CHARACTERIZATION OF THE WEST COAST DEEP-SET LONGLINE FISHERY OPERATING OUTSIDE OF THE U.S. EXCLUSIVE ECONOMIC ZONE

ENVIRONMENTAL ASSESSMENT

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Cover Sheet
Environmental Assessment of U.S. West Coast Deep-set Longline Fishery on the High Seas

Proposed Action:	To allow the U.S. west coast deep-set longline pelagic tuna fishery to continue operating outside of the U.S. Exclusive Economic Zone.
Type of Statement:	Environmental Assessment
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Abstract

A single U.S. west-coast-based deep-set longline fishing vessel targeting tuna has been conducting fishing operations on the high seas since 2005 under the authority of the High Seas Fishing Compliance Act and a Highly Migratory Species permit issued under the Pacific Fishery Management Council's Highly Migratory Species Fishery Management Plan. When the Fishery Management Plan for U.S. west coast fisheries for Highly Migratory Species was developed, the Pacific Council and the National Marine Fisheries Service assumed that a deep-set longline fishery on the West Coast would not develop due to the economic and vessel constraints associated with operating far from west coast ports, thus a thorough analysis of the possible impacts to the human environment was not done in the Environmental Impact Statement prepared for the Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species. This environmental assessment provides a detailed characterization and analysis of the existing deep-set longline fishery operating on the high seas off the U.S. West Coast, as well as an analysis of a potential minor expansion of the fishery. Two alternatives are analyzed in this environmental assessment: closing the fishery (action alternative), or allowing the fishery to remain open (no action alternative). Impacts to the human environment (e.g., effects of the proposed action on protected species, finfish, seabirds, and socioeconomics) were found to be insignificant. The preferred alternative for this Environmental Assessment is the no action alternative, which would allow the west coast deep-set longline fishery to continue operating on the high seas in accordance with the management measures established by the Council and NMFS in section 6.2.2 of the HMS FMP (PFMC 2007).

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List of Acronyms

AMSY- Average Maximum Sustainable Yield
BET- Bigeye Tuna
BFAL- Black-Footed Albatross
BO- Biological Opinion
CCS- California Current System
CEQ- Council on Environmental Quality
CFR- Code of Federal Regulations
CH-Critical Habitat
CITES- Convention on International Trade in Endangered Species
CPFV- Commercial Passenger Fishing Vessels
CPS- Coastal Pelagic Species
CPUE- Catch Per Unit of Effort
CZMA- Coastal Zone Management Act
DGN- Drift Gillnet
DPS- Distinct Population Segment
DSLL- Deep-set Longline
EA- Environmental Assessment
EEZ- Exclusive Economic Zone
EFH- Essential Fish Habitat
EFP- Exempted Fishing Permit
EIS- Environmental Impact Statement
EJ- Environmental Justice
ENSO- El Niño Southern Oscillation
EO-Executive Order
EPO- Eastern Pacific Ocean
ESA- Endangered Species Act
FEIS- Final Environmental Impact Statement
FONSI- Finding of No Significant Impact
FMP- Fishery Management Plan
FR-Federal Register
HMS- Highly Migratory Species
HMS FMP- Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species
HMSAS- Highly Migratory Species Advisory Subpanel
HMSMT- Highly Migratory Species Management Team
HSFCA- High Seas Fisheries Compliance Act
IATTC- Inter-American Tropical Tuna Commission
ITS- Incidental Take Statement
IUCN- World Conservation Union
IWC- International Whaling Commission
LAAL- Laysan Albatross
LOF- List of Fisheries
MBTA- Migratory Bird Treaty Act
MCSST- Multi-Channel Sea Surface Temperature
MMPA- Marine Mammal Protection Act
MSA- Magnuson-Stevens Fishery Conservation and Management Act
MSY- Maximum Sustainable Yield
MUS- Management Unit Species
NEPA- National Environmental Policy Act
NMFS- National Marine Fisheries Service

NPTZ- North Pacific Transition Zone
NOAA- National Oceanic and Atmospheric Administration
OY- Optimum Yield
PacFIN- Pacific Fisheries Information Network
PBR- Potential Biological Removal
PDO- Pacific Decadal Oscillation
Pelagics FMP- Fishery Management Plan for Pelagics Fisheries of the Western Pacific Region
PFMC- Pacific Fishery Management Council
PIFSC- Pacific Islands Fisheries Science Center
POCTRP- Pacific Offshore Cetacean Take Reduction Plan
PRA- Paperwork Reduction Act
PRD- Protected Resources Division
RecFIN- Recreational Fisheries Information Network
RFA-Regulatory Flexibility Act
RIR-Regulatory Impact Review
RFMO-Regional Fisheries Management Organization
SAFE- Stock Assessment and Fishery Evaluation Report
SAFZ- Subarctic Frontal Zone
SAO- Southwestern Atlantic Ocean
SAR- Stock Assessment Report
SCB-Southern California Bight
SSLL-Shallow-set Longline
SST-Sea Surface Temperature
STAL- Short-Tailed Albatross
STFZ- Subtropical Frontal Zone
TDR- Time and Depth Recorder
TRP- Take Reduction Plan
TRT- Take Reduction Team
USFWS- United States Fish and Wildlife Service
WPFMC- Western Pacific Fishery Management Council
WCPO- Western Central Pacific Ocean
ZMRG- Zero Mortality Rate Goal

Glossary

Biological Opinion: The written documentation of a Section 7 Endangered Species Act consultation.

Biomass: The estimated amount, by weight, of a highly migratory (HMS) population. The term biomass means total biomass (age one and above) unless stated otherwise.

Bycatch: Fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards. Such term does not include fish released alive under a recreational catch and release fishery management program.

Commercial fishing: Fishing in which the fish harvested, either in whole or in part, are intended to enter commerce through sale, barter, or trade.

Council: The Pacific Fishery Management Council, including its Highly Migratory Species Management Team (HMSMT), Highly Migratory Species Advisory Subpanel (HMSAS), Scientific and Statistical Committee (SSC), and any other committee established by the Council.

Eastern Pacific Ocean: The area of the Pacific Ocean bounded by the coastline of North, Central, and South America, and 50° N., 150° W., and 50° S.

Endangered Species Act (ESA): Enacted in 1973, the ESA directs Federal departments and agencies to conserve endangered species and threatened species and utilize their authorities in furtherance of the purposes of the ESA.

Exclusive Economic Zone (EEZ): The zone established by Presidential Proclamation 5030, 3 CFR part 22, dated March 10, 1983, and is that area adjacent to the United States which, except where modified to accommodate international boundaries, encompasses all waters from the seaward boundary of each of the coastal states to a line on which each point is 200 nautical miles (370.40 km) from the baseline from which the territorial sea of the United States is measured. Off the west coast states, the EEZ is the area between 3 and 200 miles offshore.

High Seas: All waters beyond the EEZ of the United States and beyond any foreign nation's EEZ, to the extent that such EEZ is recognized by the United States (Note, this definition is used in the HMS Fisheries Management Plan (FMP) and differs from the definition in the Magnuson-Stevens Act, which defines "high seas" as waters beyond the territorial sea).

Highly Migratory Species: Pelagic species of fish (those that live in the water column as opposed to on the surface or on the bottom) including tunas, sharks, billfish/swordfish and which undertake migrations of significant but variable distances across oceans for feeding or reproduction.

Incidental take: "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, or collect individuals from a species listed on the ESA. Incidental take is the non-deliberate take of ESA listed species during the course of a Federal action (e.g., fishing under an FMP).

Incidental Take Statement: A requirement under the ESA Section 7 consultation regulations, it is the amount of incidental take anticipated under a proposed action and analyzed in a biological opinion.

Jeopardy: The conclusion of a Section 7 consultation if it is determined that the proposed action would reasonably be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the numbers, reproduction, or distribution of that species.

Maximum sustainable yield (MSY): The largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions.

Mortality or serious injury: A standard used for measuring impacts on marine mammals under the Marine Mammal Protection Act (MMPA). Serious injury is defined as an injury likely to result in the mortality of a marine mammal.

Mean annual takes: The estimated number of marine mammals seriously injured or killed each year due to fishery interactions.

Optimum Yield: The amount of fish that will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and, taking into account the protection of marine ecosystems; that is prescribed on the basis of the MSY from the fishery, as reduced by any relevant economic, social, or ecological factor; and, in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the MSY in such fishery.

Overfishing or Overfished: As defined in the Magnuson-Stevens Fishery Conservation and Management Act, the terms “overfishing” and “overfished” mean a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis.

Potential Biological Removal: A requirement of the MMPA, it is the estimated number of individuals that can be removed from a marine mammal stock while allowing the stock to maintain or increase its population.

Section 7 consultation: A requirement of all discretionary Federal actions to ensure that the proposed action is not likely to jeopardize ESA listed endangered or threatened species. Refers to Section 7(a)(2) of the ESA.

Stock: A group of fish with some definable attributes which are of interest to fishery managers, for example: bigeye tuna stock.

Strategic Stock: A marine mammal stock for which the level of direct human-caused mortality exceeds the potential biological removal level which, based on the best available scientific information, is declining and is likely to be listed within the foreseeable future or is already listed as a threatened or endangered species under the ESA of 1973.

Take: The term is used with respect to protected species (marine mammals, sea turtles, and seabirds), is defined by the applicable statute (Marine Mammal Protection Act, Endangered Species Act, or the Migratory Bird Treaty Act), and the associated implementing regulations.

1.0 INTRODUCTION

1.1 Organization of the Document

This Environmental Assessment (EA) characterizes and analyzes the current and potential future expansion of a west-coast-based deep-set longline (DSLL) pelagic tuna fishery operating on the high seas (proposed action). When the Fishery Management Plan (FMP) for U.S. West Coast Fisheries for Highly Migratory Species (HMS) and accompanying and Environmental Impact Statement (EIS) were developed by the Pacific Fishery Management Council (hereafter, the Council) in collaboration with the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS), shallow-set and DSLL fishing were not considered separate fisheries and the analysis in the HMS FMP was primarily focused on shallow-set longline fishing. At the time, most of the west-coast-based pelagic longline fishing on the high seas consisted of shallow-set longline fishing for swordfish. In addition, there was no distinct DSLL fishery for tuna and it was presumed that the DSLL fishery would not develop primarily due to economic and operational constraints associated with operating out of west coast ports. Thus only a limited analysis of historic DSLL fishing was provided in the HMS FMP and accompanying environmental impact statement. In 2005 a single commercial vessel entered this fishery on an experimental basis and has continued seasonally operating with close to 100 percent observer coverage, provided by NMFS, adhering to fisheries management regulations under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), 16 U.S.C. 1801 et seq., the HMS FMP, and the High Seas Fishery Compliance Act (HSFCA), 16 U.S. C. chapter 75.

Potential expansion of the fishery is estimated to be minimal due to the high operational costs (e.g., fuel and labor costs) and vessel constraints associated with fishing outside of the exclusive economic zone (EEZ). Fishing on the high seas requires larger vessels than those used for coastal or near-shore fishing because the trips are longer, require greater ice and fish hold capacity, and the sea conditions can be more challenging. Due to these logistical challenges of fishing on the high seas from west coast ports coupled with the current experimental nature of the fishery, NMFS does not anticipate that additional vessels will participate in this fishery however, up to five additional vessels could enter the fishery as soon as the next three years if regulations and/or poor catches in other west-coast-based fisheries force eligible vessels to seek alternate open-access fishing options available to them. The estimate for the potential expansion of this fishery originated from discussions with the U.S. west coast fishing industry to determine who had the capacity and could be interested in entering the fishery over the next three years. Based on these discussions, the current maximum fleet estimate for the west-coast-based DSLL fishery is a total of six vessels over the next three years. The projected impacts of this fishery are analyzed in chapter 4 of this EA using the six vessel estimate.

Because a thorough analysis of the DSLL fishery was not included in the HMS FMP EIS, this EA is being written to evaluate the fishery as required under the National Environmental Policy Act (NEPA) and the Regulatory Flexibility Act (RFA). The purpose of this EA is to disclose and evaluate the effects of allowing the continuation of the west coast DSLL pelagic tuna fishery operating on the high seas, and to analyze the impacts of permitting a minor expansion of this fishery on the human environment and briefly provide sufficient evidence and analysis for determining whether to prepare an EIS or a finding of no significant impact (FONSI) (40 CFR 1508.9). This document contains the analyses required under NEPA. A separate analysis of the impacts on Endangered Species Act (ESA) listed species is being conducted through a Section 7 consultation as required under the ESA, the results of which will be provided in the final EA.

Environmental impact analyses have four essential components: a description of the purpose and need for the proposed action, alternatives that represent different ways of accomplishing the proposed action, a description of the human environment affected by the proposed action, and an evaluation of the expected direct, indirect, and cumulative impacts of the alternatives. (The human environment includes the natural and physical environment and the relationship of people with that environment, as defined at 40 CFR 1508.14). These elements allow the decision maker to look at different approaches to accomplishing a stated goal and understand the likely consequences of each choice or alternative. Based on this structure, the document is organized into six main chapters:

- Chapter 1 describes the purpose and need for the proposed action and considerations that went into the development of this EA.
- Chapter 2 outlines the alternatives that have been considered to address the purpose and need of the proposed action.
- Chapter 3 describes the components of the human environment potentially affected by the proposed action (the "affected environment"). The affected environment may be considered the baseline condition, which would be potentially changed by the proposed action. Section 3.4 describes the protected resources that would be potentially affected by the proposed action.
- Chapter 4 evaluates the effects of the alternatives on components of the human environment in order to provide the information necessary to determine whether such effects are significant, or potentially significant.
- Chapter 5 details how this action meets 10 National Standards set forth in the MSA (§301(a)).
- Chapter 6 provides information on those laws and Executive Orders, in addition to the MSA and NEPA, that an action must be consistent with, and how this action has satisfied those mandates.

Additional chapters (7-9) list those who contributed to this EA, information on EA distribution, and the references cited list.

1.2 Proposed Action

The proposed action is to allow the continuation and possible minor expansion of the west coast DSLL pelagic tuna fishery operating on the high seas. As part of its review of this fishery, NMFS determined that the very limited analysis provided in the HMS FMP EIS did not adequately address the potential impacts of HSFCA permits; therefore, NMFS is doing this environmental assessment. NMFS has determined that the regulations that are currently in place are sufficient to meet the need to regulate the current and any reasonably foreseeable fishery; however, NMFS may consider additional regulations and do additional NEPA analysis in the future should the fishery develop beyond the scope of this analysis.

1.3 Proposed Action Area

The proposed action area analyzed in this EA is the high seas off the West Coast of the United States. The HMS FMP defines the high seas as all waters beyond the EEZ of the United States and beyond any foreign nation's EEZ, to the extent that such EEZ is recognized by the United States. The fishery is expected to operate in a relatively small subset of the eastern Pacific Ocean (EPO)[1]; more specifically, in the area east of 140° W. longitude, north of the equator, south of 35° N. latitude, and outside the U.S. and Mexico EEZ's (beyond 200 nautical miles (nm) offshore). Most, if not all, future DSLL fishing is expected to occur in this small subset of the EPO, based on the assumption that participants in this fishery

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[1] The IATTC defines the EPO according to the Antigua Convention Area, which is the area of the Pacific Ocean bounded by the coastline of North, Central, and South America, and 50°N., 150°W., and 50°S.

would use fresh fish boats or vessels without freezer capacity. There is, however, a possibility of one to two larger vessels with freezer capacity entering the fishery in the future. Despite the fact that NMFS has no indication that a vessel with freezer capacity would enter the DSLL fishery, or that fishing would occur outside of this subset of the EPO, this analysis incorporates these possibilities by defining the action area as the high seas. This is also consistent with the description of the DSLL fishery on the high seas found in the HMS FMP. The current regulations do prohibit the use of longline gear from April 1 to May 31 in waters bounded on the south by 0° latitude, on the north by 15° N. latitude, on the east by 145° W. longitude, and on the west by 180° longitude.

1.4 Purpose and Need

The purpose of the proposed action is to continue responsibly and sustainably managing the DSLL fishery according to the goals and objectives of the HMS FMP based on the thorough evaluation of the fishery's impacts on the human environment. Since 2005, a single commercial vessel has participated in the DSLL fishery on the high seas; therefore, this EA will provide the needed analysis to manage the fishery based on the best available science to ensure that the fishery is consistent with all Federal statutes and management objectives.

1.5 Background

Under California law, it is illegal to fish with longline gear in state waters or to land fish at California ports that were caught with longline gear within the U.S. EEZ off California. Washington State prohibits the use of longline gear within its state waters. The HMS FMP prohibits all longline fishing within the west coast EEZ, and SSLL fishing in the open ocean is prohibited except for vessels in possession of a Hawaii pelagics limited entry permit. Neither a prohibition on DSLL fishing on the high seas, nor an explicit characterization of the fishery exists in the HMS FMP because the Council and NMFS did not expect the fishery to develop because of economic constraints. However, in 2005 one west-coast-based fishing vessel entered this fishery and has been successfully targeting tuna.

Some small scale and experimental longline fisheries have taken place off the West Coast since 1988. An experimental drift longline fishery for sharks occurred within the EEZ from 1988 to 1991. In 1991, there were three longline vessels that fished beyond the EEZ targeting swordfish and bigeye tuna. Those vessels unloaded their catch and re-provisioned in California ports. In 1993, a Gulf Coast fish processor set up at Ventura Harbor, California, to provide longline vessels with ice, gear, bait, fuel, and fish offloading and transportation services (Vojkovich and Barsky 1998). Consequently, longline vessels seeking an alternative to the Gulf of Mexico longline fishery, but precluded from entering the Hawaii fishery due to a limitation on the number of permits, began arriving in southern California. By 1994, 31 vessels comprised this California-based fishery, fishing beyond the EEZ, and landing swordfish and tunas in California ports. These vessels fished alongside Hawaiian vessels in the area around 135° W. longitude in the months from September through January. Historically, vessels from Hawaii had the option of returning to Hawaii to land their catch, or landing their catch on the West Coast.

In 1987, the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region (Pelagics FMP) was developed by the Western Pacific Fishery Management Council (WPFMC) and implemented by NMFS. In response to a rapid influx of East Coast longline fishing vessels in the late 1980s, Amendment 4 to the Pelagics FMP extended previous emergency interim rules (56 FR 14866; 56 FR 28116) to arrest the rapid growth of the Western Pacific Region longline fishery. This 1991 amendment established a moratorium on new participants entering the Hawaii-based longline fishery. In 1994, Amendment 7 to the Pelagics FMP replaced the moratorium with a limited entry program for the Hawaii-based longline fishery (59 FR 26979), limiting the fishery to 167 vessels. The limited entry of 167 vessels for this fishery is still in place.

During 1995, only six longline vessels made a high seas trip from a California port, although 35 longline vessels made at least one landing of HMS (Vojkovich and Barsky 1998, table 1–1). The group of vessels that came to California from the Gulf of Mexico in 1993 and 1994 left the California-based fishery. This group of vessels either returned to the Gulf of Mexico fishery, or was able to acquire Hawaii longline permits in order to have fishery options for the months of February through September, when fishing within range of California ports drops off substantially. Many of the vessels that had participated in the California fishery had discovered productive swordfish and tuna fishing grounds in the fall and winter that were further east than where the Hawaiian fleet usually operated. As the California fleet migrated to Hawaii, these vessels continued to move east later in the year, and operated out of California ports when these ports became closer than Hawaiian ports. These vessels fished from California until about January, when the pattern of fishing moved to the west, and operating from Hawaii became more convenient. Consequently, beginning in the latter part of 1995, a number of vessels from the Hawaiian fleet began a pattern of fishing operations that moved to California in the fall and winter and then back to Hawaii in the spring and summer.

In August 2000, as the result of the Federal district court case *Center for Marine Conservation vs. NMFS*, the court issued an order directing NMFS to complete an EIS to assess the environmental impacts of fishing activities conducted under the Pelagics FMP by April 1, 2001, and ordered restrictions and closures over millions of square miles of the Hawaii-based longline fishery's usual fishing grounds. These court-ordered closures essentially closed the SSLL fishery in Hawaii from 2001-2004. As a result, some Hawaii longline permit holders de-registered their vessels from the permit, and proceeded to fish from California ports, as was their custom during this time of the year, and participation in the DSLL fishery targeting tuna increased. On April 1, 2004, the court vacated the fisheries restrictions after NMFS was challenged in a lawsuit by the Hawaiian Longline Association. The WPFMC developed a plan to re-open the Hawaii SSLL fishery through Regulatory Amendment 3. The regulations became effective April 2, 2004, (69 FR 17329) and increased opportunity in the Hawaii swordfish fishery. At almost the same time, April 7, 2004, (69 FR 18444) the final rule for implementing the HMS FMP was implemented (effective date, May 7, 2004), effectively closing the west coast high seas longline fishery for swordfish. As seen in table 1–1, the number of high seas longline vessels making HMS landings on the West Coast increased substantially in the years 1997–2004; some of these increases were likely due to the regulatory changes discussed here. Commercial landings of tuna have generally been a small share of landings of west coast longline fisheries; however, since the closure of the west-coast-based SSLL fishery for swordfish in 2004, tuna has become the target species for west-coast-based longline fishermen.

Other marketable species that are landed in the deep-set tuna longline catch include, but are not limited to opah (*Lampris regius*), mahi mahi (*Coryphaena hippurus*), escolar (*Lepidocybium flavobrunneum*), and pomfret (*Taractichthys steindachneri)*. Relatively few sharks, in proportion to those caught, have been marketed from the high seas fishery. The major shark bycatch in this fishery is blue shark, which is discarded for economic reasons because the flesh quickly deteriorates after death. Other incidental catch of concern includes striped marlin, sea turtles, seabirds, and marine mammals.

Longline fishing allows a vessel to distribute effort over a large area to harvest fish that are not concentrated in great numbers. Overall catch rates in relation to the number of hooks are generally low. In general, longline gear consists of a continuous main line set on the surface and supported in the water column horizontally by floats with branch lines connected at intervals to the main line. Plastic floats are commonly used; in addition, radio buoys are also used to keep track of the mainline. A line shooter is used on deep-sets to deploy the mainline faster than the speed of the vessel, thus allowing the longline gear to sink to its target depth (average target depth in the Hawaii-based DSLL fishery targeting tuna on the high seas from 2003-2007 was 191 m) (PIFSC 2008). The main line is typically 30 to 100 km (18 to 60 miles) long. A minimum of 15, but typically 20 to 30, weighted branch lines (gangions) are clipped to the mainline at regular intervals between the floats. Each gangion terminates with a single baited hook. The branch lines are typically 11 to 15 m (35 to 50 ft) long. Sanma (saury), sardines, or mackerel are used for bait. Lightsticks are not typically attached to the gangions on this type of longline set. Longline vessels typically make a single gear haul (i.e., set) each day and DSLL gear is generally set in the morning and retrieved in the afternoon (Ito and Machado 2001). From 2003-2007 the Hawaii-based DSLL fishery on the high seas averaged approximately 2,050 hooks per set, and the average soak time was 19 hours (PISC 2008).

Table 1–1. Commercial landings (round mt) in the west coast longline fisheries, 1981–2006.

		Sharks					Tunas								
Year	**Sword-fish**	**Common Thresher**	**Pelagic Thresher**	**Bigeye Thresher**	**Shortfin Mako**	**Blue**	**Albacore**	**Other**	**Dorado**	**Ground-fish**	**Coastal Pelagics**	**Crab**	**Salmon**	**Other**	**Total**
1981	<0.5				19	72	25	1		2	<0.5			1	120
1982	<0.5	1			6	18	42	1	<0.5	<0.5	<0.5			2	70
1983	<0.5	<0.5			1	2	6	3	<0.5	<0.5	<0.5			7	19
1984	12	3		<0.5	2		2	2	3	2	<0.5			4	30
1985	<0.5	1			<0.5	<0.5	<0.5			10				1	12
1986		2			1	<0.5				6	<0.5			4	13
1987		<0.5			3	<0.5	<0.5			43				3	49
1988	<0.5	1			152	1		<0.5		27	<0.5			5	186
1989					5	1				<0.5					5
1990		<0.5			15	4	<0.5	1		<0.5	<0.5			<0.5	20
1991	27	<0.5			23	<0.5	<0.5	2	<0.5	3				18	73
1992	63	2		<0.5	2	<0.5	1	<0.5		21	<0.5			2	91
1993	27	<0.5			1	<0.5	<0.5	5	1	1	1			2	38
1994	722	19		3	20	12	49	56	32	4	<0.5			15	932
1995	271	11		1	7	5	4	58	5	8	2			4	376
1996	346	2			5	<0.5	3	68	9	6	<0.5			5	444
1997	663	4		2	3	<0.5	6	83	1	32	<0.5			2	796
1998	418	3			4	<0.5	9	96	1	9	1			20	561
1999	1,325	5			7		66	161	17	1				4	1,586
2000	1,885	5	<0.5	<0.5	6	<0.5	22	99	41	12		3		11	2,084
2001	1,749	20		1	7	2	22	73	15	7	<0.5			53	1,949
2002	1,320	2			3	41	1	12	<0.5	12	<0.5			2	1,393
2003	1,811	<0.5			3		2	29	1	4				4	1,854
2004	898	1		<0.5	2		2	31	1	13	<0.5			3	951
2005	1	<0.5			<0.5		7	11	<0.5	2				4	25
2006	25	2			1		11	54	1	4	<0.5			9	107

Source: table 4–13 in the 2007 HMS SAFE; PacFIN, extracted July 31, 2007.
Additional processing info:
Only fish tickets where at least 1 lb of any HMS (except striped marlin) was landed for the longline fishery were used.
Landings in lb are converted to round weight in mt by multiplying the landed weights by the conversion factors in each fish ticket line and then dividing by 2204.6.
Aquaculture fish ticket/fish ticket line info is excluded.

2.0 ALTERNATIVES

2.1 Alternative 1 – No Fishery

This alternative would close the current west-coast-based DSLL fishery operating on the high seas, which currently consists of one vessel. To implement this alternative, the Council process would be initiated to amend the HMS FMP, and NMFS would need to publish regulations that would close the west-coast-based DSLL fishery.

2.2 Alternative 2 – No Action Alternative – Continue Fishery (Preferred)

This alternative would allow the west coast DSLL pelagic tuna fishery to continue operating on the high seas and to expand to a maximum of six vessels. The current terms and conditions of the fishery are listed here and can also be found in section 6.2.2 of the amended HMS FMP and apply to all fishing on the high seas by west coast longline fishing vessels. Longline vessels operating on the high seas outside the EEZ are currently subject to the same controls that applied to Hawaii-based longline fishing vessels holding longline permits in 2003. The limitations and specifications for the fishing area, gear configuration, sea turtle and seabird mitigation measures, skipper workshops, and VMS are consistent with current Federal regulations applicable to vessels fishing under the WPFMC's Pelagics FMP (50 CFR 665 Subpart C) and the PFMC's HMS FMP (50 CFR 660 Subpart K).These are as follows:

1. 100 percent observer coverage, paid for by NMFS. Requiring 100 percent observer coverage would allow independent verification of total catch (including bycatch), protected species takes and interactions, and the area of operation.
2. Fishing is only authorized on the high seas (all waters beyond the EEZ of the United States and beyond any foreign nation's EEZ, to the extent that such EEZ is recognized by the United States).
3. From April 1 through May 31, a vessel may not use longline gear in waters bounded by the equator and 15º N. latitude, and 145º W. longitude and 180º W. longitude[2].
4. Utilizing DSLL gear configuration:
    a. No fewer than 15 branchlines may be set between any two floats (10 branchlines if using basket gear).
    b. Longline gear must be deployed such that the deepest point of the main longline between any two floats (i.e. deepest point in each sag of the main line is at a depth greater than 100m below the sea surface).
    c. No light stick (any light emitting device for attaching underwater to the longline gear) may be possessed on board a vessel. The use of light sticks may attract turtles.
    d. A vessel may not use longline gear to fish for or target swordfish north of the equator (0° latitude); landing or possession of more than 10 swordfish per trip is prohibited.
    e. The length of each float line possessed and used to suspend the main longline beneath a float must be longer than 20 m.
5. While fishing for management unit species north of 23º N. latitude a vessel must (seabird avoidance and mitigation measures):
    a. Maintain a minimum of two cans (each sold as 0.45 kg or 1 lb size) containing blue dye on board the vessel during a fishing trip.
    b. Use completely thawed bait. Completely thawing and dying bait dark blue reduces seabirds' ability to see the bait by reducing the bait's contrast with the sea surface.

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[2] This time/area closure was put into place by NMFS to reduce fisheries interactions with protected species in 2002. The court vacated this decision but it was never removed from the HMS FMP regulations. NMFS is currently looking into how to remove this closure since it is no longer valid.

  c. Use only bait that is dyed blue of an intensity level specified by color quality control card issued by NMFS.
  d. Retain sufficient quantities of offal for the purpose of discharging the offal strategically in an appropriate manner. Sufficient quantities of offal must be available in order to strategically attract seabirds to an area where hooks are not being set in order to prevent seabirds from becoming entangled and caught in the longline.
  e. Remove all hooks from offal prior to discharging the offal.
  f. 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
  g. Use a line-setting machine or line-shooter to set the main longline (unless using basket gear).
  h. Attach a weight of at least 45 g to each branch line within 1 m of the hook
  i. 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.

6. Line clippers, dip nets, and bolt cutters meeting NMFS's specifications must be carried aboard each vessel for releasing turtles (specifications vary by vessel size).
7. Proper release and handling of turtles and seabirds[3]. Following the sea turtle and seabird handling, resuscitation, and release procedures for accidentally hooked or entangled sea turtles and seabirds minimizes injury and promotes survival of the animals.
8. Vessel operators must attend a protected species workshop each year. These workshops are aimed at raising awareness of fishermen to the proper methods for avoiding, handling and dehooking protected species.
9. Requirement for Vessel Monitoring Systems (VMS).

2.3 Alternatives Eliminated from Detailed Study

Another management option that was discussed during the scoping process involved allowing for the continuation of the west-coast-based DSLL pelagic tuna fishery on the high seas, but limiting the number of vessels that could enter the fishery using a limited entry permit system. This alternative was eliminated from detailed study after discussing the potential expansion of the fishery with the HMS Advisory Subpanel (including members of industry) and estimating that at most, only five additional vessels would be interested in and capable of entering the fishery over the next three years. A limited entry permit system is not appropriate for such a small number of vessels.

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[3] Full description of all applicable measure are in 50 CFR Part 660, see 66 FR 63630 (turtles) and 67 FR 34408 (seabirds).

3.0 AFFECTED ENVIRONMENT

3.1 Introduction

This chapter and chapter 4 comprise the analytical portion of the EA. This EA considers the effects of the alternatives on different parts of the human environment, which are referred to as *environmental components*. Three environmental components have been identified for further evaluation and discussion in these chapters: target and non-target finfish, protected species (marine mammal, sea turtle and seabird species), and the socioeconomic environment (fishermen, processors, consumers, bait, fuel, fishing gear, etc.).

3.1.1 Data Sources

Data that may be used to characterize the effects are often limited or unavailable. This is true for most of the international fishing fleets in the Pacific where there may be a small or non-existent fisheries observer programs. In addition, because the action will continue to occur in the future, there is a need to either project or infer effects based on what has occurred in the past. Since there has not been a long history of U.S. vessels DSLL fishing on the high seas, and NMFS cannot disclose observer data related to the current west-coast-based DSLL fishery because only one vessel is participating in the fishery and that information is strictly confidential[4], the characterizations of other comparable longline fisheries are presented to project impacts of this fishery. Given the similarity in gear and techniques between the west -coast- and Hawaii-based DSLL fisheries, Hawaii's DSLL fishery records provide the best approximation of the west-coast-based DSLL fishery.

3.1.1.1 Hawaii-based DSLL Fishery (2003-2007)

The following is a brief description of the Hawaii-based DSLL fishery targeting tuna on the high seas, using data from observed trips that occurred from the beginning of 2003 through the end of 2007. Data was extracted from 17,334 observed sets during 1,385 trips. The area of fishing operations occurred between the latitudes of 1.345º N – 35.443º N. and the longitudes of 137.922º W - 173.62º W.

For the purposes of understanding general aspects of the DSLL fishing gear configurations, ranges will be given where applicable. Mainline material generally consists of monofilament line ranging from 2mm-6.4mm in diameter. Fishing depths were between 13 m and 728 m but averaged about 191 m. Tuna are normally targeted deeper than 100 m but 1,156 of the sets were made shallower than this, most likely because the tuna were spotted at this depth on a scanner.

The number of hooks per set ranged from 85 to 4,110, and averaged 2,050 hooks per set. The total number of hooks observed was 35,526,205. Bait consisted of mackerel (1.1 percent, or 198 sets), mixed (17.1 percent, or 2,972 sets), sardine (30.9 percent, or 5,364 sets), saury (49.9 percent, or 8,654 sets), and other (0.8 percent, or 146 sets).

Soak times ranged from less than one hour up to 86 hours, with an average soak time of 19 hours. Vessel speed, when reported, ranged from less than one knot to nine knots, and averaged seven knots. Temperatures observed during set times ranged from 60.5 to 91° Fahrenheit (begin set sea surface temperature), and averaged 78.4° Fahrenheit.

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[4] Section 118(d)(8) of the MMPA provides for the maintenance of confidentiality, as does NMFS implementing regulations, 50 CFR §229.11, and NOAA Administrative Order 216-100.

3.1.1.2 West-Coast-Based DSLL Fishery Outside of the EEZ (2005-present)

The west-coast-based DSLL fishery operating outside of the EEZ since 2005 has only included one vessel to date. This vessel has had close to 100 percent observer coverage since the fishery began so that NMFS could adequately characterize the impacts of DSLL fishing in this area. For the purposes of this EA the data from 2005-present for this vessel cannot be disclosed for confidentiality reasons; however, it will be used qualitatively to highlight some of the differences of the Hawaii-based DSLL fishery.

3.2 Climate and Biophysical Factors Contributing to Baseline Effects

3.2.2 Tuna Movements Correlated to Oceanographic Conditions

Oceanic fronts are characterized by steep gradients in temperature and salinity and tend to be associated with high biological productivity. These fronts serve as habitat and foraging areas for swordfish, tunas, seabirds and sea turtles. In the North Pacific two major frontal regions important to the tuna fisheries occur, the subarctic frontal zone (SAFZ) occurs between 40° and 43° N. latitude, and the subtropical frontal zone (STFZ) occurs between 27° N. and 33° N. latitude. The STFZ occurs variously as a temperature front from late fall to summer and all year as a salinity front (Bigelow, *et al.* 1999). This oceanographic feature creates ideal fishing conditions for the tuna fishery within the proposed action area during the winter and spring months. Within these zones fronts develop, persist, and shift seasonally in complex patterns (Seki, *et al.* 2002). Seki, *et al.* (2002) identifies two prominent semi-permanent fronts within the STFZ: the Subtropical Front (STF) located between 32° N. and 34° N. latitude, and the South Subtropical Front (SSTF) located between 28° N. and 30° N. latitude. The STF is identifiable by the 17° Celsius sea surface temperature (SST) isotherm and 34.8 isohaline (line of equal salinity) while the SSTF can be identified by the 20° Celsius isotherm and 35.0 isohaline and 24.8 isopycnal (line of equal density) (Seki, *et al.* 2002). Large geological features such as islands and seamounts can create divergences and convergences which concentrate tuna prey species. Tuna species are also attracted to upwelling zones along ocean current boundaries such as the transition zone west of the California Current System (CCS).

Studies on the movements of bigeye tuna have shown similar patterns in vertical and horizontal migrations related to temperature and oxygen (Bertrand, *et al*. 2002; Sibert, *et al*. 2003; Dagorn, *et al*. 2000). Bigeye tuna are able to withstand a range of sea temperatures (10-26º C) and their unique anatomy and physiology allow them to forage at the surface and at depth (Holland, *et al*. 1992; Holland and Sibert 1994). The depth distribution for bigeye tuna can range between the surface and 600 m but they may spend most of their time around 250-400 m (11-20º C) depending on the latitude. Bigeye tuna will migrate up and down throughout this vertical range during the day spending a longer period of time at depth in the morning hours (Dagorn, *et al*. 2000). In the North Pacific the hook depth to catch tunas is usually shallower than in tropical areas because the temperatures are cooler at a shallower depth. Bigeye tunas can also forage in low oxygen waters giving them an advantage over other tuna species that are not capable of tolerating these conditions. Horizontal movements of tagged bigeye tuna were tracked throughout several months to a year and the data showed high site fidelity to geographical points of attraction such as weather buoys, seamounts, and islands (Sibert, *et al*. 2003).

Yellowfin and albacore tuna are caught at shallower depths than bigeye tuna and are not as tolerant of low temperatures and oxygen levels (Bertrand, *et al*. 2002). Albacore and yellowfin tuna are both found throughout the action area and make up a large proportion of the overall tuna catch other than bigeye tuna.

3.2.3 Climate Variability

Two meso-scale climate phenomena likely affect frontal activity and the distribution of tuna, other target and non-target finfish, and protected species that may be caught in the proposed action area. The first is El Niño-Southern Oscillation (ENSO), which is characterized by a relaxation of the Indonesian Low and subsequent weakening or reversal of westerly trade winds, causing warm surface waters in the western Pacific to shift eastward. Although the effects can be global, especially during an intense event, off the West Coast an El Niño event brings warm waters and a weakening of coastal upwelling. Tropical species, such as tuna and billfish, are found farther north during El Niño years. During the strong El Niño event from 1997 to 1999, striped marlin were recorded off the Oregon coast (Field and Ralston 2005). A related condition is termed La Niña and results in inverse conditions such as an intensified Indonesian Low, strengthened westerly trade winds, pooling of warm water in the western Pacific, and relatively cooler water in the eastern tropical Pacific and CCS. Etnoyer, *et al.* (2004) found the Northeast Pacific was less active in terms of front concentration and persistence during El Niño and relatively more active during La Niña.

Longer period cycles, which are partially identified by an index termed the Pacific Decadal Oscillation (PDO), also have important ecological effects in the CCS. Regime shifts indicted by the PDO have a periodicity operating at both 15-25 and 50–70 year intervals (Schwing 2005). The PDO indicates shifts between warm and cool phases. The warm phase is characterized by warmer temperatures in the Northeast Pacific (including the West Coast) and cooler-than-average sea surface temperatures and lower-than-average sea level air pressure in the Central North Pacific; opposite conditions prevail during cool phases. Rapid phase shifts occurred in 1925, 1947, 1977, and 1989. A regime change has been detected occurring in 1998. The 1977 shift, from a cool to warm phase in the CCS produced less productive ocean conditions off the West Coast and more favorable conditions around Alaska. Hare, *et al.* (1999) documented the inverse relationship between salmon production in Alaska and the Pacific Northwest and related this to PDO-influenced ocean conditions. Researchers have identified similar relationships between meso-scale climate regimes and the productivity of other fish populations (see Francis, *et al.* 1998 for a review). However, both the 1989 and 1998 shifts have different characteristics from previous shifts. The 1989 shift did not bring cooler water and enhanced upwelling to the West Coast. This has apparently resulted in a further decline in the productivity of some fish populations in the Northeast Pacific (McFarlane, *et al.* 2000). The 1998 shift resulted in dramatic cooling of west coast waters, but the characteristics of this phase are obscured by the short time series since onset and the development El Niños in 1998-99 and 2002-03. The cooling trend was interrupted or may have ended in 2003 (Schwing 2005).

Because the effects are similar, "in-phase" ENSO events (i.e., an El Niño during a PDO warm phase) can be intensified. However, aside from these phase effects, regime conditions identified by the PDO index, although of much longer duration than ENSO events, are milder. It is also important to note that—while the fundamental causes of PDO are not fully understood—they are known to be different from those driving ENSO events. And while ENSO has its primary effect on the Tropical Pacific, with secondary effects in colder regions, the opposite is true of PDO; its primary effects occur in the Northeast Pacific.

The ecosystem effects of PDO conditions are pervasive. Climate conditions directly affect primary production (phytoplankton abundance), but ecosystem linkages ensure these changes influence the abundance of higher trophic level organisms, including fish populations targeted by fishers (Francis, *et al.* 1998; MacCall 2005).

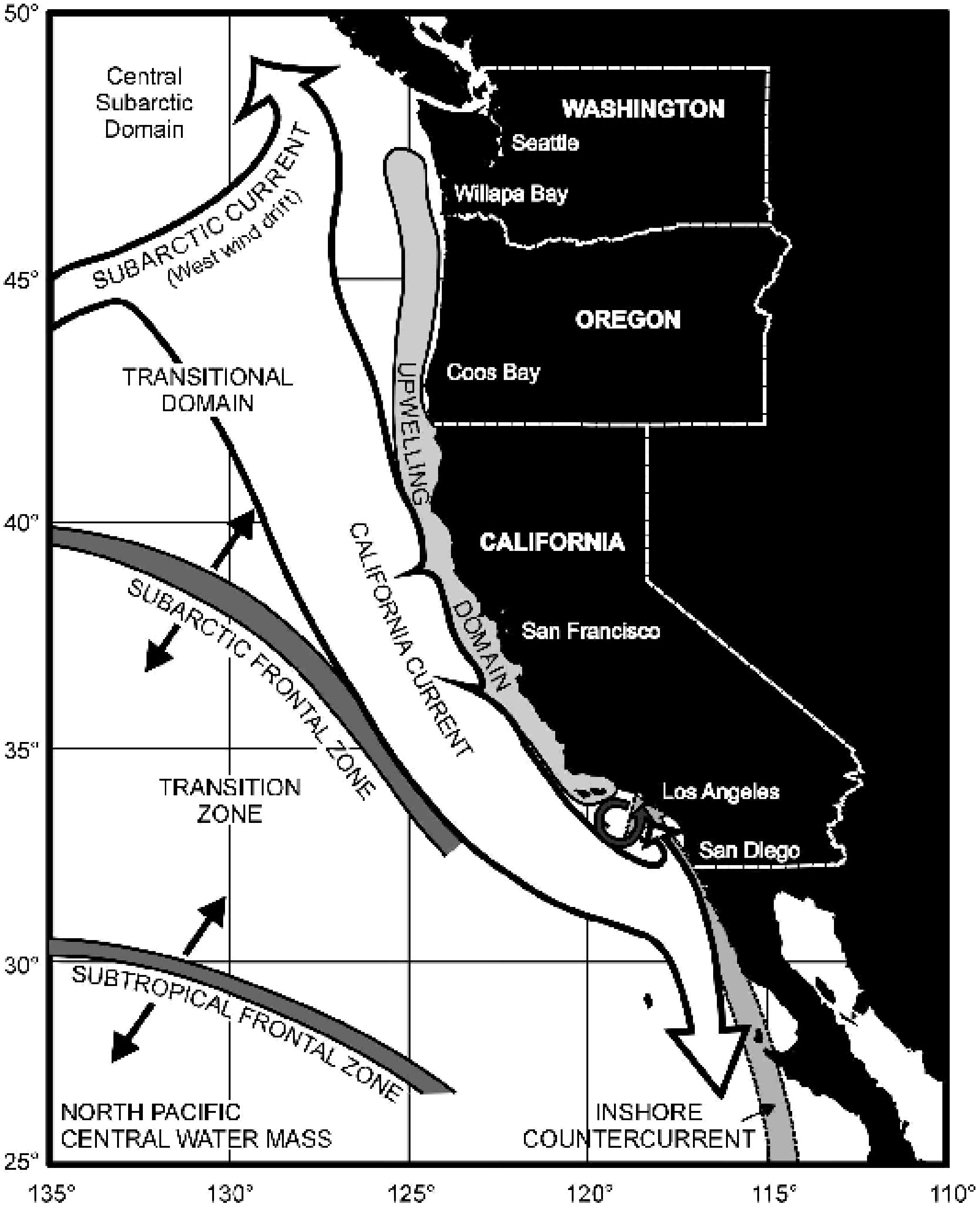


Figure 3–1. Major current and water mass systems that influence essential fish habitat of highly migratory management unit species in the U.S. west coast EEZ.

3.3 Finfish, Billfish and Sharks

This section describes the baseline conditions of the finfish species likely to be caught within the proposed action area. The baseline conditions include the range of fisheries contributing to mortality of the stocks, reviews fishery catches on a stock basis, and summarizes what is currently known about stock status.

3.3.1 Baseline Description of Fisheries in the Proposed Action Area

The target species for the proposed action are pelagic tunas, including bigeye, yellowfin, skipjack, and albacore tunas. Baseline descriptions are provided for tuna species, and several major non-target finfish species included as HMS management unit species (MUS) (table 3–1) under the HMS FMP (PFMC 2003). The HMS FMP further designates a complex of fish species as "prohibited species", meaning that they cannot be retained, or can be retained only under specified conditions, by persons fishing for MUS (2003). These FMP categories are used to organize the discussion of the current condition of finfish stocks that may be affected by the proposed action. The amended HMS FMP provides a detailed description of the baseline environment for all HMS fisheries and the reader is referred to that document for further insight (PFMC 2007a).

There are numerous foreign fisheries that operate throughout the Pacific Ocean using, among other gears, pelagic longline, pole-and-line, purse seine, and troll gears. By comparison, U.S. fisheries generally harvest a small fraction of the total Pan-Pacific harvest of HMS. The U.S. catch of tuna in the EPO (with all gear types combined) has averaged about 2.6 percent of the total catch of tuna in the EPO from 2002 to 2006; in 2006 the U.S. catch of tuna in the EPO was only about 0.2 percent of the total tuna catch in the EPO (IATTC 2007). The purse seine fishery contributes approximately 94 percent of the tuna caught in the EPO while the rest comes from longlining, gillnetting, trolling and recreational fisheries (PFMC 2007b). The U.S. tuna longline fishery contributes less than one percent (on average 0.03 percent from 2002 to 2006) of the total tuna landings in the EPO.

The HMS FMP requires that all commercial and recreational charter fishing vessel operators maintain and submit to NMFS logbook records of catch and effort statistics, including bycatch. These statistics, together with existing data collection and reporting requirements (e.g., observer records), are intended to provide a comprehensive standardized bycatch reporting system. However, HMS logbook bycatch records suffer from under-reporting and non-reporting biases, common shortcomings in regards to accuracy of bycatch estimates from most fishery logbook programs. When available, estimates of bycatch reported in HMS logbooks are presented, but the limitations of the data should be kept in mind.

Description of past and present longline fisheries taking place outside the U.S. west coast EEZ are presented followed by a brief description of pertinent non-longline fisheries that interact and harvest HMS species. Observer records from the Hawaii-based DSLL fishery are used to compute catch per unit of effort (CPUE) estimates as a proxy for the expected take under the proposed action.

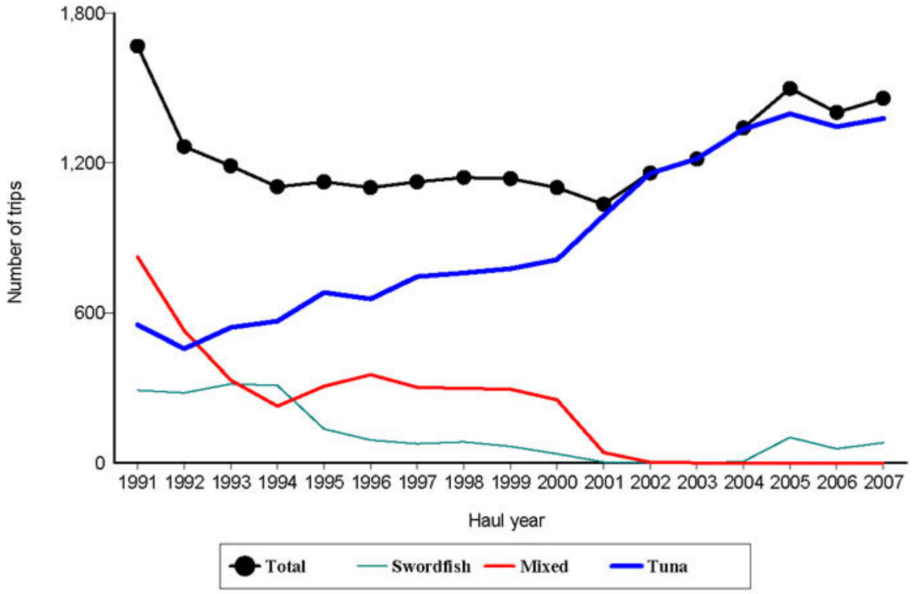
Table 3–1 HMS FMP management unit species.

Common Name	**Scientific Name**
striped marlin	*Tetrapturus audax*
swordfish	*Xiphias gladius*
common thresher shark	*Alopias vulpinus*
pelagic thresher shark	*Alopias pelagicus*
bigeye thresher shark	*Alopias superciliosus*
shortfin mako shark	*Isurus oxyrinchus*
blue shark	*Prionace glauca*
North Pacific albacore	*Thunnus alalunga*
yellowfin tuna	*Thunnus albacares*
bigeye tuna	*Thunnus obesus*
skipjack tuna	*Katsuwonus pelamis*
northern bluefin tuna	*Thunnus orientalis*
Dorado(a.k.a.mahimahi, dolphinfish)	*Coryphaena hippurus*

3.3.1.1 U.S. Pacific Longline Fisheries

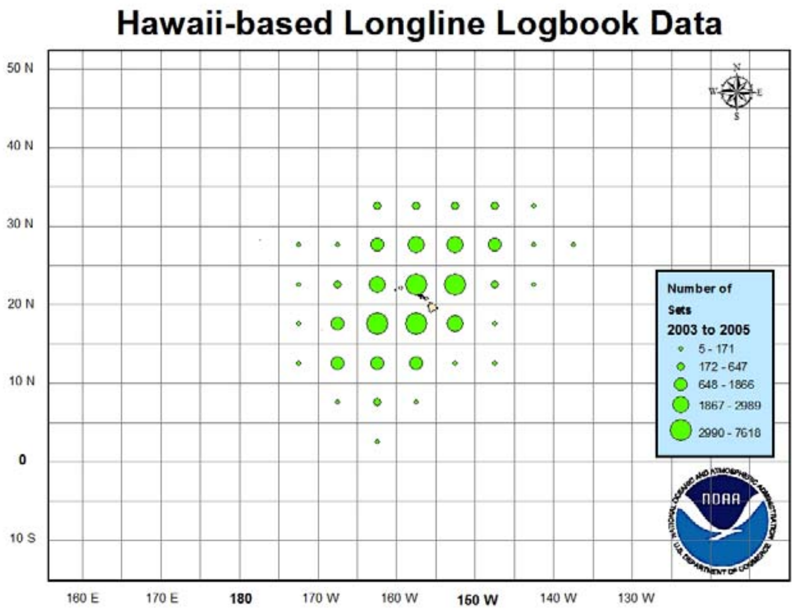
Hawaii-based Longline Tuna Fishery, 1994-present

The Hawaii-based longline fishery has operated since 1994 with varying levels of effort taking place within the proposed action area. Most of the current Hawaii DSLL fishing effort is located west of 140º W. longitude and between 10º N. and 30º N. latitudes (fig. 3-2; fig. 3-3). In 2006, there were 127 active longline vessels based and landing in Hawaii which took part in the swordfish and/or tuna fisheries (PIFSC 2007). A portion of the vessels only target tuna using DSLL gear, or swordfish using SSLL gear; however, some alternate the species they are targeting depending on seasonal variations in fish movements and oceanographic conditions. Currently, the vessel owner or operator must notify the NMFS Pacific Islands Region Observer Program contractor before departure on a fishing trip, and declare the intended trip type (shallow-set or deep-set); once a trip type has been declared, the operator must make sets only of the declared type (NMFS 2006a). In addition, if any of the SSLL fishery turtle caps (maximum allowed bycatch of turtles) are met in a given year, the vessels may also choose to switch over to DSLL fishing for tuna in the spring or summer (personal communication with Lyle Enriquez, National Marine Fisheries Service, Biologist, 2007).



Source: PIFSC 2008[5]

Figure 3–2. Number of fishing trips by longline vessels based and landing in Hawaii, by year and trip type, 1991-2007.



Source: Figure prepared by NMFS Pacific Island Fisheries Science Center, Honolulu, HI.

Figure 3–3. Hawaii-based DSLL fishing effort for the Pacific Ocean is shown.

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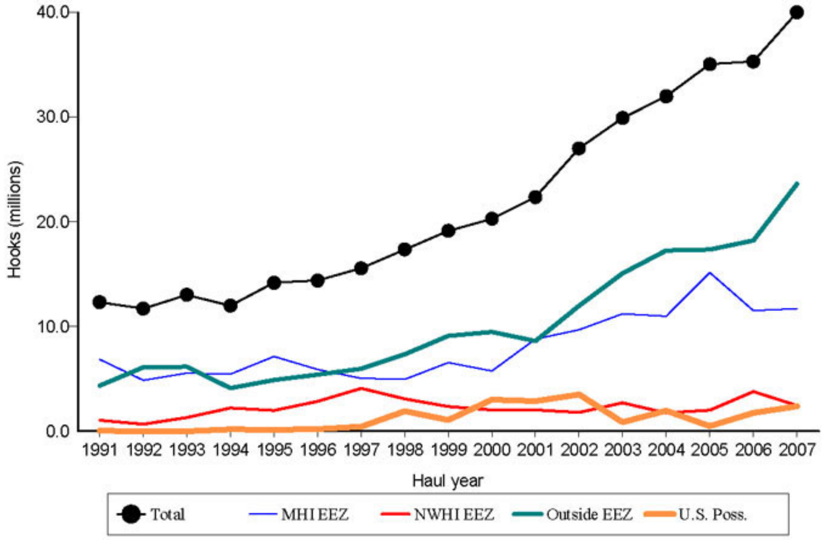
[5] http://www.pifsc.noaa.gov/fmsd/reports/hlreports/lltables/2008q1/2008_1_fig_a2.jpg



Note: NMWHI: Northwestern Hawaiian Islands; MHI: Main Hawaiian Islands; U.S. Poss.: U.S. Possession.
Source: PIFSC 2008.[6]

Figure 3–4. Number of hooks set by longline vessels based and landing in Hawaii, by year and fishing area, 1991-2007.

West-Coast-Based Deep-set Tuna Longline Fishery, 2005–Present

A single west-coast-based DSLL vessel has been operating on the high seas out of southern California ports since 2005. This vessel primarily targets tropical tuna species using DSLL gear with a percentage of swordfish and other HMS taken incidentally. At the present time, DSLL fishing by west-coast-based vessels must take place outsid of the U.S. EEZ. Participation in the fishery is expected to be minimal with a potential expansion of five vessels over a three year time frame (Personal communication, industry participants at HMS Advisory Subpanel meeting, November 2006) The high operational costs, time constraints and safety considerations of fishing outside the EEZ will most likely keep participation in this fishery at a minimum.

Hawaii-based SSLL Swordfish Fishery, 1994–present

The target species of the Hawaii-based SSLL fishery are the broadbill swordfish and tuna species. Non-target species include a host of other marine species captured incidentally in this fishery. The NMFS Pacific Islands Fishery Science Center (PIFSC) provides logbook summaries for all longline vessels, including SSLL and DSLL vessels landing product in Hawaii.[7] For the 2006 fishing year, a total of 127 longline vessels based and landing in Hawaii were active, based on logbook records submitted to the PIFSC. The area of fishing operations for the Hawaii-based boats occurred between 16.9° N. and 44.7° N. latitude, and 127.3° W. and 179.7° E. longitude.

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[6] http://www.pifsc.noaa.gov/fmsd/reports/hlreports/lltables/2008q1/2008_1_fig_a3.jpg

[7] Data source: http://www.pifsc.noaa.gov/fmsd/reports/hlreports/2005.pdf

3.3.1.2 International Longline Fisheries

Tuna Longline Fisheries in the EPO

There are currently an estimated 1,292 large-scale longline vessels (> 24 m total length) from 15 different countries authorized to target tuna and tuna-like species in the EPO (table 3–2). The vessel list presented below is a recent estimate from the Inter-American Tropical Tuna Commission (IATTC). This list is constantly changing; the IATTC website provides the most up to date list[8]. Also, these vessels are authorized to fish in the EPO but are not necessarily all operating at this time. The total annual reported catch of all tuna species combined, by longline gear, in the EPO was 63,761 mt in 2005, and 41,031 mt in 2006 (table 3–3). In comparison, the total U.S. annual reported catch of all tuna species combined, by longline gear, in the EPO was 562 mt in 2005, and 78 mt in 2006 (table 3–3). Annual quotas of bigeye tuna catches are set for all IATTC parties due to current overfishing for this species (IATTC 2007). The 2007 U.S. quota for bigeye tuna catch in the Pacific was 500 mt; IATTC has not reached a consensus on the quotas for 2008.

Table 3–2. List of large-scale longline vessels over 24 meters that are authorized to fish for tunas and tuna-like species in the EPO.

Country	Number of Vessels
Japan	528
Korea	202
Chinese Taipei	124
Spain	119
China	93
Panama	71
Vanuatu	48
United States	17*
Ecuador	22
Belize	29
France	14
Costa Rica	11
Mexico	9
Honduras	4
Nicaragua	1
Total	**1292**

* Five of these vessels are registered to ports on the U.S. West Coast in California, Oregon and Washington; 12 are registered to ports in the Hawaiian Islands.
Source: IATTC 2007.

Artisanal Longline Fisheries in the EPO

Artisanal (small-scale, traditional) longline fisheries exist along the coasts of Central and South America targeting several fish species including tuna, billfishes, and sharks. Most of these fisheries take place within each country's EEZ, but some countries have larger vessels that can fish on the high seas. Some of these larger vessels are included in table 3-2 above. An observer program was established for some artisanal vessels within the EEZ of Costa Rica from August 1999 through February 2000. In the observed

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[8] http://www.iattc.org/VesselRegister/VesselList.aspx?List=Longline&Lang=ENG

fishery, “mother lines” were set between 12 and 15 miles with hooks attached every 5–10 m, for a total of 400–800 hooks/set. Seventy-seven longline sets were observed on nine cruises; seven of the cruises targeted mahi mahi (daytime soak), and two of the cruises targeted yellowfin tuna (nighttime soak). There is also an effort in Ecuador, Colombia, Costa Rica, El Salvador, Guatemala, Mexico, Nicaragua, and Panama for increased observer coverage of artisanal fisheries and to have fishermen adopt the use of circle hooks to reduce sea turtle bycatch in shallow-sets (Lagarcha, *et al*. 2005; Hall, *et al*. 2006).

Table 3–3. Estimates of the retained catches of tunas and bonitos, by flag, gear type, and species, in metric tons, in the EPO, 2006.

Flag Country	**Gear type[4]**	**Yellowfin**	**Skipjack**	**Bigeye**	**Pacific Bluefin**	**Albacore**	**Black Skipjack**	**Bonitos nei[3]**	**Tuna nei[3]**	**Total**
Belize	LL	105	13	75	*	8	*	*	*	201
Canada	LTL	*	*	*	*	5,139	*	*	*	5,139
China	LL	36	*	709	*	13	*	*	*	758
Costa Rica	NK	642	*	8	*	*	*	*	*	650
Ecuador	PS	26,152	143,094	34,176	*	*	79	*	67	203,568
Honduras	PS	1,694	6,483	3,061	*	*	*	*	*	11,238
Japan	LL	*	*	13,618	*	278	*	*	*	13,896
Korea	LL	*	*	8,694	*	58	*	*	*	8,752
Mexico	LP	693	429	*	*	*	*	12	*	1,133
	PS	67,859	19,118	*	9,795	109	1,897	3,229	31	102,038
Nicaragua	PS	7,257	5,371	1,878	*	*	*	*	1	14,507
Panama	LL	2,164	114	37	*	110	*	*	*	2,425
	PS	23,673	46,742	10,645	*	*	8	*	*	81,068
Peru	NK	595	73	*	*	*	*	*	192	860
Chinese Taipei	LL	1,671	57*	6,412	*	4,235	*	*	*	12,375
United States	LL	*	*	78	*	*	*	*	*	78
	RG	641	16	*	96	376	*	*	*	1,129
Venezuela	PS	17,226	25,725	4,135	*	*	11	248	*	47,345
Vanuatu	LL	*	*	648	*	1,688	*	*	*	2,336
Other[1]	LL	*	*	*	*	207	*	*	3	210
	PS[2]	22,878	61,615	17,300	*	*	5	*	2	101,800

[1] This category is used to avoid revealing the operations of individual vessels or companies

[2] Includes Bolivia, Colombia, El Salvador, Guatemala, Spain, United States and Vanuatu.

[3] Not elsewhere included (nei)

[4] LL: longline; LTL: troll; NK: unknown; PS: purse-seine; LP: pole-and-line; RG: recreational

Source: IATTC 2007.

3.3.1.3 U.S. Non-longline Fisheries

U.S. Tuna Purse Seine Fishery

There are two components to the U.S. tuna purse seine fishery: large vessels (greater than 400 short tons (st)[9] carrying capacity) and small vessels (equal to or less than 400 st carrying capacity). The large vessels usually fish outside U.S. waters and deliver their catch to foreign ports or transship to processors outside the mainland United States. The fleet of large vessels based on the West Coast and fishing in the EPO has been greatly reduced over the past 20+ years so that in 2007, there were one to two large purse seine vessels in the U.S. tuna purse seine fleet (50 CFR Part 300).

The small vessel tuna purse seine fleet, based primarily out of southern California ports, is a multi-fishery fleet that fishes within the U.S. west coast EEZ most of the year, reliant primarily on coastal pelagic species (CPS) such as sardines, mackerel, and squid. The southern California fleet opportunistically fishes for tropical tunas when the tunas migrate further north and within the range of these vessels, which are not equipped for long-range excursions. Specifically, yellowfin and skipjack tunas seasonally (during the months of August, September, and October) migrate within range of these vessels, and bluefin and albacore tunas are also periodically landed. However, predicting the movements of these tuna species is uncertain. For example, in 2006, neither yellowfin nor skipjack tunas ventured close enough to the range of the southern California small purse seine fleet, resulting in zero landings (50 CFR Part 300). There are approximately 61 small purse seine vessels with limited entry permits under the CPS FMP[10]; however, only about 5-10 of these vessels were targeting tuna in 2007. The CPS fishery is under a limited entry program when operating south of 39º N. latitude pursuant to the CPS FMP. Alternatively, vessels could enter the purse seine fishery to target tunas as there is currently no limited entry program for purse seine vessels operating under the HMS FMP.

HMS Albacore Troll and Baitboat Fleet

U.S. troll and baitboat vessels have fished for albacore in the North Pacific since the early 1900s using artificial lures with barbless hooks. The total catch (all fishing gears combined) of North Pacific albacore was about 62,000 mt in 2005, the lowest observed catch since the early 1990s. During the past five years, fisheries based in Japan accounted for 66 percent of the total harvest, followed by fisheries in the United States (16 percent), Chinese Taipei (8 percent), and Canada (7 percent). In 2006, 632 U.S. troll vessels fished in the North Pacific albacore fishery and landed 12,749 round mt of albacore. (PFMC 2007b).

In recent years, the North Pacific albacore troll season started as early as mid-April in areas northwest of Midway Atoll. In July and August, fishing effort expands to the east, towards the West Coast of North America (160° W. longitude to 120° W. longitude), extending from southern California to Vancouver Island (32° N. latitude to 55° N. latitude). Fishing can continue into November if weather permits.

3.3.1.4 International Non-longline Fisheries

Tuna Purse Seine Fishery in the EPO

The international purse seine fleet represents the majority of the fishing effort and carrying capacity in the EPO tuna fishery, with much of the total capacity consisting of large purse seiners with a carrying

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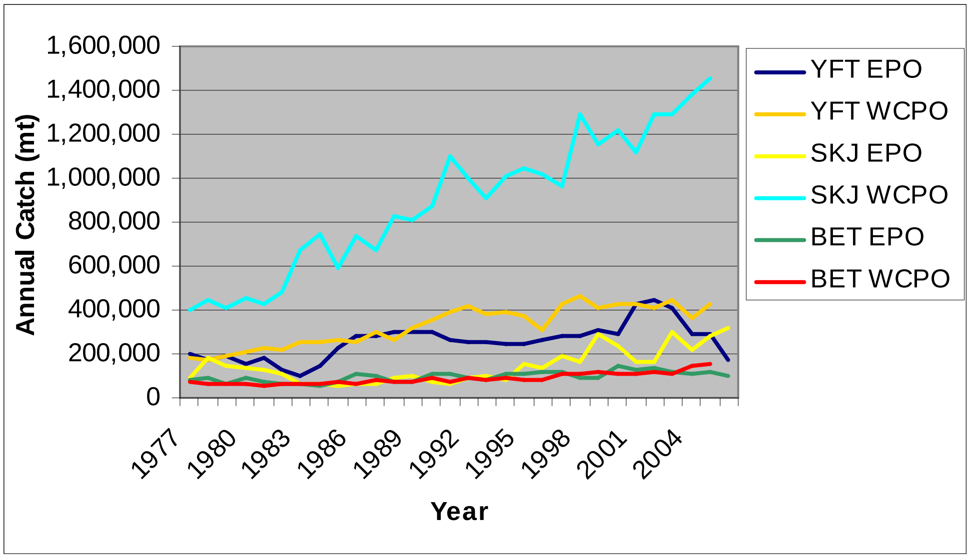
[9] The IATTC uses short tons in its stock status reports. 400 short tons is equal to about 363 metric tons.
[10] http://www.pcouncil.org/cps/cpsback.html

capacity of 400 st or greater[11]. The latest information from IATTC shows that the number of purse seine permit holders of all sizes is 238 vessels, with Mexico and Ecuador comprising the majority of the fleet (IATTC 2007). The number of active vessels in the purse seine fleet is constantly changing; the IATTC website provides the most up to date list.[12].

Figure 3-5 shows the total annual yellowfin (YFT), skipjack (SKJ) and bigeye tuna (BET) catches for the EPO and western central Pacific Ocean (WCPO) from 1977-2006. All gears and countries are combined for each of the tuna species shown. Skipjack tuna comprise the highest amount of catch for the WCPO and yellowfin tuna comprise the highest number of catches for the EPO. Bigeye tuna catches have always been less than 200,000 mt for the WCPO and EPO.



Note: The EPO totals for 1993-2006 include discards from purse seine vessels with a carrying capacity greater than 363 mt. Data for 2006 for the WCPO was not available.
Data source: IATTC 2007.

Figure 3–5. Total annual yellowfin, skipjack and bigeye tuna catches for the EPO and WCPO from 1977-2006. All gear types and countries combined.

3.3.2 Current Stock Status of Target and Non-target Finfish Species

The HMS FMP provides an overview of the stock status for HMS MUS at the time of FMP adoption (PFMC 2003). The 2007 HMS Stock Assessment and Fishery Evaluation Report (SAFE) provides an update and a more detailed account of the status of the HMS MUS (PFMC 2007b). Given the highly migratory nature of many of the HMS FMP management unit species, effective management can only be achieved with coordinated cooperation in the international arena. HMS stock assessments are periodically carried out by scientists from Pacific-based regional fisheries management organizations (RFMOs) such as IATTC and the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific (ISC).

Stock status refers to the condition or health of the species (or stock) in the management unit. Status is usually determined by estimating the abundance (or biomass or yield) of the stock throughout its range

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[11] The IATTC uses short tons in its stock status reports. 400 short ton is equal to about 363 metric ton.
[12] http://www.iattc.org/VesselRegister/VesselList.aspx?List=AcPS&Lang=ENG

and comparing the estimate of abundance with an adopted acceptable level of abundance (reference point). The 2007 HMS FMP, as required by the MSA, establishes a level of biomass (or proxy) below which a stock is defined as being in an "overfished" condition, and a level of fishing mortality above which "overfishing" is occurring. If overfishing is occurring, fishing levels must be reduced. Stocks that are overfished must be rebuilt to certain biomass levels within a certain time period. As required by the MSA, HMS stocks are to be managed to achieve optimum yield (OY). The HMS FMP provides a detailed description of overfishing criteria and default control rules (PFMC 2007a).

3.3.2.1 Target Tuna Species

The target species are tunas, including bigeye, yellowfin, skipjack, and albacore tunas. The majority of the tuna catch in the EPO is made up of bigeye, yellowfin tuna, and skipjack tunas, with a smaller contribution from albacore (table 3-3; page 19).

Bigeye (*Thunnus obesus*) (Aires-da-Silva and Maunder 2008)

Stock status of bigeye tuna in the EPO is assessed every 1–2 years by IATTC. The latest assessment was conducted in May 2008 (Aires-Da-Silva and Maunder 2008). The *Stock Synthesis II* assessment model was used with data through December 2007. Four scenarios were examined which differed by the assumption of a stock recruitment relationship, which fishery CPUE time series were included, and whether size selectivities were constant throughout the assessment period. The base case assessment assumed no relationship between stock and recruitment and included CPUE time series for the floating-object and longline fisheries. Furthermore, it was assumed that size selectivity had remained constant throughout the assessment period. Results of the base case assessment indicate that at the beginning of 2008, the spawning biomass of bigeye tuna in the EPO was below the MSY level and near a historic low. However, total biomass exceeded the biomass at MSY (B_{MSY}). Both recent catches and fishing effort have been above levels corresponding to MSY. Analyses show that before the expansion of the floating-object fishery in 1993, the MSY was greater than the current MSY and the fishing mortality was below the fishing mortality at MSY (F_{MSY}). If bigeye were caught only by the longline fishery, the MSY would be about 89 percent greater than that currently estimated for all gears combined. Simulations demonstrated that without the conservation measures put in place through 2007 under IATTC resolutions C-04-09 and C-06-02, the spawning biomass ratio would have decreased to below current levels. Furthermore, continuation of those conservation measures would be insufficient to allow the population to maintain above levels corresponding to the MSY in the long term. The IATTC has not yet put restrictions on the EPO fisheries for 2008; however, based on the previous declaration of overfishing, the Council and NMFS continue to work through the U.S. delegation to the IATTC to promote appropriate conservation measures for bigeye tuna. The assessment was based on the assumption that there is a single stock of bigeye tuna in the EPO.

The floating object fishery, which consists of purse seine fishermen who set nets on tuna schools associated with floating objects (either man-made fish aggregating devices known as FADs, or natural debris known as flotsam), began to increase in importance in the EPO in 1993. Purse seine sets on floating objects are known to yield catches of small fish below the critical size; however, the AMSY of bigeye in the EPO could be maximized if the age-specific selectivity pattern of the fishery were similar to that for the longline fishery, which in general catches larger individuals. The two most recent estimates indicate that the bigeye stock in the EPO is overfished (Spawning biomass, $S < SAMSY$) and that overfishing is taking place ($F>FAMSY$). Based in part on the previous IATTC bigeye tuna stock assessment, NMFS determined that the bigeye tuna stocks are experiencing overfishing. The Council is working with IATTC to end bigeye tuna overfishing in the EPO. Catch of bigeye tuna by U.S. west coast fisheries constitutes less than one percent of the eastern Pacific-wide catch.

Yellowfin (*Thunnus albacares*) (Maunder and Aires-Da-Silva 2008)

Stock status of yellowfin tuna in the EPO is assessed every 1–2 years by IATTC. The IATTC conducted the latest stock assessment of eastern Pacific yellowfin tuna in May 2008 (Maunder and Aires-Da-Silva 2008). The model used data through December 2007 and methods comparable to those used in 2007. In general, the assessment was slightly more optimistic than the previous assessment. The 2008 base case assessment, which does not include a stock-recruitment relationship, indicates that at the beginning of 2008 the biomass of yellowfin in the eastern Pacific Ocean (EPO) was above the level corresponding to maximum sustainable yield (MSY), and recent catches have been substantially below the MSY level. In addition, the recent fishing morality rate (*F)* was below the level corresponding to MSY. Under current levels of fishing mortality (2005-2007), the biomass is predicted to remain at or above current levels through 2012. Simulations were run which indicated that without the conservation measures put in place through 2007 under IATTC resolutions C-04-09 and C-06-02, including a six week purse seine closure and longline catch limits, biomass and spawning biomass ratio would have decreased to near MSY levels. The IATTC has not yet put restrictions on EPO fisheries for 2008; however, based on the previous declaration of overfishing, the Council and NMFS continue to work through the U.S. delegation to the IATTC to promote appropriate conservation measures for yellowfin tuna.

The latest assessment was based on the assumption that there is a single stock of yellowfin tuna in the EPO, and a single stock of yellowfin tuna in the WCPO, although it is likely that there is a continuous stock throughout the Pacific Ocean. Fishing is concentrated in the east and west, making separate consideration of the EPO stock relevant for management purposes. Catch of yellowfin tuna by U.S. west coast fisheries constitutes less than one percent of the eastern Pacific-wide catch.

Skipjack (*Katsuwonus pelamis*) (Maunder and Deriso 2007; Maunder 2008)

Stock status of skipjack tuna in the eastern Pacific is assessed every 1–2 years if deemed necessary by IATTC. There was an assessment conducted in 2004 that was considered preliminary because of uncertainties about stock structure, the vulnerabilities of all age classes, and how well fishery catch/effort data tracks abundance. The analysis indicated that a group of relatively strong cohorts entered the fishery in 2002–2003 (but not as strong as those of 1998) and that these cohorts increased the biomass and catches during 2003. There is an indication that more recent recruitments are average, which may lead to lower biomass and catches. Unfortunately, it was not possible to estimate the status of the stock relative to AMSY because of uncertainties in estimates of natural mortality and growth.

In 2006, an analysis of skipjack CPUE was performed which was consistent with the previous assessment (Maunder and Hoyle 2006). Thus, IATTC concluded that there was not a conservation concern for skipjack in the eastern Pacific and did not recommend that management was necessary.

Beginning in 2007, the IATTC developed a simple stock assessment model to evaluate indicators of skipjack biomass, recruitment, and exploitation rate and used simple indicators of stock status based on relative values of fishery data, such as, CPUE, average weight of fish caught, and effort (Maunder and Deriso 2007, Maunder 2008). The latest analyses show some inconsistencies. Indicators of biomass, recruitment and CPUE for the unassociated purse seine fishery are near the healthy reference levels; whereas, indicators for effort, exploitation rate and average fish weight are near the unhealthy reference levels. Theoretically, average fish weight could be low due to either above average recruitment or high exploitation rates. The indicators have yet to detect any adverse consequences of relatively high exploitation rates. The results of the simple stock assessment model were similar to the 2004 assessment and there still appears to be no conservation concern for skipjack in the Eastern Pacific.

North Pacific albacore (*Thunnus alalunga*) (ISC 2007)

Stock status of North Pacific albacore is reviewed at one- to two-year intervals by ISC Albacore Working Group (formerly the North Pacific Albacore Workshop) with participating members from the United States, Mexico, Canada, Japan, and Taiwan. The latest assessment was finalized by the working group in July 2007. Spawning stock biomass (SSB) estimates for the period 1966-2006 show fluctuations around an estimated time series average of roughly 100,000 mt. The assessment demonstrates a recent increase in SSB from 73,500 mt in 2002 to 153,300 mt in 2006 with a projected further increase to 165,800 mt in 2007. The recent increases are likely due to strong year classes in 2001 and 2003. Despite the high SSB estimates relative to the time series average, fishing mortality rates are high relative to most commonly used reference points. The population is being fished at roughly $F_{17\%}$ (i.e. at a rate resulting in a reduction of the spawning potential ratio to 17 percent of the maximum spawning potential ratio in the absence of fishing). If fishing continues at the current level, and all else being equal, then SSB is projected to decline to an equilibrium level of 92,000 mt by 2015. Considering the high fishing mortality rates, and the fact that total catch has been in decline since 2002, the ISC recommended that all nations practice precautionary-based fishing practices.

Since the mid-1970s, the U.S. component of the overall pan-Pacific Ocean catch is estimated at roughly 15 percent. Albacore troll boats account for nearly all the west coast catch. Currently there are no quotas or harvest guidelines established for North Pacific albacore catch under the HMS FMP.

3.3.2.2 Non-target Finfish Species

Overview

The purpose of this section is to discuss the stock status of fish species that make up a significant part of the overall finfish catch in Hawaii- and west-coast-based DSLL fisheries. Although tuna species are the target species in DSLL fishing, there are also significant catches of non-target finfishes. The review of species below includes commercially important finfish species managed under the HMS FMP (table 3-4) and bycatch species that constituted a significant part of the catch but are not managed by the HMS FMP.

The criteria used for determining major non-target finfish species were any species that had a CPUE for 1,000 hooks of 0.05 or higher, and had been observed in the west-coast-based fishery. Table 3-4 shows the CPUE values for the Hawaii-based DSLL fishery. Some of the CPUEs shown for various species in this table may not be an entirely accurate representation of the west-coast-based fishery because there are physical and biological oceanographic differences between the two regions; however, the relative proportions of species caught in the Hawaii- and west-coast-based DSLL fisheries are similar. Care was taken to consider only those species that would likely have a high CPUE for the west-coast-based DSLL fishery.

Table 3–4. Total observed catch for the Hawaii-based DSLL fishery on the high seas (2003-2007).
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Species Caught	Total Observed Catch (HI DSLL)	CPUE (catch/1,000 hooks)
Barracuda, Great	2,686	0.076
Bonyfish, Unidentified	526	0.015
Dogfish, Velvet	365	0.010
Dolphinfish (Corado, Mahimahi)	73,837	2.078
Escolar, Smith's	24,538	0.691
Lancetfish, Longnose	174,837	4.921
Mackerel, Black (Escolar, Longfin)	483	0.014
Mackerel, Snake	39,634	1.116
Marlin, Indo-Pacific Blue	4,659	0.131
Marlin, Striped	20,601	0.580
Mola, Slender	2,102	0.059
Oilfish	895	0.025
Opah	13,543	0.381
Pomfret, Brama	868	0.024
Pomfret, Dagger	1,705	0.048
Pomfret, Sickle	56,228	1.583
Remora	9,506	0.268
Sailfish	354	0.010
Shark, Bigeye Thresher	5,889	0.166
Shark, Blue	82,589	2.325
Shark, Crocodile	1,249	0.035
Shark, Oceanic Whitetip	2,074	0.058
Shark, Shortfin Mako	2,419	0.068
Shark, Silky	1,438	0.040
Shark, Unidentified	999	0.028
Shark, Unidentified Thresher	605	0.017
Spearfish, Shortbill	15,614	0.440
Stingray, Pelagic	5,850	0.165
Swordfish, Broadbill	6,913	0.195
Tuna, Albacore	14,108	0.397
Tuna, Bigeye	143,885	4.050
Tuna, Skipjack	29,299	0.825
Tuna, Unidentified	1,598	0.045
Tuna, Yellowfin	34,575	0.973
Wahoo	19,113	0.538

Note: Finfish species with CPUE less than 0.010 were not shown. Species is italics most likely do not occur in the proposed action area; these species are generally found further west where the majority of the Hawaii DSLL fishing occurs.
Data source: PISC 2008.

Status of Major Non-target Sharks

As with the rationale presented for delineating between major and minor non-target tuna catch, a similar approach is applied here for the shark species taken in the DSLL fishery. The focus of the analysis will be on the major non-target shark species, namely blue sharks and shortfin mako sharks. For all sharks in the management unit, the HMS FMP establishes that OY be set at 75 percent of the maximum sustainable yield (MSY), because these species have low productivities and are vulnerable to overfishing. Stocks of the shortfin mako shark are being managed using precautionary harvest guidelines under the HMS FMP. Basic population dynamic parameters for these shark species are poorly known, and they are considered vulnerable given their life history characteristics (slow growth, late maturing, and low fecundity). A harvest guideline is a numerical harvest level that is a general objective and is not a quota. A quota is a specified numerical harvest objective, the attainment of which triggers the closure of the fishery or fisheries for that species. If a harvest guideline is reached, NMFS initiates review of the species' status according to provisions in the HMS FMP and in consideration of the Council's recommendations.

Blue shark *(Prionace glauca)* (Kleiber, *et al*. 2001)

Blue sharks are found world-wide in temperate and tropical pelagic waters, but have been known to frequent inshore areas around oceanic islands and locations where the continental shelf is narrow. In the eastern Pacific, blue sharks range from the Gulf of Alaska down to Chile, migrating to higher latitudes during the summer, and lower latitudes during the winter.

Within the U.S. west coast EEZ, blue sharks are entangled in pelagic drift gillnet (DGN) gear, but rarely taken by other commercial HMS gears. On the high-seas, blue sharks have been caught with longline gear in the Hawaii-based SSLL fishery and the California-based SSLL fishery prior to its closure. In addition, blue sharks are caught in the deeper-set tuna longline fisheries. Most commercially-caught blue sharks are considered undesirable bycatch, since the meat quickly ammoniates, reducing marketability. As with several other shark species, the fins of blue sharks are sold to Asian markets for use in shark-fin soup; however, since implementation of the U.S. Shark Finning Prohibition Act which prohibits landing shark fins without accompanying carcasses, blue sharks are rarely landed or marketed when taken in U.S. commercial fisheries. Recreationally, blue sharks are considered a sport fish and larger individuals provide a challenge for fishermen using light tackle. Because most of the recreational shark trips are based out of southern California, and the average size of blue sharks taken is small (7 lb), blue sharks are often caught and released in this fishery.

For the North Pacific blue shark population, a range of examples of what might be considered "plausible" MSY were calculated in 2001 (Kleiber, *et al*. 2001). The data on which the analysis was based consisted of catch, effort, and size composition data collected during the period 1971–1998 from commercial fisheries operating in the North Pacific west of 130° W. longitude; primarily the Japan- and Hawaii-based pelagic longline fisheries, which catch significant numbers of blue sharks. The results indicated that the blue shark stock, under the fishing regime present at that time in the North Pacific, appeared to be in no danger of collapse. An updated analysis covering the same spatial area and which included data through 2003 was recently completed and produced results similar to the previous assessment, namely that blue sharks in the North Pacific are neither suffering overfishing nor approaching an overfished state (Sibert, *et al*. 2006). The blue shark is currently listed as "near threatened", a lower risk status, by The World Conservation Union (IUCN) due to the impact of annual fisheries mortality (mainly of bycatch) on the world population, and the concern over the removal of such large numbers of this likely keystone predator from the oceanic ecosystem; however, monitoring data are inadequate to assess the scale of any population decline[13].

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[13] IUCN Red List of Threatened Species: http://www.iucnredlist.org/search/details.php/39381/summ

Shortfin mako shark *(Isurus oxyrinchus)* (PFMC 2003)

The shortfin mako shark occurs throughout the tropical and temperate Pacific, but is not managed internationally. The mako is widely distributed in pelagic waters, and the population fished off the West Coast is likely part of a stock that extends considerably to the south and west. Although makos are most frequently found above the mixed layer, they have been recorded down to depths of 740 m. Tagging and fishery catch data show makos prefer water temperatures between 17–20° Celsius, and it has been hypothesized that this species migrates seasonally from the coast of California along the Baja peninsula following favorable seasonal water conditions (Cailliet and Bedford 1983). This movement pattern has been supported by tag and release studies. West coast commercial fisheries take mainly juveniles, with an average dressed weight of 34 lb (Leet, *et al*. 2001). Shortfin mako constitutes an important incidental catch whose market quality and ex-vessel value make it an important component of the landed catch of the DGN fishery (Cailliet and Bedford 1983; Holts, *et al.* 1998).

Shortfin mako is an important component of California's ocean recreational fishery. The majority are caught by anglers fishing with rod-and-reel gear from private vessels in the Southern California Bight from June through October, with a peak in August. Historically, makos have been esteemed as a prized game fish along the east coast of the United States. During the early 1980s, they increased in prominence as a popular game fish on the U.S. West Coast as well, with annual west coast recreational catches peaking in 1987 at about 21,600 fish. Since 2001, annual recreational catch estimates have ranged from 3,000–14,700 fish, with a percentage of sharks successfully released by southern California fishermen favoring catch-and-release versus harvest (PFMC 2007b; personal communication with Chugey Sepulveda, Pfleger Institute of Environmental Research, Senior Research Biologist and USCG-Licensed Captain, 2006). In 2005 it is estimated that recreational anglers fishing from private vessels in U.S. EEZ waters kept 14,000 shortfin mako sharks, and released alive 7,000; and in 2006 it is estimated that 5,000 shortfin mako sharks were kept, and 6,000 were released alive (PFMC 2007b). It is important to note that catch estimates from RecFIN must be used with caution because sampling anglers that pursue HMS is a occurrence and as such can lead to unusually high or low catch estimates with high variances.

Because basic population dynamic parameters for this species of shark are unknown, it is being managed under the HMS FMP with a precautionary harvest guideline of 150 mt. Catch statistics from the CA/OR DGN fishery suggest that the shortfin mako was not overexploited through the 1990s; however, CPUE rates indicated a possible overall decrease (PFMC 2003). Clear effects of exploitation have not been shown, and it is tentatively assumed that overfishing of the local stock is not occurring. The IUCN currently lists the shortfin mako as "near threatened", a lower risk status, because the shortfin mako shark is subject to significant bycatch and targeted fisheries in some areas and has a relatively low reproductive capacity; however, the species is very wide-ranging and has a relatively fast growth rate.

Status of Major Non-target Billfish

Striped marlin (*Tetrapturus audax*)

Stock status of striped marlin in the eastern Pacific has been assessed regularly by IATTC. The latest EPO assessment was conducted in 2003. The Marlin Working Group of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) also recently conducted an assessment of the North Pacific striped marlin population status (ISC 2006). The stock structure of striped marlin in the Pacific Ocean is not well known. An analysis of trends in CPUE in several sub areas suggest that the fish in the EPO constitute a single stock thus that is an assumption of IATTC assessments.

Striped marlin are found throughout the Pacific Ocean between about 45° N. and 45° S. latitude. They are caught mostly by the longline fisheries of the Far East and Western Hemisphere nations. Lesser amounts are caught by recreational, gillnet, and other fisheries. The HMS FMP prohibits commercial take of striped marlin, however there is a small seasonal recreational fishery for striped marlin in the Southern California Bight in the late summer months. Similarly, in Mexico, commercial take of striped marlin is prohibited within 50 nm of the coast to provide opportunities for recreational anglers.

For the EPO assessment, standardized catch rates were obtained from a general linear model and from a statistical habitat-based standardization method. Analyses of stock status were made using two production models, taking into account the time period when billfish were targeted by longline fishing in the EPO, that were considered the most plausible. A Pella-Tomlinson model yielded estimates of the AMSY in the range of 3,700–4,100 short tons (st)[14]. The current biomass is estimated to be greater than the biomass that would produce the AMSY. An analysis, using the Deriso-Schnute delay-difference model, yielded estimates of AMSY in the range of 8,700–9,200 st, with the current biomass greater than that needed to produce the AMSY.

The catches and standardized fishing effort for striped marlin decreased in the EPO from 1990–1991 through 1998, and this decline has continued, with the annual catches during 2000–2003 between about 2,000–2,100 st, well below estimated AMSY. This may result in a continued increase in the biomass of the stock in the EPO.

The status of a hypothesized stock of striped marlin spanning the North Pacific was conducted by the ISC in 2007. The status is difficult to determine due to a range of uncertainties in the fishery data as well as biological uncertainties (e.g., maturity schedule, growth rates, stock structure, etc.). Nonetheless, the results of the two models demonstrate that biomass has declined to levels that are 6 to 16 percent of their level in 1952. In addition, landings and indices of abundance have declined markedly, and recruitment has been steadily declining with no evidence that strong year-classes have or are about to enter the fishery. There appears to be inconsistency in the indices developed for the western Pacific and the eastern Pacific, and it was recommended that future modeling efforts include spatial segregation. The ISC Plenary recognized that current levels of fishing effort across the North Pacific are not likely to be sustainable, and recommended that fishing effort not be increased above current levels. Catch of striped marlin by U.S. west coast fisheries constitutes about one percent of the eastern Pacific-wide catch.

Status of Major Non-target Finfish

Swordfish (*Xiphias gladuis*)

Swordfish occur throughout the Pacific Ocean between about 50° N. latitude and 50° S. latitude. They are caught mostly by the longline fisheries of Far East and Western Hemisphere nations. Lesser amounts are caught by gillnet and harpoon fisheries, and infrequently by recreational fishermen. The stock structure of swordfish is not well known in the Pacific. There are indications that there is only a limited exchange of swordfish between the EPO and the WCPO. Hinton and Maunder (2003) concluded that there are northern and southern stocks of swordfish in the EPO, with the boundary between the stock distributions occurring at 5° S. latitude, and there may at times be some mixing of stocks from the Central Pacific with the northeastern stock. The northeastern stock appears to be centered off California and Baja California, Mexico, recognizing that there may be movement of a western North Pacific stock of swordfish into the EPO at various times.

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[14] The IATTC uses short tons in its stock status reports. 1 short ton is equal to 0.9072 metric ton.

The lack of contrast in the standardized catch and effort series in the northern and southern regions of the EPO suggests that the fisheries that have been taking swordfish in these regions have not been of a magnitude sufficient to cause significant responses in the populations. In addition, catches in the region have been fairly stable since 1989, averaging about 3,700 mt in the northern region and 8,400 mt in the southern region annually. Based on these considerations, it appears that swordfish are not overfished in the northern and southern regions of the EPO (Hinton, *et al*. 2004). Swordfish stocks have not been declared overfished or undergoing overfishing, nor are there currently quotas or harvest guidelines in place under the HMS FMP.

Recent ISC analyses of swordfish stocks in the North Pacific (north of 10° N. latitude and west of 130° W. longitude), based on CPUE indices from Japanese longline vessels, show declining trends (ISC 2004). These trends are mainly driven by declines in the northwest portion of the study area (north of 10° N. latitude and west of 170° E. longitude) and their proximate cause is not known at present (e.g., changes in stock abundance, environmental variability, and/or fishing practices). A special session of the ISC's Billfish Working Group will be convened in November 2008 to address the uncertainty in stock structure. The ISC will be conducting a stock assessment of North Pacific swordfish in 2009 based on the outcome of the special session. The conclusions from the previous analyses remain: swordfish stocks in the north and eastern Pacific have not been declared overfished or undergoing overfishing.

Dorado (*Coryphaena hippurus*)

Dorado are predominantly a warm water tropical species that are seasonally abundant in the SCB most likely from populations reproducing off Baja California, Mexico. Catch estimates from international fisheries are poorly documented due in part to the artisanal fishing nature of this fishery, and due to the lack of bycatch monitoring programs. West coast fishermen access the northern range of the species; there are no HMS FMP harvest guidelines recommended at this time (PFMC 2003). The total U.S. west coast catch of dorado for commercial vessels was less than 20 mt, and for recreational vessels was 10-50 mt (PFMC 2007b). This species is more important in the recreational private sport fishery, which has accounted for an average of 5,000 fish caught annually along the Pacific coast for the years 2002-2006, and the California Commercial Passenger Fishing Vessel Fleet (CPFV), which accounts for an average of about 11,000 fish caught annually in California and Mexico water for the years 2002-2006.

Dorado are a fast-growing and highly productive species with a short life span of 2–4 years and the ability to rebound relatively quickly from exploitation. Females mature at 4–7 months and spawning can occur all year long in the tropics. The high adult mortality rates may limit the resiliency of this species (PFMC 2003). Dorado from the EPO feed during both day and night, and dominant prey species vary by location (Olson and Galvan-Magana 2002).

Pelagic stingray (*Pteroplatytrygon (Dasyatis) violacea*)

The pelagic stingray is found worldwide in latitudes spanning tropical to temperate waters. This species is small, reaching a maximum size of 80 cm (disc width), and sexual maturity occurs at an average 37.5 cm in males and 50 cm in females. There is evidence suggesting that the eastern Pacific population migrates to the warmer waters off Central America during the winter. Females give birth in the warmer waters before migrating to higher coastal latitudes such as along the Southern California Bight. This species is commonly found within the top 100 m in deep, blue water zones and are often caught as bycatch in longline and DGN fisheries targeting HMS (Mollet 2002). The bycatch of pelagic stingray in the longline fishery is not marketable and therefore discarded.

Smith's Escolar (*Lepidocybium flavobrunneum*)

The black escolar occurs throughout the world's oceans and are distributed between 40º N. and 40º S. latitude. Biological information is lacking for the Pacific populations. Daily catch and fishing effort data was used to determine escolar population structure for the southwestern Atlantic Ocean (SAO). In the SAO, black escolar are taken as incidental catch when longlining for tuna and swordfish. It was found that the intra-annual catch patterns for the black escolar were similar to those of the target species. This suggests that escolar have similar trophic and reproductive behavior as tuna and swordfish. Highly productive oceanic fronts that are developed in winter and spring attract pelagic species that feed on squid and anchovy. Catches are lower in the summer when presumably escolar are migrating to lower latitudes to reproduce (Milessi and Defeo 2002). In California, escolar were the third most frequently caught species in the pelagic longline fishery with 132 total fish, along with 504 swordfish, and 459 blue sharks in 2001-2002. Catches of escolar declined slightly throughout 2002–2004 (PFMC 2007). The bycatch of escolar in the longline fishery is marketable, and it is generally retained and sold.

Longnose lancetfish (*Alepisaurus ferox)*

Longnose lancetfish range from Alaska to Chile and are considered almost worldwide in distribution ranging from temperate to tropical seas. The longnose lancetfish have been found from the surface down to 1829 m. They are prey for sharks, marlins, tunas, opahs, and other predatory fish that are commercially important. There is no commercial fishery for longnose lancetfish, but this fish is considered bycatch for other fisheries such as bottom and pelagic trawls, driftnets, longlines and other fishing gear. Longnose lancetfish are discarded when caught by the west-coast-based DSLL fishery.

Opah (*Lampris guttatus*)

The opah is distributed worldwide and throughout the Pacific basin in temperate and tropical seas (Japan to the Gulf of Alaska to the Gulf of California). All life stages of this species are pelagic and oceanic, occurring from the sea surface to a depth of 1,680 ft. Seasonal movements are not well known in the Pacific. Although not much is known about their basic reproductive habits, anecdotal evidence suggests a spring spawning window. The size of the opah population off the coast of California, and whether local subpopulations exist, is not known at this time.

The opah is an oceanic predator that has been caught on tuna longlines in the western Pacific Ocean as well as by those fishing for albacore and salmon (Barut 1999). Between 1990 and 1999, over 660 mt of opah were landed in California, with annual landings ranging from 37 mt to 112 mt. The highest landings of the decade occurred in 1998; associated with the 1997–98 El Niño. Although the majority of opah landed in California since 1990 were landed from San Luis Obispo County and south (about 50 percent from San Diego County alone), landings were reported as far north as Crescent City. A small number of opah are caught and retained by the west-coast-based DSLL fishery.

Sport fishermen targeting albacore from British Columbia to Baja California occasionally catch opah. Within California, many sport caught opah are taken from the northern Channel Islands south to the Coronado Islands, just below the United States-Mexico border.

Wahoo (*Acanthocybium solandri*)

Wahoo are commercially important pelagic fish that occur in both tropical and subtropical waters in the Indian, Pacific, and Atlantic Oceans. Wahoo are often taken with billfish in both commercial and recreational fisheries, and landed as incidental catch (Hyde, *et al.* 2005). Wahoo are harvested and sold as commercially important incidental catch by U.S. longline and surface troll vessels fishing in warmer waters, where this species is predominantly found (e.g., the U.S. west-coast-based DSLL fishery, and the Hawaii and American Samoa pelagic fisheries). Wahoo are a seasonally important game fish for the San Diego-based charter recreational fishery that targets them on long range trips (8-14 days) to the islands, banks, and ridges inside and adjacent to the EEZ of Mexico's Baja Peninsula.

Sickle Pomfret (*Taractichthys steindachneri*)

The sickle pomfret is frequently caught on tuna longlines in the warm waters of the Pacific and Indian Oceans. They are commonly found at the shelf edge and considered oceanic and highly migratory. There are several species of pomfrets (Bramidae), known locally in Hawaii by the generic term “monchong”, that are taken as incidental catch in the Hawaii-based longline fishery. The most common species taken in open water is the bigscale pomfret (*Taractichthys steindachneri*). In California, pomfret have been found from Point Conception and south (Itano 2004). They are retained and sold by the west-coast-based DSLL fishery.

Shortbill Spearfish (*Tetrapturus angustirostris*)

There is no special fishery for spearfish; they are caught incidentally by longliners and occasionally by surface troll. They bycatch of shortbill spearfish is marketable, and is generally retained. There is currently no available stock assessment for shortbill spearfish. The shortbill spearfish is an Istiophorid billfish. Nakamura (1985) described the shortbill spearfish as an oceanic pelagic fish which does not generally occur in coastal or enclosed waters but is found offshore. Boggs (1992), conducting research in 1989 on longline capture depth, obtained the highest catch rates at depths of 120-360 m, with a few fish caught at depths of 280-360 m. In another survey in 1990, the highest catch rates were shallower (40-80 m deep) with no catch below 200 m. Similarly, Nakano, *et al.* (1997), analyzing catch depth data from research cruises in the mid-Pacific, classes shortbill spearfish among fish for which catch rates declines with depth. The hypothetical habitat for this fish may be described as open ocean epipelagic and mesopelagic waters from the surface to 1,000 m in the tropics and subtropics.

Spearfish are heterosexual and no sexual dimorphism is reported. Shortbill spearfish apparently spawn in winter months in tropical and subtropical waters between 25° N. and 25° S. latitude. Kikawa (1975) noted that unlike other billfish, spawning does not “take place in large groups over a very short period of time, but probably is continuous over a long period and over broad areas of the sea.”

3.3.2.3 Prohibited Finfish Species

Any HMS stocks managed under the HMS FMP for which quotas have been achieved and the fishery closed are deemed prohibited species. In addition, table 3–5 lists the prohibited non-HMS species designated under the HMS FMP. In general, prohibited species must be released immediately if caught, unless other provisions for their disposition are established, including for scientific study.

There have been recorded interactions of great white sharks in the Hawaii-based SSLL fishery based on observer records. There has been one recorded interaction of a basking shark in the Hawaii-based SSLL fishery based on observer records. The shark was captured December 3, 2003, and was discarded dead.

None of these prohibited species have been observed taken in the west-coast-based DSLL fishery and none are anticipated to be taken by the proposed action. Descriptions of the stock status of great white and basking sharks are included because of the interactions observed in the Hawaii-based SSLL fishery.

For a detailed description and the stock status of other prohibited species refer to the 2007 SAFE document (PFMC 2007b).

Table 3–5. HMS FMP prohibited species.

Common Name	**Scientific Name**
Great white shark	*Carcharodon carcharias*
Basking shark	*Cetorhinus maximus*
Megamouth shark	*Megachasma pelagio*
Pacific halibut	*Hippoglossus stenolepis*
Pink salmon	*Onchorhynchus gorbuscha*
Chinook salmon	*O. tshawytscha*
Chum salmon	*O. keta*
Sockeye salmon	*O. nerka*
Coho salmon	*O. kisutch*

Great White Shark (*Carcharodon carcharias*)

The great white shark is an oceanic and coastal inhabitant ranging in the eastern Pacific from the Gulf of Alaska to the Gulf of California, although it appears to prefer temperate waters (Eschmeyer, *et al*. 1983). As a large, true apex predator, this species is relatively rare. This shark commonly patrols small coastal archipelagos inhabited by pinnipeds (seal, sea lions, and walruses); offshore reefs, banks, and shoals; and rocky headlands where deepwater lies close to shore. Its low productivity and accessibility in certain localized areas make it especially vulnerable. Overall population estimates for this species are unknown and even regional and localized estimates are questionable.

Adult great whites sighted off northern California most likely originate from southern California. The northward migration may be triggered by a shift in dietary preference toward seals and sea lions as the sharks grow large (Klimley 1994). Large males and females tend to be captured along the northern coast, while juveniles as well as large females are generally found to the south. This species has been prohibited by the State of California since 1995; it may not be taken except for scientific and educational purposes under permit. The HMS FMP adopts the State measures across the board. At present, the great white shark is listed as “vulnerable” by the IUCN throughout its range, and is now protected in some regions.

In 2004, the Convention on International Trade in Endangered Species (CITES) placed this shark on its Appendix II list, which demands tighter regulations and requires a series of permits that will control the trade in great white shark products.

There have been several interactions with great white sharks in the DGN fishery. Most are retained as incidental catch, or discarded if dead. There have also been some instances in which live great white sharks incidentally caught by commercial fishermen were given to the Monterey Bay Aquarium for its Great White Research Project[15]. The project has two primary goals: tagging and field studies, and exhibiting a great white shark to promote public understanding and protection of white sharks.

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[15] http://www.montereybayaquarium.org/cr/whiteshark.asp

Basking Shark (*Cetorhinus maximus*)

The basking shark is a coastal pelagic species inhabiting the eastern Pacific from the Gulf of Alaska to the Gulf of California. The basking shark is typically seen swimming slowly at the surface, mouth agape in open water near shore. This species is known to enter bays and estuaries as well as venturing offshore. Basking sharks are often seen traveling in pairs and in larger schools of up to 100 or more. Basking sharks are highly migratory. Sightings of groups of individuals of the same size and sex suggest that there is pronounced sexual and population segregation in migrating basking sharks.

In the past, basking sharks were hunted worldwide for their oil, meat, fins, and vitamin-rich livers. Today, most fishing has ceased except in China and Japan. The fins are sold as the base ingredient for shark fin soup. A small fishery took place off Monterey Bay during the period from 1924 to the 1950s for fish meal and liver oil; it is still taken as bycatch in the area. Basking sharks occur in greatest numbers during the autumn and winter months off California, but may shift to northern latitudes in spring and summer along the coasts of Washington and British Columbia. The harvest of this species has not been allowed by California since 2000, and the HMS FMP adopted the same State measures. It is thought to be the least productive of shark species. The basking shark is also currently categorized as “vulnerable” throughout its range and “endangered” in the Northeast Atlantic Ocean and North Pacific Ocean regions by the IUCN. There have been two recorded captures of basking shark in the DGN fishery (December 1993, May 2002); one was released alive and one was released assumed dead.
four DGN interactions, can be found at Florida Museum of Natural History 2006)[16]. There have been no recorded interactions of megamouth sharks in the DSLL fishery based on observer records.

3.4 Protected Species

This section provides an evaluation of protected species likely to be affected by the west-coast-based DSLL fishery on the high seas, and information about the current environmental baseline for these species. Within the action area, all sea turtle species and some seabirds are protected under the ESA (listed as threatened or endangered). Takes of marine mammals on the high seas in U.S. fisheries is covered under the Marine Mammal Protection Act (MMPA). Not all protected species are likely to be affected by the DSLL fishery; encounters between marine mammals and sea turtles with DSLL are very rare (Gilman and Kobayashi 2007), therefore this section includes an analysis of the available information to determine which species are most likely to be affected. The primary source of information is the Hawaii-based DSLL fishery observer data from the high seas. There is only limited observed sets in the area where most west-coast-based DSLL effort is expected to occur (i.e., east of 140° W. longitude). To supplement the Hawaii-based DSLL observer data, observer records from the west-coast-based and Hawaii based SSLL fisheries were reviewed to assist in determining species that may be in the area. However data from SSLL fisheries cannot be used to estimate likely takes in the DSLL fishery due to the differences in marine mammal and sea turtle biology (some species are very unlikely to regularly dive to depths of 100 meters or more, thus would be unlikely to get hooked by gear; although, entanglements in gear is not impossible). Information on the distribution and abundance of marine mammals and sea turtles, particularly within the area east of 140° W. longitude, is used to augment quantitative assessments. Where possible, marine mammals are identified by stock as described in the annual stock assessment reports. Similarly, where possible, sea turtles are identified by the nesting population.

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[16] http://www.flmnh.ufl.edu/fish/Sharks/Megamouth/mega.htm.

3.4.1 Marine Mammals

All the marine mammals that may be found in the proposed action area are listed below. The marine mammal species shown on this list were selected based on their distribution west of the west coast EEZ. Because most fishing effort is expected to occur east of 140° W. longitude, it is most likely that U.S. west coast stocks will occur in the area of fishing, however, because fishing effort may expand across the entire north Pacific, Hawaiian stocks that may be encountered in an enlarged fishing area are listed. Complete descriptions of Pacific marine mammal stocks can be found in the Pacific Stock Assessment Report (SARs; Carretta, *et al*. 2007) and the Alaska SARs (Angliss and Outlaw 2006). All marine mammals are protected under the MMPA and managed under that statute on a per stock basis.

Cetaceans

Dall's porpoise (*Phocoenoides dalli*) – CA/OR/WA stock
Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) – CA/OR/WA stock, northern and southern stocks
Risso's dolphin (*Grampus griseus*) – CA/OR/WA stock, Hawaiian stock, eastern tropical Pacific (ETP) stock
Rough-toothed dolphin (*Steno bredanensis*) – Hawaiian Stock
Pantropical spotted dolphin (*Stenella attenuata*) – Hawaiian Stock, ETP stock
Spinner dolphin (*Stenella longirostris*) – Hawaiian Stock. ETP stock
Fraser's dolphin (*Lagenodelphis hosei*) – Hawaiian Stock, ETP stock
Melon-headed whale (*Peponocephala electra*) – Hawaiian Stock
Bottlenose dolphin offshore stock (*Tursiops truncatus*) – CA/OR/WA stock, Hawaiian stock, ETP stock
Short-beaked common dolphin(*Delphinus delphis)* – CA/OR/WA stock, ETP stock
Northern right whale dolphin (*Lissodelphis borealis*) – CA/OR/WA stock
Striped dolphin (*Stenella coeruleoalba*) – CA/OR/WA stock, Hawaiian stock, ETP stock
Short-finned pilot whale (*Globicephala macrorhynchus*) – CA/OR/WA stock, Hawaiian stock, ETP stock
Sperm whale (*Physeter macrocephalus*) – CA/OR/WA stock, Hawaiian stock
Dwarf sperm whale (*Kogia sima*) - CA/OR/WA stock, Hawaiian stock
Pygmy sperm whale (*Kogia breviceps*) - CA/OR/WA stock, Hawaiian stock
Killer whale (*Orcinus orca*) – eastern North Pacific offshore stock, Hawaiian stock
Pygmy killer whale (*Feresa attenuate*) – Hawaiian stock
False killer whale (*Pseudorca crassidens*) – ETP stock
Mesoplodont beaked whales (*Mesoplodon* spp.) - CA/OR/WA stock
    Hubbs' beaked whales
    Gingko-toothed whale
    Stejneger's beaked whales
    Blainville's beaked whales (including Hawaiian stock)
    Pygmy beaked whale or Lesser beaked whale
    Perrin's beaked whale
    Due to the difficulties involved with identifying different species, as well as the rarity of these species, the SAR for these species designated all Mesoplodont beaked whales as one stock in the EEZ waters off the coasts of CA/OR/WA
Cuvier's beaked whale (*Ziphius cavirostris*) - CA/OR/WA stock, Hawaiian stock
Baird's beaked whale (*Berardius bairdii*) – CA/OR/WA stock
Longman's beaked whale (*Indopacetus pacificus*) – Hawaiian stock
Blue whale (*Balaenoptera musculus)* – eastern North Pacific stock, western North Pacific stock
Fin whale (*Balaenoptera physalus*) - CA/OR/WA stock, Hawaiian stock
Bryde's whale (*Balaenoptera edeni*) – Hawaiian stock
Minke whale (*Balaenoptera acutorostrata*) – Hawaiian stock

Humpback whale (*Megaptera novaeangliae*) – eastern and central North Pacific stocks
North Pacific right whale (*Eubalaena glacialis*) – eastern North Pacific stock
Sei whale (*Balaenoptera borealis)* - eastern North Pacific stock, Hawaii stock

The ESA-listed marine mammals under NMFS's jurisdiction are listed below (table 3-6). Under the ESA, marine mammals are generally listed based upon the global population and not by stocks (as under the MMPA), although some distinct population segments (DPS) are listed (i.e., the eastern North Pacific resident killer whale DPS).

Table 3–6. Threatened or endangered species listed under the ESA of NMFS's jurisdiction and occurring in the Pacific high seas.

Marine Mammals	Status
Blue whale *(Balaenoptera musculus)*	Endangered
Fin whale *(Balaenoptera physalus)*	Endangered
Humpback whale *(Megaptera novaeangliae)*	Endangered
Sei whale *(Balaenoptera borealis)*	Endangered
Sperm whale *(Physeter macrocephalus)*	Endangered

3.4.1.1 Marine Mammal Species Most Likely to be Affected by the Action

Very little observer information is available for the area where most fishing activity is expected to occur (i.e., east of 140° W. longitude, and from the equator to 35° N. latitude); therefore, data from other fisheries is used to generally characterize the level of anticipated takes and species composition along with what is known of the distribution and abundance of marine mammal species.

Interactions between marine mammals and longline fishing are rare events and therefore difficult to predict. Most of the longline interactions with marine mammals are attributed to odontocetes (toothed whales, dolphins or porpoises) either feeding on the bait, or fish caught on the hooks, a behavior referred to as depredation; less frequently, marine mammals are entangled in longline gear (Gilman, *et al*. 2006). Forney and Kobayashi (2008) reviewed the Hawaii-based longline fishery (shallow- and deep-sets combined); 24,542 sets were observed, and 67 marine mammal interactions were observed. Within the tuna longline fishery, there were 43 observed marine mammal takes in 20,375 observed sets. Of these 43 animals, there were 6 immediate mortalites, 29 animals seriously injured, and 8 released without injury (Forney and Kobayashi 2008).

In the historical California SSLL fishery only two marine mammals were observed taken in 469 sets, one Risso's dolphin and one unidentified dolphin. This suggests that the likelihood of marine mammal takes in the DSLL fishery operating outside the west coast EEZ is very low for two reasons. First, take rates in SSLL gear are estimated to be higher than take rates in DSLL gear (Forney and Kobayashi 2008); therefore, given the low observed bycatch in the SSLL, it is reasonable to believe that bycatch in the DSLL will be even lower or non-existent. While the two gear types are not directly comparable, this data does provide the closest existing proxy, in terms of area fished. However, there are a number of caveats to using the SSLL data to predict marine mammal interactions: the SSLL fishery occurred generally north of the area where most DSLL fishing effort is considered likely to occur and most effort was made in the area during the fourth quarter, while most effort in the DSLL is expected to occur in the first and second quarters. Nonetheless, this does provide insight into the possible presence of marine mammals in an area that could be utilized by the DSLL and suggests that takes would be expected to be very low.

Finally, surveys from the EPO were reviewed to determine which marine mammal species may be within, and east and south of the area where most DSLL effort is likely to occur. This information is important to consider given the abundance of marine mammal species in the area. The EPO is a highly dynamic area with equatorial currents, equatorial countercurrent, the Costa Rica dome, the California Current to the north, and the Peru Current to the south all feeding into the equatorial currents. As described in section 2, tuna are found in dynamic areas such as these utilizing the oceanography to forage on a variety of prey. Four species of dolphins are known to have winter distributions that overlap with the DSLL fishery area: spotted dolphins, spinner dolphins, striped dolphins, and common dolphins (Reilly 1990). Surveys of dolphins in the EPO are conducted by the SWFSC and the most recent survey information is provided in table 3–7.

Table 3–7. Survey information of dolphins in the ETP

Species/stock	Population estimate
Northern offshore spotted dolphin	736,737
Western/southern offshore spotted dolphin	627,863
Coastal spotted dolphin	149,393
Eastern spinner dolphin	612,662
Whitebelly spinner dolphin	441,711
Striped dolphin	1,470,854
Rough-toothed dolphin	47,921
Short-beaked common dolphin	1,098,429
Bottlenose dolphin	277,568
Risso’s dolphin	76,595

Of these species, spotted dolphins and spinner dolphins have been observed foraging in the same areas as tunas (Reilly 1990). Of these species, Risso’s, spotted, and bottlenose dolphins have been observed entangled in the Hawaii-based DSLL fishery; although, at very, very low levels. The most recent population estimates of Risso’s, spotted, and bottlenose dolphins in the waters fished by the Hawaii-based DSLL fishery is given in table 3–8.

Table 3–8. Population estimates of dolphins in waters fished by the Hawaii-based DSLL fishery.

Species/Hawaii stock	Population estimate
Risso’s dolphin	2,351
Spotted dolphin	10,260
Bottlenose dolphin	3,263
Spinner dolphin	2,805

Source: Caretta, *et al.* 2007.

Risso’s dolphin (*Grampus griseus*)

Risso’s dolphins are found worldwide in tropical and warm-temperate waters. From seasonal distribution patterns seen from aerial and boat surveys, it is thought that Risso’s dolphins move northward into Oregon and Washington during the late spring and summer, while they are found generally off California during the cold water months (Carretta, *et al.* 2007). They have a distinctive, beakless head shape, and a body that is noticeably more robust in the front half than in the back, a blunt snout, and prominent appendages, with long pointed flippers and a tall, slender, falcate dorsal fin. Adults have extensive linear scarring concentrated on the back and sides, which makes many adults appear almost completely white except for the dark dorsal fin and flippers (Leatherwood, *et al.* 1983; Reeves, *et al.* 2002). Risso’s dolphins travel in groups of on average 25 individuals and feed most often on squid, primarily at night (Reeves, *et al.* 2002). Risso’s dolphins in California, Oregon, and Washington waters are considered one stock in the SARs. The best estimate of population abundance for this stock is 16,066 animals (CV=0.28), with a minimum population estimate of 12,748 animals. PBR for this stock is estimated to be 115 animals per year. The mean annual serious injury and mortality in commercial fisheries for this stock is estimated to be 3.6 (CV=0.63) animals per year, based on data from 1997 to 2001. The population estimates for this stock in the ETP and HI waters are given above. The DSLL may interact with any of these stocks, although if fishing effort remains east of 140° W. longitude, then it is unlikely that the Hawaii stock would be affected.

Spotted dolphin (*Stenella attenuate)*

Pantropical spotted dolphins are primarily found in tropical and subtropical waters worldwide (Perrin and Hohn 1994). Much of what is known about the species in the North Pacific has been learned from specimens obtained in the large directed fishery in Japan and in the ETP tuna purse seine fishery (Perrin and Hohn 1994). These dolphins are common and abundant throughout the Hawaiian archipelago. Morphological differences and distribution patterns have been used to establish that the spotted dolphins around Hawaii belong to a stock that is distinct from those in the ETP (Perrin 1975; Dizon, *et al.* 1994; Perrin, *et al.* 1994). Their possible affinities with other stocks elsewhere in the Pacific have not been investigated. Due to the distribution of the stocks, if the DSLL fishery effort remains east of 140° W. longitude, it is likely that only the ETP stock of spotted dolphins would be affected.

Bottlenose dolphin (*Tursiops truncatus*)

Bottlenose dolphins are widely distributed throughout cold temperate to tropical seas worldwide. The offshore populations are common around oceanic islands and can be seen in the EPO. There are offshore and inshore stocks. The main difference in the two varieties other than location is that the offshore bottlenose dolphin variety tends to have a more robust form than the inshore variety. The coloring of both groups is varying shades of gray with a dark dorsal cape. Adults may also have some scarring. This species has a rounded forehead with a distinct beak and melon crease (Carwardine 1995). No seasonality distribution is apparent for this stock and little is known about population trends and net productivity rates. Total observed fishing mortality for this species is less than the PBR, so this stock is not considered strategic under the MMPA (Carretta, *et al.* 2007). Population estimates for the ETP and Hawaii stocks are provided above. The DSLL fishery may interact with these stocks; however, if fishing effort remains east of 140 ° W. longitude, it is unlikely that the Hawaii stock would be affected.

Short-finned pilot whale (*Globicephala macrorhynchus*)

Short-finned pilot whales are found in tropical, subtropical and warm temperate waters worldwide. No set migration patterns are known and the exact range of the species is difficult to pinpoint due to identification confusion with the long-finned pilot whale. However, the short-finned pilot whale is more typically found in deeper tropical waters than the long-finned species. Lateral movement of this whale is generally determined by prey movement (mostly squid), or water temperature. Short-finned pilot whales are known to be capable of diving to deep depths presumably in search of squid, their primary prey (personal communication with K.A. Forney, Southwest Fisheries Science Center, Biologist, 2007).

Some populations of this species are present year-round in Hawaii and the Canary Islands and are often found in the presence of small cetaceans such as bottlenose dolphins (Carwardine 1995). Although once commonly seen off southern California, surveys conducted since the strong 1982/83 El Niño suggest that their abundance in this area has declined since the 1980s (Carretta, *et al.* 2006). The abundance of short-finned pilot whales appears to be variable and related to changes in oceanographic conditions such as El Niño, or periods of unusually warm water off the coast (Forney 1997). Short-finned pilot whales have been found off Baja California, Mexico, and there is a theory that their range has contracted since the 1982/83 El Niño event (personal communication with Jim Carretta, Biologist, Southwest Fisheries Science Center, 2007). Short-finned pilot whales are not among the species that NMFS is required to monitor under the International Dolphin Conservation Act; however, this species has been observed as part of NMFS's long-term surveys in the ETP, and population estimates are in the thousands (Ferguson and Barlow 2001). Short-finned pilot whales have been observed taken in the Hawaii-based DSLL fishery. The take rate per 1,000 sets is 0.25 (Forney and Kobayashi 2008).

False killer whale (*Pseudorca crassidens*)

One marine mammal species of particular concern in the Hawaii-based DSLL fishery is the false killer whale. Most of the observed takes in the tuna longline fishery were of false killer whales (18 of 43 observed takes). It must be noted that this number may actually underestimate the actual level of take of this species, since there were 11 animals observed taken but not identified to species (listed as false killer whale or pilot whale on the observer logs). Since most deep-set gear is hauled at night, positive identifications can be difficult (Forney and Kobayashi 2008). Over half of the takes of false killer whales occurred within the EEZ of the Hawaiian Islands, Johnston Atoll, or Palmyra Atoll, all areas that would not be fished as part of the west-coast-based DSLL fishery.

False killer whales are widely distributed in deep tropical, subtropical and warm temperate waters within 9 to 30.8° Celsius. This whale species has one of the largest continuous ranges of any cetacean (Stacey, *et al*. 1994). Migration patterns for this species are unknown, but may follow seasonal warming and cooling patterns of the sea. The false killer whale has a long slender body shape and is darkly colored. This species has a characteristic elbow-like bend in the flippers and off-white or gray W-shaped markings on the chest (Carwardine 1995). The dorsal fin may be pointed or rounded at the tip and the position on the body varies with sex and age. This species of whale is also often observed with other cetaceans, most commonly the bottlenose dolphin (Stacey, *et al*. 1994). A 2002 shipboard line-transect survey of the Hawaiian island's EEZ indicated an estimated abundance of 236 false killer whales (Carretta, *et al*. 2007)

Common prey items of this species include squid and various fish, including yellowfin tuna and mahi mahi, which could make up a large part of the catch in a DSLL fishery. Some false killer whale deaths have been associated with the yellowtail tuna fishery off Iki Island in Japan from February to April (Kasuya 1985). This species has a low PBR of 1.0 false killer whale per year and because incidental take for the Hawaii-based longline fishery exceeds the current PBR, this stock is considered strategic under the MMPA (Carretta, *et al*. 2007).

It is important to note that recent genetics work suggests that there are different stocks of false killer whales and that false killer whales in the ETP are distinct from the small population within the Hawaii EEZ (Chivers, *et al*. 2007). More research on these stocks of false killer whales is necessary, but it appears that there is a small population limited to within the Hawaii EEZ. The proposed DSLL will not occur within the Hawaii EEZ; therefore, this population would not be affected. If interactions with false killer whales do occur, it is likely to be with the population from the ETP or eastern North Pacific. As with all marine mammal interactions, takes of false killer whales is expected to be very low.

Humpback whale (*Megaptera novaeangliae*)

In the area where most of the fishing activity is likely to occur, east of 140° W. longitude and outside the U.S. west coast EEZ, humpback whales are rarely encountered. Most humpbacks from the eastern North Pacific stock, which is the stock most likely to be found in an area close to where most fishing activity is expected, remain within the U.S. west coast EEZ when migrating in the fall, and spend the winter mating and birthing season off the coasts of Mexico and Central America, generally close to shore and outside of the proposed action area. If the fishery does expand to the entire North Pacific, effort may occur where humpbacks from the western North Pacific and central North Pacific stocks may be exposed to the fishery operations, particularly as these animals migrate from feeding areas in the waters off Alaska and western Canada to wintering grounds in Hawaii. Reviewing the observer records from the Hawaii-based DSLL fishery indicates that only two humpbacks have been observed taken in the DSLL fishery prior to 2004; both were released, one was released with a serious injury, and one was released unharmed. Based upon the area where most fishing is likely to occur and the rarity of humpback whale takes in the Hawaii-based DSLL, which operates in the wintering grounds of the western North Pacific and central North Pacific stocks of humpbacks, it is considered very unlikely that the west-coast-based DSLL fishery will result in the take of humpback whales.

3.4.2 Sea Turtles

Four species of sea turtles may be found in the proposed action area (section 1.2) and are listed along with their status in table 3-9.

Table 3–9. Sea turtles within the proposed action area.

Sea turtles	Status
Leatherback (*Dermochelys coriacea*)	Endangered
Loggerhead (*Caretta caretta*)	Threatened
Olive ridley (*Lepidochelys olivacea*)	Endangered/threatened
Green (*Chelonia mydas*)	Endangered/Threatened

3.4.2.1 Species of sea turtles most likely affected by the proposed action

All four species of sea turtles have been observed incidentally taken in longline fisheries in the Pacific. As noted previously, the current DSLL fishery is subject to 100 percent observer coverage; however, these records are confidential, and not considered sufficient to estimate possible impacts of a larger DSLL fleet (up to six vessels) over an expanded area. Therefore, as above, a variety of resources were used in determining which species may be exposed and affected by the DSLL fishery as described in alternative 2. Records from the existing Hawaii-based DSLL fishery were reviewed, along with records from the Hawaii- and west-coast-based SSLL fisheries, and finally a review of the abundance and distribution of the species was considered.

Due to the lack of observer records from the proposed action area, a quantitative assessment of sea turtle impacts for this action were derived using observer data from the Hawaii-based DSLL fishery as a proxy (NMFS 2005). Although the DSLL fishery has a lower sea turtle interaction rate compared to the SSLL swordfish fishery, the mortality rates are higher because most sea turtles cannot reach the surface to breathe once hooked by DSLL gear. The nature of the DSLL interaction is shown in tables 3-10 amd 3-11. A majority of the sea turtles do not survive interactions with DSLL gear because they cannot reach the surface to breathe once entangled or hooked. Most of the interactions with hard-shelled sea turtles involved being hooked primarily in the mouth due to their attraction to the bait on the hooks. Leatherbacks are more commonly hooked externally (i.e., on the flippers, shoulders, or shell).

Table 3–10. Summary description of observed sea turtle takes in the Hawaii-based DSLL fishery from 2003-2006.

Species (total number)	**Dead**	**Released injured**	**Released alive**	**Entangled**	**Hooked**	**Unknown**	**Mouth**	**Front Flipper**	**Ingestion**
Green (4)	4				4	1	1	2	
Leatherback (7)	3	4		3	6			6	
Olive Ridley (39)	38	1			39	2	25	4	8
Loggerhead (4)	1	2	1	1	3		2		1

Note: Only animals that were released alive were included in the "Gear Attached" section of the table
Source: PIFSC 2007.

In 2005, the Pacific Islands Regional Office (PIRO) conducted a Section 7 consultation on the Hawaii-based DSLL fishery. This fishery set an estimated 35,055,119 hooks in 2005 and the projected levels of sea turtle takes in the Hawaii DSLL fishery were based upon that level of effort and observed takes in 2004 and 2005, which are shown in table 3-11.

Table 3–11. Number of turtles expected to be taken or killed in the Hawaii-based deep-set longline fishery over a period of three consecutive years.

	Number captured	**Number killed**
Greens	21	18
Leatherbacks	39	18
Loggerheads	18	9
Olive Ridleys	123	117

Source: NMFS 2005.

In order to better estimate the likelihood of marine mammal and sea turtle takes in the proposed DSLL fishery, other fisheries that occur in the same general area were considered, including the SSLL fishery. However, there were very few observed SSLL sets made in the waters south of 35° N. latitude and east of 140° W. longitude, the area where most of the fishery activity is expected to occur. Further, most of the 469 observed SSLL sets made between October 2001 and February 2004 does not match the timing of the DSLL (i.e., December through May). No other longline fisheries occur in the area described as likely to have the highest level of DSLL activity (i.e., from the equator to 35° N. latitude and east of 140° W. longitude).

The following sections provide brief status descriptions of the sea turtle species considered most likely to be affected by the continued operation of the west-coast-based DSLL fishery. Complete status descriptions can be found in previous documents including NMFS's 2004 Biological Opionion (BO) on the HMS FMP. Updates of that data are provided as available for sea turtles.

Green Turtles

Green turtles are found throughout the world, occurring primarily in tropical and, to a lesser extent, subtropical waters (NMFS and USFWS 1998a). The breeding populations of the green turtle off the coast of Florida and the Pacific coast of Mexico are listed as endangered, while the other global populations are listed as threatened. Green turtles are generally found in warm waters, temperatures greater than 18° Celsius, which is within the temperature range of preferred tuna habitat. In the Pacific Ocean this species occurs in nesting aggregations within the eastern, central, and western regions (NMFS 2005). Green turtle nesting aggregations occur in Mexico and Ecuador (eastern Pacific), French Frigate Shoals, Hawaii (central Pacific) and the Great Barrier Reef (western Pacific). Using a precautionary approach, Seminoff (2002) estimates that the global green turtle population has declined by 34 percent to 58 percent over the last three generations (approximately 150 years); although, actual declines may be closer to 70 percent to 80 percent. Causes for this decline include harvest of eggs, harvest of subadults and adults, incidental capture by fisheries, loss of habitat, and disease. A more complete review of the most current information on green sea turtles is available in the Five Year Status Review document published in 2007 by the U.S. Fish and Wildlife Service and NMFS[17].

Eastern Pacific - Distribution and Abundance of Nesting Females

The primary green turtle nesting grounds in the eastern Pacific are located in Michoacán, Mexico, and the Galapagos Islands, Ecuador (NMFS and USFWS 1998a). Here, green turtles were widespread and abundant prior to commercial exploitation and uncontrolled subsistence harvest of nesters and eggs. Sporadic nesting occurs on the Pacific coast of Costa Rica. Analysis using mitochondrial DNA (mtDNA) sequences from three key nesting green turtle populations in the eastern Pacific indicates that they may be considered distinct management units: Michoacán, Mexico; Galapagos Islands, Ecuador, and Islas Revillagigedos, Mexico (personal communication with Peter Dutton, Southwest Fisheries Science Center, Biologist and lead of the Marine Turtle Research Program, 2003).

Table 3–12. Estimates of current green turtle nesting rookeries in the eastern Pacific Ocean.

Eastern Pacific Ocean	Units[1]	Years	Abundance	Trend
Revillagigedos Islands, Mexico	AN	1999-2002	90	stable
Michoacan, Mexico	AF	2000-2006	1395	increasing
Central American Coast	AN	late 1990s	184-344	uncertain
Galapagos Islands	AF	2001-2006	1650	stable

[1]AN = Annual number of nests. AF = Number of females nesting annually.
Data source: 2007 Five Year Status Review

The most current information on the status of eastern Pacific green turtle nesting is given in table 3-12. This indicates that three of the four known significant populations appear to be stable or increasing. Nesting along the Central American coast has not been well described or documented as of yet.

Green turtles are also known to migrate long distances from nesting areas to feeding grounds. In the Atlantic, green turtles migrated 2200 km from Ascension Island (middle of the Atlantic) to the South American coast (Hays, *et al*. 2001). Green turtles that were satellite tagged at the French Frigate Shoals nesting site showed an eastward migration to the main Hawaiian islands off Oahu in 26 days, traveling far from shore and over waters thousands of meters deep (Balazs, *et al*. 1994). The EPO population of green turtles has been reported to stay close to shore and have relatively small home ranges. In the Gulf of California, a group of green turtles that were tagged with radio and sonic telemetry transmitters showed a range of diving depths including dives to greater than 40 m. This population of turtles did not leave the Gulf of California throughout the summer study months (Seminoff, *et al*. 2002). In 2005, there were 1.4 estimated mortalities of green turtles in the purse seine fishery (IATTC 2006).

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[17] www.nmfs.noaa.gov/pr/pdfs/species/greenturtle_5yearreview.pdf

Central Pacific - Hawaii

Green turtles in Hawaii are considered genetically distinct and geographically isolated; although, the nesting population at Islas Revillagigedos in Mexico appears to share the mtDNA haplotype that commonly occurs in Hawaii. Since the establishment of the ESA in 1973, the nesting population of Hawaiian green turtles has shown a gradual but definite increase (Balazs 1996; Balazs and Chaloupka 2004). In three decades the number of nesting females at East Island increased from 67 nesting females in 1973 to 467 nesting females in 2002. Unfortunately, the green turtle population in the Hawaiian Islands area is afflicted with a tumor disease, fibropapilloma, which is of an unknown etiology and often fatal, as well as spirochidiasis; both of these diseases are major causes of strandings of this species (personal communication with Balazs, G., National Marine Fisheries Service, 2000).

Loggerhead Turtles

The loggerhead turtle is listed as threatened under the ESA throughout its range, primarily due to direct take, incidental capture in various fisheries, and the alteration and destruction of its habitat. Loggerheads are circumglobal, inhabiting continental shelves, bays, estuaries, and lagoons in temperate, subtropical, and tropical waters. Major nesting grounds are generally located in temperate and subtropical regions, with scattered nesting in the tropics (*in* NMFS and USFWS 1998b). In the Pacific Ocean, loggerhead turtles are represented by a northwestern Pacific nesting aggregation (located in Japan) which is comprised of separate nesting groups (Hatase, *et al.* 2002) and a smaller southwestern nesting aggregation that occurs in Australia (Great Barrier Reef and Queensland), New Caledonia, New Zealand, Indonesia, and Papua New Guinea. Clutch size averages 110 to 130 eggs, and one to six clutches of eggs are deposited during the nesting season (Dodd 1988). The average re-migration interval is between 2.6 and 3.5 years (NMFS and USFWS 1998c), and adults can breed up to 28 years (Dobbs 2002). More information can be found by reviewing the 5-Year Status Review document published in 2007 by the U.S. Fish and Wildlife Service and NMFS[18].

For loggerheads, the transition from hatchling to young juvenile occurs in the open sea, and evidence from genetic analyses and tracking studies show that this part of the loggerhead life cycle involves trans-Pacific developmental migration (Polovina, *et al.* 2003). Large aggregations (numbering in the thousands) of mainly juveniles and subadult loggerheads are found off the southwestern coast of Baja California, over 10,000 km from the nearest significant nesting beaches (Nichols, *et al.* 2000; Pitman 1990). Genetic studies have shown these animals originate from a Japanese nesting subpopulation (Bowen, *et al.* 1995), and their presence reflects a migration pattern probably related to their feeding habits (Cruz, *et al.* 1991, cited in Eckert 1993). While these loggerheads are primarily juveniles, carapace length measurements indicate that some of them are 10 years old or older.

Distribution and Abundance of loggerheads in the Pacific Ocean

Loggerhead populations can be divided in two nesting aggregations in the Pacific, a northwestern Pacific population located in Japan and a smaller southwestern population occurring in Australia, New Caledonia, New Zealand, Indonesia, and Papua New Guinea. The nesting populations in Japan have declined by 50-90 percent in the last 50 years (Kamezaki, *et al.* 2003).

Japan

In the western Pacific, the only major nesting beaches are in the southern part of Japan (Dodd 1988). Balazs and Wetherall (1991) speculated that 2,000 to 3,000 female loggerheads nested annually in all of Japan. From nesting data collected by the Sea Turtle Association of Japan since 1990, the latest estimates

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[18] www.nmfs.noaa.gov/pr/pdfs/species/loggerhead_5yearreview.pdf

of nesting females on almost all of the rookeries are as follows: 1998 - 2,479 nests; 1999 - 2,255 nests; and 2000 - 2,589 nests. Considering multiple nesting estimates, Kamezaki, *et al*. (2003) estimated that approximately less than 1,000 female loggerheads return to Japanese beaches per nesting season. Matsuzawa (2005) has updated nesting numbers from 2001-2004 to 3,122; 4,035; 4,519; and 4,854. So over the short term, the last seven years, nesting appears to be increasing; however, these data are not sufficiently long-term to conclude a trend in the population.

In Japan, loggerheads nest on beaches across 13° of latitude (24° N. to 37° N.), from the mainland island of Honshu south to the Yaeyama Islands, which appear to be the southernmost extent of loggerhead nesting in the western North Pacific. Researchers have separated 42 beaches into five geographic areas: (1) the Nansei Shoto Archipelago (Satsunan Islands and Ryukyu Islands); (2) Kyushu; (3) Shikoku; (4) the Kii Peninsula (Honshu); and (5) east-central Honshu and nearby islands. There are nine "major nesting beaches" (defined as beaches having at least 100 nests in one season within the last decade) and six "submajor nesting beaches" (defined as beaches having 10-100 nests in at least one season within the last decade), which contain approximately 75 percent of the total clutches deposited by loggerheads in Japan (Kamezaki, *et al*. 2003).

Australia

In eastern Australia, Limpus and Riemer (1994) reported an estimated 3,500 loggerheads nesting annually during the late 1970s. Since that time, there has been a substantial decline in nesting populations at all sites. Currently, less than 500 female loggerheads nest annually in eastern Australia, representing an 86 percent reduction within less than one generation (Limpus and Limpus 2003).

New Caledonia

Loggerheads are the most common nesting sea turtle in the Île de Pins area of southern New Caledonia. Historically, there was little quantitative information available, and surveys in the late 1990s failed to locate regular nesting. However, anecdotal information from locals indicates that there may be more substantial loggerhead nesting occurring on peripheral small coral cays offshore of the main island. Limpus and Limpus (2003) estimate that the annual nesting population in the Île de Pins area may be in the "tens or the low hundreds". A recent study did identify 60-70 nests on four beaches during the 2004-2005 nesting season (Limpus, *et al*. 2006).

Recently, satellite tracking of loggerheads has provided insight into their behavior and distribution in the Pacific. Loggerheads exhibit shallow dive patterns with more than 90 percent of their dives within the top 40 m of water, which is shallower than the hook depth range of DSLL fishing gear (hook depths of 100 m or more below the water's surface) (Polovina, *et al*. 2004). Genetic analysis of loggerheads that may be exposed to the west-coast-based DSLL fishery indicate that they are likely to be those from nesting beaches in Japan (95 percent), and those foraging off Baja California and the central North Pacific (Bowen, *et al.* 1995). Satellite tracking of loggerheads indicates that they occupy a wide range of SSTs from 15–25° Celsius while in the central North Pacific, although tracks of turtles within narrowly defined temperature bounds were also observed (Polovina, *et al.* 2004). Satellite tracking indicates that loggerheads tagged and released from North Pacific fisheries and Japan travel in the North Pacific Transition Zone (NPTZ) and the Kuroshio Extension Current, perhaps spending years as juveniles feeding in these large Pacific currents (Polovina, *et al.* 2004; Polovina, *et al.* 2006). Satellite tracks of juvenile loggerheads in the NPTZ end at approximately 130° W. longitude, which is the eastern boundary of the sub-arctic and subtropical gyre in which the NPTZ is found (Polovina, *et al*. 2004). This area is within the proposed action area and on the western edge of the California Current. Researchers speculate that when the gyre meets the southbound California Current, objects in the gyre, including juvenile loggerheads, are moved into the waters off Baja (Nichols, *et al*. 2000). Many juvenile loggerheads spend years in the near shore, primarily feeding off Baja California, Mexico feeding. As adults, loggerheads head back across the Pacific to nesting beaches in Japan and Australia. Limited satellite tracking of loggerheads tagged in Baja indicate a due east movement which suggests they may be utilizing the subtropical front at 25–30° N. latitude (Nichols, *et al*. 2000).

Leatherback Turtles

The leatherback turtle is listed as endangered under the ESA throughout its global range. Spotila, *et al*. (1996) estimated that the *global* population of female leatherback turtles in 1995 was only 34,500 nesting females (confidence interval: 26,200 to 42,900); however, this number is likely an underestimate as recent population estimates for the North Atlantic alone range from 34,000 to 90,000 adult leatherbacks. The population estimates in the Pacific are lower than the Atlantic. In the eastern Pacific, nesting counts indicate that the population has continued to decline since the mid 1990s, leading some researchers to conclude that the leatherback is on the verge of extinction in the Pacific Ocean (Spotila, *et al*. 1996; Spotila, *et al.* 2000). However, the status of western Pacific leatherbacks appears to be less dire. Recently published estimates of breeding females suggest that the western Pacific population is 2,700 to 4,500 adult females (Dutton, *et al*. 2007). This number is substantially higher than the population estimate of 1,775 to 1,900 western Pacific breeding females published in 2000 and used to predict possible extinction in the Pacific (Spotila 2000). The larger population estimate is due to adding in a number of nesting females from beaches that were not previously included in population estimates and thus is not indicative of a positive growth trend in the population. Leatherbacks are highly migratory, exploiting convergence zones and upwelling areas in the open ocean, along continental margins, and in archipelagic waters (Morreale, *et al*. 1994; Eckert 1998; Eckert 1999). For a more complete review of leatherbacks, see the Five Year Status Review document published in 2007 by the U.S. Fish and Wildlife Service and NMFS[19].

Based on published estimates of nesting female abundance, leatherback populations are declining at all major Pacific basin nesting beaches, particularly in the last two decades (Spotila, *et al*. 1996; NMFS and USFWS 1998c; Spotila, *et al*. 2000). Declines in nesting populations have been documented through systematic beach counts or surveys in Malaysia (Rantau Abang, Terengganu), Mexico and Costa Rica. In other leatherback nesting areas, such as Papua New Guinea, 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, however, current nesting populations are reported by scientists, government officials, and local observers to be well below abundance levels of several decades ago.

Western Pacific Nesting Populations of Leatherback Turtles

Leatherbacks in the western Pacific nest at Indonesia, Papua New Guinea, the Solomon Islands, Vanuatu, with limited leatherback nesting activity in Viet Nam, Thailand, Fiji, and Australia. Malaysia was once the site of an enormous leatherback nesting population, which is now considered functionally extinct with only two to three females returning annually to nest each year. The largest extent nesting populations are in northern Indonesia at Jamursba-Medi and Wermon.

All leatherbacks in the Pacific face similar threats to their populations including poaching of eggs, killing of nesting females, human encroachment on nesting beaches, incidental capture in fishing gear, beach erosion, and egg predation by wild and domestic animals. Little is known about the status of the western Pacific leatherback nesting populations, but once major leatherback nesting assemblages have declined, some to the point of extirpation. Dutton, *et al*. (2007) report that there may be between 1,100 and 1,800 females nesting annually at 28 nesting sites in the western Pacific. Calculations using the same methods used by Spotila, *et al*. (1996) yield a minimum total estimate of nesting females in this area of

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[19] www.nmfs.noaa.gov/pr/pdfs/species/leatherback_5yearreview.pdf

approximately 2,700 to 4,500 animals taking into account an estimated re-nesting interval of 2.5 years (Spotila, *et al*. 1996). The actual re-nesting interval for western Pacific leatherbacks may vary from this estimate.

Migratory routes of leatherback turtles originating from eastern and western Pacific nesting beaches are not entirely known. However, satellite tracking of post-nesting females and foraging males and females, as well as genetic analyses of leatherback turtles caught in U.S. Pacific fisheries or stranded on the West Coast of the United States suggests that the leatherbacks found off the U.S. West Coast are from the western Pacific nesting populations. Leatherbacks forage off central California, generally at the end of the summer, when upwelling relaxes and SSTs increase. These areas are upwelling "shadows," regions where larval fish, crabs, and jellyfish are retained in the upper water column during relaxation of upwelling. Researchers estimated an average of 178 leatherbacks (CV=0.15) were present between the coast and roughly the 50 fathom isobath off California. Abundance over the study period was variable between years, ranging from an estimated 20 leatherbacks (1995) to 366 leatherbacks (1990) (Benson, *et al*. 2007a). Other observed areas of summer leatherback concentration include northern California and the waters off Washington through northern Oregon, offshore from the Columbia River plume. Foraging areas of leatherbacks in the high seas is not known; although, based upon limited satellite tracking of turtles tagged off California, the animals move southwest off the coast, generally moving towards waters south of Hawaii.

Eastern Pacific Nesting Populations of Leatherbacks

Leatherback nesting populations are declining at a rapid rate along the Pacific coast of Mexico and Costa Rica. Leatherbacks have been documented nesting as far north as Baja California Sur and as far south as Panama, with few areas of high nesting (personal communication with L.M. Sarti, Biologist, UNAM, 2002).

Costa Rica

Since 1988, leatherback turtles have been studied at Playa Grande (in Las Baulas), the fourth largest leatherback nesting colony in the world. During the 1988-89 season (July-June), 1,367 leatherback turtles nested on this beach, and by the 1998-99 season, only 117 leatherback turtles nested (Spotila, *et al*. 2000). The last four nesting seasons have shown continued declines, with only 69 nesting females during the 2001-02 season, and 55 nesting females during the 2002-03 season. Scientists speculate that the low turnout during 2002-03 may be due to the "better than expected season in 2000-01 which temporarily depleted the reproductive pool of adult females in reproductive condition following the El Niño/La Niña transition" (personal communication with R. Reina, Drexel University, 2003). The number of females nesting in 2003-04 was 159 turtles, while during 2004-05, only 49 females nested. As of February 3, 2006, 107 individual leatherbacks had nested at Playa Grande (personal communication with P. Tomillo, Drexel University, 2006). There have also been anecdotal reports of leatherbacks nesting at Playa Caletas and Playa Coyote.

Mexico

The decline of leatherback subpopulations is even more dramatic off the Pacific coast of Mexico. Surveys indicate that the eastern Pacific Mexican population of adult female leatherback turtles has declined from 70,000[20] in 1980 (Pritchard 1982, *in* Spotila, *et al*. 1996) to approximately 60 nesting females during the 2002-03 nesting season, the lowest seen in 20 years (personal communication with L.M. Sarti, Biologist,

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[20] This estimate of 70,000 adult female leatherback turtles comes from a brief aerial survey of beaches by Pritchard, who has commented: "I probably chanced to hit an unusually good nesting year during my 1980 flight along the Mexican Pacific coast, the population estimates derived from which have possibly been used as baseline data for subsequent estimates to a greater degree than the quality of the data would justify" (Pritchard 1996).

UNAM, June 2003). A summary of total leatherback nestings counted and total females estimated to have nested along the Mexican coast from 2000 through 2006 is shown in table 3-13.

Table 3–13. Annual number of estimated leatherback nestings (# nests) from 2000-2005 on index beaches and total nesting beaches.

Index beach	2000-01	2001-02[1]	2002-03[2]	2003-04[3]	2004-05[4]	2005-06[4]
Primary Nesting Beaches (40-50% of total nesting activity)						
Mexiquillo	624	20	36	528	42	190*
Tierra Colorada	535	49	8	532	57	292*
Cahuitan	539	52	73	349	31	230*
Barra de la Cruz	146	67	3	275	28	121*
Total - primary index beaches	1,957	188	120	1,684	158	833*
Total - Mexican Pacific	4,513	658	n/a	4,045	n/a	n/a

[1] Source: Personal communication with L.M. Sarti, Biologist, UNAM, 2002, index beaches; Sarti, *et al.*, 2002, totals.

[2] Source: Personal communication with L.M. Sarti, Biologist, UNAM, December 2003, index beaches and totals.

[3] Source: García, *et al*. 2004.

[4] Source: Personal communication with L.M. Sarti, Biologist, UNAM, 2006 [*note that these numbers are preliminary].

Olive Ridley Turtle

Although the olive ridley turtle is regarded as the most abundant sea turtle in the world, olive ridley nesting populations on the Pacific coast of Mexico are listed as endangered under the ESA; all other populations are listed as threatened. Olive ridley turtles occur throughout the world, primarily in tropical and subtropical waters. Nesting aggregations in the Pacific Ocean are found in the Mariana Islands, Australia, Indonesia, Malaysia, and Japan (western Pacific), and Mexico, Costa Rica, Guatemala, and South America (eastern Pacific). Like leatherback turtles, most olive ridley turtles lead a primarily pelagic existence (Plotkin, *et al*. 1993), migrating throughout the Pacific, from their nesting grounds in Mexico and Central America to the North Pacific. While olive ridleys generally have a tropical to subtropical range, with a distribution from Baja California, Mexico to Chile (Silva-Batiz, *et al*. 1996), individuals do occasionally venture north, some as far as the Gulf of Alaska (Hodge and Wing 2000). A more complete review of current information can be found in the Five Year Status Review document published in 2007 by the U.S. Fish and Wildlife Service and NMFS[21].

Olive ridleys are usually found in warm waters, 23-28° Celsius, often within equatorial or nearby waters (Polovina, *et al*. 2004). Sightings of olive ridley turtles from tuna purse seine vessels (1990-2002) in the EPO show turtles from 15º S. to 30º N. latitudes and spotted as far as 145º W. longitude (figure 3-6; IATTC 2004). Shaded areas on the map show different levels of fishing effort with darker shading representing higher effort. This map cannot be used to represent overall distribution of olive ridley turtles for this area, but in areas where there is more effort and less turtles, or less effort and more turtles, we can infer some natural distribution.

A main nesting population occurs along the north-east coast of India in the Indian Ocean. Another major nesting population exists in the eastern Pacific on the West Coast of Mexico and Central America. Both of these populations use the North Pacific as foraging grounds (Polovina, *et al*. 2004). Recent genetic information indicates that 75 percent of the Hawaii-based longline fisheries interactions with this species are from the eastern Pacific subpopulations, and 25 percent are from the Indian and western Pacific

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[21] www.nmfs.noaa.gov/pr/pdfs/species/oliveridley_5yearreview.pdf.

rookeries (personal communication with Peter Dutton, Southwest Fisheries Science Center, Biologist and lead of the Marine Turtle Research Program, 2005).

Eastern Pacific Ocean

The largest known arribadas in the eastern Pacific are off the coast of Costa Rica (~475,000 - 650,000 females estimated nesting annually) and in southern Mexico (~1,000,000+ nests/year at La Escobilla, in Oaxaca (Marquez-M, *et al*. 2005)).

Mexico
The nationwide ban on commercial harvest of sea turtles in Mexico, enacted in 1990, has improved the situation for the olive ridley. Surveys of important olive ridley nesting beaches in Mexico indicate increasing numbers of nesting females in recent years (Marquez, *et al*. 1995; Arenas, *et al*. 2000). In La Escobilla, Mexico, conservation measures, such as increased nesting beach protection and closure of the turtle fishery have led to a dramatic increase in the once largest nesting population in the world. The number of olive ridley nests has increased from 50,000 in 1988 to over 700,000 in 1994 to more than a million nests in 2000 (Márquez, *et al*. 2002).

Costa Rica
In Costa Rica, 25,000 to 50,000 olive ridleys nest at Playa Nancite and 450,000 to 600,000 turtles nest at Playa Ostional each year (NMFS and USFWS 1998d). In an 11-year review of the nesting at Playa Ostional, (Ballestero, *et al*. 2000) report that the data on numbers of nests deposited is too limited for a statistically valid determination of a trend; however, there does appear to be a six-year decrease in the number of nesting turtles. The greatest single cause of olive ridley egg loss comes from the nesting activity of conspecifics on *arribada* beaches, where nesting turtles destroy eggs by inadvertently digging up previously laid nests or causing them to become contaminated by bacteria and other pathogens from rotting nests nearby. In addition, some female olive ridleys nesting in Costa Rica have been found afflicted with the fibropapilloma disease (Aguirre, *et al*. 1999).

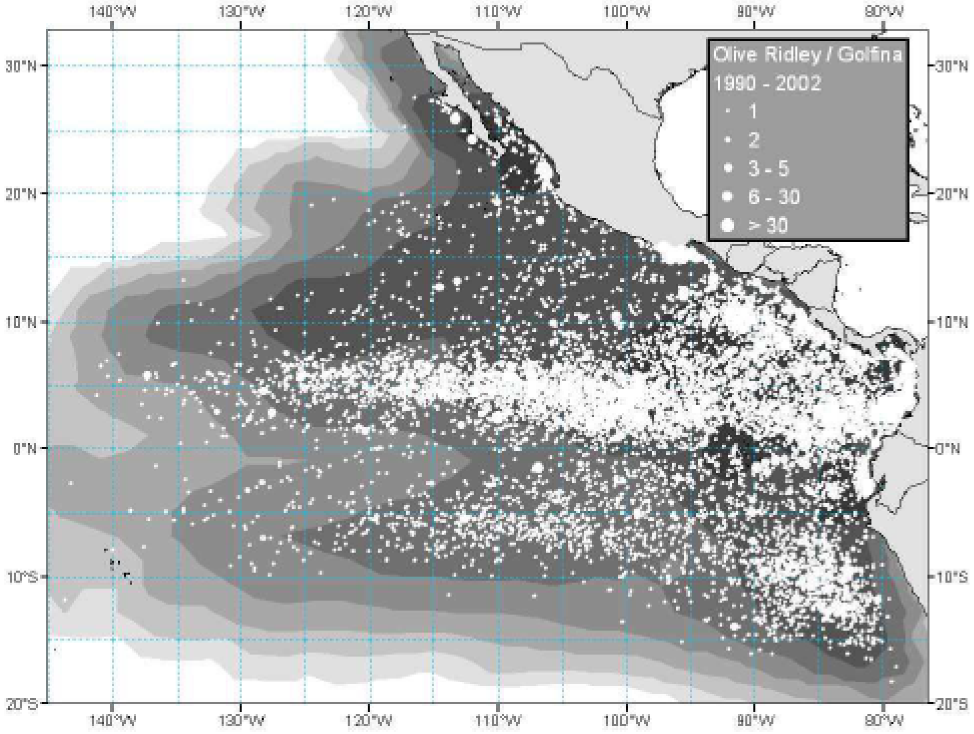
Western Pacific Ocean

In the western Pacific, olive ridleys are not as well documented as in the eastern Pacific, nor do they appear to be recovering as well. There are small documented nesting sites in Indonesia, Thailand, and Malaysia. In Indonesia, extensive hunting and egg collection, in addition to rapid rural and urban development, have reduced nesting activities, and locals report daily trading and selling of sea turtles and their eggs in the local fish markets (Putrawidjaja 2000). The main threats to turtles in Thailand include egg poaching, harvest and subsequent consumption or trade of adults or their parts (i.e., carapace), indirect capture in fishing gear, and loss of nesting beaches through development (Aureggi, *et al*. 1999).

Olive ridleys live within two distinct oceanic regions including the subtropical gyre and oceanic currents in the Pacific. The gyre contains warm surface waters and a deep thermocline preferred by olive ridleys. The currents bordering the subtropical gyre, the Kuroshio Extension Current, North Equatorial Current and the Equatorial Counter Current all provide for advantages in movement with zonal currents and location of prey species (Polovina, *et al*. 2004).

Satellite tracking of ten juvenile olive ridleys caught in Hawaii-based longline gear over a period of five years from 1997-2001, provides more insight into the movement patterns of this species. The olive ridley turtles moved between 130° W. and 150° W. longitude and south of 28° N. latitude. The overall latitudinal range for these turtles was 8º N. and 31º N. latitude (Polovina, *et al*. 2004). In another study, two olive ridleys were equipped with a depth recorder to record diving depth. Dives to a depth of 150 m occurred approximately once a day for 20 percent of the days surveyed, and 10 percent of the time was spent at a depth greater than 100 m (Polovina, *et al*. 2002). The target depth for tuna is generally 100 to 300 m, thus olive ridleys are considered likely to encounter DSLL fishing gear due to their pattern of deep dives.

Hawaii-based DSLL data shows 38 observed takes of olive ridley turtles over the 2002 to 2006 time period (table 3-11). As noted above, juvenile olive ridley turtles (from western Pacific nesting grounds) are known to forage in the area surrounding and south of the Hawaiian Islands, where the majority of the Hawaii-based DSLL fishing effort is taking place (figure 3-6). There is limited information about movements of turtles from the eastern Pacific nesting grounds. In a study from Mexico, one large male olive ridley turtle off the coast of Mexico was tagged with satellite telemetry and was followed for four months. In those four months the male traveled south from 17º N. to 7º N. latitudes and west to 120º W. longitude (Beavers and Cassano 1996).



Source: IATTC 2004.

Figure 3–6. Distribution of sightings of olive ridley turtles reported by observers aboard tuna purses-seine vessels, 1990-2002.

3.4.2.2 Other Actions Contributing to the Baseline Condition of Sea Turtles

This section discusses all of the fishery and non-fishery (anthropogenic and natural) impacts on the sea turtles that may interact with the west-coast-based DSLL fishery. It is important to consider all of the other effects on sea turtle populations to determine if fishing impacts will cause significant declines in the population. When all of the impacts are added together, there could be a longer term effect than if the impacts were considered separately.

Fishery Effects

Sea turtles are subject to take in U.S. and international fisheries. For each of the U.S. Pacific fisheries, Section 7 consultations have been conducted and cumulative anticipated sea turtle takes under the current ITS's are 33 annually, of which there are projected to be 10 mortalities. In the Hawaii-based SSLL fishery, which has 100 percent observer coverage, a sea turtle cap is imposed upon the fishery which is equal to the ITS developed by NMFS (16 leatherbacks, 17 loggerheads, 5 olive ridleys, and 1 green) with a small number of mortalities. On March 20, 2006, the Hawaii-based SSLL fishery was closed after reaching the loggerhead sea turtle cap of 17 takes. Only one leatherback sea turtle was observed taken before the fishery closed. For all other U.S. fisheries in the Pacific, if the take of sea turtles exceeds the ITS, re-initiation of consultation is required and if necessary, emergency rules can be implemented to close the fishery to protect ESA-listed species.

Very few international fisheries have observer programs so that takes of sea turtles in most fisheries is unknown. A complete review of fisheries that are known to take, or may take, leatherback sea turtles is provided in the NMFS 2004 BO on the HMS FMP (NMFS 2004b). The Japanese tuna longline fishery and the coastal setnet and DGN fisheries in Taiwan are known to incidentally take a small number of leatherbacks; they are cumulatively estimated to take less than 30 animals annually. The EPO purse seine tuna fishery has a requirement of 100 percent observer coverage on large vessels, which make up 66 percent of the fleet. Observer records indicate that only one leatherback was observed taken in this fishery (personal communication with J. Kondel, Program Coordination Office, Office of the Under Secretary of Commerce for Oceans and Atmosphere, 2006).

Foreign tuna longline fleets in the Pacific have a significant effect on sea turtles. It is difficult to quantify the impacts of the foreign tuna longline fleet in the central and western Pacific. Observer levels are very low, less than one percent, and there are no observers on Japanese, Korean, or Australian distant water fisheries (NMFS 2004b). From these low observer rates, it has been estimated that 2,182 sea turtles are taken, and 500–600 turtles mortalities occur annually in the various tuna longline fisheries in the central and western Pacific (NMFS 2004b). The species taken, in order of highest to lowest occurrence: olive ridley, green, leatherback, loggerhead, and hawksbill (NMFS 2004b). The Japanese tuna longline fleets reported taking 166 leatherbacks in 2000 (IATTC 2004). It is unknown where in the EPO these takes occurred.

Non-Fishery Effects

A number of anthropogenic actions may affect sea turtle populations including poaching of eggs, killing of female turtles at nesting beaches, human encroachment on nesting beaches, incidental capture in fishing gear, beach erosion, climate change and microclimate-related impacts at nesting sites (e.g., loss of trees due to deforestation and sub-optimal incubation conditions for eggs in nests). Some natural events that could affect sea turtle populations are egg predation by animals, low hatchling production, and natural disasters (e.g., tsunamis, etc.).

The effects of climate on sea turtles are just beginning to be studied and are still largely speculative. Nonetheless, long-term changes in climate could have a profound affect on sea turtles. Changes in temperature may affect nesting success; high temperatures while eggs are incubating in the sand may kill the offspring. In addition, the sex of turtles is temperature dependent, that is, eggs incubated at higher temperatures produce more females, while eggs incubated at lower temperatures result in more males. Increased air temperatures may result in a bias of the sex ratio of offspring and over the long-term could lead to reduced fecundity (insufficient males to fertilize eggs). Thus, while the number of nesting females may be stable or increasing, the eggs may not be viable or the hatchling output may not produce the balanced sex ratio necessary for future successful reproduction.

The climate may also affect turtle nesting habitat. Long-term climate change (e.g., rising average temperatures) will likely result in rising sea levels due to loss of glaciers and snow caps coupled with thermal expansion of warming ocean water which may lead to the loss of usable beach habitat (Baker, *et al.* 2006). Studies suggest that leatherbacks do not have the same high level of nesting site fidelity as hard shelled turtles and may be able to better adapt to the loss of habitat by seeking out new nesting areas. Similarly, short-term climate variability may cause an increase in storm or tidal activity that can inundate nesting sites, causing loss of habitat.

Oceanographic changes due to climate change may also affect sea turtle prey availability, migration and nesting. Short term variability in climate such as the ENSO may limit prey due to a reduction in upwelling brought by warm surface waters and limited or no wind. Over the longer term, climate models suggest a number of possible changes in oceanographic conditions, including slowing of the thermohaline circulation, higher precipitation storms, rising SST and rising sea levels (IPPC 2001). Also, as temperature patterns change in oceans, current foraging habitats may shift (McMahon and Hays 2006). There is already evidence to suggest that some sea turtles' re-migration periods are being affected by variations in SSTs (Chaloupka 2001; Solow, *et al.* 2002). Additional studies will be necessary to determine how climate may be affecting sea turtles and the entire marine ecosystem in the Pacific and elsewhere.

Finally, the effects of the December 2004 tsunami have been reported by the signatory states to the Indian Ocean and Southeast Asia Marine Turtle Memorandum of Understanding. The report discussed the impacts on leatherback turtle populations in the Indian Ocean region. The tsunami hit the northern coast of Indonesia, the country with perhaps the largest nesting populations of leatherbacks, but the northern coast is not a major nesting area. Low nesting densities have been observed in Sumatra following the tsunami but nesting was not occurring when the tsunami hit. A small number of leatherbacks nest in the winter along the Indian Ocean in Thailand and eggs from nests laid before and after the tsunami likely did not survive. In India, all leatherback nests laid were likely lost to the tsunami (which occurred during the nesting season) and some of the most important nesting sites have been severely damaged.

Reports in the media shortly after the tsunami suggest that in the long-term there may be some benefit to sea turtles. Previously developed beaches have returned to conditions closer to pristine. New building regulations may prevent the development of these beaches, thus adding to usable nesting habitat, but at this point such suggestions are speculative. The longer term effects of the tsunami are at this point speculative, but loss of nesting habitat is a clear concern, along with loss of beach vegetation (vegetation helps prevent beach erosion and provide shade to nest sites). The effects of the tsunami on foraging habitats in all areas are unknown, although loss of seagrass, mangroves, and coral reefs has been documented. Perhaps the greatest loss is within the research and conservation community, which lost not only members, but also facilities, data, and animals.

3.5 Seabirds

Due to the nature of pelagic longline operations and the fishing area (section 1.2) under consideration for the proposed action, the only seabirds potentially impacted by this proposed fishery are the black-footed albatross (*Phoebastria nigripes*), the laysan albatross (*P.immutabilis*) and the short-tailed albatross (*P. albatrus*).

3.5.1 Current Status of Seabird Populations

Three species of albatross are known to occur within the region; short-tailed albatross are listed as endangered. The black-footed albatross is the most abundant albatross off the West Coast of Canada and the United States, ranging throughout the North Pacific between 20° N. latitude and 58° N. latitude, but more eastern in its at-sea distribution than the laysan albatross (Cousins and Cooper 2000). The estimated number of black-footed albatross worldwide is approximately 290,000, of which 58,000 pairs (116,000 birds) bred in 2001–2002 (USFWS 2005). The conservation status for black-footed albatross under the World Conservation Union (IUCN) criteria for threatened species is "Vulnerable" due to an observed 20 percent or more population decrease over three generations (~45 years). While the laysan albatross is less common in the west coast EEZ, it is the most abundant albatross Pacific-wide, with an estimated 2,200,000 individuals (USFWS 2005), with centers of concentration in the WCPO (Cousins and Cooper 2000). Numbers of breeding laysan albatross have declined over the last five years in the two largest colonies of this species (USFWS 2005). IUCN status for the laysan albatross is "Lower Risk-Least Concern". Both the black-footed and laysan albatross nest principally in the Hawaiian Islands, mate for life, and lay only one egg in a single season. The black-footed albatross occurs off the West Coast primarily from spring through fall but can be found year round; breeding birds begin returning to the Hawaiian Island chain in October. During egg-laying, incubation, and early chick feeding, which lasts from December through March, these birds are generally more concentrated near the breeding islands, although some may still travel considerable distances. The laysan albatross also occurs uncommonly off the West Coast year round, primarily in summer during the non-breeding season.

The short-tailed albatross has rarely been sighted off the West Coast of the United States or off Mexico in recent history, and has not been observed to interact with any west coast HMS fishery. It is nonetheless highly endangered, has historically occupied west coast EEZ waters, and will likely return to its former range as its population recovers (and may have already begun to do so). Of the 23 sightings of this species off the West Coast since 1947, 74 percent have been made in the last two decades (1983–2000) with 88 percent occurring from August–January (Roberson 2000). This temperate and subarctic species breeds only on the western Pacific islands of Torishima and Minami-Kojima in Japan. The most recent estimate of its population includes 1,712 individuals on Toroshima and 340 individuals from Minami-Kojima (USFWS 2005). In summer, the nonbreeding season, individuals appear to disperse widely throughout the historical range of the North Pacific, with observed concentrations in the northern Gulf of Alaska, Aleutian Islands, and Bering Sea. Individuals have been recorded as far south as the Baja Peninsula and south to about 20° N. latitude off the Pacific coast of Mexico (USFWS 2000). Its current distribution may also be complicated by identification problems. For the untrained observer, even though the short-tailed albatross is the largest albatross and has an extremely large pink bill, during its various plumage stages it can be confused with black-footed and laysan albatross (Mitchell and Tristram 1997). The short-tailed albatross is currently listed as endangered throughout its range under the ESA, including U.S. waters (65 FR 46643, July 31, 2000).

3.5.2 Fishing-related Sources of Mortality

3.5.2.1 Pelagic Longline Fishing in the United States

U.S.-based pelagic longline swordfish and tuna fisheries in the vicinity of the Hawaiian Islands have the potential to affect albatross. NMFS observer records from 1994–2000 (based on four percent observer coverage) estimate an average take of 1,380 black-footed and 1,163 laysan albatross per year. No takes of short-tailed albatross in any U.S.-based pelagic longline fishery have been reported. The Hawaii-based swordfish longline fishery was closed by court order in 2001 due to concerns over incidental catch of sea turtles. Seabird incidental catch decreased significantly with the fishery closure. The swordfish fishery based in Hawaii was reopened on a limited basis in 2004, with requirements to conduct sets beginning no earlier than one hour after local sunset and ending deployment no later than one hour before local sunrise, use large 18/0 circle hooks, and carry 100 percent observer coverage. In addition, all swordfish-target sets are to use thawed and blue-dyed bait. Observers have documented 10 black-footed and 71 laysan albatross captured in this fishery since it reopened in 2004, with 2,133,096 hooks observed.

The Hawaii-based tuna, or DSLL fishing vessels are not required to use any seabird deterrents when fishing south of 23° N latitude, generally south of the southernmost short-tailed albatross observations in Hawaii. When fishing north of 23°N latitude, these vessels are required to use a line-setting machine, minimum 45 g weights on branch lines, thawed and blue-dyed bait, and strategic offal discharge. The west-coast-based DSLL fishery would also be subject to these regulations.

3.5.2.2 Trawl Fishing in the United States

U.S.-based trawl fisheries also have the potential to affect albatrosses. In some trawl fisheries, sonar equipment mounted on the trawl net transmits sonar data to the vessel via a "third wire" or "net sonde" cable. Seabirds attracted to offal and discards from trawl vessels may either strike the hard-to-see cable while in flight, or get caught and tangled in the cable while they sit on the water. The U.S. Fish and Wildlife Service (USFWS) is currently investigating the possibility of seabird collisions with U.S.-based trawl fishing gear, both with third wires and with warp cables (larger diameter and more visible cables running to the trawl doors).

3.5.3 Non-fishing-related Sources of Mortality to Seabirds

USFWS lists current non-fishing threats to short-tailed albatross as catastrophic events at breeding colonies, climate change and oceanic regime shift, contaminants, air strikes, disease/parasitism, predation and other natural factors, invasive species, and other human activities (USFWS 2005). Black-footed and laysan albatross experience many of the same threats as the short-tailed albatross.

3.6 Socioeconomic Environment

3.6.1 West-Coast-Based HMS Commercial Fisheries for Tuna

The target species of DSLL fishing are bigeye, yellowfin, albacore and skipjack tuna, but to a lesser degree, a variety of other fish species are landed as well. Some of the other species landed by DSLL gear include opah and dolphinfish. Due to the vast assortment of fish catch in the longline fishery, this analysis will focus on the four major tuna species landed from longline gear: bigeye, albacore, yellowfin and skipjack. Since only a minimal amount of bluefin tuna are landed, it will not be analyzed here.

There is currently only one vessel participating in the west-coast-based DSLL fishery, thus data from the west-coast-based DSLL fishery cannot be shown for confidentiality reasons. There will be a general discussion pertaining to the west coast tuna fishery, and data from the Hawaii-based longline fisheries will be used as proxies to provide some insight on how much revenue this fishery may generate in the future. However, it should be emphasized that it is not possible to predict precise revenues without information about the level of allowable effort that might occur in a west coast DSLL fishery.

The socioeconomic characteristics of the west coast commercial HMS fisheries are described in section 2.2.2, and section 2.2.5, of the HMS FMP (PFMC 2003); and section 4.1 of the HMS Stock Assessment and Fisheries Evaluation (SAFE) report (PFMC 2007b). Relevant portions of these descriptions are incorporated below as background on the socioeconomic environment.

A significant portion of the west coast commercial bigeye tuna landings are harvested with DSLL gear. Yellowfin and skipjack tunas also make up a considerable portion of the total DSLL catch (skipjack to a lesser degree); however, higher catches of yellowfin and skipjack are made in the purse seine fishery. Albacore tuna also makes up a portion of the catch in the DSLL fishery; however, the majority of albacore tuna is harvested with surface hook and line. Table 3-14 below shows total west coast tuna landings by HMS and non-HMS gear in metric tons. Table 3-15 shows commercial west coast tuna revenues (2006 $) by all HMS and non-HMS gears. In 2006, total tuna landings were valued at about $24.18 million in revenue, with bigeye accounting for $205,677. It is important to note that both tables 3-14 and 3-15 include other gear types, so west coast commercial tuna landings by longline gear only makes up a portion of these totals.

Table 3–14. West coast commercial tuna landings (round mt) of HMS by all HMS and non-HMS gears, 1987-2006.

Year	Albacore	Yellowfin	Skipjack	Bigeye	Total
1987	3,160	23,201	5,724	50	32,135
1988	4,908	19,520	8,863	6	33,297
1989	2,214	17,615	4,505	1	24,335
1990	3,028	8,509	2,256	2	13,795
1991	1,676	4,178	3,407	7	9,268
1992	4,902	3,350	2,586	7	10,845
1993	6,151	3,795	4,539	26	14,511
1994	10,686	5,056	2,111	47	17,900
1995	6,528	3,038	7,037	49	16,652
1996	14,173	3,347	5,455	62	23,037
1997	11,292	4,775	6,070	82	22,219
1998	13,801	5,799	5,846	53	25,499
1999	9,770	1,353	3,759	108	14,990
2000	9,042	1,158	780	87	11,067
2001	11,194	655	58	53	11,960
2002	10,029	544	236	10	10,819
2003	16,671	465	349	35	17,520
2004	14,540	488	307	22	15,357
2005	9,055	285	523	10	9,873
2006	12,749	77	48	35	12,909

Source: 2007 SAFE Report (PFMC 2007b).

Table 3–15. West coast real commercial ex-vessel revenues (2006 $) from tuna landings by HMS and non-HMS gears, 1987-2006.

Year	Albacore	Yellowfin	Skipjack	Bigeye	Total
1987	8,129,094	44,195,730	7,017,623	279,810	59,622,257
1988	13,966,295	41,438,192	14,180,327	40,098	69,624,912
1989	5,591,725	30,759,590	5,827,023	3,567	42,181,905
1990	7,992,537	13,346,016	2,700,718	12,475	24,051,746
1991	3,880,634	5,492,558	3,699,801	58,830	13,131,823
1992	15,426,372	4,940,141	1,894,877	60,090	22,321,480
1993	15,319,919	6,331,059	4,310,370	277,723	26,239,071
1994	25,804,456	5,814,247	2,251,490	394,891	34,265,084
1995	14,577,755	3,836,047	5,987,956	325,976	24,727,734
1996	33,657,634	3,994,754	4,928,428	321,842	42,902,658
1997	24,232,694	6,070,458	6,694,875	437,583	37,435,610
1998	22,535,172	7,051,556	6,271,059	327,101	36,184,888
1999	21,066,499	1,740,821	3,258,487	779,133	26,844,940
2000	19,910,454	1,534,123	560,801	672,373	22,677,751
2001	23,476,743	527,605	38,115	363,616	24,406,079
2002	15,924,058	655,688	142,844	97,242	16,819,832
2003	26,697,191	492,173	174,459	286,583	27,650,406
2004	29,140,475	473,571	115,858	156,623	29,886,527
2005	21,572,874	324,961	300,765	61,906	22,260,506
2006	23,759,098	175,646	40,384	205,677	24,180,805

Source: 2007 SAFE Report (PFMC 2007b).

Similar to the West Coast, the majority of Hawaii commercial bigeye tuna landings are harvested with DSLL gear. More than half of the albacore and yellowfin tuna catch is made with longline gear as well. Skipjack tuna is mostly caught with pole and line, with a smaller portion from longline gear.

Table 3-16 shows total landings and revenue of all species caught in the Hawaii longline fishery. It is important to note that this includes both SSLL and DSLL gears, and all species (not just tunas). Table 3-17 shows Hawaii's longline tuna landings including both DSLL and SSLL gears. It can be assumed that the vast majority of tuna catch is made with DSLL gear, since swordfish is the target species for SSLL gear. Hawaii pelagic longline tuna landings have remained fairly stable for the last several years, and in 2005 totaled 6,103 mt.

To give some perspective on the comparability of data from the west-coast- and Hawaii-based longline fishery, there needs to be some discussion on fleet size. In 2006, Hawaii's longline fishery was estimated to have 127 active vessels; all of these vessels targeted tunas on at least one trip during the year, and 35 of the vessels targeted swordfish on at least one trip during the year[22]. More importantly, there is a limit of 2,120 shallow-set certificates available each year to those who hold Hawaii longline limited entry permits. The west-coast-based DSLL longline fishery had one vessel targeting tuna in 2006. For our analysis we are estimating that up to six vessels may participate in the west-coast-based DSLL fishery, thus we are estimating that there would be about 420 sets made per year.

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[22] http://www.pifsc.noaa.gov/fmsd/hlrep.php

Table 3–16. Hawaii Longline Landings and Revenue of all species.

Year	Total Landings (round mt)	Nominal Revenue ($1000)	Adjusted Revenue ($1000)	Honolulu CPI[1]
1987	1,765	10,579	18,211	114.9
1988	3,039	16,470	26,768	121.7
1989	4,510	23,199	35,655	128.7
1990	6,685	35,309	50,574	138.1
1991	8,835	42,932	57,378	148.0
1992	9,573	44,387	56,607	155.1
1993	11,342	53,365	65,932	160.1
1994	8,225	41,788	50,248	164.5
1995	10,307	43,632	51,341	168.1
1996	9,776	42,700	49,479	170.7
1997	12,313	50,052	57,594	171.9
1998	12,986	46,609	53,757	171.5
1999	12,858	47,386	54,085	173.3
2000	10,803	49,174	55,171	176.3
2001	7,169	32,533	36,071	178.4
2002	7,889	37,469	41,105	180.3
2003	8,004	38,616	41,400	184.5
2004	8,382	41,374	42,937	190.6
2005	10,557	57,979	57,979	197.8
Average	**8,685**	**39,766**	**47,489**	
Std. Dev.	**3,023**	**11,755**	**11,622**	

[1] Consumer Price Index in Honolulu, Hawaii.

Source: WPFMC 2006.

Table 3–17. Hawaii Longline Tuna Landings, 1987-2005 (round mt).

Year	Bigeye	Yellowfin	Albacore	Skipjack	Total
1987	815	261	150	1	1,227
1988	1,239	594	307	4	2,143
1989	1,442	986	248	10	2,686
1990	1,514	1,098	177	5	2,795
1991	1,553	733	312	30	2,628
1992	1,486	346	333	22	2,188
1993	2,121	631	438	36	3,226
1994	1,787	606	497	53	2,942
1995	2,051	979	879	101	4,011
1996	1,787	630	1,182	41	3,641
1997	2,449	1,141	1,645	106	5,341
1998	3,226	722	1,111	76	5,136
1999	2,719	473	1,474	99	4,765
2000	2,644	1,205	898	100	4,848
2001	2,354	1,033	1,271	207	4,866
2002	4,389	560	519	128	5,596
2003	3,591	823	526	198	5,138
2004	4,324	707	358	133	5,522
2005	4,978	735	301	89	6,103
Average	**2,446**	**751**	**665**	**76**	**3,948**
Std. Dev.	**1,138**	**258**	**455**	**60**	**1,393**

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Estimating Change in Fishing Effort under the Alternatives

The impact analysis in this EA is based on estimates of the change in fishing effort that would occur under each of the alternatives. The baseline is the current level of fishing effort, which is one vessel operating in the west-coast-based DSLL fishery on the high seas. Alternative 1, No Fishing, would result in a decrease in the fishing effort of one vessel, or approximately 133,000 fewer hooks set per year (1,900 hooks/set; 14 sets/trip; 5 trips/year)[23]. Alternative 2, or the Maintain Fishery alternative, would likely result in no change in fishing effort in the short run, since the one vessel currently operating in the fishery would most likely continue operations, and no additional vessels are expected to enter the fishery in the near future. In the long run, there could be a minor increase in fishing effort. We are estimating that five additional vessels could enter the fleet over the next three years, which would lead to approximately 665,000 additional hooks set per year (1,900 hooks/set, 14 sets/trip; 5 trips/year; 5 vessels entering the fishery). This would lead to a fishery with six active vessels setting approximately 800,000 hooks per year (1,900 hooks/set, 14 sets/trip; 5 trips/year; 6 vessels operating in the fishery).

As referenced in the description of the baseline condition in chapter 3, the quantitative estimation of potential impacts for the proposed action on target and non-target finfish can utilize, in a proxy fashion, observer records from the Hawaii DSLL fishery. The Hawaii- and west-coast-based DSLL fisheries are similar in terms of gear and operational methods employed, but the areas fished are not fully comparable due to the differences in the species found in each region, and their distribution based on the oceanographic processes in tropical and temperate habitats. In response to these differences, the west coast data will be discussed qualitatively in order to supplement the quantitative estimations calculated with Hawaii DSLL observer data. The west-coast-based DSLL fishery data is confidential due to the fact that only one vessel is participating in the fishery, thus the actual data cannot be presented.

The impact estimates of the DSLL fishery on finfish, protected species, and seabirds are calculated using the CPUE from the Hawaii observed catch. The CPUE is then multiplied by the estimated average number of sets, trips, and hooks that would be used in the DSLL fishery on the West Coast since 2005 in order to project the catch estimates for one vessel (short run), and six vessels (long run) operating in the fishery.

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[23] This hook estimate is based on historic West Coast-based DSLL observed trips (PIFSC 2007).

Table 4–1. Annual projected takes of finfish for one vessel (133,000 hooks) and six vessels (800,000 hooks) in a west-coast-based DSLL fishery.

Species Caught	CPUE (catch/1,000 hooks)	CPUE – 1 vessel (catch/133,000 hooks)	CPUE – 6 vessels (catch/800,000 hooks)
Lancetfish, Longnose	4.921	654.54	3,937.08
Tuna, Bigeye	4.050	538.66	3,240.09
Shark, Blue	2.325	309.19	1,859.79
Dolphinfish (Corado, Mahimahi)	2.078	276.42	1,662.71
Pomfret, Sickle	1.583	210.50	1,266.18
Mackerel, Snake	1.116	148.38	892.50
Tuna, Yellowfin	0.973	129.44	778.58
Tuna, Skipjack	0.825	109.69	659.77
Escolar, Smith's	0.691	91.86	552.56
Marlin, Striped	0.580	77.12	463.91
Wahoo	0.538	71.55	430.40
Spearfish, Shortbill	0.440	58.45	351.61
Tuna, Albacore	0.397	52.82	317.69
Opah	0.381	50.70	304.97
Remora	0.268	35.59	214.06
Swordfish, Broadbill	0.195	25.88	155.67
Shark, Bigeye Thresher	0.166	22.05	132.61
Stingray, Pelagic	0.165	21.90	131.73
Marlin, Indo-Pacific Blue	0.131	17.44	104.91
Barracuda, Great	0.076	10.06	60.48
Shark, Shortfin Mako	0.068	9.06	54.47
Mola, Slender	0.059	7.87	47.33
Shark, Oceanic Whitetip	0.058	7.76	46.70
Pomfret, Dagger	0.048	6.38	38.39
Tuna, Unidentified	0.045	5.98	35.98
Shark, Silky	0.040	5.38	32.38
Shark, Crocodile	0.035	4.68	28.13
Shark, Unidentified	0.028	3.74	22.50
Oilfish	0.025	3.35	20.15
Pomfret, Brama	0.024	3.25	19.55
Shark, Unidentified Thresher	0.017	2.26	13.62
Bonyfish, Unidentified	0.015	1.97	11.84
Mackerel, Black (Escolar,Longfin)	0.014	1.81	10.88
Dogfish, Velvet	0.010	1.37	8.22
Sailfish	0.010	1.33	7.97

Based on an estimated average number of trips per year (5), sets per trip (14) and hooks per set (1,900) in the west-coast-based DSLL tuna fishery, using CPUEs derived from Hawaii-based DSLL observer data (see table 3-4). Shaded species were not observed taken in the west-coast-based DSLL fishery and most likely do not occur in the proposed action area.

4.2 Direct and Indirect Impacts of Alternatives on Finfish

4.2.1 Evaluation Criteria for Alternatives

To evaluate the potential impacts of the alternatives, a set of criteria were developed to help determine whether the alternatives would be likely to result in significant adverse impacts. For the target, non-target, and prohibited species finfish interactions under the various alternatives, the following criteria are used:

- Would the alternative likely result in catch levels that would substantially contribute to an "overfished" or "overfishing" condition for any of the HMS FMP management unit species?[24]

- Would the alternative likely result in catch levels that would exceed any of the management objectives of the HMS FMP?

- Would the alternative likely result in catch levels that would contribute to a substantially elevated conservation concern for prohibited species under the HMS FMP?

- Would the alternative provide sufficient monitoring to ensure that management objectives of the HMS FMP are being adhered to and that needed data elements are collected for future management decisions?

For each criterion above, the effects are measured in terms of estimated effort in number of hooks (as discussed in section 4.1) for the alternatives, and the corresponding catch based on the CPUE estimates from the Hawaii- and west-coast-based DSLL fishery observer data. Table 4-1 provides effort estimates in number of sets associated with the alternatives. The CPUE used for each finfish species was calculated using catch data for the Hawaii-based DSLL fishery.

4.2.2 Direct and Indirect Impacts of Alternative 1 – No Fishing

Given that there is only one vessel currently operating in the west-coast-based DSLL fishery, closing the fishery would likely produce very insignificant overall benefits to finfish populations. The closure of the fishery would lead to approximately 133,000 fewer hooks set per year on the high seas, which would result in fewer finfish being caught. For estimates of the number and species of finfish that are projected to be caught by one vessel operating in the fishery for one year see table 4-1.

The target species would not necessarily benefit from the reduction of effort associated with closing the west-coast-based DSLL fishery. With trans-boundary species such as tuna migrating across many nations' EEZs and the high seas, fish formerly caught in the fishery are likely to be caught by other nations and imported back into the nation with the closed fishery, creating production and trade leakages and resulting in little or no net conservation gain (Dutton and Squires 2008). In addition, the majority of tropical tuna species in the EPO are caught with purse seine sets. The majority of yellowfin tuna catch is made with purse seine sets associated with dolphins, and the majority of bigeye and skipjack tuna catch is made with purse seine sets on floating objects. Purse seine fishing using fish aggregating devices (FADs) tends to yield more juvenile fish, altering the trophic structure of some populations and causing further ecosystem impacts. In contrast, the longline fishery tends to yield larger fish that are sexually mature and caught at a

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[24] "Substantially contribute" means that if the activity were prohibited (i.e., alternative 1) there would be a high likelihood that this action alone would result in the cessation of overfishing and/or a high probability that the stock returns to the target biomass.

higher value. Two other marketable species with relatively high CPUEs that could benefit from closing the fishery are dorado and sickle pomfret.

Several bycatch species of concern have high CPUEs, including blue sharks and longnose lancetfish. As stated previously, the biomass of the North Pacific blue shark population appears to be slightly increasing; therefore, the existing west-coast-based DSLL fishery is not considered detrimental to the status of the blue shark population. Little is known about the status of longnose lancetfish populations, but they represent a large amount of the non-marketable catch for the DSLL fishery. Again given the low level of current effort in the west-coast-based DSLL fishery, a small benefit to this population might be realized upon closure of the west-coast-based DSLL fishery.

Alternative 1 would most likely satisfy all of the evaluation criteria and not result in any significant adverse impacts to finfish. Alternative 1 would result in the closure of the west-coast-based DSLL fishery, so there could be a decrease in catch levels, or a transfer of the fishing effort to other fisheries to meet the demand for fresh tuna. Thus, it is unclear whether the impacts of closing the fishery would ultimately be beneficial to finfish stocks because of the decrease in fishing effort, or whether the fishing effort would be transferred to other nations (which may have less stringent bycatch mitigation measures) which would result in either no benefits, or possibly some adverse impacts to finfish stocks.

4.2.3 Direct and Indirect Impacts of Alternative 2 (Maintain Fishing)

Direct impacts to target, non-target, and prohibited finfish species under alternative 2 would initially be unchanged from the baseline, assuming that in the short run there would most likely not be a change in participation in the fishery, and the one vessel currently operating in the fishery would continue to do so. In the long run, there could be a potential increase in the catch of these species because of the possible expansion of the fishery. It is estimated that five additional vessels may enter the fishery over a three year time period for a total of six vessels operating in the fishery in the long run. Projected catches of target, non-target, and prohibited finfish species are presented in table 4-1 utilizing the Hawaii-based DSLL observer records. Evaluation of the effects of alternative 2 includes the entire affected environment, as described in chapter 3 of this document.

Catch estimates are provided for the single existing participant (133,000 hooks set per year) and for the potential estimated increase in participation for a total of six vessels (800,000 hooks set per year) operating in the fishery. The estimates utilize the original CPUE that was calculated for all finfish species using the Hawaii-based DSLL observer records. Impacts to target, non-target, and prohibited fish species from the fishery would be minor, especially considering that the U.S. tuna longline fishery contributes one percent or less of the overall landings for the EPO (PFMC 2006). A qualitative approach to analyzing the impacts of this fishery on finfish populations based on the projected CPUEs is presented below.

4.2.3.1 Risk of Overfishing

The following question is discussed in this section: “Would the alternative likely result in catch levels that would create an “overfished” or “overfishing” condition for any of the HMS FMP management unit species?” The terms “overfishing” and “overfished” mean a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis (16 U.S.C. 1802 § 104-297).

Target Tuna Species

Based on the most recent stock assessments, coupled with the relatively small increase in total effort and catch on a regional basis, the increase in tuna catch under alternative 2 would not exacerbate either an overfished or an overfishing condition. The two most recent stock assessments indicate that no MUS of the HMS FMP are overfished; however, bigeye tuna (considered a single stock Pacific-wide), and yellowfin tuna (considered two separate stocks in the EPO and WCPO) have been declared subject to overfishing (the most recent IATTC stock assessment for yellowfin tuna in the EPO indicates that the stock is not currently being overfished; however, the overfishing declaration was based on a previous stock assessment). Due to the fact that these stocks have a wide distribution and the vast majority of catches are made outside of U.S. waters by vessels from other nations, many management measures intended to end overfishing are implemented through the Regional Fisheries Management Organization (RFMO) framework. RFMO management measures aimed at ending overfishing affect the cumulative impacts of alternative 2 on finfish, and are further discussed in section 4.2.4. Member nations, including the United States are obligated to implement these measures for their national fisheries. Within the United States, HMS fishery management in the Pacific Ocean is the responsibility of three regional fishery management councils, WPFMC, the North Pacific Fishery Management Council (NPFMC) and the Council (PFMC), and the adjacent states. Some form of coordination among councils is required because fishers from the different council areas are harvesting the same stocks of HMS, and in some cases are fishing in the same areas, but landing in different locations.

According to section 304(i) of the MSA (as amended), if the Council is notified that overfishing is occurring on a stock due primarily to international fishing pressure, within one year of the notification date the Council must: 1) develop recommendations for domestic regulations to address the relative impact of fishing vessels of the United States on the stock and, if developed by a Council, the Council shall submit such recommendations to the Secretary of Commerce (or in effect, NMFS); and 2) develop and submit recommendations to the Secretary of State, and to the Congress, for international actions that will end overfishing in the fishery and rebuild the affected stocks, taking into account the relative impact of vessels of other nations and vessels of the United States on the relevant stock.

On December 15, 2004, NMFS notified both the Council and WPFMC that overfishing was occurring on bigeye tuna Pacific-wide. The Council, having fisheries for bigeye tuna in the EPO only, and WPFMC, having fisheries in both the EPO and the WCPO, developed an international strategy that addresses overfishing Pacific-wide. The Council's Amendment 1 to the HMS FMP, in combination with WPFMC's Amendment 14 to the Pelagics FMP, address overfishing of bigeye tuna Pacific-wide (50 CFR Part 665). The general recommendations of the Council to end overfishing of bigeye tuna, such as focusing on the fisheries with the greatest impacts and on the regions of highest catches and on spawning areas, reducing surplus capacity, and restricting the use of purse seine FADs, are outlined in section 4.5 of the amended HMS FMP (2007). The specific actions to end overfishing are implemented by multilateral cooperation through RFMOs and are discussed in section 4.2.4. Because bigeye tuna are targeted by many nations, and taking into consideration the comparatively small portion of total fishing mortality on the stock contributed by the United States, no additional Federal regulations to limit fishing effort by west coast vessels managed under the HMS FMP have been proposed. According to IATTC data, the U.S. longline catch of bigeye tuna in the EPO (including catch from Hawaii and American Samoa) has accounted for less than one percent (on average 0.2 percent) of the total catch of bigeye tuna in the EPO with all gear types combined for the last five years (IATTC 2007).

In a letter dated October 25, 2006, NMFS notified the Council that overfishing was occurring on the EPO yellowfin tuna stock. In a subsequent letter dated March 30, 2007, NMFS informed the Council that section 304(i) to the MSA is applicable to the EPO yellowfin tuna stock; consequently, the Council submitted recommendations to the Department of State, Congress, and IATTC in similar letters dated

March 28, 2008. Because west coast fisheries are a negligible contributor to total fishing effort on the stock, further curtailment of these catches would have no practical effect on ending overfishing. The U.S. longline catch of yellowfin tuna in the EPO (including catch from Hawaii and American Samoa) has accounted for less than one percent (on average 0.0014 percent) of the total catch of yellowfin tuna in the EPO with all gear types combined for the last five years (IATTC 2007).

In August 2005, the Scientific Committee of the Western and Central Pacific Fisheries Commission (WCPFC) reviewed a stock assessment that indicated that yellowfin tuna in the WCPO is subject to overfishing, and on March 16, 2006, NMFS officially notified WPFMC that overfishing was occurring. WPFMC is the agency responsible for overfishing response of the yellowfin tuna stock in the WCPO (16 U.S.C. 1852 § 302; § 104-297). It is highly unlikely that any west-coast-based DSLL fishing would occur in the WCPO due to the economic, time and vessel size constraints previously mentioned (fuel costs, fish and ice hold capacity, sea conditions, safety considerations, etc.). Therefore, alternative 2 would not exacerbate the overfishing condition of tunas in the WCPO because U.S. catch is only a small percentage of overall catch in the WCPO, there would not be a substantial increase in total U.S. effort or catch from the proposed action, and it is unlikely that any west-coast-based DSLL fishing would occur in the WCPO. If, however, any fishing operations did occur in the WCPO, they would be subject to the management measures established by WPFMC and WCPFC. Amendment 14 of the Pelagics FMP addresses the overfishing of the WCPO yellowfin tuna stock (WPFMC 2006).

Non-target Sharks

Although there are high catch rates of blue sharks in most pelagic longline fisheries, the North Pacific blue shark stock does not appear to be in an overfished or overfishing state. There have been some recent conservation measures that were put in place to protect sea turtles in the Hawaii-based SSLL fishery that have had some positive impacts on blue sharks. The use of circle hooks in SSLL fisheries does not appear to appreciably reduce blue shark catch rates, but does appear to increase survivorship of those that are caught. Hawaii-based SSLL observer records for trips utilizing circle hooks, mackerel-type bait, and de-hooking pliers (162 trips, June-March, 2006), indicate that approximately 95 percent of captured blue sharks were released alive. Given this information and the status of this stock, it appears that the west-coast-based DSLL fishery would not create an overfished or overfishing state.

Other Major Non-target Finfish

The other marketable species that represent a large amount of the non-target finfish species that are caught by DSLL fishing are dorado, sickle pomfret, wahoo and escolar. Not much is known about the population status of the sickle pomfret, so it is difficult to say if overfishing is taking place. Since sickle pomfret is not a highly desirable commercial species and a fishery targeting the species does not exist, this is not a species currently managed under the HMS FMP (PFMC 2003). The catch of wahoo and escolar are currently low enough that even with the estimated increase of five vessels, overfishing is highly unlikely. The stock status of dorado is unknown; however, dorado are highly productive and widely distributed throughout the tropical and subtropical Pacific (PFMC 2007). There are no harvest guidelines recommended for these finfish species and it appears that overfishing would not likely take place as a result of the proposed action (PFMC 2003).

4.2.3.2 Meeting HMS FMP Management Objectives

Target Tuna Species

The HMS FMP management objectives for bigeye, yellowfin, and skipjack tuna stocks are, among others, those embodied in the goal of the MSA, namely to ensure the long term sustainability of fisheries and fish stocks by halting or preventing overfishing and by rebuilding overfished stocks. A detailed description of the control rules for these HMS FMP management objectives are presented in the HMS FMP (PFMC 2003). Based on stock status and summary information presented in section 3.3.2, including the current measures being implemented to address the overfishing conditions that exist for bigeye and yellowfin tuna, the alternatives proposed would not be expected to conflict with any HMS FMP management objectives.

Non-target Sharks

Shortfin Mako Sharks (*Isurus oxyrinchus*)

A harvest guideline of 150 mt has been established under the HMS FMP for shortfin mako shark catch. Utilizing the Hawaii DSLL observer records as a proxy (table 4-1), the estimated catch of shortfin mako shark for the six vessel estimate (i.e., 800,000 hooks) is 55 sharks. The average round whole weight for shortfin mako sharks caught within the action area, derived from a length-weight conversion formula (Kohler, *et al.* 1996) and utilizing at-sea observer measurements for shortfin mako sharks captured in the DGN fishery, is approximately 37 kg; multiplying the average weight of 37 kg by 55 mako sharks gives an estimated catch of approximately 2.035 mt.

If we take into account the amount of bycatch of shortfin mako sharks in the DGN fishery (35.2 mt), the fishery would still not exceed the HMS FMP harvest guideline of 150 mt. Private recreational boat catch is not well documented, but could contribute a significant amount to the overall shortfin mako catch. These private boat catch estimates, however, must be used with caution due to the high variances and potentially biased catch estimates (PFMC 2006). It is also important to note that no interactions with shortfin mako sharks were observed in the west-coast-based DSLL fishery in 2005 and 2006.

Other Major Non-target Finfish

There are no HMS FMP management objectives, outside of the aforementioned MSY control rules for HMS management unit species, for the major non-target finfish that may be captured under the proposed action.

4.2.3.3 Elevated Conservation Concern for HMS FMP Prohibited Species

Given the low interaction rates and catch probabilities, both for current effort and under the proposed action, the impacts on prohibited species are not likely to elevate conservation concerns for the species in question.

4.2.3.4 Sufficient Monitoring

The west-coast-based DSLL fishery monitoring protocol requires 100 percent observer coverage for all trips, and observer protocols require monitoring the entire set and haul-back sequences. As such, there would be an adequate amount of monitoring in place to ensure that HMS FMP management objectives are adhered to for the proposed action.

4.2.4 Cumulative Impacts on Finfish

Cumulative impacts are the impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions; cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (43 FR 55990 Sec. 1508.7).

The target and non-target species in the DSLL fishery have a Pacific-wide distribution and are subject to other sources of fishing mortality (e.g., other U.S. domestic fisheries, and to a greater degree, international fishing fleets). These fisheries are described in chapter 3. Several of the HMS species of concern being addressed in this document have a wide migratory range that cross established political and management boundaries in the Pacific. Despite the fact that the majority of the catch and effort from these fisheries occurs outside of the action area, many of the HMS species are considered single stocks in the Pacific, thus fishing mortality of these stocks in other areas of the Pacific would affect these species. In addition, for most of these distant water fishing fleets, little or no data exists regarding catch and bycatch of marine species. Without such information, it is difficult to assess the cumulative impacts of these fisheries on the species under review in this EA.

4.2.4.1 Target Species

The catch and effort data presented for other fisheries that interact with HMS populations, including tuna, are parameters that for the most part are utilized by regional stock assessment scientists, including NMFS scientists, to produce a stock status and other key population level estimates. As detailed under section 3.3.2.2 of this document, there are overfishing concerns for some tuna species that are being addressed through RFMO's and amendments to FMPs. The proposed action, taken as a very minor component of existing commercial and recreational fisheries throughout the Pacific Ocean, would not significantly increase the total catch of tuna.

IATTC is the RFMO responsible for the conservation and management of HMS in the EPO. For 2007, IATTC set the annual U.S. total allowable longline catch of bigeye tuna in the Convention area at 500 mt. NMFS has defined the "Convention Area" to consist of the waters bounded by the coast of the Americas, the 40° N. and 40° S. parallels, and the 150° W. meridian (50 CFR Part 300, Subpart C). After the quota is reached, any U.S. fishery targeting bigeye tuna would have been closed for the remainder of the calendar year (72 FR 30711). IATTC has not reached a consensus for 2008 measures, including total allowable catch of bigeye, thus the quotas and management measures are uncertain.

WCPFC is the RFMO responsible for the conservation and management of HMS in the WCPO. Alternative 2 includes an estimated increase of five vessels to the current DSLL fishery, which could potentially increase the U.S. west coast effort and catch in the WCPO; however, WCPFC has established conservation and management measures for bigeye and yellowfin tuna in the Convention area that limit the total level of U.S. fishing effort to current levels, and conservation measures have established that the catch of bigeye for the next three years shall not exceed the average annual bigeye catch for the years 2001-2004 or the year 2004 (the year 2004 only applies to China and the U.S.). WCPFC also states that nations shall establish measures to be taken to ensure that purse seine effort levels do not exceed 2004 levels, or the average of 2001 to 2004 levels, in waters under their national jurisdiction, beginning in 2006 (the year 2004 only applies to China and the U.S.).

In the case of the North Pacific albacore tuna stock, IATTC and WCPFC have called upon member nations to not increase the total level of fishing effort for North Pacific albacore tuna in the EPO. The United States, as a member nation, is developing a plan of action to meet the obligations to limit efforts to current levels in the EPO and WCPO. The U.S. has begun formulating a definition for "current" levels of effort; however, the task has proved to be complex (IATTC 2007). In general, it appears that U.S. commercial landings of albacore have remained fairly stable over the past few years, and recreational landings have decreased substantially since around 2003; however, there is a great deal of uncertainty with the exact numbers of landings due in part to the large, private recreational fleet (PFMC 2007b). In a letter to NMFS dated May 23, 2007, the Council did acknowledge that its Highly Migratory Species

Management Team report on current fishing effort demonstrated that U. S. fishing effort on North Pacific albacore was stable and had not increased during the 1996-2005 time period.

4.2.4.2 Major Non-target Species

As stated in section 3.3.2.2 of this document, the best available science indicates that none of the non-target finfish likely to be taken in the west-coast-based DSLL fishery are in an overfished or overfishing condition. Given the relatively low DSLL effort, the cumulative effect of the proposed action would not increase the regional catch of these species to a level triggering a resource conservation concern.

The catch and effort data presented for those major non-target finfish species for which population assessments have not been conducted to date (e.g., dorado, sickle pomfret, wahoo, escolar, and longnose lancetfish), do not allow for a stock status determination at this point. It is assumed that the proposed action would not increase the regional catch of these species to a level triggering a resource conservation concern.

4.3 Direct and Indirect Impacts of Alternatives on Protected Species

4.3.1 Direct and Indirect Impacts of Alternative 1

4.3.1.1 Marine Mammals

Alternative 1, which would close the west-coast-based DSLL fishery, would not result in any direct, appreciable benefits to marine mammal species. The species of finfish being harvested (e.g., bigeye, yellowfin, skipjack, albacore) are not species that are a major component of the diet of marine mammals in the area; therefore, closing the fishery would have no indirect effect on marine mammals by increasing their available forage.

4.3.1.2 Sea Turtles

There could be possible benefits to sea turtle populations if alternative 1 was implemented, however, they would most likely be minimal because the number of takes in the current fishery are so low, and the fishing effort could be transferred to other fisheries, that could have less stringent turtle mitigation measures. As with marine mammals, there are not anticipated indirect beneficial effects expected by closing down the DSLL fishery, since species being targeted by the existing fishery are not prey items for sea turtles.

4.3.1 Direct and Indirect Impacts of Alternative 2

An exposure analysis was conducted to determine which species have the highest risks of exposure and effects on protected species under the proposed action. As described in section 3.4, it is difficult to project the species that may be affected by the proposed action due the low amount of current fishing effort that has been observed in the action area. Projected takes of sea turtles are shown in table 4-3. Evaluation of the consequences of Alternative 2 includes the entire affected environment, as described in chapter 3 of this document. A qualitative approach to analyzing the impacts of this fishery on protected species populations, based on the projected CPUEs, is presented below.

4.3.1.1 Evaluation Criteria

In an attempt to compare the alternatives, the following questions were developed to judge the effects of each alternative:

1. Would the anticipated level of marine mammal take under the alternative result in serious injuries or mortalities that would significantly affect the current status of the stock?

2. Would the anticipated level of sea turtle take under the alternative result in mortalities that would significantly affect the status of sea turtle populations?

4.3.1.2 Marine Mammals

For the purposes of this analysis, it is assumed that most DSLL activity will occur east of 140° W. longitude and north of the equator to 35° N. latitude. Current population estimates of these species/stocks are provided in section 3.4.1. Most of these stocks number in the thousands or hundreds of thousands in the EPO, therefore, the very small number of takes would not significantly affect these populations.

As part of the review of the Hawaii-based longline fishery, Forney and Kobayashi (2008) calculated take rates for marine mammals within and outside EEZs for different gear types. A summary of their calculations is shown in table 4–2. The take rates are provided as animals per 1,000 sets. In order to use this information to approximate marine mammal take levels in a DSLL fishery with up to 800,000 hooks per year, the hook level was converted to sets assuming that one set consists of approximately 2,000 hooks. Thus 800,000 hooks, the maximum number of hooks considered likely to be set, is approximately 400 sets per year for a fleet of up to six vessels. This level of effort is less than half of the 1,000 sets effort measure used by Forney and Kobayashi (2008).

As shown in table 4–2, at 1,000 sets the take rate in the Hawaii-based DSLL is less than one marine mammal. Thus, at 400 sets there is a very low likelihood of take of marine mammals in the proposed action, based upon what has been observed in the Hawaii longline fisheries and the distribution of the species/stocks within the proposed action area. Only a few marine mammal species may be affected by the preferred alternative, including the short-finned pilot whale, false killer whale, Risso's dolphin, spotted dolphin, and bottlenose dolphin. It is estimated that one or fewer individuals from each of these stocks will be taken in the DSLL fishery. In the case of short-finned pilot whatles, the take rate per 1,000 sets is 0.25 (Forney and Kobayashi 2008). Applying this rate to the anticipated total number of sets, 400, that may be set per year in the west-coast-based DSLL fishery suggests that the probability of a take is very low, even over three years; however, the possibility can not be completely eliminated.

Table 4–2. Take rate of marine mammals per 1,000 sets.

	BE	DD	GG	GM	MD	MN	PC	PM	SA	SL	TT	UC
All areas N=24,542	0.04	0.04	0.37	0.29	0.08	0.12	0.81	0.04	0.04	0.08	0.16	0.65
Outside EEZ N=11,582	0.09	0.09	0.78	0.43	0.00	0.17	0.78	0.00	0.00	0.17	0.17	0.69
Tuna type N= 20,375	0.00	0.00	0.05	0.25	0.10	0.15	0.88	0.00	0.05	0.00	0.10	0.54

Note: BE = Bryde's whale; DD = short-beaked common dolphin; GG = Risso's dolphin; GM = short-finned pilot whale; MD = Blainsville beaked whale; MN = humpback whale; PC = false killer whale; PM = sperm whale; SA = Pantropical spotted dolphin; SL = spinner dolphin; TT = bottlenose dolphin; UC = unidentified cetacean.
Source: Forney and Kobayashi 2008.

4.3.1.3 Sea Turtle Mortality Impacting Populations

The PIRO staff calculated a three year incidental take statement (ITS) for the Hawaii-based DSLL fishery based upon probability distributions of annual anticipated take of ESA-listed sea turtles (NMFS 2005). Utilizing the anticipated rate of sea turtle takes calculated by PIRO and scaling to the level of the proposed action (i.e., 800,000 hook effort), the following rates of sea turtle incidental take are anticipated over the next three years in the west-coast-based DSLL tuna fishery: three olive ridley sea turtles, one leatherback sea turtle, one green sea turtle, and one loggerhead sea turtle (most of the takes of olive ridley and green sea turtles in the DSLL fishery would result in mortalities, and about 50 percent of the loggerhead and leatherback takes would result in mortality (see table 3-11 for more details). These rates may over-estimate the actual takes since a conservative approach was taken by PIRO in developing the anticipated annual interactions for each of the four species expected to interact with the DSLL fishery. Also, the distribution of sea turtles at the time and area of the proposed action may not be the same as the distribution of sea turtles in the proposed action area for the west-coast-based DSLL tuna fishery.

Table 4–3. Projected takes of sea turtles in the west-coast-based DSLL fishery over three years.

Species/Stock	Estimated three year take(s) of west-coast-based DSLL fishery
Green	1
Leatherback	1
Olive Ridley	3
Loggerhead	1

The projected take rates that are presented in table 4–3 and associated mortalities of these turtle species are low in terms of overall impacts to these populations. In section 3.4.2 the status of sea turtle populations was discussed; it was noted that some are declining while others are increasing. It’s important to note that for many sea turtle populations, overall trends in abundance can not be derived from the limited available information. For all of the sea turtle populations included in this EA, significant declines have been recorded in the last century.

As detailed in section 3.4.2, some populations of olive ridley and green turtles have been increasing over the last few decades. Loggerhead sea turtle nesting numbers are low but not declining at most beaches in Japan and over the past several years, and increases in nesting females to some beaches have been observed. The population of leatherbacks most likely to be affected by the west-coast-based DSLL fishery would be the western Pacific leatherbacks. As described in the affected environment section, research over the past eight years has indicated that leatherbacks from the western Pacific travel across the north Pacific to forage and some move into the U.S. West Coast to forage. By comparison, tracks of eastern Pacific leatherbacks indicate that they remain south of the equator and thus out of the proposed action area. Leatherbacks in the eastern Pacific have shown steep declines at nesting beaches and there is concern that this population could go extinct. By comparison, western Pacific leatherbacks have traits (e.g., a wide variety of nesting sites, year round nesting, and a variety of foraging areas) that may make the population more resilient than the eastern Pacific leatherback population. While there has not been long-term monitoring of the nesting sites in the western Pacific, it is clear that the population has declined.

Based upon the current status of the four sea turtle populations considered most likely to be affected by the preferred alternative, the loss of one leatherback, one loggerhead, one green turtle, and/or three olive ridley sea turtles in three years is not likely to significantly affect the population.

4.3.1.4 Indirect Effects of Alternative 2 on Protected Species

The indirect effects of this alternative on marine mammals and sea turtles are likely to be quite minor. Indirect effects of a fishery on protected species could include displacement of animals out of the area (e.g., harbor porpoise moving out of an area with a high concentration of pingered gillnets in the Atlantic (Dawson, *et al*. 1998), loss of forage (e.g., the salmon fishery targeting fish that may be prey for ESA listed killer whales (NMFS 2006b), or destruction of habitat. None of these effects are anticipated under the proposed fishery. As described above, there is no anticipated indirect effect from a loss of prey species due to fishing under the preferred alternative, since none of the species targeted are considered primary prey items for protected species.

4.3.1.5 Direct and Indirect Effects of Alternative 2 on Critical Habitat of Protected Species

DSLL fishing would be taking place far from any critical habitat of the endangered species listed in section 3.4. Critical habitat designations are contained in the Code of Federal Regulations at 50 CFR 226. Critical habitat for two sea turtle species, leatherback and hawksbill, has been designated in the Atlantic, but has not been designated in the Pacific. No other sea turtles found in the proposed action area have designated critical habitat. Of listed marine mammals, only Steller sea lions and monk seals have critical habitat designated in the Pacific, but these areas do not fall within the proposed action area. Salmon and steelhead critical habitat is limited to inshore waters and very limited nearshore marine/estuary waters; therefore, the proposed action would not result in destruction or adverse modification of any designated critical habitat.

4.3.2 Cumulative Impacts on Protected Species

4.3.2.1 Marine Mammals

Anthropogenic threats to marine mammals in the North Pacific are detailed in section 3.4.1.2. These include such threats as entanglement in fishing gear (active fishing gear and discarded gear), ship strikes, exposure to toxins, pollution, loss of habitat or prey, and underwater sound. The effects of these threats are difficult to quantify, but may be reflected in stock trends, some of which are increasing (e.g., eastern North Pacific humpback whales).

4.3.2.2 Sea Turtles

General threats to Pacific sea turtles are detailed in section 3.4.2.2. These include poaching of eggs, killing of females at nesting beaches, human encroachment (development), beach erosion, microclimate-related impacts at nesting sites, low hatchling success, and incidental capture in fisheries. Even taking these other impacts into consideration, the proposed action is not expected to significantly impact the status of leatherback, loggerhead, olive ridley or green sea turtle populations because the estimated take rates are so low for the three year time frame.

4.4 Direct and Indirect Impacts of Alternatives on Seabirds

Alternative 1 would close the current DSLL fishery. This could provide more seabird protection than is currently in place in the fishery; however, the effect on seabirds would be minimal since very few seabirds interact with the fishery already and the fishing effort may be transferred to another fishery, which may have even less stringent seabird mitigation measures.

Seabird impacts of alternative 2 are calculated using an estimated fishing effort of 800,000 hooks, along with seabird interaction rates from the Hawaii-based DSLL fishery from 2003 to 2006. In this fishery, observers recorded 0.0018 black-footed albatross and 0.0017 laysan albatross captured per 1,000 hooks observed. Zero short-tailed albatross have been observed caught in the Hawaii-based longline fishery. Using these take rates, the proposed action would be expected to take two black-footed, two laysan, and no short-tailed albatross.

4.4.1 Cumulative Impacts on Seabirds

Threats to seabirds are detailed in section 3.5. The summary includes such threats to seabirds as catastrophic events at breeding colonies, climate change and oceanic regime shifts, contaminants, air strikes, disease/parasitism, predation and other natural factors, and invasive species. DSLL fishery impacts to seabird populations are not expected to significantly affect these species.

4.5 Direct and Indirect Impacts of Alternatives 1 and 2 on the Socioeconomic Environment

4.5.1 Introduction

NEPA regulations define the human environment “to include the natural and physical environment and the relationship of people with that environment” (40 CFR 1508.14); under this definition, the socioeconomic effects of the proposed action are considered. This evaluation also addresses the requirements of two other cross-cutting mandates, the Regulatory Flexibility Act and Executive Order 12866. In examining the socioeconomic effects of the DSLL fishery alternatives, benefits, costs, and economic impacts are evaluated by comparing the estimated impact of the alternatives to the baseline. In this section a qualitative analysis of the socioeconomic impacts of alternatives 1 and 2 is provided. As the proposed fishery currently has only one participant and did not exist historically, there is limited data on which to base a quantitative assessment. Cost and earnings data from the “Economic and Operational Characteristics of the Hawaii-Based Longline Fleet in 2000” are used to gauge the potential scale of the economic impacts, but should not be interpreted as predictive for what might occur under the proposed alternatives, as many relevant factors would likely differ between west-coast-based and the Hawaii-based fisheries (O’Malley and Pooley 2000).

Benefit-cost analysis (the focus of Regulatory Impact Review, required by Executive Order 12866) concerns the change in net benefits resulting from the alternatives that would be realized by society as a whole, known as welfare effects. Benefits are measured by willingness to pay and costs are opportunity costs or the value of the next best alternative. These are primarily quantified here through measures of economic producer surplus (anticipated economic benefits to society of estimated increased effort under alternative 2).

Net economic benefits primarily consist of economic producer surplus, which on an individual commercial fishing vessel basis is the difference between gross ex-vessel revenues and all fishing costs, including labor costs for captain and crew and a return to the vessel owner. The net economic benefit also includes consumer surplus, which is the net value of fish products to the consumer. The net benefit to the consumer is the difference between what the consumer actually pays and what they are willing to pay, i.e., the value to the consumer over and above the actual purchase price. Producer surplus can increase through decreases in unit harvesting costs (improved economic efficiency), or an increase in ex-vessel prices received. Consumer surplus can increase through a decrease in prices paid, increases in the quantities consumed, or improvements in product quality. If the inputs used to harvest fish and the resulting landings are traded in competitive markets, theoretically, consumer and producer surplus can be measured or approximated by market demand and supply curves.

Financial impacts (the subject of Regulatory Flexibility Analysis) relate to the potential consequences of the action alternative on the financial well being of small entities. This concerns changes in profitability, i.e., changes in firms' cost and earnings. For small organizations (not-for-profit enterprises), concern is with the potential impact of the action alternative on their economic viability. In the case of small government jurisdictions, the impacts deal with how the action alternative would affect the income and expenditures of public authorities.

4.5.1.1 Evaluation Criteria

The evaluation criteria employed to assess economic consequences of the action alternative and regulatory changes have both quantitative and qualitative components. The former involves the use of an estimate of potential costs and gross revenue per vessel from the Hawaii-based longline fishery to produce a corresponding estimate of producer surplus. The latter involves a number of considerations, addressed below in this section.

4.5.1.2 Direct and Indirect Impacts of Alternatives

Direct economic effects of changes in economic production are normally measured by the change in producer surplus, an economic concept intended to measure the net benefit of changes in production. The producer surplus is calculated as the difference between the anticipated increase in revenues less the anticipated increase in costs due to a change in the level of production effort. In the case of the west-coast-based DSLL fishery, financial producer surplus was estimated. Financial producer surplus is the estimated increase in producer revenues less the estimated increase in pecuniary costs under each alternative.

Estimates of potential financial producer surplus were estimated using data from the "Economic and Operational Characteristics of the Hawaii-Based Longline Fleet in 2000" (O'Malley and Pooley 2000) Gross revenue and total cost information was provided for the longline fishery in the year 2000 according to vessels targeting tuna and vessel size. A small vessel is defined as less than 56 feet in length, a medium vessel is between 56.1 and 73.9 feet in length and a large vessel is greater than 74 feet in length. All of the data presented in this document was adjusted for year 2007 inflation using the Bureau of Labor Statistics' inflation calculator. The results are shown in table 4–4 below. The one DSLL participant currently in the West Coast would be categorized as a large vessel here and therefore could be estimated to have a producer surplus of $21,855.

Table 4–4. Net revenue estimates for longline tuna vessels according to vessel size in 2007.

Year 2007	Small Vessel < 56 ft	Medium Vessel 56.1ft -73.9 ft.	Large Vessel > 74 ft.	Average
Gross Revenue	$603,422	$596,026	$582,473	$593,974
Total Costs	$482,024	$532,081	$560,618	$524,908
Net Revenue	$121,398	$63,945	$21,855	$69,066

Source: O'Malley and Pooley 2000.

The average revenue and costs from the above table are used below to show possible estimates for producer surplus as additional vessels may enter this fishery. It is important to note that the greater the number of vessels, the smaller the net revenue. Table 4–5 shows a net revenue range from about $70,000 to $415,000 for one to six vessels, respectively.

Table 4–5. Average net revenue (2007 $) estimates for longline tuna vessels according to number of vessels.

Number of Boats	1	2	3	4	5	6
Gross Revenue	$593,974	$1,187,948	$1,781,922	$2,375,896	$2,969,870	$3,563,844
Total Costs	$524,908	$1,049,816	$1,574,724	$2,099,632	$2,624,540	$3,149,448
Net Revenue	$69,066	$138,132	$207,198	$276,264	$345,330	$414,396

There would be some indirect economic effects that have not been estimated because of the lack of data and fisheries confidentiality agreements. Indirect effects of the DSLL fishery would potentially include downstream effects on fish processors who would purchase and process the catch, and on consumers who would benefit from an additional supply of locally caught fresh tuna and other fish species.

It should be understood that the estimates of financial producer surplus are based on experience from the Hawaii-based longline fishery for year 2000, which may not accurately represent what would occur in the West Coast for many different reasons:

1. Costs are variable on vessel size, crew size and other factors, such as fuel costs, which would vary between the two geographic locations, Hawaii versus the West Coast
2. Gross Revenue would vary depending on the amount and size of catch, what entity purchases the catch and at what price
3. Participant's decisions about where and when to fish would have an uncertain and unquantifiable impact on profitability
4. Differences in fishing conditions, environmental conditions and experience would have an uncertain and unquantifiable impact on profitability

It should be noted that the CPUE would provide variability in cost and revenue estimates; however, currently CPUE for the West Coast and Hawaii are comparable, but this may change in the future.

Under alternative 1, no economic benefits would be realized from west coast DSLL fishing. Under alternative 2 such benefits could be realized, as reflected in the estimates provided in table 4–5.

4.5.1.3 Fishing Communities Involved in the Longline Fishery (Including Buyers/Processors)

Socioeconomic impacts of the longline fishery on affected communities would be realized by: 1) the commercial fishing sector (harvesters, processors and consumers); 2) non-use sectors (protectionists and preservationists); and, 3) fishing communities. Because there is currently only one participant, and future participation is expected to only minimally increase, any impact on affected communities would be small, under alternative 1 (no fishing) and alternative 2 (fishing permitted). In future years, under alternative 2, the primary affected communities of concern would be west coast ports where participants are based out of and/or landing catches.

4.5.2 Cumulative Impacts on the Socio-Economic Environment

Under alternative 1, there would be no longline fishery and therefore a loss in economic benefits to society. This loss would be a direct effect on the current fishermen, estimated by the net revenue for one large vessel of $21,855, as well as to any intermediate or final purchasers. Longline fishing has been prohibited inside the U.S. west coast EEZ since 2004, which has negatively impacted many longline fishermen, processors, and consumers of locally caught fish, while positively impacting the non-consumptive and non-use values of the ocean (e.g., decrease in mortality to various species that may be caught/taken in a longline fishery in the west coast EEZ, etc.). Alternative 1 would further constrain longline fishermen, and negatively impact west coast processors, and consumers of locally caught fish (tuna in particular); however, it would have a positive impact on the non-use values of the ocean due to a decrease in the mortality of some marine species.

Under alternative 2, there would be a direct positive economic benefit. The estimated economic surplus is estimated using the average net revenue for one to six vessels at a range of $70,000 to $415,000. This is most likely unrepresentative of total economic benefits due to the indirect effects mentioned previously. Alternative 2 would positively impact west-coast-based longline fishermen, processors, and consumers of locally caught fish who were all negatively impacted by the closure of the longline fishery inside the west coast EEZ. It would negatively impact the non-use values of the ocean due to the increase in mortality of various species that may be caught/taken in the fishery.

By any reasonable objective standard, the direct impact of the longline fishery would be limited and fairly small, at least in the next three years, given that there is currently only one participant, and the predicted future participation is estimated to be around six vessels. The incremental effect of the proposed action is very small relative to baseline mortality levels and cumulative effects are not expected to materially alter any finding with respect to significant impacts resulting from the proposed action.

5.0 CONSISTENCY WITH MSA NATIONAL STANDARDS

An FMP or supplemental must be consistent with ten national standards contained in the MSA (§301). These are:

National Standard 1 states that conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

Based on the most recent stock assessments, coupled with the relatively small increase in total effort and catch on a regional basis, the increase in major non-target tuna catch under the action alternatives would not trigger either an overfished or an overfishing condition with the exception noted for bigeye and yellowfin tuna. The Council and NMFS are undergoing action as required by the MSA to reduce fishing mortality below an identified threshold (the default being F_{MSY}). Because these stocks have a wide distribution and the majority of catches are made outside of U.S. waters by vessels from other nations, management measures intended to end overfishing will be implemented through the RFMO framework.

National Standard 2 states that conservation and management measures shall be based on the best scientific information available.

The analyses and baseline information in this EA are based on the best scientific information available. The references cited in chapter 9 lists the sources for this information.

National Standard 3 states that, to the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

Target species stocks have a distribution wider than the proposed action. The HMS FMP recognizes the need for managing these stocks in the international context through the RFMOs, including IATTC and WCPFC.

National Standard 4 states that conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various United States fishers, such allocation shall be (A) fair and equitable to all such fishers; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

The proposed action currently includes only one fishing vessel and the projected expansion to six vessels is not large enough to warrant an allocation or assignment of fishing rights.

National Standard 5 states that conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.

The proposed action would have no effect on efficiency of utilization.

National Standard 6 states that conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

The proposed action focuses on a single fishery and is not expected to affect other fisheries catching the same fish species. The evaluation in this EA recognizes differences in the status of target and non-target species to the degree known.

National Standard 7 states that conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

The proposed action does not involve the implementation of any new regulations or management measures. The preferred alternative is to keep the DSLL fishery operating as status quo. Additional management measures may be implemented in the future.

National Standard 8 states that conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

The proposed action is intended to minimize socioeconomic impacts to fishermen while complying with existing regulations.

National Standard 9 states that conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

The MSA defines “fish” as all forms of marine animal and plant life other than marine mammals and birds. To the degree that overall fishing effort increases as a result of the proposed action, there could be an increase in bycatch. However, since IATTC currently has established an annual quota of 500 mt for bigeye tuna for the United States, there would not be an increase of overall fishing in the EPO, where most fishing is expected to take place. In addition, according to WCPFC resolutions, there cannot be an increase in the current catch of bigeye in the WCPO, and it is also unlikely that fishing will occur in the WCPO because of economic, time and vessel-size constraints. The DSLL gear used in the fishery is a new and innovative gear that has proven effective in other domestic and international fisheries at increasing the post-hooking survivorship of bycatch species such as blue sharks and sea turtles. Fishermen are also required to attend a protected species workshop where they learn methods to avoid interactions with turtles and marine mammals, and safe handling techniques for de-hooking animals, if caught.

National Standard 10 states that conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

The proposed action involves one vessel and is not expected to affect safety. This vessel has been operating outside of the EEZ for several years now in a safe manner.

6.0 CROSS-CUTTING MANDATES

6.1 Other Federal Laws

6.1.1 Coastal Zone Management Act (CZMA)

Section 307(c)(1) of the Coastal Zone Management Act (CZMA) as amended in 2006 requires all Federal actions that have reasonably foreseeable effects on any land or water use or natural resource of the coastal zone should be consistent with the enforceable policies of a coastal state's federally approved coastal management program to the maximum extent practicable. The preferred alternative would be implemented in a manner that is consistent to the maximum extent practicable with the enforceable policies of the approved coastal zone management programs of Washington, Oregon, and California. The recommended action is consistent and within the scope of the actions contemplated under the framework of the HMS FMP. The proposed action is not expected to affect any state's coastal management program.

6.1.2 Endangered Species Act (ESA)

NMFS is required under section 7(a)(2) of the ESA to ensure that any action it carries out is not likely to jeopardize the continued existence of any endangered or threatened marine species or adversely modify designated critical habitat. To fulfill this obligation, NMFS is conducting a section 7 consultation to determine if the DSLL fishery would jeopardize the continued existence of endangered or threatened species. Because NMFS would implement the proposed action and must protect protected marine species, it functions as both the action agency and the consulting agency during the section 7 consultation. However, different divisions within the agency fulfill these roles. Additionally, USFWS is responsible for potential impacts to listed seabirds, and it has been determined through informal consultation that the proposed action is not likely to adversely affect ESA-listed seabird species. Chapter four evaluates impacts to ESA-listed species.

6.1.3 High Seas Fishing Compliance Act (HSFCA)

The HSFCA requires the Secretary to license U.S. vessels fishing on the high seas. The "high seas" are defined as the waters beyond the territorial sea, exclusive economic zone or the equivalent of any nation, to the extent that these areas are recognized by the United States. The DSLL fishing vessel which is currently operating outside of the west coast EEZ is compliant with this act and has a HSFCA permit.

6.1.4 Marine Mammal Protection Act (MMPA)

The MMPA of 1972, as amended, is the principle Federal legislation that guides marine mammal species protection and conservation policy in the United States. Under the MMPA, NMFS is responsible for the management and conservation of 153 stocks of whales, dolphins, porpoise, seals, sea lions, and fur seals. USFWS is responsible for walrus, sea otters, and the West Indian manatee.

Off the West Coast the following marine mammal stocks are considered depleted under the MMPA: the Steller sea lion (*Eumetopias jubatus*) eastern stock, Guadalupe fur seal (*Arctocephalus townsendi*), southern sea otter (*Enhydra lutris*) California stock, sperm whale (*Physeter macrocephalus*) Washington, Oregon, and California stock, humpback whale (*Megaptera novaeangliae*) eastern North Pacific stock, blue whale (*Balaenoptera musculus*) eastern North Pacific stock, fin whale (*Balaenoptera physalus*) Washington, Oregon, and California stock, killer whale (*Orcinus orca*) eastern North Pacific southern resident DPS, sei whale (*Balaenoptera borealis*), and northern right whale (*Eubalaena glacialis*). Any species listed as endangered or threatened under the ESA is automatically considered depleted under the MMPA. Chapter 4 evaluates impacts of the alternatives on marine mammal species.

6.1.5 Migratory Bird Treaty Act (MBTA)

The MBTA of 1918 was designed to end the commercial trade of migratory birds and their feathers that, by the early years of the 20th century, had diminished the populations of many native bird species. The MBTA states that it is unlawful to take, kill, or possess migratory birds and their parts (including eggs, nests, and feathers) and implements a multilateral treaty between the United States, Canada, Japan, Mexico, and Russia to protect common migratory bird resources. The MBTA prohibits the directed take of seabirds, but the incidental take of seabirds does occur. The MBTA applies within three nautical miles of the U.S. coastline. Because the EFP would occur in Federal waters (seaward of three nautical miles), the fishery would not be subject to the MBTA. Chapter 4 of this EA evaluates the effect of the alternatives on seabirds.

6.2 Executive Orders (EO)

6.2.1 EO 12866 Regulatory Impact Review (RIR)

EO 12866, Regulatory Planning and Review, was signed on September 30, 1993 and modified by EO 13422 on January 18, 2007, and establishes guidelines for promulgating new regulations and reviewing existing regulations. The EO covers a variety of regulatory policy considerations and establishes procedural requirements for analysis of the benefits and costs of regulatory actions. Section 1 of the EO 12866 pertains to the regulatory philosophy and principles that guide agency development of regulations. It stresses that in deciding whether and how to regulate, agencies should assess all of the costs and benefits across all regulatory alternatives. Based on this analysis, NMFS should choose those approaches that maximize net benefits to society, unless a statute requires another regulatory approach. This action does not involve rulemaking, so the RIR requirement is not applicable.

6.2.2 EO 12898 (Environmental Justice)

EO 12898 obligates Federal agencies to identify and address “disproportionately high adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations in the United States” as part of any overall environmental impact analysis associated with an action. NOAA guidance, NAO 216-6, at §7.02, states that “consideration of EO 12898 should be specifically included in the NEPA documentation for decision-making purposes.” Agencies should also encourage public participation—especially by affected communities—during scoping, as part of a broader strategy to address environmental justice issues.

There would not be any significant adverse human health or environmental effects on any population in the United States, including minority and low-income groups. The proposed action would occur on the high seas (200 nm from the U.S. coast), and would not likely affect any population. There will be a notice in the Federal Register announcing when NMFS will be accepting public comments; substantive public comments will be considered in the review and revision of the draft EA. NMFS encourages public participation in these decisions, especially by communities that could experience disproportionately high and adverse impacts.

6.2.3 EO 13132 Federalism

EO 13132, which revoked EO 12612, an earlier federalism EO, enumerates eight fundamental federalism principles. The first of these principles states “Federalism is rooted in the belief that issues that are not national in scope or significance are most appropriately addressed by the level of government closest to the people." In this spirit, the EO directs agencies to consider the implications of policies that may limit the scope of or preempt states' legal authority. Preemptive action having such federalism implications is subject to a consultation process with the states; such actions should not create unfunded mandates for the states; and any final rule published must be accompanied by a federalism summary impact statement.

NMFS offers many opportunities for States (through their agencies, Council appointees, consultations, and Council meetings) to participate in the formulation of management measures.

6.2.4 EO 13175 Consultation and Coordination with Indian Tribal Governments

EO 13175 is intended to ensure regular and meaningful consultation and collaboration with tribal officials in the development of Federal policies that have tribal implications, to strengthen the United States government-to-government relationships with Indian tribes, and to reduce the imposition of unfunded mandates upon Indian tribes.

The Secretary recognizes the sovereign status and co-manager role of Indian tribes over shared Federal and tribal fishery resources. At section 302(b)(5), the Magnuson-Stevens Act reserves a seat on the Council for a representative of an Indian tribe with federally-recognized fishing rights from California, Oregon, Washington, or Idaho.

The U.S. government formally recognizes the four Washington coastal tribes (Makah, Quileute, Hoh, and Quinault) have treaty rights to marine fish. In general terms, the quantification of those rights is 50 percent of the harvestable surplus of groundfish available in the tribes' usual and accustomed fishing areas (described at 50 CFR 660.324). Each of the treaty tribes has the discretion to administer their fisheries and to establish their own policies to achieve program objectives. There is no tribal involvement with the proposed fishery.

6.2.5 EO 13186 Responsibilities of Federal Agencies to Protect Migratory Birds

EO 13186 supplements the MBTA (above) by requiring Federal agencies to work with USFWS to develop memoranda of agreement to conserve migratory birds. NMFS is in the process of implementing a memorandum of understanding. The protocols developed by this consultation will guide agency regulatory actions and policy decisions in order to address this conservation goal. The EO also directs agencies to evaluate the effects of their actions on migratory birds in environmental documents prepared pursuant to the NEPA. Impacts to seabirds were found to be insignificant (section 4).

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8.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE EA WERE SENT

This EA will be posted on the NMFS Southwest Regional Office website[25] and an email will be sent announcing its availability on the Pacific Council and NMFS Southwest Region HMS listserves. NMFS will also distribute copies of this final EA upon request.

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[25] http://swr.nmfs.noaa.gov/

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