenorhynchus obliquidens	Pacific white sided dolphin
Lagenorhynchus obscurus	Dusky dolphin
Lissodelphis peronii	Southern right whale dolphin
Mesoplodon bowdoini	Andrew's beaked whale
Mesoplodon ginkgodens	Ginkgo-toothed whale
Mesoplodon grayi	Gray's beaked whale
Mesoplodon hectori	Hector's beaked whale
Mesoplodon layardii	Strap-toothed whale
Mesoplodon stejnegeri	Stejneger's beaked whale
Mesoplodon traversii	Spade-toothed whale
Orcinus orca	Killer whale
Peponocephala electra	Melon headed whale
Phocoena dioptrica	Spectacled porpoise
Phocoena phocoena	Harbor porpoise
Phocoenoides dalli	Dall's porpoise
Pseudorca crassidens	False killer whale
Stenella attenuata	Pantropical spotted dolphin
Stenella coeruleoalba	Striped dolphin
Stenella longirostris	Spinner dolphin
Steno bredanensis	Rough toothed dolphin
Tursiops truncatus	Bottlenose dolphin
Ziphius cavirostris	Cuvier's beaked whale

3.6.1.2.3 *Marine Mammal Fisheries Interactions*

All marine mammals are protected under the MMPA. Pursuant to the MMPA, NMFS has promulgated specific regulations that govern the incidental take of marine mammals during fishing operations (50 CFR § 229). The regulations designate three categories of fisheries, based on relative frequency of incidental serious injuries and mortalities of marine mammals in each fishery:

- Category I designates fisheries with frequent serious injuries and mortalities incidental to commercial fishing;
- Category II designates fisheries with occasional serious injuries and mortalities;
- Category III designates fisheries with a remote likelihood or no known serious injuries or mortalities.

The Hawaii-based longline fishery is divided into deep-setting and shallow-setting which are classified as Category I for the deep-set portion and Category II for the shallow-set portion of the fishery, the west coast-based longline fisheries and the WCPO purse seine fishery are classified as Category II, (73 Fed. Reg. 72737, December 1, 2008).

When marine mammals interact with fisheries there may be both direct and indirect impacts. Direct impacts result when marine mammals get hooked, entangled, or hurt by human activities. Direct impacts may result from depredation (a marine mammal's removing or damaging fish hooked on fishing gear), removal of bait from fishing gear, or unintentional interactions with gear. Indirect impacts take place either later in time or further away from the physical location where direct impacts occur. An indirect impact to consider between fisheries and marine mammals is competition for prey (SPC 2001) due to increasing scarcity of food resources driven by overfishing (Tudela 2004).

3.6.1.2.3.1 Marine mammal interactions with the U.S. WCPO purse seine fishery

Interactions with the large whales, including listed whales, are uncommon throughout the Pacific Ocean. Of the baleen whales, sei whales are most often encircled in the purse seine net on baitfish associated sets. The most recent data available indicates that during 2005 there were two marine mammals (unidentified) encountered on U.S. purse seine vessels in 293 observed sets, and both were listed as dead when returned to the sea. Based on preliminary data (88 sets) there were no marine mammal observations on U.S. purse seine vessels for 2006 (SPC unpublished data).

3.6.1.2.3.2 Marine mammal interactions with U.S. pelagic longline fisheries

Excluding observations of the Hawaii-based longline fleet and sets made south of 31°, Molony (2005) found that the available WCPO longline observer data for 1980-2004 contained 378 records of marine mammal interactions. Thirty animals were not identified to species. Two were recorded as unidentified toothed whales. Two were recorded as sperm whales and four as short-finned pilot whales. The fate and condition of 19 were recorded: 14 were alive at the time of capture and five were dead. Eleven were in healthy condition at the time of release. After adjusting the observed rates of capture and mortality according to the level of observer coverage, Molony (2005) estimated that up to 2,200 marine mammal captures occurred each year in the WCPO longline fisheries, with mortality rates less than 30% in most years.

The average annual mortality of North Pacific stock fin whales from interactions with the Hawaii longline fishery over the five-year period from 1999-2003 is 0.6 (95% CI = 0.20 - 1.55). Between 1994 and 2002, no interactions with the Hawaiian stock of fin whales were observed in the Hawaii-based longline fishery, with approximately 4-25% of all effort observed (Forney 2004). There have been no reported ship strikes on the North Pacific stock of fin whales.

Table 19 shows the U.S. Hawaii longline deep-set and shallow-set interactions in 2006, 2007, and 2008. In 2008, there were a total of 12 observed interactions by deep-set longliners; one animal was released dead and 11 were released injured. For the shallow-set component of this longline fleet there were nine marine mammal interactions; one was released dead and eight were released injured. It should be noted that the pelagic stock of false killer whale is a “strategic stock” under the 1994 amendments to the MMPA because interactions in the Hawaii-based longline fishery around Hawaii have exceeded the level of potential biological removal (NMFS 2008b).

Table 19 2006/2007/2008 marine mammal interactions with the U.S. Hawaii-based deep-set and shallow-set longline fisheries

2006				
Species	**Released dead**	**Released injured**	**Released unknown**	**Fishery method**
Bottlenose dolphin		1		Deep-set
Risso's dolphin		2		
False Killer whale		4		
Short-finned Pilot whale		2		
Striped dolphin	1			
Unidentified cetacean		2		
Unidentified dolphin		2		
Bottlenose dolphin		1		Shallow-set
Humpback whale		1		
Risso's dolphin	1	1		
2007				
Species	**Released dead**	**Released injured**	**Released unknown**	**Fishery method**
Unidentified cetacean		1		Deep-set
False Killer Whale		4		
Short-finned Pilot Whale		1		
Unidentified dolphin		1		
Risso's dolphin	1			
Bottlenose dolphin		3		Shallow-set
Risso's dolphin		3		
2008				
Species	**Released dead**	**Released injured**	**Released unknown**	**Fishery method**
Unidentified cetacean		2		Deep-set
Unidentified whale		3		
Short-finned Pilot Whale		3		
False Killer Whale		2		
Risso's dolphin		1		
Spotted dolphin	1			
False Killer Whale		1		Shallow-set
Humpback Whale		1		
Risso's dolphin	1	3		
Pygmy Sperm Whale		1		
Striped dolphin		1		
Unidentified Whale		1		

°The shallow-set data for 2007 covers the first three quarters only.
Source: NMFS Pacific Island Regional Observer Program 2009.

3.6.1.3 Seabirds

This section identifies the seabird species of concern found in the WCPO and summarizes the biology and population status of the species listed under the ESA, the short-tailed albatross (*Phoebastria albatrus*) and Newell's shearwater (*Puffinus* *auricularis newelli).* Seabird interactions with fisheries are covered from a regional perspective.

Some 39 species of seabirds are known to breed in the tropical Pacific islands of the region covered by the SPC (which encompasses the SPTT Area), and an additional 17 species visit or pass through the region on annual migration. In describing further the situation in the Southern Hemisphere, Watling (2002) notes that "an analysis of the seabird avifauna of the tropical Pacific in comparison with the seabird avifauna of New Zealand (and higher latitudes Australia) indicates that there is very little overlap in species." Table 20 provides a list of the status of the species of concern in the WCPO.

Table 20 Listing status of seabird species of concern in the WCPO

Species	ESA[1]	IUCN[2]
Short-tailed albatross (*Phoebastria albatrus*)	Endangered	Vulnerable
Black-footed albatross (*Phoebastria nigripes*)	Not listed	Endangered
Laysan albatross (*Phoebastria immutabilis*)	Not listed	Vulnerable
Newell's shearwater (*Puffinus auricularis newelli*)	Threatened	Endangered
Wedge-tailed shearwater (*Puffinus pacificus*)	Not listed	Least Concern

1. Codes for the U.S. ESA - http://www.nmfs.noaa.gov/pr/species/esa.htm, 2008.
2. Codes for the IUCN - http://www.iucnredlist.org/search, 2008.

3.6.1.3.1 *Seabird Fisheries Interactions with the WCPO Purse Seine Fisheries*

In recent years, seabird interaction with fisheries, such as for albatross in subtropical regions of the Pacific near Hawaii, has been the subject of much research and the subsequent promulgation of regulatory measures designed to minimize adverse impacts of longline fisheries on several species of seabirds. Although these efforts have focused on subtropical fisheries, very little has been written specifically about seabirds and tropical tuna fisheries in the WCPO. The Oceanic Fisheries Program (OFP) of the SPC commissioned a report by Watling (2002) to help address this shortcoming and the report remains one of the few available on the subject.

Seabirds are an important indicator of tuna schools in the WCPO. In fact, advanced types of radar (designated "bird radar" by fishermen and manufacturers alike) have been developed and are commonly employed on purse seiners to detect such birds at great distances. One example of the complexities of potential indirect effects of fisheries on seabirds noted by Montevecchi (2002) is that overfishing large pelagic fishes in tropical oceans can have a negative effect on marine birds that are dependent on large pelagic schools of fishes to drive small fishes to the surface where the birds can access them.

Molony (2005) reports that from 27,644 purse seine sets observed in the WCPO between 1994 and 2004 only a single bird was reported as captured. Previous reports had indicated there were no records of bird catches by purse seiners in the WCPO (MRAG Americas 2002). Purse seine fisheries including the U.S. fishery do not result in measurable bycatch of seabirds;[29] thus the impact on the sustainability of seabird populations from purse seine fisheries in the WCPO is negligible.

3.6.1.3.2 *Seabird Interactions with the WCPO Longline Fisheries*

Examination of the observer data held by SPC by Molony (2005) revealed 3,887 records of seabirds captured during longline operations in the WCPO since 1980. Most bird interactions occurred in the New Zealand and southern Australian EEZs and to the north and east of the Hawaiian EEZ. Estimates from the same data set suggest an average of 1,593 (95% CI 8,714) captures and 1,440 (95% CI 7,574) mortalities of seabirds per year, for all WCPO longline fisheries combined.

3.6.1.3.2.1.1 Short-tailed albatross (*Phoebastria albatrus*)

Short-tailed albatross breed primarily on Torishima, Japan, and the Senkaku Islands that are claimed jointly by Japan, China, and Chinese Taipei. In the Convention Area, short-tailed albatross generally range north of 23° N latitude (USFWS 2005).

No short-tailed albatross have been recorded caught or killed by the Hawaii-based longline fishery. However, this fleet could potentially interact with the short-tailed albatross. Specific measures to avoid interaction with seabirds are required for participants in the Hawaii longline fishery, and no take of short-tailed albatross has been reported (USFWS 2005).

3.6.1.3.2.1.2 Newell's shearwater (*Puffinus auricularis newelli*)

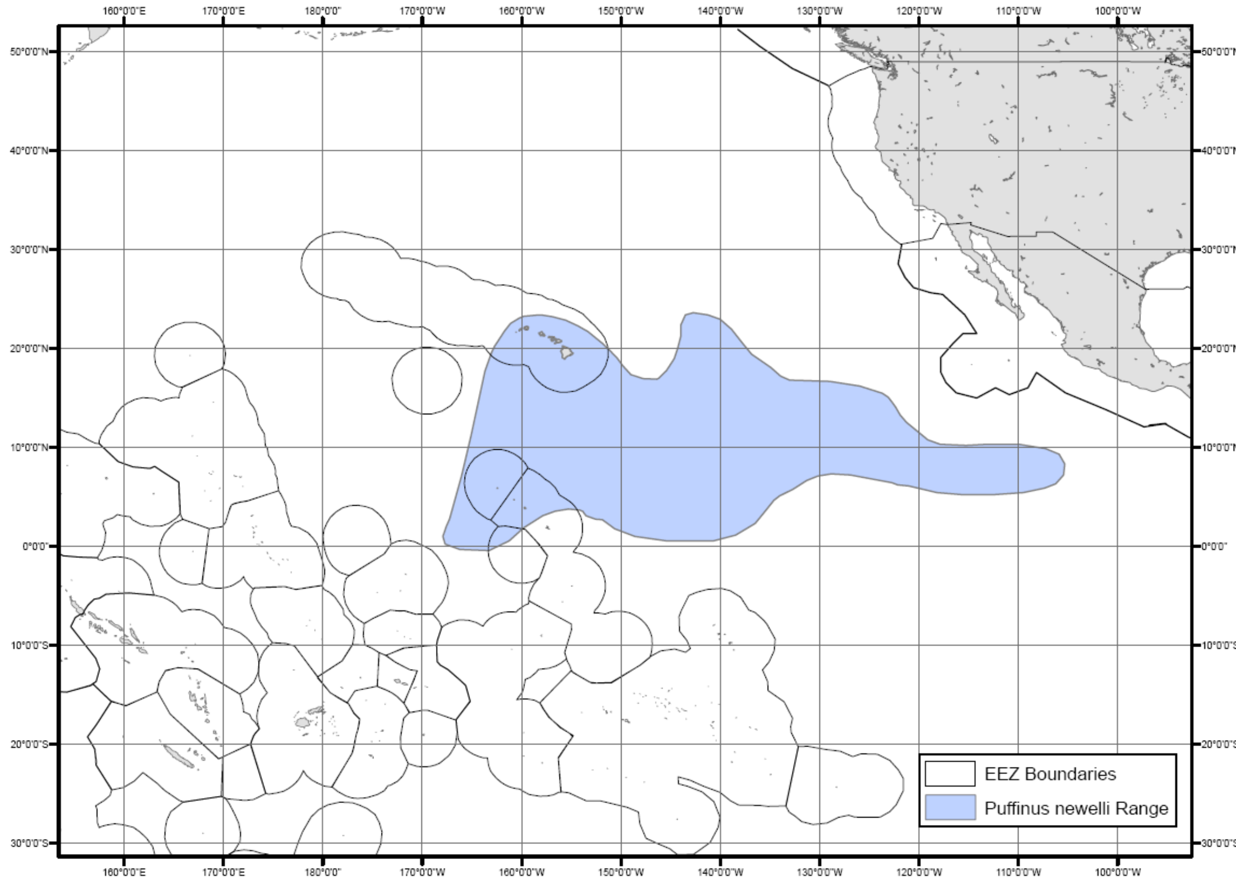
The Newell's shearwater (*Puffinus auricularis newelli*) nests primarily in the Hawaiian Islands and ranges to the south and east of the islands (IUCN 2008). Based on data obtained from BirdLife International, Figure 4 shows the range of the Newell's shearwater. As indicated in Figure 4, the operations of the U.S. WCPO purse seine and the Hawaii longline fisheries could overlap with the range of the Newell's shearwater.

With respect to the U.S. WCPO purse seine fishery, data obtained from the SPC indicate that there have been no recorded interactions between U.S. purse seine vessels and seabirds, based on observer data from August 1994 to January 2007,[30] and the U.S. purse seine fishery has had high levels of observer coverage – at least 20%observer coverage in a given year, sometimes higher. No Newell's shearwaters have been recorded caught or killed by the Hawaii-based longline fishery.

[29] In the 12-and-a-half years during which observers have been deployed on U.S. purse seine vessels in the western and central Pacific Ocean and for which data is available, no interactions with seabirds have been observed (August 1994 to January 2007) (SPC personal communication, December 17, 2008).

[30] SPC personal communication, December 17, 2008.

Figure 10 Known range of *Puffinus auricularis newelli*



Source: BirdLife International.

3.6.2 Essential Fish Habitat

The EFH provisions (50 CFR Part 600 Subpart J) of the MSA are intended to maintain sustainable fisheries. NMFS and the Regional Fishery Management Councils must identify and describe EFH and Habitat Areas of Particular Concern (HAPC) for each managed species using the best available scientific data and must ensure that fishing activities being conducted in such areas do not have adverse effects to the extent practicable. This process consists of identifying specific areas and the habitat features within them that provide essential functions to a particular species for each of its life stages. Both the EFH and the HAPC are documented in the FMPs established under the MSA.[31]

EFH and HAPC have been designated in the WCPO for pelagic, bottomfish, precious corals, crustaceans, and coral reef species. The relevant EFH and HAPC for PMUS in the WCPO were designated in Amendment 8 to the Pelagics FMP. The EFH for PMUS are

[31] The FMPs being the FMP for Pelagic Fisheries of the Western Pacific Region, the West Coast HMS FMP (Pelagics FMP), the Coral Reef Ecosystems FMP, the Precious Corals FMP, and the Crustaceans FMP.

the areas within the U.S. EEZ from the surface to a depth of 1,000 meters below the surface. Eggs and larvae of the PMUS are distributed throughout the tropical epipelagic zone[32] and the subtropical epipelagic zone in the summer. Thus, EFH for these life stages is the epipelagic zone in the U.S. EEZ. The HAPC for PMUS is designated as the water column to a depth of 1,000 meters above all seamounts and banks within the U.S. EEZ that are shallower than 2,000 meters, because topographic features, such as seamounts and banks, influence the overlaying mesopelagic zone (NMFS 2001b). Table 21 lists the EFH and HAPC for species managed under the various western Pacific FMPs.

Table 21 EFH and HAPC for species managed under the pelagics, crustaceans, bottomfish and seamount groundfish, precious corals, crustaceans, and coral reef ecosystems, western Pacific FMPs[1]

Species Group	EFH (juveniles and adults)	EFH (eggs and larvae)	HAPC
Pelagics	Water column down to 1,000 meters	Water column down to 200 meters	Water column down to 1,000 meters that lies above seamounts and banks
Bottomfish	Water column and bottom habitat down to 400 meters	Water column down to 400 meters	All escarpments and slopes between 40-280 meters, and three known areas of juvenile opakapaka habitat
Seamount Groundfish	(adults only): water column and bottom from 80 to 600 meters, bounded by 29°-35°N and 171°E-179°W	(including juveniles): epipelagic zone (0-200 meters) bounded by 29°-35°N and 171°E-179°W	Not identified
Precious Corals	Keahole, Makapuu, Kaena, Wespac, Brooks, and 180 Fathom gold/red coral beds, and Milolii, S. Kauai and Auau Channel black coral beds	Not applicable	Makapuu, Wespac, and Brooks Bank beds, and the Auau Channel
Crustaceans	Bottom habitat from shoreline to a depth of 100 meters	Water column down to 150 meters	All banks within the Northwestern Hawaiian Islands with summits less than 30 meters
Coral Reef Ecosystems	Water column and benthic substrate to a depth of 100 meters	Water column and benthic substrate to a depth of 100 meters	All Marine Protected Areas identified in FMP, all PRIAs,[2] many specific areas of coral reef habitat

Source: Management Measures to Implement New Technologies for the Western Pacific Pelagic Longline Fisheries (NMFS 2004c).
[1] All areas bounded by the shoreline and the outward boundary of the U.S. EEZ, unless otherwise indicated.
[2] Pacific Remote Island Areas.

[32] The epipelagic zone extends from the sea surface to a depth of 200 meters below the surface.

3.6.3 National Wildlife Refuges (NWRs) and Monuments

Pursuant to the National Wildlife System Administration Act of 1966 (NWSAA; 16 U.S.C. § 668dd, et seq.), USFWS carries out the mission of NWRs, which is "to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." National Monuments are designated by the President using the authority of the Antiquities Act of 1906 (16 U.S.C. 431). This act allows the president to protect areas of "historic or scientific significance". Below is a description of NWRs, and National Monuments in the Convention Area.

3.6.3.1 Guam National Wildlife Refuge

The Guam NWR contains three separate administrative units: the Ritidian Unit; the Anderson Air Force Base Unit; and the Navy Unit. Located in northern Guam, the Ritidian Unit contains 401 acres of marine waters that support habitat for fish and marine invertebrates, as well as the hawksbill and green sea turtles. The other units do not include marine waters. USFWS is currently preparing a Comprehensive Conservation Plan that will specify long-term management objectives for the refuge (72 Fed. Reg. 37037, July 6, 2007).[33]

3.6.3.2 Baker Island National Wildlife Refuge

Located approximately 1,830 nautical miles southwest of Honolulu just north of the equator, the Baker Island NWR includes 531 acres of terrestrial habitat and 31,378 acres of submerged habitat. No humans currently inhabit the island, which is composed of a large extinct volcano overlaid by a steep coral reef cap. The waters surrounding the island are known for increased levels of marine productivity, because the western side of the island deflects the equatorial undercurrent, which acts to push nutrient-rich waters into the sunlit zone.[34]

3.6.3.3 Howland Island National Wildlife Refuge

The Howland Island NWR is located 1,815 nautical miles southwest of Honolulu, and contains 648 acres of terrestrial habitat and 33,671 acres of submerged habitat. Due to conditions similar to those at Baker Island, the waters surrounding Howland Island also experience increased levels of marine productivity.[35]

[33] It should be noted that the boundaries of the NWRs described here and the amount of lands and waters included in each refuge are those asserted by USFWS as included in the National Wildlife Refuge System pursuant to the NWSAA. Other federal and state entities share management authority and/or have jurisdiction over some of the areas described here.

[34] USFWS Baker Island National Wildlife Refuge page at http://www.fws.gov/bakerisland/

[35] USFWS Howland Island National Wildlife Refuge page at http://www.fws.gov/howlandisland/

3.6.3.4 Jarvis Island National Wildlife Refuge

The Jarvis Island NWR contains 1,273 acres of terrestrial habitat and 36,214 acres of submerged habitat. The refuge is located approximately 1,305 nautical miles south of Honolulu and about 50 coral species have been identified in the area to date. The waters in the area are nutrient rich, like the waters surrounding Baker and Howland Islands, and thus, they similarly support increased levels of marine productivity. Large fish, sea turtles, and manta rays frequent the area, and 252 fish species have been identified to date.[36]

3.6.3.5 Johnston Island National Wildlife Refuge

The Johnston Island NWR is an atoll composed of four islands and a marginal emergent reef. This isolated atoll is located in the central Pacific Ocean between Hawaii and the Marshall Islands, and supports a vast array of marine life. Forty coral species have been identified in the area to date, as well as over 300 species of fish. Seabirds also frequent the area.[37]

3.6.3.6 Kingman Reef National Wildlife Refuge

Located 932 miles southwest of Hawaii, the Kingman Reef NWR contains three acres of emergent reef and 483,754 acres of submerged reef. The refuge is a coral reef atoll ecosystem, and supports numerous and varied marine species, including over 225 species of fish, bottlenose dolphins, and giant clams.[38]

3.6.3.7 Palmyra Atoll National Wildlife Refuge

The Palmyra Atoll NWR includes approximately fifty small islands, several lagoons, 15,000 acres of shallow and submerged reefs. Located approximately midway between Hawaii and American Samoa, the area supports diverse marine life, such as pilot whales, white-tip reef sharks, and green sea turtles. Surveys have identified 193 coral species in the area to date, and the area could be a source for dispersing coral larvae to other central Pacific atolls and reef islands, due to its location within the equatorial countercurrent.[39]

[36] USFWS Jarvis Island National Wildlife Refuge page at http://www.fws.gov/jarvisisland/

[37] USFWS Johnston Island National Wildlife Refuge page at http://www.fws.gov/johnstonisland/

[38] USFWS Kingman Reef National Wildlife Refuge page at http://www.fws.gov/kingmanreef/

[39] USFWS Palmyra Atoll National Wildlife Refuge page at http://www.fws.gov/palmyraatoll/

3.6.3.8 Rose Atoll National Wildlife Refuge

The Rose Atoll NWR forms a square-like shape and contains two small islands and 39,004 acres of submerged lands and waters. Located about 130 nautical miles east-southeast of Pago Pago Harbor, American Samoa, the atoll is the easternmost Samoan island and the southernmost NWR. The atoll contains about 100 species of coral, and 270 species of fish have been identified in the area to date. The atoll also supports nesting sites for the green turtle and 12 species of migratory seabirds. The majority of American Samoa's seabird population (97%) lives in the atoll.[40]

3.6.3.9 Hawaiian Islands National Wildlife Refuge

Part of the Papahanaumokuakea Marine National Monument, the Hawaiian Islands NWR includes the Northwestern Hawaiian Islands (aside from the Midway and Kure Atolls). This chain of islands and atolls extends about 1,200 miles northwest of Kauai, Hawaii. The refuge contains 1,729 acres of emergent land and over 638,360 acres of submerged lands and waters. The refuge contains numerous species that are found nowhere else in the world, including corals, reef fish, and invertebrates. Approximately 240 fish species have been identified in the area to date, and the refuge supports breeding sites for 19 seabird species.[41]

3.6.3.10 Midway Atoll National Wildlife Refuge

Also part of the Papahanaumokuakea Marine National Monument, the Midway Atoll NWR contains three islands and is located 1,200 miles northwest of Honolulu.[42] The refuge includes almost 300,000 acres of lagoon and surrounding nearshore waters. The refuge supports 18 seabird species, the green turtle, the Hawaiian monk seal, a resident pod of about 300 spinner dolphins, and coral reef fishes and invertebrates.[43]

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[40] USFWS Rose Atoll National Wildlife Refuge page at http://www.fws.gov/roseatoll/

[41] USFWS Hawaiian Islands National Wildlife Refuge page at http://www.fws.gov/Hawaiianislands/

[42] USFWS Midway Atoll National Wildlife Refuge profile page at http://www.fws.gov/refuges/profiles/index.cfm?id=12520

[43] USFWS Midway Atoll National Wildlife Refuge page at http://www.fws.gov/midway/

3.6.3.11 Papahanaumokuakea Marine National Monument [44]

The Papahanaumokuakea Marine National Monument sets apart 139,793 square miles of federal lands and waters to protect the area's significant natural, cultural, and historic resources.

3.6.3.12 The Marianas Trench Marine National Monument, the Pacific Remote Islands Marine National Monument, and the Rose Atoll Marine National Monument

The Marianas Trench Marine National Monument consists of three components: the waters and submerged lands encompassing the coral reef ecosystem of the three northernmost islands of the CNMI; the Marianas Trench, the deepest place on Earth, is approximately 940 nautical miles long and 38 nautical miles wide within the U.S. EEZ; and a series of twenty-one active, hyrdrothermal submarine volcanoes and thermal vents. Many scientists believe extreme conditions like these could have been the first incubators of life on Earth.[45]

The Pacific Remote Islands area consists of Wake, Baker, Howland, and Jarvis Islands, Johnston Atoll, Kingman Reef, and Palmyra Atoll, which lie to the south and west of Hawaii. With the exception of Wake Island, these islands are also NWRs, and are described above.[46]

The Rose Atoll includes about 20 acres of land and 1,600 acres of lagoon.[47]

[44] USFWS Papahanaumokuakea Marine National Monument page at http://www.fws.gov/hawaiianislands/monument.html

[45] USFWS Marianas Trench Marine National Monument page at http://www.fws.gov/pacific/news/2009/Monuments/TrenchMarine.pdf

[46] USFWS Pacific Remote Islands Marine National Monument page at http://www.fws.gov/pacific/news/2009/Monuments/pacificremoteislands.pdf

[47] USFWS Rose Atoll Marine National Monument page at http://www.fws.gov/pacific/news/2009/Monuments/roseatoll.pdf

Chapter 4

Chapter 4 Environmental Consequences: Direct and Indirect Effects

This chapter examines the direct and indirect environmental impacts that could be caused by the implementation of each of the two rules under any of the action alternatives, as well as the No-Action Alternative for each rule; cumulative impacts are addressed in Chapter 5.[48] Chapter 6 uses the analyses presented in Chapters 4 and 5 to compare the alternatives for each rule. This chapter follows the organization of Chapter 3. This chapter begins by assessing the potential impacts from the U.S. Purse Seine Rule to the U.S. WCPO purse seine fishery from the implementation of any of the action alternatives for the rule, as well as the No-Action Alternative. This chapter continues by assessing the potential impacts from the U.S. Longline Rule to the U.S. WCPO longline fishery from the implementation of any of the action alternatives for the rule, as well as the No-Action Alternative. The discussion of impacts to the fisheries is presented first to establish the changes that the affected fisheries would experience from implementation of each of the rules. Then Sections 4.3 through 4.6 analyze the environmental impacts the anticipated changes to the fisheries could cause to each of the potentially affected resources in the affected environment.

4.1 The U.S. WCPO Purse Seine Fishery

The direct and indirect effects to the U.S. WCPO purse seine fishery from the proposed rule to implement specific management measures for the fishery or from any of the alternatives to the proposed rule would fall into two categories: (1) economic; and (2) changes to fishing patterns and activities. The Regulatory Impact Review (RIR) for the proposed rule, prepared under Executive Order 12866, provides an in-depth analysis of the potential economic impacts of the proposed rule to the fleet and to the nation and is incorporated here by reference, pursuant to 40 CFR §1502.23. The general information regarding economic impacts in the discussion below is provided to help compare the alternatives assessed and to determine whether the economic impacts are interrelated with environmental impacts. The potential impacts from implementation of any of the alternatives to each of the potentially affected resources are analyzed in Sections 4.3 to 4.6.

4.1.1 Alternative A: No-Action Alternative, U.S. Purse Seine Rule

Under Alternative A, the No-Action Alternative, the rule to implement specific management measures for the U.S. WCPO purse seine fishery would not go into effect,

[48] According to the CEQ regulations implementing the Procedural Provisions of NEPA at 40 CFR §1508.7 and §1508.8, direct effects are caused by the action and occur at the same time and place; indirect effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable; and cumulative impacts are the impacts on the environment that result from the incremental impact of the Proposed Action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions.

and the fishery would continue to be managed under existing regulatory and SPTT-related requirements. Thus, under this alternative there would be no direct changes to the fishery's status quo in the near term.

As discussed throughout Chapter 3, additional management measures that lead to a reduction in the mortality of yellowfin and bigeye tuna are needed to sustain WCPO tuna stocks at MSY level. Although skipjack tuna accounts for the majority of the proportion of the fleet's catch, diminished catches of yellowfin tuna could affect the revenue generated by the fleet. Thus, this alternative could lead to negative impacts on the ability of the U.S. WPCO purse seine fleet to maintain catch levels and in turn to generate revenue that would maintain the profitability of the fleet in the long term. However, many other factors affect the stock status of WCPO bigeye and yellowfin tuna and implementation of the proposed rule under any of the alternatives would not substantially change the fishing practices and patterns of the fleet. Thus, the status of the fleet under the No-Action Alternative would be similar to the status of the fleet under any of the action alternatives analyzed in this EA.

4.1.2 Alternative B: Action Alternative for the U.S. Purse Seine Rule

Under Alternative B, the U.S. WCPO purse seine fishery would be subject to six new management measures, as detailed in Chapter 2: (1) limits on fishing effort, measured in terms of fishing days, on the high seas and the U.S. EEZ for the years 2009-2011; (2) periods during which fishing on schools in association with FADs would be prohibited on the high seas and in the U.S. EEZ (August and September in 2009 and July through September in 2010 and 2011); (3) specific areas of high seas in which fishing would be prohibited during 2010-2011; (4) effective in 2010 and until the end of 2011, a requirement to retain 100% of the catch of skipjack tuna, yellowfin tuna, and bigeye tuna, up to the first point of landing or transshipment; (5) a requirement to carry observers during the FAD prohibition period in 2009, and starting in 2010 until the end of 2011, on all trips; and (6) a requirement to implement sea turtle interaction mitigation requirements to be effective indefinitely.

4.1.2.1 Fishing Effort Limit

The fishing effort limit could affect the amount of fish captured and revenue earned by vessels in the U.S. WCPO purse seine fleet by reducing fishing opportunities and constraining the historic fishing patterns of the fleet. However, as indicated in Chapter 2, Section 2.1.1.1, the effort limit should take into consideration the maximum number of vessels – 40 – that could operate in the U.S. WCPO purse seine fishery at any one time, pursuant to the provisions of the SPTT. In other words, the limit would be set at approximately the level expected to be exerted by 40 vessels. As indicated in Chapter 3, the current number of licensed vessels is 39, and the expected future number of vessels is approximately 40 (and in no case more than 40). Thus, the limit would be set at approximately the level of effort expected under no action: the effort limit may not represent real change from the status quo – depending on how well the 2001-2004 base period represents the historic activities of the fleet, and the degree to which climatic events such as ENSO occur under unknown conditions such as global climate change/variation. Moreover, in order to take into consideration variations in fishing patterns among years, the high seas and the U.S. EEZ would not be treated separately – there would be no boundary between the two areas for the purpose of the fishing effort limit, and the limit would be implemented on three different time scales: First, there would be a limit of 7,764 fishing days (3 times the base of 2,588) for the entire three-year 2009-2011 period. Second, there would be a limit of 6,470 fishing days (2.5 times the base of 2,588) for each of the two-year periods 2009-2010 and 2010-2011. Third, there would be a limit of 3,882 fishing days (1.5 times the base of 2,588) for each of the one-year periods 2009, 2010, and 2011.

The effort limit could, however, change the temporal patterns of fishing effort. Since the limit is a competitive, "Olympic" style allocation whereby fishing days are available until the cap is reached, vessel operators would have an incentive to fish harder in this zone earlier in the calendar year than they otherwise would in an attempt to obtain as many fishing days as they can (i.e., "the race to fish") before the cap is reached. To the extent such a shift does occur, it would affect the seasonal timing of deliveries to canneries, the implications of which are addressed in the RIR. A race to fish could also bring costs if it causes vessel operators to forego vessel maintenance or to fish in weather or ocean conditions that it otherwise would not. This could bring costs in terms of human safety as well as the performance of the vessel and its fishing gear and crew. This race to fish effect could also be expected in the time period between when a closure of the fishery is announced and when the fishery is closed. However, given that the effort limits may not represent real change from the status quo and that this alternative takes into consideration variations in fishing patterns between different years, it is unlikely that any adverse impacts from the race to fish would be substantial.

The U.S. WCPO purse seine fleet typically spends the majority of its fishing effort in the EEZs of PIC, as indicated in Chapter 3, Section 3.2. Only effort that occurs in the U.S. EEZ and high seas areas would be affected by this provision. Vessels could increase their fishing effort in PIC EEZs in the WCPO or conceivably even shift effort to outside of the WCPO – to the EPO. U.S. vessels have the option of taking up to 32 trips in the IATTC area (see Chapter 3, Figure 4), as defined by the yet-to enter into force Antigua Convention.[49]

Under Alternative B, because the fishing effort limit potentially allows for continuation of historic fishing patterns, it is unlikely that the fleet's total fishing effort would be appreciably affected, and any spatial shift in fishing effort, such as into PIC EEZs, would likely be minor. However, if average per-vessel fishing effort in 2009-2011 is substantially greater than during the baseline period or if climate/ocean conditions are such that the U.S. EEZ or the high seas are unusually attractive fishing grounds in 2009-2011, the likelihood and magnitude of these two potential effects would be greater.

[49] See: http://www.iattc.org/PDFFiles/C-02-03%20Capacity%20resolution%20Jun%202002%20REV.pdf Capacity Resolution C-02-03. Refer to item #12.

4.1.2.2 FAD Prohibition Period

Under the proposed action, the FAD prohibition period for the U.S. WCPO purse seine fleet would be in effect from August 1 to September 30, 2009, or 60 days, and from July 1 to September 30, or for about 90 days, in 2010 and 2011. During these months, no fishing on or near schools associated with FADs, and no deploying or servicing FADs, would be permitted in the Convention Area,[50] and only vessels carrying observers approved by or deployed from the WCPFC's ROP or observers deployed by NMFS would be allowed to fish during those periods (in order to ensure that FAD fishing does not occur).[51] The FAD prohibition period could affect the fleet's fishing patterns and activities.

As described in Chapter 3, Section 3.2.4 the U.S. WCPO purse seine fleet has used FADs, or associated sets, to varying degrees for its fishing operations. Regional landing data suggest that FAD sets tend to yield more skipjack and bigeye tuna than yellowfin tuna. Unassociated sets tend to yield more yellowfin tuna than skipjack tuna and very little bigeye tuna. As indicated in Table 5 in Chapter 3, between 2003 to 2008, approximately 70% of the catch of the U.S. WCPO purse seine fleet was made on associated sets. During this same period, approximately 53% of the U.S. WCPO purse seine fleet's catch of yellowfin tuna was made on associated sets, while approximately 71% of the catch of skipjack tuna and 94% of the catch of bigeye tuna was made on associated sets.

The FAD prohibition periods can be expected to affect the overall composition of the catch made by the fleet. It is expected that there will be some transfer of effort to fishing on unassociated sets during the prohibition period – given that represents the only viable fishing option if vessels continue to operate – so the composition of the catch during those periods is expected to consist of more yellowfin tuna and less bigeye tuna with the overall effect on skipjack tuna difficult to predict. As shown in Table 5 in Chapter 3, bigeye tuna accounts for only very small percentage of the catch of the U.S. WCPO purse seine fleet. FAD sets contribute a substantial percentage of skipjack catches (as indicated in Table 5 in Chapter 3, 71.5% of the total catch of skipjack tuna during the years 2003-2008 was from FAD sets). By prohibiting FAD sets for 17% of the year in 2009 and 25% of the year in 2010 and 2011, skipjack tuna catches would expect to be impacted accordingly. According to a study conducted to evaluate (for all national fleets, not just the U.S. fleet) the potential impacts of a FAD prohibition period in the third quarter, a FAD prohibition for a 3 month period was predicted to reduce long term average catches

[50] Although the proposed rule would implement the FAD prohibition periods only for the U.S. EEZ and high seas, identical FAD prohibition periods would be in effect in the EEZs of the Parties to the Nauru Agreement pursuant to the Third Arrangement Implementing the Nauru Agreement.

[51] As discussed in Chapter 2, Section 2.1.1.2.2.5, the requirement to carry an observer from the WCPFC ROP would apply at all times starting January 1, 2010 to the end of 2011, not simply during the FAD prohibition periods.

of skipjack tuna in the Convention Area by 6.5% (Hampton and Harley 2008).[52] Although this represents a considerable volume of fish – uncertainties associated with this prediction suggest it could be much more or much less. The expected shift in composition of the catch during the FAD prohibition periods would be expected to affect gross revenues generated by the fleet, but the magnitude of the impact would depend on market conditions (i.e., the price of bigeye tuna and skipjack tuna compared to the price of yellowfin tuna and the prices of small fish versus large fish – particularly, whether the canneries are even buying small fish).

The FAD prohibition periods could also affect operating costs (e.g., FAD fishing generally involves less searching time and thus lower fuel costs). In aggregate it is likely that the prohibition period would have some negative effect on the profits generated by the fleet in the short term.[53] Since other factors (e.g., shifts in ocean conditions, climatological changes, shifts in market conditions, fuel prices) also influence the catch made by a fleet and/or the revenue generated by a fleet during a specific time period, quantification of the economic impact of the FAD prohibition periods on the U.S. WCPO purse seine fleet cannot be made with any degree of precision. It seems unlikely that given current market conditions (as of this writing) that most purse seine vessels would choose not to fish as a result of the prohibition periods. However, as described below for the proposed observer coverage requirements, affected vessels would also bear costs associated with having to carry an observer during the 2009 FAD prohibition period. To mitigate the costs that the FAD prohibition period (and in 2009, the observer requirement) would bring, vessel operators might choose to schedule their routine vessel maintenance during a portion of those periods. The result of this could be somewhat less effort during those periods than there otherwise would be.

As stated above, the FAD prohibition periods are expected to affect the fishing patterns and practices of the fleet by transferring fishing effort from FAD sets to unassociated sets during the prohibition periods, and possibly reducing the amount of fishing effort during the prohibition periods relative to other periods of the year. Ideally bigeye tuna catches will be minimal as will juvenile yellowfin catch – and operators will target unassociated schools of large skipjack and yellowfin tuna.

As discussed in Chapter 3, section 3.2.4, the WCPFC ROP is currently being developed and approximately 20% of the trips made by the U.S. purse seine fleet carry observers provided by the Pacific Islands FFA. All vessels will incur additional costs in order to comply with the observer requirement during the FAD prohibition period in 2009, but these additional costs would be unlikely to affect the fishing patterns and practices of the fleet, since they would be limited in comparison to the overall revenue generated by the

[52] The closure period studied was a "three month ban during the third quarter on FAD sets within EEZs and on the high seas in the region between 20° N and 20° S (but excluding Indonesia and the Philippines and archipelagic waters)" (Hampton and Harley 2008).

[53] See the Initial Regulatory Flexibility Analysis (IRFA) and RIR for the purse seine rule for more detailed discussion of the economic impacts of the rule on the U.S. WCPO purse seine fleet.

fleet. Please see the RIR and the Initial Regulatory Flexibility Analysis (IRFA) for the purse seine rule for more detailed discussion of the economic impacts on the U.S. WCPO purse seine fleet of the requirements to increase observer coverage.

4.1.2.3 High Seas Area Closures

Two areas of the high seas, otherwise known as high seas pockets, would be closed to fishing for the U.S. WCPO purse seine fleet as of January 1, 2010, through 2011. These closures could affect the revenue generated by the fleet as well as their fishing patterns and activities. However, as discussed above, the U.S. WCPO purse seine fleet exerts the majority of its fishing effort in PIC EEZs, so the closure of the high seas areas are not expected to have a large effect on the ability of the fleet to fish and generate revenue. NMFS unpublished data from vessel logbooks indicate that from 1997 through 2007, the proportion of the fleet's total annual catch that was taken from the two areas collectively was about 10%, and ranged from about 3 to 20%. Total fishing effort by particular vessels would likely be unaffected, but the spatial distribution of effort would necessarily shift out of the affected areas into what would be less attractive, and in some cases, less profitable, fishing grounds. However, the closed areas would be small relative to the available and typical fishing grounds of the fleet. Thus, overall, the high seas closures would not be anticipated to cause large operational changes to the U.S. WCPO purse seine fleet.

4.1.2.4 Catch Retention

U.S. WCPO purse seine vessels would have to retain 100% of their catch of skipjack, bigeye, and yellowfin tuna, and then land or transship the catch at port, if and when NMFS determines that 100% observer coverage is being implemented throughout all the purse seine fleets, but no earlier than January 1, 2010. Exceptions to full retention are provided in the following circumstances: (1) fish that are unfit for human consumption (including but not limited to fish that are spoiled, pulverized, severed, or partially consumed at the time they are brought on board) upon their being boarded may be discarded; (2) if at the end of a fishing trip there is insufficient well space to accommodate all the fish captured in a given purse seine set, fish captured in that set may be discarded, provided that no additional purse seine sets are made during the fishing trip; or (3) if a serious malfunction of equipment occurs such that fish in the wells cannot be maintained in a way that ensures they are safe for human consumption, those fish may be discarded.

The impacts of this provision would likely be different for those vessels that fish out of a port and deliver their fish to canneries versus those vessels that transship most of their catch to other vessels. Vessels fishing out of ports typically try to maximize trip revenue, because they have to travel large distances from port to reach fishing grounds, so they may be forced to retain catches that decrease the already limited storage room on the vessels given the fishing trips typically only terminate for these vessels when all the fish holds are full. For vessels that transship most of their catch to other vessels and are less dependent on vessel capacity, this provision would likely have a lower impact on vessel profitability. It is unclear whether markets for smaller fish that up to this date would often have been discarded will develop at those ports that have historically not purchased small fish. There are also instances where the canneries charge the vessels to unload small fish in which case these costs (typically on a per ton basis) are a deduction from gross trip revenues.

4.1.2.5 Increased Observer Coverage

Beginning January 1, 2010, U.S. WCPO purse seine vessels would be required to carry an observer from the WCPFC ROP on every trip. Pursuant to the SPTT, approximately 20% of the trips made by the U.S. WCPO purse seine fleet carry observers provided by the Pacific Islands FFA. Vessels would incur additional costs in order to comply with this requirement. The compliance costs are small compared to the revenue generated by vessels in the fleet, so it seems unlikely that the costs would be great enough to affect the fishing patterns and practices of the fleet. As noted above with respect to the FAD prohibition periods, during the 2009 FAD prohibition period vessel operators would bear both the costs of carrying an observer and of not being able to set on FADs. To mitigate those costs, vessel operators might schedule their routine vessel maintenance during the FAD prohibition periods. The result would be less fishing effort during that period than would otherwise occur, but probably little or no impact on total fishing effort in 2009. Please see the RIR and IRFA for the purse seine rule for more detailed discussion of the economic impacts of the rule on the U.S. WCPO purse seine fleet.

4.1.2.6 Sea Turtle Interaction Mitigation Requirements

U.S. WCPO purse seine vessels and their crew would be required to carry specific equipment and use specific measures to disentangle, handle, and release sea turtles that are encountered in fishing gear, including purse seines and FADs. The required equipment would be a dip net with specified minimum design standards. The required measures would include immediately releasing sea turtles that are observed enclosed in purse seines; disentangling sea turtles that are observed entangled in purse seines or FADs, stopping net roll until a sea turtle is disentangled from the purse seine, resuscitating sea turtles that appear dead or comatose, and releasing sea turtles back to the ocean in a specified manner.

Vessel owners and operators would incur some costs in ensuring that they and their crew are adequately trained to be able to execute the required mitigation requirements: vessel owners and operators would incur some additional expense to ensure that vessels are equipped with the required dip net; and time- and labor-associated costs might be incurred in actually handling and releasing turtles in the required manner. However, in part because sea turtle interactions in the fishery are rare, the costs would be negligible compared to the overall revenue generated by the fleet (see RIR and IRFA) and thus, would be unlikely to affect the fleet’s fishing patterns or practices. Fishing operations may be affected but these impacts are believed to be minor – as long as personnel are trained and available to implement the mitigation actions in the rare event of a sea turtle interaction.

As stated in Chapter 3, Section 3.6.1.1.6 (Sea Turtle Fisheries Interactions), during the six year period 1997-2002 for 6,058 sets (25% of all sets during the period) by U.S. purse seine vessels fishing in the WCPO there were three interactions with sea turtles. Thus, due to the small number of potential sea turtle interactions likely to occur with any given vessel, vessels would not be expected to experience significant reduction in fishing time in order to comply with the sea turtle mitigation requirements.

4.1.2.7 Summary of Impacts

The requirements of implementing the proposed rule under Alternative B have the potential to impact the gross revenue and profits earned by the U.S. WCPO purse seine fleet and cause impacts to its fishing patterns and practices. Overall, although these effects are somewhat speculative and unquantifiable, it is unlikely that Alternative B would cause substantial financial burden to the fleet or substantially affect the fleet's current fishing patterns and practices. The primary direct effects of Alternative B on the U.S. WCPO purse seine fishery are the following: (1) the FAD prohibition periods and the catch retention requirement would affect the size and species composition of landed fish; (2) the fishing effort limit and high seas area closures could lead to slight increases in fishing effort in PIC EEZs in the WCPO and overall slight decreases in total fishing effort; and (3) the FAD prohibition periods would likely transfer some fishing effort from FAD sets to unassociated sets during the prohibition periods, and possibly shift fishing effort from the FAD prohibition periods to other periods of the year.

4.1.3 Alternative C: Allocation of Fishing Effort Limit

Under Alternative C, for the U.S. purse seine vessels fishing in the U.S. EEZ and high seas in the Convention Area, the effort limit would be allocated among different individual vessels in some undetermined manner (the specific manner is not fully developed in this document, as those details are not relevant to the task of analyzing the environmental consequences of the action and the comparative consequences of the alternatives). All other provisions of this alternative would be identical to Alternative B. Allocation of the effort limit would provide for individual vessels to have a fixed share of the effort limit, and thus, vessels would not compete for fishing days. The allocation scheme would not affect the overall level of fishing effort exerted by the fleet or affect overall fishing practices or patterns, except that it would not cause the temporal shift in fishing effort and catch that might occur under Alternative B as a result of a race to fish.

4.1.4 Alternative D: Most Restrictive Variation of the Fishing Effort Limit Provision

Under Alternative D, for the U.S. purse seine vessels fishing in the Convention Area, the effort limit would be implemented on a single year basis, coinciding with the licensing year, no extra fishing days could be transferred from other years, and there would be separate effort limits for the high seas and U.S. EEZ. All other provisions would be identical to Alternative B. As discussed above, the overall effort limit takes into consideration the maximum number of vessels that could operate in the U.S. WCPO purse seine fishery at any one time, pursuant to the provisions of the SPTT. Thus, the effort limits would likely represent no real change from the status quo. However, this alternative would not allow for any flexibility in the effort limit to account for variations in fishing patterns in different years and the separate limits for the high seas and U.S. EEZ would further restrict where the vessels could conduct fishing activities. In some years, the maximum number of fishing days may not be used when the actual fishing effort is less than that set by the effort limits; also, no fishing could be transferred from the limits of other years.

Under this alternative the fleet would be limited to 558 days in the U.S. EEZ or a limit of 2030 days on the high seas areas. The most immediate impact would occur if and when the next ENSO occurs and vessels shift to the eastern portion of the WCPO. Although not clear which constraint would apply first, it is quite possible that operators could be forced into PIC EEZs during periods of high yellowfin tuna abundance in the high seas and U.S. EEZ. With the two high seas pockets being closed – and there being considerable high seas areas in the eastern part of the WCPO – fishers could find fishing opportunities restricted. Forgone revenue typically generated by large yellowfin tuna (typically found in unassociated schools) could be forgone as a result of this alternative.

This alternative would also set the limits to begin at the start of the licensing year (June 15th) rather than the calendar year. Since the limit would be a competitive, "Olympic" style allocation whereby fishing days are available until the cap is reached, vessel operators would have an incentive to fish harder in this zone earlier in the licensing year than they otherwise would in an attempt to obtain as many fishing days as they can (i.e., "the race to fish") before the cap is reached. As for Alternative B, the race to fish could also bring costs if it causes vessel operators to forego vessel maintenance or to fish in weather or ocean conditions than they otherwise would not. This could bring costs in terms of human safety as well as the performance of the vessel and its fishing gear and crew. This race to fish effect could also be expected in the time period between when a closure of the fishery is announced and when the fishery is closed. Given that the overall effort limit may not represent real change from the status quo, it is unlikely that any adverse impacts from the race to fish would be substantial.

4.1.5 Alternative E: Least Restrictive Variation for Fishing Effort Limit Provision

Under Alternative E, for the U.S. purse seine vessels fishing in the Convention Area, the effort limit would be implemented on a three-year combined basis. All other provisions would be identical to Alternative B. This alternative allows for the maximum flexibility in the effort limit to account for variations in fishing patterns in different years. Overall, the impacts to the fleet would be similar to those under Alternative B. However, the lack of any limits for a given year would bring the potential for a longer closed period (e.g., during a substantial part of 2011) than would likely occur under Alternative B (under which relatively brief closures might be expected in one or more of the years 2009-2011). To the extent that continuous fishing and continuity of supply are important for the fishery, several short closures might cause less adverse economic impacts than a single long closure. For example, with a brief closure each year, vessel owners and operators might be able to schedule routine vessel maintenance during the closed periods and mitigate the losses of not being able to fish. This would be more difficult to do during a longer closed period. In any case, because the majority of the fleet's traditional fishing grounds would not be subject to the limit or the closure, the potential losses caused by a closed period – however short or long – are likely to be relatively minor.

4.2 The U.S. Longline Fisheries

The direct and indirect effects to the U.S. longline fisheries from the proposed rule to ensure the timely implementation of the bigeye tuna catch limit established by the WCPFC or from any of the alternatives to the proposed rule would fall into two categories: (1) economic; and (2) changes to fishing patterns and activities. The RIR for the proposed rule provides an in-depth analysis of the potential economic impacts of the proposed rule to the fleets and is incorporated here by reference, pursuant to 40 CFR § 1502.23. The general information regarding economic impacts in the discussion below is provided to help compare the alternatives analyzed and to determine whether the economic impacts are interrelated with environmental impacts. The potential impacts from implementation of any of the alternatives to each of the potentially affected resources are analyzed in Sections 4.3 to 4.6.

4.2.1 Alternative 1: No-Action Alternative, U.S. Longline Fisheries Bigeye Tuna Catch Limit Rule

Under Alternative 1, the catch limit for WCPO bigeye tuna established by the WCPFC for the U.S. longline fisheries would not be implemented in a timely manner and the U.S. longline fisheries would be able to continue targeting and landing bigeye tuna after the established limit has been exceeded. This alternative would cause no direct changes to the status quo.

As discussed throughout Chapter 3, additional management measures that lead to a reduction in the mortality of yellowfin and bigeye tuna are needed to sustain WCPO tuna stocks at MSY. Thus, this alternative could lead to negative impacts on the ability of the U.S. longline fleets to maintain catch levels and in turn to generate revenue that would maintain the profitability of the fleets in the long term. However, many other factors affect the stock status of WCPO bigeye and yellowfin tuna and the proposed rule would be in effect for a three-year limited period. Thus, the status of the fleets under the No-Action Alternative would be similar to the status of the fleets under any of the action alternatives analyzed in this EA.

4.2.2 Alternative 2: Closure of the Deep-Set Sector

Alternative 2 would implement the specific bigeye tuna longline catch limit for the Hawaii and west-coast based U.S. longline fleets, set by the WCPFC, calculated to be 3,763 metric tons for the years 2009, 2010, and 2011, as described in Chapter 2, Section

2.1.2. Under this alternative, once the limit has been reached for a given year it would be prohibited to use a U.S. fishing vessel to deploy longline gear in the Convention Area, to retain on board bigeye tuna or yellowfin tuna captured by longline gear in the Convention Area, or to land or transship bigeye tuna or yellowfin tuna captured by longline gear in the Convention Area. Exempt from the prohibitions would be the use of a vessel to deploy longline gear in a shallow-set manner to target swordfish. Also, any bigeye tuna or yellowfin tuna on board at the time of the closure may be retained on board and landed, and captured bigeye tuna and yellowfin tuna could be landed in the Territory of American Samoa, the Territory of Guam, or the CNMI, provided that it was not caught in the portion of the U.S. EEZ surrounding the Hawaiian Archipelago and that it is landed by a U.S. fishing vessel operated in compliance with a valid permit issued under the Pelagics FMP or West Coast HMS FMP. Bigeye and yellowfin tuna currently landed in the territories is caught by the vessels based in the territories. Thus, this alternative could give Hawaii-based longline vessels the incentive to land bigeye and yellowfin tuna in the territories. However, the likelihood of this occurring is small, since the market for fresh caught bigeye and yellowfin tuna in these areas is limited and the cost of transporting the fish to larger markets could be prohibitive.

This alternative could cause changes to the fishing patterns and practices of the Hawaii longline fleet. If and when the maximum allowable amount of bigeye tuna landings is reached in a given year, affected fishing businesses would be expected to cease fishing for the remainder of the calendar year or to shift from deep-setting in the WCPO to the next best opportunity. Although those opportunities cannot be predicted with certainty, two opportunities that would appear to be attractive to vessels in the fishery include shallow-setting (i.e., for swordfish) and deep-setting for bigeye tuna in other areas, specifically the EPO. Making such shifts would bring opportunity costs to the affected fishing operations, but the magnitude of those costs cannot be projected.

Because the limit would be set on a calendar year basis, the “race to fish” effect would be expected at the beginning of the calendar year, and the closure of the deep-set sector of the fishery would be expected toward the end of the calendar year. A race to fish could cause vessel operators to forego vessel maintenance or to fish in weather or ocean conditions than they otherwise would not, which could affect human safety and the performance of the vessel and the fishing gear and its crew. This race to fish effect could also be expected in the time period between when closure of deep-setting is announced and when the closure takes place. The degree of the race to fish effect cannot be predicted with certainty. However, given that fishing effort and catch is dependent on many other factors (e.g., ocean conditions and market conditions), it is unlikely that any adverse effects would be substantial.

This alternative would also be expected to bring costs to the affected fishing operations (e.g., through lost revenues and/or opportunity costs), as well as economic impacts to forward- and backward-linked economic sectors, including businesses that supply fishing vessels and businesses that market the fish they catch. As mentioned above, detailed discussion of these economic impacts is included in the RIR for the rule.

4.2.3 Alternative 3: Prohibition on Retention, Landing, or Transshipping of Bigeye Tuna

Under Alternative 3, in order to ensure NMFS' timely implementation of the WCPO bigeye tuna catch limit for the U.S. longline fleets established by the WCPFC, vessels would be prohibited from retaining on board, landing, or transshipping any catch of bigeye tuna in the limit's area of application, once the limit has been reached for the calendar year, except that any bigeye tuna already on board a vessel at the time of the prohibition may be retained on board and landed and any captured bigeye tuna could be landed in the Territory of American Samoa, the Territory of Guam, or the CNMI, provided that it was not caught in the portion of the U.S. EEZ surrounding the Hawaiian Archipelago and that it is landed by a U.S. fishing vessel operated in compliance with a valid permit issued under the Pelagics FMP or West Coast HMS FMP. In other words, this alternative would differ from Alternative 2 only in that fishing vessels would be allowed to continue longlining in the affected area after the limit is reached, provided that no bigeye tuna are retained or landed.

This alternative would be expected to cause changes to the fishing patterns and practices of the Hawaii longline fleet. If and when the maximum allowable amount of bigeye tuna landings is reached in a given year, affected fishing businesses would be expected to cease fishing for the remainder of the calendar year or shift from deep-setting for bigeye tuna in the WCPO to the next best opportunity. Although those opportunities cannot be predicted with certainty, three opportunities that would appear to be attractive to vessels in the fishery include shallow-setting (i.e., for swordfish), deep-setting for bigeye tuna in other areas, specifically the EPO, and deep-set longline fishing in the Convention Area for species other than bigeye tuna. Making such shifts would bring opportunity costs to the affected fishing operations, but the magnitude of those costs cannot be projected. Unlike Alternative 2, this alternative would also allow vessels to continue deep-setting in the Convention Area, provided they do not retain or land any bigeye tuna. It is not known whether fishing in such a manner would be economically viable. Given the lack of this kind of fishing activity historically, it would appear to be more costly than shallow-setting or deep-setting for bigeye tuna in the EPO.

As for Alternative 2, because the limit would be set on a calendar year basis, the "race to fish" effect would be expected at the beginning of the calendar year, and the prohibitions would be expected to go into effect at the end of the calendar year. This race to fish effect could also be expected in the time period between when announcement of the prohibition is made and when the prohibition takes place, leading to the same potential safety and operational effects that could be caused by Alternative 2.

This alternative would also be expected to bring costs to the affected fishing operations (e.g., through lost revenues and/or opportunity costs), as well as economic impacts to forward- and backward-linked economic sectors, including businesses that supply fishing vessels and businesses that market the fish they catch. As mentioned above, detailed discussion of these economic impacts is included in the RIR for the rule.

4.2.4 Alternative 4: Closure of the Deep-Set and Shallow-Set Sectors

Under Alternative 4, in order to ensure the timely implementation of the WCPO bigeye tuna catch limit for the U.S. longline fishery established by the WCPFC, both the shallow-set and deep-set components would be closed once the limit has been reached for the calendar year (i.e., no U.S. vessels would be allowed to conduct longline fishing operations in the limit's area of application), except that any bigeye tuna already on board a vessel at the time of the closure may be retained on board and landed and any captured bigeye tuna could be landed in the Territory of American Samoa, the Territory of Guam, or the CNMI, provided that it was not caught in the portion of the U.S. EEZ surrounding the Hawaiian Archipelago and that it is landed by a U.S. fishing vessel operated in compliance with a valid permit issued under the Pelagics FMP or West Coast HMS FMP.

This alternative would be expected to cause changes to the fishing patterns and practices of the Hawaii longline fleet. If and when the maximum allowable amount of bigeye tuna landings is reached in a given year, affected fishing businesses would be expected to cease fishing for the remainder of the calendar year or shift from deep-setting and shallow-setting in the WCPO to the next best opportunity. Although those opportunities cannot be predicted with certainty, one opportunity that would appear to be attractive to vessels in the fishery is deep-setting for bigeye tuna in other areas, specifically the EPO. Making such shifts would bring opportunity costs to the affected fishing operations, but the magnitude of those costs cannot be projected.

Because the limit would be set on a calendar year basis, the same "race to fish" effects discussed for Alternatives 2 and 3 would be expected. This alternative would also be expected to bring costs to the affected fishing operations (e.g., through lost revenues and/or opportunity costs), as well as economic impacts to forward- and backward-linked economic sectors, including businesses that supply fishing vessels and businesses that market the fish they catch. As mentioned above, detailed discussion of these economic impacts is included in the RIR for the rule.

4.3 Bigeye and Yellowfin Tuna and Principal Target Stocks

This section begins with the impact analysis for bigeye tuna and yellowfin tuna from the alternatives assessed for each of the proposed rules, because both rules focus on limiting the fishing mortality of bigeye tuna and yellowfin tuna.

The section then presents the impact analysis for other principal target stocks of the U.S. WCPO purse seine and longline fisheries, because (although bigeye tuna is not a principal target stock of the U.S. WCPO purse seine fleet), the impacts to these stocks would be similar to the impacts to bigeye tuna and yellowfin tuna.

4.3.1 Alternative A: No-Action Alternative for the U.S. Purse Seine Rule

Under Alternative A, the U.S. purse seine fleet would continue to be managed through existing requirements, and the provisions of the proposed rule would not be implemented. As discussed in Chapter 3, Section 3.4, WCPO bigeye tuna has been determined to be subject to overfishing, and the fishing mortality rate of WCPO yellowfin tuna is believed to be very close to the overfishing threshold. Thus, under Alternative A, the No-Action or baseline alternative, WCPO bigeye and yellowfin tuna stocks could decline to sizes smaller than that which is capable of producing MSY. However, as stated above, many other factors affect the stock status of WCPO bigeye and yellowfin tuna and implementation of the proposed rule under any of the alternatives would not substantially change the fishing practices and patterns of the fleet. Thus, the status of the stocks under the No-Action Alternative would not differ substantially from any of the action alternatives. Under this alternative, however, the minor beneficial effects that the stocks could experience from implementation of the proposed rule under any of the action alternatives would not occur. Thus, there could be some increased potential for long-term negative effects to the stocks over the action alternatives, although such effects cannot be predicted with certainty.

4.3.2 Impacts to Bigeye Tuna and Yellowfin Tuna from the Proposed U.S. Purse Seine Rule – Alternative B

Overall, Alternative B would likely lead to some beneficial impact on the WCPO stocks of bigeye and yellowfin tuna by reducing the fishing mortality on predominantly the juvenile stocks of yellowfin tuna and bigeye tuna during the FAD prohibition periods and possibly by reducing the fishing mortality on the same juvenile tuna through the catch retention requirement. The FAD prohibition periods would likely have some potentially negative effect on the WCPO stock of yellowfin tuna by increasing the fishing mortality on the stock as a result of targeting large unassociated tunas. This negative impact would be ameliorated by reduced catches of both juvenile yellowfin tuna and bigeye tuna, which may have a chance to move or recruit to a deeper, non-predominantly FAD associated life cycle that would provide benefits both in terms of more (larger yellowfin tuna) available to unassociated fishing as well as to the longline fishery. There could also be some as yet impossible to quantify benefits of reduced fishing mortality on juvenile yellowfin tuna through the catch retention requirement. Overall, it is likely that the indirect effects of Alternative B on WCPO bigeye and yellowfin tuna stocks would be beneficial. However, these beneficial effects would be relatively small, because: (1) the duration of the FAD prohibition periods is only three years and the catch retention requirement would be implemented for a maximum of two years; and (2) this alternative would result in only a small reduction in the fishing mortality contributed by the U.S. purse seine fleet.

As discussed in Chapter 3, section 3.5.2, both adult bigeye tuna and adult yellowfin tuna are considered among the top predators of the tropical or warm pool marine ecosystem. Changes to the WCPO stocks of these species could lead to trophic interactive effects, including increased competition for prey species with other top predators. Larval and juvenile bigeye tuna and yellowfin tuna are also sources of food for other marine species, such as fish, seabirds, porpoises, marine mammals, and sharks. Thus, increases in larval and juvenile tuna could increase the food available for these other species. It is unlikely that the effects of Alternative B to the WCPO stocks of bigeye and yellowfin tuna, which would be short-lived, would be large enough to impact the marine ecosystem. There are those who have postulated that the robustness of the WCPO skipjack stocks may in part be due to the reduction in biomass of adult bigeye tuna and yellowfin tuna – both of which are known to be voracious feeders on all forms of small fish including skipjack tuna. A return to higher biomass levels of these two stocks may lead to a reduction in the WCPO skipjack biomass, but this would be unlikely to occur from implementation of the proposed rule under Alternative B. Overall, Alternative B would not cause substantial effects on biodiversity and ecosystem function.

4.3.3 Impacts to Bigeye Tuna and Yellowfin Tuna from the Proposed U.S. Purse Seine Rule – Alternatives C, D, and E

Under Alternative C and E, the impacts to the WCPO stocks of bigeye and yellowfin tuna would be essentially the same as the impacts under Alternative B.

Under Alternative D there would be no flexibility in the number of fishing days available to U.S. purse seine owners and operators. In the years where fishing conditions allowed for more catch of bigeye and yellowfin tuna than in typical years (due to ocean conditions, climate conditions, or market conditions), less bigeye and yellowfin tuna catch would be expected under Alternatives D than under the Alternatives B, C, or E. Overall, the fishing mortality of bigeye and yellowfin tuna would likely be less under Alternative D than under B, C, or E because under Alternative D it would be more likely that the fishing day effort limit would be reached and the fishery closed in a given year. Alternative D would also set the limit at the start of the license period as opposed to the calendar year, meaning that the impacts from the “race to fish” would be experienced at a different time. However, because the fishery operated year round, timing of the “race to fish” would be unlikely to impact the tunas stocks. Moreover, given that the effort limit would in place for a three-year period, the differences between the alternatives in terms of effects to WCPO bigeye tuna and yellowfin tuna would not be substantial.

4.3.4 Alternative 1: The No-Action Alternative for the U.S. Longline Rule

Under Alternative 1, the U.S. longline fleets would continue to be managed through existing requirements, and the provisions of the proposed rule would not be implemented. As discussed in Chapter 3, Section 3.4, overfishing of the WCPO bigeye tuna stock is likely occurring, meaning that if it continues, the stock size can be expected to decline to levels smaller than those needed to produce MSY. However, as stated above, many other factors affect the stock status of WCPO bigeye tuna and implementation of the proposed rule under any of the alternatives would not substantially change the fishing practices and patterns of the fleets. Thus, the status of WCPO bigeye tuna under the No-Action

Alternative would be similar to the status of the stocks under any of the action alternatives analyzed in this EA. Under this alternative, however, the minor beneficial effects that the stocks could experience from implementation of the proposed rule under any of the action alternatives would not occur. Thus, there could be some increased potential for long-term negative effects to the stocks over the action alternatives, although such effects cannot be predicted with certainty. The analysis in the RIR indicates that implementation of the proposed rule under any of the alternatives would have the potential to reduce the stock's total fishing mortality rate by about one half of one percent.

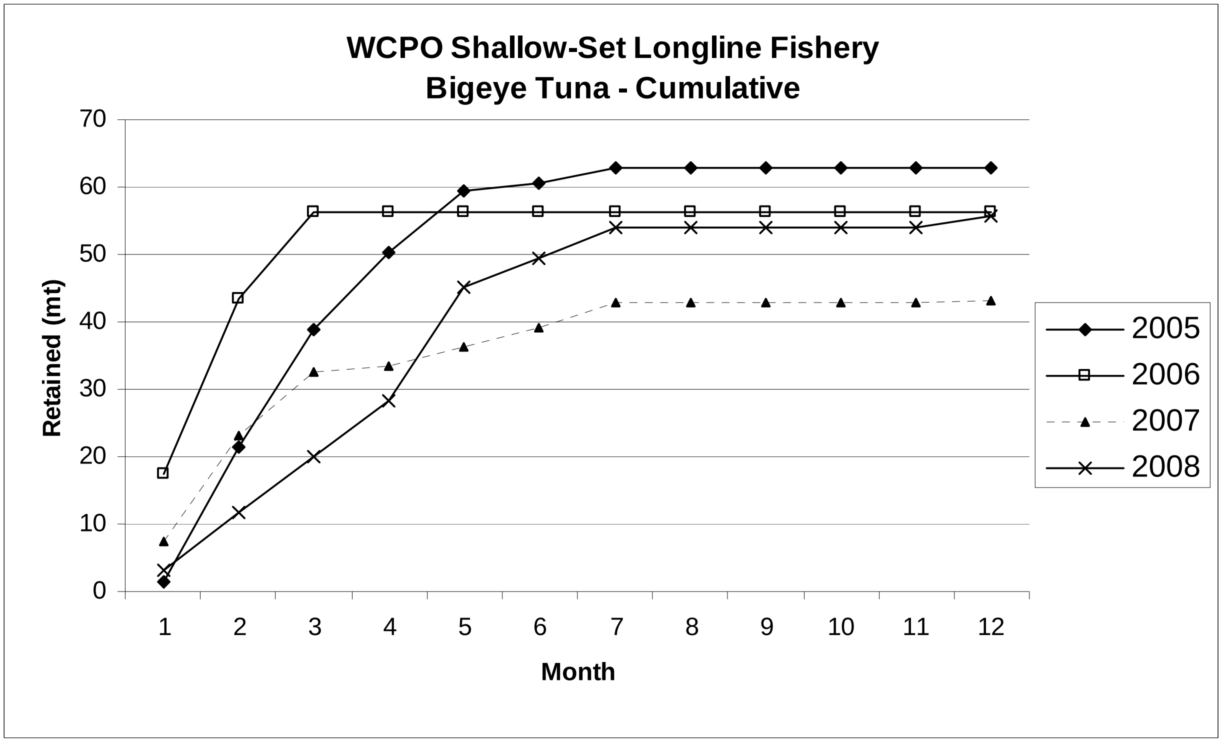
4.3.5 Alternative 2: Action Alternative for the U.S. Longline Rule, Closure of the Deep-Set Sector of the Fishery

Under Alternative 2, as soon as the bigeye tuna limit for bigeye tuna established by the WCPFC is reached for a given calendar year, U.S. longline vessels would not be able to conduct any deep-set fishing activities in the Convention Area, or retain on board or land or transship any catch of bigeye or yellowfin tuna caught in the Convention Area (except for fish that were taken before the limit was reached), unless the catch is landed in the Territory of American Samoa, the Territory of Guam, or the CNMI, provided that it was not caught in the portion of the U.S. EEZ surrounding the Hawaiian Archipelago and that it is landed by a U.S. fishing vessel operated in compliance with a valid permit issued under the Pelagics FMP or West Coast HMS FMP.

Alternative 2 would likely lead to a direct reduction in fishing mortality on WCPO bigeye tuna and yellowfin tuna, and thus, would have direct beneficial impacts on the stocks. However, those impacts are likely to be negligible because: (1) the limit would be in effect for only three years, after which fishing rates and fishing mortality rates contributed by the U.S. longline fisheries on the two stocks would be expected to rebound to the levels under No-Action; and (2) as stated above, under Alternative 2, after the limit is reached, longline vessels could transfer their effort to other areas, such as the EPO, mitigating any diminishing effect of the closure on fishing mortality rates (as stated in Section 3.4, the stock structure of bigeye tuna in the Pacific Ocean is not well known, but there is some degree of mixing between the EPO and WCPO, so any fishing mortality in the EPO would likely affect the status of the stock in the WCPO). Moreover, the stock of EPO yellowfin tuna is subject to overfishing. Although there is not a distinct boundary between WCPO yellowfin tuna and EPO yellowfin tuna, an increase in effort on EPO yellowfin tuna could lead to additional adverse (but again, very minor) effects on this stock. There could also be some transfer of effort to the shallow-set fishery, but the amount of bigeye tuna incidentally caught (and discarded) in the shallow-set fishery would likely be very small.

Figure 11 below shows the amount of bigeye tuna landings from the shallow-set sector of the fishery from 2005 to 2008. The effects on the stocks would be so minor under this alternative, that any effects to ecosystem function and biodiversity would not be expected.

Figure 11 Bigeye tuna in the WCPO shallow-set fishery, cumulative by month, 2005-2008



Source: NMFS unpublished data, compiled by the Pacific Islands Fisheries Science Center.

4.3.6 Alternative 3: Action Alternative for the U.S. Longline Rule, No Retention, Landing, or Transshipping of Bigeye Tuna

Under Alternative 3, as soon as the bigeye tuna limit is reached in a given calendar year, U.S. longline vessels would not be able to retain or land or transship any catches of bigeye tuna made in the Convention Area (except for fish that were taken before the limit was reached), unless the catch is landed in the Territory of American Samoa, the Territory of Guam, or the CNMI, provided that it was not caught in the portion of the U.S. EEZ surrounding the Hawaiian Archipelago and that it is landed by a U.S. fishing vessel operated in compliance with a valid permit issued under the Pelagics FMP or West Coast HMS FMP.

Alternative 3 would have effects on WCPO bigeye tuna similar to those of Alternative 2. Any beneficial impacts, however, could be somewhat less than under Alternative 2, since the longline vessels could still be used to both deep-set and shallow-set in the Convention Area, provided that no bigeye tuna is retained, landed, or transshipped. As stated above, the amount of bigeye tuna incidentally caught (and discarded) in the shallow-set fishery would likely be very small. However, given that bigeye tuna is one of the most commonly caught species in the deep-set fishery, it is likely (unless fishing methods are radically modified to reduce catch rates) that substantial amounts of bigeye tuna would be caught in any deep-setting that occurs in the Convention Area after the limit is reached.

The opportunity costs of deep-setting for species other than bigeye tuna is not known; that is, it is not known whether it would be an economically viable activity for any of the affected vessels. The opportunity cost of simply shifting to the EPO to deep-set for bigeye would seem to be almost certainly less, so substantial deep-setting in the Convention Area after the limit is reached would not be expected.

The beneficial impacts to WCPO yellowfin tuna under this alternative would be less than under Alternative 2, since yellowfin tuna could continue to be retained, landed, and transshipped. However, as for Alternative 2, the effects on WCPO bigeye tuna and WCPO yellowfin tuna would so minor, that any effects to ecosystem function and biodiversity would not be expected.

4.3.7 Alternative 4: Action Alternative for the U.S. Longline Rule, Closure of the Deep-set and Shallow-set Sectors of the Fishery

Under Alternative 4, as soon as the bigeye tuna limit is reached in a given calendar year, U.S. longline vessels would not be able to conduct any longline fishing in the Convention Area, or retain on board and land or transship any catch of bigeye tuna and yellowfin tuna captured in the Convention Area, unless the catch is landed in the Territory of American Samoa, the Territory of Guam, or the CNMI, provided that it was not caught in the portion of the U.S. EEZ surrounding the Hawaiian Archipelago and that it is landed by a U.S. fishing vessel operated in compliance with a valid permit issued under the Pelagics FMP or West Coast HMS FMP.

Alternative 4 would have effects on WCPO bigeye tuna and WCPO yellowfin tuna similar to those of Alternative 2. Any beneficial impacts, however, would likely be slightly greater than those of Alternatives 2 or 3. Because both the deep-set and shallow-set components of the fishery would be closed, there would be no risk that any WCPO bigeye tuna or yellowfin tuna would be captured incidentally after the fishery is closed. However, as for Alternatives 2 and 3, the effects on WCPO bigeye tuna and WCPO yellowfin tuna would be so minor, that any effects to ecosystem function and biodiversity would not be expected.

4.3.8 Impacts to Other Principal Target Stocks from the U.S. Purse Seine Rule

Skipjack tuna is the other principal target stock of the U.S. WCPO purse seine fishery. The impacts to the WCPO stock of skipjack tuna from the proposed purse seine rule under any of the alternatives would be similar to the impacts experienced by the WCPO stocks of bigeye and yellowfin tuna. As discussed above, studies have predicted that the FAD prohibition periods could lead to a 6.5% reduction in the overall average catch of skipjack tuna in the Convention Area in the long term. The catch retention requirement could also reduce the amount of juvenile skipjack tuna caught; because vessels would be unable to discard small-sized fish, they would have more incentive to target large-sized fish. However, because the size and species composition of landed fish are affected by many variations unrelated to the proposed rule (changes in ocean conditions, changes in climate, fuel prices, market conditions, etc.), the impacts from the proposed rule to skipjack tuna could be offset by these other factors.

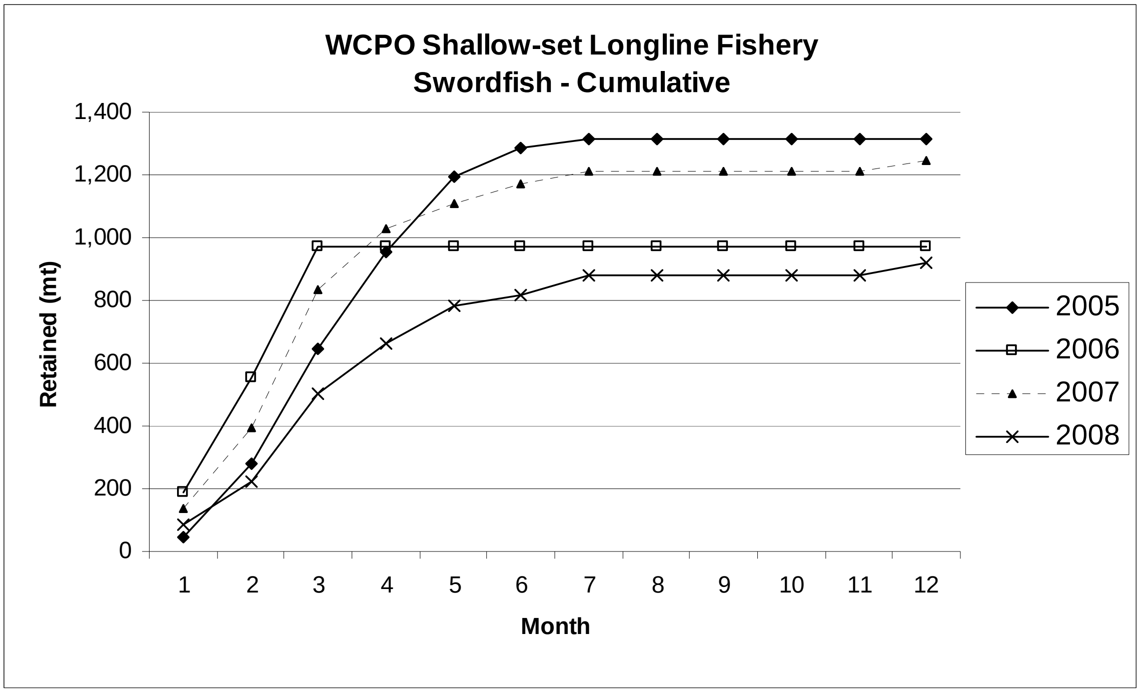
The FAD prohibition periods are projected to have a beneficial effect on the WCPO stock of skipjack tuna by decreasing the fishing mortality on the stock, which would be enhanced by the reduction in fishing mortality on juvenile skipjack tuna through the catch retention requirement.

Under Alternative A, the No-Action Alternative, the WCPO stock of skipjack tuna would not experience these small potential beneficial effects. The effects to the stock under Alternatives C and E would essentially be the same as the effects under Alternative B. Under Alternative D there would be no flexibility in the number of fishing days available under these alternatives. In the years where fishing conditions allowed for more catch of skipjack tuna than in typical years (due to ocean conditions, climate conditions, or market conditions), less skipjack tuna catch would be expected under Alternative D than under Alternatives B, C, or E. Overall, the fishing mortality of WCPO skipjack tuna would likely be less under Alternative D than under B, C, or E, because under Alternative D it would be more likely that the fishing day effort limit would be reached and the fishery closed in a given year.

4.3.9 Impacts to Other Principal Target Stocks from the U.S. Longline Rule

The other principal target stock for U.S. longline fleets in the Convention Area is swordfish. Under Alternative 1, the No-Action Alternative, there would be no effects to the swordfish stock. Under Alternative 2, the shallow-set sector of the longline fishery, which targets swordfish, would remain open, so there would likely be slightly increased fishing mortality of swordfish. As stated in Chapter 3, the stock status of swordfish is currently neither overfishing nor overfished, so it is unlikely that such an increase would cause detrimental impacts to the stock. Moreover, as shown in Figure 12 below, in the Convention Area for the years 2005-2008, the majority of swordfish was landed by the fleets in the beginning of the calendar year. Therefore, since any closure of the deep-set sector would take place toward the end of the calendar year, it is unlikely that any shift in effort to the shallow-set sector would cause large increases in swordfish mortality.

Figure 12 Retained catch of swordfish by U.S. fleets in the WCPO shallow-set longline fishery



Source: NMFS unpublished data, compiled by the Pacific Islands Fisheries Science Center.

Under Alternative 3, although both the shallow-set and deep-set sectors of the fishery would remain open, it is likely that there would be some transfer of effort to the shallow-set sector to target swordfish. So the effects to the stock under this alternative would be the same as under Alternative 2.

Under Alternative 4, both the shallow-set and deep-set sectors of the fishery would be closed, so there would be no shift in fishing effort to target swordfish.

4.4 Secondary Target Stocks

This section discusses the principal effects from each of the proposed rules to the secondary target stocks of the affected fisheries.

4.4.1 Effects to Secondary Target Stocks from the U.S. Purse Seine Rule

4.4.1.1 Alternative A

Under Alternative A, the No-Action Alternative to the purse seine rule, there would be no additional effects to secondary target stocks.

4.4.1.2 Action Alternatives for the U.S. Purse Seine Rule

Under Alternatives B, C, and E for the proposed rule, there could be some change in the amount and type of secondary target stocks caught by the U.S. WCPO purse seine fleet. As discussed above, during the FAD prohibition periods, the fleet may fish in different areas than fished historically, which would affect the composition of the catch, including both target stocks and secondary target stocks, and there could be some shift in effort to PIC EEZs. If the proposed rule under any of these alternatives leads to the catch of larger amounts of secondary target stocks, the catch retention requirements could counteract potential negative effects to these species. Under the provisions of the catch retention requirement, vessels would have less well space for secondary target stocks, since they would have to retain all catch of their target species (skipjack, bigeye, and yellowfin tuna). Moreover, any decrease in overall fishing effort could also have beneficial impacts to these species.

Under Alternative D, there would be no flexibility in the number of fishing days available. In the years where fishing conditions allowed for more catch of secondary target stocks than in typical years (due to ocean conditions, climate conditions, or market conditions), less catch from these stocks would be expected under Alternative D than under Alternatives B, C, or E.

4.4.2 Effects to Secondary Target Stocks from the U.S. Longline Rule

None of the alternatives are anticipated to cause large changes to the overall amount of secondary target stocks currently caught by the U.S. longline fleets operating in the Convention Area. Under Alternative 1, the No-Action Alternative, there would be no change to existing conditions. Under Alternative 2, the deep-set sector of the fishery would be closed in the Convention Area, so there could be some transfer of fishing effort to the shallow-set sector and to other areas, such as the EPO; so similar amounts of secondary target stocks would be expected as under existing conditions. Under Alternative 3, both the deep-set and shallow-set sectors of the fishery would remain open; any transfer of effort would be expected to result in catch of secondary target stocks that is similar to existing conditions. Under Alternative 4, although both sectors of the fishery would be closed, transfer of effort to other areas, such as the EPO, would be expected, and thus, the amount of catch of secondary target stocks would also be expected to remain similar to existing conditions. Should vessels cease fishing during a prohibition or closure period, effects to secondary target stocks would be beneficial.

The U.S. longline fleets that would be affected by the proposed rule (the Hawaii and west coast-based fleets) do not currently target albacore. However, as stated in Chapter 3, longlining is one of the main fishing methods for targeting this species. The stock status (with respect to the status determination criteria established under the MSA, and as determined by NMFS) of North Pacific albacore tuna is currently unknown, while the stock status of South Pacific albacore tuna is neither overfished nor subject to overfishing.

In 2005, the WCPFC adopted two CMMs regarding albacore: CMM 2005-02, Conservation and Management Measure for South Pacific Albacore; and CMM 2005-03, Conservation and Management Measure for North Pacific Albacore. The WCPFC has found that the stock of albacore tuna in the North Pacific is either fully exploited or experiencing fishing mortality greater than long-term sustainable levels. Accordingly, CMM 2005-02 requires CCMs to ensure that fishing effort directed at albacore tuna in the North Pacific does not increase. As stated above, under Alternative 3, the affected fleets could shift their fishing effort to targeting other species, such as albacore tuna, in the Convention Area. Should the proposed rule under this alternative cause U.S. longline fleets to shift their fishing effort from targeting bigeye tuna to targeting albacore tuna, NMFS would have to evaluate the fishing effort directed at albacore tuna in light of the obligations of the United States under the CMM and possibly consider regulatory action with respect to North Pacific albacore tuna.

4.5 Protected Resources

This section discusses the potential impacts from each of the proposed rules to protected resources in the affected environment.

4.5.1 Impacts to Protected Resources from the Proposed U.S. Purse Seine Rule

4.5.2 Alternative A

Under Alternative A, the No-Action Alternative to the purse seine rule, there would be no additional effects to protected resources, and the provisions to mitigate impacts to sea turtles from U.S. WCPO purse seine fishing activities would not be implemented.

4.5.3 Action Alternatives for the U.S. Purse Seine Rule

Chapter 3, Section 3.6, identifies the species in the Convention Area listed as threatened or endangered under the ESA. Table 14 lists the marine mammals in the Convention Area that are protected pursuant to the MMPA.

As stated above and in Chapter 3, the number of observed interactions between sea turtles and U.S. WCPO purse seine vessels are very limited and in most instances result in the animal being released alive and in good condition. The proposed rule under the action alternatives B, C, D, and E would have the following effects: (1) the FAD prohibition periods and the catch retention requirement would affect the size and species composition of landed fish; (2) the fishing day effort limit and high seas area closures could lead to an increase in fishing effort in PIC EEZs in the WCPO and a slight overall reduction in fishing effort; and (3) the FAD prohibition periods could transfer some fishing effort from FAD sets to unassociated sets during the prohibition period and possibly shift fishing effort from the FAD prohibition period to other periods of the year. As discussed above, overall, the changes to the fishing practices and patterns of the fleet under these alternatives are not expected to be substantial. The proposed rule under these alternatives would also contain specific provisions to mitigate the effects on sea turtles from U.S. WCPO purse seine fishing operations. Thus, the overall effects to sea turtles from the proposed rule under any of these alternatives would be beneficial – even if just for that very small portion of turtles that are reported to be harmed as a result of interaction with the purse seine fleet's fishing operations. To the extent that there could be a slight reduction in fishing effort, any effects to ESA-listed species or critical habit of these species would be beneficial, since there would be a reduced risk of interaction with the protected resource.

The Final Biological Opinion and Incidental Take Statement for the U.S. WCPO purse seine fishery for effects to ESA-listed sea turtles and marine mammals was issued on November 1, 2006, concluding formal Section 7 ESA consultation for species under the jurisdiction of NMFS. The terms and conditions of the Incidental Take Statement are very similar to the provisions of CMM 2008-03 that would be implemented through the proposed rule. By letter dated January 28, 2009, the USFWS concurred with NMFS' determination that a proposed regulation that would not alter U.S. purse seine fishing practices or fishing effort would not be likely to adversely affect ESA-listed species under the jurisdiction of USFWS. The proposed rule under these alternatives would not cause any impacts to ESA-listed threatened or endangered species that have not been addressed in prior consultations.

The proposed rule under any of these alternatives also would not cause any impacts to marine mammals not previously considered or authorized by the commercial taking exemption under section 118 of the MMPA. The changes to the fishing practices and patterns of the fleet under these alternatives are not expected to be substantial and to the extent that there could be a slight reduction in fishing effort, any effects to marine mammals would be beneficial, since there would be a reduced risk of interaction.

The proposed rule under any of these alternatives would not cause any impacts to the NWRs or National Monuments described in Chapter 3, Section 3.6.3. Any geographical shifts in fishing effort would be minor and increased fishing effort would not be expected to affect these areas (the possible increases in fishing effort would be expected in PIC EEZs).

The proposed rule under any of these alternatives would not cause any adverse impacts to areas designated as EFH or HAPC, as described in Chapter 3, Section 3.6.2, or to ocean and coastal habitats. The proposed rule under any of these alternatives would not cause changes to overall fishing practices, and any geographical shifts in fishing effort would be minor and would not occur in areas designated as EFH (the possible increases in fishing effort would be expected in PIC EEZs).

4.5.4 Impacts to Protected Resources from the U.S. Longline Rule

Under Alternative 1, the No-Action Alternative, there would be no change to existing conditions, and thus, no impacts to protected resources than those presently assessed under current management measures.

Alternatives 2, 3, and 4 could each lead to a shift of fishing effort to other areas and to other species. If this transfer of fishing effort leads to an increase in fishing activity in areas where there is a greater incidence of protected resources, the potential for the fleet to interact with protected resources could be increased. However, any effects in terms of catches and fishing mortality rates to protected species are expected to be small compared to, for example, typical year-to-year variations in catches among species driven by changing oceanic and economic conditions. Thus, any shift that may occur as a result of Alternatives 2, 3, and 4 would be minor. To the extent that there could be a slight reduction in fishing effort, any effects to ESA-listed species or critical habit of these species would be beneficial, since there would be a reduced risk of interaction with the protected resource.

NMFS has completed several previous ESA consultations for the U.S. longline fishery in the Convention Area. They are as follows:

(1) Biological Opinion on Adoption of (1) proposed HMS FMP; (2) continued operation of HMS fishery vessels under permits pursuant to the HSFCA; and (3) ESA regulation on the prohibition of shallow longline sets east of the 150° West longitude (NMFS 2004a).

(2) Biological Opinion for the FMP for U.S. West Coast Fisheries for HMS and its effect on the endangered short-tailed albatross (*Phoebastria albatrus*) and the endangered brown pelican (*Pelecanus occidentalis*) (USFWS 2004).

(3) Biological Opinion on Continued Authorization of the Hawaii-based Pelagic, Deep-Set, Tuna Longline Fishery based on the FMP for Pelagic Fisheries of the Western Pacific Region (NMFS 2005b).

(4) Biological Opinion on Management Modifications for the Hawaii-based Shallow-set Longline Swordfish Fishery – Implementation of Amendment 18 to the FMP for Pelagic Fisheries of the Western Pacific Region (NMFS 2008c).

(5) Biological Opinion for the Effects of the Hawaii-based Domestic Longline Fleet on the Short-tailed Albatross (*Phoebastria albatrus*) (USFWS 2002).[54]

The proposed rule under these alternatives would not cause any impacts to ESA-listed threatened or endangered species that have not been addressed in prior or ongoing consultations.

As stated in Chapter 3, pursuant to the regulations implementing the MMPA at 50 CFR Part 229, the Hawaii longline fishery is classified as a Category I fishery. This means that

[54] The Incidental Take Statement in this biological opinion expired on December 31, 2006; USFWS and NMFS are currently consulting regarding impacts of the longline fishery to the short-tailed albatross and expect this consultation to be completed by the end of 2009. See Informal Consultation for the Western and Central Pacific Fisheries Convention Implementation Act Proposed Rulemaking, Letter from USFWS to NMFS, January 28, 2009.

the fishery has the potential for frequent incidental mortality and serious injury to marine mammals. However, it is unlikely that the proposed action would affect the number of interactions between the fishery and marine mammals. As discussed above, any effects in terms of catches and fishing mortality rates to protected species from shifts in fishing effort from the action alternatives are expected to be small compared to, for example, typical year-to-year variations in catches among species driven by changing oceanic and economic conditions.

The proposed rule under any of these alternatives would not cause any impacts to the NWRs or National Monuments described in Chapter 3, Section 3.6.3. Any geographical shifts in fishing effort would be minor and would not be expected to affect these areas.

The proposed rule under any of these alternatives would not cause any adverse impacts to areas designated as EFH or HAPC, as described in Chapter 3, Section 3.6.2, or to ocean and coastal habitats. The proposed rule under any of these alternatives would not cause changes to overall fishing practices, and any geographical shifts in fishing effort would be minor.

4.6 Environmental Justice

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," states 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." As discussed above, the overall environmental effects from each of rules under any of the alternatives would be minor and beneficial and generally would be distributed evenly among the affected vessels. Thus, none of the alternatives considered would result in significant and adverse effects on minority or low-income populations.

Chapter 5

Chapter 5 Cumulative Impacts

This chapter presents the cumulative impacts analysis for the Proposed Action. The Proposed Action would involve the implementation of two distinct rules. As set forth in Chapter 2, one rule would implement six management provisions for the U.S. WCPO purse seine fishery and the other rule would ensure NMFS' timely implementation of the bigeye tuna catch limit established by the WCPFC for U.S. longline fleets.

A cumulative impact is defined by the CEQ's regulations at 40 CFR § 1508.7 as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." And further: "cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

Before beginning a cumulative impacts analysis, the geographic area of the analysis and the time frame for the analysis must be identified to determine the appropriate scope for the analysis (CEQ 1997). The geographic area of the analysis here is the Pacific Ocean area as described in Chapter 3 and in Section 5.1.1. The time frame for this analysis is from the present to some years into the future.

5.1 Affected Environment

Chapter 3 describes the affected environment that potentially could be affected by the Proposed Action under any of the alternatives studied in depth. Chapter 3 sets forth the baseline for assessing the direct and indirect impacts of the Proposed Action, as presented in Chapter 4. This section supplements the information in Chapter 3 in order to establish the baseline for studying the other actions that are part of the cumulative impacts analysis. The section provides information on the fisheries that are active in the area of application of the Convention.

5.1.1 Convention Area HMS Fisheries

The dominant HMS fisheries in the Convention Area are tuna fisheries that target skipjack tuna, yellowfin tuna, bigeye tuna, and albacore tuna. Many distant-water fishing nations and coastal states participate and operations vary from small-scale, subsistence, and artisanal operations in the coastal waters of PIC, to industrial scale operations both in the EEZs of PIC and on the high seas.

HMS fisheries in the Convention Area are individually managed under a number of international agreements and associated domestic authorities. Catch and effort information is compiled by the OFP at the SPC as the scientific and data support provider to the WCPFC for most fisheries. The WCPFC Tuna Yearbook, produced by the OFP at SPC, summarizes this information and is available to the public (SPC website at: http://www.spc.int/oceanfish/Docs/Statistics/TYB.htm). Table 22 through Table 25 below summarize relevant data, such as, total catch by species, catch by gear, catch by nation, and number of active vessels.

Williams and Reid (2007) summarized the Convention Area HMS fishery in the following terms:

> Annual total catches of the four main tuna species (skipjack, yellowfin, bigeye, and albacore tuna) in the Convention Area increased steadily during the 1980s as the purse seine fleet expanded and remained relatively stable during most of the 1990s until the sharp increase in catch during 1998. During recent years, there has been an increasing trend in total tuna catch, primarily due to increases in purse-seine fishery catches. The provisional total Convention Area tuna catch for 2006 was estimated at 2,189,985 metric tons, the second highest annual catch recorded, and only slightly less than the record in 2005 (2,204,335 metric tons). During 2006, the purse seine fishery accounted for an estimated 1,573,447 metric tons (72% of the total catch–only 12,000 metric tons less than the record catch of 2005), with pole-and-line taking an estimated 211,829 metric tons (10%), the longline fishery an estimated 229,323 metric tons (10%), and the remainder (8%) taken by troll gear and a variety of artisanal gears, mostly in eastern Indonesia and the Philippines. The Convention Area tuna catch (2,189,985 metric tons) for 2006 represented 78% of the total Pacific Ocean catch of 2,800,740 metric tons and 51% of the global tuna catch (the provisional estimate for 2006 is just over 4.3 million metric tons).

Table 22 Tuna catches in WCPFC Statistical Area by species (in metric tons)

Year	Albacore	%	Bigeye	%	Skipjack	%	Yellowfin	%	Total
1996	92,032	6	92,412	6	1,022,589	67	322,072	21	1,529,105
1997	113,874	7	120,895	7	965,188	59	440,958	27	1,640,915
1998	112,997	6	122,161	6	1,309,692	65	462,769	23	2,007,619
1999	131,227	7	122,150	7	1,175,558	64	402,589	22	1,831,524
2000	101,894	5	124,234	7	1,238,181	65	430,147	23	1,894,091
2001	117,069	7	115,098	6	1,137,011	63	425,924	24	1,795,102
2002	146,196	7	130,302	7	1,312,991	66	408,900	20	1,998,389
2003	124,842	6	117,968	6	1,315,246	66	441,539	22	1,999,595
2004	122,331	6	156,348	8	1,404,977	68	374,844	18	2,058,500
2005	100,405	5	137,388	6	1,504,770	69	438,249	20	2,180,610
2006	104,405	5	139,061	6	1,566,472	70	439,756	20	2,249,694
2007	94,819	4	142,974	6	1,697,856	72	434,900	18	2,370,549
Current 5 year average	109,360	5.2	138,748	6.4	1,497,864	68.5	425,858	19.6	2,171,790

Source: Lawson, 2008, Table 90.

Table 23 Tuna catches in WCPFC Statistical Area by gear (albacore, bigeye, skipjack, and yellowfin tuna, in metric tons)

Year	Longline	%	Pole & Line	%	Purse seine	%	Troll	%	Other	%	Total
1996	200,673	13	251,053	16	909,963	60	11,071	1	156,345	10	1,529,105
1997	217,089	13	273,844	17	993,681	61	8,848	1	147,453	9	1,640,915
1998	237,527	12	282,965	14	1,309,065	65	9,970	0	168,092	8	2,007,619
1999	206,998	11	302,239	17	1,144,752	63	6,417	0	171,118	9	1,831,524
2000	226,144	12	261,937	14	1,198,461	63	9,472	1	198,077	10	1,894,091
2001	236,038	13	207,300	12	1,175,404	65	7,790	0	168,092	9	1,795,102
2002	258,242	13	216,945	11	1,329,683	67	7,397	0	186,122	9	1,998,389
2003	241,296	12	221,676	11	1,327,211	66	8,802	0	200,610	10	1,999,595
2004	262,613	13	203,903	10	1,412,443	69	7,362	0	172,179	8	2,058,500
2005	232,210	11	213,050	10	1,565,218	72	5,856	0	164,276	8	2,180,610
2006	247,801	11	217,736	10	1,604,489	71	4,741	0	174,927	8	2,249,694
2007	230,479	10	214,735	9	1,715,702	72	4,230	0	205,403	9	2,370,549
Current 5 year average	242,880	11.4	214,220	10	1,525,013	70	6,198	0	183,479	8.6	2,171,790

Source: Lawson, 2008, Table 96.

Table 24 2007 Tuna catches in WCPFC Statistical Area by nation/territory/fishing entity (albacore, bigeye, skipjack, and yellowfin tuna, in metric tons)

Japan	468,104	Fiji	10,042
Philippines	368,518	Kiribati	18,020
Indonesia	322,170	French Polynesia	6,596
Chinese Taipei	276,458	Spain	19,747
Korea	278,482	Australia	4,735
Papua New Guinea	222,624	Cook Islands	2,826
United States of America	87,061	New Caledonia	1,770
Vanuatu	75,582	Samoa	3,559
China	69,796	Tonga	861
Marshall Islands	59,409	Niue	0
Federated States of Micronesia	15,440	Canada	27
Solomon Islands	21,511		
New Zealand	32,905	Total	2,266,243

Source: Lawson, 2008, Table 97.

Table 25 Number of vessels active[55] in WCPFC Statistical Area

Year	Purse seine	Pole & Line	Longline
1996	597	1,668	4,696
1997	606	1,552	5,121
1998	338	1,483	4,982
1999	417	1,518	4,885
2000	406	1,436	4,871
2001	1,383	619	5,856
2002	1,579	549	5,788
2003	1,488	547	5,295
2004	1,468	553	5,019
2005	1,445	599	5,013
2006	1,392	603	4,935
2007	1,400	572	4,869

Source: Lawson, 2008, Tables 68-70.

The changes in purse seine and pole and line between years 2000-2001 are due to increasingly improved data coming from Indonesia. In recent years Indonesia has reported around 1,000 domestic purse seine vessels – most of which are small (under 400 gross tons), many of which had been previously counted as pole and line vessels.

5.2 Past, Present, and Reasonably Foreseeable Future Actions

This section describes the other actions that have the potential to affect the same resources as the Proposed Action. The analysis of cumulative impacts is presented in the following section.

5.2.1 Past Actions

For the purposes of this cumulative impacts analysis, the past actions are all the fishery management actions and the actions of the fleets that have been taken in the affected environment to date, which together have resulted in the current management regime, current fishing patterns, and have affected the current status of the stocks. The effects of those actions are reflected in the baseline, as described in Chapter 3 and Section 5.1.1.

5.2.2 Other Present Actions

Other present actions would include specific actions being taken to manage the fisheries in the Convention Area.

The WPFMC is considering several amendments to the FMP for the Pelagic Fisheries of the Western Pacific Region at this time that would manage fishing activities. In

[55] An active vessel is any vessel that has actively fished at some point during the course of the year.

particular, Amendment 18 to the FMP for Pelagic Fisheries in the Western Pacific Region, Management Modifications for the Hawaii-based Shallow-set Longline Swordfish Fishery that Would Remove Effort Limits, Eliminate the Set Certificate Program, and Implement New Sea Turtle Interaction Caps (Amendment 18), aims to provide increased opportunities for sustainable harvest of swordfish and other fish species, while continuing to avoid jeopardizing the existence and/or recovery of threatened and endangered sea turtles or their habitat. NMFS is in the process of developing a proposed rule to implement specific provisions of the Convention. The proposed rule would impose specific regulatory requirements on U.S. HMS fleets operating in the Convention Area. The proposed requirements include the following: obtaining fishing authorizations; submitting vessel information; carrying and using VMS units; accepting observers; accepting transshipment inspectors; accepting boarding and inspection; vessel marking; maintaining and submitting information about fishing effort and catch; and at-sea transshipments of HMS from purse seine vessels.

5.2.3 Reasonably Foreseeable Future Actions

The categories of reasonably foreseeable future actions identified here are: (1) future fishery management actions; and (2) actions that contribute to changes in oceanic conditions.

It is reasonably foreseeable that WCPFC CCMs will implement for their purse seine and longline fisheries requirements similar to those in the Proposed Action to implement the recent decisions of the WCPFC. Given that the Proposed Action is for a limited duration (three years) it is also reasonably foreseeable that the WCPFC would adopt CMMs similar to CMM 2008-01 for bigeye tuna and yellowfin tuna that would require implementation for 2012 and beyond.[56]

Other future fishery management actions in the first category include actions taken by the United States and other nations to manage their fisheries in the Convention Area, and to some extent, Pacific Ocean as a whole, particularly HMS fisheries. In the United States, such actions will be driven by a variety of factors, including a number of different statutes with different mandates (e.g., the MSA for federal fisheries generally, the ESA with respect to threatened and endangered marine species, the SPTA to implement the SPTT or terms and conditions as a result of a renegotiated Treaty – after 2013, the WCPFCIA to implement the decisions of the WCPFC, and the Tuna Conventions Act to implement the decisions of the IATTC). Internationally and as a whole, such actions would be driven largely by, in addition to local issues and mandates, internationally agreed measures, including those adopted by the WCPFC and the IATTC.

It is not possible to predict what other specific management measures will be implemented by other nations or what additional management measures will be

[56] Paragraph 46 of CMM 2008-01 specifically states that the effectiveness of the measure will be reviewed annually and that alternative measures could be adopted in order to achieve the WCPFC's conservation goals.

implemented by the United States, but for the most part, given the biological status of many of the target stocks of HMS in the Pacific Ocean, they can be reasonably expected to be conservative in the sense that they will constrict fishing capacity, effort, and/or catch. The consequence of these measures being implemented in the fisheries in the WCPO and the Pacific Ocean would be, generally, to improve the status of affected resources (not necessarily relative to their current status, but relative to their future status under the baseline). What is not clear is how the benefits of conservation and management measures imposed by the various regulatory institutions will accrue to the various users of fleets. Ideally conservation benefits would be broadly based. However, at this time, this is difficult to predict.

The second category of future actions are actions that contribute to changes in oceanographic conditions. As discussed in Chapter 3, Section 3.1.1, there is substantial evidence that changing climate conditions may be causing observed changes in marine systems. Any changes in climate patterns would likely be associated with changes in oceanographic patterns that would have the potential to impact fishery and other biological resources. The target and non-target species that interact with the fisheries subject to this action tend to be highly migratory, wide-ranging organisms that are biologically tied to temperature regimes. Such species would be expected to respond to global or regional changes in climate and oceans in various aspects of their physiology and behavior. Examples include shifts in their geographic ranges, in the spatial (both horizontal and vertical) and temporal aspects of their migration patterns, and in their reproductive patterns. There could be interactive effects among species, such as local depletion of a given species resulting in less forage available for its predators. Species that nest on land, including seabirds and turtles, could be subject to impacts resulting from other types of climate-driven changes, such as sea level. Sea turtles, for example, as a species that exhibits temperature-dependent sex determination, might experience changes in hatchling sex ratios as a result of changes in atmospheric and oceanic temperatures. Sea turtle populations might also lose nesting habitat due to sea level rise.

Roessig, Woodley, Cech et al. (2004) discussed the potential impacts of climate change on marine and estuarine fishes and fisheries as follows:

> Possible oceanic condition scenarios would produce three expected responses by motile fish: (1) areas where favorable conditions exist will increase in size, allowing a species to expand its range and/or proliferate; (2) areas where favorable conditions exist may move, causing a population’s numbers to decline in certain areas and increase in others, effectively shifting the population’s range; and (3) favorable conditions for a species may disappear, leading to a population crash and possible extinction. Each species has its physiological tolerance limits, optima, and ecological needs, thus within a community you can expect different responses from different organisms. Because marine and estuarine systems are complex, and our knowledge of how they work is in its infancy, we can only speculate at the possible consequences of global climate change on their fishable stocks and the people who depend on them.

5.3 Discussion of Impacts

As discussed throughout Chapter 4, the overall effects to fisheries, target and secondary target stocks, and protected resources from the two rules to be implemented under the Proposed Action under any of the alternatives assessed in depth are expected to be minor and beneficial. The objective of each of the rules is to implement conservation and management measures to help sustain the resources in the affected environment and maintain fishing activities for the long term. As discussed above, the other present actions and the reasonably foreseeable future management actions have the same objective and would be expected to cause beneficial impacts to the affected environment. Specifically, should other CCM's implement the provisions of the CMMs that will be implemented in the proposed rules or the WCPFC adopt other similar CMMs that are implemented, the beneficial impacts to resources from the proposed rules would be enhanced (i.e., there could be a greater likelihood that the objectives of the CMMs could be attained, such as the 30% reduction in bigeye tuna fishing mortality). In addition, should the IATTC adopt conservation and management measures such as catch limits or other fishery restrictions for bigeye tuna, the effects of any shift in fishing effort to the EPO from the proposed U.S. Longline Rule would be reduced and the beneficial effects on bigeye tuna would be increased. As discussed in Chapters 3 and 4, the stock structure of bigeye tuna in the Pacific Ocean is not well known, but there is some degree of mixing between the EPO and WCPO, so any fishing mortality in the EPO would likely affect the status of the stock in the WCPO.

On the other hand, if and when Amendment 18 is implemented, longline vessels affected by the proposed U.S. Longline Rule under the Proposed Action may have greater incentive to target swordfish, since the current annual shallow-set effort limits would be removed and the sea turtle interactions caps would be increased. However, as discussed in Chapter 4, the shift in fishing effort that would be caused by the proposed rule is unquantifiable and would likely be minor in comparison to typical variations in fishing effort caused by ocean and market conditions.

The second category of reasonably foreseeable future actions (changes in ocean conditions, including climate change) could cause substantial adverse impacts to the resources in the affected environment but could cause some beneficial impacts as well. As discussed in Chapter 3, Section 3.1, changes to oceanographic conditions have been documented to affect fishing effort and catch.

The cumulative, or additive, impacts on the affected environment from the Proposed Action, other present actions, and all reasonably foreseeable future actions would likely be beneficial, but would be counteracted by any detrimental impacts caused by changes in ocean conditions. Thus, this EA concludes that the Proposed Action would provide a small, beneficial contribution to the cumulative environmental impacts experienced by the affected environment.

Chapter 6

Chapter 6 Comparison of Alternatives

This chapter provides a summary of the potential environmental impacts that could be caused by each of the alternatives analyzed in depth and compares the alternatives for the U.S. Purse Seine Rule and the U.S. Longline Rule.

6.1 Summary of Impacts: U.S. Purse Seine Rule

Implementation of the U.S. Purse Seine Rule under any of the alternatives studied in depth could have some minor beneficial impacts to principal tuna stocks targeted by purse seine vessels, as well as stocks of incidentally-caught species. The primary direct effects of implementation of the proposed rule on the U.S. WCPO purse seine fishery are the following: (1) the FAD prohibition periods and the catch retention requirement that would affect the size and species composition of landed fish; (2) the fishing effort limit and high seas area closures would lead to little, if any, change in fishing effort in the U.S. purse seine fishery, but could lead to a slight geographical shift in effort to PIC EEZs in the WCPO and perhaps a slight reduction in fishing effort; and (3) the FAD prohibition periods would likely transfer some fishing effort from FAD sets to unassociated sets during the prohibition periods and possibly shift fishing effort from the FAD prohibition period to other periods of the year.

Overall, it is believed that these direct effects on the fishery would reduce the fishing mortality rate of the WCPO stocks of yellowfin and bigeye tuna (as well as skipjack tuna) and have similar impacts on secondary stocks. The possibility of an increase in fishing effort in PIC EEZs would be unlikely to lead to any adverse impacts on resources in the affected environment. The transfer of fishing effort from FAD sets to unassociated sets during the FAD prohibition periods could lead to increased fishing mortality on the WCPO stock of yellowfin tuna because comparatively more yellowfin tuna are captured in unassociated sets than in FAD sets. However, this would be counteracted by the reduction in fishing mortality on juvenile bigeye and yellowfin tunas from the FAD prohibition periods. The effect of the catch retention requirement could also have some beneficial effects on juvenile bigeye tuna and yellowfin tunas. The overall direct and indirect effects of the purse seine proposed rule on WCPO tuna stocks would likely be minor because: (1) the duration of the FAD prohibition periods would be only three years and the catch retention requirement would be implemented for a maximum of two years, so their effects on stocks would be short-lived; and (2) there would be only a small reduction in the fishing mortality rate contributed by the U.S. WCPO purse seine fleet.

The effects to protected resources similarly would be beneficial but minor, because the proposed rule would not cause substantial changes to the fishing activities of the fleet. With respect to sea turtles, however, the beneficial impacts would be long-lasting, because the proposed requirements to mitigate interactions with sea turtles would, unlike the other elements of the proposed rule, be of indefinite duration.

As discussed in Chapter 5, in terms of cumulative effects, the effects of the U.S. Purse Seine Rule and U.S. Longline Rule, under any of the action alternatives, in combination with the effects of similar actions taken by other WCPFC members, as well as possible future actions to implement any future WCPFC decisions with respect to bigeye tuna and yellowfin tuna, could have beneficial effects on the stocks. These effects would be greater than if the proposed U.S. Purse Seine Rule were implemented in isolation. The contribution of the U.S. Purse Seine Rule to cumulative effects under any of the action alternatives would be small and essentially the same under all the action alternatives.

Table 26 below summarizes the direct and indirect effects to resources in the affected environment from each of the alternatives analyzed in depth in Chapter 4, including Alternative A, the No-Action Alternative.

Table 26 Summary of direct and indirect effects for the U.S. Purse Seine Rule alternatives

Alternative	Effects to WCPO Bigeye Tuna	Effects to WCPO Yellowfin Tuna	Effects to WCPO Skipjack Tuna	Effects to other Secondary Target Stocks	Effects to Protected Resources
Alternative A (No-Action)	Direct Effects: None Indirect Effects: Increased Potential for Long-Term Negative	Direct Effects: None Indirect Effects: Increased Potential for Long-Term Negative	Direct Effects: None Indirect Effects: Increased Potential for Long-Term Negative	Direct Effects: None Indirect Effects: Increased Potential for Long-Term Negative	Direct Effects: None Indirect Effects: Increased Potential for Long-Term Negative
Alternative B (Action Alternative for the U.S. Purse Seine Rule)	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial or None	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial or None	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial or None	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial or None	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial
Alternative C (Effort Limit Allocated among Vessels)	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial or None	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial or None	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial or None	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial or None	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial
Alternative D (Effort Limit – Most Restrictive)	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial or None	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial or None	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial or None	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial or None	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial
Alternative E (Effort Limit – Least Restrictive)	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial or None	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial or None	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial or None	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial or None	Direct Effects: Minor Beneficial Indirect Effects: Minor Beneficial

As indicated in Table 26, all of the alternatives would have similar effects. The main distinction between the action alternatives would be the manner of implementation of the fishing effort limit. As stated in Chapter 4, additional management measures that lead to further reduction in the fishing mortality of WCPO bigeye tuna and that ensure no increase in the fishing mortality of WCPO yellowfin tuna are needed to sustain WCPO tuna stocks at or greater than their MSY levels. Thus, the No-Action Alternative would have increased potential for long-term negative impacts on these fish stocks over the action alternatives.

Alternative D would be the most restrictive in terms of operational effects to fishery participants. Under this alternative there would be separate fishing effort limits for the high seas and U.S. EEZ that would be fixed for each licensing year. Thus, this alternative would allow the fleet no flexibility should there be variations in optimal fishing grounds in different years. Alternative E would be the least restrictive. Under this alternative, there would be one fishing effort limit set for the entire three-year period (2009-2011) for the high seas and U.S. EEZ combined, which would allow vessel owners and operators to continue fishing through the three-year period until the limit is reached. Alternative B would implement the fishing effort limit on three different time scales. To provide operational flexibility with respect to the substantial inter-annual variability that is expected to occur in terms of the spatial and temporal distribution of fish and of optimal fishing grounds and times, the limit would be implemented on three different time scales: First, there would be a limit of 7,764 fishing days (3 times the base of 2,588) for the entire three-year 2009-2011 period. Second, there would be a limit of 6,470 fishing days (2.5 times the base of 2,588) for each of the two-year periods 2009-2010 and 2010-2011. Third, there would be a limit of 3,882 fishing days (1.5 times the base of 2,588) for each of the one-year periods 2009, 2010, and 2011. Alternative C would be the same as Alternative B, except the fishing effort limit would be allocated among different vessels in some manner.

Alternative C would eliminate the “race to fish” effect that could be caused by the other alternatives, since under this alternative, vessels would not have to compete against each other to obtain fishing days from a common pool of days.

Under Alternative D, there may be some increased benefit to living marine resources in the affected environment over the other alternatives, because it would be more likely that the fishery would be closed in certain areas in a given year. The demand for these areas – the U.S. EEZ and the high seas areas of what is the eastern portion of the WCPO – has been most acute during ENSO events. This alternative would offer the fleet no flexibility to account for the fishing patterns in different years.

Alternative E would offer the fleet the maximum amount of flexibility, since vessels could continue to fish until the single three-year limit is reached and there would be only one potential closure of the fishery. However, the lack of any limits for a given year would bring the potential for a longer closed period (e.g., during a substantial part of 2011) than would likely occur under Alternative B (under which relatively brief closures might be expected in one or more of the years 2009-2011). To the extent that continuous fishing and continuity of supply are important for the fishery, several short closures might cause less adverse economic impacts than a single long closure. For example, with a brief closure each year, vessel owners and operators might be able to schedule routine vessel maintenance during the closed periods and mitigate the losses of not being able to fish. This would be more difficult to do during a longer closed period.

Under Alternative B, there would be some flexibility to accommodate variations in optimal fishing grounds in different years. However, the fishing effort limit would be set so that there would be a maximum number of fishing days set for any given year (and for each of the two-year periods), so, the potential lengths of fishery closures would be shorter than under Alternative E.

6.2 Summary of Impacts: U.S. Longline Rule

Implementation of the U.S. Longline Rule under any of the alternatives could have some minor beneficial effects to WCPO bigeye tuna as well as other fish stocks present in the WCPO. The proposed rule would implement the WCPFC's established catch limit for WCPO bigeye tuna for the years 2009-2011, which could cause some beneficial effects on the stocks. Each of the action alternatives could cause some shift in fishing effort from targeting bigeye tuna in the WCPO, which could cause effects to other fish stocks in both the WCPO and EPO. Such shifts in fishing effort could also cause effects to protected resources, but these effects would be minor, since the shift in fishing effort would likely be less than that caused by typical year-to-year variations in catches among species driven by changing oceanic and economic conditions. Thus, because the duration of the rule would be limited to three years and because the proposed rule would not cause substantial changes to the fishing practices and patterns of the affected fleets, the overall direct and indirect impacts from implementation of the rule under any of the action alternatives would be minor.

As discussed in Chapter 5, in terms of cumulative effects, the effects of the U.S. Longline Rule and U.S. Purse Seine Rule, under any of the action alternatives, in combination with the effects of similar actions taken by other WCPFC members, as well as possible future actions to implement any future WCPFC decisions with respect to bigeye tuna and yellowfin tuna, could have beneficial effects on the stocks. These effects would be greater than if the proposed U.S. Longline Rule were implemented in isolation. The contribution of the U.S. Longline Rule to cumulative effects under any of the action alternatives would be essentially the same under all the action alternatives.

Table 27 Summary of direct and indirect effects for the U.S. Longline Rule alternative

Alternative	Effects to WCPO Bigeye Tuna	Effects to WCPO Yellowfin Tuna	Effects to WCPO Swordfish	Effects to other Secondary Target Stocks	Effects to Protected Resources
Alternative 1 (No-Action)	Direct: None Indirect: Increased Potential for Long-Term negative	Direct: None Indirect: Increased Potential for Long-Term negative	Direct: None Indirect: Increased Potential for Long-Term negative	Direct: None Indirect: Increased Potential for Long-Term negative	Direct: None Indirect: Increased Potential for Long-Term negative
Alternative 2 (Closure of Deep-Set Fishery)	Direct: Minor beneficial Indirect: Minor beneficial or None	Direct: Minor beneficial Indirect: Minor beneficial or None	Direct: Minor detrimental or None Indirect: Minor detrimental or None	Direct: Minor detrimental or beneficial or None Indirect: Minor detrimental or beneficial or None	Direct: Minor Indirect: Minor
Alternative 3 (No Retention, Landing, or Transshipment of Bigeye Tuna)	Direct: Minor beneficial Indirect: Minor beneficial or None	Direct: Minor detrimental or None Indirect: Minor detrimental or None	Direct: Minor detrimental or None Indirect: Minor detrimental or None	Direct: Minor detrimental or beneficial or None Indirect: Minor detrimental or beneficial or None	Direct: Minor Indirect: Minor
Alternative 4 (Closure of Fishery)	Direct: Minor beneficial Indirect: Minor beneficial or None	Direct: Minor beneficial Indirect: Minor beneficial or None	Direct: Minor beneficial Indirect: Minor beneficial or None	Direct: Minor detrimental or beneficial or None Indirect: Minor detrimental or beneficial or None	Direct: Minor Indirect: Minor

Table 27 indicates that the overall effects from the alternatives would be similar and minor. However, each of the action alternatives would cause some slightly disparate effects to the resources in the area. As stated in Chapter 4, additional management measures that lead to a reduction in the fishing mortality of bigeye tuna and that ensure no increase in the fishing mortality of yellowfin tuna are needed to sustain WCPO tuna stocks at or greater than their MSY levels. Thus, the No-Action Alternative would have increased potential for long-term negative impacts on these fish stocks over the action alternatives.

Alternative 3 is the least restrictive of the action alternatives. Under this alternative, once the limit for WCPO bigeye tuna established by the WCPFC is reached, U.S. longline vessels would be prohibited from retaining on board, landing, or transshipping any bigeye tuna captured in the limit's area of application for the remainder of the calendar year, except that any bigeye tuna already on board a vessel at the time of the closure may be retained on board and landed. Under this alternative, vessels could continue to fish in both the shallow-set and deep-set sectors of the fishery, provided that no bigeye tuna are kept. As a result, there could be a shift in effort to the shallow-set sector, to deep-setting for bigeye tuna in the EPO, or to deep-setting for species other than bigeye tuna in the WCPO. Thus, to the extent that deep-setting for species other than bigeye tuna in the WCPO does occur after the limit is reached, the beneficial impacts to WCPO bigeye tuna would be less than under the other action alternatives, since WCPO bigeye tuna would likely be caught and discarded in the course of such fishing activities (to an unknown degree).[57]

Alternative 2 is more restrictive than Alternative 3, but less restrictive than Alternative 4. Under this alternative, once the WCPO bigeye tuna limit is reached, vessels would be prohibited from deep-setting in the limit's area of application. This could lead vessels to shift their effort to deep-setting for bigeye tuna in the EPO or to shallow-setting in the WCPO, although, as discussed in Chapter 4 the degree of such shifts in effort cannot be predicted with certainty or estimated quantitatively at this juncture. Because no deep-setting would be allowed in the limit's area of application, this alternative could have some beneficial effects on both WCPO bigeye tuna and to a lesser degree WCPO yellowfin tuna. However, this alternative could cause increased fishing in the shallow-set sector, leading to increased fishing mortality on swordfish and other species caught in that sector, including sea turtles (but any such increase would be slight, as it would be constrained by the existing annual limits on shallow-set effort and on interactions with loggerhead and leatherback turtles). Under this alternative, the overall beneficial impacts to WCPO bigeye tuna could be greater than under Alternative 3; because deep-setting would be prohibited in the WCPO, there would be less WCPO bigeye tuna being caught and discarded (but only to the extent that under Alternative 3 deep-setting for species other than bigeye tuna in the WCPO would occur and bigeye tuna would be caught after the limit is reached).

Alternative 4 is the most restrictive of the action alternatives. Under this alternative, once the limit for WCPO bigeye tuna established by the WCPFC is reached, U.S. fishing vessels would be prohibited from longline fishing in the limit's area of application. This could cause vessels to shift their effort to deep-setting in the EPO, although, as discussed in Chapter 4 the likely degree of such a shift cannot be predicted. Under this alternative, the overall beneficial impacts to WCPO bigeye tuna could be greater than under the other action alternatives; because the entire fishery would be closed, no WCPO bigeye tuna would be caught by longlining in the limit's area of application.

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[57] The discussion of the action alternatives for the U.S. Longline Rule in this chapter focuses on comparing the impacts of the alternatives on WCPO bigeye tuna – to which the WCPFC's established catch limited directly applies. As stated in Chapter 3 Section 3.4, the stock structure of bigeye tuna in the Pacific Ocean is not well known, but there is some degree of mixing between the EPO and WCPO, so any fishing mortality in the EPO would likely affect the status of the stock in the WCPO as well as in the EPO. So, though the direct effects to WCPO bigeye tuna under the alternatives would differ, the overall effects from any of the alternatives to WCPO bigeye tuna would be similar.

Consultation

Consultation

NAO 216-6 requires a listing of the agencies and persons who were consulted while preparing the EA. Table 28 lists the agencies, NOAA units, and entities that were contacted for information. Table 29 lists the names of the individuals who were responsible for the preparation of this document.

Table 28 List of agencies and offices contacted

Agency/Organization
Department of State - Office of Marine Conservation
NMFS - International Affairs
NMFS - Office for Law Enforcement, Pacific Islands Division
NMFS - Pacific Islands Fisheries Science Center
NMFS - Southwest Regional Office
NMFS - Southwest Fisheries Science Center
NOAA - General Counsel for Enforcement and Litigation, Pacific Islands Region
U.S. Coast Guard

List of Preparers

List of Preparers

Table 29 lists the preparers of this document.

Table 29 List of Preparers

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