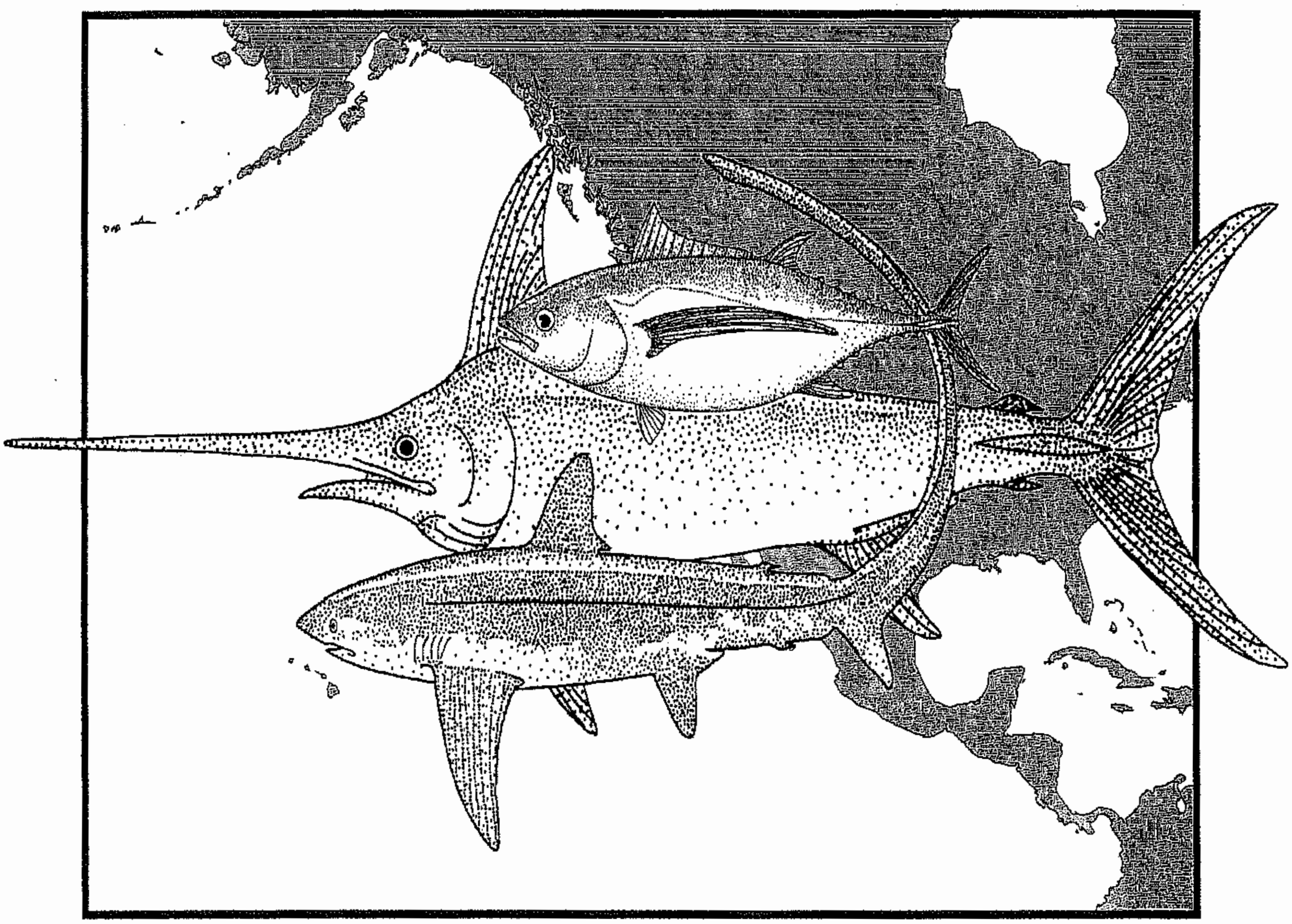
Fishery Management Plan
and
Environmental Impact Statement

for

U.S. West Coast Fisheries for Highly Migratory Species



Pacific Fishery Management Council

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Credits

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COVER SHEET

[X] Final Environmental Impact Statement, consolidated with Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species

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PROPOSED ACTION:

Approval and implementation of the Fishery Management Plan (FMP) for U.S. West Coast Fisheries for Highly Migratory Species (HMS).

ABSTRACT:

The proposed action is to implement the HMS FMP under the provisions of the Magnuson-Stevens Fishery Conservation and Management Act of 1976 as amended. The FMP would manage 5 species of tuna, 5 species of sharks, striped marlin, swordfish and dorado (dolphinfish). Commercial and recreational fisheries for HMS would be managed under the FMP. Commercial gears include surface hook and line, drift gillnet, harpoon, longline, and purse seine. The FMP defines and prevents overfishing, describes and protects essential fish habitat, and documents and minimizes bycatch of fish and interactions with protected species (marine mammals, birds, turtles). The FMP is a framework plan that contains some specific measures but also authorizes actions to be taken in the future following specific procedures without amending the FMP. In addition, the FMP includes a set of proposed initial fishery conservation and management measures. The impacts of the proposed actions and their alternatives are assessed. The principal proposed actions include: 1) permits for commercial and charter fisheries, 2) logbook requirements for commercial and charter fisheries, 3) prohibited species, 4) harvest guidelines for certain shark species, 5) prohibition on sale of striped marlin, 6) voluntary recreational catch-and-release program, 7) new observer programs for pelagic longline, surface hook and line, small purse seine, and recreational charter fisheries, 8) incidental catch limits for non-HMS gears, and 8) restrictions on the use of drift gillnets and pelagic longlines.

FINAL

Fishery Management Plan
and
Environmental Impact Statement

for

U.S. West Coast Fisheries for
Highly Migratory Species

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In Conjunction with the:
Department of Commerce
National Marine Fisheries Service
Southwest Region

August 2003

EXECUTIVE SUMMARY

This is a summary of the final fishery management plan (FMP) and environmental impact statement (EIS) for U.S. West Coast fisheries for highly migratory species (HMS). The FMP and the EIS are combined into one document which meets the requirements of various federal laws that apply to fishery management. Hereafter in this summary, the document will be referred to as the "FMP." This summary attempts to provide a concise, easy-to-read overview of the FMP. It describes the purpose and need for an FMP, and includes a brief description of the species and fisheries to be managed, the issues and problems that need to be resolved, and the alternative management actions considered, including the preferred alternative.

In addition to the FMP, draft regulations implementing the FMP and a Regulatory Impact Review/Regulatory Flexibility Analysis have been prepared and are appended to the FMP.

Fishery Management Process

This FMP was developed by the Pacific Fishery Management Council, one of 8 regional councils in the U.S. charged with developing fishery management plans for marine fisheries. The Pacific Council's management area includes the ocean waters off the States of Washington, Oregon and California, beyond 3 miles and out to 200 miles from shore. This is a portion of the area known as the "exclusive economic zone" (EEZ) of the U.S. Councils make recommendations to the National Marine Fisheries Service (NMFS) (in the Department of Commerce of the federal government), which approves and implements the councils' FMPs by adopting federal regulations to govern fishing activities. The Magnuson-Stevens Fishery Conservation and Management Act is the federal law which authorizes this process. Under this Act, highly migratory species of fish are managed by the councils in the Pacific Ocean area: the Western Pacific Regional Fishery Management Council (Hawaii and the U.S. Pacific Islands), the North Pacific Fishery Management Council (Alaska), and the Pacific Fishery Management Council.

This document is a "framework" FMP, which includes some fixed elements and a process for implementing or changing regulations without amending the FMP. Ongoing management of highly migratory species, and the need to address new issues that arise, make it impossible to foresee and address all regulatory issues in the initial FMP. Some framework adjustments can be implemented more quickly than FMP amendments, allowing for more timely management response. Changes to any of the fixed elements in the FMP require an FMP amendment. The framework procedures are described in Chapter 8 of the FMP.

The FMP also specifies and analyzes the proposed initial management measures that need to be implemented when the FMP is implemented. The initial measures will be implemented through a proposed and final rule-making. They may be modified in the future, or new regulations may be implemented, using the framework procedures in the FMP. The initial measures are intended to be the minimum necessary to manage these fisheries at the outset.

Need for the FMP

The Council process provides a means to involve all interested parties in the development of conservation and management measures needed to address problems in highly migratory species fisheries. A federal FMP provides a vehicle to resolve any inconsistencies in state regulations and address interstate management issues that may arise. An FMP also serves as a mechanism to cooperate with other councils to achieve consistent management of U.S. fisheries in the Pacific Ocean. Federal measures impacting these fisheries which arise from several different federal laws can be addressed in one forum, and related regulations can be reviewed together. An FMP assures that issues of national and international concern are addressed, and it provides a foundation for improving knowledge of the species and fisheries involved. Finally, this process may be useful in determining how recommendations of international bodies should be applied to domestic fisheries of the West Coast. (See FMP section 1.5)

Species to be Included

Highly migratory species of fish are those which move great distances in the ocean to feed or reproduce. Their distribution is determined by such factors as ocean temperature and availability of food. They tend to occur within the waters of several nations, and beyond those waters on the high seas. Sometimes these species also are labeled as "pelagic," living free from the bottom, or "oceanic," inhabiting the open sea. The Magnuson-Stevens Act defines highly migratory species as tuna species, marlins, oceanic sharks, sailfishes and swordfish. The United Nations Convention on the Law of the Sea defines highly migratory species more broadly to include such groups as pomfrets, sauries, dorado and cetaceans in addition to those defined in the Act. Other types of finfish are simply defined as "fish" in the Act, and may also be regulated under the FMP.

Since these species are distributed throughout large areas of the Pacific and are fished by many nations and gear types, unilateral fishery management by the United States will not be sufficient to ensure long term sustainability of harvests.

The FMP includes several alternatives for species to be included in the management unit. Public opinion on this matter covers a wide range. Some prefer to include a relatively short list of commercial target species in West Coast fisheries for highly migratory species, while others support a long list of all species harvested by these fisheries. The Council assumes that species placed in the management unit would be candidates for active management; that is, the fisheries for these species may need to be regulated under federal regulations implementing this FMP.

The following is the Council's preferred list of species to be included in the management unit initially (see the species illustrations following this summary):

Proposed Management Unit Species

Tunas	Sharks	Billfish/Swordfish	Other
north Pacific albacore	common thresher	striped marlin	dorado
yellowfin	pelagic thresher	swordfish	
bigeye	bigeye thresher		
skipjack	shortfin mako		
northern bluefin	blue		

In addition to the above species, other species of fish are included in the FMP for purposes of monitoring. These may be minor species which are caught and landed, or they may be discarded at sea (bycatch). The Council recommends that these species be monitored to the extent possible to track trends on a consistent and routine basis. (See FMP section 3.1).

The FMP also proposes to designate some species of fish as prohibited in HMS fisheries because of their special status. These

<u>Proposed Prohibited Species</u>
great white shark
megamouth shark
basking shark
Pacific halibut
Pacific salmon

species, if intercepted, must be released immediately, unless other provisions for their disposition are established. Proposed prohibited species include great white shark, megamouth shark, basking shark, Pacific halibut and Pacific salmon. Also, the Council proposes to prohibit the sale of striped marlin.

Fisheries to be Managed

The FMP proposes to include a number of commercial and recreational fisheries for highly migratory species of the West Coast. Commercial fisheries include surface hook and line, drift gillnet, harpoon, pelagic longline, and purse seine. Recreational fisheries include various private boat and charter boat fisheries targeting different species. For more information on the fisheries, see FMP Chapter 2.

> Metric Units
>
> Scientists usually express catch and abundance of commercial fish species in metric units of weight, such as metric tons (mt). 1 mt = 2,204.6 pounds (lbs). Recreational catches usually are stated in numbers of fish.

Commercial Fisheries

Surface Hook and Line

This commercial fishery harvests albacore tuna usually by trolling jigs, although some troll vessels stop and fish with live bait on occasion. Vessels from Washington, Oregon and California are involved, and the fishery is important to all three West Coast states. This fishery operates both inside and outside of the U.S. EEZ and provides nearly all of the U.S. albacore landings. Much of the catch of albacore is sold to tuna canners. Albacore tuna is the only tuna that is labeled as "white meat tuna." An increasing amount of albacore is being processed and marketed as frozen loins or steaks. A small amount of the catch is sold directly to the public from vessels home ported on the West Coast. Some West Coast vessels tranship at sea or deliver to Hawaii or American Samoa. Landings during the last 20 years have varied annually from about 1,600 mt to over 14,000 mt, and the number of vessels participating also has varied, peaking at more than 2,000 in the mid 1970's. In 1999, 775 troll vessels landed albacore. There is no limit on participation in this fishery. Currently there are no time or area closures for albacore fishing, and there are no gear restrictions. Under a treaty with Canada, albacore vessels from Canada may fish in U.S. waters and land in U.S. ports, and U.S. vessels may fish in Canadian waters, within certain limits (see FMP section 1.6.2).

LEADING HMS IN THE COMMERCIAL CATCH
Landings in West Coast ports in 1999, all gears
(From inside and beyond the U.S. zone)

Species	Landings (mt)
Albacore	9,746
Skipjack	3,759
Swordfish	2,018
Yellowfin	1,353

Source: Pacific Fishery Information Network

There also is a U.S. fleet of 8-10 vessels based in San Diego participating in a live bait fishery using pole-and-line gear, which harvests yellowfin, skipjack and bigeye tunas primarily in the eastern tropical Pacific.

Drift Gillnet

A gillnet is a panel of netting suspended vertically in the water by floats along the top and weights along the bottom, to entangle fish that swim into it. Drift gillnet gear is anchored to a vessel and drifts with the current. This commercial fishery harvests primarily swordfish and common thresher shark and occurs largely off California with a small segment off Oregon. The California fishery operates primarily outside state waters to about 150 miles offshore. This gear is not legal in Washington. The fishery also lands smaller quantities of pelagic and bigeye thresher sharks, shortfin mako shark and blue shark. The fishery occurs largely from August through December, and most of the catch enters the fresh fish market. Since 1994, swordfish landings have ranged between 600 and 900 mt per year, and thresher shark landings have varied between 200 and 400 mt. There were around 70 active vessels in 1999.

This fishery is regulated heavily. The State of California limits entry into this fishery and has adopted gear restrictions and time and area closures, including a minimum stretched mesh size of 14 inches The State of Oregon has adopted similar restrictions. To minimize interaction with marine mammals, the federal government imposes additional restrictions on the drift gillnet fishery. In addition, new measures to protect sea turtles were implemented in August 2001.

In California, there is a small-mesh drift gillet fishery which targets white seabass, barracuda and yellowtail. These vessels also land HMS incidentally including thresher, mako and blue sharks and albacore, bluefin, yellowfin and skipjack tunas. A few vessels have targeted thresher shark and tunas opportunistically, when available, but little is known about the directed harvest of highly migratory species in this fishery. In the late 1990's, vessels using small-mesh (3.5-8.5 inches) drift gillnets started targeting albacore and bluefin tuna off southern and central California. The industry estimates that there are about 8-10 vessels that occasionally use small-mesh gear when albacore and bluefin tuna are available. In 2001, 4 vessels that were documented as using small-mesh drift gillnets landed between 1.0 and 15.0 mt of albacore and 0.0 to 3.0 mt of bluefin tuna. Under California law, it is illegal to land swordfish with stretched mesh less than 14 inches. This is a limited entry fishery. California vessels that participate in the small-mesh fishery need a General Gill/Trammel Net permit and must fill out gillnet logbooks. In 2002, NMFS began deploying observers to collect information on this fishery.

Harpoon

This fishery targets swordfish using a hand-held harpoon. Some vessels work in conjunction with an airplane to spot swordfish basking at the surface. The modern harpoon fishery off California began in the early 1900's and was the primary gear for swordfish until the 1980's when the drift gillnet fishery started. Many harpoon vessels converted to drift gillnet gear or obtained permits to use both types of gear. Only a handful of vessels continues to participate in this fishery. Harpoon landings of swordfish were 80 mt in 1999. This fishery typically begins in May and ends in December, with fishing concentrated in the Southern California Bight. Harpoon is not defined as legal gear in Washington.

Pelagic Longline

Pelagic longline gear consists of a main line that is deployed horizontally, which is not stationary nor anchored, and to which short lines with baited hooks are attached. This gear is fished in the water column as opposed to bottom longline gear used for groundfish and other species. The gear is fished at various depths and at different times of day depending on the target species. Longliners based both on the West Coast and in Hawaii target swordfish and tunas on the high seas. California prohibits pelagic longline gear inside 200 miles, but longliners currently fish beyond 200 miles and land in California ports. In 1999, longliners landed about 1,300 mt of swordfish and about 200 mt of tunas in West Coast ports. Washington also prohibits this gear. Oregon allows the harvest of swordfish and blue shark outside 25 miles under a developmental fishery permit, however no landings have occurred under the permits.

Purse Seine

A purse seine is an encircling net that is closed by means of a purse line threaded through rings on the bottom of the net. Purse seine gear is legal in California and Oregon, but not in Washington. "Coastal" purse seiners are the smaller vessels (less than 400-short ton (st) carrying capacity) that fish relatively close to shore off California. These vessels primarily harvest coastal pelagic species (anchovy, sardine, mackerel), but also fish for northern bluefin and other tunas when these species enter West Coast waters during May through October. "Large" seiners are those that are greater than 400 st in carrying capacity.

Currently, the NMFS monitors 33 "large" seiners and 3 "coastal" seiners. During 2000, the Inter-American Tropical Tuna Commission (IATTC) reported that 5 U.S. "coastal" seiners made tuna landings.

Pursuant to the Tuna Conventions Act of 1950, NMFS promulgates regulations to implement recommendations of the IATTC. For 2000, the IATTC reports that the U.S. tuna fleet of 11 seiners and 8 baitboats harvested a preliminary estimate of 18,123 mt or 3.3% of the total catch, of which 13,450 mt or 2.5% of total landings were unloaded in the U.S.

Pursuant to the South Pacific Tuna Act of 1988, NMFS also promulgates regulations to implement the South Pacific Tuna Treaty. Currently, about 30 "large" U.S. seiners operate within treaty waters located within the western and south Pacific Ocean. Some of the "large" seiners have moved their operations to or from the eastern Pacific Ocean. No "coastal" seiners operate in the western or south Pacific Ocean.

Recreational Fisheries

The recreational fisheries for highly migratory species off the West Coast of the U.S. and northern Mexico consist of private vessels and charter vessels targeting essentially all of the species in the management unit. Charter vessels are also known as commercial passenger fishing vessels (CPFV) and are in the business of providing a platform for anglers to fish. The most common gear type is rod and reel, which may be used with artificial lures, live bait or dead bait. The tropical tunas, billfish and sharks become available off southern California as those species move seasonally northward from Mexico. Albacore move into the coastal waters of the West Coast from offshore and are taken off all three West Coast states. In 1999, the coast-wide catch of albacore was about 180,000 fish, the most abundant highly migratory species in the catch. Numerous angler trips are made from private and charter vessels in pursuit of highly migratory species.

LEADING HMS IN THE SPORT CATCH
Estimated West Coast Catches in 1999
Private and Charter
(From inside and beyond the U.S. zone)

Species	Catch (no.)	Catch (mt)
Albacore	180,000	1,746
Yellowfin	17,000	105
Thresher shark	1,500	18

In southern California, there are a number of distinct sport fishing "communities" which target tunas and dorado, billfish, and sharks. The estimated number of private boats in southern California fishing for these species ranges from 4,000 to 6,000. A considerable number of trips are made to Mexican waters.

Status of Fish Stocks

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) of the stock throughout its range and comparing the estimate of abundance with an adopted acceptable level of abundance. As required by the Magnuson-Stevens Act, the FMP establishes a level of abundance below which a stock is defined as being in an "overfished" condition. Another way to look at status is to estimate the level or rate of fishing on a stock and compare this level to an adopted acceptable level. The FMP also defines a fishing level above which "overfishing" is occurring. If overfishing occurs for a long enough period, the stock will become overfished. 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 Act.

Application of the rebuilding requirement in the context of international fisheries in the eastern Pacific is a special problem. U.S. fisheries for highly migratory species in the Pacific Ocean, and West Coast fisheries in particular, harvest a small fraction of the total catch taken by all nations involved. In most cases, effective conservation will require international action. The IATTC conducts most of the stock assessments that would be used to determine if any management unit species is overfished, but the IATTC does not use a specific control rule for determining if a stock is overfished and when remedial action should begin. Therefore, the criteria in the FMP will be used. However, only through international cooperation in the IATTC arena can measures be implemented that would result in rebuilding of any overfished stock in the eastern Pacific. While the United States must develop a rebuilding plan, the United States will need to work with the IATTC and its member countries to implement such a plan. Unilateral action to control fishing by U.S. vessels could be useful, however, to help protect vulnerable species in certain life stages or to prevent local depletion (see section 8.2).

> West Coast Harvest Compared to Total
>
> The catch of HMS by U.S. vessels based on the West Coast, as a percentage of the total catch for the stock, ranges from less than 1% for bigeye tuna to about 16% for albacore.

Notwithstanding the limited effects that unilateral action could have in terms of stock conservation and rebuilding, this FMP proposes status determination criteria to be used to assess whether any stock is overfished under the terms of the Magnuson-Stevens Act. These would be in place until an international organization establishes status determination criteria for the stock involved. Chapter 3 presents information and analysis to support the control rules proposed for assessing whether a stock is overfished, or being subjected to overfishing such that it is approaching an overfished condition, and whether a rebuilding plan needs to be developed for any overfished stock.

As required by the Magnuson-Stevens Act, HMS will be managed to achieve optimum yield (OY). The FMP proposes that OY equals maximum sustainable yield (MSY) for albacore, yellowfin, bigeye, and skipjack tunas; swordfish; and dorado. OY would equal 0.75 MSY for bluefin tuna, striped marlin, and the five shark species in the management unit, as explained in the species summaries below.

Stock assessment is the activity of determining the status of a stock. Many sources of information are used in assessments, and various methods and models are used to analyze this information and provide estimates of abundance. The major species in the management unit are assessed regularly by the IATTC or other organizations, such as the Interim Scientific Committee for Tuna and Tuna-like Species of the North Pacific (ISC). For most marine fish species, including highly migratory species, there is a substantial amount of uncertainty in the estimates of abundance. Knowledge is incomplete, requiring fishery scientists to make assumptions and interpretations. The stock status information in the FMP must be viewed with this in mind.

See FMP section 3.3 for more detail on status of stocks.

North Pacific Albacore Tuna

There are assumed to be two stocks of albacore in the Pacific, roughly divided at the equator. U.S. vessels fish on both stocks, but for purposes of this FMP, the discussion will be limited to the north Pacific stock. Stock status of albacore is reviewed at one to two-year intervals by the North Pacific Albacore Workshop (members: United States, Japan, Canada, Taiwan). Presently the albacore stock is healthy and not being overfished. Stock and catches are increasing. No quotas are contemplated, and no regional harvest guideline is recommended for the present 16% regional take of stock-wide production.

Eastern Pacific Yellowfin Tuna

The yellowfin tuna stock appears to be below but near that for producing MSY, with fishing mortality higher than recommended in this FMP, but it is being actively managed by the IATTC to obtain long-term MSY. Recruitment in the late 1990s was higher than average, supporting harvest levels in 2000-2002 above the estimated MSY without apparent harm to the stock. The IATTC has actively managed the fisheries to conserve yellowfin with quotas around 250,000 mt to 300,000 mt per year in its regulatory area. For 2002, the IATTC agreed to close all tuna purse seine fisheries in the eastern Pacific for the month of December with the intent of limiting fishing mortality on yellowfin and other tuna taken by purse seine gear. This action exempts longline, baitboat and sport fisheries. As a member nation, the U.S. must abide by this closure. In view of the small share (about 1%) of total eastern Pacific yellowfin catch made by West Coast fishers, the productivity of the stock, and the apparent effectiveness of IATTC management, no regional harvest guideline is recommended.

Bigeye Tuna

The bigeye tuna stock in the eastern Pacific appears to be near the level that produces MSY. MSY is estimated at 79,000 mt, which is in the range of recent catches. However, there is concern over increased fishing on juveniles since the advent of the expanded fishery targeting tuna by sets on floating objects. Fishing mortality appears to be above the MSY level, reflecting apparently high recruitment in the mid to late 1990s and resulting better fishing. The IATTC assesses the status of bigeye annually and has adopted both quotas (40,000 mt in 1999 for the purse seine fisheries) and restrictions on floating object sets to control the catch of juvenile bigeye. As a member nation, the U.S. abides by these restrictions. In view of the small share of total bigeye catch made by West Coast fishers (< 1%), the productivity of the stock, and the apparent effectiveness of IATTC management, no regional harvest guideline is recommended at this time.

Skipjack Tuna

The skipjack tuna stock in the eastern Pacific is assessed annually by the IATTC and appears to be very productive though somewhat more variable than the yellowfin and bigeye stocks in recruitment and availability to the fisheries. No upper limit to the catches is evident, and no MSY estimate has been derived for the stock. There is no indication that recent high harvests have in any way harmed the stock. In view of the small share (about 3%) of the total harvest made by West Coast fishers, the productivity of the stock and the apparent effectiveness of IATTC management, no regional harvest guideline is recommended at this time.

Northern Bluefin Tuna

The north Pacific bluefin tuna stock appears to be distributed in and spawn mainly in the western Pacific, though substantial fisheries occur in the eastern Pacific. Catches have decreased since the late 1950's but appear to be recovering. The IATTC reviews the status of the stock occasionally. Evidence of overfishing or persisting decline in the stock is lacking. West Coast fishers account for about 10% of the total catch from the stock, harvesting mainly juveniles that migrate irregularly to the eastern Pacific. OY is recommended to be set at 75% of MSY, because bluefin tuna are the least productive and have the most restricted spawning among the tunas. Its populations status also is problematic because there are no indexes reliably reflecting overall stock abundance. In view of the general distribution of the stock in the western Pacific, the limited impact that West Coast fisheries would have on the spawning stock, and the lack of international agreement on the need to control fishing mortality, no regional harvest guideline is recommended at this time.

Common Thresher Shark

For all sharks in the management unit, the FMP proposes that OY be set at 75% of MSY, because these species have low productivities and are vulnerable to overfishing.

The common thresher occurs throughout the tropical and temperate Pacific but is not managed internationally and there are no quotas. It is more abundant near coasts, and there appears to be a regional stock off southern California and Baja California, judging by how that population declined after fishing began off California in the early 1980s (plus fishing off Mexico) and results of tagging experiments. With the time and area restrictions in place since 1990, the population now appears to be in recovery, which should continue as long as present catch levels do not increase. A new regional harvest guideline of 340 mt is recommended.

Pelagic Thresher and Bigeye Thresher Sharks

Pelagic and bigeye thresher shark populations occur throughout the tropical and temperate Pacific but are not managed internationally, and there are no quotas. They are thought to be more vulnerable to overfishing than the common thresher shark. Little is known of their abundance and stock structure. Considering their minor importance in West Coast catches, no harvest guidelines are recommended at this time.

Shortfin Mako Shark

The shortfin mako occurs throughout the tropical and temperate Pacific but is not managed internationally, and there are no quotas. It 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. West Coast fisheries take mainly juveniles, of unknown proportion to the overall stock. Clear effects of exploitation have not been shown, and the local stock tentatively is assumed to be not overfished. Recognizing the importance of protecting critical life stages of sharks, a harvest guideline of 150 mt is recommended, pending better information, especially from the fisheries off Mexico.

Blue Shark

Blue shark, the most oceanic of the sharks in the management unit, occurs throughout the Pacific from tropical to temperate seas. It is not actively managed internationally and there are no quotas. Recent studies indicate the species, which may comprise a single Pacific-wide stock, is abundant and healthy, in spite of being incidentally fished by high-seas longline fleets for over 50 years. MSY for the north Pacific stock tentatively is estimated to be about 120,000 mt. No harvest guideline is recommended at this time.

Swordfish

Swordfish are widely distributed in the Pacific and may comprise one or more stocks. In the eastern Pacific, stock status is reviewed regularly by the IATTC. No quotas have been set, and no MSY has been estimated. Recent U.S. and IATTC assessments indicate the eastern Pacific stock is healthy with respect to fishing mortality and biomass levels, noting also the assessment uncertainties and the need for careful monitoring in the international fisheries. In view of the stock's apparent health in the eastern Pacific and the relatively small catch fraction taken by West Coast fishers (12%), no regional harvest guideline is recommended at this time.

Striped Marlin

The status of striped marlin is reviewed by the IATTC as well as the ISC. There are several hypotheses for the stock structure, and the stock assessment results vary significantly depending on the structure assumption adopted. If there is a single stock, then the eastern Pacific stock appears healthy and not overfished (the position taken in this FMP). If there are separate north and south Pacific stocks, the north Pacific stock may be below the level for MSY. OY is recommended to be set at 75% of MSY, because of catch and stock structure uncertainties. There are no international quotas or management measures to control fishing mortality on this species. Since commercial harvest of this species is presently prohibited (which would be maintained by this FMP) and a voluntary "catch-and-release" program for the recreational fishery is recommended for this species, and in the absence of agreement on stock assessment and stock structure or on any international agreement to control fishing, no regional harvest guideline is recommended. However, additional research into stock structure and associated assessments is strongly recommended.

Dorado

The dorado (dolphinfish) is a fast-growing, widespread species of tropical seas that occurs seasonally in the Southern California Bight. Regional populations are not regularly reviewed by international organizations, and presently there is no management and no quotas. The population is presumed to be healthy. Considering that West Coast fishers are accessing only the northern fringe of an extensive regional population, a population that should be able to rebound quickly from exploitation even if significantly reduced, and that its West Coast fishing is primarily recreational, no harvest guideline is recommended at this time.

Primary Issues

Jurisdictional Issues

Management of highly migratory species fisheries is complicated by the wide-ranging behavior of the stocks and the many jurisdictions which are involved. (See the map following this summary.) The fish are distributed throughout the Pacific Ocean, and they are harvested by vessels from the U.S. and many other nations. Fisheries based in West Coast ports harvest highly migratory species in U.S. waters off the West Coast, on the high seas, and inside the waters of other nations. Effective management of the stocks throughout their ranges requires international cooperation. Effective management of U.S. fisheries requires cooperation among the states and fishery management councils and regulation of U.S. fisheries both inside the exclusive economic zone and outside the zone on the high seas.

MANAGEMENT ENTITIES AND AGREEMENTS

- States: Washington, Oregon, California, Hawaii, Alaska, and U.S. Island Territories
- Councils: Pacific, Western Pacific, North Pacific
- Foreign nations: many
- International Organizations and Obligations:
  - Inter-American Tropical Tuna Commission
  - Central/Western Pacific Convention (not in force)
  - South Pacific Tuna Treaty
  - U.S./Canada Albacore Treaty

This FMP covers West Coast-based fisheries for highly migratory species. Highly migratory species fisheries that are based in Hawaii and the island territories are managed by the Western Pacific Regional Fishery Management Council pursuant to its fishery management plan for pelagic fisheries. The North Pacific Council currently does not have an FMP for highly migratory species. Coordination among councils is necessary to assure consistent management of fisheries from all council areas that harvest stocks in common.

WHERE DO THE REGULATIONS APPLY?

Federal regulations resulting from this FMP are intended to apply to all vessels fishing for these species in the U.S. exclusive economic zone off the West Coast, regardless of the vessel's origin or port of landing. The regulations also will apply to U.S. vessels harvesting these species that fish beyond the U.S. zone and land in West Coast ports.

The Tuna Conventions Act of 1950 provides limited federal authority to regulate activities of U.S. fishing vessels in the eastern Pacific. Under this authority, NMFS promulgates regulations to implement recommendations of the IATTC that have been approved by the U.S. Department of State (DOS). The IATTC is an international body that makes recommendations for conservation measures (such as quotas, gear restrictions, closed areas, and bycatch avoidance measures) for tuna fisheries in the eastern Pacific Ocean. This FMP provides a mechanism that could be used to implement or supplement recommendations of the IATTC or other international fishery management bodies, particularly for U.S.

fisheries based on the West Coast. For example, if a U.S. quota or allocation for a species were adopted by an international body, the Council could use the FMP to decide how to distribute that quota or allocation among competing U.S. vessels. Exactly how or whether this FMP will be used to implement recommendations of international bodies depends on the legislation authorizing actions and agreement among the Council, DOS, and NMFS.

U.S. Unilateral Action

For most management unit species in this FMP, U.S. harvest by West Coast-based vessels represents a small fraction of total fishing mortality out of the overall range of the species, and any unilateral action, such as a reduction in the U.S. West Coast harvest or effort, would not likely have a significant biological effect on the stock. However, U.S. law requires unilateral action when overfishing is determined. Furthermore, unilateral management of U.S. vessels may also be appropriate under some circumstances apart from overfishing. This is particularly true for vulnerable stocks, defined, in part, as stocks that will require more than ten years to recover from depletion (see Chapter 3, section 3.2.3). Circumstances where unilateral management may be appropriate, not necessarily because of stock overfishing, include, but are not limited to, the following situations:

- Where a stock is regionally distributed, and a significant portion of the regional distribution is subject to harvest by U.S. West Coast fisheries;
- Where U.S. laws mandate that a species be protected in both United States' and international waters; or
- Where unilateral action is needed to address domestic issues such as local depletion, protection for essential fish habitat in United States' waters, bycatch reduction, catch allocations, or conflicts among user groups.

Bycatch

Bycatch of fish occurs in nearly all fisheries, although the magnitude of bycatch is not known in many cases. Bycatch is a major concern in the drift gillnet, pelagic longline and large-vessel purse seine fisheries for highly migratory species. Chapter 5 describes the extent of bycatch, recommends standardized bycatch reporting methodology, and reviews measures to minimize bycatch and bycatch mortality in commercial and recreational fisheries. At-sea observer programs are proposed for most HMS fisheries to document bycatch and protected species takes. In the recreational fishery, a voluntary catch and release program is proposed in which released fish would not be considered bycatch. Also, the FMP contains specific proposed actions designed to minimize bycatch in pelagic longline and drift gillnet fisheries (see section 8.5).

BYCATCH AND U.S. LAW

The Magnuson-Stevens Act defines "bycatch" as fish which are harvested in a fishery but are not sold or kept for personal use. Fish are discarded because they are undesirable or because regulations require that they be discarded. FMPs must establish methods to estimate bycatch, and they must include measures to minimize bycatch as well as minimize mortality of bycatch which cannot be avoided.

Protected Species

Marine mammals, seabirds and sea turtles are intercepted by some fisheries for highly migratory species. Various U.S. laws protect these animals, and regulations have been implemented to minimize interceptions. These laws include the Marine Mammal Protection Act, Endangered Species Act and Migratory Bird Treaty Act. A benefit of the FMP is that these regulations can be incorporated into the Council fishery management process so that all federal regulations impacting this fishery are addressed in one process. In fisheries where protected species takes are already being addressed, as by the Pacific Offshore Cetacean Take Reduction Team for the drift gillnet fishery, any recommendations and supporting analyses would be provided by NMFS to the Council for consideration. The Council would make recommendations as it deems appropriate to NMFS, which will make final decisions on whether to proceed with rule-making under the Marine Mammal Protection Act or Magnuson-Stevens Act, as appropriate. Chapter 6 describes current interactions of highly migratory species fisheries with protected species. The FMP authorizes the Council to adopt measures to reduce interactions with protected species, and it also contains specific proposed measures for drift gillnet and longline fisheries, most of which have already been implemented pursuant to other applicable laws described above (see section 8.5).

Essential Fish Habitat

The FMP identifies and describes essential fish habitat (EFH) for highly migratory species as required by the Magnuson-Stevens Act. The proposed descriptions are found in section 4.6 and Appendix A. The Act also requires that adverse effects of fishing and non-fishing activities be minimized to the extent practicable. At this time, the FMP concludes that there is no evidence that HMS fishing practices or gear are causing identifiable adverse effects on HMS EFH, or that other fishing practices are causing such effects. Therefore, no further action is recommended at this time. With regard to non-fishing activities, federal action agencies must consult with NMFS regarding any of their actions authorized, funded or undertaken or proposed to be authorized, funded or undertaken, that may adversely affect EFH. Research is needed to identify specific habitat areas of particular concern, such as shark pupping grounds, key migratory routes, feeding areas, and areas of concentration of large adult females. The FMP authorizes changes to the identification and description of habitat, and the identification of habitat areas of particular concern, as new information is collected. The FMP also authorizes the adoption of management measures to minimize adverse effects on habitat from fishing, if there is evidence that a fishing activity is having an identifiable adverse effect.

Shark Conservation

Sharks tend to be vulnerable to overfishing because of their biology and life history, and there is concern that local depletion of shark stocks can occur. Precautionary measures to conserve sharks have been taken by the West Coast states. A new federal law (the Shark Finning Prohibition Act) prohibits the practice of "finning" sharks, which is removing and landing the fins without the carcass. The final rule implementing this Act was effective in March 2002 (50 CFR Part 600 Subpart M). The FMP does not address finning. The FMP would establish regional harvest guidelines for common thresher and shortfin mako sharks of 340 mt and 150 mt, respectively. As data become available on the status of other locally-distributed or regional stocks, additional harvest guidelines may be considered in the future. A harvest guideline is a catch level that, if reached, calls for a review rather than a closure of the fishery.

Relationship of FMP to State Regulations

State regulations for HMS in Washington, Oregon, and California vary from state to state. For example, Washington and California prohibit the use of pelagic longlines, but Oregon allows longlining with a special permit. California allows drift-netting, but Washington does not, and Oregon allows drift-netting for swordfish but not for thresher shark. The FMP contains federal measures for HMS fisheries which would provide a region-wide management regime applicable to all vessels landing in West Coast ports.

State regulations not superseded by the initial federal regulations will continue to remain in effect until such time as the Council determines they should be supplanted by federal regulations. The Council has reviewed these state regulations and determined that they are consistent with the FMP. Some of the state regulations are inconsistent from state to state, but these inconsistencies do not pose management problems that require immediate federal action.

Data Collection and Monitoring

Fishery data collection and reporting requirements are inconsistent and inadequate, at the state and federal levels, for commercial and recreational fisheries for highly migratory species. The FMP describes research and data needed for effective management, and includes a requirement for federal logbooks for all commercial and charter fisheries. The FMP also proposes to require federal permits for all commercial and charter fisheries for highly migratory species, which would help to improve data collection and management of these fisheries.

The FMP proposes a standardized reporting methodology to assess the amount and type of bycatch occurring in HMS fisheries, which includes a proposed requirement for at-sea observer programs for some fisheries. In addition to maintaining the current observer program in the drift gillnet fishery, new programs would be required for the longline, small purse seine, surface hook-and-line, and charter fisheries. Also, an automated vessel monitoring system would be required for the longline fishery.

Limited Access

Some individuals from the surface hook-and-line fishery expressed concern to the Council that a limited entry program may be necessary to control excess capacity. In response to this concern, the Council adopted a control date of March 9, 2000 in the event that a limited entry program may be needed in the near future. This date was announced in the *Federal Register* as an advance notice to the public that a limited entry program may be adopted, and that any new entrants in the fishery after the control date may not qualify for a permit. The announcement applies to all commercial and charter fisheries for highly migratory species. Control dates are established to minimize the rush of new entrants in a fishery that often occurs when limited entry is being considered. The FMP does not include a program at this time, but an amendment to the FMP could be developed sometime in the near future to establish a program.

Issues in Specific Fisheries

In addition to the general issues described in the previous section, there are specific issues associated with some of the separate fisheries for highly migratory species based on the West Coast.

Surface Hook and Line

Under provisions of the U.S./Canada Albacore Treaty, albacore vessels from each country are authorized to fish in waters of the other country. Recently, U.S. fishers have become concerned about the sharply increased levels of Canadian fishing effort in U.S. waters since 1998 and the lack of a mechanism to control the extent of fishing in each other's EEZ. In addition, there has not been a systematic program for monitoring the parties' respective catch and effort. Meetings of the two nations were held to discuss these and other issues, and agreement was reached in April 2002. The agreement specifies a three-year regime for reducing effort by U.S. and Canadian troll albacore fishing vessels' activities in each other's waters.

Some U.S. albacore vessels based on the West Coast fish inside the EEZ as well as on the high seas, while other, usually smaller vessels stay in U.S. waters. There is a need to make sure that all vessels fish under the same regulations and reporting requirements, regardless of where they operate. Measures in this FMP will apply to West Coast albacore troll vessels on the high seas if they land in West Coast ports.

During development of the FMP, fishery representatives urged that the State of California's "far offshore fishery declaration" be eliminated. This declaration requirement calls for fishers who operate on the high seas to file a declaration to that effect and to return to port before beginning a trip with fishing in the EEZ or in state waters. This creates a hardship particularly for the surface hook-and-line fleet fishing for albacore. In September 2002, a bill was signed by the governor of California that exempts albacore troll vessels from declaration requirements. The law became effective January 2003.

Drift Gillnet

There is a limited entry program in place in California for this fishery. The Council could "defer" to the State of California on this matter, which would leave the current State program in place, or it could adopt a federal version of the State program. The Council is proposing to defer to the State in order to focus on the regulations that are most needed initially when the FMP is implemented.

Bycatch of fish and interception of protected species are issues in this fishery. There is a substantial amount of information on bycatch in the West Coast drift gillnet fishery collected by at-sea observers required as part of a program to reduce take of marine mammals. Federal regulations currently are in effect to minimize marine mammal interactions, and new regulations to protect sea turtles were put in place in August 2001. These regulations are necessary to fulfill requirements of other federal laws, namely the Marine Mammal Protection Act and the Endangered Species Act. The FMP proposes measures for the drift gillnet fisheries to reduce bycatch and interactions with protected species.

There also is a small, relatively new fishery off California using small-mesh drift gillnet gear to target tunas. This fishery has not been monitored like the large-mesh fishery for swordfish and shark, and there is concern about impact on targeted species as well as the extent of bycatch and protected species interactions. The FMP proposes to require a minimum mesh size of 14 inches for drift gillnet gear. This would prohibit the practice of targeting on highly migratory species with mesh size less than 14 inches, which is the current mesh size limitation for the swordfish/shark drift gillnet fishery.

Longline

One of the most controversial issues associated with this FMP is the potential use of pelagic longlines inside 200 miles off California. The State of California currently prohibits this gear inside 200 miles, but longliners may fish outside 200 miles and land in California ports. Some drift gillnetters have proposed a limited longline fishery in the zone to target tunas and swordfish, with effort and area restrictions. The intent is to evaluate longline gear as an alternative gear type to reduce bycatch, or bycatch mortality in the drift gillnet fishery. Recreational fishing interests are opposed to such a fishery, and the environmental community has major concerns. Unfortunately, there is little information for estimating impacts of a longline fishery in the EEZ. The preferred alternative in the FMP is to prohibit pelagic longlining in the West Coast EEZ.

With respect to longlining on the high seas, the major concern is consistency with regulations affecting longliners based in Hawaii. Large areas of the north Pacific have been closed to longline fishing by vessels targeting swordfish with a Western Pacific longline permit in order to protect turtles. In addition, restrictions have been implemented to minimize interactions with albatrosses. Vessels without a Western Pacific permit, including those based on the West Coast or landing in West Coast ports, are not constrained by these regulations. The FMP proposes that West Coast-based longline vessels fishing on the high seas be subject to the conservation and management measures applied to western Pacific longline vessels to control sea turtle and seabird interactions, except that east of 150° W longitude swordfish targeting would be allowed.

Recreational Fisheries

There are major gaps in data on catch, effort and economics of West Coast recreational fisheries for highly migratory species, and the FMP includes recommendations for research and data collection that would fill these gaps. Current reporting requirements, license provisions and bag limits in the three West Coast states are different. The need for bag limits to reduce waste, the level of such limits, and whether federal bag limits are required, are issues. The Council proposes to defer to the states on most measures, because the states are in the best position to address local recreational issues. The FMP includes a proposal to implement a voluntary catch-and-release program. The program is designed to promote the handling and release of fish in a manner that minimizes the risk of incidental mortality, encourages the live release of small fish, and discourages waste. Released fish would not be considered bycatch under this proposal.

Management Goals and Objectives

These management goals and objectives apply to all sectors and are not listed in order of priority:

1. Promote and actively contribute to international efforts for the long-term conservation and sustainable use of highly migratory species fisheries that are utilized by West Coast-based fishers, while recognizing these fishery resources contribute to the food supply, economy, and health of the nation.

2. Provide a long-term, stable supply of high-quality, locally caught fish to the public.

3. Whenever practicable, minimize economic waste and adverse impacts on fishing communities when adopting conservation and management measures.

4. Provide viable and diverse commercial fisheries and recreational fishing opportunity for highly migratory species based in ports in the area of the Pacific Council's jurisdiction, and give due consideration for traditional participants in the fisheries.

5. Implement harvest strategies which achieve optimum yield for long-term sustainable harvest levels.

6. Provide foundation to support the U.S. State Department in cooperative international management of highly migratory species fisheries.

7. Promote inter-regional collaboration in management of fisheries for species which occur in the Pacific Council's managed area and other councils' areas.

8. Minimize conflicts among federal and state regulations for highly migratory species fisheries.

9. Minimize bycatch and avoid discard and implement measures to adequately account for total bycatch and discard mortalities.

10. Prevent overfishing and rebuild overfished stocks, working with international organizations as necessary.

11. Acquire biological information and develop a long-term research program.

12. Promote effective monitoring and enforcement.

13. Minimize gear conflicts.

14. Maintain, restore, or enhance the current quantity and productive capacity of habitats to increase fishery productivity for the benefit of the resource and commercial and recreational fisheries for highly migratory species.

15. Establish procedures to facilitate rapid implementation of future management actions, as necessary.

16. Promote outreach and education efforts to inform the general public about how West Coast highly migratory species fisheries are managed and the importance of these fisheries to fishers, local fishing communities, and consumers.

17. Ensure that regulations are consistent with applicable laws and regulations to conserve and restore protected species.

18. Allocate harvest fairly and equitably among commercial, recreational and charter fisheries for HMS, if allocation becomes necessary.

Framework Management

This framework FMP includes some fixed elements, and it provides for the implementation and adjustment of flexible management measures, within the scope and criteria established by the FMP and implementing regulations, without the need for amending the FMP (see Chapter 8, section 8.3.4). Framework regulatory changes may be implemented more quickly than FMP amendments, allowing for more timely management response. FMP amendments are required when changing fixed elements of the FMP or for major or controversial actions which are outside the scope of the original FMP. Fixed elements include:

- Management objectives;
- Species in the management unit;
- Control rules;
- Framework procedures for changing management measures; and
- Management cycle.

New measures or changes to measures may be implemented for one or more fisheries for highly migratory species in the Pacific Council area through the framework procedures, if new information demonstrates that there are biological, social, or economic concerns in a fishery that need to be resolved through such regulatory action. Analyses of biological, ecological, social, and economic impacts will be considered when a particular change is proposed. As a result, time required to take action will vary depending on the type of action, its impacts on the fisheries, resources, and environment, as well as review of these impacts by interested parties. Actions must also satisfy legal requirements of other applicable laws, e.g., the Administrative Procedure Act, National Environmental Policy Act, Regulatory Flexibility Act, and Executive Order 12866.

The Council proposes to establish a biennial management cycle, i.e. management actions would be formally considered every other year. However, it is anticipated that action could be taken whenever a resource conservation issue is identified. Under the preferred biennial cycle, the Highly Migratory Species Management Team would conduct ongoing reviews of the fisheries and status of stocks and prepare an annual Stock Assessment and Fishery Evaluation document, which would be presented to the Council at its September meeting. Proposed and final actions would occur every other year at the September and November meetings, respectively. The regulatory/statistical year would be April 1 to March 31.

In addition to various provisions of the FMP outlined above, the Council is proposing a set of initial management measures which should be implemented when the FMP is implemented. These measures are not fixed elements of the FMP, and may be changed using the framework adjustment procedures of the FMP described above. If adopted and implemented as federal regulations, these measures would remain in effect until changed. State regulations not superceded by the initial federal regulations will continue to remain in effect until such time as the Council determines that it is necessary to adopt federal regulations. The alternatives for these measures are described in the next section.

Alternatives Including the Proposed Action

The alternatives considered and analyzed in the FMP are summarized in the following matrix. For a complete description of the alternatives, refer to Chapter 8. In each case, alternative 1 is the no-action alternative, and alternative 2 is the Council's preferred alternative.

The effects of the alternatives are described in Chapter 9.

SUMMARY OF ALTERNATIVES IN THE HMS FMP

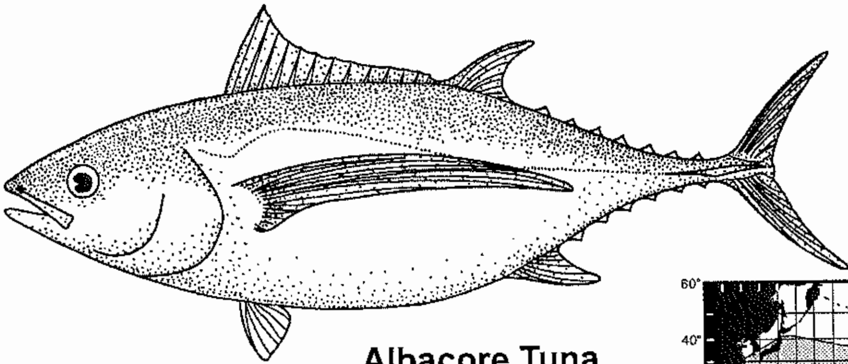
	Alternative 1 No Action	Alternative 2 Preferred	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
FMP or no FMP (Ch 8, Sec 8.0, 8.5.7; Ch 9, Sec 9.1)	FMP not adopted. Regulation continues under existing state and federal authorities.	FMP adopted, with proposed components as specified in preferred alternatives below.					
Species in management unit (Ch 3, Sec 3.1.1)	Managed species are not defined.	Albacore, yellowfin, skipjack, bigeye, and north Pacific bluefin tunas; swordfish; striped marlin; common thresher, bigeye thresher, pelagic thresher, shortfin mako, and blue sharks; and dorado (dolphinfish)	Same as alternative 2, but dorado not included.	Same as alternative 2, but dorado, bigeye thresher and pelagic thresher sharks not included.	Same as alternative 2, but sixgill shark included.	Same as alternative 2, but all sharks deleted.	
Control rule (Ch 3, Sec 3.2)	A control rule is not established.	Adopt default MSY (or MSY proxy) control rule, but use an OY target for vulnerable species set initially at 0.75MSY.					
Framework procedures (Ch 8, Sec 8.3.4)	No framework procedures; all changes would be made via FMP amendment process.	Adopt framework procedures for changing conservation and management measures, with the point-of-concern mechanism.	Adopt framework procedures as in 2, but without the point-of- concern mechanism.				
Management cycle (Ch 8, Sec 8.3.5)	No cycle established. Annual SAFE document presented to Council, but no fixed schedule for addressing management issues.	Establish biennial cycle with regulatory/ statistical year of April 1 thru March 31.	Establish biennial cycle with regulatory/ statistical year of January 1 thru December 31.	Establish biennial cycle with regulatory/ statistical year of October 1 thru September 30.	Establish annual cycle with regulatory and statistical fishing year April 1 through March 31.	Establish multi-year cycle. Similar to biennial cycle, except actions would be considered every 3 or more years.	
Legal gear (Ch 8, Sec 8.4.1)	Legal gears are not specified.	Legal commercial gears are harpoon, surface hook and line, drift gillnet, purse seine, and pelagic longline. Drift gillnets must be minimum stretched mesh size of 14 inches. Legal recreational gears are rod and reel, spear, and hook and line.	As in alternative 2, except pelagic longline gear would not be legal gear for vessels landing in U.S. West Coast ports.				

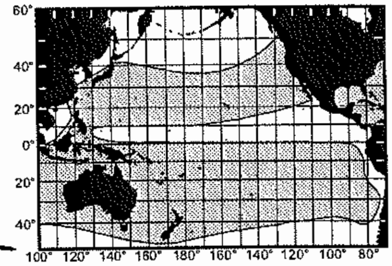
	Alternative 1 No Action	Alternative 2 Preferred	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
Incidental catch allowance (Ch 8, Sec 8.4.2)	Landings of HMS could be made using any gear authorized by individual states' regulatory requirements.	Small-mesh drift gillnet and setnet: 10 fish of each HMS per landing, except no swordfish. Bottom longline: 3 HMS sharks in total per landing or 20% of total landings by weight of HMS sharks, whichever is greater by weight. Trawl, pot and all other gear: maximum of 1% of total weight per landing for all HMS shark species combined or 2 HMS sharks, whichever is greater.	Do not allow landings of HMS by other gears. All landings of HMS taken with non-HMS gears would be prohibited.				
Essential fish habitat (Ch 4, Sec 4.3; Ch 8 Sec 8.4.3)	EFH of HMS would not be designated and described in FMP.	Adopt species and stage-specific designations for individual management unit species as described in section 4.6.	Adopt broad designation to apply to all species: all surface waters of the ocean in the EEZ down to 1000m.	Adopt designations for individual species in the surface waters of the ocean in the EEZ down to 1000m, but restrict EFH areas to documented capture locations.			
Bycatch and catch-and-release programs (Ch 5; Ch 8, Sec 8.4.4)	No bycatch and/or catch-and-release programs would be implemented under the FMP.	Provides for fishery-by-fishery review of measures to reduce bycatch and bycatch mortality; establishes framework for implementing bycatch reduction; adopts measures to minimize bycatch in pelagic longline and drift gillnet fisheries (section 8.5); and adopts formal voluntary "catch-and-release" program for HMS recreational fisheries.	As in alternative 2 but does not authorize a catch-and-release program for recreational fisheries. All HMS caught and released by anglers would be considered bycatch.	As in alternative 2 but establish a catch-and-release program for striped marlin only.			
Fishery observer authority (Ch 8, Sec 8.4.5)	The FMP would not contain authority to establish observer programs for HMS fisheries.	Authorize NMFS to require that vessels carry observers when directed by the NMFS Regional Administrator, and mandates observer programs initially for the longline, surface hook-and-line, small purse seine, and CPFV fisheries, with NMFS to complete initial observer sampling plans within six months of FMP implementation.	Authorize NMFS to require that vessels carry observers when directed to do so by the NMFS Regional Administrator, but do not mandate any new observer programs.				

	Alternative 1 No Action	Alternative 2 Preferred	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
Protected species (Ch 8, Sec 8.4.6)	Adopt no measures to minimize interactions with protected species under the FMP. Such measures would continue to be implemented by NMFS under other processes.	Adopt framework authorization for protected species conservation measures and implement initial measures for drift gillnet and pelagic longline fisheries (sec 8.5).					
Prohibited species (Ch 8, Sec 8.4.7)	Prohibitions on retention of certain species would not be incorporated into the FMP	Prohibit retention of great white, basking and megamouth sharks; Pacific halibut; and Pacific salmon.					
Quotas or harvest guidelines (Ch 8, Sec 8.4.8)	Establish no harvest guidelines or quotas for any HMS.	Establish harvest guidelines for selected shark species and authorize establishment or modification of quotas or harvest guidelines under framework provisions. The initial harvest guidelines are: common thresher shark, 340 mt and shortfin mako shark, 150 mt.	Establish quotas or harvest guidelines for additional species.				
Allocation (Ch 8, Sec 8.4.9)	The FMP would not establish quota allocations of HMS to different fisheries or fishery sectors.	The FMP would not establish allocations initially, except to prohibit sale of striped marlin, but authorizes allocation using framework procedures.	The FMP would make specific initial allocations among fisheries or fishing sectors.				
Treaty Indian fishing rights (Ch 8, Sec 8.4.10)	Establish no specific measures or procedures, either in the FMP or in the initial implementing regulations, for accommodating treaty Indian fishing rights.	Authorize adoption of measures and procedures to accommodate treaty fishing rights in the initial implementing regulations for the FMP; and authorize future revisions through regulatory changes.	Include specific provisions in the FMP describing the measures and procedures for accommodating treaty fishing rights.				
Exempted fishing permits (Ch 8, Sec 8.4.12)	The FMP would not specify any general or specific EFP process for any HMS fishery. NMFS regulations at 50 CFR §600.745 would be available to issue EFPs.	The FMP would require that applicants submit an initial EFP plan, following a specific Council-supplied EFP protocol, for Council review and action prior to formal application to NMFS.					

	Alternative 1 No Action	Alternative 2 Preferred	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
Drift gillnet (Ch 8, Sec 8.5.1)	Regulatory authority would continue under existing state and federal authorities.	Endorses or adopts in FMP all federal conservation and management measures in place under MMPA and ESA; adopts all state regulations for swordfish/shark drift gillnet fishing under Magnuson-Stevens authority except limited entry programs; modifies an OR closure inside 1000 fm to be in effect year round; closes EEZ waters off WA to all DGN fishers; and includes two current turtle protection closures.	Endorses or adopts only existing federal (MMPA, ESA) drift gillnet regulations.	Endorses or adopts all federal conservation and management measures in place under MMPA and ESA, and adopts state regulations under MSFCMA authority, but also includes and federalizes the states' limited entry programs.	As in Alternative 8, but substitutes the time/area closures of the Biological Opinion on issuance of the 101(a)(5)(E) permit under the MMPA for the current turtle conservation closed areas now in place (see section 8.5.1).	As in Alternative 8, but additionally drift gillnets could not be used to take swordfish and sharks in any exclusive economic zone (EEZ) waters less than 1000 fm off Oregon <u>and</u> Washington.	As in Alternative 8, but also drift gillnets could not be used to take swordfish and sharks in any EEZ waters north of 45° N latitude year round. **<u>Alternative 8</u>**: Like Alternative 2, but does not modify any existing Oregon area closures.
Longlining inside the U.S. West Coast EEZ (Ch 8, Sec 8.5.2)	Regulatory authority would continue under existing state and federal authorities.	Establishes a general prohibition on the use of pelagic longline gear in the EEZ.	Prohibits longlining by indefinite moratorium, with the potential for re-evaluation by the Council following completion of a bycatch reduction research program with pre-established strict protocols. Must prove negligible impact on protected and bycatch species.	Authorizes limited entry pelagic longline fishery for tunas and swordfish with effort and area restrictions, to evaluate longline gear as an alternative to drift gillnet gear to reduce bycatch or bycatch mortality and protected species interactions.	Prohibits longlining with the potential for re-evaluation by the Council following completion of a tuna-swordfish-bycatch research experiment carried out under a qualified EFP to determine if longline gear can be fished in ways that produce bycatch and protected species interaction levels that are significantly less than by drift gillnets.		
Longlining outside the EEZ (Ch 8, Sec 8.5.2)	Regulatory authority would continue under existing state and federal authorities.	All restrictions applied to Hawaii-based longline vessels also would apply to West Coast-based vessels when fishing west of 150° W longitude. East of that line only selected restrictions would apply in order to allow swordfish targeting. These restrictions control sea turtle and seabird interactions and monitor the fishery.	All restrictions applied to Hawaii-based longline vessels would apply to West Coast-based vessels.				
Purse seine (Ch 8, Sec 8.5.3)	Regulatory authority would continue under existing state and federal authorities.	Opens the entire EEZ to purse seine fishing.	Closes the area within the EEZ north of 45° N latitude.	Closes the EEZ off Washington to purse seine fishing, but allows it off Oregon and California.			

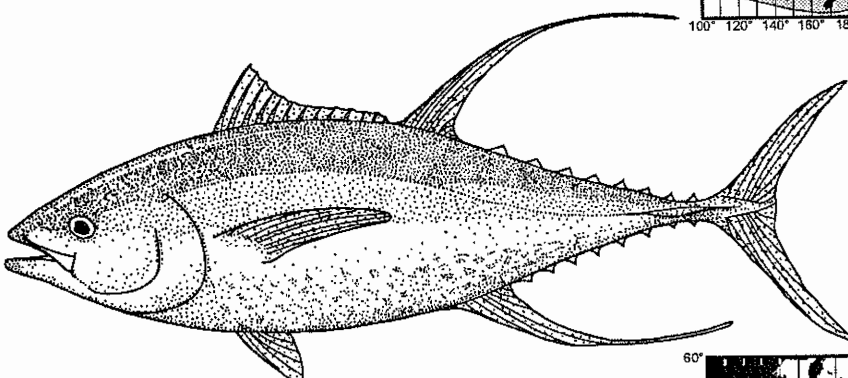
	Alternative 1 No Action	Alternative 2 Preferred	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
Prohibit sale (Ch 8, Sec 8.5.4)	Sale of striped marlin would not be prohibited by FMP, but would continue to be prohibited by the State of California.	Prohibit the sale of striped marlin by vessels under PFMC jurisdiction.					
Commercial fishing permits (Ch 8, Sec 8.5.5)	Require no new federal permits. Existing state and federal permit requirements apply.	Require a federal permit be obtained by the owner of each individual vessel intended to be used in commercial fishing for HMS, with a specific endorsement for each gear type.	Require one federal permit for HMS vessels covering all HMS fisheries.	Require federal vessel permit for selected fisheries.			
Recreational fishing permits (Ch 8, Sec 8.5.5)	Require no new federal permits for recreational vessels, private or CPFV.	Require a federal permit for CPFVs that fish for HMS, but existing state permit or license could meet this requirement.	Require federal permit for all CPFVs that fish for HMS; a state permit could **not** be used to meet this requirement.	Require federal permit for **all** recreational fishing vessels (private and CPFV) that fish for HMS.			
Reporting requirements (Ch 8, Sec 8.5.6)	No new federal requirements for reporting.	Require all commercial and CPFV vessels to maintain and submit logbooks to NMFS.	Limit new federal reporting requirements to commercial vessels not already required to report under existing federal laws.				

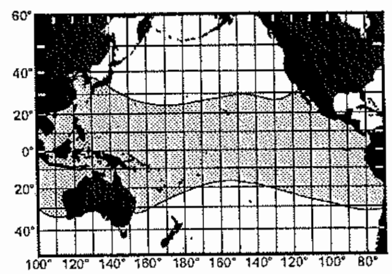




Albacore Tuna

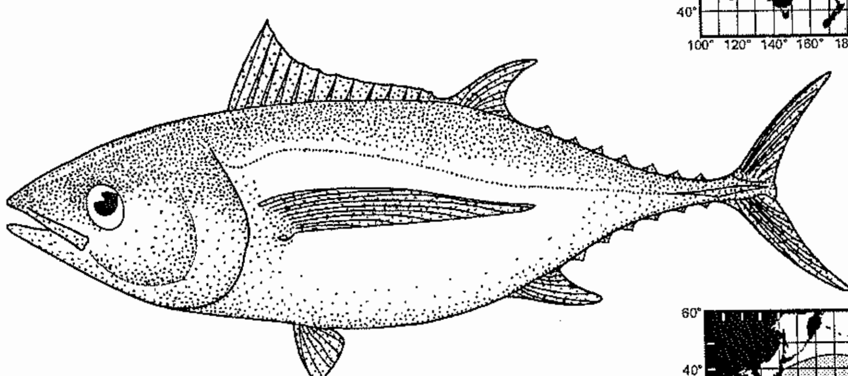
Thunnus alalunga

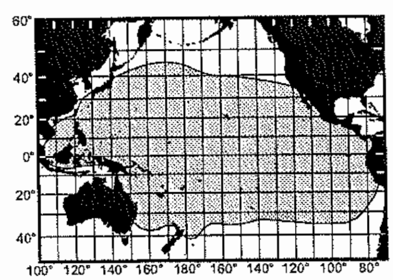




Yellowfin Tuna

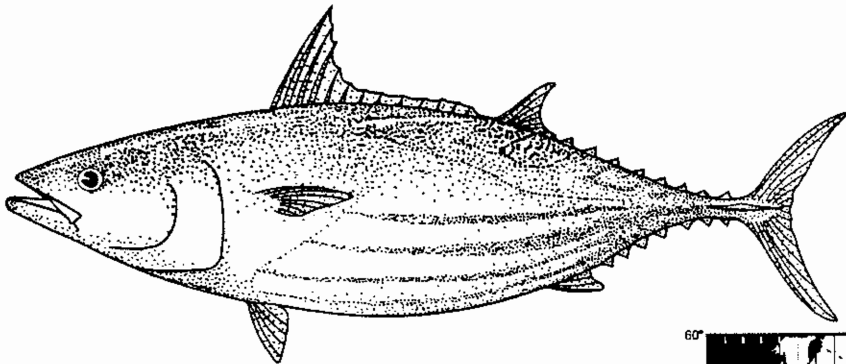
Thunnus albacares

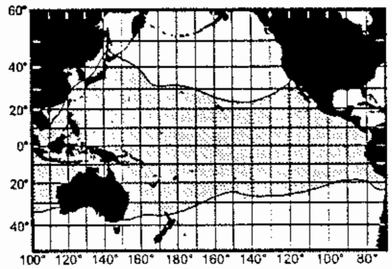




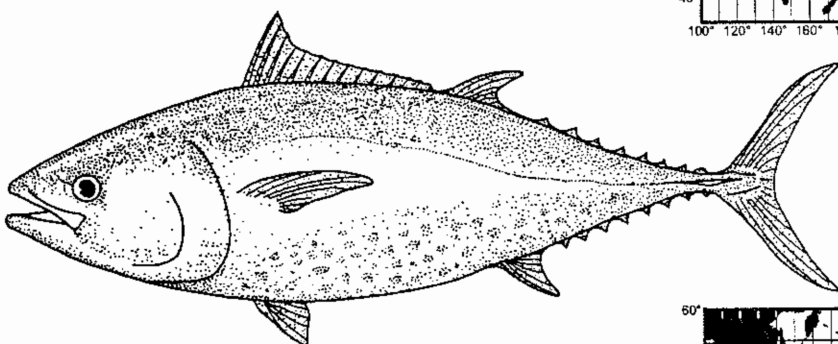
Bigeye Tuna

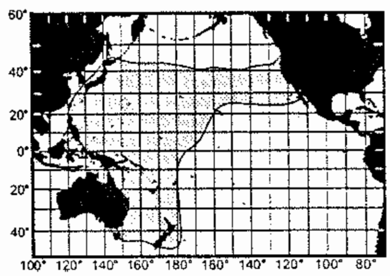
Thunnus obesus



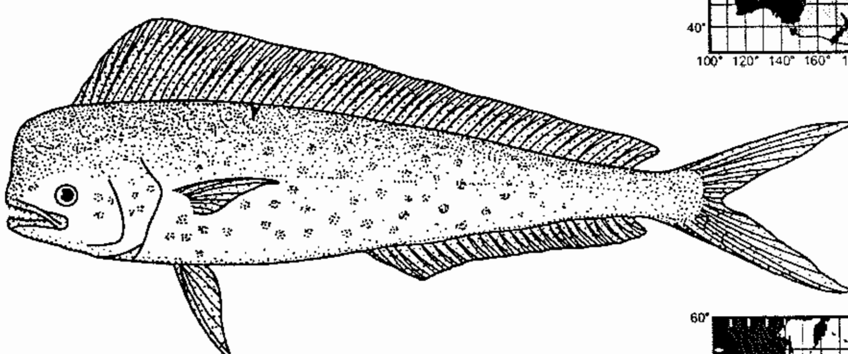


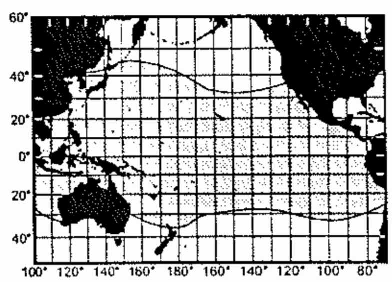
Skipjack Tuna
Katsuwonus pelamis



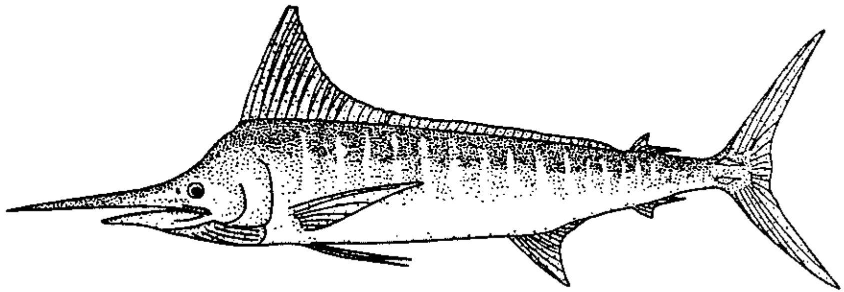


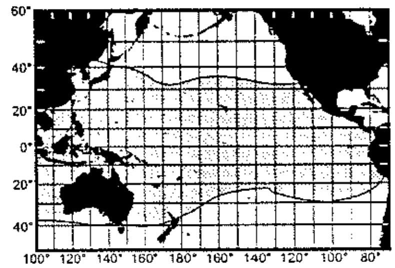
Northern Bluefin Tuna
Thunnus orientalis





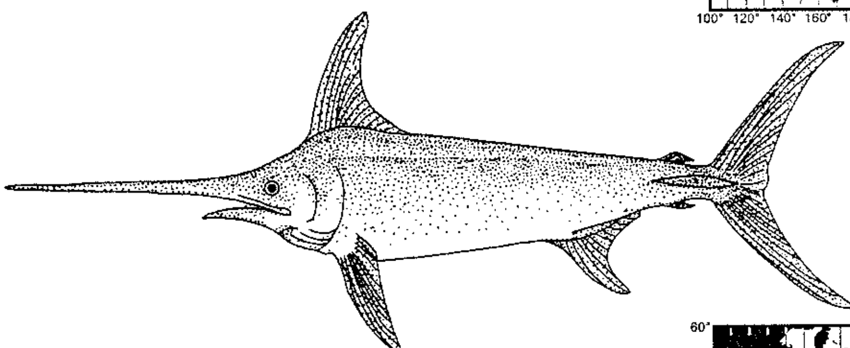
Dorado (dolphin)
Coryphaena hippurus

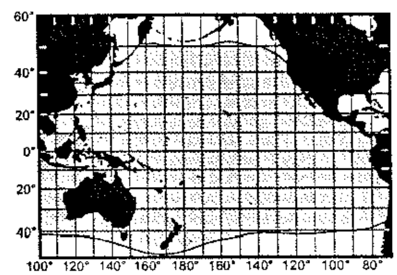




Striped Marlin

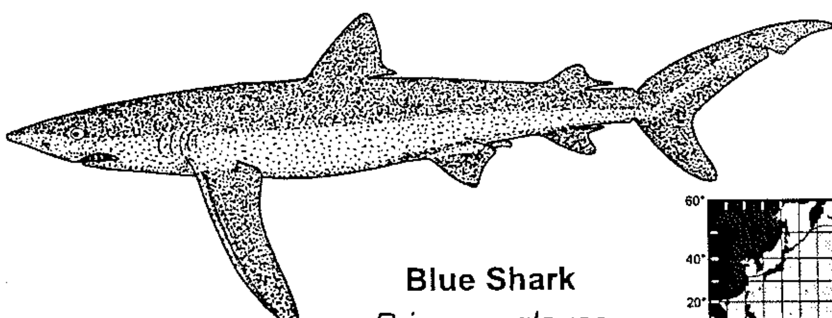
Tetrapterus audax

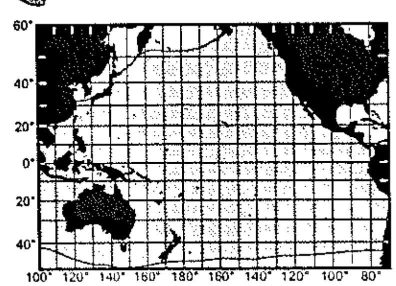




Broadbill swordfish

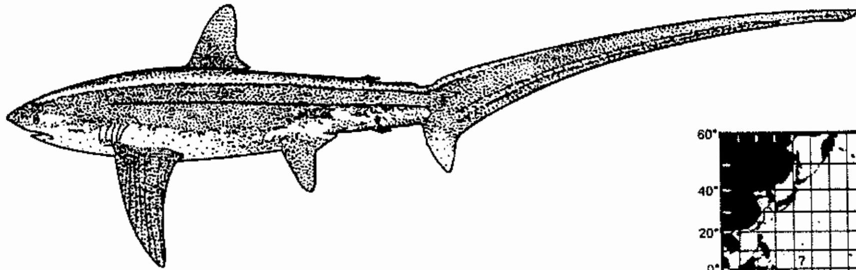
Xiphias gladius

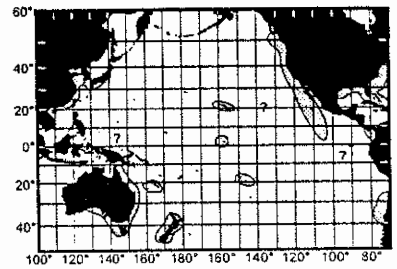




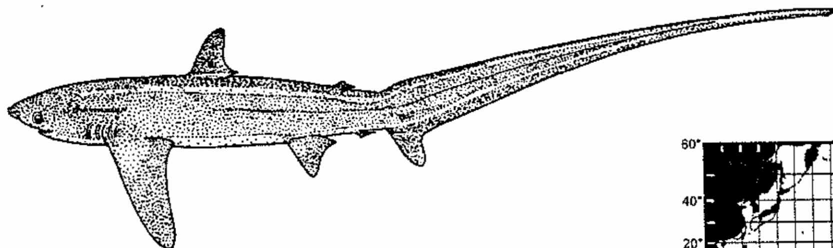
Blue Shark

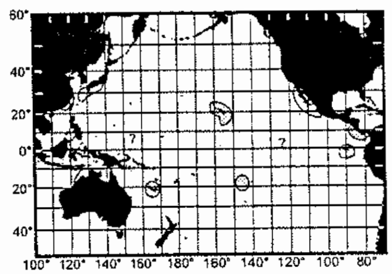
Prionace glauca



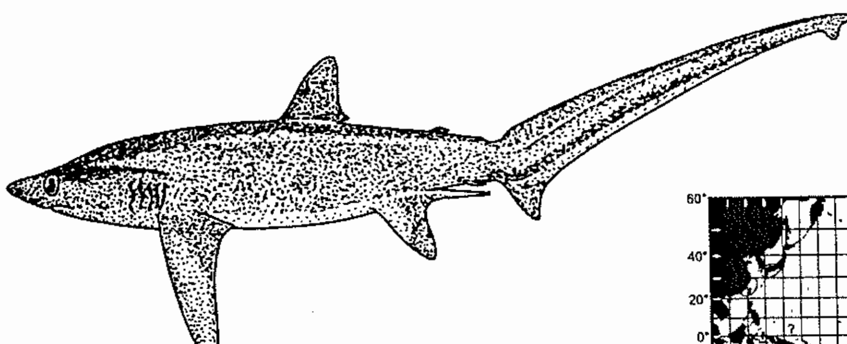


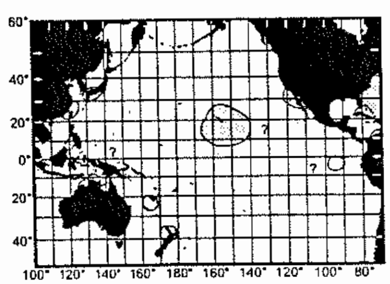
Common Thresher Shark
Alopias vulpinus



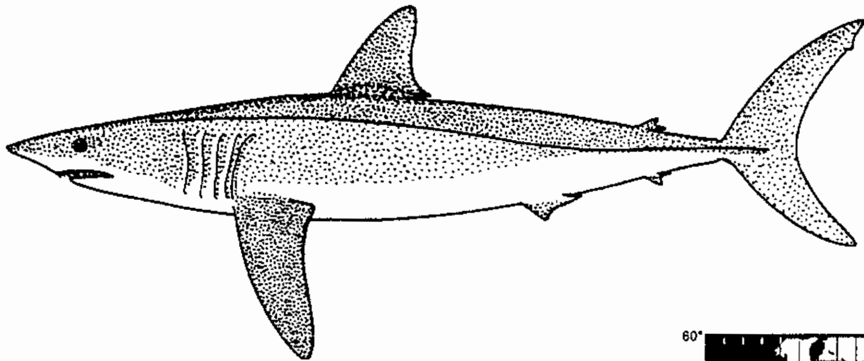


Pelagic Thresher Shark
Alopias pelagicus



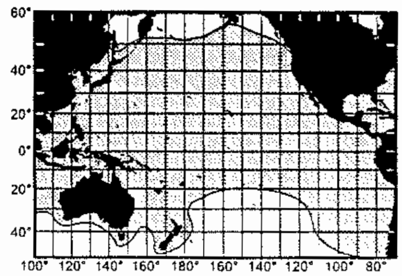


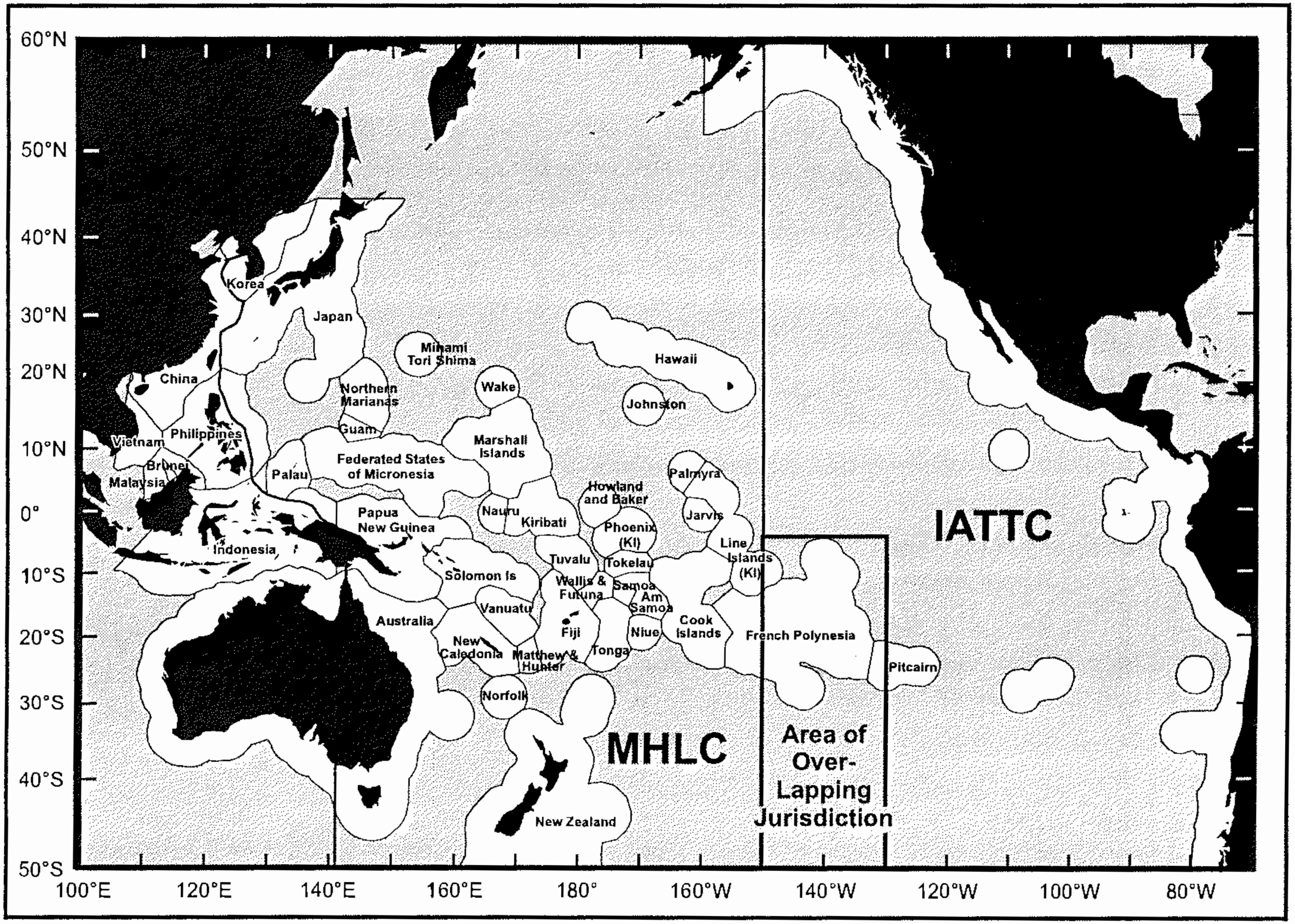
Bigeye Thresher Shark
Alopias superciliosus



Shortfin Mako Shark

Isurus oxyrinchus





National and proposed international fishery management jurisdictions in the Pacific for highly migratory species (MHLC = Multilateral High-Level Conference, IATTC = Inter-American Tropical Tuna Commission) (white areas are the Exclusive Economic Zone of each country).

TABLE OF CONTENTS
(Required EIS section)

VOLUME I

DEFINITIONS OF TERMS

(as used in this fishery management plan)

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

Bycatch
: Fish that are harvested in a fishery, but 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.

California Bight
: The region of concave coastline off southern California between the headland at Point Conception and the U.S. Mexican border, and encompassing various islands, shallow banks, basins and troughs extending from the coast roughly 200 km offshore.

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 HMSMT, HMSAS, SSC, and any other committee established by the Council.

Epipelagic
: The vertical habitat within the upper water column from the surface to depths generally not exceeding approximately 200 m (0-109 fm), i.e. above the mesopelagic zone.

Essential fish habitat
: Those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.

Exclusive economic zone
: 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.

Far offshore
: 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.

Fishery Management Area
: The EEZ off the coasts of Washington, Oregon, and California between three and 200 nautical miles offshore, bounded in the north by the Provisional International Boundary between the United States and Canada, and bounded in the south by the International Boundary between the United States and Mexico.

Fishing:
: (1) the catching, taking, or harvesting of fish;
(2) the attempted catching, taking, or harvesting of fish;
(3) any other activity which can reasonably be expected to result in the catching, taking, or harvesting of fish; or
(4) any operations at sea in support of, or in preparation for, any activity described above.
This term does not include any activity by a vessel conducting authorized scientific research.

Gear conflict

Any incident at sea involving one or more fishing vessels: (1) In which on fishing vessel or its gear comes into contact with another vessel or the gear of another vessel; and (2) That results in the loss of, or damage to a fishing vessel, fishing gear or catch.

Harvest guideline

A numerical harvest level or range of levels that is a general objective and is not a quota. Attainment of a harvest guideline does not require a management response, but it does prompt review of the fishery.

Harvesting vessel

A vessel involved in the attempt or actual catching, taking or harvesting of fish, or any activity that can reasonably be expected to result in the catching, taking or harvesting of fish.

Highly Migratory Species

Species managed under the HMS FMP, specifically:

Tunas:

North Pacific Albacore (*Thunnus alalunga*)
Yellowfin tuna (*Thunnus albacares*)
Bigeye tuna (*Thunnus obesus*)
Skipjack tuna (*Katsuwonus pelamis*)
Northern bluefin tuna (*Thunnus thynnus*)

Sharks:

Common thresher shark (*Alopias vulpinus*)
Pelagic thresher shark (*Alopias pelagicus*)
Bigeye thresher shark (*Alopias superciliosus*)
Shortfin mako shark (*Isurus oxyrinchus*)
Blue shark (*Prionace glauca*)

Billfish/Swordfish:

Striped marlin (*Tetrapturus audax*)
Swordfish (*Xiphias gladius*)

Other:

Dorado or Dolphinfish (*Coryphaena hippurus*)

Highly Migratory Species Advisory Subpanel (HMSAS)

The HMSAS is comprised of members of the fishing industry and public appointed by the Council to review proposed actions for managing the highly migratory species fisheries.

Highly Migratory Species Fishery Management Plan (HMS FMP)

The Fishery Management Plan for the Washington, Oregon, and California Highly Migratory Fisheries developed by the Pacific Fishery Management Council and approved by the Secretary of Commerce, and as it may be subsequently amended.

Highly Migratory Species Management Team (HMSMT)

The individuals appointed by the Council to review, analyze, and develop management measures for the HMS fishery.

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 differs from the definition in the Magnuson-Stevens Act which defines high seas as waters beyond the territorial sea).

Incidental catch or incidental species

Species caught and retained while fishing for the primary purpose of catching a different species (Note, this differs from bycatch which are discarded at sea).

Incidental take

The take of marine mammals, sea turtles, or sea birds during fishing operations.

Local depletion

Occurs when localized catches are in excess of replacement from local and external sources of production (via net immigration). Local depletion can occur independently of the status of the overall stock. The local depletion of abundance can be greater than stock-wide decreases.

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

Mesopelagic
The vertical habitat within the mid-depth ocean water column, from depths between 200 and 1000 m (109-547 fm) i.e., below the epipelagic zone.

Neritic
Inhabiting coastal waters primarily over he continental shelf; generally over bottom depths equal to or less than 183 m (100 fm) deep.

Oceanic
Inhabiting the open sea, ranging beyond continental and insular shelves, beyond the neritic zone.

Optimum yield (OY)
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.

Overfished
Stock or stock complex whose size is sufficiently small that a change in management practices is required in order to achieve an appropriate level and rate of rebuilding.

Overfishing
To fish at a rate or level that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis.

Owner of a vessel or vessel owner
A person identified as the current owner in the Certificate of Documentation (CG-1270) issued by the U.S. Coast Guard for a documented vessel, or in a registration certificate issued by a state or the U.S. Coast Guard for an undocumented vessel.

Pan-Pacific
Throughout the entire Pacific region.

Pelagic
Inhabiting the water column as opposed to being associated with the sea floor; generally occurring anywhere from the surface to 1000 meters (547 fm). (See also epipelagic and mesopelagic)

Person
Any individual, corporation, partnership, association or other entity (whether or not organized or existing under the laws of any state), and any federal, state, or local government, or any entity of any such government that is eligible to own a documented vessel under the terms of 46 U.S.C. 12102(a).

Processing or to process
The preparation or packaging of HMS to render the fish suitable for human consumption, pet food, industrial uses or long-term storage, but does not mean heading and gutting unless there is additional preparation.

Prohibited species
Those species and species groups whose retention is prohibited unless authorized by other applicable law (for example, to allow for examination by an authorized observer or to return tagged fish as specified by the tagging agency).

Quota
A specified numerical harvest objective for a single species of HMS, the attainment (or expected attainment) of which causes the complete closure of the fishery for that species.

Recreational fishing
Fishing with authorized recreational fishing gear for personal use only, and not for sale.

Regional Administrator
The Administrator, Southwest Region, NMFS, or designee.

Sustainable Fisheries Division (SFD)

The Assistant Regional Administrator for Sustainable Fisheries, Southwest Region, NMFS, or a designee.

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 its implementing regulations.

ACRONYMS

ABC	allowable biological catch
AIDCP	Agreement on the International Dolphin Conservation Program
ATCA	Atlantic Tunas Convention Act
BO	Biological Opinion
CalCOFI	California Cooperative Oceanic Fisheries Investigations
CDFG	California Department of Fish and Game
CEQ	Council on Environmental Quality
CFGC	California Fish and Game Commission
CFR	Code of Federal Regulations
Council	Pacific Fishery Management Council
CPFD	catch per fishing day
CPFV	commercial passenger fishing vessel
CPS	coastal pelagic species
CPUE	catch per unit of effort
CWP	central-western Pacific
CYRA	Commission (IATTC) yellowfin regulatory area
CZMA	Coastal Zone Management Act
DAH	domestic annual harvest
DAP	domestic annual processing
DEIS	draft environmental impact statement
DGN	drift gillnet
DML	dolphin mortality limit
DOS	U.S. Department of State
EA	environmental assessment
EEZ	exclusive economic zone
EFH	essential fish habitat
EFL	eye-to-fork length
EIS	environmental impact statement
EFP	exempted fishing permit
ESA	Endangered Species Act
ESU	evolutionarily significant unit
EPOTFA	Eastern Pacific Ocean Tuna Fishing Agreement
ETP	eastern tropical Pacific
EPO	eastern Pacific Ocean
FAO	Food and Agriculture Organization of the United Nations
FAD	fish aggregating devices
FEAM	Fishery Economic Assessment Model
FFA	(South Pacific) Forum Fishery Agency
FL	fork length
FMP	fishery management plan
FY	fiscal year
GIS	geographic information system
HAPC	habitat area of particular concern
HMS	highly migratory species
HMSAS	Highly Migratory Species Advisory Subpanel
HMS FMP	Highly Migratory Species Fishery Management Plan
HMSMT	Highly Migratory Species Management Team
HSFCA	High Seas Fishing Compliance Act

IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Convention for the Conservation of Atlantic Tunas
IDCPA	International Dolphin Conservation Program Act
IPOA	International Plan of Action
ISC	Interim Scientific Committee for Tuna and Tuna-like Species in the North Pacific
ITQ	individual transferable quota
IUCN	World Conservation Union
JFL	jaw-to-fork length
JVP	joint venture processing
LOS	Law of the Sea
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MBTA	Migratory Bird Treaty Act
MFMT	maximum fishing mortality threshold
MHLC	Multi-Lateral High Level Conference for Conservation and Management of Highly Migratory Species of the Central and Western Pacific
MMC	Marine Mammal Commission
MMPA	Marine Mammal Protection Act
MRFSS	marine recreational fisheries statistics survey
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSST	maximum stock size threshold
MSY	maximum sustainable yield
MUS	management unit species
NAICS	North American Industry Classification System
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NNB	net national benefits
NOAA	National Oceanic and Atmospheric Administration
NPDES	national pollutant discharge elimination system
NPFMC	North Pacific Fishery Management Council
NPOA	National Plan of Action
NPTZ	North Pacific transition zone
NS	National Standards (of the Magnuson-Stevens Act)
NWI	National Wetlands Inventory
ODFW	Oregon Department of Fish and Wildlife
OMB	Office of Management and Budget
OY	optimum yield
PacFIN	Pacific Fisheries Information Network
PBR	potential biological removal
PFMC	Pacific Fishery Management Council
PGR	population growth rate
POCTRP	Pacific Offshore Cetacean Take Reduction Plan
POCTRT	Pacific Offshore Cetacean Take Reduction Team
POFI	Pacific Oceanic Fishery Investigations
PRA	Paperwork Reduction Act
PRBO	Point Reyes Bird Observatory
PSMFC	Pacific States Marine Fisheries Commission
RA	Regional Administrator (of NMFS)
RecFIN	Recreational Fisheries Information Network
RIR	Regulatory Impact Review
RFA	Regulatory Flexibility Act
RPA	reasonable and prudent alternative
SAC	Sportfishing Association of California
SAFE	stock assessment and fishery evaluation

SCB	Southern California Bight
SCTB	Standing Committee on Tuna and Billfish
SDC	status determination criteria
SFA	Sustainable Fisheries Act of 1996 (amendment to the Magnuson-Stevens Act)
SIC	Standard Industrial Classification
SPC	Secretariat of the Pacific Community
SPTT	South Pacific Tuna Treaty
SSC	Scientific and Statistical Committee
SST	sea surface temperature
SWFSC	Southwest Fisheries Science Center (NMFS)
TALFF	total allowable level of foreign fishing
TRP	(Pacific Offshore Cetacean) Take Reduction Plan
TRT	(Pacific Offshore Cetacean) Take Reduction Team
UNIA	United Nations Implementing Agreement on the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
VMS	vessel monitoring system
WCBA	Westport Charter Boat Association
WDFW	Washington Department of Fish and Wildlife
WPRFMC	Western Pacific Regional Fishery Management Council
YPR	yield per recruit
ZMRG	zero mortality rate goal

CONVERSION TABLE

Metric to U.S. Customary

Multiply	By	To Obtain
millimeters (mm)	0.03937	inches (in)
centimeters (cm)	0.3937	inches (in)
meters (m)	3.281	feet (ft)
meters (m)	0.5468	fathoms (fm)
kilometers (km)	0.6214	statute miles (mi)
kilometers (km)	0.5396	nautical miles (nm)
milligrams (mg)	0.00003527	ounces (oz)
grams (g)	0.03527	ounces (oz)
kilograms (kg)	2.205	pounds (lb)
metric ton (mt)	2,204.6	pounds (lb)
metric ton (mt)	1.102	short tons (t)
Celsius degrees (°C)	1.8(°C) + 32	Fahrenheit degrees (°F)

U.S. Customary to Metric

Multiply	By	To Obtain
inches (in)	25.40	millimeters (mm)
inches (in)	2.54	centimeters (cm)
feet (ft)	0.3048	meters (m)
fathoms (fm)	1.829	meters (m)
statute miles (mi)	1.609	kilometers (km)
nautical miles (nm)	1.852	kilometers (km)
ounces (oz)	28350.0	milligrams (mg)
ounces (oz)	28.35	grams (g)
pounds (lb)	0.4536	kilograms (kg)
pounds (lb)	0.00045	metric ton (mt)
short tons (t)	0.9072	metric ton (mt)
Fahrenheit degrees (°F)	0.5556 (°F-32)	Celsius degrees (°C)

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Chapter 1
INTRODUCTION

1.0 INTRODUCTION

This document is a combined Environmental Impact Statement (EIS) and Fishery Management Plan (FMP) for Highly Migratory Species (HMS) developed by the Pacific Fishery Management Council which meets the requirements of the National Environmental Policy Act, the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act or MSFCMA), 16 U.S.C. 1801 et seq., and other applicable law. The Magnuson-Stevens Act is administered by the U.S. Department of Commerce through its subagencies, the National Oceanic and Atmospheric Administration (NOAA) and the National Marine Fisheries Service (NMFS), based on recommendations made by regional fishery management councils.

The FMP includes important species of tunas, billfish and sharks which are harvested by West Coast HMS fisheries. A complete list of species in the management unit is provided in Section 3.1.1.

The FMP is intended to ensure conservation and promote the achievement of optimum yield of HMS throughout their ranges, both within and beyond the U.S. Exclusive Economic Zone (EEZ), to the extent practicable. Effective conservation and management in most cases will require concerted U.S. and international action. The FMP may serve as a vehicle for fulfilling the West Coast portion of U.S. obligations under international conservation agreements, if domestic U.S. implementing legislation authorizes its use.

This document is a "framework" plan, which includes some fixed elements and a process for implementing or changing regulations without amending the plan (flexible measures). Ongoing management of highly migratory species, and the need to address new issues that arise, make it impossible to foresee and address all regulatory issues in the initial plan. Some framework adjustments can be implemented more quickly than plan amendments, allowing for more timely management response. Changes to any of the fixed elements in the plan require a plan amendment. The framework procedures are described in Chapter 8.

This document also specifies and analyzes the initial management measures that need to be implemented when the plan is implemented, pursuant to the framework procedures in the plan. If adopted, these measures would become federal regulations affecting one or more fisheries for highly migratory species. They may be modified in the future, or new regulations may be implemented, using the framework adjustment procedures in the plan.

1.1 Format and Content of the EIS/FMP

This document includes the required contents of an EIS and an FMP in a combined format, therefore it differs somewhat from the format recommended by the Council on Environmental Quality (CEQ) for an EIS. The following table is presented to help the reader find the required EIS components.

CEQ Format	HMS EIS/FMP
Cover sheet	Cover sheet
Summary	Executive summary
Table of contents	Table of contents
Purpose of and need for action	Chapter 1 (section 1.5)
Alternatives including proposed action	Chapter 8
Affected environment	Chapters 2, 3, 4, 5, and 6
Environmental consequences	Chapter 9
List of preparers	Chapter 1 (section 1.8)
List of agencies, organizations and persons to whom copies of the statement are sent	Chapter 1 (section 1.10)
Index	Index
Appendices	Appendices

This introductory chapter (Chapter 1) describes the complexity of HMS management, the history of the FMP, and explains why an FMP is needed. Chapter 2 describes the domestic fisheries for HMS and the economic and social characteristics of the fisheries and the fishing communities. Chapter 3 includes the species to be managed by the FMP, the status of these species, and the definition of overfishing. Chapter 4 describes and identifies essential fish habitat (EFH) for HMS, describes threats to EFH, and recommends measures to protect EFH. Chapter 5 addresses bycatch of fish in HMS fisheries, and Chapter 6 deals with interactions of HMS fishing gears with protected species. Chapter 7 describes current management programs, including fishery monitoring programs. Chapter 8 presents the management alternatives including the preferred alternatives. The environmental consequences of the alternatives are presented in Chapter 9. Chapter 10 describes the relationship of the EIS/FMP to other applicable laws and executive orders. Appendices include the following:

Appendix A - Life History Accounts and Essential Fish Habitat Descriptions
Appendix B - Comparison of State Regulations
Appendix C - California Fish and Game Code 2000 - Drift Gillnet Shark and Swordfish Fishery
Appendix D - Current State and Federal Logbook Formats
Appendix E - Threatened and Endangered Species in the Area of HMS Fisheries
Appendix F - Costs Involved in Managing Pacific Coast HMS
Appendix G - Comments on the DEIS and Responses
Appendix H - Regulatory Impact Review and Initial Regulatory Flexibility Analysis
Appendix I - Draft Regulations

1.2 Application of Federal Authority

The management unit in this FMP consists of highly migratory species and their associated fisheries which occur within the West Coast EEZ and on the high seas with the catch being landed on the West Coast. This is consistent with National Standard three of the MSFCMA, which requires 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." It also is consistent with Section 102 of the Act which states that, "The United States shall cooperate directly or through appropriate international organizations with those nations involved in fisheries for highly migratory species with a view to ensuring conservation and shall promote the achievement of optimum yield of such species throughout their range, both within and beyond the exclusive economic zone."

This FMP applies to all U.S. vessels that fish for management unit species within the EEZ off California, Oregon or Washington. This FMP also applies to U.S. vessels that fish for management unit species on the high seas (seaward of the EEZ) and land their fish in California, Oregon or Washington. However, pelagic longline vessels that are registered for use under a Western Pacific longline limited entry permit and fish on the high seas and land their fish in California, Oregon and Washington will continue to be subject to the requirements for vessel monitoring system units, observer coverage, Western Pacific longline logbook forms, seabird avoidance gear, time and area closures, gear restrictions, and other measures at 50 CFR 660 Subpart C. U.S. vessels that fish with longline gear for management unit species on the high seas and land their catch solely in western Pacific ports (Hawaii, American Samoa, Guam, Northern Mariana Islands) likewise are subject to the western Pacific regulations at 50 CFR 660 Subpart C.

The FMP does not apply to U.S. vessels that fish for management unit species on the high seas and land into a non-U.S. port. However, those vessels are subject to the requirements of the High Seas Fishing Compliance Act (HSFCA, 16 U.S.C. 5501 et seq.), including permit and reporting requirements.

U.S. vessels that fish for tuna and associated species in the eastern tropical Pacific Ocean also may be subject to management measures under the Tuna Conventions Act (16 U.S.C. 951 et seq.) which implemented the agreement that established the Inter-American Tropical Tuna Commission. There also is the potential for regulations to be promulgated in the future pursuant to other international arrangements such as the U.S.-Canada Albacore Treaty. Section 1.6 provides more information about the relationship of fishery management under this FMP with fishery management under international arrangements.

The application of federal authority as described above promotes the achievement of many of the objectives of the FMP (section 8.2), including:

- ensure or contribute to international cooperation in the long-term conservation and sustainable use of highly migratory fish stocks that are caught by West Coast-based fishers.
- promote inter-regional collaboration in management of fisheries for species which occur in the Pacific Council's managed area and other Councils' areas.
- promote effective monitoring and enforcement.
- establish procedures to facilitate rapid implementation of future management actions, as necessary.
- ensure that fisheries are in compliance with laws and regulations to conserve and restore species listed pursuant to the ESA, MMPA and MBTA.

This application of authority is appropriate for the following reasons:

1. To ensure consistent application of conservation and management measures applying to U.S. fishers on the high seas under other FMPs (e.g., Hawaii longline restrictions);

2. To implement measures adopted by international management organizations in which the U.S. participates; if authorized by domestic U.S. implementing legislation;

3. To promote consistent and coordinated data collection and management throughout the range of HMS; and

4. To promote cooperative and reinforcing management of U.S. HMS fisheries throughout the Pacific such that vessels cannot avoid conservation requirements simply by relocating their operations.

1.3 Complexity of HMS Management

The management of highly migratory species presents formidable challenges, particularly in the Pacific area. There are numerous species of tuna, billfish, oceanic sharks and others which range throughout vast areas of the Pacific Ocean. Knowledge of stock distribution and status is limited. There is a moderate amount of information for the commercially important tunas, lesser amounts for swordfish and other billfishes, and scant information for sharks and other highly migratory fishes. Regular and comprehensive stock assessments are needed for certain species. These species are harvested by numerous coastal and distant-water fishing nations throughout the Pacific. Chapter 2 (section 2.6) documents 36 nations harvesting HMS in the Pacific. United States fisheries harvest HMS in the EEZ of the U.S., in the zones of other nations and on the high seas.

Conservation of HMS is contingent on effective international management institutions and measures. There is no single, pan-Pacific institution that manages all HMS throughout their ranges. The Inter-American Tropical Tuna Commission (IATTC) adopts conservation measures for yellowfin and bigeye tunas in the eastern Pacific Ocean. Member nations, including the U.S., are obligated to implement these measures for their national fisheries. On September 5, 2000, the Convention on Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean was adopted. The Convention, which is subject to ratification, establishes a Commission that would adopt management measures for HMS throughout their ranges. Both of these commissions affect West Coast-based HMS fisheries. Section 1.6 describes these international institutions in more detail.

In 1981, the United States and Canada signed the Treaty on Pacific Coast Albacore Tuna Vessels and Port Privileges, which permits fishing vessels of each nation to fish for albacore tuna in waters of the other nation beyond 12 miles. Recently, U.S. albacore fishermen became concerned about the increased effort by Canadian vessels in U.S. waters and the lack of information on the amount of albacore taken by Canadian vessels. The U.S. and Canada have agreed to Treaty changes to resolve these issues. See section 1.6.2 for more information on this issue.

Within the U.S., HMS fishery management in the Pacific area is the responsibility of three regional fishery management councils, the Western Pacific Regional Fishery Management Council (WPRFMC), North Pacific Fishery Management Council (NPFMC) and 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. This is complicated by the fact that the council regions have different fishery traditions in addition to different management objectives, measures and concerns. The WPRFMC manages HMS fisheries pursuant to the FMP for the Pelagic Fisheries of the Western Pacific Region. The NPFMC does not manage HMS, except that sharks, including some migratory species, are included in the Gulf of Alaska Groundfish FMP and Bering Sea and Aleutian Islands Groundfish FMP. Currently, the NPFMC is not contemplating development of an FMP for HMS fisheries in their management area. However, the Pacific Council intends to keep the NPFMC informed of its proposed actions. Procedures for coordination with the WPRFMC and NPFMC are described in Chapter 8, section 8.3.4.2. This process ensures that WPRFMC and NPFMC are informed of and provided opportunity to comment on Pacific Council management actions affecting fisheries in their respective management areas, and it promotes consistent management of HMS fisheries.

Until now, there has been no FMP for West Coast-based fisheries for HMS. The fisheries have been managed by the States of Washington, Oregon and California, although some federal laws also apply. Federal statutes include the High Seas Fishing Compliance Act, Tuna Conventions Act, Marine Mammal Protection Act, Migratory Bird Treaty Act and Endangered Species Act. The lack of a single FMP covering all U.S. vessels in the Pacific creates a situation where U.S. vessels fishing on the high seas may be subject to different regulations, depending on where they start their trip or where they land. This could create inequities and frustrate achievement of management goals. In addition, foreign vessels and U.S. vessels may be subject to different regulations.

Within the U.S. West Coast-based fisheries, HMS are harvested by five major commercial gear groups and various recreational fisheries. The commercial gears include surface hook and line, pelagic drift gillnet, pelagic longline, purse seine and harpoon, and are used in the EEZ, in state waters and on the high seas. Anglers pursue HMS from commercial passenger fishing vessels as well as private boats. There are sport fisheries targeting albacore, mixed tunas and dorado, billfish, and sharks. Currently there are no quotas or allocations among gear groups, however user conflicts have arisen, particularly in California, where state regulations prohibit longlining within 200 miles and control time and area for the drift gillnet fishery.

Representatives of the drift gillnet fishery have proposed a limited longline fishery in the EEZ to target tunas and swordfish. Longliners currently may land HMS in California if the fish are harvested outside 200 miles. The proposers' intent is to evaluate longline gear as an alternative to drift gillnet gear to reduce bycatch or bycatch mortality, and determine if a longline fishery is an economically viable substitute for drift gillnet gear. The recreational community, particularly in southern California, is concerned about the status and availability of tunas, billfish and sharks and the impacts of the commercial fisheries on the recreational fisheries for these species. Anglers oppose a longline fishery in the EEZ off California targeting tunas and swordfish. They are concerned about increased fishing mortality and commercial effort in general and increased bycatch of striped marlin, sharks and other species.

In addition, a growing conservation community is concerned about the management of HMS, including sharks, which are particularly vulnerable to overexploitation. This community also is concerned about increasing bycatch and bycatch mortality of HMS and other fish, and protected species. Longline and drift gillnet gears targeting HMS also capture protected species such as marine mammals, seabirds and turtles. There is substantial information on the catch and bycatch of fish and the capture of protected species in the West Coast drift gillnet fishery, which has been observed since 1990 under the auspices of the Marine Mammal Protection Act. This fishery is subject to a Take Reduction Plan, and more restrictive gear measures have been in effect since 1997 to reduce the take of marine mammals.

1.4 History of the Fishery Management Plan

The Pacific Council was created in 1976 pursuant to the Magnuson-Stevens Act, and began to develop FMPs for all of the major fisheries in its area of authority, including a draft FMP for billfish (including swordfish) and oceanic sharks (PFMC 1981). At that time, tunas were not included in the Magnuson-Stevens Act and thus could not be managed by councils. The draft billfish FMP and several others were not adopted by the Council, because it became clear that federal management of all West Coast fisheries was not necessary nor cost-effective. With limited resources, the Council decided to concentrate its efforts on those which required federal management, such as salmon and groundfish. In the case of billfish and oceanic sharks, the Council concluded that effective stock conservation required international management efforts and that there was little the Council could accomplish. The fishery management problems were primarily in California, and the State was addressing these problems.

In 1990, the Pacific States Marine Fisheries Commission (PSMFC) adopted an interjurisdictional fishery management plan for thresher shark (PSMFC 1990) pursuant to the Interjurisdictional Fisheries Act, 16 U.S.C. 4101 et seq. The fishery for thresher shark began off California in 1977. Thresher sharks are harvested in drift gillnets in California along with swordfish and mako sharks. Incidental catches of thresher shark also occur in set gillnet fisheries. Drift gillnet fisheries for thresher shark began off the coasts of Oregon and Washington in 1983 under experimental fishing permits. This permit fishery in Oregon and Washington continued through 1988, when it was terminated due to bycatch of marine mammals and leatherback turtles, declining interest in the fishery and concerns about the abundance of thresher shark. The PSMFC plan established a management panel comprised of one member each from the states of Washington, Oregon and California, which makes management recommendations to the state agencies. The plan proposed an annual coastwide thresher shark harvest guideline of 750,000 pounds (340 mt dw) and discouraged catches of juvenile sharks. No quotas were established but states did agree to this harvest guideline, which since 1991 has never been approached. There have been no additional management actions since the plan was adopted.

In December 1994, the Western Pacific Council requested that the Secretary of Commerce designate it as the single council responsible for management of domestic pelagic fisheries in the Pacific.[1] This request was based on a paper developed by the Western Pacific Council which evaluated several alternatives, including status quo, coordinated data collection, a joint FMP, Secretarial management, and single council designation (WPRFMC 1994). The Western Pacific Council argued that one FMP was necessary to "ensure the ability to monitor and manage the fisheries throughout their range, to the extent practicable, in a consistent and efficient manner." The initial focus of the comprehensive FMP would be to address data gaps and inconsistencies. The Council concluded that the single designation alternative was most efficient and effective. The Council already had an FMP for tunas and other large pelagic fishes, which could be amended to include fisheries in the other two council areas. The Western Pacific Council did not favor a joint FMP because of the requirement that all councils must approve all measures and the need for joint meetings, and it felt that Secretarial management was undesirable because it removed regional control over management. Under the Western Pacific proposal, the North Pacific and Pacific Councils would make management recommendations for fisheries in their areas and submit them to the Western Pacific Council, which would take final action on all measures for approval by the Secretary of Commerce.

The Western Pacific Council consulted the Pacific and North Pacific Councils on the proposal for single council designation. The Pacific Council opposed this approach. At that time, the Pacific Council was not convinced of the need to alter management arrangements for HMS, and was concerned that the decision process might be neither convenient for, nor in the best interest of, fishery interests on the West Coast. Since the principal issue at the time was the need for coordinated and comprehensive data collection, the Pacific Council recommended that data collection gaps be documented and filled.

In July 1996, after receiving input from the affected councils and industry groups, the NMFS concluded that single council designation was not necessary at that time to achieve effective management under the Magnuson-Stevens Act or to support the Department of State in carrying out U.S. obligations. With regard to data needs, NMFS stated that recent international agreements and implementing domestic legislation (High Seas Fishing Compliance Act, 16 U.S.C. 5501 et seq.) provided authority for NMFS to require U.S. vessels fishing for HMS to report their fishing activities. The Western Pacific Council continued to maintain that a comprehensive FMP with single council designation was necessary, and the issue was raised again at the

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[1] Under the Magnuson-Stevens Act, for fisheries under the authority of more than one council, the Secretary of Commerce may designate one council to prepare the plan or may require the plan be prepared jointly by the concerned councils. In the latter case, the plan must be approved by a majority of the voting members of each council.

Council Chairs' meeting in June 1997. As a result of this discussion, the Director of NMFS asked the Southwest Regional Administrator to work with the three Pacific area councils to develop a recommendation on how to proceed.

At the September 1997 Pacific Council meeting, the Southwest Region of NMFS presented a paper outlining options for Pacific Council involvement in HMS management. Options included no action, the Western Pacific proposal, Secretarial management, a joint FMP and a separate West Coast FMP. The paper summarized numerous activities at the national and international levels affecting HMS fisheries based on the West Coast. NMFS argued that the regional councils should play an active role in planning U.S. participation in future internationally managed HMS fisheries, and that the Pacific Council has unique capabilities for reaching the diverse fishing industry of the West Coast and involving them in the development of management policy. At that meeting, the Pacific Council established an HMS Policy Committee to address HMS issues and coordinate with the other councils. At the November 1997 meeting, the Council appointed a representative to attend meetings of the IATTC and MHLC and recommended establishment of an inter-council coordinating committee. In June 1998, the Council appointed members to a West Coast HMS Advisory Subpanel comprised of representatives of constituent groups.

In September 1998, representatives of the three Pacific area councils and NMFS met to discuss collaboration in HMS management. The NMFS Southwest Region presented a "straw man" approach for coordinated management. The objectives of this approach were:

- to achieve effective conservation and management of HMS fisheries throughout the EEZ and adjacent waters to the extent practicable consistent with the Magnuson-Stevens Act and other applicable law, including international agreements;
- to ensure comprehensive collection of comparable and compatible data throughout the range of U.S. HMS fisheries;
- to ensure the ability to take action on a timely basis as the need arises; and
- to ensure that those who would be affected by management have ample notice of prospective action and opportunity to advise the decision makers about their interests and needs.

Under this approach, the existing Western Pacific Council FMP would serve as the foundation for the comprehensive plan. It would be amended to include, among other things, framework management procedures for the Pacific Council. Each council would manage its respective fisheries independently, except when an action might affect the other council. In the latter case, both councils would vote. If there were disagreement, the councils would ask the Regional Administrator of NMFS to mediate the issue.

The Western Pacific Council did not support the collaborative approach proposed by NMFS, because it believed that joint actions would increase the work load, increase costs, delay implementation of regulations, and weaken the authority of the Western Pacific Council.

In June 1999, the Pacific Council voted to begin development of an FMP for HMS fisheries. The Council preferred that some form of comprehensive FMP be developed with all three councils involved and wrote the other two councils inviting their participation. While the Council recognized the difficulties associated with joint FMPs, it was optimistic that framework procedures and operational mechanisms could be developed to allow either independent or joint council actions as necessary and appropriate to achieve FMP objectives. While the North Pacific Council expressed support for a joint FMP, the Western Pacific Council stated that it was not inclined to participate at that time. The Pacific Council decided to begin development of a separate FMP for West Coast-based HMS fisheries, holding open the alternative of a comprehensive FMP in the future should the Western Pacific decide to participate.

In March 2001, NMFS wrote the Council to provide updated information on recent domestic HMS fishery management issues that had a bearing on the development of the FMP. NMFS Regional Administrator Rebecca Lent stated:

"When the decision was made to develop the FMP, there was no clear and pressing need for consideration of management measures that would immediately go into effect. It was envisioned that the FMP could include some reporting requirements and perhaps some changes in permit requirements, and it would almost certainly establish framework procedures for implementing regulations in the future if new information or conditions warranted it. The FMP also could conceivably incorporate under Magnuson-Stevens Act authority a variety of regulations currently in effect under other Federal law or State laws and regulations. However, the legal and programmatic environment for the FMP changed substantially as a result of the following factors:

"1. Drift Gillnet Fishery Management - This fishery has been managed under a mix of State laws (time/area closures, limited entry, mesh size, logbooks) and Federal regulations (net depth, pingers, observers) under the Marine Mammal Protection Act. As a result of a new Section 7 consultation under the Endangered Species Act (ESA), NMFS is requiring that new restrictions be imposed on the fishery by August 2001. NMFS will promulgate these regulations by that time under the authority of the ESA. However, I would urge the Council to be sure that the draft FMP, when cleared for public review and comment, include an alternative under which the drift gillnet fishery would be managed through the FMP rather than under the anticipated mix of State laws and regulations and Federal regulations under the MMPA and ESA. Consolidating the management program under a single authority should greatly simplify the ability of fishers and managers to adjust to changing conditions in the future.

"In addition, the changes being required under the ESA will likely make it very difficult for some fishers to maintain profitable operations. This adds to the feeling on the fleet's part that there should be some form of relief, and a proposal has been made to allow the vessels to fish with longline gear subject to a variety of restrictions, possibly including an experimental fishery process. This is a very contentious proposal, but the drift net fleet owners definitely want the Council to address it in the FMP process. I would strongly encourage that the plan include a full evaluation of the pros and cons of allowing longline fishing in the EEZ so that the final decision can be based on that evaluation.

"2. Hawaii Longline Fishery Restrictions - As a result of court actions, a number of restrictive regulations have been promulgated for the Hawaii-based longline fishery. In addition, NMFS prepared and distributed for public comment and hearings a Draft Environmental Impact Statement (DEIS) that reviewed the history and performance of that fishery and analyzed several alternatives for management of the fishery. I believe the Council has received a copy of that DEIS. While final action has not yet been taken, the preferred alternative would further constrain the fishery, including prohibiting a fishing strategy that targets swordfish and setting time/area closures for the fishery. NMFS also is completing a Section 7 consultation to determine if the fishery jeopardizes the continued existence of any species of sea turtle and if conditions should be set for the fishery to ensure that there will be no jeopardy and to mitigate or reduce the potential for interactions. NMFS recognizes that longline fishing in the EEZ, or on the high seas seaward of the EEZ, off the West Coast might not have the exact same impacts on fish and protected species as longlining out of Hawaii. However, NMFS also believes it would be inappropriate to allow fishing by vessels out of the West Coast in times and areas that would be closed to vessels out of Hawaii or using strategies that would not be available to Hawaii-based vessels until further information is available to indicate that the impacts would be different. At the least, the draft FMP should include an alternative that would establish the same measures for West Coast-based longliners as for Hawaii-based longliners. This also would include provisions to minimize interactions with seabirds and to authorize the Regional Administrator to require that observer accommodations be made and to require the use of automated vessel monitoring system units at vessel expense.

"3. U.S.-Canada Albacore Treaty - During the scoping process for the FMP, there was sufficient force of recommendations from the public that the Council established a control date for possible use in setting up a limited entry program in the future. Most of the interest came from the troll albacore fishery which is concerned that further restrictions in other fisheries (especially groundfish) might result in vessels shifting into the albacore fishery, possibly adversely affecting present participants and exacerbating marketing problems that have sometimes occurred when catches are too high and markets are flooded with landings. Also of concern was that additional effort could result in lower catch rates for historic participants. A more recent concern, however, is that there has been a dramatic increase in the participation of Canadian vessels in U.S. waters under the Treaty, so much so that the Western Fishboat Owners Association has promoted suspension of the Treaty unless the Canadians agree to some limit on their vessels' fishing in U.S. waters. We have now scheduled a negotiating session with Canadian authorities April 10-11, 2001, in Seattle, to discuss changes in Annex A to the Treaty under which there would be a process for annually determining fleet or fishing limits and to discuss potential limits in 2001.

"In discussing the matter with NOAA General Counsel and industry, we have identified a broader issue. That is, there is no statute to implement the Albacore Treaty; thus there is no statute authorizing NMFS (or anyone else) to issue regulations to carry out the Treaty. Before we can propose legislation, however, we need to consider and agree on how the FMP and Treaty interrelate. We need to consider what kinds of measures would best be handled by different agencies and through different procedures. We will be discussing with industry and General Counsel the manner in which different possible future fishery management measures might be carried out under the FMP or under the Albacore Treaty, or even under laws implementing other future international management agreements (e.g., IATTC). For example, if there were a total allowable catch of north Pacific albacore with an allocation to the U.S., the internal allocation between sectors could be done through the Council as with Pacific halibut; or it could be done by the Secretary of Commerce in consultation with the Council and the member States."

The consequence of these conditions or actions is that the Council needed to address immediate HMS fishery management regulation issues rather than to prepare only a framework plan. The Council agreed that it might not be sufficient to simply leave in place existing state or federal regulations (under other authorities) or simply defer to state regulations.

1.5 Purpose and Need for FMP

West Coast-based fisheries for HMS currently are managed by the States of Washington, Oregon and California, except that federal regulations have been implemented in specific instances (see section 7.2). So far, the states have been able to resolve local management problems without the need for regional management measures and may continue to do so with or without an FMP. But the momentum is building for international management of Pacific HMS under the auspices of the IATTC and the new Commission in the Western and Central Pacific. At a minimum, there will be a need to implement, in the U.S. EEZ and on the high seas, management measures that may be adopted by these international bodies. With an FMP, the Pacific Council is prepared to become involved in how these measures are applied to domestic fisheries. The councils are well equipped to work with the fishery constituents in their areas to develop domestic policy. In addition, an FMP provides a mechanism for the Pacific Council to obtain public comment and provide advice to NMFS and the Department of State for effective representation of West Coast interests in international negotiations and decision-making affecting those interests.

The fisheries for HMS, with the exception of the swordfish drift gillnet fishery in California, are among the few remaining open access fisheries on the West Coast. However, some in the fishing industry are concerned that problems in other fisheries will result in increased participation in HMS fisheries with negative impacts. In response to this concern, the Pacific Council adopted a control date of March 9, 2000 for commercial and charter fisheries for HMS, in anticipation that a limited access program may be needed in the near future. This date was announced in the *Federal Register* as an advance notice to the public that a limited entry program may be adopted, and that any new entrants in the fishery after the control date may not qualify for a permit. Control dates are established to minimize the rush of new entrants in a fishery that often occurs when limited entry is being considered. If the Council decides that it is necessary, the implementation of a limited access program will be facilitated by an FMP.

Once in place, an FMP provides a mechanism to address any interstate management issues or conflicts that may arise, such as those addressed by the interjurisdictional plan for thresher sharks. An FMP is backed by federal regulation and enforcement, whereas interstate plans are not binding on the states. Currently, there are inconsistencies in the regulations promulgated by Washington, Oregon and California. For example, Washington and California prohibit the use of pelagic longlines, but Oregon allows longlining with a special permit. California allows drift gillnetting, but Washington does not, and Oregon allows drift gillnetting for swordfish, but not for thresher shark. These differences create the potential for management problems, which the FMP could resolve. These inconsistencies generally have not created management problems which require immediate federal action. This situation could change.

Currently, one of the most controversial HMS issues is the use of pelagic longlines inside 200 miles off California. This gear currently is not allowed inside 200 miles off California, but longliners may fish outside 200 miles and land in California ports. Some drift gillnetters have proposed a limited longline fishery in the zone to target tunas and swordfish, with effort and area restrictions. The intent is to evaluate longline gear as an alternative gear type to reduce bycatch, or bycatch mortality, and to reduce protected species interactions. Recreational fishing interests are opposed to such a fishery, and the environmental community has major concerns.

With respect to longlining on the high seas, the major concern is consistency with regulations affecting longliners based in Hawaii. Large areas of the north Pacific have been closed to longline fishing targeting swordfish by vessels with a Western Pacific longline permit in order to protect turtles. Vessels without a Western Pacific permit, including those landing in West Coast ports, are not constrained by these regulations. This inconsistency needs to be addressed. The initial federal regulations need to address such issues as where and to what extent longline fishing will be allowed.

An FMP provides the vehicle to address issues of regional, national and international concern. The conservation community has raised concerns about the status of HMS, essential fish habitat, and bycatch of fish and capture of protected species in HMS fisheries. International and U.S. policies reflect these concerns. The 1995 Agreement on Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks provides that nations will cooperate in regional management bodies to establish and ensure compliance with conservation measures for HMS. The 1993 Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, adopted by the Food and Agriculture Organization of the United Nations (FAO), requires nations to maintain a registry of authorized vessels fishing on the high seas and ensure that such vessels are marked for identification and that they report sufficient information on their fishing activities. The High Seas Fishing Compliance Act is the domestic legislation enacted in 1995 to implement the FAO Agreement. The FAO also was the forum for the negotiation of a non-binding "Code of Responsible Conduct of Fisheries" which establishes principles for national and international fishery management. The final text of this code was negotiated in September 1995 and the NMFS has completed an implementation plan for the U.S. In 1999, the FAO adopted an International Plan of Action for the Conservation and Management of Sharks, which encourages nations to assess the status of shark stocks within their EEZs and those fished on the high seas. The U.S. has developed a National Plan of Action for conservation and management, and an FMP can help by focusing research and data collection efforts to support the National Plan. Within the U.S., the Magnuson-Stevens Act requires councils to describe and identify essential fish habitat, minimize to the extent practicable adverse effects on habitat caused by fishing, and identify other actions to encourage conservation and enhancement of habitat. The Act requires that conservation and management measures, to the extent practicable, minimize bycatch and to the extent that bycatch cannot be avoided, minimize the mortality of such bycatch. Finally, the Marine

Mammal Protection Act, Endangered Species Act and Migratory Bird Treaty Act provide protections for special resources. An FMP serves as a mechanism to address these critical issues in an open process and with the advice of all concerned.

An FMP provides a basis to increase federal investment in research, data collection and stock assessments for Pacific HMS. Knowledge of stock status is quite limited for many species. Increased funding is necessary to make sure that overfishing is prevented and that sustainable yields are provided for the long term. An FMP also can help to make sure that fishery data gaps and inconsistencies for HMS are addressed.

An FMP provides a mechanism for collaboration with the other Pacific area councils to achieve more consistent management of fisheries which harvest stocks in common. In particular, there is a need to ensure that some or all restrictions on Hawaii-based longliners to protect turtles and birds also apply to West Coast-based longliners. Also, the councils and the NMFS science centers in both regions should work together in the preparation of stock assessment and fishery evaluation (SAFE) reports on a regular basis. The councils should receive consistent scientific advice concerning the status of stocks which vessels from the different council areas harvest in common.

1.6 Management Context

1.6.1 Inter-American Tropical Tuna Commission (IATTC)

The U.S. is a member of the IATTC, which was established in 1950. Pursuant to the Tuna Conventions Act, NMFS promulgates regulations to carry out IATTC recommendations that have been approved by the Department of State. NMFS has implemented procedural regulations by which to announce IATTC quotas and associated management measures (e.g., incidental catch allowances when directed fishery quotas have been reached). Other IATTC recommendations take longer to implement through full rule-making procedures, including provision for a public hearing, under the Tuna Conventions Act. While the IATTC Convention does not specify the geographic boundaries of the eastern Pacific Ocean, under regulations at 50 CFR Part 300, Subpart C, 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.

Historically, the IATTC focused almost exclusively on tropical tuna species (and especially yellowfin tuna) taken in purse seine, baitboat and longline fisheries. Stock assessments are conducted regularly on tropical tunas and occasionally on albacore and northern bluefin tuna and striped marlin. The species under IATTC purview include all HMS in the Convention Area, and the scope of interest of the IATTC has expanded in recent years to include conservation measures to address additional species (e.g., bigeye tuna), fleet capacity (with focus on the purse seine sector), bycatch concerns in purse seine and longline sectors, the use of fish aggregating devices, and compliance.

In the past several years, NMFS has finalized regulations to carry out IATTC recommendations of special interest to this FMP. First, a regulation was implemented to collect vessel information for a regional register of all vessels that have harvested HMS in the IATTC Convention Area. The vessel register is intended to assist the IATTC in monitoring the international fisheries and supporting efforts to enhance compliance with IATTC conservation measures. The register will likely also prove very useful to the Council in its monitoring of West Coast-based HMS fisheries.

Second, a regulation was implemented to carry out a pilot bycatch reduction program. Under this program, purse seine vessels are required to retain and land all tuna brought on board the vessel, while releasing safely to the extent practicable all non-tuna species brought on board and taking special measures to minimize harm to any sea turtles caught in the purse seine. This approach was undertaken to deal with bycatch concerns. It is hoped that the full retention requirement will encourage the development of gear or techniques that will reduce the amount of low-value tuna (especially small yellowfin and bigeye tuna) brought on board so that the vessels will not be economically disadvantaged by the full retention program. This pilot program is to run through 2004, at which point IATTC will evaluate the effects and effectiveness of the program.

The regulations currently implementing this convention also require that U.S. purse seine vessel operators maintain logbooks of catch and effort and to make them available to U.S. enforcement and fishery officials for inspection. If IATTC logbooks are maintained and submitted to IATTC, then the federal reporting requirement is met.

In addition, at its 2002 meeting, the IATTC went one step further and adopted a recommendation to use the vessel register as the authoritative source of identified purse seine vessels qualified to fish for tuna in the Convention Area in the future. NMFS will be required to promulgate regulations to implement this measure if the Department of State approves it.

The IATTC Convention is not entirely consistent with the Magnuson-Stevens Act. The Convention establishes a simple goal of achieving maximum sustainable yields from the tuna stocks and not optimum yield from the complex of HMS species in the Convention Area. It is only in the Convention Area that regulations to implement IATTC recommendations generally apply; NMFS has not attempted to apply IATTC recommendations beyond these waters. Further, the Tuna Conventions Act does not provide authority to manage U.S. fisheries for tuna in the Convention Area except as called for by IATTC recommendations approved by the Department of State. However, the IATTC and FMP management programs can support each other. In the future, the FMP could provide a mechanism to implement certain measures agreed to by the IATTC or to ensure that regulations adopted to apply in the Convention Area are complemented if necessary and appropriate by regulations to apply to U.S. vessels fishing the same stocks in waters beyond the Convention Area. The Council HMS management process also can serve to help in formulating or evaluating management recommendations that the U.S. delegation (headed by the Department of State) can take to the IATTC for consideration or possibly to comment formally on IATTC proposals and actions. Any permits and data reporting required by this FMP can aid the U.S. in being responsive to IATTC requests for information. Conversely, data collected or reported under the Tuna Conventions Act can be provided to support implementation of this FMP. It is noted that the Department of State is restructuring its general public advisory committee, and there may be some overlapping interests in both that committee and the Council's HMS advisory subpanel or Council membership.

The International Dolphin Conservation Program Act (IDCPA) was established in 1992 by the Agreement on the Conservation of Dolphins and was revised and extended in 1999 by the Agreement on the International Dolphin Conservation Program. The IATTC provides the secretariat for the Program. The objectives of the Program are: 1) to progressively reduce incidental dolphin mortalities in the purse-seine fisheries in the Agreement Area to levels approaching zero, by setting annual limits; 2) to seek ecologically sound means of harvesting large yellowfin tuna not in association with dolphins; and 3) to ensure the long term sustainability of tuna and other species and to avoid, reduce and minimize bycatch and discards of juvenile tunas and non-target species. The bycatch provisions referred to above are consistent with the IDCPA.

1.6.2 U.S.-Canada Albacore Treaty

In 1981, the United States and Canada entered into a treaty regarding fishing for albacore tuna in the eastern Pacific. Under the treaty, U.S. albacore vessels are authorized to fish for albacore in waters under the jurisdiction of Canada and more than 12 miles from the baseline from which the territorial sea is measured and to use certain port facilities in Canada. Albacore may be landed in that port for sale, export, or transshipment back to the U.S. Similarly, Canadian vessels are authorized to fish in waters under U.S. jurisdiction more than 12 miles from the baseline from which the territorial sea is measured and to use certain U.S. ports to obtain supplies and other services. Albacore may be landed in those ports for sale, export, or transshipment back to Canada. The parties annually exchange lists of vessels that may fish in the other nation's zone, though these lists are not binding (that is, a vessel on a list is not obliged to fish in the other nation's waters). Logbooks of catch and effort are to be maintained, and the nations are to exchange data on the fisheries. There is no legislation to implement the Treaty.

The implementation of the treaty has been sporadic. Vessel lists have been exchanged, but there have not been regular exchanges of data, nor has there been an effective monitoring program to determine the level of fishing by each nation's vessels under the treaty. In recent years, there has been much more fishing by Canadian vessels in U.S. waters than fishing by U.S. vessels in Canadian waters. In fact, in 2000, the level of fishing by Canadian vessels and the consequent crowding on the grounds resulted in calls by some in the U.S. troll industry to convene a meeting to discuss the treaty with Canadian officials. Such a meeting was held in November 2000. There was agreement on a number of immediate steps, including a need for cooperative efforts to establish a better data collection and exchange program and action to establish "check-in, check-out" procedures so that the level of fishing in each zone by the vessels of the other nation can be monitored effectively. There also was general agreement that future meetings would be necessary to consider negotiation of amendments to the treaty to address the U.S. troll industry concerns as well as to ensure full exchange of information about management problems and possible solutions. Both nations are developing management programs for albacore fisheries and both parties recognize that effective albacore conservation will require international cooperation, whether through the IATTC, the MHLC, or some other mechanism.

There have since been three negotiating sessions (April and June 2001 and April 2002), and agreement was reached at the last session on changes in the Treaty. Under that agreement, limits on reciprocal fishing would be implemented and there would be a gradual decrease over three years in the allowable foreign fishing by vessels of one party in the waters of the other party. Specifically, beginning in 2003 (assuming that legislation is enacted and regulations are implemented), there would be a three-year regime for reciprocally limiting effort by U.S. and Canadian troll albacore fishing vessels' activities in each other's waters. Canadian effort would be limited in terms of numbers of vessels; U.S. effort would be limited in terms of vessel months. This is intended to provide relatively equal fishing opportunity. The limits would gradually be reduced over the 3-year period, though the agreement provides some flexibility to carry over "unused" effort from one year to the next. The target for implementation is the 2003 season, pending (a) legislation by Congress to authorize U.S. regulations to limit the U.S. fishery and (b) NMFS rule-making for procedures to monitor entry and exit of vessels against the limits each year so that, if a limit is reached, the fishery would be "closed" in a timely manner.

The limits would be as follows:

	Canadian boats in the U.S EEZ	U.S. effort in Canadian EEZ
2003	170 vessels	680 vessel-months
2004	140 vessels	560 vessel-months
2005	125 vessels	500 vessel-months

After the third year, the Parties can extend the agreement for one year or more, but if no agreement is reached, then a default of 75% of the third year would be implemented. Further meetings of the Parties and industries will be necessary to develop and implement effective reporting and monitoring mechanisms to ensure that fishing remains within the limits.

1.6.3 Central and Western Pacific Convention

The FMP could provide a mechanism for implementation of U.S. responsibilities under an international agreement to conserve central and western Pacific HMS. The U.S. participated in negotiation of and signed the new international agreement developed through the Multi-Lateral High Level Conference for Conservation and Management of Tuna and Tuna-Like Species of the Central and Western Pacific (MHLC). This effort was undertaken to develop an international arrangement to achieve long term conservation and management of

HMS in the central and western Pacific. The Convention is subject to ratification, acceptance or approval of the signatories before it goes into effect. Some major participating nations have not yet signed the agreement. While there are many specific points that the final agreement did not definitively resolve, it seems to be recognized that overall catch limits will be necessary to guard against overfishing. It also is likely that the initial focus will be on conservation of tropical tunas (skipjack, yellowfin, bigeye). While West Coast interests may seem only peripherally involved, it should be noted that there will be a "northern panel" that may make recommendations for management of such species as swordfish, albacore, and bluefin, all of which are of interest to West Coast fisheries. It will be important for the MHLC arrangement to coordinate with the Inter-American Tropical Tuna Commission on stocks that occur in waters of both entities' purview. It is already expected that scientists from both areas will frequently meet and will develop protocols for exchanging information and collaborating on stock and fishery assessments for shared stocks.

1.6.4 United Nations Agreements

The FMP may provide a mechanism for implementing U.S. responsibilities under the United Nations Agreement on the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (known as the UNIA) under the Law of the Sea Treaty. The UNIA interprets the duty of nations to cooperate in conservation and management of fishery resources. Measures adopted in the EEZ of a coastal state and by any international arrangement for HMS in the region should be compatible. A coastal state should not adopt measures that would undermine the effectiveness of regional measures to achieve conservation of the stocks. In the case of the Pacific Council, for example, while the UNIA does not dictate how management of HMS fisheries in the U.S. EEZ should be carried out, the UNIA requires that EEZ management be compatible with management under any international arrangement (such as the IATTC, for species that are under IATTC conservation measures). The UNIA is now in force as the requisite number of nations has ratified it.

The U.S. also has participated in deliberations and decisions of the Food and Agriculture Organization of the United Nations (FAO) that have implications for HMS management under the FMP. The Committee on Fisheries of FAO has agreed to international plans of action dealing with shark conservation, seabird interactions with longline gear, and fishing capacity. In turn, the United States has developed national plans of action (NPOAs) to carry out the objectives of the international plans of action. The FMP can provide a mechanism for considering and implementing specific actions that support these national plans of action. In fact, the seabird avoidance measures proposed in this FMP are consistent with the seabird NPOA.

1.6.5 High Seas Fishing Compliance Act (HSFCA)

The FMP also may provide an implementing mechanism for the U.N. Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, which was adopted by the U.N. Food and Agriculture Organization (FAO) in November 1993. It establishes the responsibility of each nation for the actions of vessels fishing under that nation's flag on the high seas. The agreement requires that vessels have specific authorization from their flag nation to participate in high seas fishing. Further, nations must maintain a registry of authorized vessels, ensure that those vessels are marked for identification according to international standards, and ensure that they report sufficient information on their fishing activities. The High Seas Fishing Compliance Act (HSFCA) is the domestic legislation enacted in 1995 to provide authority to the Secretary of Commerce to implement this FAO Agreement.

NMFS has implemented regulations requiring U.S. vessel operators fishing on the high seas to maintain and submit records of catch and effort on their high seas fishing activities. The reporting requirement would be met if a vessel operator is reporting in compliance with regulations under another federal statute (e.g., MSFCMA requirements). Thus, longline vessel operators fishing outside the EEZ, but based on the West Coast, must maintain and file the new federal logbook, and West Coast albacore trollers must maintain and file a troll logbook. NMFS provides the required forms or logbooks. Fishermen are not required to report catch and effort within the EEZ under this requirement, although NMFS has asked that all activity be recorded. The

FMP can supersede the HSFCA reporting requirements and thus provide a mechanism to harmonize eastern and western Pacific fishery reporting and monitoring mechanisms.

1.6.6 Western Pacific Pelagics FMP

Initial FMP

The initial Western Pacific FMP was adopted in 1987 and included initial estimates of maximum sustainable yield (MSY) for the stocks and set optimum yield (OY) for these fisheries in the EEZ. The regulations applied to domestic and foreign fishing for billfishes, wahoo, mahimahi, and oceanic sharks. Among the original regulations were a prohibition on drift gillnet fishing within the region's EEZ and provisions for experimental fishing permits. The FMP prohibited foreign longline vessels from fishing within certain areas of the EEZ. Additional areas up to 150 nm from Guam and the main Hawaiian Islands and up to 100 nm from the Northwestern Hawaiian Islands may be closed to foreign longline vessels if their fishing activity is causing adverse impacts on domestic fishery performance, excessive waste of catch, excessive enforcement costs, or adverse effects on stocks. No legal foreign longline fishing has occurred under the FMP.

The initial FMP defined optimum yield as the amount of each species in the management unit that will be caught by domestic and foreign vessels fishing in the EEZ in accordance with the measures in the FMP. At that time, the principal concern was regulation of the foreign longline fishery in the EEZ to ensure that foreign catches of billfish, mahimahi, wahoo, and oceanic sharks would not adversely affect domestic commercial and recreational fisheries for these species.

The initial FMP specified domestic annual harvest and total allowable level of foreign fishing in non-numeric terms, i.e. the amount of fish that could be caught while fishing in accordance with the management measures in the FMP. The FMP also addressed joint venture processing for billfish and other non-tuna species by stating that practically all fish caught be vessels in the EEZ are landed in a whole or dressed state without processing, and processors handle whatever processing that is performed; thus, there is no allowance for joint venture processing.

Amendment 1

The FMP was first amended on 29 June 1991. Amendment 1 included: (a) a measurable definition of recruitment overfishing for billfishes, mahimahi, wahoo, and ocean sharks; (b) a revised definition of OY; and (c) a revised set of objectives to bring the FMP objectives into accord with the definitions of overfishing and the revised definition of OY.

Amendment 2

The second amendment to the Western Pacific FMP, implemented on 31 May 1991, made permanent several regulations for domestic longline vessels first established by emergency interim rules. These regulations require longline vessels to have federal permits and maintain federal fishing logbooks. The regulations also authorized the placement of observers on longline vessels intending to fish within 50-nm "study areas" around certain areas in the Northwest Hawaiian Islands, to document the level of interaction with protected species. The existing observer requirement was nullified by Amendment 3.

Amendment 3

The third amendment to the Western Pacific FMP, implemented on 18 October 1991, made permanent previous emergency actions to establish a protected species zone in the Northwest Hawaiian Islands, in which pelagic longline fishing is prohibited. The zone was created to protect endangered Hawaiian monk seals. This action effectively abrogated the regulations for the placement of observers in the 50 nautical mile study areas created by Amendment 2. However, Amendment 3 includes framework provisions allowing the NMFS Regional Administrator, in consultation with the Western Pacific Regional Fishery Management Council, to modify conservation and management measures in response to changes in the fishery or new information on protected species. In September 1991, the Council requested the RA implement through this framework procedure a mandatory observer program for the longline fishery throughout its range to collect more information on longline-turtle interactions.

Amendment 4

The fourth amendment to the Western Pacific FMP, implemented on 16 October 1991, extended previous emergency interim rules that were implemented to arrest the rapid growth of the Hawaii-based longline fishery. Amendment 4 established a moratorium on new participants from entering the Hawaii fishery for a total of three years, including the six months of the emergency actions, with limited exceptions for persons who had made certain financial commitments, and for participants in the lobster fishery. A longline vessel fishing in the Hawaii EEZ or using the EEZ with pelagic species on board, or landing pelagic fishing in Hawaii, must have a limited entry permit. A one-time transfer of this limited entry permit was allowed during the three year moratorium. The Council halted the expansion of the fishery to provide a period of stability during which data could be collected and analyzed to assess the impacts of increased longline effort. The moratorium expired on 22 April 1994.

Amendment 5

The fifth amendment to the Western Pacific FMP, implemented on 4 March 1992, closed certain areas around the main Hawaiian Islands and Guam to pelagic longline fishing. This action was intended to prevent gear conflicts and vessel safety issues arising from interactions between longliners and smaller fishing boats. Amendment 5 also provided a framework mechanism to modify the area closures if new information indicates that a change is necessary to meet the objectives of the FMP. A seasonal reduction in the size of the closure was implemented on 6 October 1992.

Amendment 6

The sixth amendment to the Western Pacific FMP, effective 27 October 1992, was adopted in response to an amendment to the MSFCMA to include all tuna species as fish under U.S. management authority. Amendment 6 included tuna and related species of the genera *Allothunnus* spp., *Auxis spp.*, *Euthynnus* spp., *Gymnosarda* spp., *Katsuwonus* spp., *Scomber* spp., and *Thunnus* spp. These genera contain all tuna species caught in the EEZ or by vessels based in the region. Amendment 6 also incorporated a definition of overfishing for tuna and related species that is consistent with that developed for the other management unit species in Amendment 1. The regulations established by Amendment 6 extended all domestic longline restrictions (area closures, no new fishing in the Hawaii EEZ, etc.) to prospective foreign longline vessels. Areas closed to longline fishing were also closed to foreign purse seine and baitboats. Finally, Amendment 6 extended general foreign fishing permit and observer requirements to all foreign pelagic fishing vessels, regardless of their gear type and target species.

Amendment 7

Amendment 7 (January 1994) addressed the concerns regarding the impacts of longline fishing on fish resources, other pelagic fisheries in Hawaii, and protected species. Swordfish is the only stock that the U.S. longline fishery has the potential, if unregulated, to negatively impact on a stock-wide basis. Managing the growth of the longline fleet that is permitted to land their catch in Hawaii was considered a prudent measure to address stock conservation concerns, even though much larger distant-water fishing fleets from other nations participate in the same fishery. In addition, Amendment 7 added several pelagic species caught by the longline fishery, including moonfish or opah (*Lampris sp.*), pomfret (pelagic spp. of family *Bramidae*), and oilfish or walu (family *Gempylidae*). Overfishing definitions for these species are also added.

Amendment 7 modified the Pelagics FMP by establishing a new limited entry plan for the longline fishery based in Hawaii. The new program replaced a moratorium on new entry to the longline fishery. The limited entry program and longline area closures address the concerns of catch competition among longliners and commercial and recreational troll/handline fisheries. (The area closures required longline fishers to operate a minimum of 50-75 miles from shore.) The limited entry program also helps retard takes of protected species such as sea birds and turtles.

The specific provisions of the limited entry program are:

- Persons eligible for permits were initially those who were longline limited entry permit holders at the end of the moratorium and (a) whose vessels were used to make at least one landing in Hawaii of longline-caught fish during the moratorium; or (b) whose vessels were smaller than 40 feet in length, or those people who qualified for or would have qualified for a longline limited entry permit due to eligibility for a limited entry permit for the lobster fishery in the Northwestern Hawaiian Islands (the latter would be exempt from the landing requirement).

  If an individual or corporation has more than one permit, new permits would be issued to replace each qualifying permit. The former requirement was eliminated for limited entry permit holders to have a separate general longline fishery permit in non-Hawaii areas managed under the Pelagics FMP.

- Permits are transferable with or without a vessel, subject to the restriction on vessel upgrading. A vessel owner can upgrade a vessel up to the length of the longest vessel that was active under the moratorium. One intent of these provisions was to give permit holders the ability to obtain vessels large enough to fish beyond the nearshore closed areas and safely reach international waters where swordfish and bluefin tuna are most frequently caught. Limiting the number of longline vessels and restricting upgrades were expected to prevent any adverse impacts on fish stocks, other fisheries, and protected species.

- The amendment includes broad framework procedures for the adjustment of management regulations in the event new information on the fisheries and the status of the stocks demonstrates the need for such action. The framework process provides for adjustments in fleet size (upward or downward), catch, and/or effort. Adjustment mechanisms could include, but are not limited to, fractional licensing, consolidation of permits, different types of permits, or individual quotas. The framework procedures include all elements of the limited entry program, as well as area closures and exemption criteria previously covered under framework procedures established by earlier amendments, along with changes in permit conditions and modifications of the reporting and observer requirements for longline vessels. The framework procedures allow adjustments to be made through a single action in the Federal Register, following one or two Council meetings at which the opportunity for public input was provided. The intent is to allow for more rapid adjustment, when necessary, since an amendment to the FMP would not be required for most actions.

- Longliners holding a Hawaii limited entry permit would be required to have only one federal permit to fish throughout the Western Pacific region.

- The NMFS Southwest Regional Administrator is allowed to charge fees to cover the costs of administering limited entry permits.

- Domestic longliners without Hawaii limited entry permits are allowed to transit the EEZ or enter Hawaii ports to re-provision, but are prohibited from offloading their catch. This port call privilege, formerly granted to foreign longliners, was unavailable to U.S. vessels during the moratorium.

The amendment is complemented by provisions that will be implemented under framework procedures already in the FMP, to authorize the NMFS Southwest Regional Administrator to place observers aboard permitted longline vessels, and to implement a requirement for longliners to carry an electronic vessel monitoring system. In September 1993, the Western Pacific Regional Fishery Management Council requested the RA to establish a mandatory observer program for the longline fishery and to implement a vessel monitoring system through the framework provisions of Amendments 3 and 4, respectively.

Amendment 7 also modified the definition of OY to clarify that OY encompasses fishing by all vessels to the extent regulated by the FMP.

Protected Marine Resources and Longline Fishery Interactions

Twelve federally protected marine animals are known to have interactions with Hawaii-based longline vessels within or beyond the EEZ surrounding the Hawaiian archipelago. (1) Marine Mammals: Hawaiian monk seal (*Monachus schauinslandi*) - endangered; Humpback whale (*Megaptera novaeangliae*) - endangered; False killer whale (*Pseudorca crassidens*) - protected; Dolphin spp. - protected. (2) Sea Turtles: Green turtles (*Chelonia mydas*) - threatened; leatherback turtle (*Dermochleys coriacea*) - endangered; Olive ridley turtle (*Lepidochlys olivacea*) -endangered; Loggerhead turtle (*Caretta caretta*) - threatened; Hawksbill turtle (*Eretmochelys imbricata*) - endangered. (3) Sea Birds: Laysan albatross (*Phoebastria immutabilis*) - protected; Black-footed albatross (*P. nigripes*) - protected; Short-tailed albatross (*P. albatrus*) - endangered; Booby (*Sula* sp.) - protected.

Species in the Management Unit

The Western Pacific FMP, as amended through Amendment 7, includes the following fish species:

mahimahi (dolphinfish)	*Coryphaena* spp.
marlin and spearfish	*Makaira* spp.
	Tetrapturus spp.
oceanic sharks	family *Alopiidae*
	family *Carcharhinidae*
	family *Lamnidae*
	family *Sphyrnidae*
sailfish	*Istiophorus* spp.
swordfish	*Xiphias* sp.
tuna and related spp.	*Allothunnus* sp.
	Auxis spp.
	Euthynnus spp.
	Gymnosarda sp.
	Katsuwonus sp.
	Scomber spp.
	Thunnus spp.
wahoo	*Acanthocybium* sp.
moonfish (opah)	*Lampris* sp.
pomfret	family *Bramidae*
oilfish (walu)	family *Gempylidae*

Longline Fishery Restrictions to Protect Sea Turtles and Seabirds

On December 27,1999 (64 FR 72290), NMFS issued, under the authority of the Magnuson-Stevens Act, an emergency interim rule, effective for 180 days, closing certain waters to fishing by the Hawaii based longline fishery. The intent was to reduce adverse impacts to sea turtles resulting from the fishery while NMFS prepared a comprehensive EIS for the FMP. The objective was to have appropriate time and area closures based upon the greatest benefit to sea turtles while considering the costs to the longline fishery. Subsequently, NMFS issued a proposed rule (65 FR 8107, February 17, 2000), requiring possession and use of line clippers and dip nets aboard vessels registered for use under a Hawaii longline limited access permit. Line clippers and dip nets were to be used to disengage sea turtles hooked or entangled by longline fishing gear. The rule required specific methods for handling, resuscitating, and releasing sea turtles. The final rule was published on March 28, 2000 (65 FR 16346). The December 27, 1999, emergency interim rule was extended on June 19, 2000 (65 FR 37917). The temporary area closure was maintained until December 23, 2000, or until new time and area closures, as imposed by the Court, were implemented by NMFS.

On July 5, 2000 (65 FR 41424), NMFS issued a proposed rule to require Hawaii-permitted operators to use two or more of six specific bird mitigation techniques when fishing with pelagic longline gear north of 25° N latitude; annually attend a protected species workshop conducted by NMFS; and release all hooked or entangled sea birds in a manner that maximizes their post-release survival. The rule was intended to reduce fishery impacts on black-footed and Laysan albatrosses that are accidentally hooked or entangled and killed by Hawaii pelagic longliners during the setting and hauling of longline gear. The rule was also expected to reduce the potential for interactions between pelagic longline fishing vessels and endangered short-tailed albatrosses, which are known to occasionally visit the Northwestern Hawaiian Islands.

On August 16, 2000 (65 FR 49968), NMFS published a notice of an August 4, 2000, order of the United States District Court for the District of Hawaii (65 FR 49968), which amended the Court's earlier Orders Of Injunction. The order would remain in effect until NMFS completed an EIS by April 1, 2001, analyzing the effect of fishing activities regulated under the Western Pacific Pelagics FMP. Under the order, certain areas were closed year-round to fishing by vessels engaged in the Hawaii-based pelagic longline fishery and other areas are seasonally closed. In certain areas, limitations were placed on fishing effort and 100 percent observer coverage was required. In the remaining area, fishing for swordfish was prohibited, observer coverage had to be increased to 10 percent by September 21, 2000, and to 20 percent by November 2, 2000, and vessel operators were required to submit written reports to NMFS within 5 days of returning to port of any swordfish taken during that trip. NMFS had be make observer reports available to the court by the first of each month, continue to require Hawaii longline vessels to carry and use NMFS-approved line clippers and dip nets, and continue its research into the effects of several different gear modifications to reduce or eliminate the incidental catch of sea turtles. On August 25, 2000 (65 FR 51992), NMFS published an emergency interim rule replacing the previous emergency rule and implemented the court's August 4th order. On November 3, 2000 (65 FR 66186), NMFS published changes to the emergency interim rule restricting fishing for swordfish in a specific area, established requirements for setting longline gear, and prohibited light sticks. On February 22, 2001 (66 FR 11120), NMFS published an extension to the emergency rule. On March 19, 2001 (66 FR 15358), NMFS published an emergency interim rule that closed the longline fishery during a specific period and clarified closure requirements. On April 19, 2001 (66 FR 20134), NMFS published a notice that announced the terms of the March 30, 2001, order of the court, which modified the previous order of August 4, 2000. The order restricted the Hawaii-based longline fishery based on the preferred alternative of the Final FEIS, which had been completed according to the court's order.

On June 12, 2001 (50 CFR Part 660, 66 FR 31561), NMFS issued an emergency interim rule, effective for 180 days, applicable to vessels registered for use under a Hawaii longline limited access permit. The rule: prohibits the targeting of swordfish north of the equator by Hawaii longline vessels; prohibits longline fishing by Hawaii longline vessels in waters south of the Hawaiian Islands (from 15° N latitude to the equator, and from 145° W longitude to 180° longitude) during the months of April and May; allows re-registration of vessels to Hawaii longline limited access permits only in October; imposes additional sea turtle handling and resuscitation measures; and requires all Hawaii longline vessel operators to attend an annual protected species workshop. This rule implements the order issued on March 30, 2001, by the court and supersedes the court's order of August 4, 2000, and the rule supersedes the emergency rules published on August 25, 2000; November 3, 2000; February 22, 2001; and March 19, 2001. Other parts of this emergency interim rule implement the terms and conditions contained in the November 28, 2000, Biological Opinion (BO) issued by the U.S. Fish and Wildlife Service on the effects of the Hawaii-based longline fishery on the endangered short-tailed albatross. To protect albatrosses, thawed, blue-dyed bait and practicing strategic discard of offal are required while fishing north of 23° N latitude. Observer coverage of 20% also is required. The rule is effective through December 10, 2001. On December 10, 2001 (66 FR 63631), the emergency rule was extended to June 8, 2002. This emergency rule also established basket-style longline gear as approved gear for the fishery.

On April 5, 2002 (67 FR 16323), NMFS published an emergency interim rule, also effective until June 8, 2002, which prohibits longline fishing north of 26° N latitude, and prohibits the retention or landing of more than 10 swordfish per trip by Hawaii longline vessels that fish north of the equator.

On April 29, 2002 (67 FR 20945), NMFS published a proposed rule establishing sea turtle take mitigation measures in the Hawaii-based longline fishery. The regulations would implement gear specifications for longline gear, prohibit targeting swordfish north of the equator, prohibit landing or possessing more than 10 swordfish per trip by longline vessels fishing north of the equator, establish a closed area during April and May south of Hawaii between the equator and 15° N latitude, and require all longline vessel operators to attend a protected species workshop annually. This rule would implement the reasonable and prudent measures of the March 29, 2001, biological opinion issued by NMFS under the Endangered Species Act. This proposed rule contains the 10 swordfish possession restriction that appears in the April 5, 2002, emergency interim rule mentioned above, but does not propose prohibiting longline fishing north of 26° N latitude.

On May 6, 2002 (67 FR 30346), NMFS published a proposed rule that would establish permit and reporting requirements for any U.S. fishing vessel that uses troll or handline fishing gear to harvest pelagic management unit species in waters around certain U.S. possessions in the western Pacific, referred to as Pacific Remote Island Areas.

On May 14, 2002 (67 FR 34408), NMFS published a final rule governing seabird mitigation measures in the Hawaii-based longline fishery. The regulations require fishermen to use line-setting machines and thawed blue-dyed bait and strategic offal discards during setting and hauling of longline gear. This rule codifies the terms and conditions of a biological opinion issued by the U.S. Fish and Wildlife Service on November 28, 2000, to protect the endangered short-tailed albatross. The rule also implements measures recommended by the Western Pacific Council in a proposed rule published on July 5, 2000 (mentioned above).

1.6.7 Relationship to Existing Fishery Management

As indicated in section 1.6.6, the FMP will provide a basis for harmonizing management of fisheries by U.S. vessels that fish in both the western and eastern Pacific. However, in addition, the FMP can be a mechanism for consolidating federal marine resources management responsibilities under a single set of rules. For example, the drift gillnet fishery is currently subject to controls under California law and regulations and under Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA) regulations. To obtain the complete set of regulations, a fisher would have to go to three sources. Under the FMP, additional regulations would be implemented under Magnuson-Stevens Act authority. It would be reasonable to seek an approach under which at the least, all federal regulations could be found in one place and under a single statutory authority. If the MMPA and ESA regulations were essentially integrated into the FMP process, then this could be accomplished. This would be consistent with the provision of the Magnuson-Stevens Act that a FMP must be consistent with other applicable law. It also would be consistent with the ESA mandate to use all available authorities to further the purposes of that law. Further, by incorporating these regulations into the FMP process, the Council and NMFS would effectively provide an open and continuing process for considering the possible need for changes in those regulations as conditions change or new information becomes available. Under this approach, fishery participants might find it easier to understand what is required and why.

1.6.8 Treaty Indian Fishing Rights

Legal Considerations

Treaties between the United States and numerous Pacific Northwest Indian tribes reserve to these tribes the right of taking fish at usual and accustomed grounds and stations ("u & a grounds") in common with all citizens of the United States. See U.S. v. Washington, 384 F. Supp. 312, 349-350 (W.D. Wash. 1974).

The National Marine Fisheries Service recognizes four tribes as having u & a grounds in the marine areas managed by this FMP: the Makah, Hoh, and Quileute tribes, and the Quinault Indian Nation. The Makah Tribe is a party to the Treaty of Neah Bay, Jan. 31, 1855, 12 Stat. 939. See 384 F. Supp. at 349, 363. The Hoh and Quileute tribes and the Quinault Indian Nation are successors in interest to tribes that signed the Treaty with the Quinault, et al. (Treaty of Olympia), July 1, 1855, 12 Stat. 971. See 384 F. Supp. at 349, 359 (Hoh), 371 (Quileute), 374 (Quinault). The tribes' u&a grounds do not vary by species of fish. U.S. v. Washington, 157 F. 3d 630, 645 (9th Cir. 1998).

The treaty fishing right is generally described as the opportunity to take a fair share of the fish, which is interpreted as up to 50 percent of the harvestable surplus of fish that pass through the tribes' u&a grounds. Washington v. Washington State Commercial Passenger Fishing Vessel Association, 443 U.S. 658, 685-687 (1979) (salmon); U.S. v. Washington, 459 F. Supp. 1020, 1065 (1978) (herring); Makah v. Brown, No. C85-160R, and U.S. v. Washington, Civil No. 9213 - Phase I, Subproceeding No. 92-1 (W.D. Wash., Order on Five Motions Relating to Treaty Halibut Fishing, at 6, Dec. 29, 1993) (halibut); U.S. v. Washington, 873 F. Supp. 1422, 1445 and n. 30 (W.D. Wash. 1994), aff'd in part and rev'd in part, 157 F. 3d 630, 651-652 (9th Cir. 1998), cert. denied, 119 S.Ct. 1376 (1999) (shellfish); U.S. v. Washington, Subproceeding 96-2 (Order Granting Makah's Motion for Summary Judgment, etc. at 4, November 5, 1996) (Pacific whiting). The court applied the conservation necessity principle to federal determinations of harvestable surplus in Makah v. Brown, No. C85-160R/ United States v. Washington, Civil No. 9213 - Phase I, Subproceeding No. 92-1, Order on Five Motions Relating to Treaty Halibut Fishing, at 6-7, (W.D. Wash. Dec. 29, 1993); Midwater Trawlers Co-op. v. Department of Commerce, 282 F.3d 710, 718-719 (9th Cir. 2002).

The treaty right was originally adjudicated with respect to salmon and steelhead. However, it is now recognized as applying to all species of fish and shellfish within the tribes' u&a grounds. U.S. v. Washington, 873 F.Supp. 1422, 1430, aff'd 157 F. 3d 630, 644-645 (9th Cir. 1998), cert. denied, 119 S.Ct. 1376; Midwater Trawlers Co-op. v. Department of Commerce, 282 F.3d 710, 717 (9th Cir. 2002) ["The term 'fish' as used in the Stevens Treaties encompassed all species of fish, without exclusion and without requiring specific proof. (citations omitted)"]

The original 1974 District Court decision in U.S. v. Washington specifically references a Makah tuna (albacore) vessel:

> There are presently eight [Makah] boats of commercial size fishing on the high seas. Three of these boats are gill netting in the Strait of Juan de Fuca, four are trolling, and one is tuna fishing. The commercial boats are thirty-six feet in length except that the tuna boat is fifty-four feet in length. (citation omitted) These boats were obtained by the tribe using its resources to acquire the boats and are managed by a tribal corporation. (citation omitted) These commercial boats go as far as fifty miles out to sea, east to Puget Sound and south to Westport and the Columbia River. (citation omitted)

U.S. v. Washington, 384 F.Supp. 312, 364-365 (W.D. Wash. 1974).

The National Marine Fisheries Service recognizes the areas set forth in the regulations cited below as marine u&a grounds of the four Washington coastal tribes. The Makah u&a grounds were adjudicated in U.S. v. Washington, 626 F.Supp. 1405, 1466 (W.D. Wash. 1985), aff'd 730 F.2d 1314 (9th Cir. 1984); see also Makah

Indian Tribe v. Verity, 910 F.2d 555, 556 (9th Cir. 1990); Midwater Trawlers Co-op. v. Department of Commerce, 282 F.3d 710, 718 (9th Cir. 2002). The u&a grounds of the Quileute, Hoh, and Quinault tribes have been recognized administratively by NMFS. See, e.g., 67 Fed. Reg. 30616, 30624 (May 7, 2002) (u&a grounds for salmon); 50 C.F.R. 660.324(c) (u&a grounds for groundfish); 50 C.F.R. 300.64(i) (u&a grounds for halibut). The u&a grounds recognized by NMFS may be revised as ordered by a federal court.

The legal principles described above support the conclusion that treaty Indian fishing rights apply to highly migratory species that pass through the coastal tribes' ocean u&a grounds. The quantity of this right has not yet been determined or adjudicated.

Prospective Tribal Fisheries for HMS

Three Makah boats are presently reported to fish for albacore. They fish mostly beyond the EEZ, but sometimes within the EEZ. Landings are either in Ilwaco, Washington, or in Canada pursuant to the "Treaty Between the Government of the United States of America and the Government of Canada on Pacific Coast Albacore Tuna Vessels and Port Privileges (1981)." One Makah fisherman is currently planning to fish for thresher shark. In addition, two Quinault boats and one Quileute boat plan to fish for HMS. Currently there is no regulatory impediment to the tribes' pursuit of HMS fisheries. However, it is possible that specific treaty Indian allocations may be necessary in the future. To anticipate this eventuality, and to establish an orderly process for implementing treaty fisheries, this FMP authorizes adoption of procedures to accommodate treaty fishing rights in the implementing regulations (see Chapter 8).

1.6.9 Other International Entities

Standing Committee on Tuna and Billfish (SCTB)

The SCTB evolved from a committee of international scientists charged with review of the work of the Offshore Fisheries Program of the Secretariat of the Pacific Community (SPC; formerly the South Pacific Commission) to a more general committee with the following terms of reference:

- Coordinate fisheries data collection, compilation and dissemination according to agreed principles and procedures;
- Review research on the biology, ecology, environment and fisheries for tuna and associated species in the western and central Pacific Ocean;
- Identify research needs and provide a means of coordination, including the fostering of collaborative research, to most efficiently and effectively meet those needs;
- Review information pertaining to the status of stocks of tunas and associated species in the western and central Pacific Ocean, and to produce statements on stock status where appropriate; and
- Provide opinion on various scientific issues related to data, research and stock assessment of western and central Pacific Ocean tuna fisheries.

Participation on the SCTB is open to scientists and others with an interest in the tuna fisheries of the western and central Pacific Ocean. The participation of scientists from coastal states and territories of the region, scientists from countries whose vessels fish in the region, and scientists from international tuna fishery management organizations is encouraged.

The 1999 annual meeting of the SCTB included 81 participants from American Samoa, Australia, Canada, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Japan, Kiribati, Korea, Nauru, New Caledonia, New Zealand, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Philippines, Samoa, Taiwan, Tonga, Tuvalu, USA, Vanuatu, Wallis & Fortuna, Forum Fisheries Agency, Inter-American Tropical Tuna Commission, and the SPC.

To perform its functions the SCTB formed a Statistics Working Group, and various species research groups which include skipjack, yellowfin, bigeye and albacore, and a research group for billfish and bycatch species.

Reports and information are available from the Secretariat of the Pacific Community, Noumea, New Caledonia.

Interim Scientific Committee (ISC)

The ISC evolved through a series of consultations between the U.S. and Japan with a twofold purpose:

- To enhance scientific research and cooperation for conservation and rational utilization of the species of tuna and tuna-like fishes which inhabit the north Pacific Ocean during a part or all of their life cycle; and
- To establish the scientific groundwork, if at some point in the future, it is decided to create a multilateral regime for the conservation and rational utilization of these species in this region.

The ISC membership can include coastal states/economies of the region and states/economies with vessels fishing for these species in the region. Observer participants include relevant intergovernmental fishery organizations, relevant intergovernmental marine science organizations and other entities with vessels fishing for these species in the region. Current membership includes Canada, Chinese-Taipei, Japan, Korea, Mexico, People's Republic of China, U.S., IATTC and SPC.

The functions of the ISC are to:

1. Regularly assess and analyze fishery and other relevant information concerning the species covered;
2. Prepare a report on its findings or conclusions on the status of such species such as trends in population abundance of such species, developments in fisheries, and conservation needs;
3. Strive to adopt reports and findings by consensus of all Members, however, it is not necessary that consensus is achieved on all matters, and reports and findings may reflect options and differing views when a consensus has not been achieved;
4. Formulate proposals for conduct of and, to the extent possible, coordinate international and national programs of research addressing such species; and
5. Consider any other matters, as appropriate, at the request of one of the members.

Species currently considered by the ISC include swordfish, bigeye tuna, northern bluefin tuna, yellowfin tuna, blue and striped marlins, and north Pacific albacore. Additional species such as sharks, wahoo, and sailfish may be considered at a later date.

1.7 Scoping

The Pacific Council engaged in a full scoping process under the National Environmental Policy Act (NEPA) prior to beginning development of the FMP. A scoping document was prepared to describe the fisheries and resources involved, to discuss the kinds of issues that might be addressed, and to provide a basis for soliciting public input on whether to develop an FMP and, if so, what kinds of issues and what kinds of measures should be considered and evaluated. The scoping document was distributed to more than 150 people and was also available on the internet. The states sponsored scoping meetings (one each in Oregon and Washington and two in California) to ensure that the public had an opportunity to discuss and make recommendations. The results of the scoping meetings were presented to the Council, which agreed to begin the plan development process with specific guidance to the Plan Development Team in November 1999. The Team outline for the FMP established that the FMP would be a combined EIS and FMP while also addressing all other legal requirements.

1.8 List of Preparers

This document was prepared by the Highly Migratory Species Plan Development Team of the Pacific Fishery Management Council, with contributions from other individuals.

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The EIS/FMP was prepared with the advice of members of the Council's Highly Migratory Species Advisory Subpanel, representing the fishing industry, recreational fisheries, the conservation community and the public.

Highly Migratory Species Advisory Subpanel (past and present members)

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Dr. Rod Fujita, Environmental Defense
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Mr. Wayne Heikkila, Western Fishboat Owners Association
Mr. Chuck Janisse, Federation of Independent Seafood Harvesters
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Ms. Heather Munro, consultant-processor representative
Mr. Anthony Nizetich, processor

Mr. Robert Osborn, United Anglers of Southern California
Ms. Cinda Shedore, F/V Cinda S
Mr. Bill Sutton, commercial fisher
Mr. Anthony Vuoso, processor
Ms. Kate Wing, Natural Resources Defense Council

1.9 Public Review Process and Schedule

At its public meeting of June 1999, the Pacific Fishery Management Council voted to begin development of an FMP for HMS fisheries based on the West Coast. Scoping sessions were held in October 1999 in four locations to receive public input on issues to be addressed in the FMP (see section 1.6). From December 1999 to November 2001, the HMS Plan Development Team held 14 work sessions open to the public to develop the FMP, including a range of options for managing HMS fisheries. The HMS Advisory Subpanel held eight public meetings during this period to comment on issues and drafts of the FMP. The Council addressed the FMP at eight meetings during this period and accepted public testimony at each meeting. At its November 2001 meeting, after public testimony, the Council adopted the draft EIS/FMP for public review. The formal public comment period on the DEIS was January 18 to March 4, 2002. Public hearings on the draft EIS/FMP were held as follows:

Olympia, WA	January 28, 2002
Astoria, OR	January 29, 2002
Coos Bay, OR	January 30, 2002
Eureka, CA	January 31, 2002
Monterey, CA	February 1, 2002
Long Beach, CA	February 2, 2002
San Diego, CA	February 4, 2002

From March through October 2002, the Plan Development Team met six times in work sessions open to the public to complete the draft EIS/FMP, and the HMS Advisory Subpanel held three public meetings to review the draft. The Council addressed the FMP at the March and June 2002 meetings, and at the October 29, 2002 session took final action on the EIS/FMP and directed the Plan Development Team, NMFS and staff to finalize the EIS/FMP and other required documents for submission to the Secretary of Commerce for review and approval. Public testimony was accepted at each meeting. The Plan Development Team met December 3-4, 2002 in a work session open to the public to review final revisions to the EIS/FMP.

Subsequently, NMFS notified the Council in January 2003 that it had recently received turtle interaction data from longline fishing operations that might have a bearing on the Council's preferred alternative for the West Coast-based high seas longline fishery. NMFS requested that the Council delay submission of the FMP to provide time for NMFS to conduct a rigorous review of the new data. At the March 2003 meeting, the Council reviewed a report from NMFS on this issue and decided to request its advisory entities to review the new information and report back at the June 2003 meeting. The HMS Advisory Subpanel and Plan Development Team and HMS Subcommittee of the Scientific and Statistical Committee met in April 2003 in public sessions to review the turtle analysis. At the June 2003 meeting, after hearing reports from its advisory entities and the public, the Council decided not to make any changes to the FMP. The Council believed that the information presented did not provide a basis for the Council to determine if the preferred alternative would cause jeopardy or risk to turtles.

1.10 Agencies and Organizations Consulted

Alaska Department of Fish and Game
California Department of Fish and Game
Coastal Zone Management Entities in Washington, Oregon and California

Commercial Fishing Organizations
Conservation Organizations
Environmental Protection Agency
Idaho Department of Fish and Game
Inter-American Tropical Tuna Commission
National Marine Fisheries Service
North Pacific Fishery Management Council
Oregon Department of Fish and Wildlife
Oregon State Police
Pacific States Marine Fisheries Commission
Port Authorities
Recreational Fishing Organizations
Sea Grant Agencies
Washington Department of Fish and Wildlife
U.S. Coast Guard
U.S. Department of State
U.S. Fish and Wildlife Service
Western Pacific Regional Fishery Management Council

1.11 Literature Cited

Pacific Fishery Management Council. 1981. Draft fishery management plan for billfish and oceanic sharks.

Pacific States Marine Fisheries Commission. 1990. Interjurisdictional fishery management plan for thresher shark.

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Chapter 2
DESCRIPTION OF THE FISHERIES

2.0 DESCRIPTION OF THE FISHERIES (ECONOMIC AND SOCIAL ENVIRONMENT)

This chapter describes the domestic fisheries for HMS based on the U.S. West Coast as well as foreign fisheries for HMS in the Pacific Ocean.

2.1 Description of the Domestic Fisheries and Fishing Gear

This section provides a general descriptive overview of the economic and social environment for HMS fisheries.

The fishery for highly migratory species (HMS) consists of the fish stocks and participants involved in their commercial harvest, commercial use, recreational harvest, and recreational use. The principal HMS harvested by vessels fishing in the exclusive economic zone (EEZ) or based on the West Coast include: north Pacific albacore (*Thunnus alalunga*), yellowfin tuna (*Thunnus albacares*), bigeye tuna (*Thunnus obesus*), skipjack tuna (*Katsuwonus pelamis*), northern bluefin tuna (*Thunnus orientalis*), 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*), striped marlin (*Tetrapturus audax*) and dorado (*Coryphaena hippurus*).

HMS are taken directly in fisheries that use many types of gears and vessels. Gears used to harvest HMS by directed commercial fisheries are primarily: surface hook-and-line, drift gillnet, harpoon, purse seine, and pelagic longline. HMS gears, and the corresponding primary target species, are identified by their state gear codes below:[1]

State	Gear Code	Description
Albacore Surface Hook-and-Line		
CA	1	Hook-and-Line (rod and reel)
CA	2	Live Bait
CA	6	Jig (Albacore)
CA	7	Troll (Albacore)
CA	9	Troll (Salmon)
OR	120	Ocean Troll
OR	170	Tuna Baitboat
WA	41	Troll Salmon
Swordfish and Shark Drift Gillnet		
CA	65	Gill Net, Drift
OR	140	Ocean Gillnet
Swordfish Harpoon		
CA	12	Harpoon (Plank)
Tuna Purse Seine		
CA	70	Encircling Nets
CA	71	Purse Seine and Ring Net
CA	73	Drum Purse Seine
CA	75	Lampara Net
Swordfish, Shark and Tuna Pelagic Longline		
CA	5	Long Line, Set

The recreational fishery for HMS targets albacore, yellowfin, skipjack, bigeye and northern bluefin tunas, striped marlin, swordfish, dorado, and mako, blue and thresher sharks using hook-and-line gear. The fisheries are composed of both private angler vessels and charter vessels (also known as head boats and commercial passenger fishing vessels (CPFV)).

Most HMS and the fisheries they support are distributed internationally with components in the EEZs of Canada and Mexico as well as in international waters outside of any country's EEZ. U.S. vessels' participation may reflect not only changes in domestic fishery conditions, but also changes in conditions, including the status of stocks, resulting from international fishing. Also, landings may be affected as much by market conditions as by stock conditions. These factors give rise to considerable variability in annual U.S. landings of HMS and corresponding exvessel revenues (Tables 2-1 and 2-2).

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[1] Some of these gears may also be used in non-HMS fisheries. HMS landings and exvessel revenue summaries reported for these gears herein are based on vessel trips using these gears, where HMS were the species that accounted for the largest share of the total landings for the trip, i.e. HMS were considered the directed, or target, species.

To provide a sense of the global enormity of HMS fisheries, world catches of the major market species of tuna are reported in Table 2-3. Pacific-wide catches of bluefin tuna are reported in Table 2-4, and Pacific Ocean and world catches of swordfish are shown in Table 2-5.

2.2 Characteristics of the Domestic Fisheries

This section describes the characteristics of the domestic fisheries: (1) the albacore fishery using surface hook-and-line gear and albacore harvesting using other gears; (2) the tropical tuna fisheries using purse seine, bait boat, pole-and-line, longline, and other gears; (3) the coastal purse seine fishery that concentrates on small pelagic species, especially northern anchovy and Pacific sardine, but which also harvest northern bluefin and yellowfin tuna when they migrate into the Pacific EEZ; (4) the swordfish and shark drift gillnet fishery and harpoon fishery; (5) the longline fishery based in California fishing for swordfish, tuna, and sharks beyond the EEZ; and, (6) the charter boat and private boat HMS sport fisheries.

Over the 1981-99 period, the most important HMS in terms of landings by all gear types were yellowfin, skipjack, and albacore tunas, swordfish, and common thresher shark. In recent years, the most important HMS have been albacore tuna, swordfish, and common thresher shark. By the end of the 1990s landings of yellowfin and skipjack tuna were substantially less than the amounts landed in the early 1980s. Bluefin tuna landings during the period were characterized by a high degree of variability. Through the 1980s and into the early 1990s albacore landings fell sharply, but by the late 1990s they had returned to relatively high levels of the late 1970s. Swordfish landings declined during the 1980s, but were on the rise through most of the 1990s. Common thresher shark landings followed a pattern similar to that for swordfish over the period. Landings of shortfin mako shark exhibited a fairly sharp decline over the 1981-99 period. Landings of pelagic thresher, bigeye thresher and blue sharks as well as dorado were relatively minor during the 1981-99 period (Table 2-1).

Over the 1981-1999 period, the most important HMS in terms of exvessel revenue (constant $1999), were albacore and swordfish, except for yellowfin and skipjack tunas in the early 1980s (Table 2-2). Although variable, bluefin tuna exvessel revenues were comparatively high during the period. Swordfish and common thresher shark exvessel revenues peaked in the mid-1980s, and then declined rather steadily through 1999. Over the more recent 1994-1999 period, albacore exvessel revenues have ranged from $12.4 million to $28.6 million, yellowfin tuna exvessel revenues from $1.5 million to $5.9 million, skipjack tuna exvessel revenues from $1.9 million to $5.6 million, bigeye tuna exvessel revenues from $0.3 million to $0.6 million, bluefin tuna exvessel revenues from about $1 million to $4.2 million, swordfish exvessel revenues from $6 million to $10.5 million, and from $0.5 million to $0.6 million for common thresher shark. Exvessel revenues from other HMS sharks and dorado during 1994-1999 were much smaller (Table 2-2).

Based on quantities of HMS landings and exvessel revenues available from the Pacific Fishery Information Network Management Database (PacFIN) for the 1981-99 period, the albacore surface hook-and-line fishery was the major HMS fishery off Washington (Tables 2-6 and 2-7). There were occasional landings of other HMS in Washington, but they were relatively insignificant. Oregon's major HMS fishery was also the albacore surface hook-and-line fishery. Minor amounts of swordfish have been landed in Oregon in recent years (Tables 2-8 and 2-9). The bulk of the HMS fisheries occur off California. Early in the period tropical tunas dominated the HMS landings in California (Tables 2-10 and 2-11). However when the U.S. tuna industry moved its processing operations offshore in the early 1980s albacore, bluefin tuna, swordfish and sharks became more important in the landings.

2.2.1 Albacore Surface Hook-and-Line Fishery

The west-coast based U.S. albacore fishery is comprised of vessels that predominately troll for albacore using jigs, and to a lesser extent live bait. Together, these gears (and other hook and line gears used to target albacore, see above) are known as surface hook-and-line gear and account for the bulk of West Coast albacore landings and exvessel revenues (Tables 2-12 and 2-13).U.S. landings by the surface hook-and-line fishery over 1981-1999 ranged from a 1991 low of 1,638 mt to a 1996 peak of 14,075 mt. More recently, from 1994-1999, landings ranged from a 1995 low of 6,472 mt to the 1996 high of 14,075 mt. U.S. hook-and-line landings over 1994-1999 have centered around 10,000 mt to 13,000 mt. Exvessel revenues, in constant \$1999, of the U.S. surface hook-and-line fishery over 1981-1999 ranged from a 1991 low \$3,259,841 to a 1981 peak of \$45,214,132. Over the more recent period of 1994-1999, exvessel revenues in constant \$1999 ranged from a 1995 low of \$12,278,606 to a 1996 high of \$28,434,020.

The bulk of the U.S. catch is canned as white meat tuna at canneries in American Samoa and Puerto Rico. A small amount of the catch finds its way into the fresh fish trade, which is a significant income to these participants. Other gears catching albacore in small amounts include drift gillnets, longlines, set nets, and recreational gears.

The U.S. annually takes less than 22% of the north Pacific albacore landed by all nations. U.S. troll vessels have fished for albacore in the north Pacific since the early 1900s. In recent years, the north Pacific albacore troll season has begun as early as mid-April in areas northwest of Midway Island. In July and August, the fleet moves eastward, fishing near 45° N latitude, 150° W longitude and along the West Coast of North America from Vancouver Island to southern California. Fishing can continue into November if weather permits and sufficient amounts of albacore remain available to troll gear.

The north Pacific troll fishery operates across the North Pacific and along the U.S. West Coast both inside and outside of the EEZ. Vessels operating outside of the EEZ are larger vessels, with no vessels less than 40 ft in length reported fishing outside the EEZ in 1998 and only 12 vessels less than 50 ft overall reported fishing outside the EEZ. The majority of the vessels operating beyond the EEZ are 50 ft or greater in length. By contrast, both big and small vessels fished inside of the EEZ.

The troll fleet is composed of an unknown number of vessels ranging from 16 ft to over 100 ft in length. The vast majority of vessels are 25 ft or greater. The total estimated number of vessels landing albacore peaked at more than 2,000 in the mid-1970s. Fewer vessels have been active in recent years with 741 reporting landings in 1996, 1,244 in 1997, 913 in 1998, and 775 in 1999. The number of larger vessels, greater than 50 ft , is relatively steady, ranging from 285 to 372 in the 1996 to 1998 period. In the years 1996 to 1998, the ratio of vessels less than 50 ft to vessels greater than 50 ft , was 1.6, 2.3 and 2.0 respectively, suggesting smaller vessels may move readily into the fishery as conditions warrant, and small vessels outnumber large vessels approximately two to one.

The South Pacific troll fishery annually takes about 2% of the total catch of South Pacific albacore. Exploratory fishing for albacore with troll gear in areas east of New Zealand in 1986 led to the expansion of the U.S. albacore troll fishery to the South Pacific. The fishery takes place during the austral summer months (November through April). The U.S. troll vessels that participate in the South Pacific fishery depart from the U.S. West Coast or Hawaii after the end of the North Pacific season and travel to American Samoa or French Polynesia to prepare for the South Pacific season. South Pacific albacore fishing areas extend from the Tasman Sea to approximately 110° W longitude between 25° S latitude and 45° S latitude. At the end of the season (in March or April), most troll vessels unload in American Samoa, Fiji, or Tahiti then travel to Hawaii or the U.S. West Coast to prepare for the next North Pacific fishing season.

Annual catch and effort in the U.S. south Pacific albacore fishery tends to be quite variable. Total South Pacific catch by U.S. troll vessels in the 1998-99 season decreased to 1,200 short tons (t) from 1,764 t landed in 1997-98 (Childers and Miller 2000) (Table 2-14). Twenty U.S. troll vessels participated in the 1998-99 South Pacific season compared to 37 vessels that fished in the 1997-98 season. Total fishing effort for the 1998-99 South Pacific albacore season is estimated to be 2,166 days, a decrease of 60% from 5,379 days fished in the 1997-98 season.

The basic troll vessel gear consists of between 8 and 12 (a few vessels use more) lines towed up to 30 m behind the vessel. Lateral spacing of the lines is accomplished by using outriggers or long poles extended to each side of the vessel with fairleads spreading 3 or more lines to each side, with the remainder attached to the stern. Terminal gear is generally chrome-headed jigs with varying colored plastic fringed skirts and a double barbless undulated hook. The gear is relatively inexpensive. Retrieval is done by hand or by powered gurdies, similar to salmon troll vessels.

Carrying capacity of troll vessels varies greatly with vessel size from 4.5 mt to more than 72 mt with larger vessels in the 22.5-36 mt range. Fish are frozen aboard using chilled brine, blast and plate freezing. Many small coastal vessels still use ice. Transshipment at sea is used by some vessels to extend the effective length of a fishing trip which might otherwise be limited due to carrying capacity. Catches are landed at ports along the U.S. West Coast, in Hawaii, or at canneries in American Samoa or Tahiti. Transshipped fish is generally landed in American Samoa.

Albacore may be discarded because they are undersized. Albacore troll vessels catch minor amounts of other fish species, usually while in transit to or from the fishing grounds. The primary species caught incidentally include skipjack tuna (*Katsuwonus pelamis*), bluefin tuna (*Thunnus orientalis*), yellowfin tuna (*Thunnus albacares*), dorado (*Coryphaena hippurus*), billfish, and sharks.

A few troll vessels carry small amounts of live bait, which is chummed under some conditions to aggregate albacore and improve catches. Very few vessels operate with bait only. The description of these vessels and operations is found under Tropical Tuna, Pole-and-Line Fishery. Albacore is taken in modest quantities by U.S. longline vessels off American Samoa.

Vessels participating in the coastal purse seine fishery target albacore on occasions when they available to the fishery in commercially viable quantities (section 2.2.3). Drift gillnet vessels operating off California, Oregon and Washington, and longline vessels targeting swordfish, beyond the West Coast EEZ also harvest modest amounts of albacore (sections 2.2.4.1 and 2.2.5). There is also an important recreational fishery for albacore, capturing up to 1,500 mt in some years (section 2.2.8).

Through the U.S.-Canadian albacore treaty, U.S. vessels can fish in Canadian waters and land in certain Canadian ports. A reciprocal arrangement holds for Canadian vessels. Table 2-15 reports Canadian landings for the years 1995-1999 in the U.S. West Coast ports. Tables 2-16 and 2-17 report the percentages of catch and effort by fishing areas for the U.S. and Canadian albacore vessels, respectively.

2.2.1.1 Washington

Prior to 1972, albacore landings in Washington were relatively small, ranging from 40 mt in 1953 to less than 3 mt in 1971. In recent years relatively large amounts of albacore tuna have been landed in Washington, ranging from 1,864 mt to 6,517 mt between 1992 and 1999 (Tables 2-18 and 2-19). Recent variations in tuna landings and exvessel revenues have likely been an indication of changes in availability, rather than effort, as the number of vessels participating in the fishery has been fairly constant.

The two major ports along Washington's coast which receive the most landings of albacore are Westport and Ilwaco. In addition to Westport and Ilwaco, there are several other Washington ports along the coast and in Puget Sound which typically receive albacore tuna landings. Most Washington ports have fishers selling albacore tuna directly to the public, which is small in volume, but critically important to the financial survival of the participating fishers. There is also an important recreational fishery for albacore of the Washington coast.

2.2.1.2 Oregon

Oregon has had a directed commercial fishery for albacore tuna since 1936. Annual albacore landings and exvessel revenues in Oregon have been highly variable. Landings have ranged between 490 and 4,800 mt annually over the 1981-99 period. In the last decade, catches have averaged about 2,200 mt (Tables 2-20 and 2-21). Variability in landings can be attributed to a combination of factors such as oceanic conditions, weather and markets.

The albacore fishery off Oregon is made up of local, out-of-state, and Canadian vessels that fish from about 50 to several thousand miles offshore. The smaller, ice boats usually make 3-5 day trips, and larger, freezer boats are out several weeks to several months at a time. In recent years, 300-500 vessels have landed in Oregon annually. In-state (Oregon) vessels made up 50-70% of the total fleet in the last five years. Also, in the last five years, the number of vessels from Canada that make landings in Oregon has increased. Oregon landings usually begin in July and continue through October. Newport and Astoria receive the majority of the landings with Charleston/Coos Bay third. About 90% of albacore landed goes to canned markets. In the last 10 years, up to 10% of the albacore has been sold by vessels directly to the public. In recent years, fishers and buyers have been looking to diversify into new, non-canned markets and product forms. Albacore fishing is also an important recreational activity off Oregon.

2.2.1.3 California

Albacore is a very important species for both commercial and recreational fisheries off California. Troll and baitboat are the principal commercial gears, although albacore is caught using purse seine, longline and drift gillnet gear as well. After a substantial decline in California albacore landings during the late 1980s, which also occurred coastwide, commercial landings at California ports rebounded in the 1990s ranging from 758 mt to 5,047 mt between 1990 and 1999 (Tables 2-22 and 2-23).

During the 1981-99 period an average of 200 vessels annually, that depended on albacore for the major share of their total exvessel revenues, landed albacore at California ports. The top five albacore ports in California based on average annual landings during the 1981-99 period were Terminal Island, Moss Landing, San Francisco Bay area, Eureka and San Diego.

2.2.2 Tropical Tuna Fishery using Purse Seine, Pole-and-Line, and Longline

2.2.2.1 Eastern Pacific Ocean

U.S. fishers harvest eastern Pacific yellowfin, skipjack and bigeye tunas with three main types of fishing gear, purse seines, pole-and-line (baitboat), and longlines. Some quantities are also caught with troll and rod-and-reel gears. Numbers and corresponding carrying capacities of tuna vessels using surface gear (purse seine, baitboat and troll gear) in the EPO are reported in Tables 2-24, 2-25 and 2-26. Estimated tuna catches by surface gears in the EPO are shown in Tables 2-27, 2-28, 2-29 and 2-30.

Tropical tuna caught in the U.S. purse seine fishery are canned as light meat tuna. Catches have been delivered or transshipped to canneries in California, Puerto Rico, American Samoa, other canneries in the Pacific rim or to Europe. In 1980, there were 20 U.S. tuna processing plants in operation, declining to seven in 1990. By mid-1982, Bumble Bee had closed its plants in Hawaii and San Diego. In 1984, Van Camp closed its San Diego plant and Star-Kist closed its Terminal Island (San Pedro) plant. These plants were shut down because of their high costs of operation relative to foreign competition. Conditions that led to the closure of mainland tuna processing plants, and a major restructuring of the U.S. tuna industry during the 1980s and 90s are documented in four reports by the U.S. International Trade Commission (USITC 1984, 1986, 1990, 1992). Today only four U.S. plants are in operation, two in America Samoa (conventional canneries), and one in California and one in Puerto Rico, the latter two processing imported loins only.

Until recently, most of the U.S. purse seiners operating in the EPO have been Inter-American Tropical Tuna Commission (IATTC) class 6 vessels (more than 360 mt carrying capacity)[2], lately however, smaller purse seine vessels have outnumbered the larger vessels (Tables 2-22 and 2-23). The U.S. fleet of purse seiners in the EPO reached approximately 144 vessels in 1979 but by 1999, had decreased to 10 vessels (Tables 2-

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[2] The Inter-American Tropical Tuna Commission classifies vessels according to their carrying capacity into the following size classes: class 1, less than 51 t; class 2, 51-100 t; class 3, 101-200 t; class 4, 201-300 t; class 5, 301-400 t, class 6, more than 400 t (362.8 mt). Federal regulations classify purse seiners engaged in the tuna fishery into three categories: (1) Class I are vessels of 400 t carrying capacity or less; (2) Class II are vessels greater than 400 t but built before 1961; and (3), Class III are vessels are greater than 400 t and built after 1961.

25 and 2-26). U.S. purse seine vessels employ a standard purse seine. Generally, three types of sets have been historically used: sets associated with schools of dolphin, unassociated free-swimming school sets and log or other floating object associated sets. Dolphin sets are now rare as most U.S. purse seiners currently operate in the central-western Pacific where this mode of fishing does not occur. In the central-western Pacific most (90% in 1999) of the purse seine sets are on artificial floating objects known as fish aggregating devices or FADS, the remainder on free-swimming schools. The remaining U.S. tropical tuna purse seine vessels in the Eastern Tropical Pacific now also set on fish aggregating devices. With most the U.S. tropical tuna purse seine fishing now taking place in the central-western Pacific catches are delivered or transshipped directly to canneries in American Samoa. Landings and corresponding exvessel revenues at West Coast ports have greatly decreased since the 1980s, when the major West Coast canneries began relocating overseas (Tables 2-31 and 2-32). Most of the tropical tuna landings on the West Coast are now made by "wetfish" (sardine, mackerel, anchovy) purse seiners that catch relatively small quantities of tropical tunas when they are seasonally available and which are separately discussed below.

In 1999, 10 U.S. purse seiners participated in the EPO tuna fishery, five in IATTC size classes 2-5, and five in class 6 (Table 2-26). No tuna seiners have been constructed for U.S. documentation since 1990, and sales of existing U.S. seiners to foreign citizens are expected to continue in 2001. Since 1992, U.S. tuna vessels have been adversely effected by restricted access to historic fishing grounds located within the EEZs of EPO nations to the south of California. This kindled interest by many of the displaced vessels in purse seining for coastal pelagic species within the U.S. West Coast EEZ, particularly with the resurgence of the Pacific sardine. However, some were then thwarted by the limited entry program for coastal pelagic finfish instituted under the Pacific Fishery Management Council's, Coastal Pelagic Species Fishery Management Plan.

The Inter-American Tropical Tuna Commission is an international convention with U.S. membership that provides the framework for conservation and management of tuna resources in the ETP. The implementing statue for the IATTC Convention is the Tuna Conventions Act of 1950.

No multilateral agreement is in force between the U.S. and other EPO Nations concerning the right of U.S. vessels to fish HMS within and beyond the EEZs of such nations. On March 15, 1983, the U.S. signed and ratified an agreement establishing a regional tuna fishing license arrangement the Eastern Pacific Ocean Tuna Fishing Agreement (EPOTFA). The "Eastern Pacific Tuna Licensing Act of 1984" (Title 16, United States Code, Section 972 et seq.;PL 98-445; 98 Stat. 1715) is the federal law which implements the obligations of the United States as set forth in EPOTFA. Although signed by the U.S., Costa Rica, Panama, Guatemala, and Honduras, the EPOTFA was never ratified by a sufficient number of signatory nations. Mexico did not sign the Agreement and actively opposed its ratification by certain signatory nations. Although authorized by the law, no federal regulations were promulgated by the Secretary of Commerce. The parties to the Agreement intended it to be interim in nature pending the negotiation of a more comprehensive management regime for the EPO tuna resources. The EPOTFA represents the world's first international regional licensing arrangement for tuna fishing. It represents a model for the negotiation of a regional licensing agreement between certain South Pacific Island governments and the American Tunaboat Association for the South Pacific Tuna Treaty (discussed in greater detail following) (Hunt 1997). No bilateral agreements exist between the U.S. and other EPO nations concerning the right of U.S. vessels to fish HMS within the EEZs of such nations.

The bycatch of dolphins with large yellowfin tuna by purse seiners in the Eastern Tropical Pacific led the United States to initiate action within the IATTC to establish a program to address the tuna-dolphin problem (Joseph 1994, Scott 1996). In 1976, the U.S. initiative resulted in member governments of the IATTC agreeing to address the problem of dolphin mortality in the Eastern Pacific. The international efforts toward a solution to this dilemma resulted in an agreement – the Agreement for the Conservation of Dolphins or the La Jolla Agreement – reached in April 1992 by 10 nations involved in the fishery to progressively reduce dolphin mortality to levels approaching zero through the setting of annual limits and with a goal of eliminating dolphin mortality in this fishery, to seek ecologically sound means of capturing large yellowfin tunas not in association with dolphins (Joseph 1994). A schedule of progressively decreasing annual limits on dolphin mortality was implemented and a research program was approved. The overall annual limit is divided among vessels that intend to fish for tunas associated with dolphins and that meet certain requirements regarding fishing equipment and procedures and crew training. These vessels could apply for individual dolphin mortality limits (DMLs). DMLs would be calculated by dividing the annual limit for all vessels by the number of vessels requesting DMLs. Those vessels keeping within their individual DMLs can fish for tunas associated with dolphins all year, but those that do not have to abandon this mode of fishing for the rest of the year when they have reached their DMLs. DMLs are thus a quasi-property right rather than a pure property right, since ownership is not conferred. DMLs are not transferable from one holder to another. The duration is one year, at which point it is reissued, with the amount depending on the number of candidate vessels and the total dolphin mortality set for the entire fishery.

The Panama Declaration reaffirmed the commitments and objectives of the La Jolla Agreement and seeks the transformation of a voluntary dolphin protection program that is based primarily on decreasing annual quotas into a binding international accord (Campbell, Herrick, and Squires 2000). In 1997, the U.S. Congress passed, and the President signed, the International Dolphin Conservation Program Act. In February 1998, the final language of the international agreement was agreed upon in La Jolla, California (Hedley 2001). This legislation required changes to the dolphin-safe standard in the Dolphin Protection Consumer Information Act. The changes included replacing the intentional set rule with a performance-based approach predicated on dolphin mortality in a given set. Under the proposed standard, dolphin-safe catches of yellowfin tuna would be identified by the set (deployment) of the purse-seine net and not for all of the sets made during a fishing trip as under the current standard. Dolphin safe would mean the absence of dolphin mortality in a set and not the absence of potentially dolphin-harmful techniques or dolphin mortality on a fishing trip.

U.S. baitboat fishers have harvested eastern Pacific yellowfin tuna throughout its range. The fishery uses live bait to attract surface schools of yellowfin tuna into a feeding frenzy and then fishers use poles with jigs attached to catch the feeding fish, hence pole-and-line gear. The catch from this fishery was 4,100 mt in 1979 but decreased to 500 mt in 1997. Catches are delivered or transshipped to canneries in California and American Samoa. Vessels range in size from less than 45 mt carrying capacity to 180 mt. The U.S. fleet size ranged from 28 in 1979 to less than 10 in recent years. While pole-and-line fisheries were the main gear used in the early days of the eastern Pacific yellowfin tuna fishery, catches and effort from this fishery quickly gave way to the more efficient purse seining method. In 1999, two U.S. baitboats participated in the EPO tuna fishery, IATTC size classes 1 and 2.

The longline fishery targets mainly swordfish and bigeye tunas. The U.S. longline fishery catches eastern Pacific yellowfin tuna mainly as an incidental catch species. Yellowfin tuna are caught in the northern extremes of the eastern Pacific yellowfin tuna range, between Hawaii and the West Coast, while targeting bigeye tuna. Catches have ranged between 350 mt in 1992 and 1,100 mt in 1997. Most of the catch is landed in Hawaii with lesser amounts in California. The catches are utilized in fresh fish markets and restaurants. Vessels range in length from 20 to 35 m. The U.S. fleet total (East and West Pacific) has ranged between 141 vessels in 1991 and 105 in 1997. The U.S. fleet uses a typical longline gear with a mainline up to 30 nm in length and a series of floats and branch lines. A set may fish 1,200 or more hooks. The gear is deployed at various depths depending on the target species sought and light sticks are used to enhance catches.

The U.S. longline fishery also catches eastern Pacific skipjack tuna as an incidental species catch. Skipjack tuna are caught in the northern extremes of the eastern Pacific skipjack tuna range, between Hawaii and the U.S. West Coast, while the vessels are targeting bigeye tuna. Catches have ranged between 1 mt in and 106 mt. Most of the catch is landed in Hawaii with lesser amounts in California. The catches are utilized in fresh fish markets and restaurants.

Eastern Pacific yellowfin, skipjack and bigeye tunas are also caught as incidental catch in U.S. troll fisheries and as target species in recreational fisheries. The latter is described in the Recreational Fishery section.

On July 6, 2000, two environmental organizations and a recreational fishing group filed a 60 Day Notice of Intent to Sue over violations of the ESA to protect endangered leatherback sea turtles and several other endangered species, including three other sea turtle species, seals, sea lions, and short-tailed albatross from being incidentally hooked and killed by US longline fishing vessels operating in international waters that are not operating under a Hawaiian longline permit. Hawaiian longliners are currently operating within the limits specified by the Biological Opinion prepared for the longline fishery.

US imports of canned tuna were up in 1999. Total imports reached 151,700 mt, which was 32% ahead of the 1998 figure. Thailand was again the main exporter of this product, shipping 75,100 mt, 80% more than one year earlier, mainly due to heavy purchases by StarKist in Thailand after the company reduced its cannery operations in Puerto Rico.

2.2.2.2 Central and Western Pacific Tuna Fishery

The central and western Pacific (CWP) tuna fishery is the largest and one of the most productive in the world, yielding catches of around one million short tons of tuna annually, with a landed value in excess of $1.7 billion. These catches represent around one-third of all tuna landed in the world, 60% of canned tuna, and 30% of the sashimi grade tuna imported into Japan. The fishery is characterized by its complexity and area, with close to 30 states and entities involved in the fishery spanning over 30 million square kilometers of ocean, including a number of pockets of high seas surrounded by the coastal zones of the Pacific Islands.

The fishery operates year round throughout the CWP. The CWP purse seine fishery from all nations targets yellowfin and skipjack tunas, also with substantial catches of bigeye. Skipjack tuna is the dominant species in the CWP by volume of landings (Table 2-33). The catch of skipjack increased dramatically in the 1980s due to growth in the international purse seine fleet, combined with increased catches by domestic fleets from the Philippines and Indonesia. Yellowfin tuna catches in the 1990s by all nations have varied between 300-400,000 mt , with around 60% of this total taken as juvenile fish in the purse seine fishery. As with skipjack, yellowfin is believed to be currently exploited at sustainable levels. Bigeye tuna of sashimi size and quality are the most valuable of the tropical tunas and are the principal target of large distant-water longliners who freeze catches and the smaller, locally-based fresh sashimi vessels. There has been a recent trend for purse seiners to use gear and techniques to target bigeye. The purse seine catch of adult bigeye exceeds that taken by longliners and is sold for canning at prices at or below that paid for skipjack. The present condition of the bigeye stock is uncertain. The EEZs of the Federated States of Micronesia, Papua New Guinea, Kiribati, Palau, and the pockets of high seas between these zones are the primary areas for purse seine fishing in the CWP (Lodge 1998).

In the late 1940s, tuna fishing ventures were established in Pago Pago, American Samoa, and in the Trust Territory of the Pacific Islands. Until the late 1950s, the traditional grounds of the eastern tropical Pacific were more profitable than in the CWP (Lodge 1998). Purse seining began on a significant scale only in the 1970s. In the late 1960s and early 1970s, largely as a result of decrease in the length of the fishing season in the Inter-American Tropical Tuna Commission area, U.S. fishers began to actively search for new fishing opportunities in the CWP (Lodge 1998). Concurrently, Congress passed the Central and Western Pacific Fishery Development Act of 1972 (the Fong Bill), which authorized the U.S. Secretary of the Interior to carry out a three-year program of incentives to industry to develop the latent tuna resources of the CWP. Exploratory fishing in Papua New Guinea and Micronesian waters in the early 1970s led to the first of a series of agreements between the American Tunaboat Association and the governments of the Trust Territory of the Pacific Islands in the late 1970s granting access to U.S. vessels to the waters of the countries concerned. During the late 1970s and early 1980s, the processors Star-Kist and Van Camp and U.S. fishers made investments in Guam and American Samoa. The Japanese also began experimenting with purse seining and by 1976, eight Japanese single purse seiners began year-round fishing. During the 1980s, the U.S. fleet continued to expand, reaching 67 purse seiners at one point. Since the conclusion of the Treaty on Fisheries

Between the Governments of Certain Pacific Island States and the Government of the United States of America (South Pacific Tuna Treaty, SPTT) in 1987, the number of U.S. vessels has declined (Table 2-34). In the early 1980s, Taiwan entered the CWP tuna fishery, with nearly all vessels built in Taiwan. The Korean fleet also expanded at this time .

The CWP had 601 participants in the tropical tuna purse seine fishery in 1997, ranging in carrying capacity from less than 46 t to over 2,000 t. The number of large purse seine vessels (greater than 363 t) is estimated to be more than 150, including 36 licensed U.S. vessels in 1999, which made 175 trips (Table 2-35) (Coan et al. 1999).

In the CWP, the U.S. vessels in 1998 were 39 and made 200 trips (Table 2-35). Since 1997, the number of U.S. purse seiners has fluctuated between 35 and 39, with the average carrying capacity per vessel increasing steadily from 1,122 t/vessel in 1996 to 1,184 t/vessel in 1999, an increase of approximately 6%. Available records indicate that two vessels in both 1998 and 1999 underwent capacity modification. This trend of increased carrying capacity is continuing into 2000 (Coan et al. 1999). The U.S. vessels fished under the South Pacific Tuna Treaty. In 1999, the U.S. fleet in the CWP conducted 4,758 days of fishing (Coan et al. 1999). This effort was concentrated mostly in the area between Kiribati and Tuvalu. Over 64% of the fishing effort was in areas west of the International Date Line. The number of trips per U.S. vessel was approximately 5, and similar to those recorded for the last nine years. The average number of days per trip was 41.5 and sets per trip was 208.8, a decrease of 11% and 24% respectively from 1998 levels. The overall catch rate (all species combined) in 1999 was 38.3 mt/day fished, and is the highest recorded for the fishery (Table 2-36). This high catch rate is largely attributed to increased use of drifting fish aggregating devices.

In the CWP purse seine vessels catch tunas through either free-swimming schools or off of floating objects. Floating object operations are increasingly important. The bycatch may be large for operations on floating objects or Fish Aggregation Devices (FADs) and smaller for operations on free-swimming schools of fish, and includes small tunas, sea turtles, sharks, and other fishes. The majority of the FADs used by the U.S. fleet are drifting FADs (Coan et al. 1999). A few anchored FADs are occasionally used. The U.S. fleet made approximately 3,478 sets during 1999. Of these, 90% were sets on FADs, 6% on logs, and 4% on free-swimming schools. In comparison, the 1998 fishing effort had 21% more days fished than in 1999. The total number of sets was 4,856 and only 25% was on FADs, 29% on logs, and 46% on free-swimming schools.

The U.S. purse seine fleet in the CWP caught about 182,000 t of yellowfin, skipjack, and bigeye tunas in 1999 (Table 2-36) (Coan et al. 1999). About 72% of the catch was skipjack tuna, 19% yellowfin tuna and 9% bigeye tuna. The 1999 U.S. catch is 4% higher than the 1998 catch and would have been higher yet if low prices in the second semester did not discourage vessels from operating (Coan et al. 1999). The 1999 bigeye tuna catch is the highest recorded for the U.S. fishery, up by over 200% from the 1998 catch. This increase is attributed to the substantial increase in Fish Aggregation Devices. Seventy-eight percent of the U.S. fleet's catch was landed in American Samoa in 1999, a decrease from the 89% landed there in 1998. The rest of the 1999 landings were in the Philippines (11%), Fiji (5%), Solomon Islands (3%), and others (approximately 3%). The first year of substantial landings in the Philippines was 1999.

Fishing was exceptionally good in 1999 for the U.S. fleet, but market conditions created havoc (Coan et al. 1999). Supplies of tuna were plentiful world-wide and prices fell to record lows in the second half of the year. The oversupply caused exceptionally long delays in unloading of vessels in American Samoa and poor returns for vessel owners. A number of vessels opted to unload their catches (22% or 40,000 t) in ports to the west, such as in the Philippines, Fiji, and Solomon Islands, and scheduled early and extended tie-ups for maintenance and other vessel services to by-pass delays in American Samoa and to wait for improved prices. As a result, the number of days fished per vessel fell to the lowest on record for the fleet. The adverse economic effects of low exvessel tuna prices were compounded by rising diesel fuel prices, placing U.S. and other nations' vessels in a cost-price squeeze (Figure 2-1).

In the CWP, the existing framework is the Treaty on Fisheries between Governments of certain Pacific Island States and the Government of the United States of America, or more informally, the South Pacific Tuna Treaty

(SPTT). The SPTT is a multilateral, multi-year tuna fishing agreement with the island states of the South Pacific Forum Fisheries Agency (FFA). The SPTT established terms and conditions governing the U.S. tuna industry's access to the tuna-rich waters of the FFA nations' collective exclusive economic zones (EEZs). Under the SPTT, access was granted through an arrangement of fixed annual vessel license fees and technical assistance payments paid by industry, coupled with an annual payment from the U.S. government for development assistance. The SPTT limits the number of U.S. purse seine vessels to 50 (36 vessels in 1999), but there are no limits on access or numbers to tuna vessels on the high seas in the CWP. The FFA EEZ includes about 70% of the tuna resources in the CWP with the remainder found in the high seas. In addition to the SPTT, the Palau Arrangement (Arrangement for the Management of the Western Pacific Purse Seine Fishery), signed in October 1992, provides a limit, by vessel category of the numbers of purse seine vessels (currently 205) of all nations that may operate in the waters of Parties (Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea) (Aqorau and Bergin 1997).

The Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (MHLC), whose negotiations were completed in September 2000, is a regional fishery management organization created in light of the United Nations Implementing Agreement (UNIA). The MHLC is designed to perform the task of cooperative conservation and management between the Pacific Island nations and the distant-water fishing nations. The MHLC is the first international multilateral fishing agreement to tackle sustainable management. The MHLC has been signed by the U.S. and is expected to provide treaty requirements and regulations in the next few years. Until that time, the U.S. is engaged in the SPTT.

2.2.2.3 Imports of Canned Tuna Into The U.S.

U.S. imports of canned tuna, both white meat and light meat, were up in 1999 (*GLOBEFISH Highlights* 1/2000, p. 9). Total imports reached 151,700 mt, which was 32% higher than 1998 (Table 2-37). Thailand, once again, was the main exporter to the U.S., shipping 75,100 mt, an increase of 80% from the previous year. This increase is due to heavy purchases by StarKist in Thailand and a reduced presence by StarKist as a canner in Puerto Rico. Table 2-38 presents average exvessel prices for tuna delivered to U.S. canners by U.S. vessels.

Under the new U.S. regulations, tuna products will be allowed to be imported into the USA if they are harvested in compliance with the International Dolphin Conservation Program Act. The regulations will also implement a new labeling standard that allow tuna products to carry a dolphin-safe label only if no dolphins were killed or seriously injured during a set in which tuna were caught. Previously, only tuna caught during a trip when no dolphins were encircled qualified for the dolphin-safe tuna label on products imported into the U.S.

2.2.2.4 Washington

There are no directed tropical tuna fisheries occurring off Washington (Table 2-6).

2.2.2.5 Oregon

There has been no directed fishery for these species since the late 1970s. Two to four vessels, annually, have made incidental landings of less than 0.5 mt of skipjack and yellowfin tuna in the salmon troll fishery. There are no directed tropical tuna fisheries occurring off Oregon (Table 2-8).

2.2.2.6 California

While no longer the home to any major canneries since October, 2001, California still maintains a substantial commercial fishery for tropical tunas. Several large purse seine vessels continue to use California as a home base, while a larger number of small "wetfish" seiners fish for tropical tunas on a more seasonal basis. These vessels may not be dependent on tuna as their principal target species, which are instead coastal pelagics; however, when tunas are available, these vessels will target on tuna for local markets. Total landings have been between 8,000 mt and 12,000 mt in recent years, valued at more than $12 million per year (Tables 2-10 and 2-11).

2.2.3 Coastal Purse Seine Fishery for Northern Bluefin Tuna and Yellowfin Tuna

In the eastern Pacific Ocean nearly all of the northern bluefin tuna catch is made by small coastal purse seiners fishing relatively close to shore off California and Baja California, generally in the May to October period. As discussed above, larger U.S. purse seiners conduct distant water operations, mostly for yellowfin, bigeye and skipjack tunas. In 1996, the U.S. had 12 small purse seiners (class 1-3) and 10 larger purse seiners fishing in the EPO. West Coast landings and exvessel revenues from northern bluefin tuna were 689 mt and $1,009,398 (1999 dollars) in 1995, and 4,639 mt and $4,059,268 (1999 dollars) in 1996 (Tables 2-31 and 2-32). These landings were made mostly by coastal seiners, operating out of San Pedro, California. Almost all of the catch was landed in San Pedro. The coastal purse seiners primarily harvest small pelagic species, especially Pacific mackerel and Pacific sardine. However they will switch to higher valued northern bluefin tuna when they enter the West Coast EEZ. Similarly, they will target yellowfin tuna when they become available during periods of warm water. Coastal purse seiners will even target albacore on occasions when they are sufficiently available.

Northern bluefin tuna are caught incidentally in other U.S. north pacific commercial fisheries (Table 2-39). Northern bluefin tuna is an important component of the U.S. recreational fishery although reported catches seldom exceed 100 mt per year. This fishery is described in the Recreational Fisheries section.

2.2.3.1 Washington

There is no northern bluefin tuna fishery occurring off Washington (Table 2-6).

2.2.3.2 Oregon

Up to six vessels, annually, have made incidental landings of up to 6 mt of bluefin tuna in the swordfish drift gillnet fishery. There is no directed northern bluefin tuna fishery occurring off Oregon (Table 2-8).

2.2.3.3 California

A large number of small purse seiners fish for northern bluefin tuna on a seasonal basis off California. These vessels may not be dependent on northern bluefin tuna, as their principal target species are coastal pelagics; however, when bluefin are available, these vessels will target on northern bluefin primarily for export markets. Total landings have been between 1,000 mt and 5,000 mt in recent years (Tables 2-10 and 2-11).

2.2.4 Swordfish and Shark Fishery

Swordfish and shark are harvested within the EEZ by two principal gear types, drift gillnet and harpoon.

2.2.4.1 Drift Gillnet

The shark/swordfish drift gillnet fishery initially developed in southern California in 1977 when the incidental catch of pelagic shark in small mesh coastal drift gillnets targeting barracuda and white sea bass inspired about 10 vessels to experiment with a larger mesh net to target thresher shark. By 1979 the fishery expanded to about 40 vessels (PFMC 1981). As fishing techniques and gear improved, landings, and market demand for pelagic shark increased. Fishers soon discovered that drift gillnet gear also caught swordfish, worth nearly four times the dockside value of sharks (Bedford 1987, Holts 1988). At that time, harpoon was the only commercial gear authorized under California law for the harvest of swordfish.

The California Fish & Game Commission held a series of public hearings in 1979 and 1980 to consider allowing drift gillnets to catch swordfish (Stick et al. 1990). At these meetings, the Commission heard from three major interest groups that had opposed the drift gillnet fishery since its inception. Harpoon fishers objected because they feared that increased swordfish production would drive prices down, and that increased fishing pressure would deplete the swordfish stock. Sport fishers objected because they were convinced that the bycatch of marlin would deplete that stock and virtually eliminate the sport fishery. Conservation groups objected because they believed the gear to be indiscriminate and wasteful (Bedford 1983). The Commission decided not to authorize the use of drift gillnets to catch swordfish.

Subsequent to the Commission's decision, fishers appealed to the California Legislature, and legislation was enacted in 1980 that established a non-transferable, limited entry permit system, required logbooks and observers, and imposed gear restrictions. One hundred sixty five permits were issued to fishers who landed at least one thresher or mako shark with a drift gillnet in 1978 or 1979; or who had made a significant investment in the fishery prior to May 20, 1980 (PFMC 1981). Additionally, the California Department of Fish & Game (CDFG) was directed to study the effects of the fishery on swordfish and marlin, and to report its findings to the Legislature. Pending this report, to address objections by harpoon fishers, provisions were enacted that closed the drift gillnet fishery if the catch of swordfish exceeded 25% by number of what was caught in the harpoon fishery for any given month. To address objections by sport fishers, provisions were enacted that closed the drift gillnet fishery if the bycatch of marlin exceeded 10% by number of what was caught in the sport fishery for any given month. The swordfish fishery was closed once when this quota was exceeded. The marlin quota was never exceeded.

Drift gillnets capture by entanglement. Typically, besides an appropriate vessel, drift gillnet gear required for this fishery includes a net, 45 to 60 large inflatable ball buoys, a spar buoy called a "high flyer" affixed with a radar reflector and strobe light, a deck mounted hydraulically powered reel on which to store the net, and a reel mounted level wind to assist in deploying, and retrieving the net. A large net guard of one of two basic styles, either resembling a catchers mitt or resembling a football helmet's face guard, is affixed to the stern of the vessel and lowered into the water during retrieval to keep the net from becoming entangled in the propeller. A stern roller reduces net wear. A finished, ready to fish net is not an off-the-shelf item that can be purchased. Each net is custom made from component parts that are often purchased separately from different suppliers. The basic components are the webbing, a small diameter lead-cored braided line (leadline), a large diameter braided or three-strand buoyant line (floatline), small diameter braided hollow-core poly line (buoyline), and a large quantity of seizing twine to attach it all together. Nets are most commonly constructed with one size of twisted nylon strand meshes that typically measure 18 to 20 inches between opposing knots when the mesh is stretched together. The curtain of webbing, comprised of these meshes, that makes up the net ranges from 80 to 160 meshes deep (90 to 170 ft), and from 4,800 ft long to the legal maximum of 6,000 ft finished length. Webbing is hung loosely, much like a drapery, between the floatline at the top, and the leadline at the bottom. The looseness, or "slack," gives the net its entanglement properties and is built into the net by adjusting the amount of net captured with the hangings that attach the top of the webbing to the floatline so that the finished length of the net is about 40 to 50% less than the total length of webbing used if it were stretched out. A fisher chooses the depth/length combination for his net based on the size reel that it would require, and the amount of vessel stability sacrificed by carrying the weight of reel and a wet net. When fished, the net hangs vertically in the water column between the buoyant floatline at the top of the net and the weighted leadline at the bottom. The net is suspended below the sea surface by the ball buoys to a depth equal to the length of the buoylines. This depth has historically ranged from 18 ft to as much as 90 ft , but is currently limited by regulations enacted under the Marine Mammal Protection Act (MMPA) to a minimum depth of 36 ft.

Drift gillnet trips range from one night to one month, but typically last 5 to 15 days. Fish availability, market price, weather conditions, phase of the moon, vessel fishing range, and fish-cooling capabilities dictate the timing, and length of fishing trips. Crew size is typically two or three persons, including the captain. About sunset, the net is usually deployed starting at the upwind position of the set. The high flyer is attached to the end of the net and both are lowered into the water. The vessel proceeds slowly in a downwind direction reeling off net as it goes. As a series of buoylines that are attached to the floatline about 100 ft apart unwind from the reel, a ball buoy is attached to the buoyline and thrown overboard. At the end of the set, the vessel stops, and drifts with the net attached throughout the night. Before sunrise, retrieval usually begins. The vessel is pulled stern first into the wind and seas as the net is rewound on the hydraulically powered reel. Ball buoys are disconnected from the buoylines and stored for use on subsequent sets as they come up, and the catch is removed, dressed, and stored in the fish hold. Fish-cooling capabilities vary widely from none to ice, spray brine, or blast refrigeration.

Fishers locate where to fish by looking for temperature fronts between cooler and warmer water masses, or turbidity fronts between green and blue water masses. Using prearranged high frequency radio channels, drift gillnet fishers often communicate in coded messages with other members of loosely organized "code-groups." They share information about the amounts of catch, location, and identify other boats seen in the area or along the way. When catch rates are low, code-group members often spread out in search of fish and keep each other informed. Often, fishing vessels move rapidly from one area to another based on information from their code-group. Because of competition for fish and code-group loyalty, airplanes have been hired to fly over the fishing grounds and observe where other code-groups were fishing, and get some idea of their catch rates. Pilots would sometimes throttle back their engines and glide over a fishing boat in hopes of covertly gaining information. To counter this spy tactic, fishers sometimes covered their catch with tarps or created fake fish by leaving a fish head protruding from under a tarp (Hanan et al. 1993). However, in recent years, the accessibility of high-resolution satellite generated sea surface temperature data has greatly reduced the importance of code-group communications for locating the temperature fronts where swordfish are typically found.

California's drift gillnet permits are issued to individual fishers rather than to vessels. This practice separates the value of the permit from the value of the vessel, keeps the value of vessels from becoming inflated and allows permit holders to buy new vessels as needed. Permit holders are required to be onboard during fishing operations, and fishers are required to declare the fishing vessel being used. In 1982, most of the drift gillnet fishing vessels were small sized wood or fiberglass boats not well suited to fishing in the more extreme northern or offshore weather. Consequently, fishing effort was concentrated south of Point Conception in the same general area as where the harpoon fishery occurred.

After gathering logbook and observer data from 1980 through 1982, the CDFG reported to the California Legislature that fish bycatch in the drift gillnet fishery was not excessive, that swordfish or marlin stock depletion was not probable, and recommended that the catch of swordfish by drift gillnets be authorized. CDFG also recommended that time/area closures be established to mitigate interactions with marine mammals, and the number of permits be limited until a determination could be made concerning the capacity of shark stocks to sustain harvest without risk of depletion (Bedford 1983). Consequently, 1982 amendments repealed the 25% swordfish quota, and the 10% marlin quota.

Notwithstanding that the new regulations placed a cap of 150 permits on the fishery, about 200 had been issued after 1982 regulations established a category for new entrants who could demonstrate landings of at least 5,000 pounds of swordfish by any gear in each of the years 1977 through 1981 (Bedford 1983). Also, for the first time in this fishery, 1982 amendments established a season closure from February 1 through April 30, and established time/area closures around various of the Channel Islands to protect pinnipeds, and off mainland portions of Southern California to mitigate conflicts with harpoon and sport fishers.

The northward movement of thresher shark in spring, combined with restrictions imposed on the California drift gillnet fishery, prompted the interest of many California based fishers in a drift gillnet fishery in Washington and Oregon waters. Washington and Oregon issued annual state experimental drift gillnet permits starting in 1983. There was limited effort and landings in this fishery through 1985, but in 1986, 37 vessels landed a total of 293 mt dressed weight of thresher shark into Washington and Oregon ports. In 1987, 29 vessels landed a total of 111 mt dressed weight (Stick and Hreha1988), and in 1988, 6 vessels landed a total of 50 mt dressed weight (Stick and Hreha 1989). Meanwhile, in California, a new and separate experimental drift gillnet limited entry system was established in 1984 and issued 35 permits limited to the area north of Point Arguello. As a probable result, the fishery began to expand northward. By 1985, the total of the combined California permits reached about 265, and the fleet was fishing as far north as Cape Mendocino. By the end of 1986, the total number of combined permits had topped out at about 300, and as larger vessels entered the fishery it moved offshore and northward to the more distant seamounts and to the edge of the continental shelf (Hanan et al. 1993).

The National Marine Fisheries Service (NMFS) awarded the Pacific States Marine Fisheries Commission (PSMFC) a contract in 1988 to study the Washington/Oregon thresher shark fishery and draft a coastwide management plan for the species to determine the viability of a coastwide drift gillnet fishery that would not jeopardize the resource (Stick and Hreha 1989). California had previously determined that restrictions were needed to reduce fishing pressure on thresher sharks. In 1985, fishing within 75 miles of the California coastline from June 1 through August 14 was prohibited to reduce fishing pressure on thresher shark. This restriction was changed to the period May 1 through July 14 in 1989, and changed again in 1992 to the current closure period of May 1 through August 14. Meanwhile, in 1989, Washington and Oregon closed the experimental drift gillnet thresher shark fishery due to concern over the observed incidental catch of marine mammals and sea turtles. The PSMFC finalized its coastwide thresher shark management plan in 1990. The Plan proposed an annual coastwide thresher shark harvest guideline of 340 mt dressed weight and discouraged catches of juvenile sharks. No quotas were established but states agreed to this guideline. The plan also recognized that thresher shark fishery restrictions in place in California, and the closure of the Washington/Oregon fishery assisted stock rebuilding, and noted that, given the low reproductive and growth rates of thresher shark, increases in abundance may not be evident for five to ten years. The plan called for the establishment of a management panel comprised of representatives from California, Oregon and Washington to monitor the resource and fishery, and meet annually to make management recommendations (Stick et al. 1990). No management recommendations came from the annual meetings. Although the plan has not been officially terminated, it has been inactive since about 1998.

Prior to 1995, it was illegal to land drift gillnet caught swordfish into Oregon. Although swordfish had been caught off Oregon for many years, they were landed in California or Washington ports. Oregon instituted a drift gillnet developmental fishery permit in 1995 allowing the landing of drift gillnet caught swordfish, and issues up to10 permits annually. Permit stipulations restrict harvest from within 75 miles of the shore from May through August 14 to protect thresher sharks and in depths less than 1,000 fm the remainder of the year. Since 1995, annual swordfish landings between 2.5 to 35.3 mt have been made by 2 to 6 vessels (J. McCrae, Oregon Department of Fish and Wildlife, pers. comm.). The direct targeting of thresher sharks with drift gillnet is prohibited, however thresher shark caught incidental to swordfish fishing may be landed at a ration of one shark per every two swordfish. Tables 2-40 and 2-41 report landings and exvessel revenues from the drift gillnet fishery landing in Oregon.

In 1994, for the first time, new California amendments eliminated any provision for allowing new entrants into the fishery, except by permit transfer. In 1998, the two previously separate permits were combined into one, and by 1999, due to the elimination of existing permits when not annually renewed, 139 valid drift gillnet limited entry shark/swordfish permits remain. Regardless of the number of permits in existence at any time, during and among fishing seasons, fishing effort varied from season to season and peaked in the 1986-87 season with over 11,000 sets, quickly declined to about 4,500 sets by 1990 (Hanan et al. 1993), and has averaged about 3,500 sets per year through 1998 (Enriquez 2000: In a NMFS working paper: Observed Catch of HMS in the California/Oregon Drift Gillnet Fishery).

The California drift gillnet fishery now operates primarily outside of state waters to about 150 miles offshore, ranging from the U.S Mexico border in the south to northward of the Columbia River depending on sea temperature conditions. Because of seasonal fishing restrictions, and the seasonal migratory pattern of swordfish, about 90% of the annual fishing effort occurs between August 15 and December 31. Depending on where they fish, drift gillnet vessels primarily land fish in San Diego, San Pedro, Ventura, Morro Bay, Monterey, Moss Landing, and San Francisco Bay area ports where it is sold in the fresh fish market providing high quality, locally-caught fish for the restaurant trade. Tables 2-42 and 2-43 report landings and exvessel revenues for the drift gillnet fishery landing in California[3].

Since 1994, swordfish landings have ranged between almost 600 mt and almost 900 mt and thresher shark landings have ranged between 200 and 400 mt. Relatively high valued landings of all species harvested in this fishery have averaged about 1,500 mt since 1994 (Tables 2-44 and 2-45). The ex-vessel value of the fishery in constant $1999 ranged between almost $3.5 million to more than $6 million during this time period. Swordfish provided the largest share of total ex-vessel revenue, ranging from $2.7 million to almost $5 million over 1994-1999.

The two other species of thresher sharks caught in this fishery are bigeye thresher and pelagic thresher. Shortfin mako constitutes an important incidental catch. They are not so abundant as to attract directed effort, but their market quality and ex-vessel value are good (Holts 1988). Blue sharks are rarely landed or marketed.

The incidental catch of non-target species in the drift gillnet fishery varies by year, but some of the predictable and saleable species include albacore and bluefin tunas, Pacific bonito (*Sarda chiliensis*), opah *(Lampris guttatus)*, and louvar *(Luvarus imperialis)*.

Bycatch in the drift gillnet fishery is mainly comprised of ocean sunfish *(Mola mola)* and blue shark. In the period 1990-1998, ocean sunfish amounted to 26.1% of the total observed catch of which 80.6% were returned alive, and blue shark amounted to 15.2% of the total observed catch of which 14.5% were returned alive (Holts and Rasmussen 1999).

To protect gray whales, in 1985, California adopted a closure within 25 miles of the mainland coastline from December 15 through the season's end on January 31. Due to marine mammal interactions, the drift gillnet fishery is listed as a Category I fishery under the MMPA, and required the formation of the Pacific Offshore Cetacean Take Reduction Team in 1996 to develop a Take Reduction Plan (TRP) for the drift gillnet fishery aimed at reducing the level of marine mammal interactions to specified levels. In 1997, regulations implementing the TRP required all drift gillnet fishers to attach a number of acoustic "pingers" to the top and bottom of the net, lower the top of the net to a minimum of 36 ft below the sea surface, and attend annual "skipper workshops" to facilitate the exchange of information with NMFS regarding marine mammal interactions in the fishery.

NMFS conducted an Endangered Species Act (ESA) required section 7 consultation to examine the impacts of issuing an MMPA permit authorizing the take of ESA listed marine mammals in the drift net fishery, and found that the operation of the drift gillnet fishery would likely jeopardize the continued existence of the leatherback and loggerhead sea turtles. The reasonable and prudent measures NMFS developed to mitigate that jeopardy calls for the imposition of additional time/area closures. Beginning August 15, 2001, the area between Point Conception and 45° N latitude will be closed to drift gillnet fishing through October 31 to reduce leatherback sea turtle impacts. If an El Niño condition is predicted to occur, or is occurring, the area south of Point Conception will be closed to drift gillnet fishing from August 15 to August 31, and during the entire month of January to reduce loggerhead sea turtle impacts.

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[3] Drift gillnet landings reported in Table 2-42 are for California drift gillnet gear (CA-65). It is speculated that significant amounts of California drift gillnet swordfish landings prior to 1994 were assigned to California unknown gear (CA-0), and California entangling net gear (CA-60). This is somewhat verified by comparing pre-1994 total West Coast swordfish landings for all gears (Table 2-1) with swordfish landings reported for HMS gears, the difference likely being largely attributable to landings by drift gillnet gear that was miss-assigned to California unknown or entangling net gear.

2.2.4.2 Harpoon

The harpoon fishery targets swordfish, although small quantities of shark are also landed by harpoon gear, most often common thresher and shortfin mako (Tables 2-46 and 2-47). There have been infrequent reports of blue, hammerhead (*Sphyrna spp*), soupfin (*Galeorhinus zyopterus*), and white (*Carcharodon carcharias*) sharks being recorded as taken with harpoon gear[4]. Swordfish landings and exvessel revenues peaked in 1978 at 1,172 mt, decreased to a record low of 16 mt in 1991, before rising over tenfold in 1993-94 and finally settling to around 80 mt over 1996-1999. Landings were typically less than 200 mt in most years. Sizes average 149 cm in length (cleithrum to fork in tail) or 85 kg dressed weight in 1981 to 1993.

The harpoon fishery for swordfish in California dates back 3,000 years when Native Americans fished with stone and wooden harpoons from driftwood canoes. The modern harpoon fishery off California began in the early 1900s, was the primary gear for swordfish from the early 1900s to the 1980s, and declined in 1980, when drift gillnet fishing started. Many vessels converted to drift gillnet fishing gear or obtained permits to use both types of gear. Today, only a handful of vessels continues to participate in the harpoon fishery.

Harpoon vessels are from 6 m to 26 m (20-87 ft) in length with a 6 m to 8 m bow plank and hold capacities up to 100 mt (Coan et al. 1998). When a fish is spotted, the plank is positioned above the swordfish and the harpoon thrown from the end of the plank. The fish is stored over ice for the rest of the trip. The hand-held harpoon consists of a 10-16 foot metal and/or wood pole attached to a 2-foot long metal shank and tipped with a 4-inch tethered bronze or iron dart. The harpoon is thrown at a surface-basking fish by a person standing on a metal pulpit at the end of a long plank at the vessel's bow (Coan et al. 1998). After harpooning, the handle is pulled free from the dart, and the mainline, marker flag, and floats are thrown overboard, leaving the fish to tire itself. The vessel then proceeds to search for and/or harpoon other fish. After the fish is tired, in approximately two hours, the vessel returns to retrieve it.

The harpoon fishing season typically begins in May, peaks in July to September, and ends in December, coincident with the annual northwesterly movement of the North Equatorial Countercurrent and during months of calm sea conditions that harpoon fishing generally requires. Fishing usually concentrates in the Southern California Bight (SCB) off San Diego early in the season and shifts to areas as far north as Oregon later in the season, especially in El Niño years. Swordfish are usually sighted basking at the surface of the water in temperatures between 12° to 26°C. In El Niño years, the range of water temperatures where the majority of swordfish sightings occur narrows and favors warmer temperatures between 20° and 22°C. Harpoon is legal gear in California and Oregon, but is not defined as legal gear in Washington.

Harpoon vessels work in conjunction with an airplane to spot swordfish basking at the surface beyond binocular range from a vessel or sub-surface swordfish. Spotter planes were introduced in the early 1970s. Spotter planes were banned by California Department of Fish and Game (CDFG) for one year during 1976. In 1984, spotter airplanes were allowed full-time in the fishery.

Confinement of the fishery to a relatively small area, principally the calm waters of the SCB, leaves it vulnerable to changing environmental conditions and competition from other gears. Environmental effects during El Niño events lead to decreased catches and CPUE. Competition from the drift gillnet fishery since 1980 has also led to decreased harpoon catches. Prices received for harpoon-caught swordfish generally exceed those from drift gillnet-caught swordfish, since the harpoon-caught swordfish do not spend the time in the net that the drift gillnet-caught swordfish do, and thereby generally allowing a fresher product. The harpoon season tends to taper off when the drift gillnet season begins because the substantial increase in swordfish volume lowers the ex-vessel swordfish price for harpoon-caught swordfish. The effects (if any) from recent increases in offshore longline fisheries are not yet seen.

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[4] Shark catches by harpoon gear are highly suspect according to industry and Coan et al. (1998).

2.2.5 High Seas Longline Fishery

The first U.S. longlining for billfish and tunas in the eastern Pacific was conducted on a non-commercial basis by the Pacific Oceanic Fishery Investigations (POFI) of the U.S. Fish and Wildlife Service. In 1952 and 1954, 18 longline sets were made from POFI vessels (Royce 1957). Similar experimental fishing was conducted by the CDFG (Wilson and Shimada, 1955). In 1954 and 1955, in connection with underwater nuclear tests conducted on the high seas southwest of California, four longline cruises were undertaken by the U.S. Atomic Energy Commission. These operations produced unspecified catches of billfish (Shimada 1962). In 1968 and 1969, the Bureau of Commercial Fisheries of the U.S. Fish and Wildlife Service conducted a series of experimental longline cruises off of Baja and Southern California to explore the viability of an alternative method for harvesting swordfish (Kato 1968, Kato 1969). The primary mission of these cruises was to see how longline fishing, a successful method on the east coast but not used by California fishers, compared with the traditional harpoon method. The results indicated that the catch rate using longline gear was high enough to support a fishery during the late fall and winter (Kato 1969). The Scripps Institute of Oceanography also conducted experimental longline fishing for tunas and billfish off Baja in 1970 (Blackburn et al. 1970).

The first major commercial longline fishery in the eastern Pacific started in 1956, and expanded rapidly, when Japanese longline vessels targeting billfish began operating east of 130° W longitude. In the mid 1960s, vessels from Korea and Taiwan also began longline operations in the eastern Pacific (Joseph et al. 1973).

Even though pelagic longline gear has been used in Hawaii since 1918, the U.S. did not participate in the Pacific longline fishery for billfish and tunas in a substantial way until the 1990s. Prior to the 1970s, pelagic longline was used to target yellowfin tuna by a small number of local vessels fishing in the waters surrounding the main Hawaiian Islands. During the 1970s, Hawaiian longline fishers began to set gear deeper to catch more valuable bigeye tuna. This fishery adopted new monofilament gear in the late 1980s, replacing older-style rope "basket" gear with a more flexible system of line throwers and snap-on branch lines and floatlines that allowed much greater flexibility in fishing depth. This flexibility contributed to the development of the swordfish longline fishery (WPFMC 1994).

In the 1950s, local Hawaiian longline vessels rarely fished more that about 20 nm from shore. During the 1960s, a higher CPUE prompted a growing number of vessels to extend their range 100 to 400 nm south of Oahu. In the late 1980s, east coast vessels began joining the Hawaiian longline fishery after leaving Atlantic and Gulf of Mexico tuna and swordfish longline fisheries. Longline techniques used to target swordfish were introduced to Hawaii by this east coast group and established Hawaii as a major producer of swordfish (Coan et al. 1999). The expanded fishery became the largest in the state in terms of landings and revenue. With the advent of the swordfish longline fishery, a segment of the fishery began to routinely make trips beyond the EEZ to swordfish grounds 400 to 1,000 nm away. In 1991, there were approximately 23 vessels, about 16% of the longline fleet, in this distant water fishery that targeted swordfish year-round. In 1992, 66 vessels targeted swordfish sometime during the year, while 27 vessels fished for swordfish full-time. Trips targeting swordfish accounted for 23% of the total number of longline trips taken in 1992 (WPFMC 1994). Hawaiian swordfish longliners average 30-40 days at sea per trip and fish up to 1,500 miles from Hawaii, compared to tuna longliners that average 7-10 days per trip and fish closer to the islands (Dollar 1992).

The Western Pacific Fishery Management Council developed and implemented the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region in 1987 (52 FR 5983). The FMP prohibited foreign longline vessels from fishing within certain areas of the EEZs of Hawaii, and Guam. In response to the rapid influx of east coast longliners in the late 1980s, Amendment 4 to this FMP extended previous emergency interim rules (56 FR 14866; 56 FR 28116) that were implemented to arrest the rapid growth of the longline fishery. This 1991 amendment (56 FR 51849) established a moratorium on new participants from entering the Hawaiian longline fishery. Under this regulation, a longline vessel fishing in the Hawaii EEZ, or using the EEZ with pelagic species onboard, or landing pelagic fish in Hawaii, must have a limited entry permit. In 1994, Amendment 7 to this FMP replaced the moratorium with a limited entry program for the Hawaiian longline fishery (59 FR 26979) limiting the fishery to 167 vessels.

Under California law, longline fishing in the EEZ off California is prohibited. However, California registered vessels are allowed to land longline caught fish in California ports as long as fishing takes place outside of the EEZ. In 1991, there were three longline vessels that fished beyond the EEZ targeting swordfish and bigeye tuna and unloaded their catch and re-provisioned in California ports. In 1993, a Gulf coast fish processor set up an infrastructure at Ventura Harbor, California to provide longline vessels with ice, gear, bait, and fuel, and fish offloading and transportation services (Vojkovich and Barsky 1998). Consequently, longline vessels seeking an alternative to the Gulf of Mexico longline fishery, and precluded from entering the Hawaii fishery, began arriving in Southern California. By 1994, 31 vessels comprised this California based fishery, fishing beyond the EEZ, and landing swordfish and tunas into California ports. These vessels fished side-by-side with Hawaiian vessels in the area around 135^0 W longitude in the months from September through January.

Other marketable species in the longline catch include opah (*Lampris regius*), dolphin (*Coryphaena hippurus*), and escolar (*Lepidocybium flavobrunneum*). Relatively few sharks, in proportion to those caught, have been marketed from this fishery. The major shark bycatch is blue shark, which is discarded. Other bycatch includes striped marlin, turtles, birds, and marine mammals.

West coast swordfish landings by California-based longline vessels have ranged from 28 mt in 1991 to 497 mt in 1994(Table 2-48), with swordfish accounting for 78%, tunas 9% and sharks 6% of total longline landings in 1994 (Table 2-49). From 1991 through 1994, swordfish landings by California-based longline vessels grew from 3 to 29% of total West Coast swordfish landings (Tables 2-48 and 2-1). In 1994, total West Coast longline landings were more than five times those in 1993 (636 mt). The overall trend for West Coast longline landings from 1991 is decidedly increasing, ranging from a 1991 low of 56 mt to the 1999 high of 1,524 mt, with longline-caught swordfish increasing from 27 mt to 1,287 mt (Table 2-50). There is a developmental pelagic longline fishery authorized off Oregon, but it has produced negligible landings (Table 2-51). California receives virtually all of the high seas longline catch (Table 2-52). In 1994, West Coast swordfish landings by California-based longline vessels represented 35% of total swordfish exvessel revenues, by 1999 this share had risen to 56% (Tables 2-53, 2-54, 2-55 and 2-2)

By 1995, only six longline vessels made a high seas trip from a California port, although 22 vessels made at least one longline landing (Vojkovich and Barsky 1998). The group of vessels that came to California from the Gulf of Mexico in 1993 and 1994 left the California based fishery and either returned to the Gulf of Mexico fishery, or acquired Hawaiian longline permits in order to have fishery options for the months from February to 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 fishing grounds in the fall and winter that were further east than 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 it became closer than returning to Hawaii. 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.

Longline fishing gear consists of a main line strung horizontally across 1-100 km (< 1-62 mi) of ocean, supported at regular intervals by vertical float lines connected to surface floats. Descending from the main line are branch lines, each ending in a single, baited hook. The main line droops in a curve from one float line to the next and bears some number (2-25) of branch lines between floats. Fishing depth is determined by the length of the floatlines and branchlines, and the amount of sag in the main line between floats (Boggs and Ito 1993). The depth of hooks affects their efficiency at catching different species (Hanamoto 1976, 1987; Suzuki et al. 1977; Boggs 1992). When targeting swordfish, vessels typically fish 24 to 72 km (15-45 mi) of 600 to 1,200 pound test monofilament mainline per set. Mainlines are rigged with 22 m branch lines at approximately

61 m intervals and buoyed every 1.6 km (1 mi). Between 800 and 1,300 hooks are deployed per set. Large squid (*Illex spp.*) are known to be used for bait; various colored light sticks are also used. The mainline is deployed in 4 to 7 hr and left to drift (unattached) for 7 to 10 hr. Radio beacons are attached to the gear for recovery. Retrieval requires 7 to 10 hr. Fishing occurs primarily during the night when more swordfish are available in surface waters. Generally, longline gear targeting tuna is set in the morning at depths below 100 m, and hauled in the evening. Longline gear targeting swordfish is set at sunset at depths less than 100 m, and hauled at sunrise. A typical longliner carries a crew of six, including the captain, although some of the smaller vessels operate with a four-man crew. Fishing trips last around 3 weeks. Most vessels do not have built-in refrigeration equipment, limiting their trip length. The fish are iced and sold as "fresh".

Longline-caught fish are sold to wholesale fish dealers. Local California fisheries, distant offshore fisheries, and imports from Hawaii, Chile, and Taiwan all influence the ex-vessel price paid to local longliners for swordfish. Swordfish are often graded by size and quality and the price adjusted accordingly.

At present, management authority rests with the State of California. Current fishery regulations include only basic commercial fishing license requirements and prohibited species (striped marlin) provisions. The High Seas Compliance Act, passed to implement the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas and adopted by the United Nations in 1993, requires logbooks for U.S. vessels fishing beyond the EEZ.

In August 2000, as the result of the case *Center for Marine Conservation vs. NMFS*, a federal district court issued an order directing the NMFS to complete an Environmental Impact Statement (EIS) to assess the environmental impacts of fishing activities conducted under the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region by April 1, 2001, and ordered restrictions and closures over millions of square miles of the Hawaiian longline fishery's usual and accustomed fishing grounds. These court ordered closures effectively eliminated the swordfish fishery. As a result, some Hawaiian 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 year.

NMFS completed the EIS in March, 2001, and, consistent with a Biological Opinion that was issued at the same time, NMFS found it necessary to implement measures for the protection of endangered and threatened sea turtles. Such measures included a prohibition against targeting swordfish north of the equator by Hawaiian longline vessels, and prohibits longline fishing by Hawaiian longline vessels in waters south of the Hawaiian Islands from 15° N latitude to the equator, and from 145° W longitude to 180° longitude during the months of April and May. This decision is being challenged in a lawsuit filed by the Hawaiian Longline Association. As of July 2001, about 20 Hawaiian longline vessels sit idle in San Pedro Harbor.

Oregon does allow the harvest of swordfish and blue shark within the EEZ under a developmental fishery permit; however, no landings have occurred under the permits. Up to 10 permits are allowed for blue shark and 20 for swordfish. Since 1995, the number of blue shark permits issued in a year has ranged from none to six and the number of swordfish permits issued has ranged from one to nine. Permit stipulations restrict the harvest from within 25 miles of the shore.

2.2.6 Other Fisheries

Gillnet fishers reported that during the late 1990s, vessels using small-mesh (3.5-8.5 inches stretched mesh) drift gillnets started fishing for albacore and bluefin tuna off southern and central California. While the large-mesh drift gillnet fishery is well documented through logbooks and NMFS at-sea marine mammal observer program, little is known about the directed take of highly migratory species in the small-mesh fishery. Data that are available from CDFG logbooks show the fishery consisted of four vessels in 2001and two vessels in 2000. Fishermen claim there may be as many as many as 8-10 vessels that occasionally use small-mesh drift gillnets when albacore and bluefin tuna are available. PacFIN data indicates there could be as many as 20 vessels which might have fished small-mesh drift gillnets based on landing receipts for drift gillnet vessels landing albacore and bluefin tuna, but not swordfish. Under California law it is illegal to take swordfish with stretched mesh less than 14 inches so an absence of swordfish landings by vessels using drift gillnet gear was used to screen potential small-mesh fishing operations.

Currently, California vessels that participate in the small-mesh drift gillnet fishery need a General Gill/Trammel Net Permit and must also fill out gillnet logs for each day they fish. Off the central California coast there are several nearshore closures to protect seabirds and marine mammals, however none extends into the EEZ. There are no restrictions on the length of net that may be set, although past observations on small-mesh gillnet fisheries shows vessels generally set no more than 800 fathoms of net. Generally, the cork line is at the surface and the lead line may extend as deep as 6 fathoms. The four vessels that submitted logs reported using stretched mesh between 6 and 7 inches. Studies by NMFS in the 1970's indicate that the maximum take of smaller fish (12-15 pounds) occurs when 7.5 inch mesh is used (Bartoo, NMFS, La Jolla, pers. comm.). Owing to similar body shape, the bluefin and yellowfin tuna taken by these nets are probably the same size. Field observations by CDFG wardens of small-mesh drift gillnet vessels landing albacore reported similar results with the fish reported in the 10-14 pound size range. This is the same general size albacore troll boats land, vessels that are fishing in the same area as the DGN vessels.

The four vessels that were documented as using small-mesh drift gillnets landed between 1.0 and 15.0 mt of albacore and 0.0 to 3.0 mt of bluefin tuna during the 2001 season (Table 2.56). These landings accounted for between 20% and 48% of gross receipts. To the north, these vessels fished between Point Conception and Point Sur and seaward as far as 50 nm offshore. In southern California, they fished seaward of La Jolla and in the vicinity of Cortez Bank. All the effort took place between July and October. None of the vessels reported making sets in the turtle closure area off central California during the closure August 15 through October 31.

Swordfish are also taken by a growing Mexican fleet of approximately 50 vessels converted from drift gillnet to longline gear. Mexican drift gillnet vessels first deployed drift gillnets in 1985. The number of vessels increased to 31 by 1993. As in the U.S. drift gillnet fishery, these vessels target the more valuable swordfish and land pelagic sharks as a profitable bycatch. The vessels and gear in this fleet are similar to the California-based drift gillnet fleet, except that in Mexico nets may be 4.8 km in length.

2.2.7 Processing, Products, and Imports

In California, there were 90 seafood processors in 1995. Of these, five processed over 45,360 kg of swordfish. Processors receive, process, and sell the fish wholesale. As with processors on the east coast, they receive mostly fresh, dressed swordfish. However, unlike the east coast, there is a greater demand for fish weighing over 45 kg dressed weight (approximately 60 kg whole weight), called marker fish, than for fish under 45 kg, called pups. Processors usually cut the swordfish into loins, but there is a growing trend of cutting the swordfish into 198-to-227 gm steaks, called portion control. Pacific processors distribute equally across the U.S. They also import fresh and frozen swordfish when the U.S. fisheries are closed. Most California swordfish is sold to local markets. U.S. imports of swordfish are shown in Table 2-57. From 1971 to 1975, virtually no swordfish were imported due to the mercury restriction of 0.5 ppm.

2.2.8 Recreational Fishing

Recreational fishing for large, migratory pelagic species began off southern California and Baja California, Mexico in the late 1800s. This fishery now operates year round with peaks in activity for tuna, billfish and pelagic sharks during the spring and summer and lasting into the fall. The fleet is composed of privately owned vessels, as well as charter vessels, party boats, and head boats, collectively called commercial passenger fishing vessels (CPFV). The HMS recreational fisheries off the Washington and Oregon coasts are solely for albacore tuna using hook-and-line gear. A recreational fishing license is not required to fish for albacore tuna in Washington but is required in Oregon. The Washington and Oregon recreational fishery is open year-round and there is no minimum size limit. In Washington, there is no catch or possession limit. In Oregon, albacore tuna come under the catch limit of 25 miscellaneous fish.

Biological and socioeconomic data for HMS recreational fisheries pale in comparison to those for HMS commercial fisheries. State administered logbook programs are an important source of recreational fishing catch and effort data for CPFV patrons, including those participating on long-range trips aboard California based CPFVs into Mexican waters (Table 2-58). The National Marine Fisheries Service conducts the Marine Recreational Fishing Statistical Survey (MRFSS) which routinely collects recreational catch and effort data from West Coast marine anglers, including those targeting HMS from CPFVs and privately owned vessels, as well as occasional add-on surveys to collect angler socioeconomic data (Table 2-59). The data available from MRFSS and the state recreational fishery monitoring programs are provided to the coastwide recreational fishery network data system (RecFIN) where they are integrated into a comprehensive coastwide marine recreational fishery data base. Recreational billfish fishery data are also collected by the Southwest Fisheries Science Center (SWFSC) through its Billfish Angler Survey and the Billfish Tagging Programs. The data from these programs are published annually in the Billfish Newsletter (Holts and Prescott 2001).

West coast recreational fishing activity directed towards large, migratory pelagic species emanates mainly from CPFVs and privately owned vessels departing sportfish landings, marinas and launch ramps dotting the southern California coast from LA to San Diego. The Sportfishing Association of California (SAC) is the major industry organization representing nearly 200 CPFVs operating out of 23 landings from Morro Bay to San Diego. This fleet carries almost 1 million passengers annually to local and Mexican fishing grounds. The fleet and supporting shoreside facilities represent a monetary investment totaling close to $80 million, and a labor force of about 4,000 persons. In 2000, there were an estimated 876,000 trips taken aboard southern California based CPFVs resulting in a total catch of 2,941,000 fish, a 44% and 30% increase respectively from 1999 (RecFIN). Approximately 429,000, 49%, of all southern California based CPFV trips in 2000 accounted for total HMS catches of 99,000 fish, 3% of the total CPFV catch. This is 12 times the number of trips, and a 21% increase in HMS catch compared to 1999.

A large number of southern California based privately owned vessels are used to recreationally fish for HMS, upwards of 6,000 annually. These vessels cover a wide rang of sizes and types, ranging in length from 17 ft skiffs to 90 ft or greater luxury yachts, with many vessels under 30 ft. In 2000, private vessels made approximately 1,760,000 fishing trips, of which 1,318,000, 75%, resulted in HMS catches. This was an increase of 51% and 100% in total trips and HMS trips from 1999 (RecFIN). The estimated total recreational catch of southern California based private vessels in 2000 was 2,594,000 fish of which 57,000, 2%, were HMS (RecFIN), up 37% and 150% respectively from 1999. Southern California based private vessels accounted for 75% of the total (CPFV plus private vessel) number of HMS trips, and 37% of total HMS catches in 2000, a decrease of 21% and an increase of 68% respectively from 1999.

Information from an add-on expenditure survey to the MRFSS in 2000 (Gentner et al. 2001) indicates that across all species, and the entire West Coast, expenditures by participants -- CPFV, private vessel and shore -- on marine recreational fishing was estimated at $4.5 billion in 2000. Southern California anglers (residents and non-residents) accounted for the largest share, 38%, followed by Washington anglers, 31%, northern California anglers, 17%, and Oregon anglers 14%. Estimates of southern California CPFV and private vessel trip expenditures totaled $205 million in 2000, 62% CPFV and 38% private vessel. Based on the proportions of HMS trips of total recreational trips for CPFV and private vessels, HMS trip expenditures for CPFVs were $62 million and HMS trip expenditures for private vessels were $58 million in 2000. In addition to trip expenditures, southern California residents spent $1.5 billion on fishing equipment (e.g. vessels and tackle) and other semi-durable (e.g. maintenance) and durable (e.g. vacation home) items used primarily for marine recreational fishing.

2.2.8.1 Charter/Party Boat Fleet

The tropical tunas, billfish and sharks become available off the West Coast as they move seasonally eastward from oceanic waters and northward from Mexico. Except during periods of warm water, recreational catches of these species are almost exclusively from waters off southern California (Table 2-60). Albacore move into the coastal waters along the West Coast from more temperate waters offshore. The timing and extent of the species appearance is dependent on seasonal development of environmental and oceanographic conditions such as water temperature, coastal up welling, strength of the California Current, El Niño episodes and possibly longer decadal cycles. Albacore are one of the most important species caught by the West Coast CPFV fleet (Table 2-61).

The CPFV fleet offers short trips from one to two days and long-range trips of up to 15 days into Mexican waters. The fleet is made up about 300 vessels from about 8 to 40 m in length and target large pelagic species when quantities occur within their range.

The smaller and faster California sport fishers licensed to carry six passengers or less are called 6-packs. Six-pack vessels target tunas, billfish and coastal pelagic species on one or two-day trips. These vessels are more likely to spend the extra time necessary to catch billfish if requested by their clientele. The larger CPFV vessels may carry 40 or more passengers and target albacore, bluefin, yellowfin, skipjack, dorado and coastal pelagic species on long-range trips into Mexico and shorter trips of one or two days within the SCB. Few CPFV vessels with more than six passengers will take the time necessary to catch billfish or pelagic sharks because it limits fishing activity of other passengers.

In California, charter vessels are required to submit logbooks from each trip detailing the number of anglers and catch by species to Department of Fish and Game. Oregon and Washington do not require CPFV logbooks, but Washington does have a voluntary CPFV logbook. The state agencies also conduct occasional angler interviews to supplement catch and effort data.

California catches from the CPFV logbooks for HMS are shown in Table 2-58 from 1980 to 1998. Fishing effort in terms of angler hours reported by CDFG is summarized for northern California, southern California and Baja California, Mexico (Figure 2-2). Annual tuna catches for the CPFV fleet over the period 1990 – 1998 averaged 85,400 yellowfin, 41,000 skipjack and 11,000 bluefin tuna (Figure 2-3). Of that, 87%, 66%, and 87%, respectively, were landed on vessels operating in Mexican waters. California's CPFV catch for 1998, by CDFG block number indicates highest catches in the SCB, and south of San Clemente Island for albacore, yellowfin, bluefin, bigeye, skipjack, and dorado. CPUE in catch per angler hours fished for 1998 and by block number show distinct areas of greater angler success for albacore, yellowfin, bluefin, bigeye, skipjack, and dorado. Figures 2-4 through 2-9 present the 1998 California charter/party fleet catch locations for albacore, yellowfin, bluefin, bigeye, skipjack, and dorado, respectively. Figures 2-10 through 2-15 present the 1998 California charter/party fleet catch per unit of effort for albacore, yellowfin, bluefin, bigeye, skipjack, and dorado by area, respectively.

Albacore is an important recreational species for California's charter/party fleet. Average catch was 90,000 fish annually over the 1980- 1998 period of which 80% were taken off Mexico (Table 2-58). Catches off California fluctuated widely during the period, ranging from 171 to 54,500 fish annually. Strong El Niño conditions and possibly decadal shifts in oceanographic conditions have a strong influence on albacore distribution and movement patterns. Reported albacore CPUE increased in the 1980s and late 1990s when El Niño conditions were present (Figure 2-16).

California CPFV vessels also conduct night fishing trips for blue and mako sharks during the spring and summer and daytime trips for thresher sharks in coastal waters when supported by adequate passengers/client interest. The CPFV data indicate catches of shortfin mako, common thresher, and blue sharks averaged 292, 90, and 2,835, respectively, between 1990 and 1998.

A specialized sector of this California fishery is the long-range and multi-day fleet that fishes extensively off Mexico. Mexico provides special permits, subject to payment of fees, certain port call requirements, and observer and reporting requirements. In 1998, an unprecedented problem occurred for the California long-range fleet when it was required to halt operations late in the calendar year off Mexico after the IATTC yellowfin purse seine quota was reached. Under IATTC's yellowfin quota system, when the quota is met, fishing ceases for both the commercial and recreational charter fleets. This resulted in the loss of the key holiday period to the U.S. charter fleet.

Mexican daily recreational catch (bag) limits are more conservative than CDFG limits. For most species, the Mexican daily bag limit is five fish, with a total daily limit of 10 fish. There are exceptions, however, and in the case of marlin, sailfish, swordfish, and shark, the limit is one, and it counts as though an angler caught five of any other species within that angler's daily 10 fish limit. The dorado limit is two, and is equivalent to five fish of any other species. When skindiving, the daily limit is five of all species combined. SCUBA diving is prohibited for taking fish in marine waters. Catch and release is encouraged. These regulations were implemented in May 1995, and may be up for revision in the near future.

The San Diego Bay long-range charter vessel fleet is comprised of approximately 57 vessels. The fleet is based at three sport fishing landings: H&M Landing, with 26 vessels; Point Loma Sport Fishing, with 13 vessels; and Fisherman's Landing, with 18 vessels (London Group 1999). The typical fishing season is March through October. During the off-season (November to February), about 15% of the vessels fish in more northerly waters and the remaining 85% remain in San Diego for repair and maintenance for the upcoming season. Approximately 544 persons are directly employed as crew members, in maintenance, dock workers, in administration, and in retail (London Group 1999). Two-thirds are full-time employees and most are employed as crew. The number of crew per vessel ranges from between three and 15 with a median of eight. Retail and administrative workers oversee the duties of booking fishing trips and running the local tackle and bait shops. During the off-season, only one or two crew members of the vessels not operating on a full-time schedule stay employed to help with the repairs and maintenance of the vessel. The other workers may find other jobs locally in San Diego but all reside in San Diego throughout the year.

A total of 154,567 fishers visited the three sportfish landings in San Diego Bay in 1998 (London Group 1999). Approximately 66,355 fished in U.S. waters and the remaining 88,212 fished the waters off of Mexico. At H&M Landing, 39,000 fished in Mexican waters and 42,356 fished in U.S. waters. At Point Loma Sportfishing, 23,246 fished in Mexican waters and 13,947 fished in Mexican waters. At Fisherman's Landing, 25,966 fished in Mexican waters and 10,052 fished in U.S. waters.

The most recent survey of the San Diego Bay charter/party sport fishing industry concluded that in 1989, only 44% of persons who fished from San Diego Bay sportfish landings actually lived in San Diego County (NMFS, Results of the Southern California Sportfish Economic Survey, 1991). The remaining 56% came to San Diego from outside of the County. The number of fishers from outside of San Diego County has now grown to 80%, with Los Angeles the largest source (London Group 1999).

The total economic activity occurring within San Diego Bay (Fisherman's Landing, Point Loma Sportfishing, and H&M Landing) in 1999 was 1,200 jobs, $25.3 million in earnings, $49 million in economic output making it a critically important industry to San Diego's economy (Table 2-62) (London Group 1999).[5] This type of detailed participation and expenditure data is currently lacking for other fleets and areas.

In Washington, the major port for charter vessels is Westport, which has seven charter offices with an average of fifteen charter vessels that routinely fish for albacore tuna in the summer months. The importance of albacore tuna to this fleet has risen in the last decade as other fishery opportunities (e.g. salmon and rockfish) have declined.

Based on information from charter vessel operators, the Washington recreational fishery has been fairly stable, with increases in catch in recent years. The distance from shore varies from year-to-year (in 2000, the average distance was 64 nm) and charter vessels often take two-day fishing trips for albacore. According to one charter operator, the number of anglers reserving tuna trips on his vessel nearly doubled from 1992 to 1998. The amount of tuna caught has also increased in proportion to the number of anglers, from about 1,300 in 1992 to about 3,000 in 1998.

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[5] Because the London Group (1999) study covered all CPFV species, not all of this economic activity can be directly attributed to HMS CPFV fishing out of San Diego Bay.

Washington has a voluntary program for charter/party logbooks, which was instituted in 2000 with a 69% compliance rate. Based on the 2000 Washington logbook data, over 8,000 albacore were caught by over 1,300 anglers. The average number of albacore caught per person is six with an average weight of 14.5 pounds. Oregon does not have a logbook program.

It is difficult to separate the charter/party boat fishery from the private vessel recreational fishery in Oregon(see the private sport description below for additional details). Albacore sport fishing off Oregon has increased in recent years due to improvements in navigational aids and marine equipment and greater appreciation of albacore as game fish. Depending upon the availability of albacore nearshore, recreational landings have ranged from 11 mt to about 80 mt in recent years, accounting for up to 2% of the total Oregon albacore harvest. Charter vessels account for 60-70% of the total recreational catch. The majority of effort and catch is concentrated along the central part of the Oregon coast, though landings occur in ports coast wide. The majority of the charter effort is out of Depot Bay and Newport, with less effort out of Garibaldi and Brookings.

2.2.8.2 Private Sport Fishing Fleet

The California recreational, rod-and-reel fishery, fishery for tuna, striped marlin and swordfish developed about the turn of the century. The Tuna Club of Avalon, Santa Catalina Island, California was established in 1898, and set the standard for big game fishing in waters off California which is widely adhered to today, "fair play to game fishes" (United Anglers of Southern California 2001: From brochure Recreational Fishing in Southern California). To this end, strict rules were designed to give the fish an even chance, and these rules became the foundation for the International Game Fish Association's regulations for fish to qualify for its record books.

The first tuna caught by an angler to receive public acclaim was a 183 lb. bluefin taken in 1898. A 251 lb. bluefin, the largest yet taken using sporting tackle, was caught in 1899. In 1903, the first striped marlin caught with rod and reel was taken off Catalina Island. The first swordfish taken by an angler was caught in 1913, using a kite to present the bait and a prototype disc clutch reel to land the fish (United Anglers of Southern California 2001: From brochure Recreational Fishing in Southern California). The development and early history of big game fishing in southern California is described by Holder (1910), Grey (1919), Ries (1997) and Farrior (1997).

Highly migratory species continue to be highly prized by the recreational fishing community (Tables 2-59 and 2-60) although their catches of tuna and swordfish are relative low in quantity compared to the commercial catch. Swordfish and striped marlin were listed as game fish in 1931 and required a sport-fishing license issued by the CDFG. The California State legislature banned the use of harpoons to take striped marlin in 1935 and further curtailed the sale and import of striped marlin in 1937 thus preserving that southern California fishery entirely for recreational anglers. Private vessel anglers are not required to report their fishing activity or catches. Catch data from the private sport vessels are obtained through occasional CDFG monitoring and the MRFSS. There is little opportunity to recreationally fish for marlins and swordfish north of San Francisco. Most striped marlin fishing is from privately owned vessels based in local southern California marinas.

Many private vessel owners also possess Mexican fishing licenses and travel south looking for schools of tuna and billfish. Sport fishing vessels will target tuna when they move into southern California and northern Baja California waters. The estimated number of private vessels in southern California fishing large pelagic fish is 4,000 to 6,000 annually, although accurate census and economic information is currently unavailable for this fishery.

The rod-and-reel season for striped marlin and swordfish can begin as early as May and continue through November, although most fish are taken from July to October. Fishing locations are primarily in the SCB from Santa Barbara, south and into Mexico. Many California anglers will fish the productive waters around Mexico's Coronado Islands for tuna, marlin, dorado and coastal pelagic species. A few private vessel owners travel as far south as Magdalena Bay and Cabo San Lucas in the fall and winter.

California recreational anglers were allowed the use of hand-held harpoons to take swordfish until 1971. Catching swordfish with a rod-and-reel is difficult because they are usually not receptive to bait or artificial lures while finning at the surface. A few anglers now successfully target swordfish at night using techniques adapted from the East Coast that employ the use of light-sticks.

Fishing records from the Balboa Angling Club, San Diego Marlin Club and the Tuna Club of Avalon provide catches in numbers and individual sizes for striped marlin and swordfish taken by their members. Reported swordfish catches totaled 577 fish between 1909 and 1996, peaking at 127 fish in 1978. Periods of greatest swordfish catch occurred between 1915 to 1930 and from 1969 to 1981. The increased catches during the latter period correspond to a similar increase in landings from California's commercial harpoon fishery and may reflect a generally higher abundance in the southern California waters. Higher abundance may also be related to years following El Niño events (Coan et al. 1998). The average weight of swordfish recorded at these three southern California sportfishing clubs declined during the 1909-96 period (Figure 2-17).

Reported annual catches of striped marlin by the Balboa Angling Club, San Diego Marlin Club and the Tuna Club of Avalon have declined in recent years from 761 fish per year during the 1980s, to 273 fish per year during the 1990s (Figure 2-18). The period between 1955 and 1965 had some of the highest catches in a single season, but the 1980s had more consistent catches. Total annual recreational striped marlin catch -- kept or released from the three clubs -- declined from a peak of approximately 1,100 in 1963 to a low of about 180 in 2000. No year in the last decade saw a catch in excess of 400 fish. Nine or ten years in the decade of the 1980s yielded catches in excess of 400 fish. The time series of catches shows an apparently significant decline from a peak of about 1100 fish/year in 1963 to a low of about 180 in 2000.

The average weight of striped marlin weighed in at the southern California sportfishing clubs from 1903 to 2000 was 68 kg (150 lbs.) (Figure 2-19) ranging from 91 kg to 55 kg (200 to 120 lbs.) (Holts and Prescott 2001). Early weight records possibly include a few blue marlin and/or swordfish incorrectly identified as striped marlin. Large striped marlin were more plentiful in the SCB during the 1920s although none in excess of 160 kg (350 lbs.) have been landed since the 1950s. The International Game Fish Association's all tackle record for striped marlin is 224 kg (494 lbs.) taken off New Zealand.

The only estimates of recreational fishing effort for marlin and swordfish come from the SWFSC's Billfish Angler Survey (Squire and Au 1990, Holts and Prescott 2001). The survey began in 1969, and collects catch and effort data from individual anglers fishing for billfish and swordfish in key locations throughout the Pacific Ocean. The average catch rate for all billfish from all areas was 0.50 fish per angler day over the 1995-99 period, and reached an all time high of 0.61 in 2000. The lowest catch rates averaged 0.34 during the mid-1970s.

Recreational striped marlin catch rates for southern California, Baja California and Hawaii are estimated using data from the Billfish Angler Survey. Highest angler success for striped marlin occurs off Baja California 0.41 fish per angler day in 1999 compared to a fairly consistent 0.10 catch rate for southern California and Hawaii (Figure 2-20). Even though there appears no overall trend for the period several periods of highs and lows are evident. For example, periods immediately following strong El Niño episodes are marked with greater variance between years. Squires and Au (1990) found that joint-venture longline fisheries operating near Baja California in the 1970s was related to declining angler catch rates for striped marlin. Mexico restricted foreign longlines from fishing in its EEZ for two years beginning in 1976, during which time, the angler catch rate for billfish off Baja California increased by almost 60%. A period of limited longlining that began in 1982 was again correlated with a decline in angler catch rates. Mexico canceled all longline permits to fish billfish and tuna within its EEZ in 1990. Patterns of striped marlin catch rates during the 1969-99 period should also be considered in the context of the technological changes in angling effort that have occurred over the period (i.e. Loran A, Loran C, GPS, satellite imagery, faster vessels, etc.). Due to the relative difficulty in catching swordfish with rod-and-reel gear, recreational swordfish catch rates are significantly lower than striped marlin catch rates. Anglers fishing in southern California (and northern Mexico) reported swordfish catches of 0 to 0.002 fish per day between 1990 and 1997.

Sport fishers successfully target both juvenile and adult shortfin mako and common thresher sharks. Shark angling has experienced increased popularity in southern California waters during the last decade. Private vessel sport-fishing effort targeting blue and shortfin mako sharks reached 410,000 trips in 1989 and has remained high. Currently there are about eight shark fishing tournaments held annually in southern California.

The SWFSC's angler-based Billfish Tagging Program provides data on the movement, geographic distribution patterns and survivability of billfish caught off the West Coast. In 1999, 486 individual anglers and 158 captains reported tagging at least one billfish (Holts and Prescott 2001). Southern California sportfishing club records show the number of striped marlin released or tagged and released has increased from 20% to 50% in the 1980s to over 90% in the most recent years. In 1998 bluefin tuna was incorporated into the tagging program.

Recapture data indicate that striped marlin and swordfish move extensively throughout the Pacific, but without specific patterns of migration. These movements, whether nomadic wanderings or generally discursive, expose them to high-seas commercial and coastal recreational fisheries. Striped marlin tag releases total 20,503 with 327 recaptures giving a 1.6% rate of recapture (Table 2-63). The majority of tagged striped marlin were released from Hawaii, southern California, and Baja California Sur. Recaptures indicate movement from southern California to Baja California, Sur (Figure 2-21) but little or no movement in the reverse direction. Striped marlin tagged off southern California and Baja California have been recaptured in the central Pacific. There is no indication of direct movement from Hawaii to the West Coast.

Cooperating billfish anglers and U.S. commercial fishers have tagged a total of 504 swordfish. Recaptures total 15 for a return rate of 2.98%. (Table 2-63). The SWFSC, along with cooperating southern California billfish anglers and commercial fishers, tagged 17 swordfish in 1978 in an effort to identify movement patterns in the SCB. Six of those swordfish were recaptured within 35 days and none had moved more than 30 nm (Figure 2-22). Two swordfish tagged north of Hawaii on U.S. longline vessels moved northeast toward the West Coast and were recaptured by other commercial fishing vessels (Figure 2-22). One swordfish was recovered near San Clemente Island by a drift gillnet vessel.

In Oregon, it is difficult to distinguish the charter/party boat fishery from the private vessel recreational fishery. Private vessels make up approximately 30-40% of the total recreational catch. The majority of effort and catch is concentrated along the central part of the Oregon coast, though landings occur in ports coast wide. The majority of private vessel effort is from Garibaldi to Newport, and Coos Bay and Brookings.

Most recreational albacore fishing in Oregon occurs within 50 miles of shore with most private vessels staying much closer (Holts 1985). Fishing is usually limited to mid-July through early October, with most of the effort and catch occurring from mid-August through early September. Anglers fishing for albacore off Oregon will usually troll "tuna" jigs near the surface at 5-8 knots, and will concentrate their effort in waters with surface temperatures of 60° F or higher.

2.2.8.3. Enhanced Collaboration with Pacific Anglers.

The rarity of billfish encounters and difficulties of capture suggest that an alliance between fishers and scientists will improve access to that resource. Modern technology such as molecular diagnostic assays, archival transmitting tags, and laser measurement devices can potentially produce more and better information during the brief period of contact when a fish is brought to the vessel for tagging. Small tissue and blood samples collected from released fish can greatly improve stock assessments by providing new information on the stress of capture, post-release survival, population structure, growth rate, age, sex, reproductive state, and nutritional condition.

Participants in the recent workshop, Pacific Federal Angler Affiliation for Billfish, (Hunter and Holts 1999) decided the best way to meet future information needs was to expand on the SWFSC's existing Billfish Tagging Program and Angler Survey. Thus an enhanced program would encourage billfish anglers to tag and release billfish as before, but in a way that will greatly increase the kinds and quality of scientific information derived from their fishing trips. Collaborative projects to improve information needed for stock assessments included the means to acquire specific life history data, time series abundance estimates, identify movement patterns and stock boundaries, and measures of physical condition at time of release.

Implementation of the following recommendations show great promise while the more costly elements await additional resources:

- Construct an Internet web site for information exchange with the angling community.
- Develop a volunteer bridge log to establish a time series index of catch-per-unit of effort.
- Obtain better length-at-catch data.
- Obtain historic club records for time series indexes of abundance.
- Upgrade tournament data recording to include some measure of total fishing effort.
- Implement tissue sampling for genetic and physiological studies.
- Develop advanced tagging methodologies including electronic tags and measuring devices.

2.3 HMS Commercial Fishing Vessels

This section presents information on HMS commercial fishing vessels. The section first examines the number of vessels participating in west-coast HMS fisheries by the particular HMS fishery in which they engage, and the port that is most prominent with respect to their overall exvessel earnings. Next the number of annual landings by HMS vessels is investigated as an indication of annual effort production in HMS fisheries. Then the amount of annual HMS landings and corresponding exvessel revenues for HMS vessels are considered in terms of their most economically important fishery. Finally, vessels participating in west-coast HMS fisheries are described in terms of their physical characteristics.

The data used to characterize HMS commercial fishing vessels are from Washington, Oregon, and California landings receipts (fish ticket) data maintained in the PacFIN management data base, as well as the Coast Guard and State Vessel tables maintained in PacFIN for data on vessel physical characteristics. Annual vessel summaries were created for each vessel that had any West Coast landings of HMS over the 1981-99 period. Vessel summaries consist of the year of participation, the number of HMS landings the vessel made during the year, quantities landed and exvessel revenues for HMS as well as for groundfish, salmon, coastal pelagics, shrimp, crab, shellfish, and collectively other species. The vessel summaries also contain the vessel's principal species, principal gear and principal port for the year. West-coast based vessels that had no West Coast landings during the year would not be included in that year's vessel summaries. This could exclude some West Coast based distant water, large purse seine vessels (section 2.2.2.), and possibly some south Pacific albacore trollers (section 2.2.1.) from the analysis if they did not make a West Coast HMS landing during the year.

A vessel's principal species is the species, relative to all species the vessel landed, that accounted for the largest share of its total exvessel revenues for the year. A vessel's principal gear is the gear, relative to all the gears used by the vessel during the year, that accounted for the greatest share of its total exvessel revenues for the year. A vessel's principal port is the port, relative to all ports at which the vessel made landings, that accounted for the largest share of the vessel's total exvessel revenues for the year. If a vessel's principal species was an HMS in a particular year, the vessel was defined as an "HMS vessel" in that year.

2.3.1 Number of Commercial Fishing Vessels Participating in HMS Fisheries

The number of vessels making West Coast landings of HMS declined precipitously from 1981 through 1991. From 1991 through 1999 the number of vessels with HMS landings varied, but increased overall by 1999 (Figure 2-23). Throughout the period from about 40% to 55% of the vessels with HMS landings were "HMS vessels", i.e. those whose principal species was an HMS.

In any year there were more vessels making albacore landings than any other HMS (Table 2-64).There were a relatively large number of vessels making West Coast landings of tropical tunas early in the period because of the major presence of the U.S. tuna industry on the West Coast during the early 1980s, but the number declined disproportionately compared to the overall decline in numbers of HMS vessels from 1981-99 with the move of the major canned tuna processors offshore. The decline in the number of vessels making swordfish landings during the period was mainly due to the shift from swordfish harpoon vessels to limited entry drift gillnet vessels in the swordfish fishery. In recent years drift gillnet activity has decreased, which partially accounts for the decrease in number of vessels landing sharks. The increase in numbers of vessels landing dorado is interesting. Dorado is not a targeted commercial species, but appears to be an increasing incidental catch by vessels using surface hook-and-line gear and vessels using longline gear (Table 2-65).

Most vessels landing albacore used surface hook-and-line gear during the 1981-99 period (Table 2-65). Vessels using surface hook-and-line gear also landed relatively large amounts of other HMS compared to vessels using other HMS gears. Because the drift gillnet fishery was a limited entry fishery during most of the period, vessels that used this gear to harvest swordfish and sharks were probably the same as those landing albacore over the period. Vessels using purse seine gear were those participating in the coastal purse seine fishery, or the distant water tropical tuna, large purse seine fishery, or both. Most of the purse seine vessels landing albacore and bluefin tuna were probably distinct from the vessels landing tropical tunas, at least early in the period.

The principal ports of vessels with HMS landings over the 1981-99 period ranged from Westport, Washington in the north to San Diego, California in the south (Table 2-66). It should be pointed out that for many vessels with HMS landings, even those that are "HMS vessels", the principal port (based on the greatest share of all exvessel revenues) was associated with a non-HMS (e.g. a vessel may land its HMS at a number of different ports but land all of another of its important species at one port). For this reason a vessel's principal port may be different from the port where it makes most of its HMS landings. While vessels can, and frequently do, land at a number of ports during the year they can only have one principal port. In Washington, Westport and Illwaco were major ports for vessels with albacore landings. In Oregon, more vessels with HMS landings made Newport their principal port not so much on the basis of their HMS landings but on their landings of non-HMS. Ports south of Santa Barbara were the principal ports for vessels landing HMS in California, particularly early in the period. Again the presence of canned tuna processors in southern California early in the period, and the prominence of HMS fisheries off southern California help to explain this. Vessels with HMS landings whose principal ports were in northern California probably depended more on non-HMS and land their HMS elsewhere.

The numbers of vessels with West Coast HMS landings over the 1981-99 period were also analyzed with respect to their principal species, principal gear (Table 2-67) and principal port (Table 2-68).For most vessels whose principal gear was surface hook-and-line, their principal species was by far albacore (Table 2-67). For most vessels whose principal gear was drift gillnet, swordfish was the principal species followed by sharks. In most years, most vessels with pelagic longline as their principal gear had non-HMS as their principal species. Swordfish was the next most important principal species for longline vessels. Early in the period there were a large number of vessels whose principal gear was purse seine and principal species was tropical tunas. The number has declined in recent years, and most vessels with purse seine as a principal gear had non-HMS as a principal species. This likely reflects the importance of HMS to vessels in the coastal pelagics fisheries. For virtually all vessels with harpoon as their principal gear swordfish was their principal species. For vessels whose principal gear was a non-HMS gear during the period most had a non-HMS as principal species. However, there were a number of vessels that had a non-HMS principal gear and an HMS as a principal species during the period, particularly swordfish as the principal species. This is probably due to reporting problems on fish tickets where in California drift gillnet gear was difficult to distinguish from other entangling net gears prior to 1994. From 1994 on, the numbers appear more reasonable in this regard, and also with regard to the number of vessels with drift gillnet as principal gear and swordfish or shark as principal species before 1994.

Many vessels with West Coast HMS landings from 1981-99, with a non-HMS as their principal species, had crab, salmon or coastal pelagics as their principal species (Table 2-69). This likely reflects the large number of West Coast vessels for which salmon, albacore and crab characterizes their annual fishing cycle, and the dependence of coastal pelagics vessels on albacore, bluefin and tropical tunas. For many West Coast vessels HMS are an important, but not the most important, component in their overall fishing operations.

The principal ports for "HMS vessels" during the 1981-99 period were primarily located south of Santa Barbara, California (Table 2-68), reflecting the significance of HMS fisheries for albacore, bluefin tuna, swordfish, sharks and tropical tunas off California. Westport and Illwaco in Washington and Astoria and Newport are major ports for "HMS vessels" along the north coast primarily for landings of albacore.

2.3.2 Number of Landings by Vessels Participating in HMS Fisheries

The number of HMS landings made by vessels with West Coast landings of HMS during the 1981-99 period were reviewed. The pattern of the number of landings (Figure 2-24) almost duplicates the pattern for changes in the number of vessels (Figure 2-23). Over the period almost 70% of the annual landings were made by "HMS vessels" suggesting a disproportionate production of effort by "HMS vessels" relative to vessels with HMS landings but whose principal species was a non-HMS.

The number of West Coast landings by "HMS vessels" from 1981-99 were categorized by principal species and principal gear (Table 2-70). For "HMS vessels" whose principal gear was an HMS gear, albacore surface hook-and-line vessels, swordfish drift gillnet vessels and swordfish harpoon vessels tended to make the most landings annually. This might be expected given the nature of these West Coast fisheries in terms of vessel harvesting capacities and fish handling capabilities i.e., relatively large number of small vessels of limited range making frequent trips of short duration. The large number of HMS landings by vessels whose principal gear is a non-HMS gear and whose principal species is swordfish or shark, especially before 1994, probably reflects the reporting concerns discussed above.

For vessels with a non-HMS principal species the pattern of landings (Table 2-71) mirrors that of numbers of such vessels participating in HMS fisheries (Table 2-69). There are a comparatively large number of HMS landings by coastal pelagics, crab, salmon and groundfish vessels (as defined by their principal species) indicating the importance of HMS in their combined fishing activities.

2.3.3 Quantities Landed and Exvessel Revenues for Vessels Participating in HMS Fisheries

The amounts of HMS landed and corresponding exvessel revenues for vessels with West Coast landings of HMS during the 1981-99 period were also examined. For the most part, the pattern of landings (Figure 2-25) and the pattern of real exvessel revenues (Figure 2-26) conforms to those of vessel participation (Figures 2.23 and 2.24). Quantities of HMS landed and their real exvessel values declined sharply through 1991 except for a brief recovery in 1987 and 1988. Between 1991and 1999 quantities landed increased slightly while real revenues remained fairly stable indicating a moderate decrease in the overall implicit real exvessel price. "HMS vessels" delivered almost 80% of the annual HMS landings and generated 70% of annual HMS exvessel revenues over the period.

West coast landings and exvessel revenues by "HMS vessels" were categorized by principal species and principal gear from 1981-99 (Tables 2-72 and 2-73). Total HMS landings and exvessel revenues were dominated by vessels whose principal gear was purse seine and principal species tropical tunas early in the 1981-99 period mainly due to the presence of major U.S. canned tuna processors in southern California at the time. With their departure the proportion of HMS landings and exvessel revenues by "HMS vessels" whose principal gear was surface hook-and-line and principal species was albacore became relatively more significant. "HMS vessels" whose principal species was swordfish figured prominently in the exvessel value of HMS landings during the period. Most of the swordfish landings reported under "other" principal gear can probably be attributed to drift gillnet gear in view of the fish ticket reporting problems -- an alternative entangling net gear reported instead of drift gillnet -- alluded to above.

For vessels with a non-HMS principal species, those with coastal pelagics as their principal species landed substantial quantities of albacore, bluefin and tropical tunas during the period (Table 2-74) which accounts for the relatively high exvessel value of their HMS landings (Table 2-75). Albacore was also significant in the landings of crab, groundfish, salmon and shrimp vessels (as defined by their principal species); these vessels also had landings of swordfish and shark during the period. Shrimp vessels landed relatively large amounts of tropical tunas for non-HMS vessels.

2.3.4. Physical Characteristics of Vessels Participating in HMS Fisheries

Physical vessel characteristics available in the Coast Guard and state vessel tables in the PacFIN database include length, gross weight, net weight, year built and horsepower as well as various identifiers. Vessel characteristics were compiled for those vessels whose principal fishery (species and gear combined) was an HMS fishery during 1981-99. Almost all of these vessels had length data reported whereas many had incomplete weight and horsepower data. Thus, only length was examined to physically describe vessels by principal HMS fishery (Table 2-76).

The largest vessels participated in the large purse seine fishery (tropical tunas), ranging from 18 ft to 239 ft and averaging 167.3 ft during 1981-99, all years together. Coastal purse seiners (albacore and bluefin tunas) ranged from 21 ft to 226 ft and averaged 80.4 ft during this period. Longliners (all HMS) ranged in size from 17 ft to 97 ft and averaged 69.6 ft. Albacore surface hook-and-line vessels ranged from 10 ft to 360 ft and averaged 47.9 ft. Swordfish and shark drift gillnet vessels ranged from 18 ft to 85 ft and averaged 44.6 ft. The smallest vessels were swordfish harpoon vessels which ranged from 17 ft to 83 ft and averaged 38.0 ft.

Vessel lengths were grouped into four categories to see any changes in vessel length distributions during the 1981-99 period for each HMS fishery (Figures 2-27, 2-28, 2-29, 2-30, 2-31, 2-32). Vessels that participated in the albacore surface hook-and-line fishery tended to become greater in length, increasing from an average length of 43.9 ft in 1981 to 51.7 ft in 1999. From 1981 to 1999 the proportion of albacore surface hook-and-line vessels over 50 ft became larger (Figure 2-27). Vessels in the coastal purse seine fishery showed an increase in average length from 44.0 ft in 1981 to 96.0 ft in 1999 (Figure 2-28). In the swordfish and shark drift gillnet fishery, there was an increase in the proportion of vessels over 50 ft at the end of the period; however, most of the vessels were still under 50 ft (Figure 2-29). The average length of drift gillnet vessels went from 39.7 ft in 1981 to 46.2 ft in 1999. The vessel length distribution remained relatively stable for the swordfish harpoon fishery over the period (Figure 2-30), with the average vessel length decreasing slightly from 38.0 ft in 1981 to 34.9 ft in 1999. The average length of vessels participating in the large purse seine fishery decreased over the period from 170.4 ft in 1981 to 134.6 ft in 1999, although the majority of large purse seiners continued to be over 75 ft (Figure 2-31). The proportion of longline vessels over 75 ft has increased in recent years (Figure 2-32). The average length of longliners rose from 52.0 ft in 1981 to 74.7 ft in 1999.

The HMS vessel length distributions were further broken down into five West Coast areas (Washington, Oregon, Northern California, Central California and Southern California) to which vessels were assigned based on their principal port (Tables 2-77, 2-78, 2-79, 2-80, 2-81). Only albacore surface hook-and-line vessels were distributed along the entire West Coast, which therefore allowed length distribution comparisons between all areas (Figures 2-33, 2-34, 2-35, 2-36, 2-37). Swordfish and shark drift gillnet vessels had principal ports in all areas, but mostly in California (Figures 2-38, 2-39, 2-40). The rest of the HMS fisheries had vessels whose principal ports were almost exclusively in southern California and consequently no area comparisons were made.

By the end of the 1981-99 period there were more larger albacore surface hook-and-line vessels in southern California, northern California and Washington (Figures 2-33, 2-34, 2-35, 2-36, 2-37). Although there were more larger albacore surface hook-and-line vessels in central California until the early 1990s, by 1999 the trend had reversed and there were more smaller vessels. During 1981-99 in Oregon, vessel length distributions showed little change. The largest albacore vessels were in northern California and Washington, averaging 47.0 and 45.1 ft respectively in 1981 and 60.1 and 58.3 ft respectively in 1999. Vessels in southern California and Oregon averaged 39.1 and 48.2 ft in 1981 and 52.1 and 50.0 ft in 1999 respectively. Vessels whose principal port was in central California averaged 46.1 ft in 1981 and 39.0 ft in 1999.

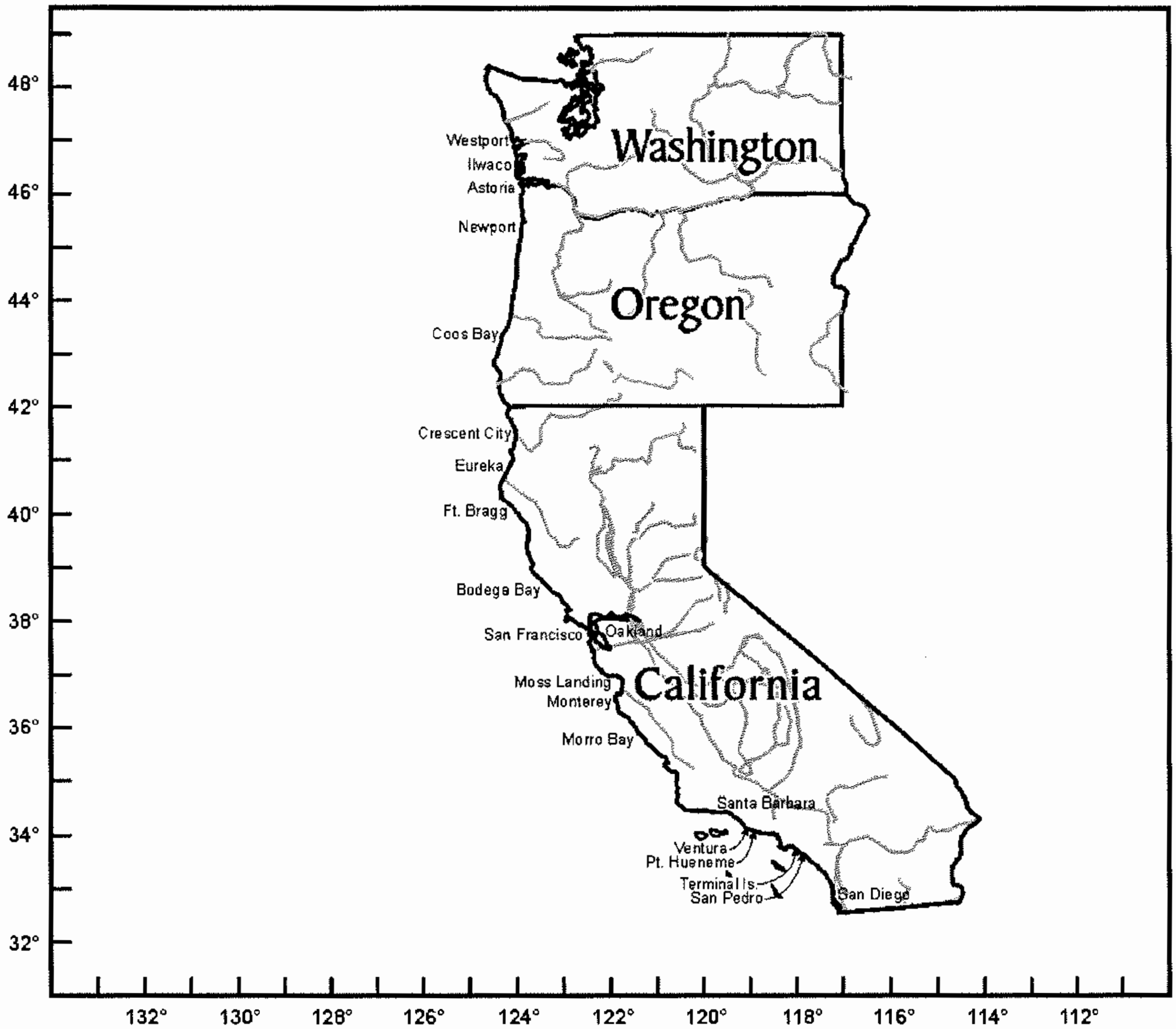
In the swordfish and shark drift gillnet fishery, most of the vessels whose principal port was in southern or central California were under 50 ft (Figures 2-38, 2-39). Drift gillnet vessels whose principal port was in northern California tended to be greater than 50 ft (Figure 2-40). From 1994 to 1998 northern and central California vessels were proportionately larger than those in Southern California and in 1999 the opposite was true. For southern California, the average length increased from 39.7 ft in 1981 to 46.9 ft in 1999. For central California, the average length rose slightly from 42.0 ft in 1985 to 42.7 ft in 1999; for northern California, it varied from 53.0 ft in 1992 to 50.8 ft in 1998.

2.4 Characteristics of HMS Communities

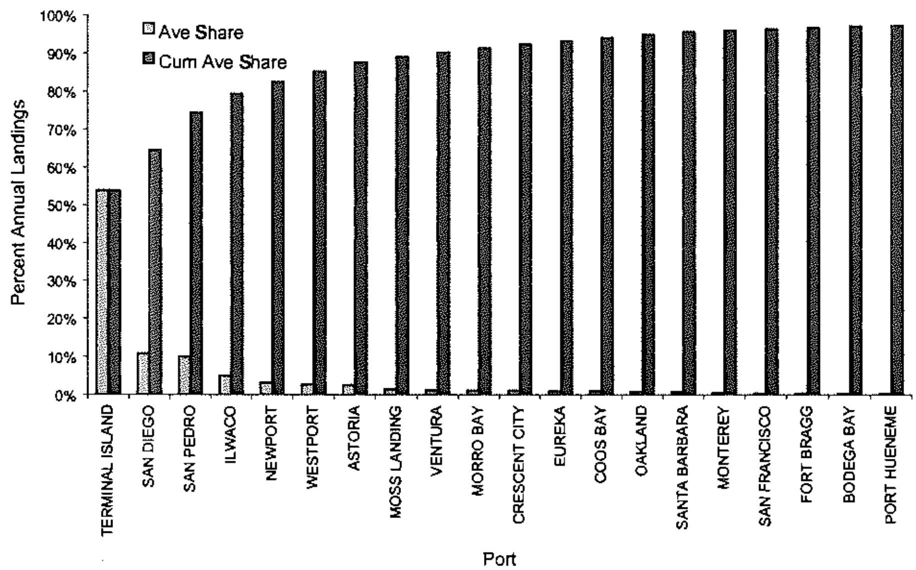
This section presents HMS fishing activity, general economic and demographic information for those West Coast communities that received a significant share of HMS commercial landings over the 1981-98 period, and for their support of HMS recreational fisheries. This information is combined to provide a socioeconomic-demographic profile of HMS communities in Washington, Oregon and California. The ports, counties and areas that comprise the communities for which this information was developed include:

Westport, Grays Harbor County, WA;
Ilwaco, Pacific County, WA;
Astoria, Clatsop County, OR;
Newport, Lincoln County, OR;
Coos Bay, Coos County, OR;
Crescent City, Del Norte County, CA;
Eureka, Humboldt County, CA;
Fort Bragg, Mendocino County, CA;
Bodega Bay, Sonoma County, CA;
San Francisco Area
    San Francisco, San Francisco County, CA
    Oakland, Alemeda County, CA;
Moss Landing, Monterey County, CA;
Monterey, Monterey County, CA;
Morro Bay, San Luis Obispo County, CA;
Santa Barbara Area
    Santa Barbara County, CA
    Ventura, Ventura County, CA
    Port Hueneme, Ventura County, CA;
San Pedro, Los Angeles County, CA;
Terminal Island, Los Angeles County, CA;
San Diego, San Diego County, CA.

These were designated HMS communities based on their relative contribution to total coastwide HMS commercial landings over the 1981-98 period, and for their support of HMS recreational fisheries. When ranked by average annual share of total HMS commercial landings for the 1981-99 period, Terminal Island, California ranked highest with an annual average share of 54% of total HMS landings (see below). A lack of port specific catch, participation and economic data precluded ranking ports according to their dependence on HMS recreational fisheries.



Major HMS ports by average annual share of total HMS landings, 1981-98.



The notion of community frequently extends beyond that associated with a specific geographic local where residents are dependent on fishery resources or are engaged in the harvesting and processing of these resources (as per MSFCMA National Standard 8). There are also communities based on a distinct occupations and communities formed around a specific interest (Conway et al. 1999). The HMS drift gillnet fishery could be considered an occupational community, whereas, based on their common interest in HMS sportfishing, members of a particular angling club or recreational fishing organization might consider themselves a community of interest. Information on these non-geographic communities particularly in the case of recreational HMS fishing is substantially lacking, and represents an important research and data need.

2.4.1 Overview of Tables and Figures

Each profile consists of a brief narrative that provides some background about the county level economy and describes the character of the HMS ports within the county. Where applicable, an Internet website is provided in order to access more information on the port or county under consideration. For each port there is a series of tables and figures that indicate the importance of HMS fishing activity within the port over the 1981-99 period:

- A table that indicates the number of commercial fishing vessels making HMS landings for which that port is the vessel's principal port[6], by the vessel's principal species[7].

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[6] A vessel's principal port is the port that accounts for the largest proportion of its total exvessel revenues.

[7] The principal species is the species that accounted for the largest proportion of the vessel's total exvessel revenues.

- A table showing the number of commercial fishing vessels making HMS landings in the port, the amount of landings by these vessels (HMS and other species) and corresponding exvessel revenues for the period.
- For commercial fishing vessels whose principal species is a HMS and whose principal port is the port under consideration, a figure showing the proportion of these vessels of all vessels making HMS landings at the port, and the proportion of these vessels of the total number of vessels making landings at the port.
- A figure showing the proportion of commercial HMS landings and exvessel revenues of total landings and exvessel revenues in the port.
- A figure showing the number of HMS processors and buyers and the number of all processors and buyers in the port.
- A figure presenting total income multipliers for landings of HMS in the port based on 1996 landings and exvessel revenues.

At the county and port level there is a summary of demographic and economic activity information including:

- Population figures for 1990 and 2000, population composition by race and Hispanic origin, the age structure of the population, population composition by levels of educational attainment, and composition of the labor force gender.
- Information about employment by Standard Industrial Classification (SIC) and North American Industry Classification System (NAICS)[8], labor and proprietor income, and number of establishments by SIC and NAICS categories.

2.4.2 Sources and Explanations of Information

2.4.2.1 HMS Fishing Activity

Information on number of vessels, quantities and exvessel values of landings and number of buyers was developed from Washington, Oregon and California landings receipts (fish tickets) maintained in the PacFIN Management Data Base. Fish tickets are records of each exvessel transaction between fishers and fish buyers. The fish ticket contains basic information on the landing, including the fishing vessel, the port of landing, the fish buyer and the gear primarily used. In addition, there is a separate line on each fish ticket (fish ticket line) that records the name of each species and the quantity landed in pounds, the exvessel price per pound, the condition of the catch (i.e. the extent to which any processing has occurred) and the gear used to catch that species if different from that primarily used.

2.4.2.2 Demographics

The demographic summaries contain information on population size and structure by county and port for 1990 and 2000, including race and Hispanic origin percentages, the age structure of the population, population percentages by level of educational attainment and gender composition of the labor force.

This information was developed from U.S. Census data for 1990 and 2000.

[8] In 1997, the NAICS system replaced the SIC system of industry classification for reporting economic census statistics. While many of the individual SIC industries correspond directly to industries as defined under the NAICS system, most of the higher level groupings do not. There is no direct correspondence between SIC-07 (agricultural services, forestry and fishing) and NAICS-11 (forestry, fishing, hunting and agriculture support). The nearest correspondence is between SIC-912 (finfish) and NAICS-114111 (finfish fishing). Unfortunately county level statistics for the SIC-912 classification were not available for this investigation.

Population Size:

U.S. Bureau of the Census, 1990 Census of Population and Housing, Summary Tape File 1.
U.S. Bureau of the Census, Profiles of General Demographic Characteristics 2000, U.S. Government Printing Office, Washington, DC, 2001.

Race and Hispanic Origin:

U.S. Bureau of the Census, 1990 Census of Population and Housing, Summary Tape File 1.

U.S. Bureau of the Census, Profiles of General Demographic Characteristics 2000, U.S. Government Printing Office, Washington, DC, 2001.

Age Structure:

U.S. Bureau of the Census, 1990 Census of Population and Housing, Summary Tape File 1.

U.S. Bureau of the Census, Profiles of General Demographic Characteristics 2000, U.S. Government Printing Office, Washington, DC, 2001.

Educational Attainment:

U.S. Bureau of the Census, 1990 Census of Population and Housing, Summary Tape File 3.

Labor Force:

U.S. Bureau of the Census, 1990 Census of Population and Housing, Summary Tape File 3.

2.4.2.3 Economic Activity

The economic activity summaries contain information on employment, income and number of establishments for the highest aggregated SIC and NAICS county level economic sectors.

This information was developed from U.S. Census, county business patterns data for 1993 and 1999:

U.S. Bureau of the Census, County Business Patterns 1993 (WA, OR, CA), U.S. Government Printing Office, Washington, DC, 1995.

U.S. Bureau of the Census, County Business Patterns 1999 (WA, OR, CA), Washington, DC, 2000.

2.4.3 Community Profiles

2.4.3.1 HMS Community Profile: Westport, Grays Harbor County, WA

Grays Harbor County and Westport http://ci.westport.wa.us/about.htm

The economic structure of Grays Harbor County generally resembles that of the state. In 1999, the manufacturing sector provided about one-third of the County's non-agricultural income. The important sectors in terms of their contribution to county income in 1999 were forestry, fishing and agriculture support, retail trade and health services.

Westport, WA is located at the mouth of Grays Harbor on the southernmost peninsula known as Point Chehalis. The area was in regular use as a summer resort by local Native American tribes before Thomas Barker Speake and his family, the first white settlers, arrived early in the summer of 1857.

By 1914, Westport was a busy, though small, center for fishing, shellfish harvesting, seafood processing and tourism. Among the earliest structures built at Westport, the Westport Lighthouse, dedicated on April 14, 1898, still stands as a majestic beacon for weary mariners anxious to return home from the sea. The City of Westport was incorporated on June 26, 1914.

Westport still relies on fishing, shellfish harvesting, seafood processing and tourism for much of its livelihood. More recently, boat building has also become an important part of Westport's economic base.

Sportfishing is an important component of the Westport economy. The Westport Charterboat Association (WCBA) is a non-profit corporation whose members are charterboat owners, operators, and booking services. WCBA was founded in 1957 for the purpose of promoting charterboat fishing for salmon in the Westport, Washington area. In the mid-1970s there were over 200 charterboats operating from Westport. Annually, over 250,000 anglers fished out of Westport and caught nearly one half million salmon per year. Today there are 30 vessels in the Westport sportfishing fleet operating out of 9 booking services. In addition to salmon, the fleet fishes for albacore tuna, halibut, lingcod, and many varieties of rockfish.

Albacore tuna are usually in range off Westport from July through early October. Charter vessels fish with live anchovies for bait. Trips usually leave late at night and arrive at the fishing grounds at daylight. Trip duration is pre-arranged and can last from 1 to 3 days. There is no bag limit on albacore, and catches average 4-6 fish per person per day but up to 20-25 per person have been caught on multi-day trips. Albacore range from 12 to 25 pounds with an occasional fish over 30 pounds.

Number of vessels with HMS landings, for which Westport, WA is their principal port, by their principal species, 1981-99.

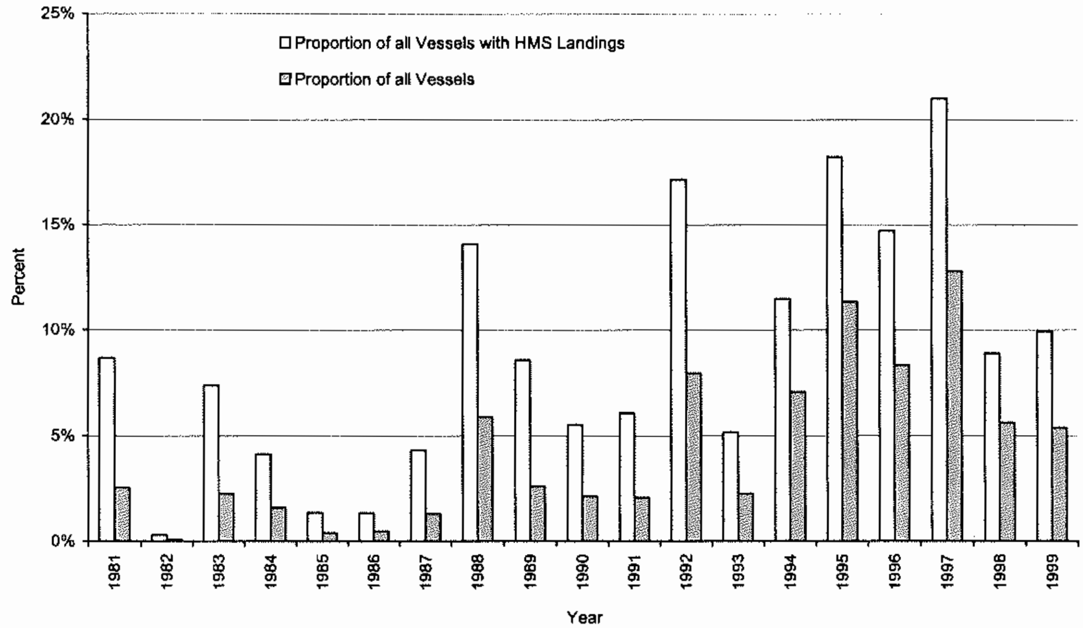
Year	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	31						71
1982	1						21
1983	23						37
1984	7						14
1985	3						9
1986	2			1			10
1987	10			1			18
1988	46						43
1989	21						6
1990	17						12
1991	15						3
1992	55						51
1993	13						30
1994	28						39
1995	39						32
1996	35						42
1997	50						56
1998	13						26
1999	16						32

Number of vessels making HMS landings, and HMS landings (mt) and exvessel revenues (1999 $) by species group, Westport, WA, 1981-99.

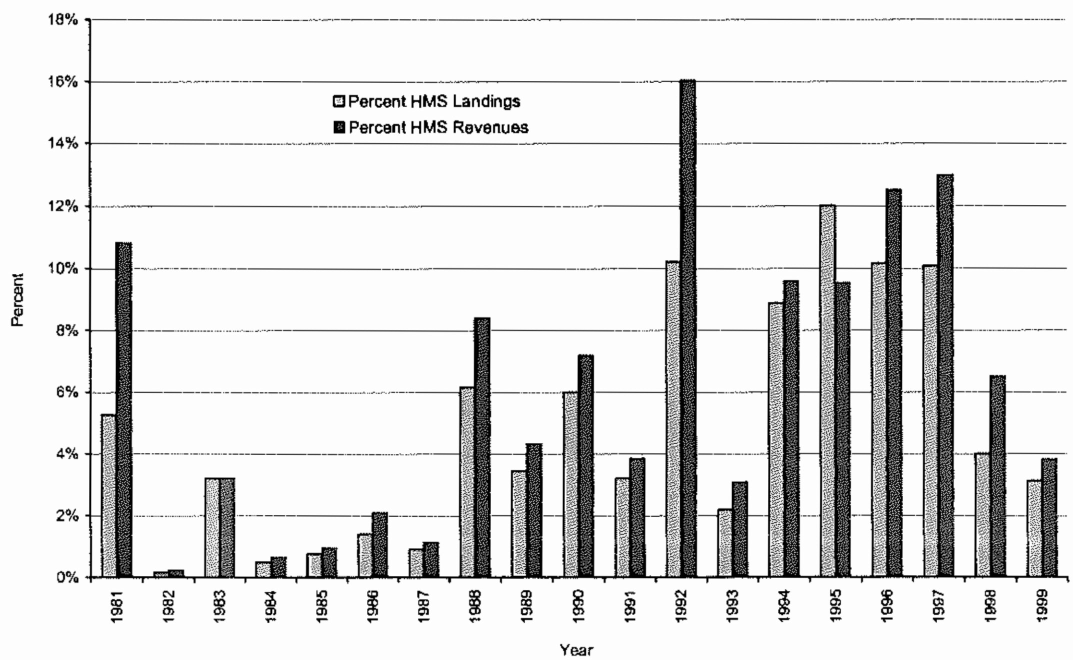
Landings (mt round weight)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	357	417						3,832
1982	338	13						4,442
1983	312	271						4,866
1984	170	33						4,728
1985	221	53						4,975
1986	224	85			56			7,659
1987	255	102			7			8,626
1988	327	977						10,685
1989	245	470						9,057
1990	309	698						7,498
1991	247	292						6,203
1992	321	1,218						7,885
1993	251	313						10,144
1994	244	1,090						7,562
1995	214	1,335						7,025
1996	238	2,093			2			14,391
1997	238	1,438						10,414
1998	146	624						7,522
1999	161	438						7,855

Exvessel Revenues (1999 $)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	357	$1,381,049						$6,174,002
1982	338	$29,379						$7,473,747
1983	312	$504,851			$143			$10,262,164
1984	170	$61,557						$6,445,932
1985	221	$98,239						$7,569,468
1986	224	$130,797			$200,957			$11,937,621
1987	255	$218,993			$29,310			$15,611,007
1988	327	$2,365,530						$18,305,333
1989	245	$935,939						$14,244,554
1990	309	$1,511,913						$13,706,447
1991	247	$559,141			$284			$9,503,797
1992	321	$3,270,612						$12,673,467
1993	251	$654,301			$34			$14,757,956
1994	244	$2,143,027						$14,226,181
1995	214	$2,506,765			$16			$16,965,859
1996	238	$3,996,402			$6,455			$19,481,458
1997	238	$2,650,314			$10			$12,137,290
1998	146	$840,610			$131			$8,420,963
1999	161	$762,312						$13,732,622

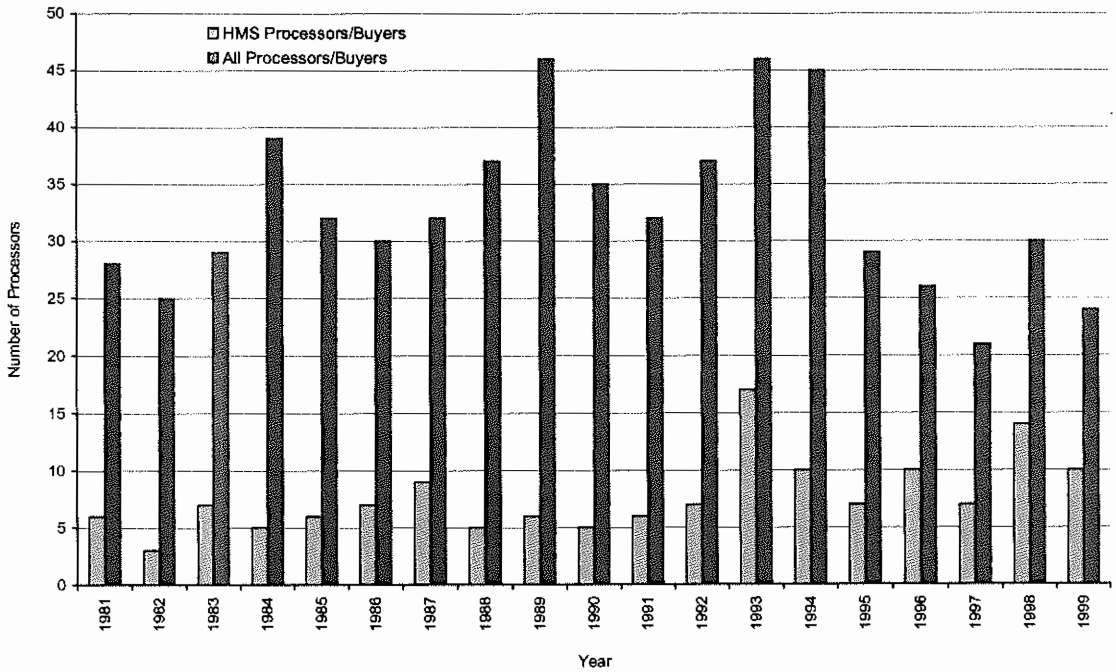
Proportion of vessels whose principal species is a HMS and whose principal port is Westport, WA of all vessels making HMS landings, and the proportion of these vessels of the total number of vessels making landings in Westport, 1981-99.



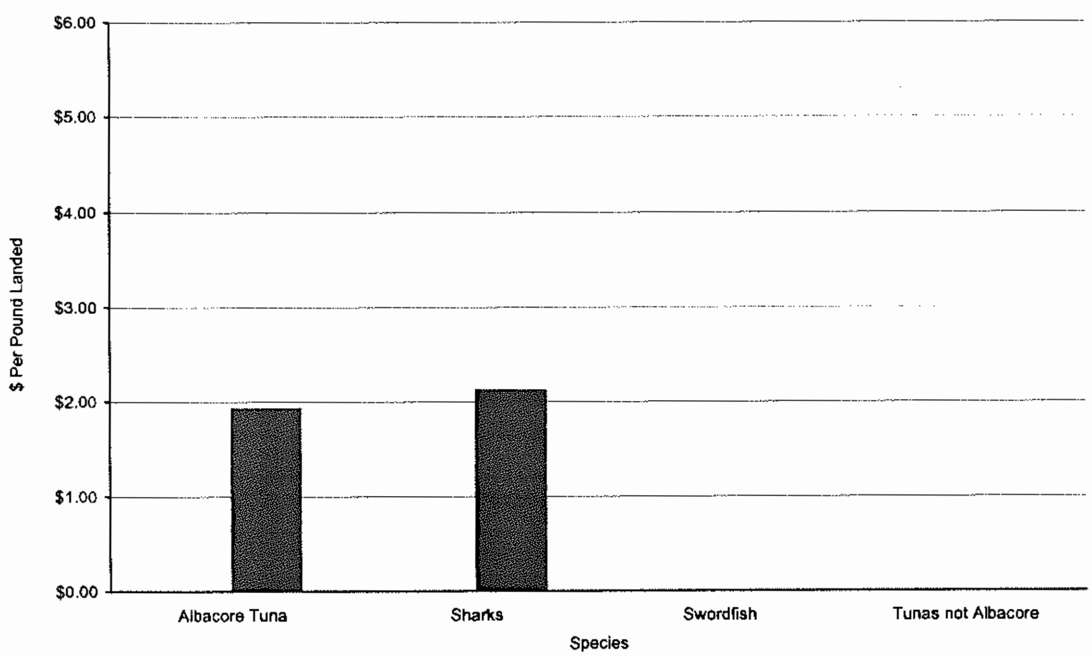
Proportion of HMS landings and exvessel revenues of total landings and exvessel revenues in Westport, WA, 1981-99.



Number of processors/buyers in Westport, WA 1981-99.



Total income multipliers for landings of HMS of species in the port of Westport, WA, based on 1996 landings and exvessel revenues.



2.4.3.2 HMS Community Profile: Ilwaco, Pacific County, WA

Pacific County and Ilwaco http://www.visit.willapabay.org/

Construction accounted for almost 28% of Pacific County's non-agricultural labor and proprietor income during 1999. Other key sectors in order of their relative contribution of labor and proprietor income in 1999 were wholesale trade, educational services and arts, entertainment and recreation. Agriculture is important to Pacific County's economy, in 1997 it accounted for 9% of labor and proprietor income. The community of Ilwaco is particularly dependent on crabbing, sports and commercial fishing, and seafood processing (including albacore).

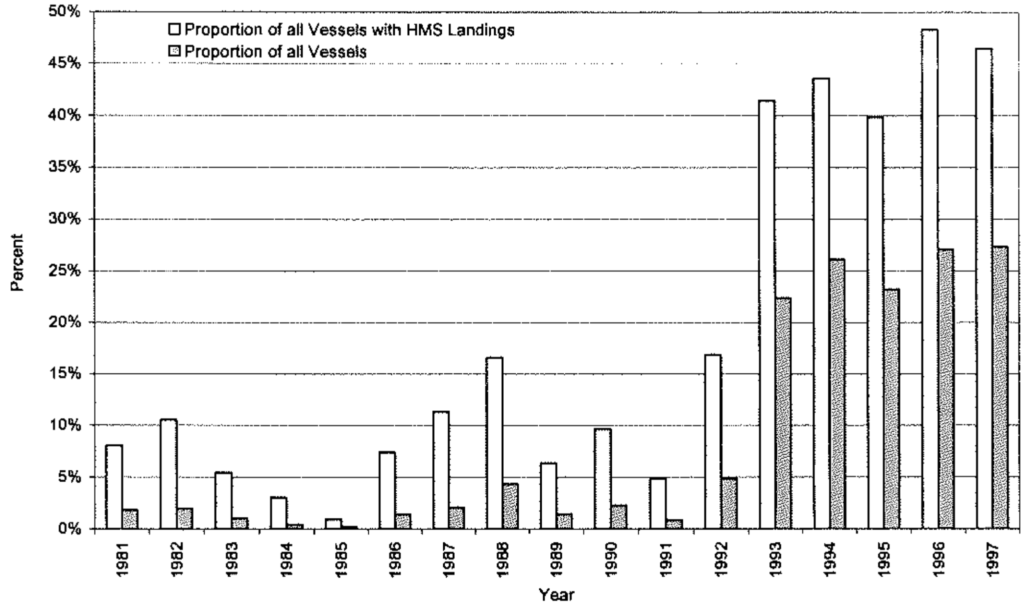
Number of vessels with HMS landings, for which Ilwaco, WA is their principal port, by their principal species, 1981-99.

Year	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	17			0	0		28
1982	15			0	0		7
1983	8			0	0		15
1984	2			0	0		7
1985	1			0	0		6
1986	12			0	0		6
1987	13			2	0		12
1988	27			0	0		15
1989	9			0	1		13
1990	14			0	0		7
1991	4			0	0		3
1992	19			0	0		14
1993	71			0	1		13
1994	85			0	0		14
1995	51			0	0		9
1996	69			0	0		8
1997	59			0	0		13
1998	89			0	2		10
1999	63			0	0		19

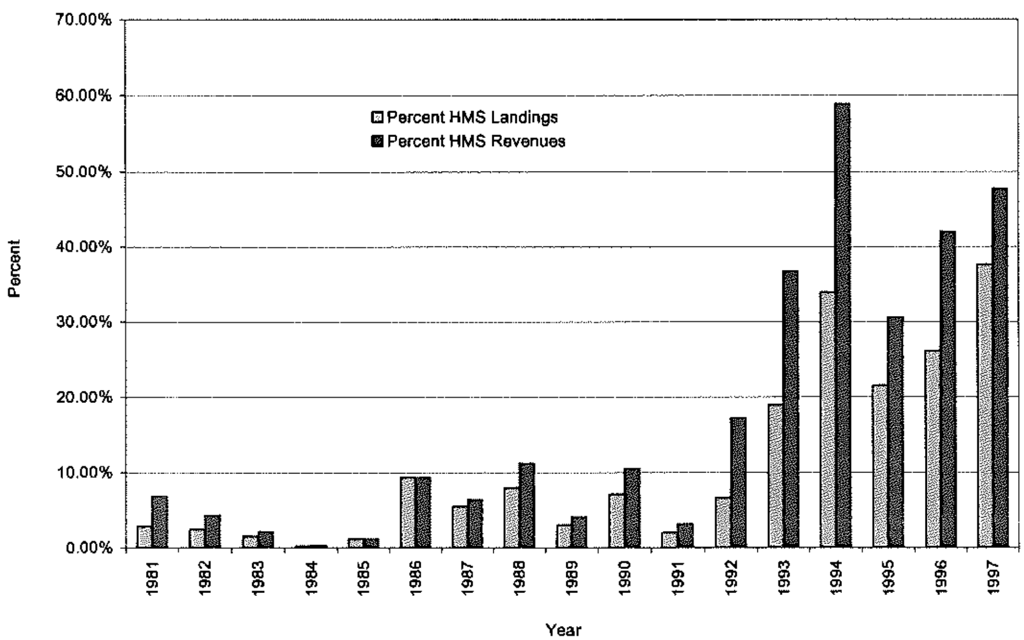
Number of vessels making HMS landings, and HMS landings (mt) and exvessel revenues (1999 $) by species group, Ilwaco, WA, 1981-99.

Landings (mt round weight)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	212	263						4800
1982	143	165						3297
1983	148	75						2558
1984	66	10						2258
1985	107	69						3304
1986	163	747			26			2635
1987	133	409			58			2916
1988	163	846			6	2		4871
1989	159	328			3			6245
1990	146	432						2796
1991	83	106						2538
1992	113	515						4948
1993	174	1800						5531
1994	195	4056						5881
1995	128	1755			5			4117
1996	143	2828			2			2663
1997	127	2226			2			2400
1998	186	5518			6			1911
1999	144	1484			65	4		3337
Exvessel Revenues (1999 $)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	212	$878,737			$14			$5,547,534
1982	143	$385,797			$102			$3,324,250
1983	148	$143,147			$58			$3,325,327
1984	66	$18,172			$11			$3,081,778
1985	107	$103,465						$4,403,550
1986	163	$1,192,916			$102,099			$4,475,919
1987	133	$898,906			$268,820			$5,901,841
1988	163	$2,105,193			$30,979	$13,525		$7,900,501
1989	159	$668,022			$10,542			$9,849,670
1990	146	$957,316			$13			$3,607,036
1991	83	$200,287			$4		$17	$2,589,412
1992	113	$1,397,594			$670		$82	$3,365,006
1993	174	$3,823,298			$953	$5,907		$3,382,539
1994	195	$8,047,266						$2,860,388
1995	128	$3,305,459			$16,542	$328		$3,283,161
1996	143	$5,416,722			$5,082			$2,655,194
1997	127	$4,147,241			$10,720			$2,141,654
1998	186	$7,530,023			$19,243			$1,314,750
1999	144	$2,608,971			$143,960	$9,445		$1,941,164

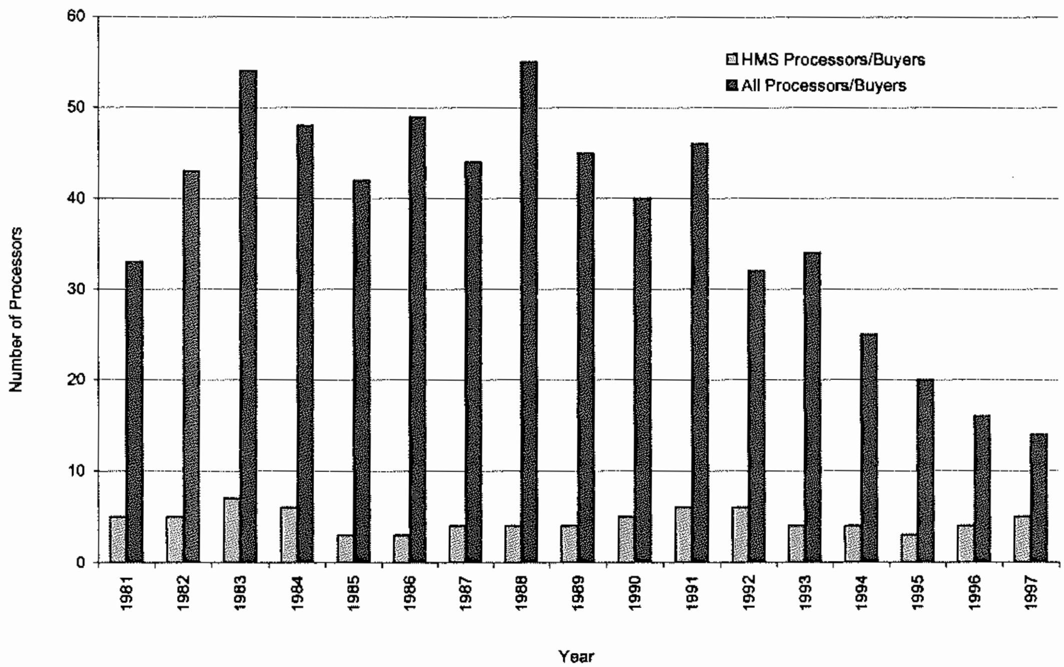
Proportion of vessels whose principal species is a HMS and whose principal port is Ilwaco, WA of all vessels making HMS landings, and the proportion of these vessels of the total number of vessels making landings in Ilwaco, WA, 1981-99.



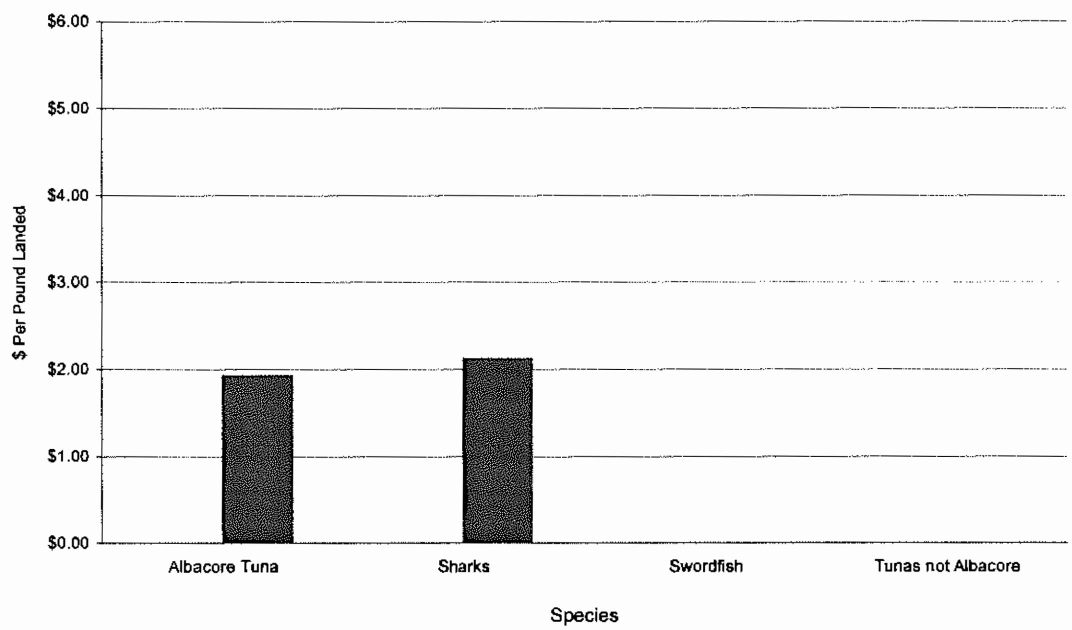
Proportion of HMS landings and exvesel revenues of total landings and exvessel revenues in Ilwaco, WA, 1981-99.



Number of processors/buyers in Ilwaco, WA, 1981-99.



Total income multipliers for landings of HMS of species in the port of Ilwaco, WA, based on 1996 landings and exvessel revenues.



Washington State HMS Communities Demographic and Economic Activity Summary

	County			
	Grays Harbor		Pacific	
	1990	2000	1990	2000
Population (numbers)	64,175	67,194	18,882	20,984
Gender (Percent total population)				
Male	49.8%	49.7%	49.4%	49.6%
Female	50.2%	50.3%	50.6%	50.4%
Race and Hispanic origin (Percent total population)				
White	93.9%	88.3%	93.7%	90.5%
Black	0.2%	0.3%	0.3%	0.2%
Native American	4.2%	4.7%	2.7%	2.4%
Asian or Pacific Islander	1.1%	1.3%	2.5%	2.2%
Other Race	0.7%	2.3%	0.8%	1.8%
Hispanic Origin (any race)	1.8%	4.8%	2.3%	5.0%
Age Structure (Percent total population)				
Under 5 years	7.3%	6.2%	6.4%	4.6%
5-9 Years	7.9%	6.8%	6.7%	5.4%
10-14 Years	7.6%	7.7%	6.6%	6.9%
15-19 Years	6.6%	7.7%	6.4%	6.8%
20-24 Years	5.5%	5.2%	4.1%	3.7%
25-34 Years	14.5%	11.3%	12.0%	8.4%
35-44 Years	15.0%	14.7%	13.7%	12.8%
45-54 Years	10.5%	14.7%	10.2%	15.1%
55-59 Years	4.5%	5.6%	5.4%	6.8%
60-64 Years	4.7%	4.7%	6.9%	6.9%
65-74 Years	8.8%	8.0%	12.9%	12.4%
75-84 Years	5.3%	5.6%	6.8%	7.8%
85 Years and greater	1.5%	1.8%	1.9%	2.4%
Median Age (years)	NA	38.8	NA	0.2%
18 Years and greater	73.0%	74.3%	75.9%	78.6%
Male	35.7%	36.5%	36.6%	38.4%
Female	37.3%	37.9%	39.3%	40.1%
21 Years and greater	69.4%	70.4%	73.0%	75.6%
62 Years and greater	18.8%	18.2%	25.9%	26.6%
65 Years and greater	15.9%	15.4%	21.5%	22.6%
Male	7.0%	6.9%	9.9%	10.6%
Female	8.9%	8.5%	11.7%	11.9%
Educational Attainment (Persons 25 years and over)				
Graduate or professional degree	2.1%	NA	2.0%	NA
Bachelor's degree	5.0%	NA	5.9%	NA
Associate's degree	4.6%	NA	3.7%	NA
Some college no degree	13.1%	NA	14.1%	NA
High school graduate	23.4%	NA	26.2%	NA
9th to 12th no diploma	11.6%	NA	11.5%	NA
Less than 9th grade	5.3%	NA	6.6%	NA
Economic Activity				
Labor Force by Gender (Persons 16 years and over)	42.0%	NA	39.4%	NA
Males	24.6%	NA	22.4%	NA
Females	17.4%	NA	17.0%	NA

Washington State HMS Communities Demographic and Economic Activity Summary

	County			
	Grays Harbor		Pacific	
	1993	1999	1993	1999
Economic Activity (Cont'd)				
Employment (numbers)				
Agricultural Services, Forestry, and Fishing (SIC-07)	292		233	
Fishing, hunting and trapping (SIC-0900)	23		75	
Mining (SIC-10)	45		41	
Construction (SIC-15)	819		163	
Manufacturing (SIC-20)	5,086		1,177	
Transportation and Public Utilities (SIC-40)	816		108	
Wholesale Trade (SIC-50)	745		76	
Retail Trade (SIC-52)	4,400		1,142	
Finance, Insurance, and Real Estate (SIC-60)	759		206	
Services (SIC-70)	4,414		1,233	
Unclassified Establishments (SIC-99)	10		0-19	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		1,285		259
Fishing (NAICS-11411)		12		20-99
Finfish fishing (NAICS-114111)		8		0-19
shellfish fishing (NAICS-114112)		4		59
Mining (NAICS-21)		0-19		0-19
Utilities (NAICS-22)		0-19		0-19
Construction (NAICS-23)		1,020		210
Manufacturing (NAICS-31)		3,368		769
Wholesale trade (NAICS-42)		576		110
Retail trade (NAICS-44)		3,021		640
Transportation & warehousing (NAICS-48)		477		20-99
Information (NAICS-51)		278		83
Finance & insurance (NAICS-52)		593		189
Real estate & rental & leasing (NAICS-53)		219		47
Professional, scientific & technical services (NAICS-54)		468		76
Management of companies & enterprises (NAICS-55)		0-19		0-19
Admin, support, waste mgt, remediation services (NAICS-56)		304		74
Educational services (NAICS-61)		26		20-99
Health care and social assistance (NAICS-62)		2,338		566
Arts, entertainment & recreation (NAICS-71)		149		65
Accommodation & food services (NAICS-72)		2,273		832
Other services (except public administration) (NAICS-81)		987		216
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		0-19		0-19
Unclassified establishments (NAICS-99)		13		5
Labor and Proprietor Income ($1,000)				
Agricultural Services, Forestry, and Fishing (SIC-07)	5,885		2,269	
Fishing, hunting and trapping (SIC-0900)	344		1,272	
Mining (SIC-10)	378		971	
Construction (SIC-15)	22,710		2,602	
Manufacturing (SIC-20)	151,603		21,020	
Transportation And Public Utilities (SIC-40)	17,820		2,180	
Wholesale Trade (SIC-50)	17,025		1,712	
Retail Trade (SIC-52)	56,626		14,496	
Finance, Insurance, And Real Estate (SIC-60)	14,299		3,857	
Services (SIC-70)	73,855		15,424	
Unclassified Establishments (SIC-99)	121		11	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		49,890		5,975
Fishing (NAICS-11411)		584		-
Finfish fishing (NAICS-114111)		337		-
shellfish fishing (NAICS-114112)		247		1,246
Mining (NAICS-21)		-		-
Utilities (NAICS-22)		-		-
Construction (NAICS-23)		35,621		3,563
Manufacturing (NAICS-31)		135,072		19,877
Wholesale trade (NAICS-42)		16,875		1,756
Retail trade (NAICS-44)		59,919		10,946
Transportation & warehousing (NAICS-46)		13,921		-
Information (NAICS-51)		8,680		1,631
Finance & insurance (NAICS-52)		16,255		4,910
Real estate & rental & leasing (NAICS-53)		3,199		438
Professional, scientific & technical services (NAICS-54)		14,864		1,728
Management of companies & enterprises (NAICS-55)		-		-
Admin, support, waste mgt, remediation services (NAICS-56)		4,761		1,563

Washington State HMS Communities Demographic and Economic Activity Summary

	County			
	Grays Harbor		Pacific	
	1993	1999	1993	1999
Economic Activity (Cont'd)				
Labor and Proprietor Income ($1,000) (Cont'd)				
Educational services (NAICS-61)		288		-
Health care and social assistance (NAICS-62)		59,194		12,002
Arts, entertainment & recreation (NAICS-71)		1,967		1,053
Accommodation & food services (NAICS-72)		23,954		8,937
Other services (except public administration) (NAICS-81)		12,844		2,556
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		-		-
Unclassified establishments (NAICS-99)		360		66
Number of Establishments				
Agricultural Services, Forestry, and Fishing (SIC-07)	55		28	
Fishing, hunting and trapping (SIC-0900)	15		12	
Mining (SIC-10)	4		5	
Construction (SIC-15)	185		77	
Manufacturing (SIC-20)	225		62	
Transportation And Public Utilities (SIC-40)	138		31	
Wholesale Trade (SIC-50)	83		15	
Retail Trade (SIC-52)	493		180	
Finance, Insurance, And Real Estate (SIC-60)	132		44	
Services (SIC-70)	582		180	
Unclassified Establishments (SIC-99)	16		4	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		128		40
Fishing (NAICS-11411)		15		15
Finfish fishing (NAICS-114111)		8		6
shellfish fishing (NAICS-114112)		7		9
Mining (NAICS-21)		1		2
Utilities (NAICS-22)		1		4
Construction (NAICS-23)		205		72
Manufacturing (NAICS-31)		99		34
Wholesale trade (NAICS-42)		61		14
Retail trade (NAICS-44)		319		116
Transportation & warehousing (NAICS-48)		105		15
Information (NAICS-51)		23		11
Finance & insurance (NAICS-52)		93		30
Real estate & rental & leasing (NAICS-53)		75		19
Professional, scientific & technical services (NAICS-54)		105		33
Management of companies & enterprises (NAICS-55)		2		1
Admin, support, waste mgt, remediation services (NAICS-56)		58		25
Educational services (NAICS-61)		8		3
Health care and social assistance (NAICS-62)		178		44
Arts, entertainment & recreation (NAICS-71)		31		19
Accommodation & food services (NAICS-72)		226		108
Other services (except public administration) (NAICS-81)		201		59
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		1		-
Unclassified establishments (NAICS-99)		25		16

Washington State HMS Communities Demographic and Economic Activity Summary

Major HMS Ports	Westport, Grays Co.		Ilwaco, Pacific Co.	
	1990	2000	1990	2000
Population (numbers)	1,892	2,137	815	950
Gender (Percent total population)				
Male	50.9%	49.5%	49.6%	47.5%
Female	49.1%	50.5%	50.4%	52.5%
Race and Hispanic origin (Percent total population)				
White	96.9%	92.7%	96.2%	92.8%
Black	0.1%	0.3%	0.9%	0.5%
Native American	2.3%	3.1%	2.7%	1.4%
Asian or Pacific Islander	0.4%	1.0%	0.1%	0.5%
Other Race	0.3%	0.5%	0.1%	1.8%
Hispanic Origin (any race)	1.4%	3.0%	2.0%	5.3%
Age Structure (Percent total population)				
Under 5 years	6.9%	4.8%	7.4%	5.9%
5-9 Years	6.2%	6.0%	7.7%	7.4%
10-14 Years	6.2%	7.4%	6.1%	6.4%
15-19 Years	5.4%	6.1%	6.6%	6.7%
20-24 Years	6.3%	4.4%	4.3%	2.7%
25-34 Years	14.2%	9.4%	14.8%	11.6%
35-44 Years	12.9%	15.4%	14.5%	12.0%
45-54 Years	10.5%	14.6%	10.9%	16.1%
55-59 Years	5.6%	6.1%	4.4%	6.4%
60-64 Years	4.7%	6.6%	6.9%	4.7%
65-74 Years	14.5%	8.8%	8.3%	11.5%
75-84 Years	5.8%	8.3%	6.1%	6.0%
85 Years and greater	0.8%	2.0%	1.8%	2.5%
Median Age (Years)	NA	43.4	NA	43.0
18 Years and greater	77.4%	78.0%	74.6%	75.8%
Male	38.4%	37.3%	36.4%	34.4%
Female	39.0%	40.6%	38.2%	41.4%
21 Years and greater	74.3%	74.6%	71.3%	73.3%
62 Years and greater	23.8%	23.4%	20.6%	22.1%
65 Years and greater	21.1%	19.1%	16.3%	20.0%
Male	10.1%	0.9%	8.1%	7.9%
Female	11.0%	10.2%	8.2%	12.1%
Educational Attainment (Persons 25 years and over)				
Graduate or professional degree	1.3%	NA	5.4%	NA
Bachelor's degree	3.6%	NA	11.5%	NA
Associate's degree	3.1%	NA	3.3%	NA
Some college no degree	14.9%	NA	15.1%	NA
High school graduate	27.1%	NA	20.0%	NA
9th to 12th no diploma	15.0%	NA	7.6%	NA
Less than 9th grade	4.0%	NA	4.2%	NA
Economic Activity (Percent total population)				
Labor Force by Gender (Persons 16 years and over)	44.2%		39.1%	
Males	25.4%	NA	20.7%	NA
Females	18.8%	NA	18.4%	NA

Source: U.S. Bureau of Census

2.4.3.3 HMS Community Profile: Astoria, Clatsop County, OR

Clatsop County and Astoria http://www.oldoregon.com/

In 1999,Clatsop County's agriculture support, forestry and fishing sector's contribution to employment and income was significant relative to that for the state, primarily due to commercial fishing. More than 50% of the county's non-agricultural labor and proprietor income was derived from the agriculture support, forestry and fishing sector, and the construction, manufacturing, health services, retail trade and tourism sectors.

The area of Astoria and Warrenton is a nationally significant historic region at the western end of the Lewis & Clark Trail. Astoria is the oldest American settlement west of the Rockies. Astoria is a city of 10,000 people on the Columbia River, just a few miles from the Pacific Ocean. It is surrounded by the beauty of the forest, mountains, 3 rivers and the sea. The area has a strong Scandinavian heritage.

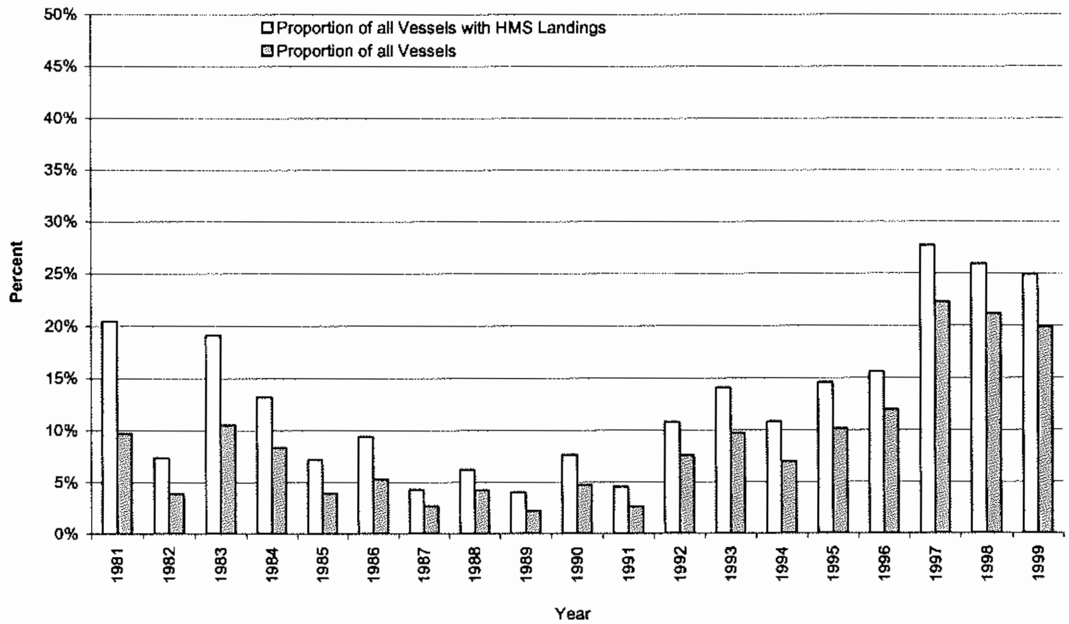
Number of vessels with HMS landings, for which Astoria, OR is their principal port, by their principal species, 1981-99.

Year	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	76				0		30
1982	21				0		11
1983	55				0		15
1984	24				0		10
1985	13				0		4
1986	20				1		1
1987	9				1		6
1988	11				1		5
1989	8				0		3
1990	16				0		4
1991	8				0		5
1992	21				0		30
1993	26				0		18
1994	15				0		13
1995	22				0		14
1996	27				1		19
1997	58				1		45
1998	49				1		28
1999	46				1		20

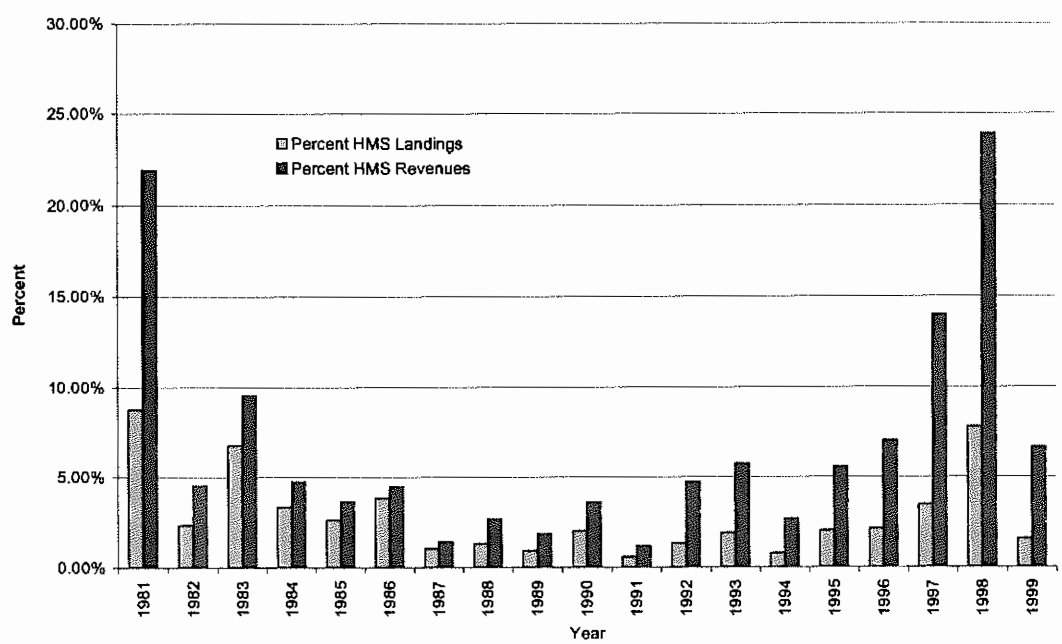
Number of vessels making HMS landings, and HMS landings (mt) and Exvessel revenues (1999 $) by species group, Astoria, OR, 1981-99.

Landings (mt round weight)								
Year	**Number of Vessels**	**Albacore**	**Bluefin Tuna**	**Dorado**	**Sharks**	**Swordfish**	**Tropical Tuna**	**Non-HMS**
1981	372	1825						7096
1982	285	331						6562
1983	288	879						6582
1984	182	350						6022
1985	182	302						7705
1986	224	646						12333
1987	234	216						16418
1988	193	248						14618
1989	200	201						15991
1990	210	375						12959
1991	177	117						16154
1992	195	398						25916
1993	185	588						25937
1994	139	274						32786
1995	151	820				1		36279
1996	180	1024						39986
1997	213	1799						43112
1998	193	3081				13		32308
1999	189	823	5			6		48871
Exvessel Revenues (1999 $)								
Year	**Number of Vessels**	**Albacore**	**Bluefin Tuna**	**Dorado**	**Sharks**	**Swordfish**	**Tropical Tuna**	**Non-HMS**
1981	372	$6,051,906						$9,021,603
1982	285	$804,975					$397	$8,676,437
1983	288	$1,685,103					$97	$8,476,571
1984	182	$603,288					$277	$7,249,509
1985	182	$508,533						$9,137,173
1986	224	$1,075,927					$177	$17,023,326
1987	234	$491,007	$9					$26,711,024
1988	193	$621,159						$16,812,366
1989	200	$459,598						$17,133,742
1990	210	$821,700						$14,887,013
1991	177	$243,300						$15,377,002
1992	195	$1,046,659						$16,219,066
1993	185	$1,246,581						$15,301,210
1994	139	$546,914						$15,821,208
1995	151	$1,539,679	$250	$22		$14,703	$46	$20,943,768
1996	180	$1,986,331	$44					$20,952,465
1997	213	$3,302,838	$1,385	$118		$4,163	$79	$18,414,557
1998	193	$4,277,148	$5,222			$111,492		$11,610,305
1999	189	$1,465,834	$29,215			$45,114	$198	$17,689,198

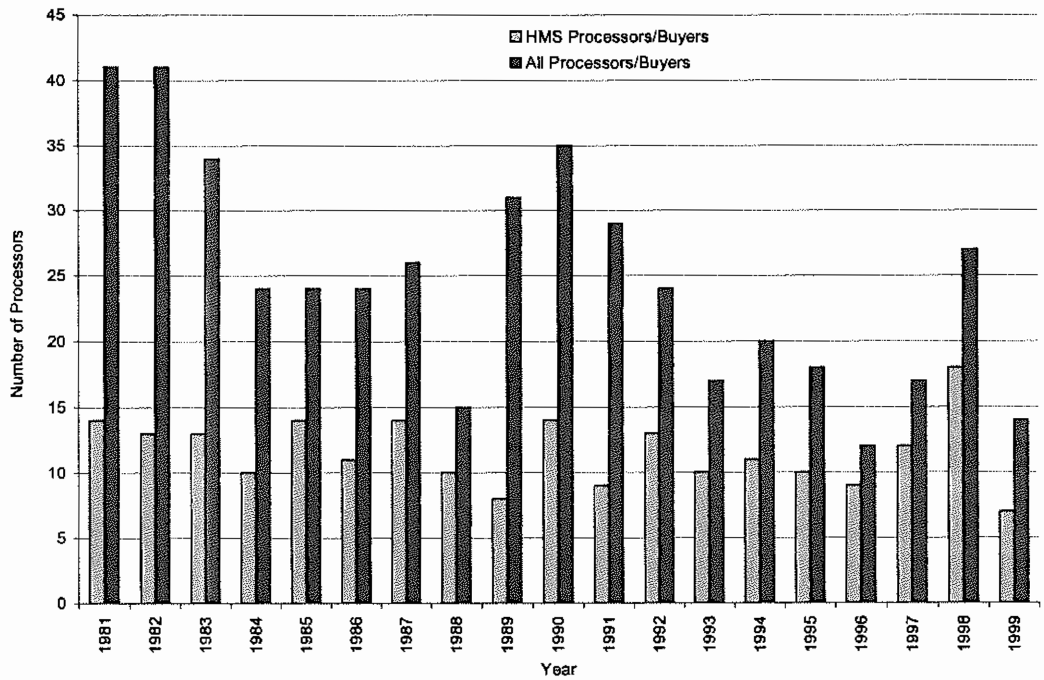
Proportion of vessels whose principal species is a HMS and whose principal port is Astoria, OR of all vessels making HMS landings, and the proportion of these vessels of the total number of vessels making landings in Astoria,1981-99.



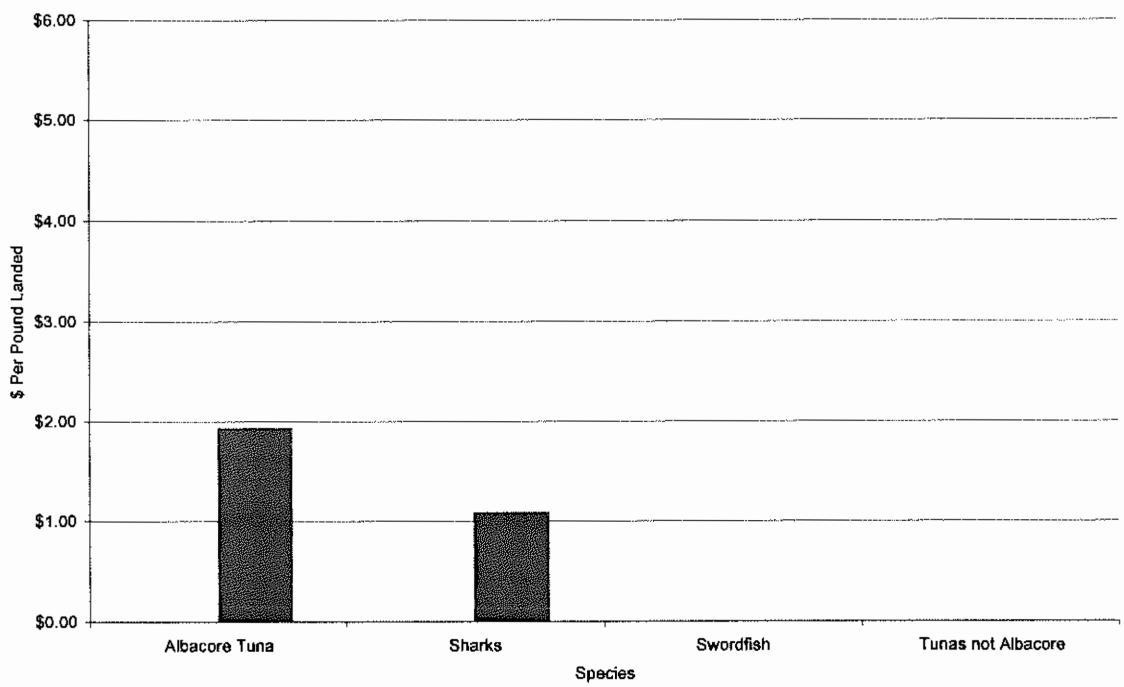
Proportion of HMS landings and exvessel revenues of total landings and exvessel revenues in Astoria, OR, 1981-99.



Number of processors/buyers in Astoria, OR, 1981-99.



Total income multipliers for landings of HMS species in the port of Astoria, OR, based on 1996 landings and exvessel revenues.



2.4.3.4 HMS Community Profile: Newport, Lincoln County OR

Lincoln County and Newport http://www.newportchamber.org/economic/home.cfm

In Lincoln County, commercial fishing helps make the agriculture support, forestry and fishing sector's contribution to the economy significantly greater than that for the state. In 1999, 62% of the non-agricultural labor and proprietor income was derived from the manufacturing, retail trade, health services and tourism sectors of the Lincoln County economy.

Newport is situated in the central region of Lincoln County which consists of the cities of Depoe Bay, Lincoln City, Newport, Siletz, Toledo, Waldport and Yachats, and the communities of Chitwood, Seal Rock and Tidewater.

Newport, the county seat of Lincoln County, is the business center of the county. Most commercial/retail development is on the bayfront and along Highway 101, which bisects the city. Newport is a transportation hub, with state highway routes to the north, south, and east, an airport, and an excellent port.

As the largest and most diversified business community in Lincoln County, Newport draws its workforce not only from Newport, but from all over Lincoln County. Lincoln County's civilian workforce of almost 22,000 people is composed of skilled, productive individuals, with approximately 45% of the workforce having an education level higher than high school.

The early economy of Newport grew as a result of fishing, timber and tourism. The current elements in the economic base of Newport and Lincoln County are tourism and recreation, fishing and seafood processing, forest products, forest management, ocean research, manufacturing, agriculture, government and retirement income. Newport's employment is largely in the trade and services sector, as tourism represents the largest portion of the City's economy.

Number of vessels with HMS landings, for which Newport, OR is their principal port, by their principal species, 1981-99.

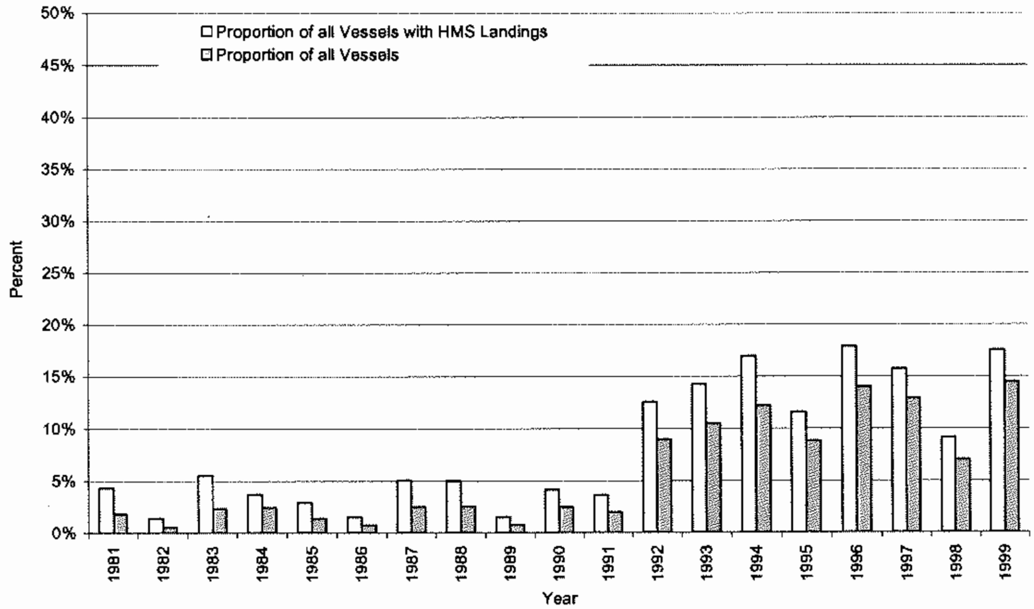
Year	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	20				0		86
1982	5				0		33
1983	23				1		63
1984	9				0		43
1985	8				1		15
1986	6				0		17
1987	22				0		37
1988	23				1		79
1989	6				0		28
1990	14				0		36
1991	12				0		13
1992	49				1		107
1993	53				0		77
1994	50				0		65
1995	38				0		41
1996	65				1		62
1997	55				1		102
1998	25				1		85
1999	50				0		59

Number of vessels making HMS landings, and HMS landings (mt) and exvessel revenues (1999 $) by species group, Newport, OR, 1981-99.

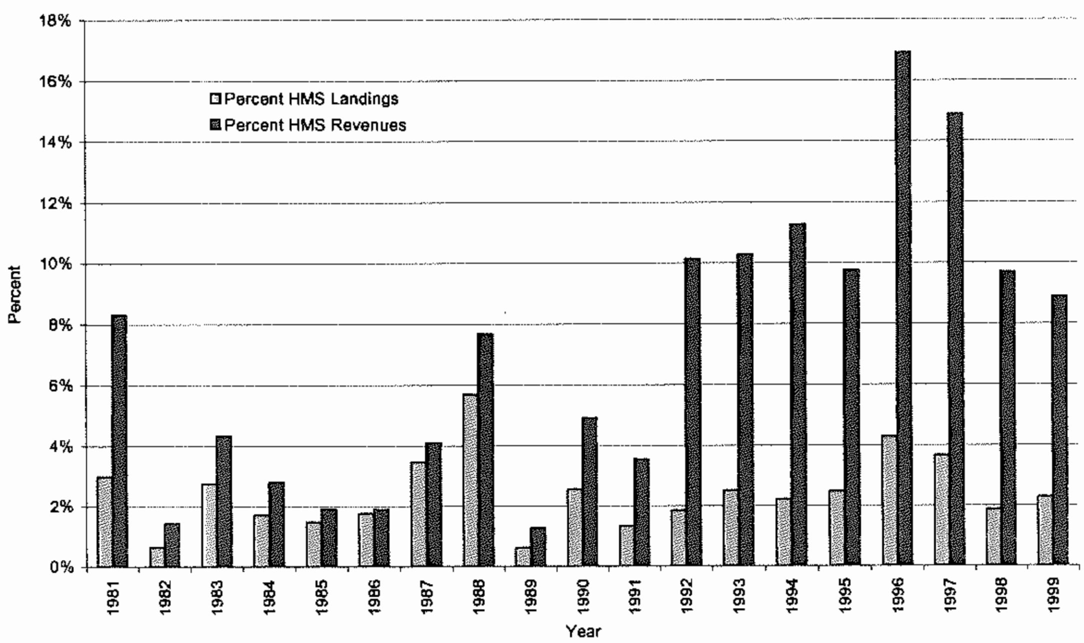
Landings (mt round weight)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	465	633						10039
1982	361	139						10019
1983	435	379						9031
1984	244	201						7979
1985	307	197						10192
1986	390	213						9296
1987	435	563						12452
1988	483	1031						13760
1989	398	121						16342
1990	340	394						12131
1991	333	316						15343
1992	399	1038						44856
1993	373	1013						28761
1994	296	1223						38187
1995	329	1264				1		39201
1996	370	2214				15		33078
1997	357	1785				5		32289
1998	285	981				15		40343
1999	286	956	1					26993

Exvessel Revenues (1999 $)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	465	$2,104,804						$14,283,907
1982	361	$336,156						$14,118,987
1983	435	$711,883					$1	$11,799,353
1984	244	$379,265						$9,981,803
1985	307	$367,141						$15,302,390
1986	390	$368,686						$15,495,220
1987	435	$1,247,439						$23,910,549
1988	483	$2,521,475						$24,118,953
1989	398	$310,684						$20,212,369
1990	340	$919,395						$15,413,774
1991	333	$611,103						$13,776,948
1992	399	$2,651,531						$20,606,193
1993	373	$1,914,723						$14,110,810
1994	296	$2,345,580						$15,749,468
1995	329	$2,384,098	$203			$10,439	$299	$19,956,663
1996	370	$4,222,351	$1,059			$115,470	$7	$18,617,049
1997	357	$3,188,854	$1,947			$47,628		$16,456,102
1998	285	$1,274,902	$4,186			$116,357		$12,076,284
1999	286	$1,730,631	$8,902			$1,841		$15,898,712

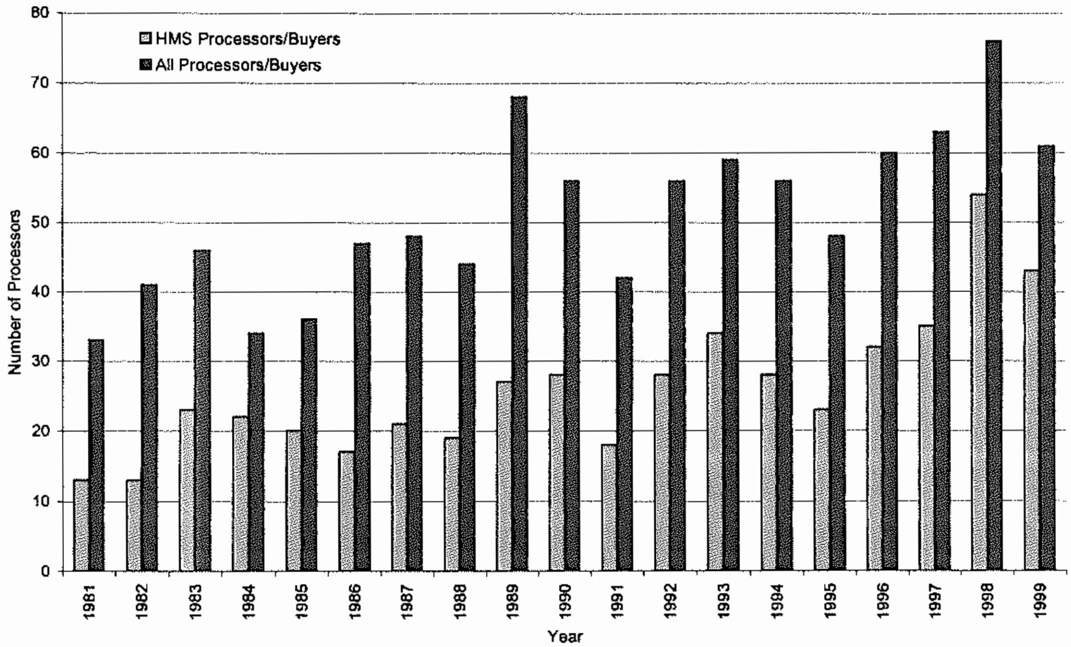
Proportion of vessels whose principal species is a HMS and whose principal port is Newport, OR of all vessels making HMS landings, and the proportion of these vessel of the total number of vessels making landings in Newport,1981-99.



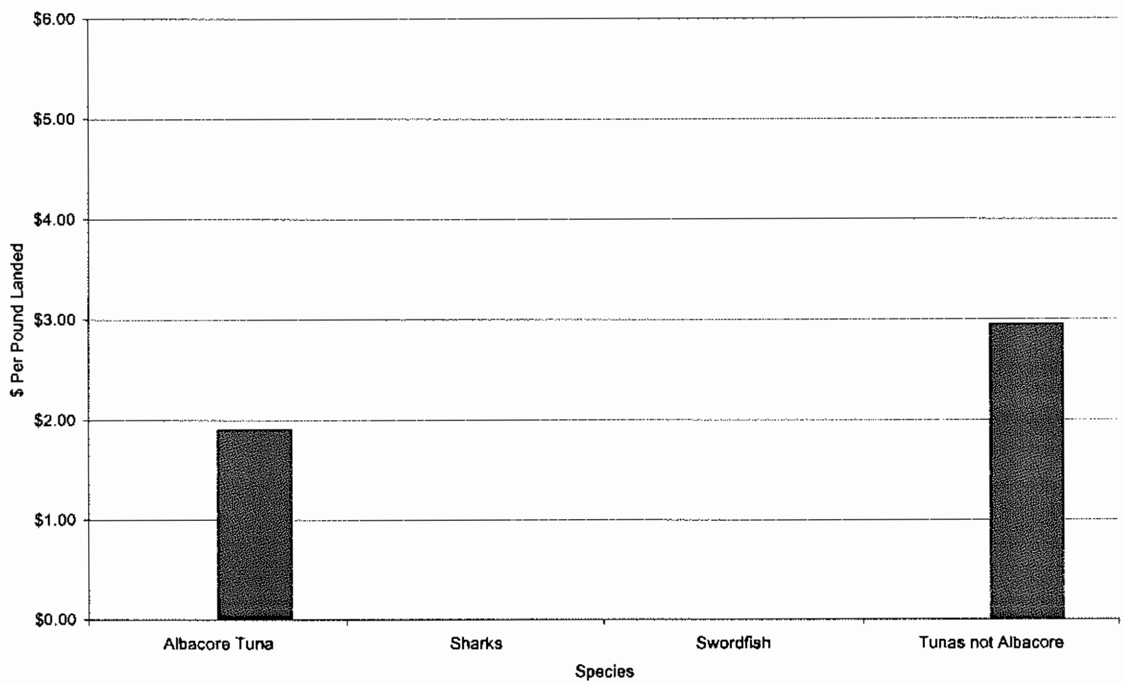
Proportion of HMS landings and exvessel revenues of total landings and exvessel revenues in Newport, Or, 1981-99.



Number of processors/buyers in Newport, OR, 1981-99.



Total income multipliers for landings of HMS species in the port of Newport, OR, based on 1996 landings and exvessel revenues.



2.4.3.5 HMS Community Profile: Coos Bay, Coos County OR

Coos County and Coos Bay http://www.ucinet.com/~bacc/index.html

Coos County's economic structure reflects the seaport activities of Coos Bay. These activities are evident in the transportation sector which historically has generated a larger proportion of non-agricultural labor and proprietor income in the county than in the state and most other Oregon counties. In 1999, the major sectors of the County's economy in terms of proprietor and labor income were forestry, fishing and agriculture support, as well as manufacturing, retail trade, transportation and health services.

Coos Bay, Oregon's largest bay, has represented a commercial passage to the sea from pioneer days to the present. The name is derived from one of the area's Native American tribes and has two Indian meanings --lake and place of pines.

Coos Bay is the largest of the communities that comprise Oregon's Bay Area. The city, founded in the 1850s, was named Marshfield after the Massachusetts home town of the city's founder J. C. Tolman, and was incorporated in 1874 under that name. In 1944, residents voted to change the name to Coos Bay.

Historically, wood products, commercial fishing and shipping have been the mainstays of the Bay Area's economy; more recently, agriculture and tourism have become increasingly important segments.

Coos County boasts 722 farms, comprising 17% of its total land area. More than 10,200 acres are irrigated, and average farm size is 242 acres.

The county ranked first in Oregon in cranberry production, with about 1,450 acres harvested in 1997. Sheep production ranked fourth highest, and dairy production ninth highest in the state during 1997.

The 1997 estimated gross value of all crops, including small woodlots, was $38.5 million, and $22.4 million for all livestock. Agricultural employment averages 500, according to the most recent estimate available from the Oregon Employment Department.

During 1997, over 33.9 million pounds of seafood were landed along the south coast of Oregon, with a value of over $21 million to local fishers; annual values tend to fluctuate due to environmental constraints and management policies. Most of the seafood products from Coos County and its south coast neighbor, Curry County, are either sold fresh or frozen in U.S. markets, or are exported to Europe and Japan. The majority of processing is done on the south coast, bringing additional dollars into the area. Another positive impact on the local economy comes from the service industry in marine repair, fabrication and other services.

Groundfish lead in value of all seafood products landed, followed closely by shrimp, crab, urchins and salmon, although the near total loss of commercial ocean salmon has reduced its income by over 90%. Smaller harvests from albacore and miscellaneous species also contribute to the income. Coos County is first in the state for oyster production.

There are approximately 610,000 acres of non-federal forest lands in Coos County, with 16% owned by Coos County and the State of Oregon, 23% owned by small woodland owners, and the remaining 61% owned by wood products corporations.

The value of timber harvested from non-federal lands as it leaves the Coos County forests reaches $113.5 million. Production facilities in the Bay Area include a containerboard mill which utilizes 100% recycled materials and an automated sawmill which opened in 1994. Another $1.5 million comes from the harvest of floral greenery and forest seedling nurseries annually. Approximately 1,700 Coos County residents are employed in the lumber and wood products industry.

Tourism ranks as an increasingly important segment of the Bay Area's economy. In addition to the many cultural and recreational attractions and events, area motels, restaurants and other businesses benefit from a variety of conferences, conventions and other meetings which are held in the community annually. New facilities, attractions, recreational activities and beautification projects are in the planning stages to make the area even more attractive to new and returning visitors. Estimated employment in the Bay Area's visitor industry is 800.

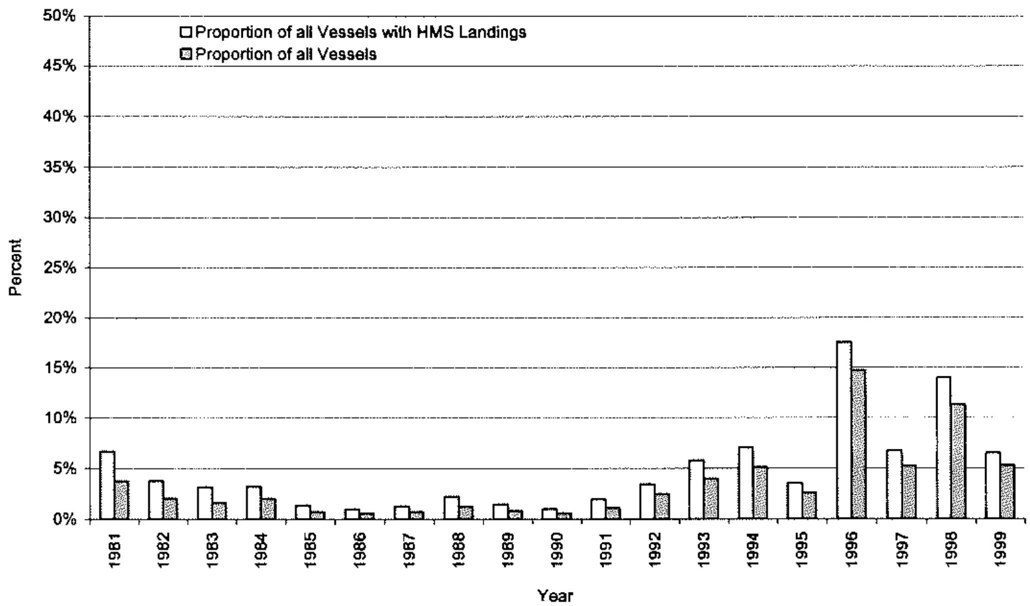
Number of vessels with HMS landings, for which Coos Bay, OR is their principal port, by their principal species, 1981-99.

Year	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	35						105
1982	19						22
1983	12						38
1984	7						7
1985	5						2
1986	4						6
1987	6						16
1988	11						17
1989	7						13
1990	4						38
1991	5						5
1992	7						30
1993	14						28
1994	14						22
1995	7						18
1996	42						29
1997	12						51
1998	23						40
1999	14						13

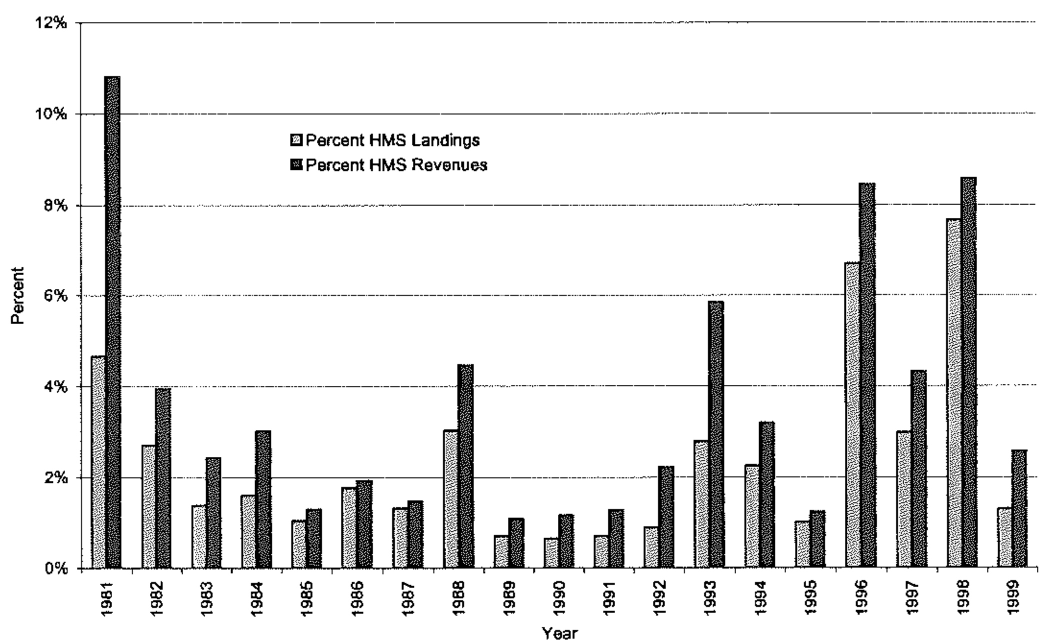
Number of vessels making HMS landings, and HMS landings (mt) and exvessel revenues (1999 $) by species group, Coos Bay, OR, 1981-99.

Landings (mt round weight)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	530	810						9860
1982	508	369						9296
1983	381	165						9089
1984	219	146						7522
1985	380	121						9829
1986	432	195						9198
1987	491	177						12043
1988	504	430						12641
1989	497	111						14226
1990	407	93						13372
1991	259	94						13031
1992	206	156						16492
1993	245	364						12134
1994	200	245						9905
1995	200	99						9398
1996	240	680				1		8746
1997	179	291						8466
1998	164	503				4		5748
1999	216	153						11052
Exvessel Revenues (1999 $)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	530	$2,695,422						$14,014,554
1982	508	$860,386						$15,206,768
1983	381	$318,757					$33	$9,998,074
1984	219	$291,756						$7,794,166
1985	380	$200,657						$12,517,783
1986	432	$331,775						$14,064,152
1987	491	$389,762						$22,439,873
1988	504	$1,063,284						$18,758,676
1989	497	$223,486						$17,324,785
1990	407	$225,982						$17,151,251
1991	259	$196,747						$14,384,937
1992	206	$389,231						$16,230,022
1993	245	$742,121						$11,242,284
1994	200	$466,269						$12,941,597
1995	200	$195,552						$14,834,331
1996	240	$1,294,863	$100			$9,950		$13,188,019
1997	179	$539,383		$108			$880	$10,827,481
1998	164	$698,014				$22,529		$7,292,550
1999	216	$304,093						$10,853,904

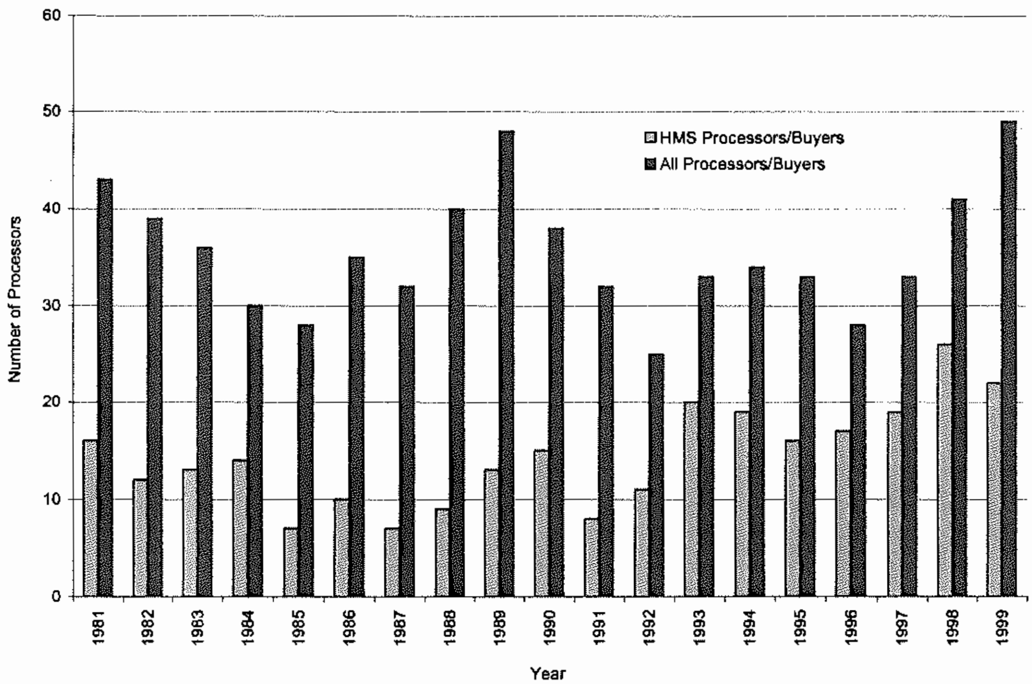
Proportion of vessels whose principal species is a HMS and whose principal port is Coos Bay, OR of all vessels making HMS landings, and the proportion of these vessels of the total number of vessels making landings in Coos Bay,1981-99.



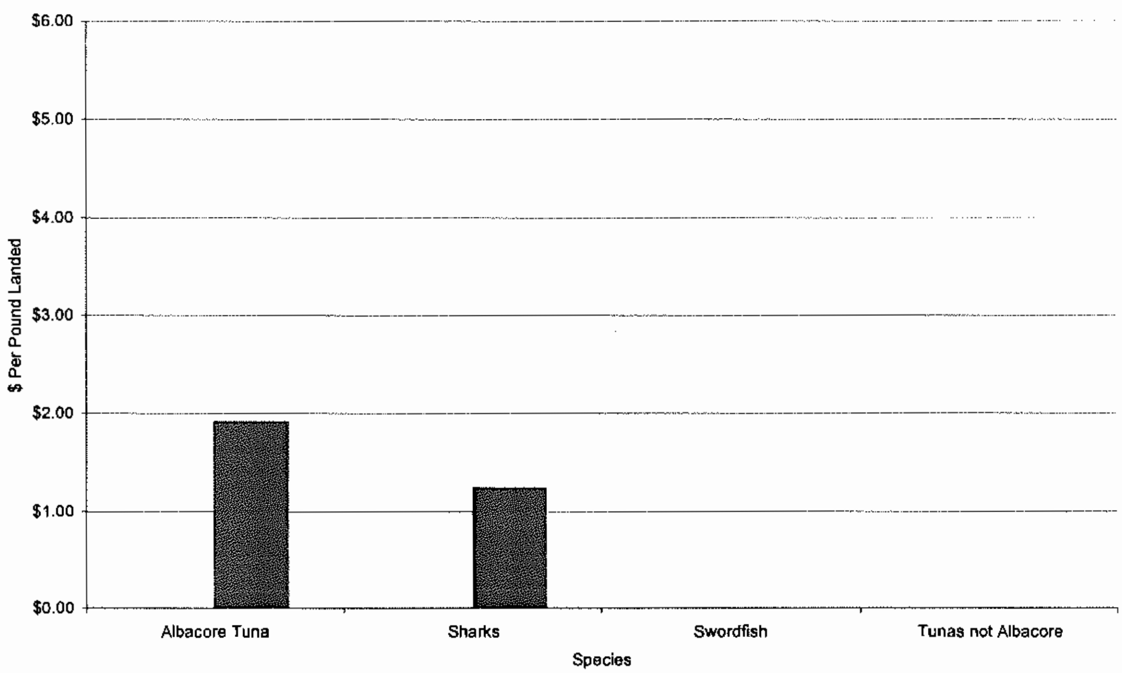
Proportion of HMS landings and exvessel revenues of total landings and exvessel revenues in Westport, OR, 1981-99.



Number of processors/buyers in Coos Bay, OR, 1981-99.



Total income multipliers for landings of HMS species in the port of Coos Bay, OR, based on 1996 landings and exvessel revenues.



Oregon State HMS Communities Demographic and Economic Activity Summary

	County					
	Clatsop		Lincoln		Coos	
	1990	2000	1990	2000	1990	2000
Population (numbers)	33,301	35,630	38,889	44,479	60,273	62,779
Gender (Percent total population)						
Male	49.7%	49.5%	48.2%	48.5%	49.4%	49.0%
Female	50.3%	50.5%	51.8%	51.5%	50.6%	51.0%
Race and Hispanic origin (Percent total population)						
White	96.4%	93.1%	96.1%	90.6%	95.9%	92.0%
Black	0.3%	0.5%	0.2%	0.3%	0.2%	0.3%
Native American	1.1%	1.0%	2.4%	3.1%	2.3%	2.4%
Asian or Pacific Islander	1.3%	1.4%	0.9%	1.1%	1.0%	1.1%
Other Race	0.8%	1.6%	0.4%	1.7%	0.6%	1.1%
Hispanic Origin (any race)	1.9%	4.5%	1.5%	4.8%	2.2%	3.4%
Age Structure (Percent total population)						
Under 5 years	6.9%	5.6%	6.1%	4.9%	6.4%	4.9%
5-9 Years	7.4%	6.1%	7.1%	5.5%	7.3%	5.7%
10-14 Years	7.3%	7.1%	6.7%	6.7%	7.3%	6.9%
15-19 Years	6.7%	7.9%	5.1%	6.6%	6.3%	7.1%
20-24 Years	5.6%	5.6%	4.2%	4.3%	4.9%	4.5%
25-34 Years	14.5%	10.5%	12.9%	9.4%	13.7%	9.6%
35-44 Years	16.0%	14.7%	16.0%	14.1%	14.9%	14.4%
45-54 Years	10.2%	16.4%	10.3%	16.7%	11.3%	15.8%
55-59 Years	4.4%	5.6%	5.2%	6.5%	5.1%	6.4%
60-64 Years	4.8%	4.7%	6.3%	5.8%	5.5%	5.7%
65-74 Years	9.2%	8.0%	12.7%	10.7%	10.3%	10.0%
75-84 Years	5.5%	5.6%	8.0%	6.9%	5.6%	6.7%
85 Years and greater	1.5%	2.0%	1.3%	1.9%	1.4%	2.4%
Median Age (years)	NA	40	NA	44.1	NA	43.1
18 Years and greater	74.3%	76.3%	76.7%	78.6%	74.9%	78.1%
Male	36.2%	37.2%	36.3%	37.2%	38.4%	37.8%
Female	38.1%	39.1%	40.3%	41.3%	38.5%	40.3%
21 Years and greater	70.4%	71.7%	74.1%	75.4%	78.7%	74.4%
62 Years and greater	19.1%	18.3%	24.0%	23.0%	20.6%	22.5%
65 Years and greater	16.2%	15.8%	20.1%	19.5%	17.3%	19.1%
Male	7.0%	6.8%	9.1%	8.6%	7.9%	8.7%
Female	9.3%	8.8%	10.9%	11.0%	9.4%	10.4%
Educational Attainment (Persons 25 years and over)						
Graduate or professional degree	3.7%	NA	4.4%	NA	2.7%	NA
Bachelor's degree	7.3%	NA	7.3%	NA	5.7%	NA
Associate's degree	4.6%	NA	3.4%	NA	4.7%	NA
Some college no degree	17.6%	NA	17.6%	NA	18.0%	NA
High school graduate	21.0%	NA	24.1%	NA	22.3%	NA
9th to 12th no diploma	8.2%	NA	10.0%	NA	11.4%	NA
Less than 9th grade	3.8%	NA	3.8%	NA	5.3%	NA
Labor Force by Gender (Persons 16 years and over)	47.7%	NA	45.0%	NA	43.1%	NA
Males	26.7%	NA	24.1%	NA	24.0%	NA
Females	21.0%	NA	20.9%	NA	19.0%	NA
Economic Activity						
Employment (numbers)						
Agricultural Services, Forestry, and Fishing (SIC-07)	103		129		394	
Fishing, hunting and trapping (SIC-0900)	46		42		13	
Mining (SIC-10)	0-19		47		76	
Construction (SIC-15)	456		753		606	
Manufacturing (SIC-20)	1,728		1,334		3,301	
Transportation and Public Utilities (SIC-40)	332		383		1,319	
Wholesale Trade (SIC-50)	463		288		777	
Retail Trade (SIC-52)	3,608		4,511		4,767	
Finance, Insurance, and Real Estate (SIC-60)	409		670		666	
Services (SIC-70)	3,029		3,444		4,605	
Unclassified Establishments (SIC-99)	0-19		15		5	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		478		241		1,004
Fishing (NAICS-11411)		20-99		49		0-19
Finfish fishing (NAICS-114111)		53		31		0-19
shellfish fishing (NAICS-114112)		0-19		18		0-19

Oregon State HMS Communities Demographic and Economic Activity Summary

	County					
	Clatsop		Lincoln		Coos	
	1993	1999	1993	1999	1993	1999
Economic Activity						
Employment (numbers)						
Mining (NAICS-21)		0-19		20-99		20-99
Utilities (NAICS-22)		69		20-99		20-99
Construction (NAICS-23)		775		678		744
Manufacturing (NAICS-31)		985		982		1,577
Wholesale trade (NAICS-42)		282		188		674
Retail trade (NAICS-44)		2,351		2,751		3,082
Transportation & warehousing (NAICS-48)		192		200		873
Information (NAICS-51)		183		226		353
Finance & insurance (NAICS-52)		252		349		534
Real estate & rental & leasing (NAICS-53)		200		170		243
Professional, scientific & technical services (NAICS-54)		279		328		505
Management of companies & enterprises (NAICS-55)		92		24		94
Admin, support, waste mgt, remediation services (NAICS-56)		216		683		1,180
Educational services (NAICS-61)		148		79		70
Health care and social assistance (NAICS-62)		1,440		1,656		3,048
Arts, entertainment & recreation (NAICS-71)		202		1,017		467
Accommodation & food services (NAICS-72)		2,276		3,341		1,921
Other services (except public administration) (NAICS-81)		585		588		665
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		0-19		7		0-19
Unclassified establishments (NAICS-99)		0-19		0-19		20-99
Labor and Proprietor Income ($1,000)						
Agricultural Services, Forestry, and Fishing (SIC-07)	1,425		2,822		8,723	
Fishing, hunting and trapping (SIC-0900)	628		1,077		215	
Mining (SIC-10)	0		1,145		2,090	
Construction (SIC-15)	10,414		13,508		14,772	
Manufacturing (SIC-20)	32,952		42,129		77,478	
Transportation and Public Utilities (SIC-40)	9,626		9,599		33,821	
Wholesale Trade (SIC-50)	10,345		5,722		18,787	
Retail Trade (SIC-52)	44,159		53,573		59,401	
Finance, Insurance, and Real Estate (SIC-60)	7,131		12,254		14,607	
Services (SIC-70)	47,756		49,978		82,375	
Unclassified Establishments (SIC-99)	0		129		94	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		15,456		6,357		29,767
Fishing (NAICS-11411)		0		1,563		0
Finfish fishing (NAICS-114111)		494		1,165		0
shellfish fishing (NAICS-114112)		0		398		0
Mining (NAICS-21)		0		0		0
Utilities (NAICS-22)		2,946		0		0
Construction (NAICS-23)		19,065		16,514		23,184
Manufacturing (NAICS-31)		22,445		41,571		53,680
Wholesale trade (NAICS-42)		7,795		5,540		20,052
Retail trade (NAICS-44)		41,060		47,291		52,826
Transportation & warehousing (NAICS-48)		7,772		4,623		28,159
Information (NAICS-51)		4,811		5,521		9,711
Finance & insurance (NAICS-52)		6,903		10,836		16,222
Real estate & rental & leasing (NAICS-53)		3,275		3,280		4,291
Professional, scientific & technical services (NAICS-54)		5,564		6,578		12,028
Management of companies & enterprises (NAICS-55)		1,970		951		2,566
Admin, support, waste mgt, remediation services (NAICS-56)		4,522		9,761		16,730
Educational services (NAICS-61)		3,073		1,118		1,029
Health care and social assistance (NAICS-62)		37,528		41,290		78,378
Arts, entertainment & recreation (NAICS-71)		3,769		21,870		7,279
Accommodation & food services (NAICS-72)		30,580		41,663		19,593
Other services (except public administration) (NAICS-81)		8,038		9,335		10,569
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		0		310		0
Unclassified establishments (NAICS-99)		0		0		0

Oregon State HMS Communities Demographic and Economic Activity Summary

	County					
	Clatsop		Lincoln		Coos	
	1993	1999	1993	1999	1993	1999
Economic Activity (cont'd)						
Number of Establishments						
Agricultural Services, Forestry, and Fishing (SIC-07)	38		52		43	
Fishing, hunting and trapping (SIC-0900)	20		26		9	
Mining (SIC-10)	2		5		7	
Construction (SIC-15)	123		197		143	
Manufacturing (SIC-20)	77		75		219	
Transportation and Public Utilities (SIC-40)	64		63		117	
Wholesale Trade (SIC-50)	59		57		88	
Retail Trade (SIC-52)	406		485		454	
Finance, Insurance, and Real Estate (SIC-60)	86		127		121	
Services (SIC-70)	365		446		532	
Unclassified Establishments (SIC-99)	14		12		15	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		70		72		109
Fishing (NAICS-11411)		36		44		8
Finfish fishing (NAICS-114111)		29		30		6
shellfish fishing (NAICS-114112)		7		14		1
Mining (NAICS-21)		1		3		6
Utilities (NAICS-22)		11		4		3
Construction (NAICS-23)		156		187		158
Manufacturing (NAICS-31)		49		59		94
Wholesale trade (NAICS-42)		38		37		61
Retail trade (NAICS-44)		260		347		279
Transportation & warehousing (NAICS-48)		49		45		81
Information (NAICS-51)		24		23		29
Finance & insurance (NAICS-52)		39		55		76
Real estate & rental & leasing (NAICS-53)		55		80		64
Professional, scientific & technical services (NAICS-54)		65		92		116
Management of companies & enterprises (NAICS-55)		5		5		6
Admin, support, waste mgt, remediation services (NAICS-56)		40		63		63
Educational services (NAICS-61)		13		19		6
Health care and social assistance (NAICS-62)		106		118		200
Arts, entertainment & recreation (NAICS-71)		20		37		22
Accommodation & food services (NAICS-72)		199		254		174
Other services (except public administration) (NAICS-81)		117		135		146
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		1		3		3
Unclassified establishments (NAICS-99)		28		25		34

Oregon State HMS Communities Demographic and Economic Activity Summary

Major HMS Ports	Astoria, Clatsop Co.		Newport, Lincoln Co.		Coos Bay, Coos Co.	
	1990	2000	1990	2000	1990	2000
Population (numbers)	10,069	9,813	8,437	9,532	15,076	15,374
Gender (Percent total population)						
Male	48.7%	48.0%	47.6%	48.9%	48.2%	48.5%
Female	51.3%	52.0%	52.4%	51.1%	51.8%	51.5%
Race and Hispanic origin (Percent total population)						
White	95.5%	91.1%	95.9%	88.6%	94.8%	90.8%
Black	0.3%	0.5%	0.3%	0.5%	0.3%	0.4%
Native American	1.4%	1.1%	1.9%	2.2%	2.5%	2.3%
Asian or Pacific Islander	2.1%	2.1%	1.4%	1.9%	1.6%	1.7%
Other Race	0.7%	2.7%	0.5%	3.9%	0.9%	1.3%
Hispanic Origin (any race)	2.5%	6.0%	2.0%	9.0%	2.7%	4.5%
Age Structure (Percent total population)						
Under 5 years	7.8%	6.4%	6.7%	5.6%	7.0%	5.7%
5-9 Years	7.5%	6.1%	7.4%	5.9%	7.3%	6.0%
10-14 Years	6.7%	7.2%	6.5%	6.3%	6.7%	6.7%
15-19 Years	6.1%	7.1%	5.6%	7.0%	6.3%	7.6%
20-24 Years	6.5%	6.3%	5.6%	5.6%	5.8%	5.7%
25-34 Years	16.1%	12.3%	14.9%	11.7%	14.5%	11.1%
35-44 Years	15.2%	14.1%	17.5%	14.0%	14.8%	14.1%
45-54 Years	9.2%	15.7%	9.8%	16.1%	10.1%	13.6%
55-59 Years	4.0%	5.0%	4.7%	5.8%	4.4%	5.4%
60-64 Years	4.4%	3.7%	4.9%	4.8%	5.4%	4.9%
65-74 Years	8.8%	7.4%	9.7%	9.0%	10.2%	9.3%
75-84 Years	5.7%	6.0%	5.5%	6.5%	5.9%	7.3%
85 Years and greater	2.1%	2.5%	1.4%	1.8%	1.6%	2.6%
Median Age (Years)	NA	38.3	NA	40.9	NA	40.1
18 Years and greater	74.8%	76.0%	75.7%	77.7%	75.2%	77.4%
Male	35.7%	36.0%	35.5%	37.2%	35.6%	36.6%
Female	38.8%	40.0%	40.3%	40.5%	39.6%	40.6%
21 Years and greater	70.7%	71.8%	72.9%	74.2%	71.6%	72.5%
62 Years and greater	19.3%	18.1%	19.7%	20.1%	21.0%	22.1%
65 Years and greater	16.6%	15.9%	16.6%	17.2%	17.7%	19.2%
Male	6.7%	6.3%	7.0%	7.3%	7.7%	8.4%
Female	9.9%	9.6%	9.6%	9.9%	10.0%	10.8%
Educational Attainment (Persons 25 years and over)						
Graduate or professional degree	3.9%	NA	5.1%	NA	3.1%	NA
Bachelor's degree	6.9%	NA	8.5%	NA	6.2%	NA
Associate's degree	4.4%	NA	4.6%	NA	4.4%	NA
Some college no degree	17.9%	NA	18.3%	NA	17.2%	NA
High school graduate	20.9%	NA	20.9%	NA	20.9%	NA
9th to 12th no diploma	7.5%	NA	8.2%	NA	10.5%	NA
Less than 9th grade	4.3%	NA	2.7%	NA	5.1%	NA
Economic Activity (Percent total population)						
Labor Force by Gender (Persons 16 years and over)	47.8%	NA	49.8%	NA	45.8%	NA
Males	27.4%	NA	25.4%	NA	25.1%	NA
Females	20.3%	NA	24.4%	NA	20.7%	NA

Source: U.S. Bureau of Census

2.4.3.6 HMS Community Profile: Crescent City, Del Norte County, CA

Del Norte County and Crescent City http://www.crescentcity.org/

The economic contribution of Del Norte County's government sector, which includes Pelican Bay prison, has typically been more than twice the state average, and accounts for the major share of the County's labor income. Other important sectors of the County's 1999 economy included forestry, fishing and agriculture support, as well as manufacturing, retail trade and tourism. Agriculture is also important to the Del Norte County economy, with 12% of the County's total labor and proprietor income derived from agriculture in 1997.

Crescent City is one of the oldest incorporated cities in California and the only incorporated city in Del Norte County. The town was laid out in 1852 along the harbor and coastline and was the first county seat of the former Klamath County. In 1855, the state legislature considered moving the state capital to Crescent City, but the bill to do so failed. Two years later, the legislature divided Klamath County, forming the new Del Norte County. Crescent City is the county seat. The city has a large harbor, a downtown area, highway frontage and several shopping districts.

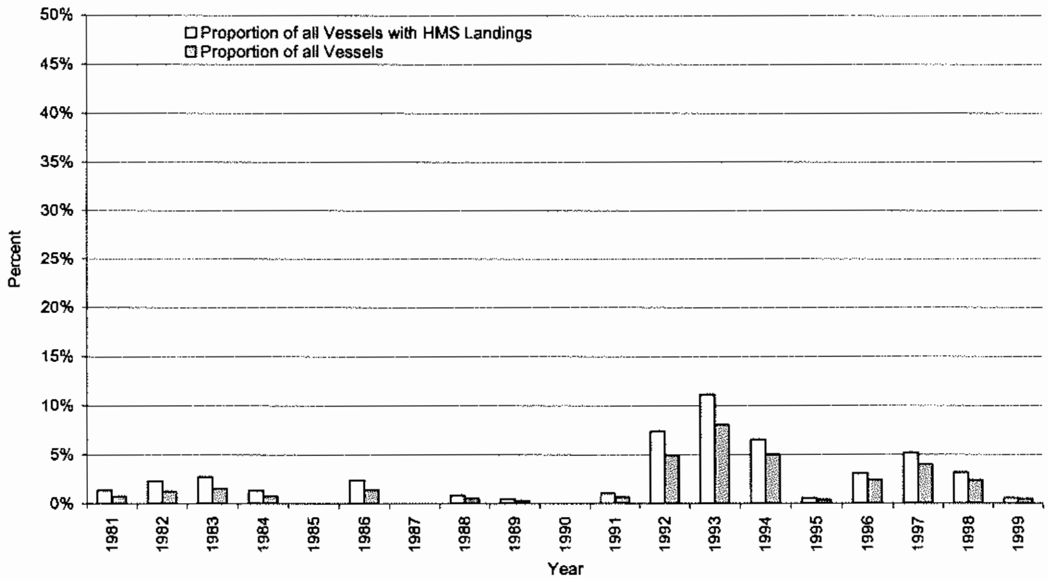
Number of vessels with HMS landings for which the Crescent City, CA area is their principal port, by their principal species, 1981-99.

Year	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	8			0	0		69
1982	13			0	0		16
1983	12			0	0		95
1984	4			0	0		24
1985							19
1986	7			0	0		14
1987							12
1988	2			0	0		21
1989	1			0	0		9
1990							17
1991	0			0	2		7
1992	2			0	15		21
1993	2			0	28		37
1994	7			1	12		73
1995	1			0	0		16
1996	6			0	1		49
1997	9			0	2		58
1998	1			0	5		23
1999	1			0	0		16

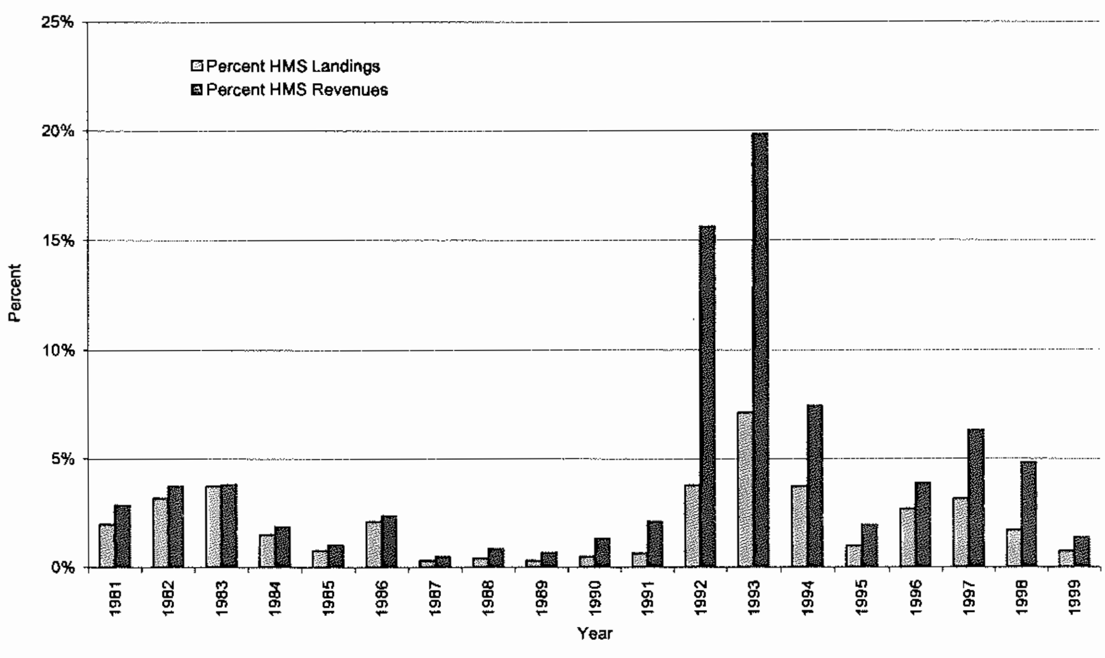
Number of vessels making HMS landings, and HMS landings (mt) and exvessel revenues (1999 $) by species group, Crescent City, CA, 1981-99.

Landings (mt round weight)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	589	172						6611
1982	566	309						7345
1983	442	251						5402
1984	303	108						6076
1985	211	68			2			7743
1986	296	224						8324
1987	275	22			10			8656
1988	249	68						14189
1989	247	39			14			14611
1990	187	11			29	27		12014
1991	195	2			52	30		12181
1992	231	96			61	516	1	15100
1993	271	239	5		86	559	3	10310
1994	307	335	15		18	120		11513
1995	193	77	1		2	16		6456
1996	228	293	2		2	23		8890
1997	214	430	3		7	29		9933
1998	190	55	5		23	93		7642
1999	185	29			2	17		4415
Exvessel Revenues (1999 $)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	589	$573,286						$15,767,137
1982	566	$705,306			$304		$148	$14,846,863
1983	442	$490,604			$958			$10,481,673
1984	303	$197,612			$34			$8,691,307
1985	211	$119,187			$4,626			$10,229,000
1986	296	$399,438			$124	$4,834	$6	$13,821,395
1987	275	$53,026			$26,256			$13,851,533
1988	249	$177,464			$127			$17,363,803
1989	247	$75,769			$35,859			$12,828,383
1990	187	$24,790			$46,371	$167,105		$14,839,241
1991	195	$4,825			$66,770	$200,740		$10,740,561
1992	231	$333,666	$2,850		$101,914	$2,559,090	$7,487	$13,432,066
1993	271	$395,661	$22,100		$136,919	$2,826,937	$19,517	$11,510,630
1994	307	$644,126	$88,912	$4,169	$36,292	$725,819		$16,280,989
1995	193	$148,600	$7,088		$2,595	$82,802		$10,286,959
1996	228	$540,433	$7,573		$4,008	$132,078		$14,385,578
1997	214	$752,902	$12,881		$12,061	$150,846	$231	$11,575,237
1998	190	$82,476	$29,379		$34,162	$395,535	$262	$8,858,153
1999	185	$69,013	$7,466		$3,080	$79,038	$1,597	$9,631,439

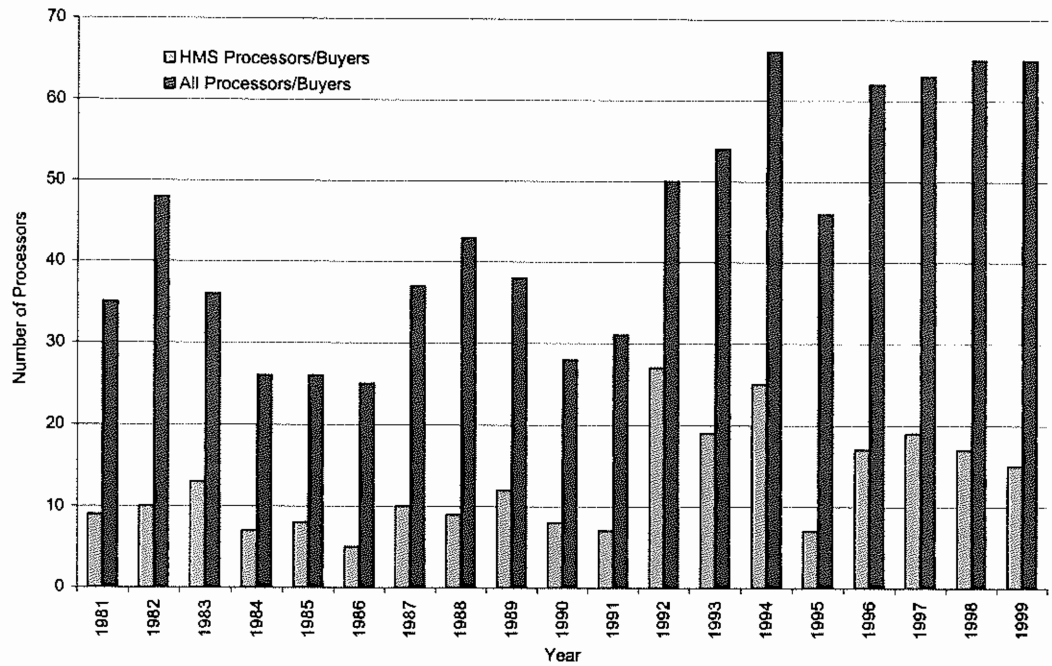
Proportion of vessels whose principal species is a HMS and whose principal port is Crescent City, CA of all vessels making HMS landings, and the proportion of these vessels of the total number of vessels making landings in Crescent City,1981-99.



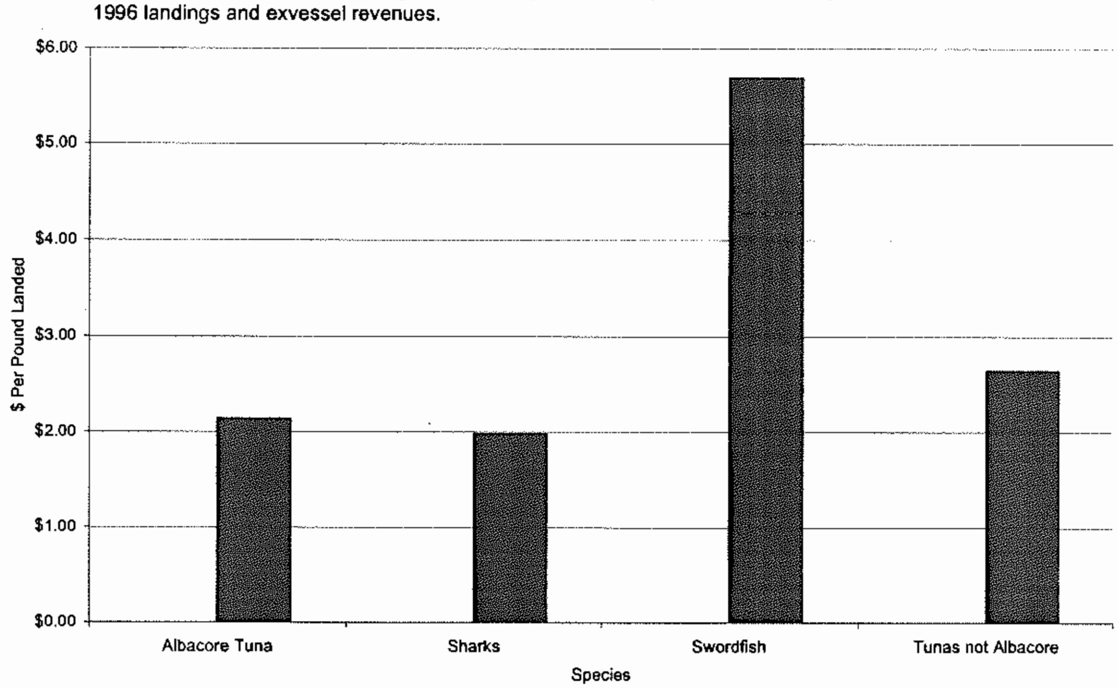
Proportion of HMS landings and exvessel revenues of total landings and exvessel revenues in Crescent City, CA, 1981-99.



Number of processors/buyers in Crescent City, CA, 1981-99.



Total income multipliers for landings of HMS of species in the port of Crescent City, CA, based on 1996 landings and exvessel revenues.



2.4.3.7 HMS Community Profile: Eureka, Humboldt County, CA

Humboldt County and Eureka http://www.eurekawebs.com/

Almost 55% of Del Norte County's non-agriculture labor and proprietor income in 1999 was generated by the manufacturing, retail trade and health care sectors of the economy. Forestry, fishing and agriculture support, as well as construction and tourism were other important components of the County's economy.

Founded in 1856, Eureka is bordered on one side by Humboldt Bay, and on the other by mountains lush with redwoods which offer a reminder of the area's rich logging heritage. The community's roots since the 1850's have been in the timber and commercial fishing industries.

Eureka is continuing to successfully transition to a broader economic base, and today enjoys its position as the governmental, commercial, industrial and transportation center of the region. The city's 28,600 residents reside within the 17 square miles of the City limits which also serves as the County seat for Humboldt County. Eureka functions more like a city twice its size due to its regional center status and the fact its service area population is about 50,000.

The Eureka/Humboldt County economy has historically depended heavily on the timber industry, which included lumber production and the manufacturing of timber-related products. Both types of manufacturing are in long-term decline due to diminishing timber resources, increased mechanization, and increased regulation of timber harvesting. Since the 1970s, there has been a major shift in the structure of the county's economy away from manufacturing toward services, retail trade, and government. However, job growth since 1991 has been in (1) services other than medical or lodging, (2) retail and restaurants, (3) medical services, (4) finance, insurance and real estate, (5) food and fish processing, and (6) other manufacturing. Humboldt State University, as well as some state and federal government employers, are also basic industries. Spending by visitors and the movement of retired persons into the county have provided some basic economic activity more recently. Basic industries generate demand for other industries to provide supplies. The railroad and port, for example, historically served the timber industry. Local-serving industries are those that serve the consumption needs of the local area.

Number of vessels with HMS landings, for which the Eureka, CA area is their principal port, by their principal species, 1981-99.

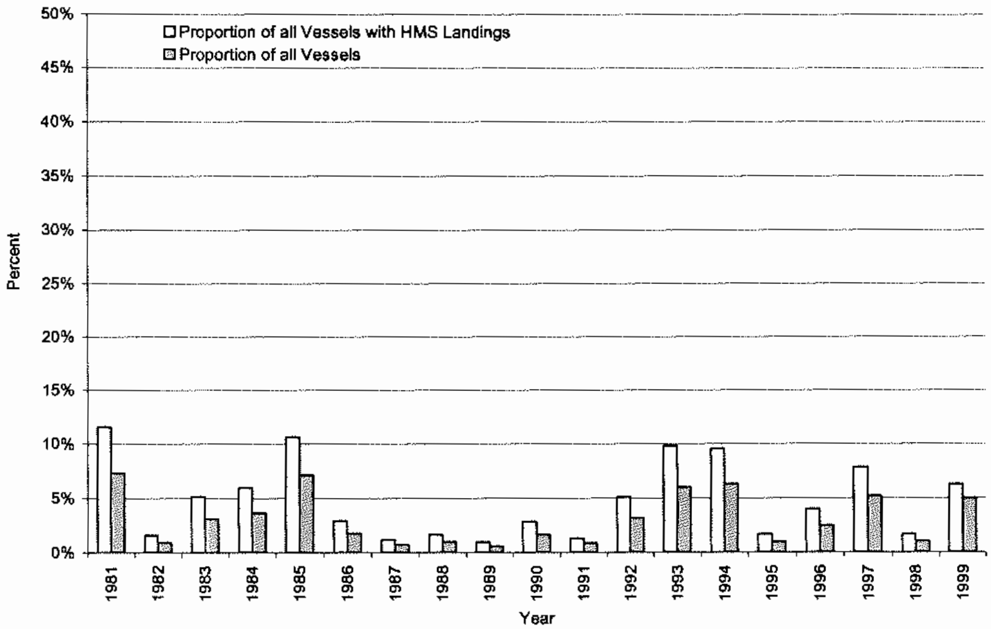
Year	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	63				0		53
1982	6				0		14
1983	16				0		62
1984	15				0		23
1985	24				0		33
1986	8				0		6
1987	3				0		12
1988	4				0		18
1989	2				0		5
1990	5				0		8
1991	3				0		3
1992	6				3		16
1993	16				0		19
1994	17				0		31
1995	2				0		11
1996	6				0		15
1997	12				0		28
1998	2				0		10
1999	9				0		19

Number of vessels making HMS landings, and HMS landings (mt) and exvessel revenues (1999 $) by species group, Eureka, CA, 1981-99.

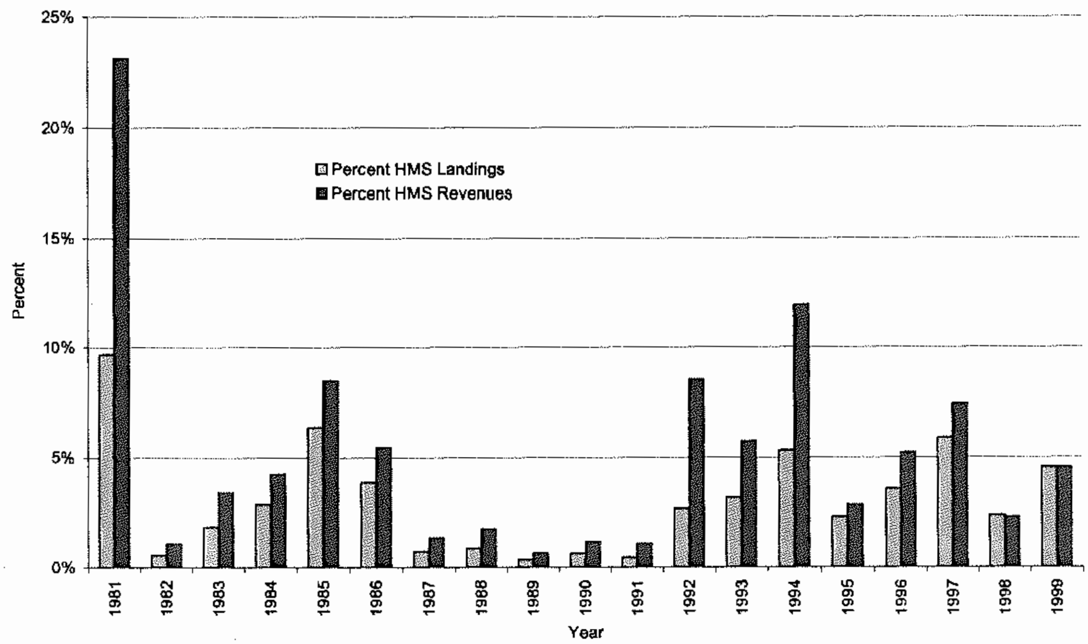
Landings (mt round weight)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	546	1659						4437
1982	378	84						3519
1983	311	178						2677
1984	251	280						2657
1985	226	815						3875
1986	275	422			4			3278
1987	256	93						3820
1988	247	105						3247
1989	212	33						2449
1990	177	70						3791
1991	234	37				3		2809
1992	177	145			7	106		3603
1993	163	287			1	2		4347
1994	178	407				15		3944
1995	120	150				4		3500
1996	151	287						4261
1997	153	518			2	5		4930
1998	121	136						3364
1999	144	164						2906

Exvessel Revenues (1999 $)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	546	$5,689,208					$300	$9,398,658
1982	378	$181,862						$7,404,551
1983	311	$333,964					$239	$4,019,298
1984	251	$478,203					$268	$4,840,778
1985	226	$1,197,708					$284	$5,639,505
1986	275	$712,136			$7,359			$5,616,238
1987	256	$214,978						$7,151,370
1988	247	$270,148						$6,537,160
1989	212	$66,602						$3,550,148
1990	177	$165,683						$7,271,931
1991	234	$79,275			$562	$23,001		$4,114,655
1992	177	$378,588	$1,711	$8	$12,410	$649,813	$171	$5,147,063
1993	163	$634,139			$1,509	$16,887		$6,215,062
1994	178	$1,364,575	$871		$966	$98,306		$6,614,026
1995	120	$289,538			$1,430	$21,973		$6,369,408
1996	151	$666,778						$7,385,752
1997	153	$946,449			$3,050	$25,220		$7,824,339
1998	121	$210,916						$6,033,858
1999	144	$333,394	$469		$72	$3,506		$6,103,300

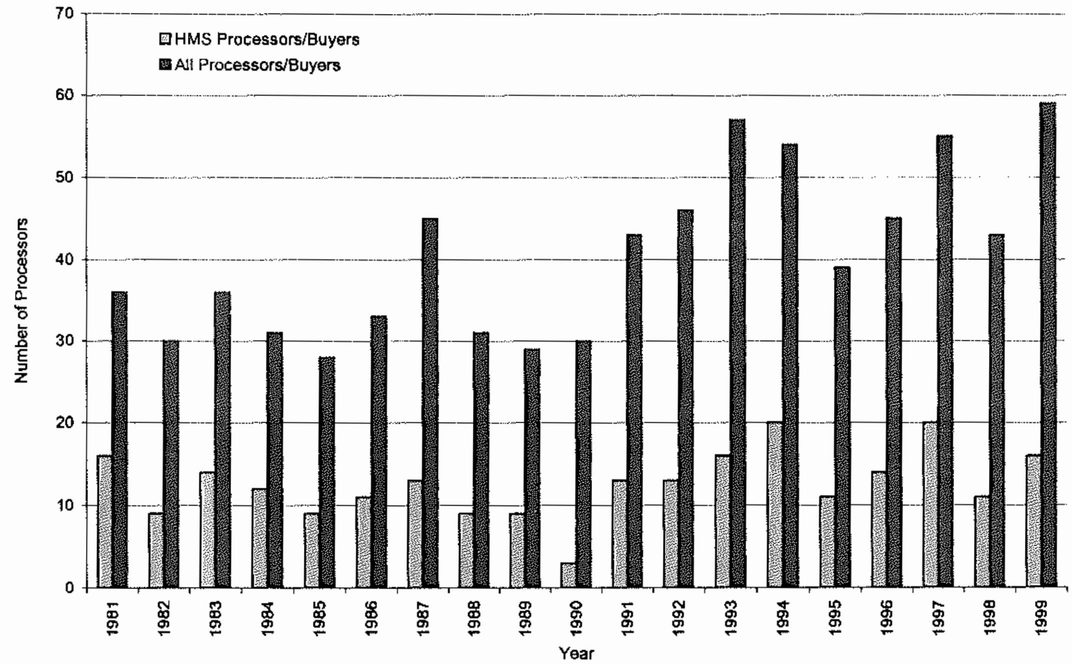
Proportion of vessels whose principal species is a HMS and whose principal port is Eurek, CA of all vessels making HMS landings, and the proportion of these vessels of the total number of vessels making landings in Eureka,1981-99.



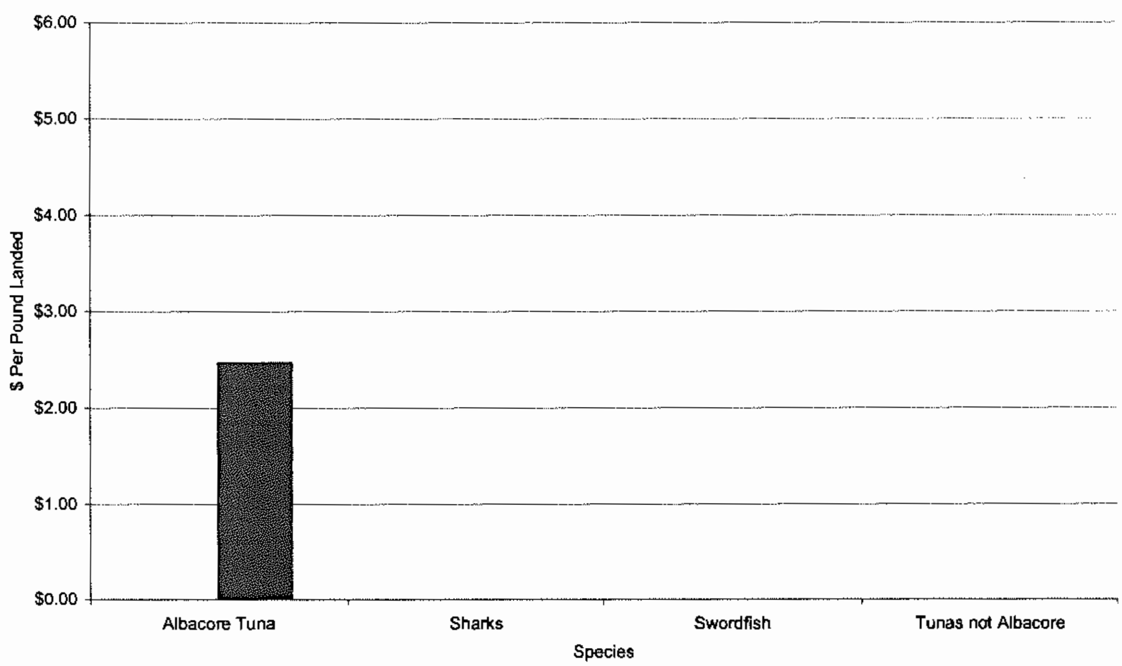
Proportion of HMS landings and exvessel revenues of total landings and exvessel revenues in Eureka, CA, 1981-99.



Number of processors/buyers in Eureka, CA, 1981-99.



Total income multipliers for landings of HMS of species in the port of Eureka, CA, based on 1996 landings and exvessel revenues.



2.4.3.8 HMS Community Profile: Fort Bragg, Mendocino County, CA

Mendocino County

Mendocino County's economic structure closely resembles that of the state. The main exception is the agriculture sector which in terms of income as a proportion of total income, is significantly greater than that of the state. In 1997, agriculture accounted for 12% of the County's total income. Of the northern California counties, Mendocino's government sector is the smallest. Manufacturing in Mendocino County accounted for almost 25% of non-agricultural labor and proprietor income in 1999. Other key industry sectors were retail trade, health services and tourism.

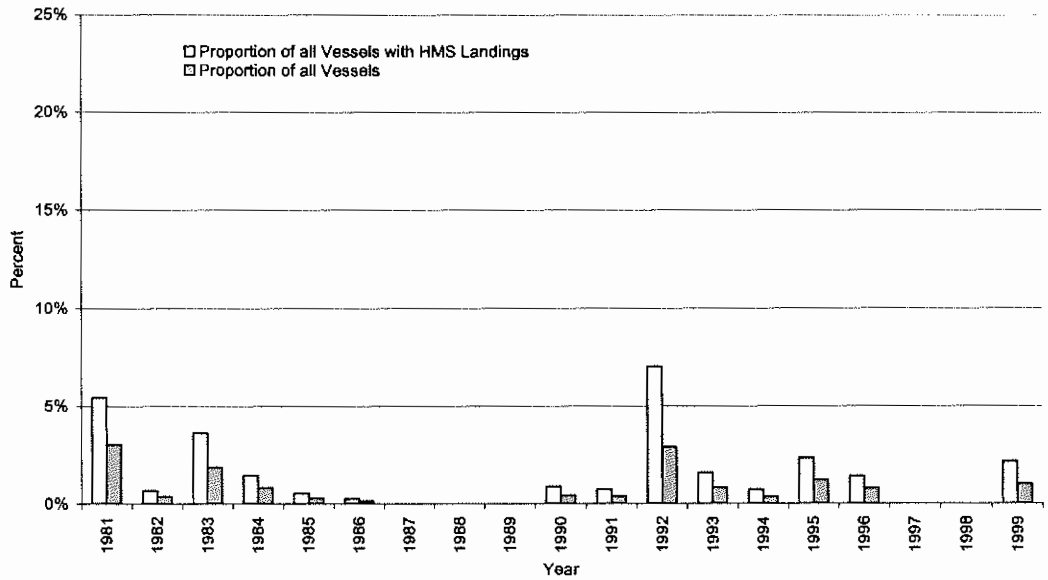
Number of vessels with HMS landings for which the Fort Bragg, CA area is their principal port, by their principal species, 1981-99.

Year	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	26				0		67
1982	3				0		40
1983	11				0		59
1984	4				0		17
1985	2				0		29
1986	1				0		12
1987							17
1988							13
1989							14
1990	1				2		4
1991	0				2		2
1992	4				4		2
1993	1				2		3
1994	1				0		4
1995	1				2		4
1996	2				0		3
1997							19
1998							3
1999	2				0		13

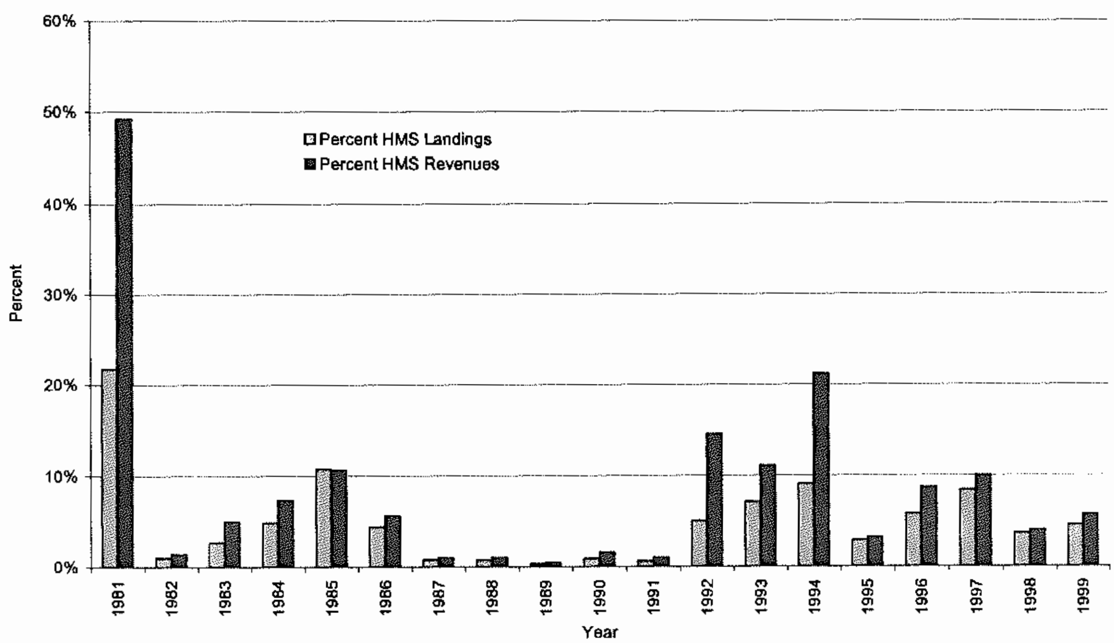
Number of vessels making HMS landings, and HMS landings (mt) and exvessel revenues (1999 $) by species group, Fort Bragg, CA, 1981-99.

Landings (mt round weight)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	480	1659						4437
1982	460	84						3519
1983	304	178						2677
1984	278	280						2657
1985	389	815						3875
1986	399	422			4			3278
1987	510	93						3820
1988	485	105						3247
1989	469	33						2449
1990	347	70						3791
1991	279	37				3		2809
1992	114	145			7	106		3603
1993	191	287			1	2		4347
1994	143	407				15		3944
1995	129	150				4		3500
1996	144	287						4261
1997	119	518			2	5		4930
1998	93	136						3364
1999	93	164						2906
Exvessel Revenues (1999 $)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	480	$5,689,208					$300	$9,398,658
1982	460	$181,862						$7,404,551
1983	304	$333,964					$239	$4,019,298
1984	278	$478,203					$268	$4,840,778
1985	389	$1,197,708					$284	$5,639,505
1986	399	$712,136			$7,359			$5,616,238
1987	510	$214,978						$7,151,370
1988	485	$270,148						$6,537,160
1989	469	$66,602						$3,550,148
1990	347	$165,683						$7,271,931
1991	279	$79,275			$562	$23,001		$4,114,655
1992	114	$378,588	$1,711	$8	$12,410	$649,813	$171	$5,147,063
1993	191	$634,139			$1,509	$16,887		$6,215,062
1994	143	$1,364,575	$871		$966	$98,306		$6,614,026
1995	129	$289,538			$1,430	$21,973		$6,369,408
1996	144	$666,778						$7,385,752
1997	119	$946,449			$3,050	$25,220		$7,824,339
1998	93	$210,916						$6,033,858
1999	93	$333,394	$469		$72	$3,506		$6,103,300

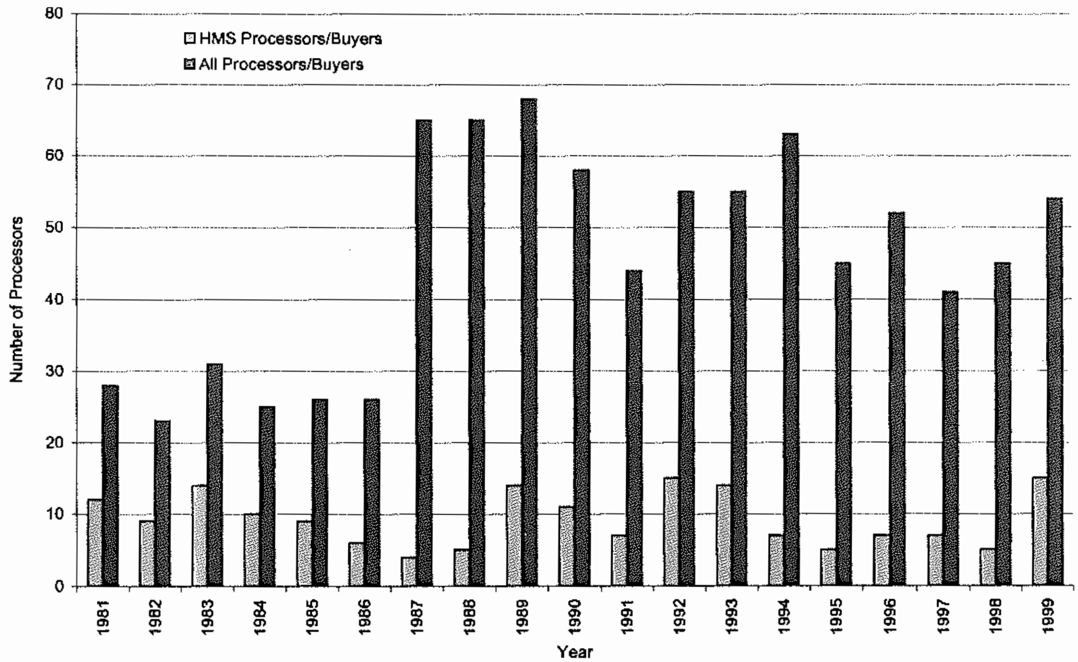
Proportion of vessels whose principal species is a HMS and whose principal port is Fort Bragg, CA of all vessels making HMS landings, and the proportion of these vessels of the total number of vessels making landings in Fort Bragg,1981-99.



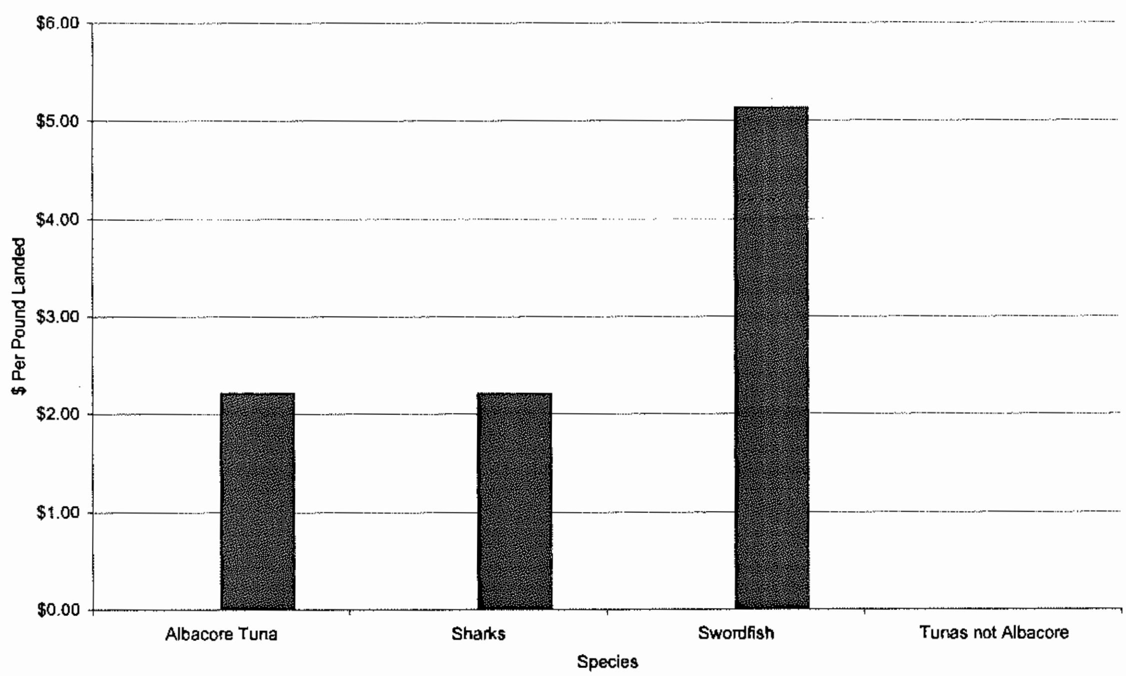
Proportion of HMS landings and exvessel revenues of total landings and exvessel revenues in Fort Bragg, CA, 1981-99.



Number of processors/buyers in Fort Bragg, CA, 1981-99.



Total income multipliers for landings of HMS of species in the port of Fort Bragg, CA, based on 1996 landings and exvessel revenues.



Northern California HMS Communities Demographic Profiles

	County					
	Del Norte		Humboldt		Mendocino	
	1990	2000	1990	2000	1990	2000
Population (numbers)	23,460	27,507	119,118	126,518	80,345	86,265
Gender (Percent total population)						
Male	54.3%	55.2%	49.7%	52.5%	49.8%	49.7%
Female	45.7%	44.8%	50.3%	53.7%	50.2%	50.3%
Race and Hispanic origin (Percent total population)						
White	86.1%	78.9%	90.6%	90.0%	89.6%	80.8%
Black	3.7%	4.3%	0.8%	0.9%	0.6%	0.6%
Native American	6.4%	6.4%	5.5%	6.1%	4.1%	4.8%
Asian or Pacific Islander	1.9%	2.4%	1.9%	2.0%	1.2%	1.3%
Other Race	1.9%	3.9%	1.2%	2.6%	4.5%	8.6%
Hispanic Origin (any race)	10.3%	13.9%	4.2%	6.9%	10.3%	16.5%
Age Structure (Percent total population)						
Under 5 years	7.4%	5.5%	7.2%	6.0%	7.3%	6.0%
5-9 Years	8.5%	6.8%	7.9%	6.6%	8.2%	6.9%
10-14 Years	7.4%	7.7%	7.0%	7.4%	7.7%	7.8%
15-19 Years	6.0%	7.5%	7.0%	8.4%	6.5%	7.6%
20-24 Years	6.9%	5.5%	7.8%	9.4%	5.2%	5.4%
25-34 Years	16.9%	14.4%	16.4%	13.4%	14.1%	11.2%
35-44 Years	14.3%	17.7%	17.0%	15.7%	17.9%	14.4%
45-54 Years	9.5%	13.7%	9.6%	16.7%	11.0%	16.9%
55-59 Years	4.0%	4.7%	3.8%	5.3%	4.1%	5.9%
60-64 Years	4.2%	3.9%	4.1%	4.0%	4.4%	4.4%
65-74 Years	8.0%	6.7%	7.2%	6.7%	8.0%	6.9%
75-84 Years	4.1%	4.4%	4.0%	4.8%	4.3%	4.9%
85 Years and greater	0.9%	1.4%	1.1%	1.7%	1.2%	1.7%
Median Age (years)	NA	36.4	NA	36.3	NA	38.9
18 Years and greater	73.0%	74.9%	74.3%	81.5%	72.7%	74.5%
Male	40.2%	42.4%	36.5%	39.8%	35.6%	36.7%
Female	32.9%	32.5%	37.8%	41.7%	37.1%	37.8%
21 Years and greater	69.5%	71.4%	69.3%	75.6%	69.2%	70.5%
62 Years and greater	15.5%	14.7%	14.7%	15.6%	16.4%	16.1%
65 Years and greater	12.9%	12.5%	12.3%	13.2%	13.6%	13.6%
Male	6.0%	5.7%	5.3%	5.6%	5.9%	5.9%
Female	6.9%	6.9%	7.0%	7.6%	7.7%	7.6%
Educational Attainment (Persons 25 years and over)						
Graduate or professional degree	2.1%	NA	3.8%	NA	3.8%	NA
Bachelor's degree	4.4%	NA	8.9%	NA	7.8%	NA
Associate's degree	4.7%	NA	4.9%	NA	4.3%	NA
Some college no degree	14.9%	NA	16.5%	NA	16.1%	NA
High school graduate	19.6%	NA	17.0%	NA	19.3%	NA
9th to 12th no diploma	12.7%	NA	8.5%	NA	8.6%	NA
Less than 9th grade	5.9%	NA	3.9%	NA	5.3%	NA
Economic Activity						
Labor Force by Gender (Persons 16 years and over)	37.7%	NA	47.3%	NA	47.2%	NA
Males	21.2%	NA	26.3%	NA	26.7%	NA
Females	16.5%	NA	21.0%	NA	33.0%	NA

Northern California HMS Communities Demographic Profiles

	County					
	Del Norte		Humboldt		Mendocino	
	1993	1999	1993	1999	1993	1999
Economic Activity (cont'd)						
Employment (numbers)						
Agricultural Services, Forestry, and Fishing (SIC-07)	57		620		255	
Fishing, hunting and trapping (SIC-0900)	27		14		0-19	
Mining (SIC-10)			0-19		0-19	
Construction (SIC-15)	148		1,846		1,034	
Manufacturing (SIC-20)	476		6,476		4,253	
Transportation and Public Utilities (SIC-40)	217		1,863		845	
Wholesale Trade (SIC-50)	237		1,363		1,256	
Retail Trade (SIC-52)	1697		9,469		5,839	
Finance, Insurance, and Real Estate (SIC-60)	157		1,677		1,021	
Services (SIC-70)	1238		10,859		6,148	
Unclassified Establishments (SIC-99)	12		20-99		0-19	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		107		937		660
Fishing (NAICS-11411)		20-99		20-99		20-99
Finfish fishing (NAICS-114111)				0-19		20-99
shellfish fishing (NAICS-114112)				14		12
Mining (NAICS-21)						20-99
Utilities (NAICS-22)		0-19		250-499		100-249
Construction (NAICS-23)		166		1,895		1,244
Manufacturing (NAICS-31)		250		5,262		4,231
Wholesale trade (NAICS-42)		140		1,295		1,079
Retail trade (NAICS-44)		920		6,868		4,569
Transportation & warehousing (NAICS-48)		65		888		506
Information (NAICS-51)		102		817		429
Finance & insurance (NAICS-52)		106		1,181		596
Real estate & rental & leasing (NAICS-53)		67		556		490
Professional, scientific & technical services (NAICS-54)		136		1,450		659
Management of companies & enterprises (NAICS-55)				244		108
Admin, support, waste mgt, remediation services (NAICS-56)		20-99		1,250		540
Educational services (NAICS-61)		0-19		371		312
Health care and social assistance (NAICS-62)		1,034		7,211		3,705
Arts, entertainment & recreation (NAICS-71)		272		647		870
Accommodation & food services (NAICS-72)		741		4,174		3,279
Other services (except public administration) (NAICS-81)		147		1,539		758
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)				20-99		205
Unclassified establishments (NAICS-99)		0-19		20-99		69
Labor and Proprietor Income ($1,000)						
Agricultural Services, Forestry, and Fishing (SIC-07)	741		14,914		2,574	
Fishing, hunting and trapping (SIC-0900)	452		211		0	
Mining (SIC-10)			0		0	
Construction (SIC-15)	2791		37,276		21,948	
Manufacturing (SIC-20)	10399		181,618		113,195	
Transportation and Public Utilities (SIC-40)	5941		54,917		24,879	
Wholesale Trade (SIC-50)	3193		29,912		27,222	
Retail Trade (SIC-52)	18251		118,520		76,163	
Finance, Insurance, and Real Estate (SIC-60)	2796		34,346		21,015	
Services (SIC-70)	20523		174,320		96,049	
Unclassified Establishments (SIC-99)	79		0		0	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		3,645		34,762		28,008
Fishing (NAICS-11411)				0		0
Finfish fishing (NAICS-114111)				0		0
shellfish fishing (NAICS-114112)				26		107

Northern California HMS Communities Demographic Profiles

	County					
	Del Norte		Humboldt		Mendocino	
	1993	1999	1993	1999	1993	1999
Economic Activity (cont'd)						
Labor and Proprietor Income ($1,000) (cont'd)						
Mining (NAICS-21)						0
Utilities (NAICS-22)		0		0		0
Construction (NAICS-23)		5,269		55,186		34,661
Manufacturing (NAICS-31)		6,201		159,329		138,919
Wholesale trade (NAICS-42)		3,210		36,462		29,040
Retail trade (NAICS-44)		13,981		122,349		86,497
Transportation & warehousing (NAICS-48)		1,387		26,000		14,759
Information (NAICS-51)		2,620		29,252		11,999
Finance & insurance (NAICS-52)		2,279		39,819		18,122
Real estate & rental & leasing (NAICS-53)		818		9,326		7,092
Professional, scientific & technical services (NAICS-54)		2,764		36,941		15,564
Management of companies & enterprises (NAICS-55)				13,575		3,586
Admin, support, waste mgt, remediation services (NAICS-56)		0		21,631		8,594
Educational services (NAICS-61)		0		4,499		6,829
Health care and social assistance (NAICS-62)		25,838		157,243		86,713
Arts, entertainment & recreation (NAICS-71)		4,574		7,719		12,992
Accommodation & food services (NAICS-72)		6,405		41,092		35,002
Other services (except public administration) (NAICS-81)		2,490		25,229		11,849
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)				0		7,360
Unclassified establishments (NAICS-99)		0		0		1,072
Number of Establishments						
Agricultural Services, Forestry, and Fishing (SIC-07)	17		71		60	
Fishing, hunting and trapping (SIC-0900)	8		10		2	
Mining (SIC-10)					3	
Construction (SIC-15)	59		416		338	
Manufacturing (SIC-20)	31		289		197	
Transportation and Public Utilities (SIC-40)	20		153		121	
Wholesale Trade (SIC-50)	17		163		140	
Retail Trade (SIC-52)	161		974		695	
Finance, Insurance, and Real Estate (SIC-60)	36		265		178	
Services (SIC-70)	175		1,274		875	
Unclassified Establishments (SIC-99)	5		30		20	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		25		116		114
Fishing (NAICS-11411)		13		12		37
Finfish fishing (NAICS-114111)				7		22
shellfish fishing (NAICS-114112)				5		15
Mining (NAICS-21)						5
Utilities (NAICS-22)		1		7		5
Construction (NAICS-23)		54		401		315
Manufacturing (NAICS-31)		16		194		166
Wholesale trade (NAICS-42)		11		117		98
Retail trade (NAICS-44)		79		660		489
Transportation & warehousing (NAICS-48)		11		86		66
Information (NAICS-51)		10		67		44
Finance & insurance (NAICS-52)		18		144		89
Real estate & rental & leasing (NAICS-53)		20		149		114
Professional, scientific & technical services (NAICS-54)		35		237		204
Management of companies & enterprises (NAICS-55)				13		6
Admin, support, waste mgt, remediation services (NAICS-56)		13		129		90
Educational services (NAICS-61)		5		34		23
Health care and social assistance (NAICS-62)		30		420		278
Arts, entertainment & recreation (NAICS-71)		13		55		52
Accommodation & food services (NAICS-72)		75		345		313
Other services (except public administration) (NAICS-81)		41		329		213
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)				4		3
Unclassified establishments (NAICS-99)		17		75		62

Northern California HMS Communities Demographic Profiles

Major HMS Ports	Crescent City		Eureka		Ft. Bragg	
	1990	2000	1990	2000	1990	2000
Population (numbers)	4380	4,006	27,025	26,128	6,078	7,026
Gender (Percent total population)						
Male	47.5%	46.2%	48.6%	49.5%	48.1%	50.1%
Female	52.5%	53.8%	51.4%	50.5%	51.9%	49.9%
Race and Hispanic origin (Percent total population)						
White	89.4%	78.3%	88.2%	82.5%	89.0%	79.5%
Black	0.6%	0.5%	1.4%	1.8%	0.5%	1.0%
Native American	5.2%	6.1%	4.6%	4.2%	1.6%	1.9%
Asian or Pacific Islander	3.1%	4.7%	4.4%	3.9%	0.8%	1.0%
Other Race	1.7%	4.3%	1.4%	2.7%	8.1%	12.1%
Hispanic Origin (any race)	7.6%	11.0%	4.8%	7.8%	13.7%	22.7%
Age Structure (Percent total population)						
Under 5 years	8.8%	9.1%	7.4%	5.7%	7.9%	6.8%
5-9 Years	10.0%	8.1%	7.5%	6.2%	7.1%	6.7%
10-14 Years	8.0%	8.0%	6.6%	6.4%	6.6%	7.0%
15-19 Years	6.9%	8.5%	6.1%	7.3%	6.3%	7.0%
20-24 Years	7.0%	7.6%	7.5%	8.4%	6.9%	6.5%
25-34 Years	15.8%	11.9%	16.6%	13.8%	16.8%	14.2%
35-44 Years	14.1%	14.8%	16.1%	15.0%	14.6%	15.8%
45-54 Years	8.7%	11.1%	9.2%	15.2%	9.3%	14.1%
55-59 Years	3.3%	3.4%	4.1%	4.7%	3.4%	4.4%
60-64 Years	3.5%	3.6%	4.0%	3.6%	4.9%	3.6%
65-74 Years	8.0%	6.7%	8.2%	8.5%	8.3%	6.0%
75-84 Years	4.4%	5.3%	5.2%	5.1%	5.9%	5.7%
85 Years and greater	1.5%	1.8%	1.5%	2.1%	1.9%	2.2%
Median Age (Years)	NA	32.1	NA	0.1%	NA	0.5%
18 Years and greater	68.8%	69.9%	75.1%	77.6%	74.9%	75.4%
Male	31.4%	31.6%	35.8%	38.0%	35.1%	37.5%
Female	37.4%	38.3%	39.3%	39.7%	39.8%	37.8%
21 Years and greater	64.5%	64.6%	70.8%	72.6%	70.6%	71.2%
62 Years and greater	16.2%	15.9%	17.2%	15.6%	19.4%	16.0%
65 Years and greater	13.9%	13.9%	14.9%	13.7%	16.1%	13.9%
Male	5.2%	5.2%	5.8%	5.4%	6.0%	4.9%
Female	8.7%	8.6%	9.1%	8.3%	10.1%	9.0%
Educational Attainment (Persons 25 years and over)						
Graduate or professional degree	2.5%	NA	3.1%	NA	2.8%	NA
Bachelor's degree	4.6%	NA	8.6%	NA	5.6%	NA
Associate's degree	3.1%	NA	5.2%	NA	3.9%	NA
Some college no degree	12.3%	NA	17.7%	NA	13.1%	NA
High school graduate	20.9%	NA	17.0%	NA	22.0%	NA
9th to 12th no diploma	11.9%	NA	9.1%	NA	10.1%	NA
Less than 9th grade	5.0%	NA	4.4%	NA	7.2%	NA
Economic Activity (Percent total population)						
Labor Force by Gender (Persons 16 years and over)	40.7%	NA	46.2%	NA	48.4%	NA
Males	20.7%	NA	25.1%	NA	27.1%	NA
Females	20.0%	NA	21.1%	NA	21.3%	NA

Source: U.S. Bureau of Census

2.4.3.9 HMS Community Profile: Bodega Bay, Sonoma County, CA

Sonoma County http://www.sonoma-county.org/index.htm

In 1999, the manufacturing sector accounted for almost 22% of the county's non-agricultural labor and proprietor income. Health services, retail trade, construction and finance and insurance were other key contributors to Sonoma County's economy in 1999. Agriculture is a vital component of the County's economy, accounting for six percent of total income in 1997.

Sonoma County environments range from the surf-pounded cliffs of the coast to the golden Mayacamas Mountains, from the cool stillness of redwood forests to the muddy marshes that feed San Francisco Bay. The economy is strong and equally diverse - from the vineyards of the Alexander Valley to high-tech Telecom Valley.

Sonoma County encompasses over one million acres of land and water, rich in scenic beauty with an array of parks, recreational facilities, campsites and lakes. Open space and agricultural land accounts for a great majority of Sonoma County acreage. The county has approximately 20,230 acres of surface water area, of which 8,580 are bay waters.

Unemployment rates for Sonoma County in the previous four years have maintained a level at least 2% lower than the California average unemployment rate. Between May 1998 and May 1999, Sonoma County employment levels grew by 5,100 jobs, representing a 2.8% growth. The services industry continued to lead growth with 1,900 new jobs. Large gains were also reported in business services and government.

The region's longest period of economic expansion in at least twenty-five years continued in 2000, spurred by a healthy $15 billion economy that out-performed both California and the nation. Small businesses (establishments with less than 50 workers) account for more than half of Sonoma County's private sector employment.

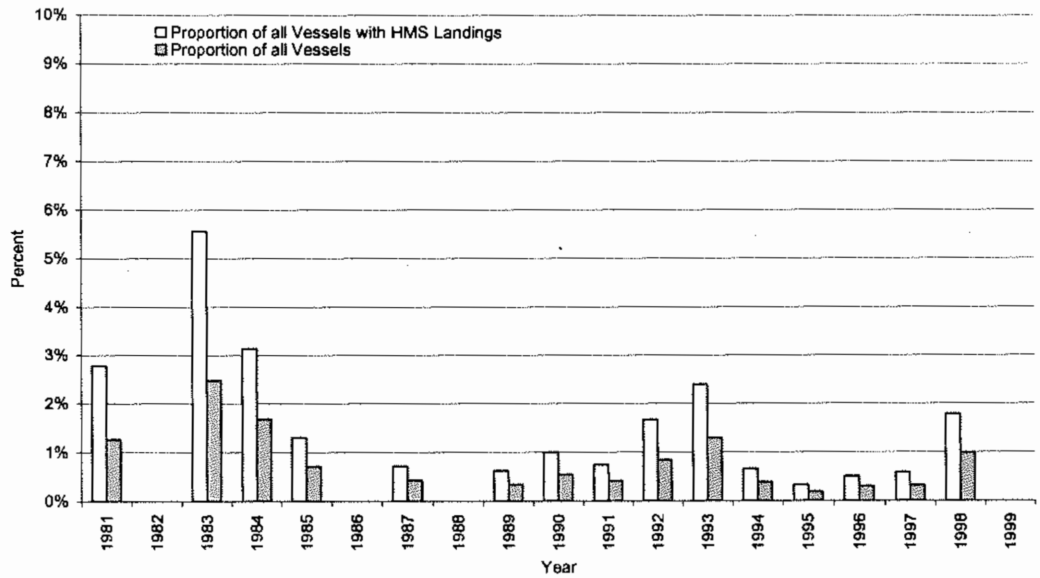
Number of vessels with HMS landings, for which Bodega Bay, CA is their principal port, by their principal species, 1981-99.

Year	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	12			0	0		61
1982							20
1983	15			0	0		30
1984	10			1	1		41
1985	4			0	2		34
1986							20
1987	1			0	3		41
1988							21
1989	0			0	3		17
1990	0			0	4		15
1991	0			0	3		5
1992	1			1	3		6
1993	2			0	5		10
1994	1			0	1		15
1995	0			0	1		3
1996	0			0	1		5
1997	0			0	1		32
1998	3			0	0		15
1999							9

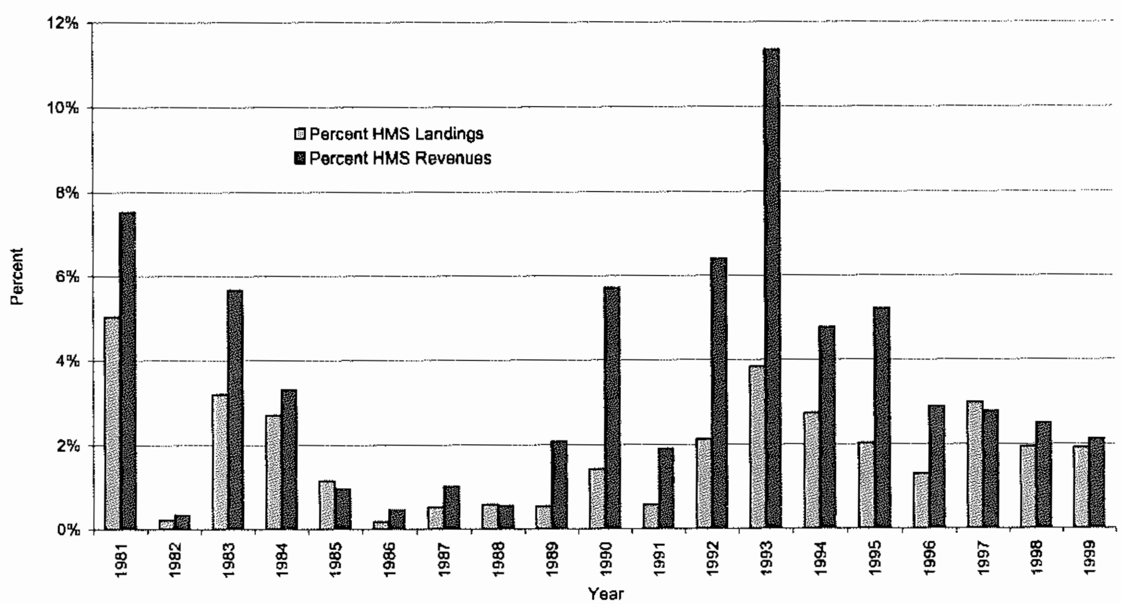
Number of vessels making HMS landings, and HMS landings (mt) and exvessel revenues (1999 $) by species group, Bodega Bay, CA, 1981-99.

Landings (mt round weight)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	432	193						1153
1982	494	13						2142
1983	270	133			2			1863
1984	383	94			23	3		2984
1985	460	32			2	4		2783
1986	398	2			3	4		3174
1987	560	17			3	11		3533
1988	581	40				1		4191
1989	483	7				21		2533
1990	400	3			6	74		2237
1991	408	2			5	28		3206
1992	301	26	1		12	74		2945
1993	293	34	2		7	99		2039
1994	308	38	2		11	22		1439
1995	306	10	3		2	47		1786
1996	200	14				14		1283
1997	170	78				4		1732
1998	169	35				4		1368
1999	175	27				2		1059
Exvessel Revenues (1999 $)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	432	$625,497			$72			$4,584,336
1982	494	$31,217			$772			$5,885,578
1983	270	$255,779			$2,653		$355	$2,338,530
1984	383	$163,380	$452	$18	$51,845	$16,192		$4,989,103
1985	460	$50,081	$32		$5,149	$18,834	$33	$6,091,806
1986	398	$3,310			$7,917	$28,978		$6,011,388
1987	560	$35,635			$7,887	$104,021		$10,532,634
1988	581	$99,670			$231	$13,883		$13,576,072
1989	483	$19,488			$1,862	$155,220	$63	$4,506,484
1990	400	$7,767	$240		$10,691	$524,408	$211	$4,541,290
1991	408	$5,230			$9,005	$196,995	$1,264	$5,728,061
1992	301	$76,900	$5,236		$18,224	$438,338	$1,926	$4,113,922
1993	293	$77,974	$8,398		$10,156	$555,921	$1,201	$2,762,746
1994	308	$80,448	$11,711		$21,393	$144,136		$3,000,986
1995	306	$18,514	$12,792		$4,349	$295,282	$356	$3,885,889
1996	200	$39,569	$1,400		$1,062	$70,096	$177	$2,290,852
1997	170	$129,671	$1,604		$950	$20,511		$3,678,031
1998	169	$106,200	$159		$210	$26,860		$3,936,634
1999	175	$68,469	$477		$82	$7,851		$2,454,025

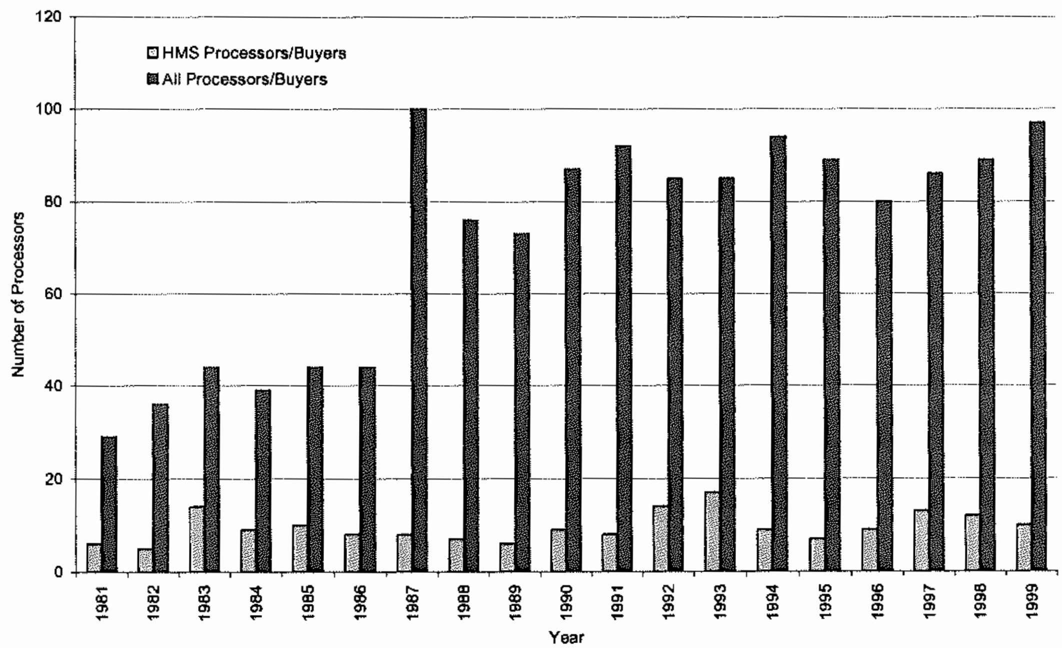
Proportion of vessels whose principal species is a HMS and whose principal port is Bodega Bay CA, of all vessels making HMS landings, and the proportion of these vessels of the total number of vessels making landings in Bodega Bay, 1981-99.



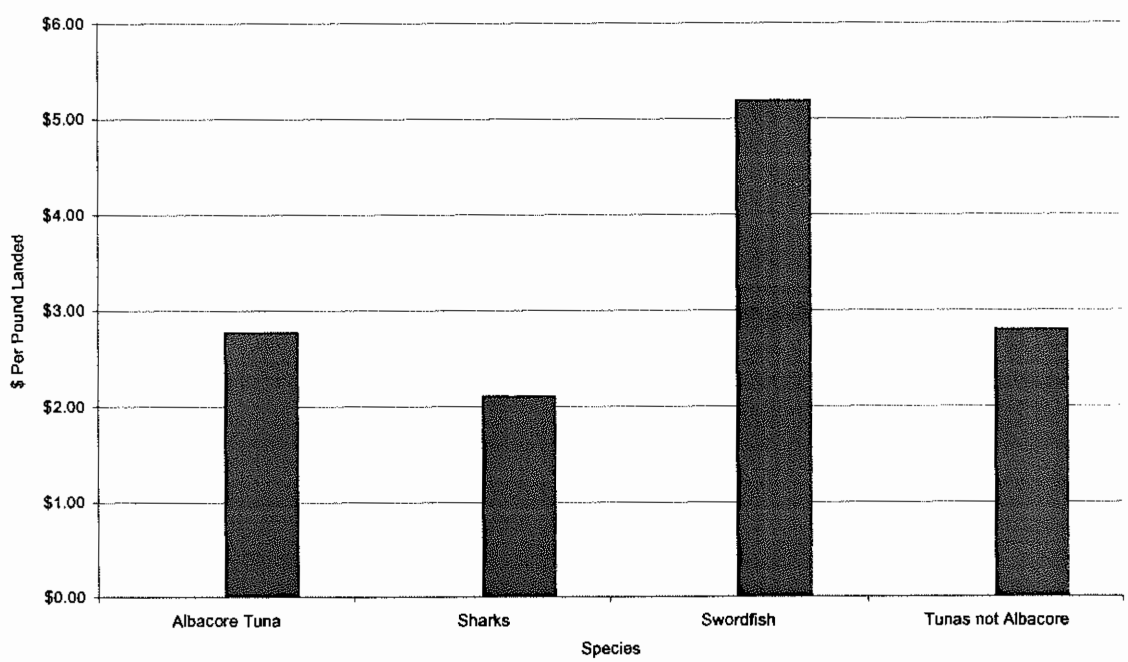
Proportion of HMS landings and exvessel revenues of total landings and exvessel revenues in Bodega Bay, CA, 1981-99.



Number of processors/buyers in Bodega Bay, CA, 1981-99.



Total income multipliers for landings of HMS of species in the port of Bodega Bay, CA, based on 1996 landings and exvessel revenues.



Sonoma County California HMS Communities Demographic Profiles

	County	
	Sonoma	
	1990	2000
Population (numbers)	388,222	458,614
Gender (Percent total population)		
Male	49.0%	49.2%
Female	51.0%	50.8%
Race and Hispanic origin (Percent total population)		
White	90.6%	81.6%
Black	1.4%	1.4%
Native American	1.1%	1.2%
Asian or Pacific Islander	2.8%	3.3%
Other Race	4.1%	8.4%
Hispanic Origin (any race)	10.6%	17.3%
Age Structure (Percent total population)		
Under 5 years	7.3%	6.0%
5-9 Years	7.4%	6.9%
10-14 Years	6.5%	7.2%
15-19 Years	6.1%	7.1%
20-24 Years	6.3%	6.1%
25-34 Years	16.8%	12.7%
35-44 Years	18.4%	16.5%
45-54 Years	10.4%	16.1%
55-59 Years	3.7%	5.2%
60-64 Years	3.8%	3.6%
65-74 Years	7.5%	6.0%
75-84 Years	4.6%	4.9%
85 Years and greater	1.3%	1.8%
Median Age (years)	NA	37.5
18 Years and greater	75.3%	75.5%
Male	36.3%	36.6%
Female	39.1%	38.9%
21 Years and greater	71.3%	71.4%
62 Years and greater	15.7%	14.7%
65 Years and greater	13.4%	12.6%
Male	5.5%	5.2%
Female	7.9%	7.4%
Educational Attainment (Persons 25 years and over)		
Graduate or professional degree	5.2%	NA
Bachelor's degree	11.1%	NA
Associate's degree	6.3%	NA
Some college no degree	17.6%	NA
High school graduate	16.0%	NA
9th to 12th no diploma	6.6%	NA
Less than 9th grade	3.8%	NA
Economic Activity		
Labor Force by Gender (Persons 16 years and over)	52.6%	NA
Males	28.7%	NA
Females	23.9%	NA

Sonoma County California HMS Communities Demographic Profiles

	County	
	Sonoma	
	1993	1,999
Economic Activity (Cont'd)		
Employment (numbers)		
Agricultural Services, Forestry, and Fishing (SIC-07)	1,833	
Fishing, hunting and trapping (SIC-0900)	20-99	
Mining (SIC-10)	174	
Construction (SIC-15)	8,413	
Manufacturing (SIC-20)	20,808	
Transportation and Public Utilities (SIC-40)	5,761	
Wholesale Trade (SIC-50)	7,668	
Retail Trade (SIC-52)	31,233	
Finance, Insurance, and Real Estate (SIC-60)	12,341	
Services (SIC-70)	40,367	
Unclassified Establishments (SIC-99)	121	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		385
Fishing (NAICS-11411)		0-19
Finfish fishing (NAICS-114111)		0-19
shellfish fishing (NAICS-114112)		
Mining (NAICS-21)		229
Utilities (NAICS-22)		500-999
Construction (NAICS-23)		11,878
Manufacturing (NAICS-31)		26,391
Wholesale trade (NAICS-42)		7,048
Retail trade (NAICS-44)		24,643
Transportation & warehousing (NAICS-48)		2,692
Information (NAICS-51)		3,998
Finance & insurance (NAICS-52)		10,612
Real estate & rental & leasing (NAICS-53)		2,757
Professional, scientific & technical services (NAICS-54)		7,117
Management of companies & enterprises (NAICS-55)		862
Admin, support, waste mgt, remediation services (NAICS-56)		10,355
Educational services (NAICS-61)		1,933
Health care and social assistance (NAICS-62)		22,328
Arts, entertainment & recreation (NAICS-71)		2,970
Accommodation & food services (NAICS-72)		14,354
Other services (except public administration) (NAICS-81)		7,218
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		607
Unclassified establishments (NAICS-99)		250-999
Labor and Proprietor Income ($1,000)		
Agricultural Services, Forestry, and Fishing (SIC-07)	26,289	
Fishing, hunting and trapping (SIC-0900)	-	
Mining (SIC-10)	6,456	
Construction (SIC-15)	226,031	
Manufacturing (SIC-20)	629,655	
Transportation and Public Utilities (SIC-40)	179,793	
Wholesale Trade (SIC-50)	218,086	
Retail Trade (SIC-52)	472,072	
Finance, Insurance, and Real Estate (SIC-60)	411,293	
Services (SIC-70)	872,424	
Unclassified Establishments (SIC-99)	1,733	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		9,068
Fishing (NAICS-11411)		0
Finfish fishing (NAICS-114111)		0
shellfish fishing (NAICS-114112)		
Mining (NAICS-21)		14,545
Utilities (NAICS-22)		0

Sonoma County California HMS Communities Demographic Profiles

	County	
	Sonoma	
	1993	1,999
Economic Activity (Cont'd)		
Labor and Proprietor Income ($1,000) (cont'd)		
Construction (NAICS-23)		438,855
Manufacturing (NAICS-31)		1,069,054
Wholesale trade (NAICS-42)		280,641
Retail trade (NAICS-44)		570,304
Transportation & warehousing (NAICS-48)		68,282
Information (NAICS-51)		176,619
Finance & insurance (NAICS-52)		470,185
Real estate & rental & leasing (NAICS-53)		73,155
Professional, scientific & technical services (NAICS-54)		324,861
Management of companies & enterprises (NAICS-55)		33,734
Admin, support, waste mgt, remediation services (NAICS-56)		249,959
Educational services (NAICS-61)		34,589
Health care and social assistance (NAICS-62)		655,209
Arts, entertainment & recreation (NAICS-71)		45,856
Accommodation & food services (NAICS-72)		176,347
Other services (except public administration) (NAICS-81)		147,976
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		50,013
Unclassified establishments (NAICS-99)		0
Number of Establishments		
Agricultural Services, Forestry, and Fishing (SIC-07)	332	
Fishing, hunting and trapping (SIC-0900)	3	
Mining (SIC-10)	22	
Construction (SIC-15)	1,707	
Manufacturing (SIC-20)	780	
Transportation and Public Utilities (SIC-40)	430	
Wholesale Trade (SIC-50)	703	
Retail Trade (SIC-52)	2,597	
Finance, Insurance, and Real Estate (SIC-60)	1,112	
Services (SIC-70)	4,383	
Unclassified Establishments (SIC-99)	129	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		54
Fishing (NAICS-11411)		2
Finfish fishing (NAICS-114111)		2
shellfish fishing (NAICS-114112)		17
Mining (NAICS-21)		15
Utilities (NAICS-22)		1,831
Construction (NAICS-23)		801
Manufacturing (NAICS-31)		630
Wholesale trade (NAICS-42)		1,774
Retail trade (NAICS-44)		263
Transportation & warehousing (NAICS-48)		217
Information (NAICS-51)		672
Finance & insurance (NAICS-52)		580
Real estate & rental & leasing (NAICS-53)		1,319
Professional, scientific & technical services (NAICS-54)		53
Management of companies & enterprises (NAICS-55)		660
Admin, support, waste mgt, remediation services (NAICS-56)		150
Educational services (NAICS-61)		1,474
Health care and social assistance (NAICS-62)		184
Arts, entertainment & recreation (NAICS-71)		1,027
Accommodation & food services (NAICS-72)		1,098
Other services (except public administration) (NAICS-81)		18
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		310
Unclassified establishments (NAICS-99)		

Major HMS Ports	Bodega Bay, Sonoma Co.	
	1990	2,000
Population (numbers)	1,127	1,423
Gender (Percent total population)		
Male	51.9%	51.9%
Female	48.1%	48.1%
Race and Hispanic origin (Percent total population)		
White	94.0%	85.5%
Black		0.4%
Native American	0.1%	1.5%
Asian or Pacific Islander	1.9%	1.3%
Other Race	4.1%	9.1%
Hispanic Origin (any race)	6.6%	15.2%
Age Structure (Percent total population)		
Under 5 years	4.5%	3.6%
5-9 Years	3.5%	4.4%
10-14 Years	3.2%	3.2%
15-19 Years	4.7%	3.0%
20-24 Years	3.9%	4.7%
25-34 Years	10.2%	10.4%
35-44 Years	19.9%	11.3%
45-54 Years	15.4%	16.9%
55-59 Years	7.8%	9.8%
60-64 Years	9.1%	9.9%
65-74 Years	12.8%	14.5%
75-84 Years	4.7%	6.9%
85 Years and greater	0.4%	1.4%
Median Age (Years)	NA	50.9
18 Years and greater	86.9%	87.3%
Male	44.6%	45.0%
Female	42.2%	42.3%
21 Years and greater	83.0%	84.9%
62 Years and greater	23.2%	28.6%
65 Years and greater	17.8%	22.8%
Male	9.5%	12.5%
Female	8.3%	10.3%
Educational Attainment (Persons 25 years and over)		
Graduate or professional degree	16.6%	NA
Bachelor's degree	13.8%	NA
Associate's degree	11.3%	NA
Some college no degree	15.7%	NA
High school graduate	12.7%	NA
9th to 12th no diploma	2.0%	NA
Less than 9th grade	1.9%	NA
Economic Activity (Percent total population)		
Labor Force by Gender (Persons 16 years and over)	45.2%	NA
Males	24.8%	NA
Females	20.3%	NA

Source: U.S. Bureau of Census

2.4.3.10 HMS Community Profile: San Francisco Bay Area, CA

San Francisco and Alameda Counties

In 1999, finance and insurance, professional, scientific and technical services, and information were the most important sectors of the San Francisco County economy in terms of non-agricultural labor and proprietor income. The most important Alameda County sectors in this regard were construction, manufacturing, real estate, rental and leasing, and educational services. Natural resource based industries, including fisheries, contributed minimally, relative to the above sectors, to the San Francisco and Alameda County economies during 1999.

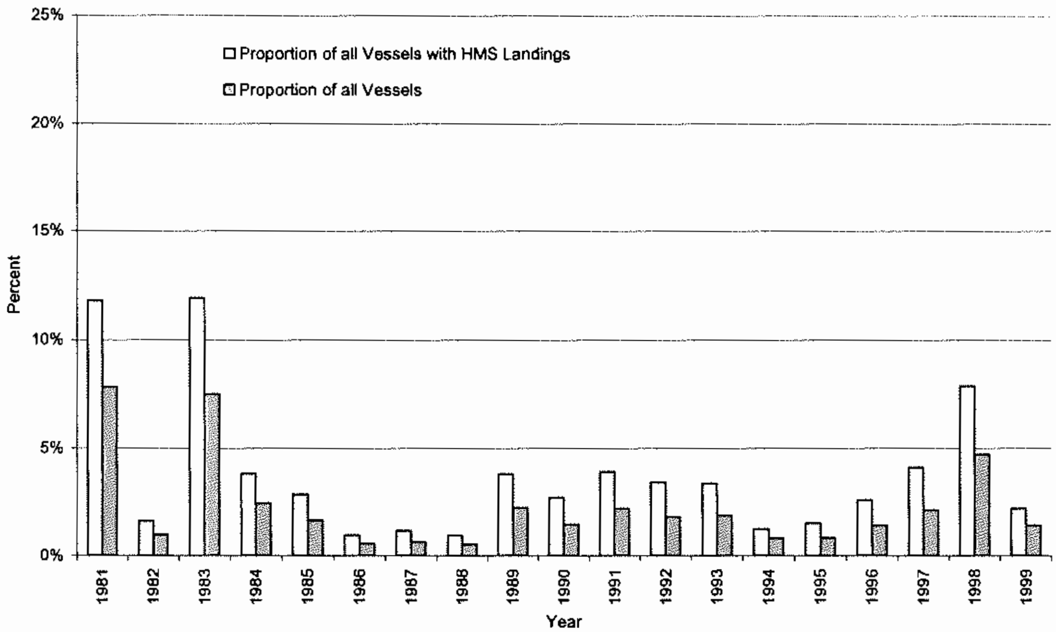
Number of vessels with HMS landings, for which San Francisco Bay Area, CA is their principal port, by their principal species, 1981-99.

Year	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	75				0	1	49
1982	9				0	0	30
1983	60				1	0	105
1984	18				1	0	40
1985	11				2	0	39
1986	3				1	0	27
1987	5				0	0	27
1988	2				2	0	15
1989	8				10	0	22
1990	4				5	0	17
1991	8				5	0	13
1992	7				3	0	11
1993	4				4	0	5
1994	3				0	0	11
1995	0				3	0	12
1996	2				4	0	10
1997	6				3	0	32
1998	8				9	0	29
1999	4				1	0	24

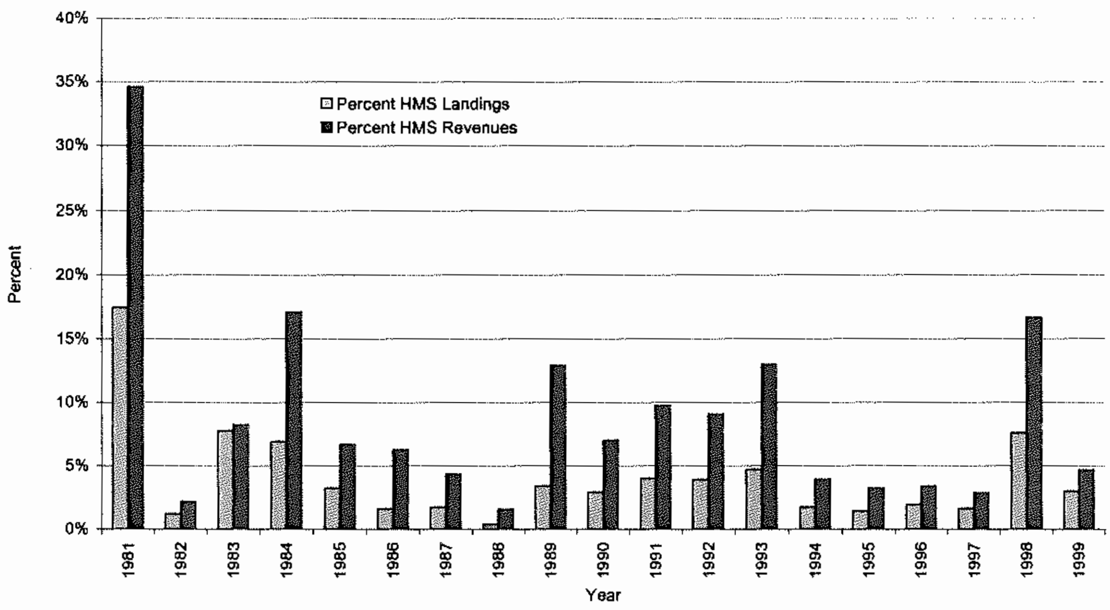
Number of vessels making HMS landings, and HMS landings (mt) and exvessel revenues (1999 $) by species group, San Francisco Bay Area, CA, 1981-99.

Landings (mt round weight)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	645	1993					1	5488
1982	557	179			1			9212
1983	512	834			14	32	2	6025
1984	499	403			35	239		6397
1985	457	285			24	107		7080
1986	418	51			5	118		5657
1987	429	142			2	38		5935
1988	426	15			2	24		6170
1989	474	222			9	193		6526
1990	333	189			8	138		5374
1991	333	229			31	163		4908
1992	294	182	13		6	140		4196
1993	239	167	2		9	84		2656
1994	243	28			5	27		1980
1995	199	14	1		8	48		2585
1996	233	46	6		5	81	1	3731
1997	220	75	13		24	74		4535
1998	216	44	7		8	184	23	1705
1999	228	63	1			38	4	1748
Exvessel Revenues (1999 $)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	645	$6,677,543		$71	$262	$2,287	$2,297	$7,830,992
1982	557	$435,144		$514	$2,276	$264	$314	$12,094,625
1983	512	$1,609,334	$14		$22,303	$161,471	$2,519	$10,452,802
1984	499	$699,240	$377		$63,160	$1,248,757	$739	$7,185,990
1985	457	$435,114	$31		$55,316	$557,777	$924	$8,908,566
1986	418	$93,561			$9,846	$806,168	$1,483	$7,589,571
1987	429	$319,486			$6,129	$327,504	$406	$8,904,186
1988	426	$46,843			$4,432	$195,590	$190	$9,995,720
1989	474	$484,355	$68		$21,430	$1,305,731	$203	$7,061,808
1990	333	$421,338	$993		$14,997	$791,790		$8,478,952
1991	333	$427,733	$170		$42,126	$1,196,473	$2,196	$7,375,683
1992	294	$495,512	$10,863		$10,772	$781,953	$758	$5,859,679
1993	239	$367,067	$9,084		$13,802	$397,576	$591	$2,962,618
1994	243	$56,422	$1,536	$197	$17,617	$160,806	$1,854	$3,539,841
1995	199	$23,752	$7,888		$14,503	$314,416	$183	$5,281,735
1996	233	$90,067	$20,092		$9,958	$449,636	$8,036	$7,099,089
1997	220	$125,823	$63,744		$36,466	$355,396	$146	$7,919,742
1998	216	$76,091	$40,548	$383	$12,290	$735,660	$117,748	$3,473,186
1999	228	$112,512	$7,068		$1,501	$149,248	$23,211	$3,798,119

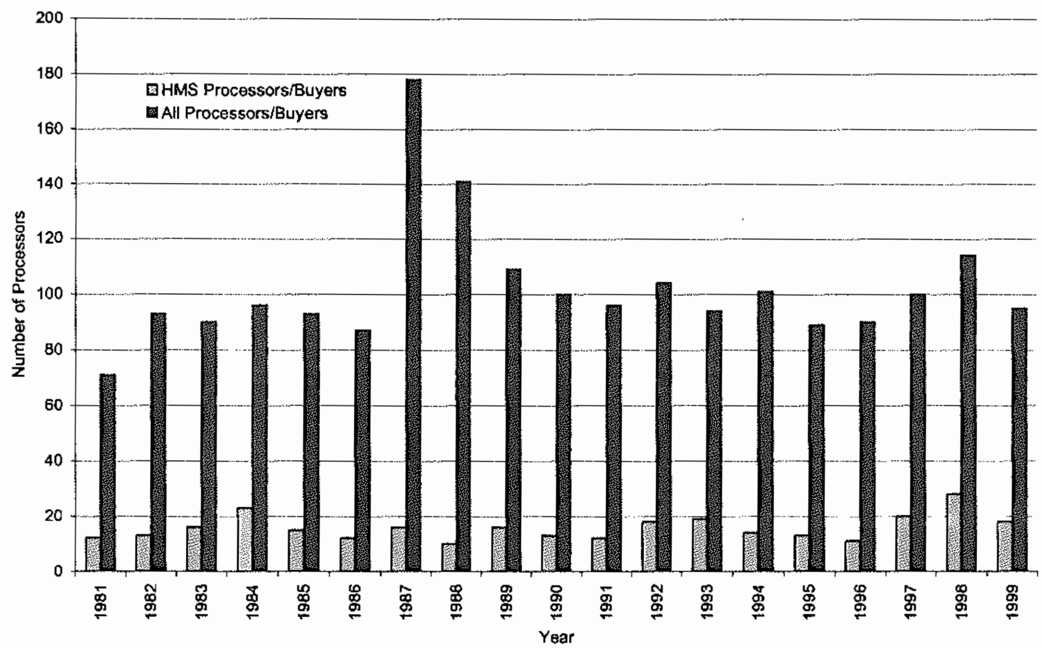
Proportion of vessels whose principal species is a HMS & whose principal port is San Francisco Area, CA of all vessels making HMS landings, & the proportion of these vessels of the total no. of vessels making landings in the San Francisco Area, 1981-99.



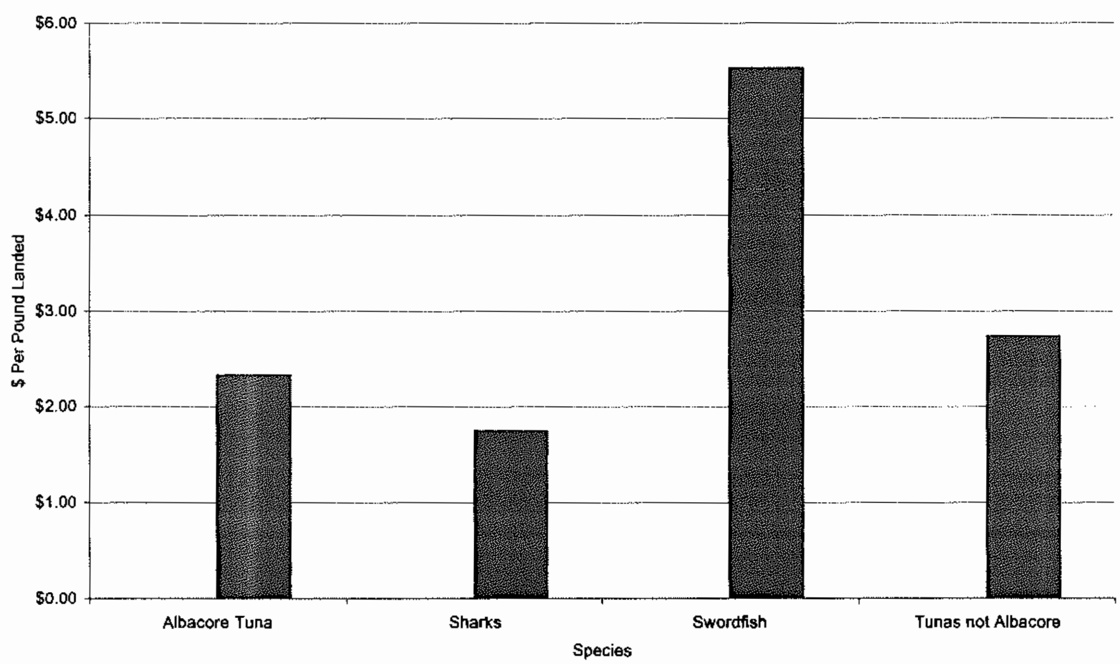
Proportion of HMS landings and exvessel revenues of total landings and exvessel revenues in San Francisco Bay Area, CA, 1981-99.



Number of processors/buyers in the San Francisco Bay Area, 1981-99.



Total income multipliers for landings of HMS of species in the San Francisco Bay Area.



San Francisco Bay Area California HMS Communities Demographic Profiles

	County			
	San Francisco		Alameda	
	1990	2000	1990	2000
Population (numbers)	723,959	776,733	1,279,182	1443741
Gender (Percent total population)				
Male	50.1%	50.8%	49.3%	49.1%
Female	49.9%	49.2%	50.7%	50.9%
Race and Hispanic origin (Percent total population)				
White	53.6%	49.7%	59.6%	48.8%
Black	10.9%	7.8%	17.9%	14.9%
Native American	0.5%	0.4%	0.7%	0.6%
Asian or Pacific Islander	29.1%	30.2%	15.1%	21.1%
Other Race	5.9%	6.5%	6.8%	8.9%
Hispanic Origin (any race)	13.9%	14.1%	14.2%	19.0%
	0.0%			
Age Structure (Percent total population)	0.0%			
Under 5 years	4.9%	4.1%	7.5%	6.8%
5-9 Years	4.4%	4.1%	6.8%	7.2%
10-14 Years	4.2%	4.0%	6.0%	6.7%
15-19 Years	4.9%	4.3%	6.3%	6.4%
20-24 Years	8.2%	7.2%	8.4%	7.0%
25-34 Years	21.9%	23.2%	19.6%	16.7%
35-44 Years	17.9%	17.2%	17.2%	17.2%
45-54 Years	10.3%	13.9%	10.3%	13.9%
55-59 Years	4.3%	4.5%	3.8%	4.5%
60-64 Years	4.5%	3.9%	3.6%	3.3%
65-74 Years	7.9%	6.9%	6.2%	5.2%
75-84 Years	5.0%	4.9%	3.3%	3.7%
85 Years and greater	1.7%	1.8%	1.1%	1.3%
Median Age (years)	NA	36.5	NA	34.5
18 Years and greater	83.9%	85.5%	76.3%	75.4%
Male	41.8%	43.4%	37.2%	36.6%
Female	42.1%	42.1%	39.1%	38.9%
21 Years and greater	80.3%	82.5%	71.7%	71.4%
62 Years and greater	17.2%	15.9%	12.8%	12.1%
65 Years and greater	14.6%	13.7%	10.6%	10.2%
Male	5.8%	5.7%	4.2%	4.2%
Female	8.7%	7.9%	6.4%	6.1%
Educational Attainment (Persons 25 years and over)				
Graduate or professional degree	9.6%	NA	7.1%	NA
Bachelor's degree	16.3%	NA	11.7%	NA
Associate's degree	4.6%	NA	5.1%	NA
Some college no degree	13.7%	NA	14.5%	NA
High school graduate	13.5%	NA	14.9%	NA
9th to 12th no diploma	7.9%	NA	7.3%	NA
Less than 9th grade	8.4%	NA	4.8%	NA
Economic Activity				
Labor Force by Gender (Persons 16 years and over)	57.6%	NA	53.9%	NA
Males	31.5%	NA	29.2%	NA
Females	26.1%	NA	24.7%	NA

San Francisco Bay Area California HMS Communities Demographic Profiles

	County			
	San Francisco		Alameda	
	1993	1999	1993	1999
Economic Activity (cont'd)				
Employment (numbers)				
Agricultural Services, Forestry, and Fishing (SIC-07)	916		3,186	
Fishing, hunting and trapping (SIC-0900)			0-19	
Mining (SIC-10)	1,344		373	
Construction (SIC-15)	13,743		25,165	
Manufacturing (SIC-20)	36,921		81,338	
Transportation and Public Utilities (SIC-40)	46,846		39,157	
Wholesale Trade (SIC-50)	23,930		50,496	
Retail Trade (SIC-52)	75,330		95,843	
Finance, Insurance, and Real Estate (SIC-60)	73,720		30,666	
Services (SIC-70)	214,889		175,302	
Unclassified Establishments (SIC-99)	195		331	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		0-19		100-249
Fishing (NAICS-11411)		0-19		0-19
Finfish fishing (NAICS-114111)				0-19
shellfish fishing (NAICS-114112)				
Mining (NAICS-21)		20-99		250-499
Utilities (NAICS-22)		5000-9999		1,654
Construction (NAICS-23)		21,119		39,026
Manufacturing (NAICS-31)		21,725		89,281
Wholesale trade (NAICS-42)		19,447		57,789
Retail trade (NAICS-44)		40,218		61,345
Transportation & warehousing (NAICS-48)		17,965		30,615
Information (NAICS-51)		27,359		22,620
Finance & insurance (NAICS-52)		61,927		23,755
Real estate & rental & leasing (NAICS-53)		13,549		11,562
Professional, scientific & technical services (NAICS-54)		72,718		40,109
Management of companies & enterprises (NAICS-55)		19,146		19,777
Admin, support, waste mgt, remediation services (NAICS-56)		42,227		55,682
Educational services (NAICS-61)		12,774		11,594
Health care and social assistance (NAICS-62)		51,480		66,885
Arts, entertainment & recreation (NAICS-71)		11,801		7,356
Accommodation & food services (NAICS-72)		64,008		38,404
Other services (except public administration) (NAICS-81)		22,476		27,119
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		6,567		7,247
Unclassified establishments (NAICS-99)		500-999		786
Labor and Proprietor Income ($1,000)				
Agricultural Services, Forestry, and Fishing (SIC-07)	21,601		71,684	
Fishing, hunting and trapping (SIC-0900)			0	
Mining (SIC-10)	114,003		17,365	
Construction (SIC-15)	468,535		874,502	
Manufacturing (SIC-20)	1,267,611		3,026,292	
Transportation and Public Utilities (SIC-40)	1,757,112		1,340,249	
Wholesale Trade (SIC-50)	969,217		1,701,173	
Retail Trade (SIC-52)	1,319,076		1,647,771	
Finance, Insurance, and Real Estate (SIC-60)	3,845,805		900,022	
Services (SIC-70)	7,042,729		5,004,535	
Unclassified Establishments (SIC-99)	5,504		4,970	
Forestry, fishing, hunting, and agriculture support (NAICS-11)				
Fishing (NAICS-11411)				
Finfish fishing (NAICS-114111)				
shellfish fishing (NAICS-114112)				
Mining (NAICS-21)				
Utilities (NAICS-22)				97,150
Construction (NAICS-23)		927,643		1,786,514
Manufacturing (NAICS-31)		607,984		4,404,207
Wholesale trade (NAICS-42)		1,028,598		2,667,487
Retail trade (NAICS-44)		1,035,218		1,508,196
Transportation & warehousing (NAICS-48)		592,376		1,077,418
Information (NAICS-51)		2,091,512		1,429,370
Finance & insurance (NAICS-52)		6,302,254		1,119,275
Real estate & rental & leasing (NAICS-53)		596,524		336,139
Professional, scientific & technical services (NAICS-54)		5,227,531		2,284,192
Management of companies & enterprises (NAICS-55)		1,347,715		1,280,658
Admin, support, waste mgt, remediation services (NAICS-56)		1,278,383		1,866,658

San Francisco Bay Area California HMS Communities Demographic Profiles

	County			
	San Francisco		Alameda	
	1993	1999	1993	1999
Economic Activity (cont'd)				
Labor and Proprietor Income ($1,000) (cont'd)				
Educational services (NAICS-61)		351,481		255,741
Health care and social assistance (NAICS-62)		1,721,254		2,309,581
Arts, entertainment & recreation (NAICS-71)		411,052		284,501
Accommodation & food services (NAICS-72)		1,223,145		504,936
Other services (except public administration) (NAICS-81)		579,655		660,050
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		399,099		432,127
Unclassified establishments (NAICS-99)				28,177
Number of Establishments				
Agricultural Services, Forestry, and Fishing (SIC-07)	137		398	
Fishing, hunting and trapping (SIC-0900)			1	
Mining (SIC-10)	28		14	
Construction (SIC-15)	1,333		2,631	
Manufacturing (SIC-20)	1,456		2,565	
Transportation and Public Utilities (SIC-40)	1,067		1,312	
Wholesale Trade (SIC-50)	2,038		3,247	
Retail Trade (SIC-52)	6,665		7,066	
Finance, Insurance, and Real Estate (SIC-60)	4,554		3,118	
Services (SIC-70)	12,512		12,925	
Unclassified Establishments (SIC-99)	223		298	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		9		31
Fishing (NAICS-11411)		4		2
Finfish fishing (NAICS-114111)				2
shellfish fishing (NAICS-114112)				
Mining (NAICS-21)		6		19
Utilities (NAICS-22)		16		16
Construction (NAICS-23)		1,558		2,790
Manufacturing (NAICS-31)		1,130		2,478
Wholesale trade (NAICS-42)		1,821		3,173
Retail trade (NAICS-44)		3,863		4,369
Transportation & warehousing (NAICS-48)		448		857
Information (NAICS-51)		1,080		797
Finance & insurance (NAICS-52)		2,303		1,586
Real estate & rental & leasing (NAICS-53)		1,571		1,693
Professional, scientific & technical services (NAICS-54)		5,510		4,404
Management of companies & enterprises (NAICS-55)		283		278
Admin, support, waste mgt, remediation services (NAICS-56)		1,557		1,858
Educational services (NAICS-61)		436		51
Health care and social assistance (NAICS-62)		2,781		3,682
Arts, entertainment & recreation (NAICS-71)		482		390
Accommodation & food services (NAICS-72)		3,239		2,743
Other services (except public administration) (NAICS-81)		2,557		3,284
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		59		130
Unclassified establishments (NAICS-99)		493		628

San Francisco Bay Area California HMS Communities Demographic Profiles

Major HMS Ports	San Fran., San Fran Co.		Oakland, Alameda Co.	
	1990	2000	1990	2000
Population (numbers)	**Same as County**	**Same as County**	372,242	399,484
Gender (Percent total population)				
Male			48.0%	48.3%
Female			52.0%	51.7%
Race and Hispanic origin (Percent total population)				
White			32.5%	31.3%
Black			43.9%	35.7%
Native American			0.6%	0.7%
Asian or Pacific Islander			14.8%	15.7%
Other Race			8.3%	11.7%
Hispanic Origin (any race)			13.9%	21.9%
Age Structure (Percent total population)				
Under 5 years			8.1%	7.1%
5-9 Years			7.1%	7.5%
10-14 Years			6.2%	6.6%
15-19 Years			6.2%	6.2%
20-24 Years			7.9%	7.2%
25-34 Years			19.0%	18.1%
35-44 Years			17.2%	15.8%
45-54 Years			9.3%	13.5%
55-59 Years			3.4%	4.3%
60-64 Years			3.6%	3.1%
65-74 Years			6.6%	5.2%
75-84 Years			4.0%	3.8%
85 Years and greater			1.4%	1.5%
Median Age (Years)			NA	33.3
18 Years and greater			75.1%	75.0%
Male			35.4%	35.6%
Female			39.7%	39.4%
21 Years and greater			70.9%	71.2%
62 Years and greater			14.3%	12.2%
65 Years and greater			12.0%	10.5%
Male			4.8%	4.2%
Female			7.3%	6.2%
Educational Attainment (Persons 25 years and over)				
Graduate or professional degree			7.2%	NA
Bachelor's degree			10.5%	NA
Associate's degree			4.3%	NA
Some college no degree			13.1%	NA
High school graduate			13.3%	NA
9th to 12th no diploma			8.9%	NA
Less than 9th grade			7.8%	NA
Economic Activity (Percent total population)				
Labor Force by Gender (Persons 16 years and over)			48.7%	NA
Males			25.3%	NA
Females			23.4%	NA

Source: U.S. Bureau of Census

2.4.3.11 HMS Community Profile: Moss Landing, Monterey County, CA

Monterey County

Traditionally, the economy of Monterey County has been comprised of three bases: Agriculture - primarily in the Salinas Valley; Tourism - primarily on the coastal areas; and Military - comprised of the Naval Postgraduate School, and the Defense Language Institute at the Presidio of Monterey.

Agriculture is the mainstay of the Monterey County economy. In 1997 agriculture accounted for 30% of the County's labor and proprietor income. Health care and social services, retail and wholesale trade, tourism and manufacturing were important contributors of non-agricultural income to the County's economy in 1999.

Moss Landing http://www.monterey-bay.net/ml/

Moss Landing was named after Captain Charles Moss who established shipping facilities and a pier to develop commercial water traffic from the area in the mid 1800s. During that period there was a whale processing plant, oyster farming, the Vierra's ferry across the slough mouth, diking for salt evaporation ponds, and commercial fishing. The Southern Pacific Railroad slowed the need for ocean shipping in the late 1800s. In the mid-1940s the Harbor was constructed and occupied by commercial fishing vessels. By 1950s, industry had moved into the area.

Moss Landing's harbor is one of the busiest harbors on the central coast. Dominated in numbers by commercial fishing vessels of various types, the catch includes salmon, albacore, rockfish, squid, flatfish, sablefish, shellfish, and a number of other species. There are two marine research and education institutions located here, Moss Landing Marine Laboratories (MLML) and Monterey Bay Aquarium Research Institute (MBARI), and both have large research ships in the harbor. MLML is a college field research station which studies a wide range of marine topics; MBARI is a deep-sea marine research facility.

Agriculture is one of the largest businesses outside of downtown Moss Landing. There are a number of crops including cauliflower, spinach, broccoli, Brussel sprouts, strawberries, artichokes and squash.

Moss Landing is home to two major industrial complexes. Mighty Moss is the Duke Energy Power Services' electricity generating steam turbine plant. The plant's two large stacks serve as a landmark for the town. National Refractors & Minerals produces fire bricks, magnesia chemicals and other refractory specialties.

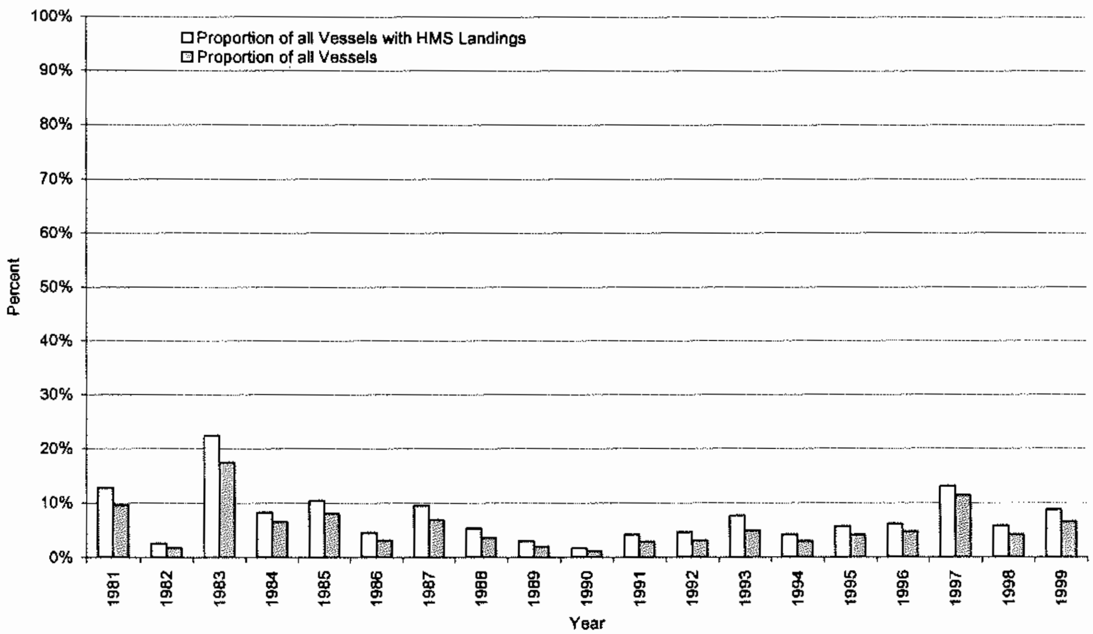
Number of vessels with HMS landings, for which Moss Landing, CA is their principal port, by their principal species, 1981-99.

Year	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	58	0		0	0		36
1982	9	0		0	0		31
1983	110	0		0	4		55
1984	33	0		0	0		25
1985	33	0		0	0		37
1986	11	0		0	1		31
1987	20	0		1	4		28
1988	6	0		0	6		26
1989	4	0		0	2		20
1990	3	0		1	0		16
1991	2	0		0	8		17
1992	3	0		3	4		17
1993	11	0		2	7		17
1994	6	0		0	2		12
1995	5	0		0	10		21
1996	11	0		0	8		13
1997	41	0		0	6		36
1998	6	0		0	6		17
1999	15	2		0	3		16

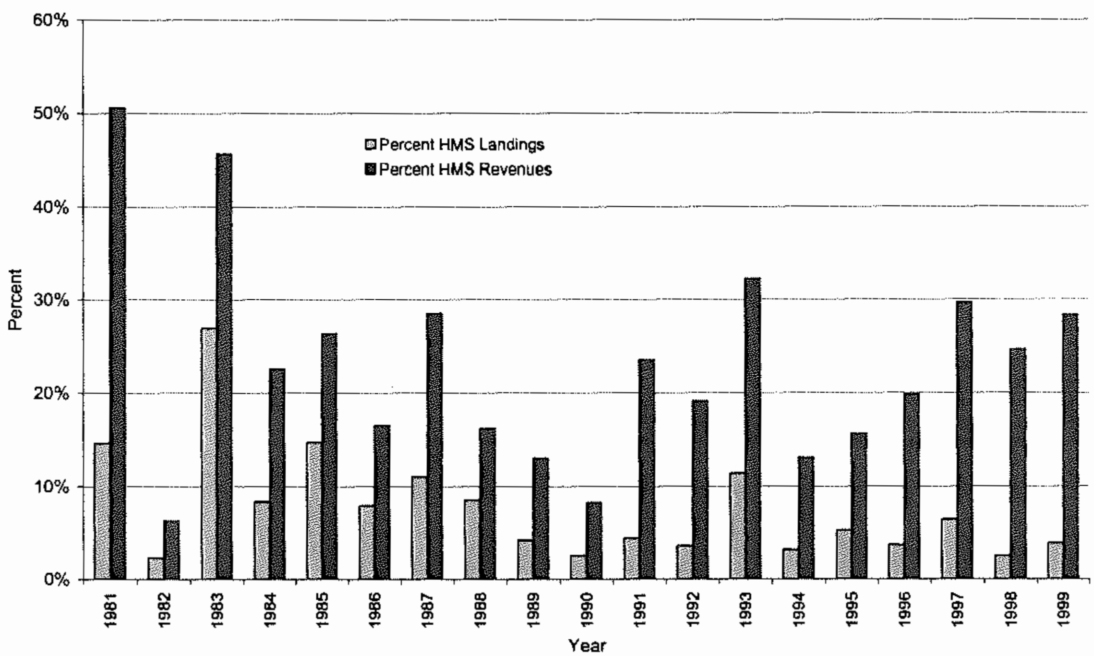
Number of vessels making HMS landings, and HMS landings (mt) and exvessel revenues (1999 $) by species group, Moss Landing, CA, 1981-99.

Landings (mt round weight)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	456	1439					30	6622
1982	350	176			8	2		6201
1983	510	1684			12	65	5	3410
1984	399	544			7	38		4731
1985	317	653			29	39		3313
1986	268	459			12	37		4436
1987	264	542			7	63		2927
1988	228	254			4	69	1	2462
1989	204	95			3	52		2333
1990	235	67			24	27	2	3219
1991	241	23			29	114	2	2873
1992	219	93	3		7	85	1	4610
1993	262	266	11		7	124	2	2037
1994	191	149	2		6	52		3853
1995	265	185	7		22	115		4003
1996	311	185	12		16	212		6154
1997	360	1050	19		47	187	4	9402
1998	208	91	12		33	164	7	3882
1999	229	460	106	3	11	127	7	4085
Exvessel Revenues (1999 $)								
Year	**Number of Vessels**	**Albacore**	**Bluefin Tuna**	**Dorado**	**Sharks**	**Swordfish**	**Tropical Tuna**	**Non-HMS**
1981	456	$4,825,677		$34	$406		$69,564	$3,455,853
1982	350	$400,998			$12,724	$15,960	$310	$4,982,761
1983	510	$3,244,401		$14	$19,154	$341,949	$6,610	$3,126,947
1984	399	$914,544			$13,066	$184,510	$53	$2,805,535
1985	317	$995,244	$138		$55,135	$209,394	$1,251	$2,707,655
1986	268	$716,607			$26,402	$242,941	$1,313	$3,530,147
1987	264	$1,199,150	$75		$17,515	$535,891	$472	$2,841,970
1988	228	$632,414			$8,238	$452,251	$5,109	$4,288,133
1989	204	$182,000			$7,377	$368,932	$815	$2,557,226
1990	235	$170,547	$730		$47,698	$153,822	$1,464	$3,029,031
1991	241	$38,560	$1,950		$43,976	$796,815	$7,600	$2,390,348
1992	219	$246,010	$9,809		$8,922	$449,036	$3,645	$2,721,169
1993	262	$722,672	$40,771		$12,066	$646,551	$7,123	$2,383,535
1994	191	$303,617	$14,958		$12,072	$334,427	$2,412	$3,248,714
1995	265	$347,331	$36,468		$43,389	$693,167	$870	$4,890,281
1996	311	$342,529	$45,474		$27,752	$1,197,746		$5,121,496
1997	360	$1,851,786	$88,867		$77,784	$846,803	$24,464	$5,209,774
1998	208	$123,804	$59,311	$2,324	$52,673	$720,743	$36,924	$2,182,383
1999	229	$753,923	$430,020	$5,620	$22,136	$465,779	$46,132	$2,970,166

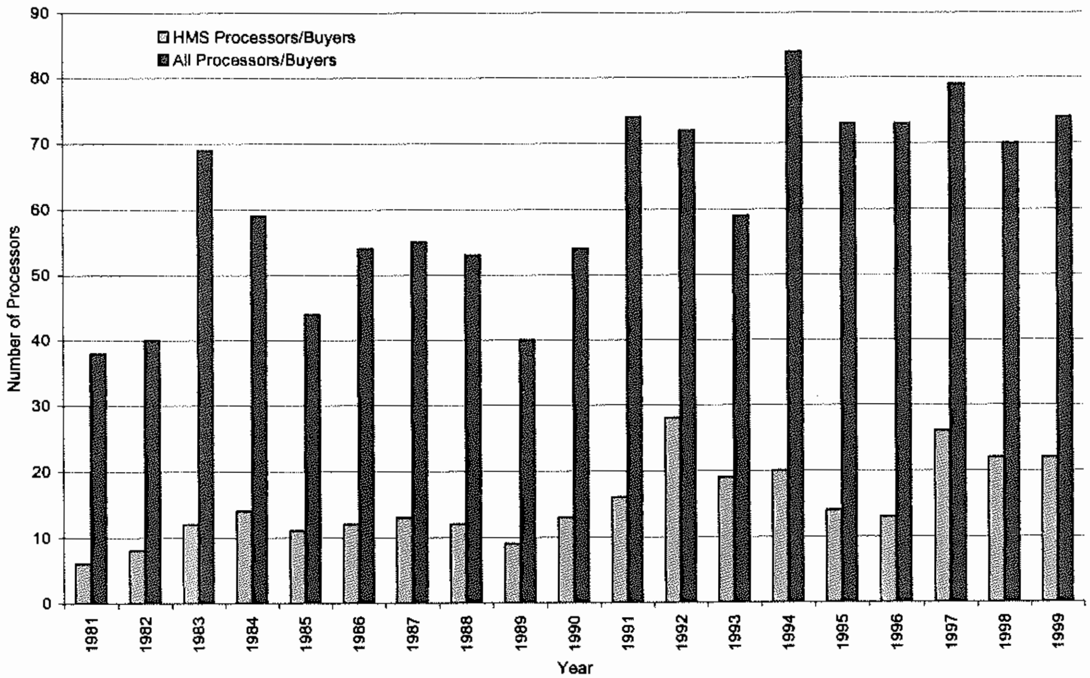
Proportion of vessels whose principal species is a HMS and whose principal port is Moss Landing, CA of all vessels making HMS landings, and the proportion of these vessels of the total number of vessels making landings in Moss Landing,1981-99.



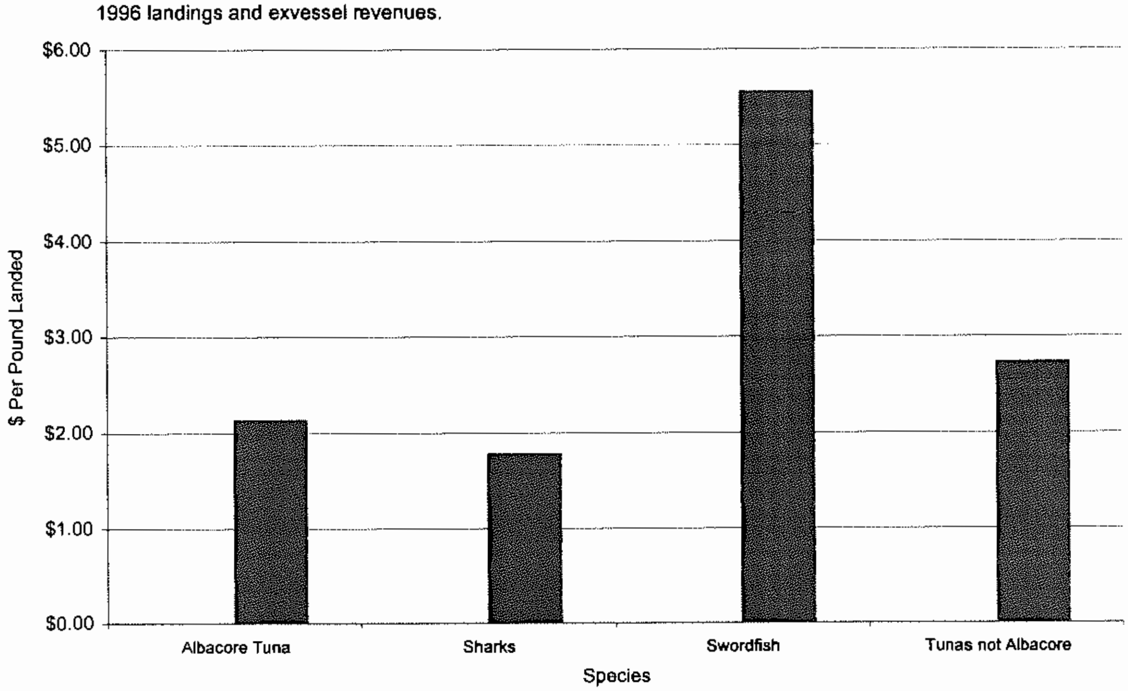
Proportion of HMS landings and exvessel revenues of total landings and esvessel revenues in Moss Landing, CA, 1981_99



Number of processors/buyers in Moss Landing, CA, 1981-99.



Total income multipliers for landings of HMS of species in the port of Moss Landing, CA, based on 1996 landings and exvessel revenues.



2.4.3.12 HMS Community Profile: Monterey, Monterey County, CA

Monterey http://www.mpcc.com/index.cb.cfm

The city of Monterey covers 8.62 square miles and has a population of approximately 33,000; population increases to nearly 70,000 during tourist seasons. Originally inhabited by Native Americans, the Monterey Peninsula was sighted by the first European in 1542. Juan Rodriguez Cabrillo, a Portuguese explorer seeking riches in the new world, came upon the windswept Peninsula and claimed it for the Crown. High seas, however, prevented him from landing, and it was not until sixty years later that a Spaniard, Sebastian Vizacaino, set foot on the Peninsula. He named the area after the Count of Monte Rey under whose order he was sailing.

Colonization began in 1770 when Spanish expedition commander Caspar de Portola and Franciscan father Junipero Serra proclaimed the area the military and ecclesiastical capital of Alta (upper) California. Governor Portola constructed the first of four California presidios, and Father Serra established the Mission San Carlos de Borromeo.

In 1822 when Mexico gained its independence from Spain, Monterey became the Mexican capital, land was redistributed, and huge cattle ranches appeared. Mexican rule ended June 7, 1846, when Commodore John Drake Sloat raised the American flag over Monterey's Custom House. Three years later, 48 California delegates convened at Colton Hall to draft a state constitution. California became the 31st state of the Union in 1850.

Monterey served as California's first capital and hosted California's first constitutional convention in the City's historic Colton Hall, where on October 13, 1849, our state constitution was signed. In the 1930s and 1940s, Monterey became the center of a thriving fishing industry at Cannery Row. Today a smaller commercial fishing fleet and industry continues to operate from the City's harbor marina. Due to its strategic location, Monterey has historically been a key military outpost. While military needs have changed, the presence of the Naval Postgraduate School and Defense Language Institute in Monterey continues this legacy of military tradition.

With the significant downsizing of Fort Ord during 1993, and the relocation of its 13,000 soldiers and their dependents, the community looked to replace the Military "industry" with an Educational industry, as a compatible third element of our economy. These efforts have far-reaching implications and impacts, but are strongly supported by a broad cross-section of the community.

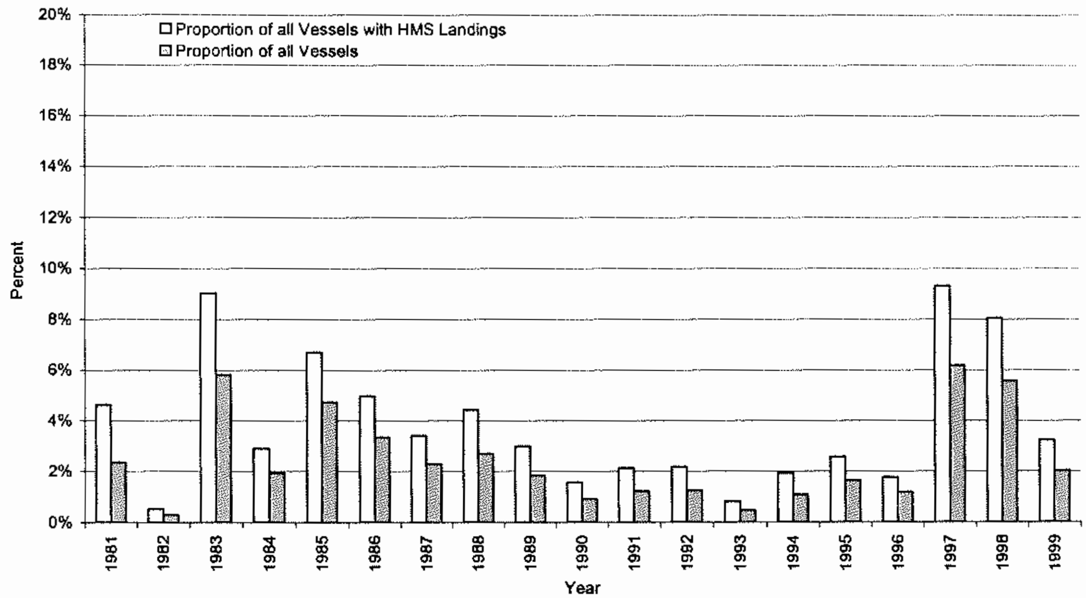
Number of vessels with HMS landings, for which Monterey, CA is their principal port, by their principal species, 1981-99.

Year	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	9				0		7
1982	1				0		9
1983	16				8		49
1984	5				2		39
1985	12				4		58
1986	5				6		24
1987	1				8		23
1988	0				8		15
1989	0				6		9
1990	0				3		4
1991	0				4		6
1992	0				3		5
1993	0				1		6
1994	0				2		3
1995	0				3		8
1996	0				2		10
1997	10				1		24
1998	6				1		14
1999	2				0		12

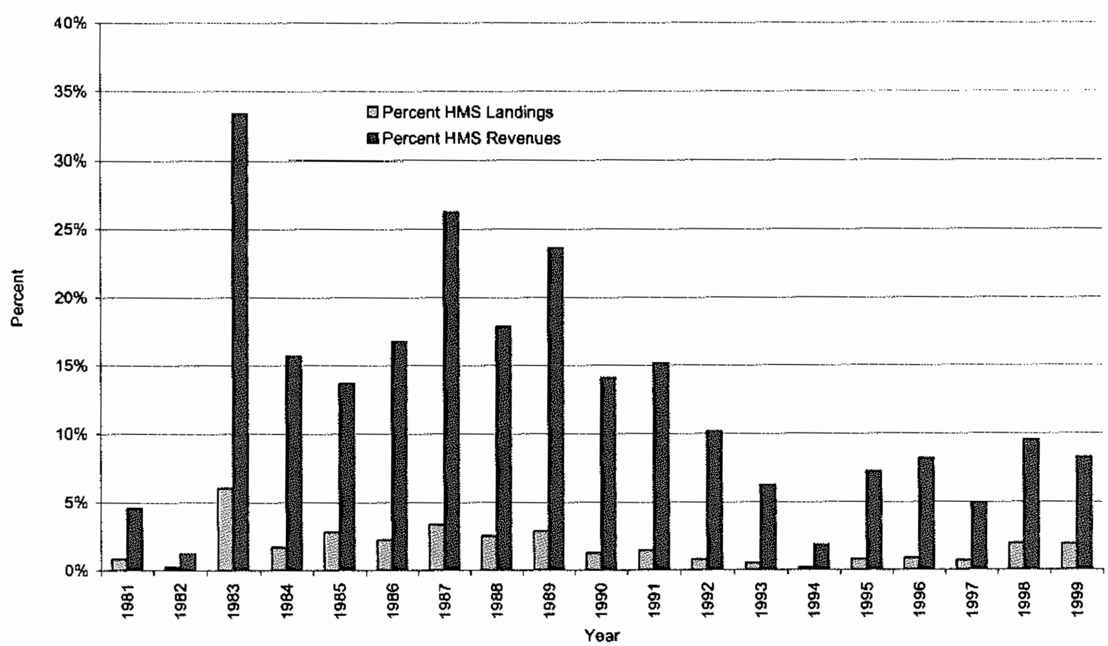
Number of vessels making HMS landings, and HMS landings (mt) and exvessel revenues (1999 $) by species group, Monterey, CA, 1981-99.

Landings (mt round weight)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	195	129						12285
1982	192	19			9	4		11541
1983	266	160			83	253	2	6944
1984	242	44			61	129		12679
1985	239	78			58	99		6889
1986	222	32			27	122		6277
1987	265	44			36	173		5801
1988	181	22			23	119	2	4961
1989	201	4			48	174		6126
1990	191	5	1		40	84		7623
1991	189	4			42	79	1	5606
1992	138				10	51	2	4533
1993	124	1			2	34	1	5166
1994	104	2			3	17		8493
1995	117	4			9	53		5579
1996	114	21			16	59		6071
1997	118	53	3		8	30		7014
1998	87	19	1		4	36		2285
1999	62	21			4	25		1438
Exvessel Revenues (1999 $)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	195	$433,036			$5			$7,080,804
1982	192	$54,173			$14,193	$27,864	$1,110	$6,023,327
1983	266	$307,162	$44		$136,813	$1,330,022	$6,800	$2,727,538
1984	242	$72,808	$600		$100,030	$687,088	$915	$3,728,109
1985	239	$119,064	$37		$117,519	$569,704	$1,107	$4,175,562
1986	222	$50,865	$257		$65,991	$845,486	$1,323	$3,590,583
1987	265	$96,013	$88		$91,129	$1,397,035	$3,755	$3,283,246
1988	181	$54,866	$405		$56,390	$898,704	$8,944	$3,360,268
1989	201	$9,457	$497		$121,241	$1,337,349	$430	$3,183,376
1990	191	$11,254	$4,695		$80,589	$561,207	$1,957	$2,892,205
1991	189	$5,991	$753	$7	$70,274	$553,533	$3,976	$2,289,976
1992	138	$1,249	$1,131		$19,923	$278,690	$6,035	$1,742,355
1993	124	$2,066	$1,852		$3,357	$205,350	$4,835	$2,426,845
1994	104	$5,151	$3,898		$5,569	$111,771		$3,790,707
1995	117	$7,629	$697		$15,803	$329,920	$1,633	$3,518,794
1996	114	$33,648	$1,690		$29,554	$326,519	$529	$2,503,524
1997	118	$76,988	$10,912		$15,398	$153,739	$708	$2,863,254
1998	87	$22,701	$5,433		$7,045	$161,887	$255	$1,361,724
1999	62	$28,107	$2,777		$6,730	$112,983	$258	$1,095,755

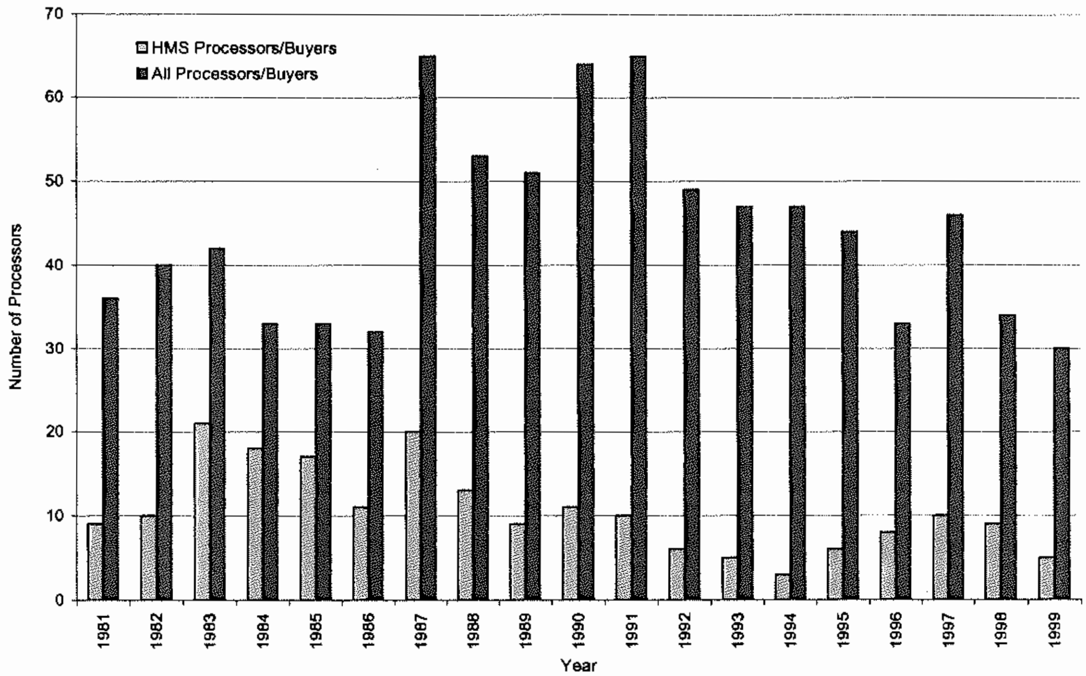
Proportion of vessels whose principal species is a HMS and whose principal port is Monterey, CA of all vessels making HMS landings, and proportion of these vessels of the total number of vessels making landings in Monterey,1981-99.



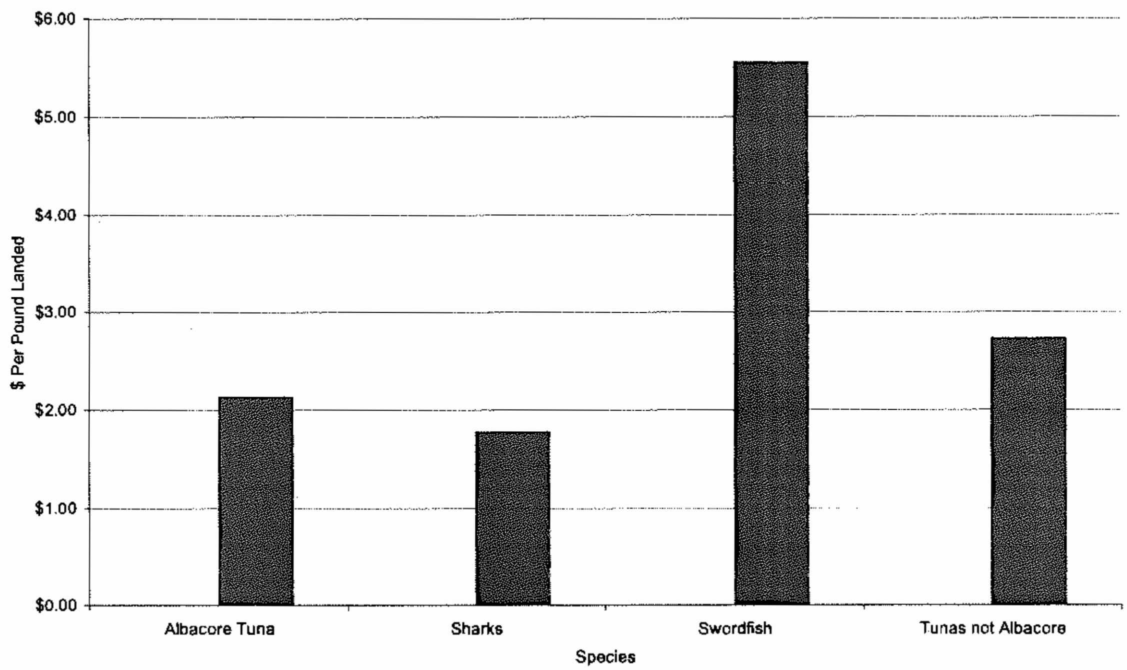
Proportion of HMS landings and exvessel revenues of total landings and exvessel revenues in Monterey, CA, 1981-99.



Number of processors/buyers in Monterey, CA, 1981-99.



Total income multipliers for landings of HMS of species in the port of Monterey, CA, based on 1996 landings and exvessel revenues.



Monterey County California HMS Communities Demographic Profiles

	County	
	Montery	
	1990	2000
Population (numbers)	355,660	401,762
Gender (Percent total population)		
Male	51.9%	51.8%
Female	48.1%	48.2%
Race and Hispanic origin (Percent total population)		
White	63.8%	55.9%
Black	6.4%	3.7%
Native American	0.8%	1.0%
Asian or Pacific Islander	7.8%	6.5%
Other Race	21.1%	27.8%
Hispanic Origin (any race)	33.6%	46.8%
Age Structure (Percent total population)		
Under 5 years	8.8%	7.8%
5-9 Years	8.0%	8.3%
10-14 Years	6.9%	7.8%
15-19 Years	7.4%	7.7%
20-24 Years	9.6%	7.7%
25-34 Years	19.5%	15.9%
35-44 Years	14.7%	15.4%
45-54 Years	8.4%	12.3%
55-59 Years	3.5%	4.0%
60-64 Years	3.5%	3.1%
65-74 Years	5.8%	5.3%
75-84 Years	3.0%	3.5%
85 Years and greater	0.9%	1.2%
Median Age (years)	NA	31.7
18 Years and greater	72.5%	71.6%
Male	37.8%	37.1%
Female	34.7%	34.5%
21 Years and greater	67.0%	66.9%
62 Years and greater	11.8%	11.8%
65 Years and greater	9.8%	10.0%
Male	4.1%	4.3%
Female	5.7%	5.8%
Educational Attainment (Persons 25 years and over)		
Graduate or professional degree	4.5%	NA
Bachelor's degree	8.3%	NA
Associate's degree	4.4%	NA
Some college no degree	13.6%	NA
High school graduate	12.6%	NA
9th to 12th no diploma	6.9%	NA
Less than 9th grade	9.3%	NA
Economic Activity		
Labor Force by Gender (Persons 16 years and over)	51.3%	NA
Males	30.1%	NA
Females	21.2%	NA

Monterey County California HMS Communities Demographic Profiles

	County	
	Montery	
	1993	1999
Economic Activity (cont'd)		
Employment (numbers)		
Agricultural Services, Forestry, and Fishing (SIC-07)	1,787	
Fishing, hunting and trapping (SIC-0900)	0-19	
Mining (SIC-10)	151	
Construction (SIC-15)	3,754	
Manufacturing (SIC-20)	7,738	
Transportation and Public Utilities (SIC-40)	5,247	
Wholesale Trade (SIC-50)	6,315	
Retail Trade (SIC-52)	24,260	
Finance, Insurance, and Real Estate (SIC-60)	7,547	
Services (SIC-70)	32,395	
Unclassified Establishments (SIC-99)	55	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		3,640
Fishing (NAICS-11411)		20-99
Finfish fishing (NAICS-114111)		20-99
shellfish fishing (NAICS-114112)		0-19
Mining (NAICS-21)		108
Utilities (NAICS-22)		715
Construction (NAICS-23)		6,225
Manufacturing (NAICS-31)		6,755
Wholesale trade (NAICS-42)		6,720
Retail trade (NAICS-44)		16,970
Transportation & warehousing (NAICS-48)		2,323
Information (NAICS-51)		2,944
Finance & insurance (NAICS-52)		4,794
Real estate & rental & leasing (NAICS-53)		1,929
Professional, scientific & technical services (NAICS-54)		3,714
Management of companies & enterprises (NAICS-55)		625
Admin, support, waste mgt, remediation services (NAICS-56)		6,532
Educational services (NAICS-61)		2,390
Health care and social assistance (NAICS-62)		12,099
Arts, entertainment & recreation (NAICS-71)		2,093
Accommodation & food services (NAICS-72)		17,885
Other services (except public administration) (NAICS-81)		5,122
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		770
Unclassified establishments (NAICS-99)		167
Labor and Proprietor Income ($1,000)		
Agricultural Services, Forestry, and Fishing (SIC-07)	44,125	
Fishing, hunting and trapping (SIC-0900)	0	
Mining (SIC-10)	5,122	
Construction (SIC-15)	102,335	
Manufacturing (SIC-20)	235,774	
Transportation and Public Utilities (SIC-40)	153,476	
Wholesale Trade (SIC-50)	204,892	
Retail Trade (SIC-52)	348,612	
Finance, Insurance, And Real Estate (SIC-60)	182,023	
Services (SIC-70)	665,237	
Unclassified Establishments (SIC-99)	667	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		105,100
Fishing (NAICS-11411)		0
Finfish fishing (NAICS-114111)		0
shellfish fishing (NAICS-114112)		0

Monterey County California HMS Communities Demographic Profiles

	County	
	Montery	
	1993	1999
Labor and Proprietor Income ($1,000) (cont'd)		
Mining (NAICS-21)		5,258
Utilities (NAICS-22)		42,803
Construction (NAICS-23)		207,398
Manufacturing (NAICS-31)		227,390
Wholesale trade (NAICS-42)		271,854
Retail trade (NAICS-44)		391,844
Transportation & warehousing (NAICS-48)		66,417
Information (NAICS-51)		116,146
Finance & insurance (NAICS-52)		216,254
Real estate & rental & leasing (NAICS-53)		48,389
Professional, scientific & technical services (NAICS-54)		156,383
Management of companies & enterprises (NAICS-55)		38,640
Admin, support, waste mgt, remediation services (NAICS-56)		136,091
Educational services (NAICS-61)		52,213
Health care and social assistance (NAICS-62)		431,427
Arts, entertainment & recreation (NAICS-71)		49,145
Accommodation & food services (NAICS-72)		302,271
Other services (except public administration) (NAICS-81)		95,339
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		28,388
Unclassified establishments (NAICS-99)		4,270
Number of Establishments		
Agricultural Services, Forestry, and Fishing (SIC-07)	226	
Fishing, hunting and trapping (SIC-0900)	7	
Mining (SIC-10)	10	
Construction (SIC-15)	760	
Manufacturing (SIC-20)	287	
Transportation and Public Utilities (SIC-40)	333	
Wholesale Trade (SIC-50)	532	
Retail Trade (SIC-52)	2,259	
Finance, Insurance, And Real Estate (SIC-60)	769	
Services (SIC-70)	2,903	
Unclassified Establishments (SIC-99)	53	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		87
Fishing (NAICS-11411)		5
Finfish fishing (NAICS-114111)		3
shellfish fishing (NAICS-114112)		2
Mining (NAICS-21)		10
Utilities (NAICS-22)		23
Construction (NAICS-23)		870
Manufacturing (NAICS-31)		296
Wholesale trade (NAICS-42)		469
Retail trade (NAICS-44)		1,535
Transportation & warehousing (NAICS-48)		248
Information (NAICS-51)		144
Finance & insurance (NAICS-52)		400
Real estate & rental & leasing (NAICS-53)		391
Professional, scientific & technical services (NAICS-54)		770
Management of companies & enterprises (NAICS-55)		29
Admin, support, waste mgt, remediation services (NAICS-56)		452
Educational services (NAICS-61)		75
Health care and social assistance (NAICS-62)		837
Arts, entertainment & recreation (NAICS-71)		130
Accommodation & food services (NAICS-72)		885
Other services (except public administration) (NAICS-81)		710
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		17
Unclassified establishments (NAICS-99)		141

Monterey County California HMS Communities Demographic Profiles

Major HMS Ports	Moss Landing, Monterey Co.		Monterey, Monterey Co.	
	1990	2000	1990	2000
Population (numbers)	NA	300	31,954	29,674
Gender (Percent total population)				
Male	NA	54.0%	50.7%	49.2%
Female	NA	46.0%	49.3%	50.8%
Race and Hispanic origin (Percent total population)				
White	NA		86.6%	80.8%
Black	NA	59.3%	2.9%	2.5%
Native American	NA	3.0%	0.6%	0.6%
Asian or Pacific Islander	NA	0.7%	7.3%	7.7%
Other Race	NA	2.0%	2.6%	3.9%
Hispanic Origin (any race)	NA	21.7%	7.8%	10.9%
		28.3%		
Age Structure (Percent total population)		0.0%		
Under 5 years	NA	4.7%	7.0%	5.0%
5-9 Years	NA	4.3%	5.2%	4.8%
10-14 Years	NA	8.7%	3.6%	4.3%
15-19 Years	NA	5.3%	7.5%	6.6%
20-24 Years	NA	10.0%	10.2%	9.1%
25-34 Years	NA	14.0%	24.1%	18.1%
35-44 Years	NA	20.3%	14.5%	15.6%
45-54 Years	NA	13.0%	7.9%	13.6%
55-59 Years	NA	4.7%	3.5%	4.3%
60-64 Years	NA	4.0%	3.6%	3.8%
65-74 Years	NA	7.0%	7.3%	6.7%
75-84 Years	NA	3.0%	4.1%	5.7%
85 Years and greater	NA	1.0%	1.5%	2.5%
Median Age (Years)	NA	36.4	NA	36.1
18 Years and greater	NA	78.7%	81.8%	83.4%
Male	NA	42.7%	41.5%	40.9%
Female	NA	36.0%	40.3%	42.5%
21 Years and greater	NA	76.3%	74.5%	77.2%
62 Years and greater	NA	13.7%	15.0%	17.0%
65 Years and greater	NA	11.0%	12.9%	14.9%
Male	NA	7.0%	5.0%	5.9%
Female	NA	4.0%	7.9%	9.0%
Educational Attainment (Persons 25 years and over)				
Graduate or professional degree	NA	NA	10.2%	NA
Bachelor's degree	NA	NA	16.4%	NA
Associate's degree	NA	NA	5.2%	NA
Some college no degree	NA	NA	15.2%	NA
High school graduate	NA	NA	12.2%	NA
9th to 12th no diploma	NA	NA	4.5%	NA
Less than 9th grade	NA	NA	3.2%	NA
Economic Activity (Percent total population)				
Labor Force by Gender (Persons 16 years and over)	NA	NA	61.0%	NA
Males	NA	NA	34.9%	NA
Females	NA	NA	26.1%	NA

Source: U.S. Bureau of Census

2.4.3.13 HMS Community Profile: Morro Bay, San Luis Obispo County, CA

San Luis Obispo County

Agriculture is an important component of the San Luis Obispo County economy. In 1997, agriculture accounted for 11% of the County's total labor and proprietor income. In 1999, health care and social assistance was the County's most important economic sector in terms of non-agricultural income followed by retail trade, manufacturing, construction and tourism.

Number of vessels with HMS landings, for which Morro Bay, CA is their principal port, by their principal species, 1981-99.

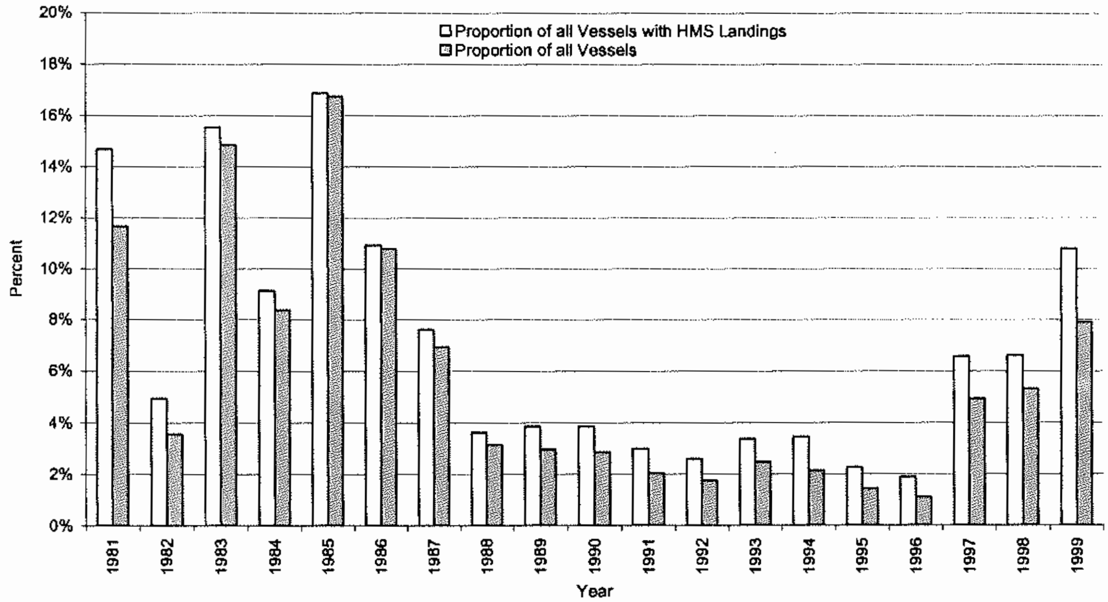
Year	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	64			0	0	0	53
1982	16			0	1	1	52
1983	65			1	6	0	82
1984	31			0	5	0	53
1985	41			1	26	0	46
1986	30			0	18	1	56
1987	15			0	15	0	54
1988	6			1	7	0	28
1989	5			0	8	0	43
1990	0			0	14	0	37
1991	1			1	8	0	20
1992	3			0	6	0	32
1993	3			2	7	0	26
1994	0			3	7	0	22
1995	2			1	4	0	31
1996	2			1	2	0	25
1997	17			2	2	0	51
1998	14			1	4	0	60
1999	14			2	6	1	34

Number of vessels making HMS landings, and HMS landings (mt) and exvessel revenues (1999 $) by species group, Morro Bay, CA, 1981-99.

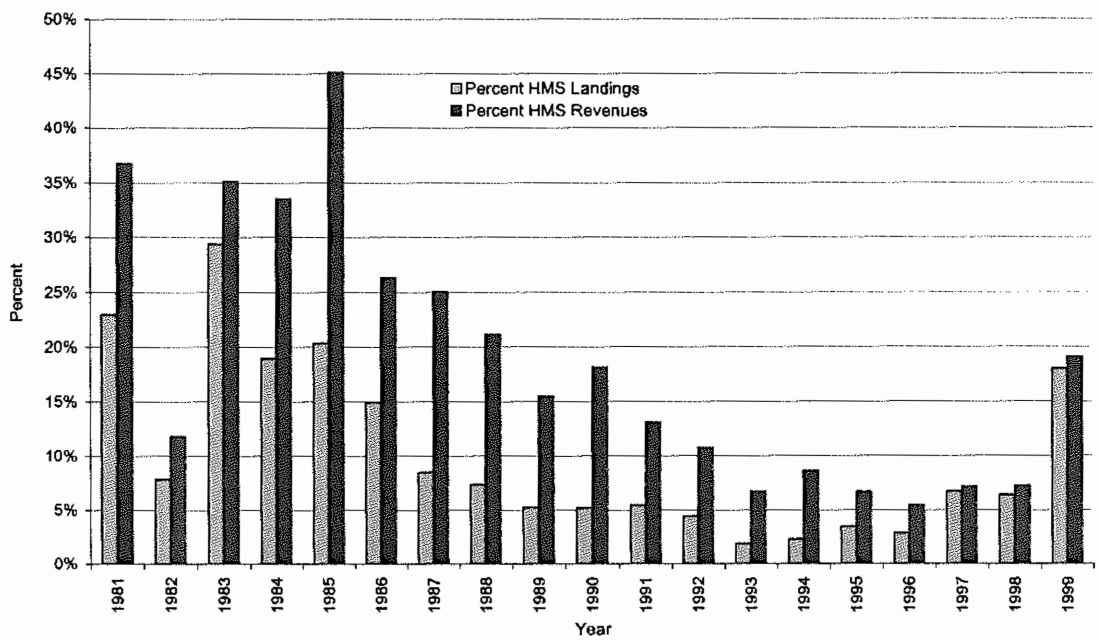
Landings (mt round weight)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	436	979			10			2997
1982	365	123			167	24		3355
1983	463	861			391	71	6	2769
1984	394	296			303	218	2	2555
1985	403	371	1		268	838	4	4024
1986	449	424			50	381	2	4037
1987	394	192			89	271	3	4755
1988	388	85			53	283	4	4152
1989	338	106			78	145		4916
1990	364	41	3		81	221	1	5270
1991	335	35			114	101	3	3637
1992	349	20	1		78	136	3	4356
1993	357	17	7		11	82	4	5722
1994	290	13	3		16	86	2	4733
1995	310	14	2		47	93		3985
1996	265	33	14		19	48		3623
1997	320	183	5		36	24		3094
1998	288	65	3		32	80	2	2181
1999	213	146	6		18	134	4	1205

Exvessel Revenues (1999 $)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	436	$3,289,678			$15,798	$3,929	$657	$4,879,896
1982	365	$299,239	$17	$20	$306,221	$157,261	$905	$4,838,476
1983	463	$1,673,646	$283		$693,999	$403,462	$11,517	$4,236,827
1984	394	$511,021	$874		$512,689	$1,298,741	$3,483	$3,570,092
1985	403	$559,765	$3,810		$578,805	$4,251,676	$8,549	$5,040,171
1986	449	$688,363	$403		$118,978	$2,389,857	$5,450	$7,777,112
1987	394	$438,387	$1,080		$235,373	$2,214,524	$9,594	$7,205,968
1988	388	$222,335	$825		$130,159	$1,948,124	$13,871	$7,012,862
1989	338	$234,230	$1,437		$172,719	$1,064,204	$2,556	$6,785,330
1990	364	$95,238	$11,216	$18	$169,850	$1,500,360	$4,901	$6,702,318
1991	335	$63,725	$3,462		$194,922	$682,821	$6,732	$5,320,448
1992	349	$56,035	$2,466		$119,359	$666,390	$8,776	$5,838,752
1993	357	$46,421	$26,433		$22,150	$414,485	$16,508	$6,215,464
1994	290	$29,950	$13,305		$34,145	$582,198	$6,380	$6,194,039
1995	310	$29,633	$8,260		$79,155	$559,441	$973	$7,896,665
1996	265	$67,707	$42,344		$36,224	$259,886	$539	$5,700,880
1997	320	$294,689	$16,016		$72,713	$105,725	$344	$4,974,516
1998	288	$121,132	$11,822		$52,579	$282,160	$2,673	$4,129,168
1999	213	$200,985	$26,709	$1,808	$28,060	$604,815	$20,400	$2,521,720

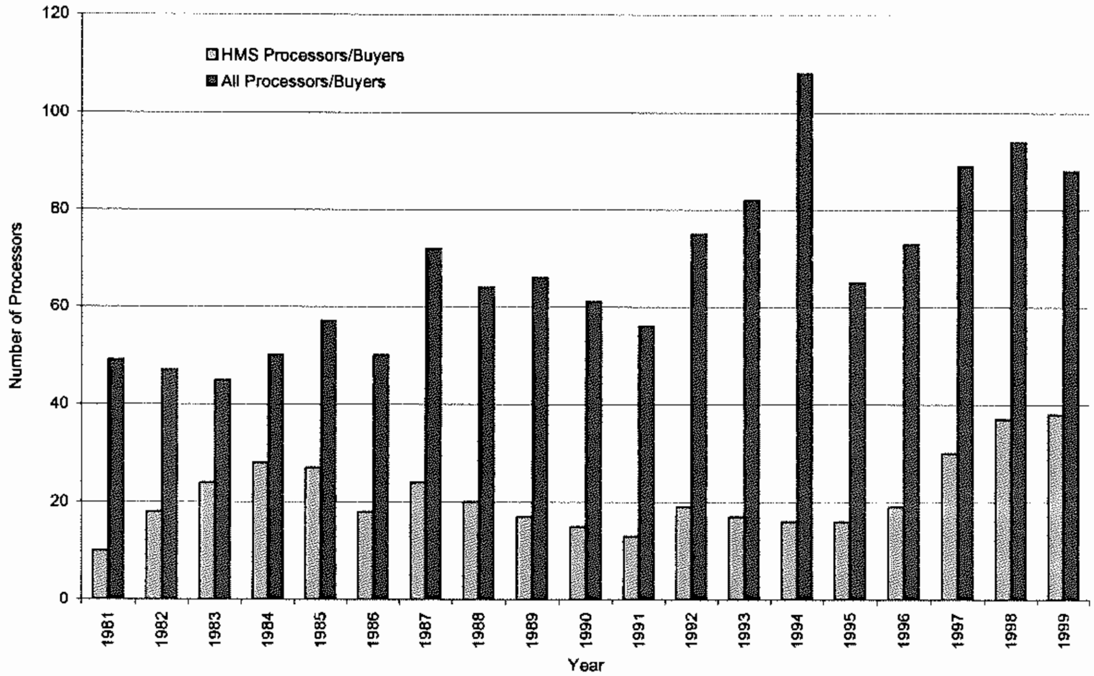
Proportion of vessels whose principal species is a HMS and whose principal port is Morro Bay, CA of all vessels making HMS landings, and the proportion of these vessels of the total number of vessels making landings in Morro Bay, 1981-99.



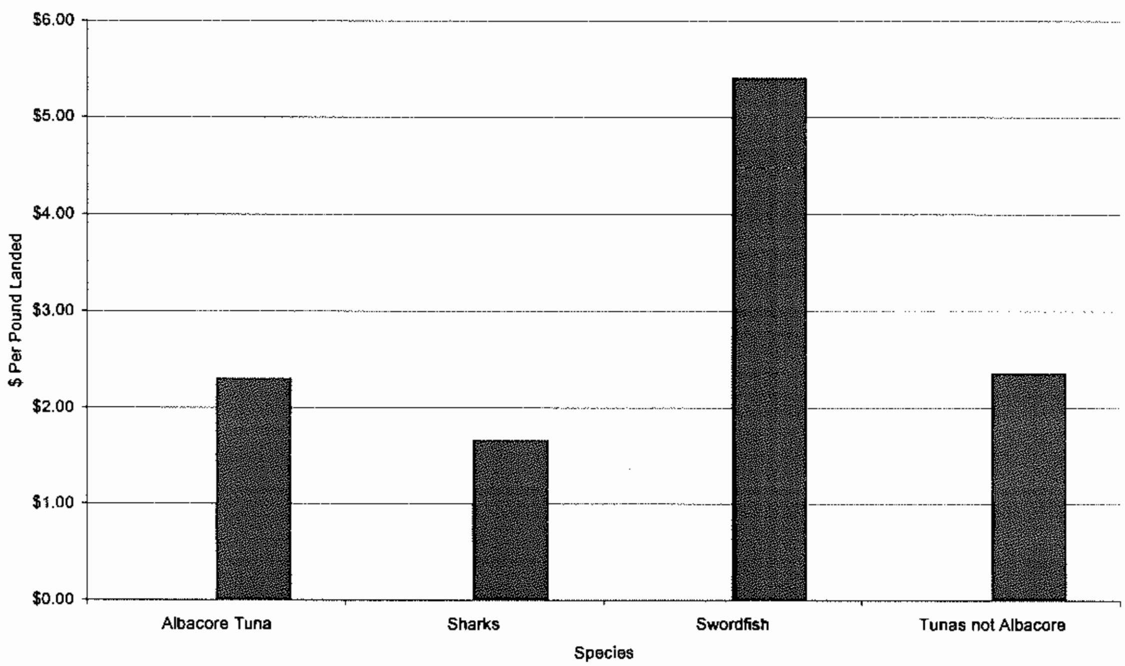
Proportion of HMS landings and exvessel revenues of total landings and exvessel revenues in Morro Bay, CA, 1981-99.



Number of processors/buyers in Morro Bay, CA, 1981-99.



Total income multipliers for landings of HMS of species in the port of Morro Bay, CA, based on 1996 landings and exvessel revenues.



San Luis Obispo County California HMS Communities Demographic Profiles

	County	
	San Luis Obispo	
	1990	2000
Population (numbers)	217,162	246,681
Gender (Percent total population)		
Male	51.6%	51.4%
Female	48.4%	48.6%
Race and Hispanic origin (Percent total population)		
White	89.2%	84.6%
Black	2.6%	2.0%
Native American	1.0%	0.9%
Asian or Pacific Islander	2.9%	2.8%
Other Race	4.3%	6.2%
Hispanic Origin (any race)	13.3%	16.3%
Age Structure (Percent total population)		
Under 5 years	6.4%	5.0%
5-9 Years	6.6%	6.0%
10-14 Years	5.7%	6.6%
15-19 Years	7.3%	8.5%
20-24 Years	10.4%	9.2%
25-34 Years	16.9%	11.4%
35-44 Years	15.8%	15.6%
45-54 Years	8.8%	14.7%
55-59 Years	3.6%	4.8%
60-64 Years	4.2%	3.8%
65-74 Years	8.4%	7.3%
75-84 Years	4.5%	5.4%
85 Years and greater	1.3%	1.7%
Median Age (years)	NA	37.3
18 Years and greater	78.1%	78.3%
Male	40.2%	40.2%
Female	37.9%	38.2%
21 Years and greater	71.7%	71.7%
62 Years and greater	16.8%	16.7%
65 Years and greater	14.2%	14.5%
Male	6.2%	6.3%
Female	8.0%	8.2%
Educational Attainment (Persons 25 years and over)	**1990**	**2000**
Graduate or professional degree	4.7%	NA
Bachelor's degree	9.9%	NA
Associate's degree	5.6%	NA
Some college no degree	17.3%	NA
High school graduate	15.7%	NA
9th to 12th no diploma	7.1%	NA
Less than 9th grade	3.6%	NA
		NA
Economic Activity		
Labor Force by Gender (Persons 16 years and over)	47.5%	NA
Males	26.1%	NA
Females	21.4%	NA

San Luis Obispo County California HMS Communities Demographic Profiles

	County	
	San Luis Obispo	
	1993	1999
Economic Activity (cont'd)		
Employment (numbers)		
Agricultural Services, Forestry, and Fishing (SIC-07)	961	
Fishing, hunting and trapping (SIC-0900)	10	
Mining (SIC-10)	71	
Construction (SIC-15)	3,034	
Manufacturing (SIC-20)	5,711	
Transportation and Public Utilities (SIC-40)	4,763	
Wholesale Trade (SIC-50)	2,269	
Retail Trade (SIC-52)	17,332	
Finance, Insurance, and Real Estate (SIC-60)	3,143	
Services (SIC-70)	21,222	
Unclassified Establishments (SIC-99)	19	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		100-249
Fishing (NAICS-11411)		0-19
Finfish fishing (NAICS-114111)		0-19
shellfish fishing (NAICS-114112)		0-19
Mining (NAICS-21)		100-249
Utilities (NAICS-22)		2500-4999
Construction (NAICS-23)		5,418
Manufacturing (NAICS-31)		6,894
Wholesale trade (NAICS-42)		1,978
Retail trade (NAICS-44)		12,020
Transportation & warehousing (NAICS-48)		1,216
Information (NAICS-51)		1,822
Finance & insurance (NAICS-52)		2,385
Real estate & rental & leasing (NAICS-53)		1,432
Professional, scientific & technical services (NAICS-54)		3,145
Management of companies & enterprises (NAICS-55)		287
Admin, support, waste mgt, remediation services (NAICS-56)		3,065
Educational services (NAICS-61)		2,369
Health care and social assistance (NAICS-62)		12,426
Arts, entertainment & recreation (NAICS-71)		749
Accommodation & food services (NAICS-72)		10,801
Other services (except public administration) (NAICS-81)		3,581
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		166
Unclassified establishments (NAICS-99)		100-249
Labor and Proprietor Income ($1,000)		
Agricultural Services, Forestry, and Fishing (SIC-07)	13,878	
Fishing, hunting and trapping (SIC-0900)	196	
Mining (SIC-10)	2,148	
Construction (SIC-15)	72,722	
Manufacturing (SIC-20)	132,199	
Transportation and Public Utilities (SIC-40)	186,794	
Wholesale Trade (SIC-50)	54,524	
Retail Trade (SIC-52)	216,756	
Finance, Insurance, and Real Estate (SIC-60)	72,498	
Services (SIC-70)	405,163	
Unclassified Establishments (SIC-99)	470	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		0
Fishing (NAICS-11411)		0
Finfish fishing (NAICS-114111)		0
shellfish fishing (NAICS-114112)		0

San Luis Obispo County California HMS Communities Demographic Profiles

	County	
	San Luis Obispo	
	1993	1999
Economic Activity (cont'd)		
Labor and Proprietor Income ($1,000) (cont'd)		
Mining (NAICS-21)		0
Utilities (NAICS-22)		0
Construction (NAICS-23)		156,010
Manufacturing (NAICS-31)		209,311
Wholesale trade (NAICS-42)		58,482
Retail trade (NAICS-44)		236,909
Transportation & warehousing (NAICS-48)		30,329
Information (NAICS-51)		104,489
Finance & insurance (NAICS-52)		90,129
Real estate & rental & leasing (NAICS-53)		28,017
Professional, scientific & technical services (NAICS-54)		112,983
Management of companies & enterprises (NAICS-55)		14,638
Admin, support, waste mgt, remediation services (NAICS-56)		69,524
Educational services (NAICS-61)		27,009
Health care and social assistance (NAICS-62)		342,637
Arts, entertainment & recreation (NAICS-71)		11,181
Accommodation & food services (NAICS-72)		126,943
Other services (except public administration) (NAICS-81)		56,855
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		3,787
Unclassified establishments (NAICS-99)		0
Number of Establishments		
Agricultural Services, Forestry, And Fishing (SIC-07)	164	
Fishing, hunting and trapping (SIC-0900)	7	
Mining (SIC-10)	14	
Construction (SIC-15)	704	
Manufacturing (SIC-20)	295	
Transportation And Public Utilities (SIC-40)	202	
Wholesale Trade (SIC-50)	282	
Retail Trade (SIC-52)	1,586	
Finance, Insurance, And Real Estate (SIC-60)	512	
Services (SIC-70)	2,177	
Unclassified Establishments (SIC-99)	43	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		24
Fishing (NAICS-11411)		6
Finfish fishing (NAICS-114111)		5
shellfish fishing (NAICS-114112)		1
Mining (NAICS-21)		11
Utilities (NAICS-22)		13
Construction (NAICS-23)		869
Manufacturing (NAICS-31)		347
Wholesale trade (NAICS-42)		250
Retail trade (NAICS-44)		1,135
Transportation & warehousing (NAICS-48)		119
Information (NAICS-51)		131
Finance & insurance (NAICS-52)		308
Real estate & rental & leasing (NAICS-53)		343
Professional, scientific & technical services (NAICS-54)		645
Management of companies & enterprises (NAICS-55)		24
Admin, support, waste mgt, remediation services (NAICS-56)		312
Educational services (NAICS-61)		64
Health care and social assistance (NAICS-62)		692
Arts, entertainment & recreation (NAICS-71)		85
Accommodation & food services (NAICS-72)		682
Other services (except public administration) (NAICS-81)		546
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		6
Unclassified establishments (NAICS-99)		130

San Luis Obispo County California HMS Communities Demographic Profiles

Major HMS Ports	Morro Bay, San Luis Obispo Co.	
	1990	2000
Population (numbers)	9,664	10,350
Gender (Percent total population)		
Male	48.0%	47.7%
Female	52.0%	52.3%
Race and Hispanic origin (Percent total population)		
White	93.7%	89.4%
Black	0.6%	0.7%
Native American	1.1%	0.9%
Asian or Pacific Islander	1.7%	1.9%
Other Race	2.9%	4.1%
Hispanic Origin (any race)	7.7%	11.4%
Age Structure (Percent total population)		
Under 5 years	4.6%	3.7%
5-9 Years	4.3%	4.3%
10-14 Years	4.0%	4.6%
15-19 Years	4.5%	4.9%
20-24 Years	6.8%	6.1%
25-34 Years	15.1%	11.8%
35-44 Years	14.7%	13.6%
45-54 Years	9.2%	15.9%
55-59 Years	4.6%	5.5%
60-64 Years	6.3%	5.4%
65-74 Years	14.3%	11.3%
75-84 Years	8.5%	9.5%
85 Years and greater	3.1%	3.4%
Median Age (Years)	NA	45.7
18 Years and greater	84.8%	84.9%
Male	40.2%	40.2%
Female	44.7%	44.7%
21 Years and greater	81.3%	81.3%
62 Years and greater	29.9%	27.5%
65 Years and greater	25.9%	24.2%
Male	10.8%	9.9%
Female	15.1%	14.3%
Educational Attainment (Persons 25 years and over)		
Graduate or professional degree	5.3%	NA
Bachelor's degree	11.2%	NA
Associate's degree	7.9%	NA
Some college no degree	20.4%	NA
High school graduate	19.1%	NA
9th to 12th no diploma	9.3%	NA
Less than 9th grade	3.4%	NA
Economic Activity (Percent total population)		
Labor Force by Gender (Persons 16 years and over)	48.7%	NA
Males	25.7%	NA
Females	23.0%	NA

Source: U.S. Bureau of Census

2.4.3.14 HMS Community Profile: Santa Barbara Area, CA (Santa Barbara County, Ventura County, Oxnard and Pt. Hueneme)

Santa Barbara County

Agriculture is an important contributor to the Santa Barbara County economy. In 1997, it accounted for 11% of the County's total income. In 1999, manufacturing was the leading sector of the County's economy in terms of non-agricultural income, followed by health care and social assistance, retail trade, professional, scientific and technical services, and construction.

Ventura County

Agriculture is an important component of the Ventura County economy. In 1997, agriculture accounted for 9% of the County's total labor and proprietor income. In 1999, manufacturing accounted for the largest share of Ventura County's non-agricultural income, followed by the retail trade, wholesale trade, health care and social assistance, and finance and insurance sectors.

Oxnard http://www.ci.oxnard.ca.us/

The earliest inhabitants of the Oxnard areas were the Chumash Indians. During the mid nineteenth century, immigrants began to pour in from the east coast and Europe. The major industry, agriculture, produced great crops of barley and lima beans. In 1897, ranchers Albert Maulhardt and Johannes Borchard believed sugar beets would be a profitable crop for the area, and invited Henry Oxnard to construct a local factory to process the harvests. Oxnard and his three brothers operated the American Beet Sugar factory in Chino, California and encouraged by a pledge of 18,000 acres of sugar beets from local farmers, built a factory in the heart of the rich fields. The Southern Pacific Railroad constructed a spur right to the factory site so the processed beets could be shipped out.

A town quickly sprang up near the factory. Almost overnight businesses and residences appeared around the town square, and schools and churches emerged almost as rapidly. The City of Oxnard was incorporated in 1903, taking its name from the Oxnard brothers who had founded the sugar beet factory.

The factory attracted many Chinese, Japanese and Mexican workers to Oxnard and the sugar beet industry brought diversification to agriculture. Major crops then included beans, beets, and barley.

Oxnard is surrounded by some of the richest agricultural land in the world, and agriculture has remained the major industry. The establishment of military bases at Port Hueneme and Point Mugu during World War II, and the rise of electronic, aerospace, and other manufacturing industries have contributed to the growth of the city and surrounding areas.

Port Hueneme http://www.portofhueneme.org/

The Port of Hueneme began sixty years ago with a mission to provide California's Central Coast agricultural community with an ocean link to global markets. Located approximately sixty miles northwest of Los Angeles in Ventura County, it became known as "the Port the Farmers Built."

In 1978 Del Monte Fresh Produce began a weekly service to the Port of Hueneme for its import of bananas and tropical fruit. This signaled the first major agricultural import interest to establish business at the Port of Hueneme and Del Monte Fresh Produce remains today as the longest-term international customer of the Port.

The Port of Hueneme is the only deep water harbor between Los Angeles and the San Francisco Bay area and is the U.S. Port of Entry for California's Central Coast region. It serves international businesses and ocean carriers from both the Pacific Rim and Europe. The Port of Hueneme ranks among the top seaports in California for general cargo throughput. The niche markets that Hueneme serves include: the import and export of automobiles, heavy agricultural equipment and industrial vehicles, fresh fruit, fresh produce, forest products, and project cargo. The Port of Hueneme is the top seaport in the United States for citrus export and ranks among the top ten ports in the country for automobile and banana imports. It is home to the largest dockside refrigeration storage facility on the West Coast. In addition, the Port provides space for local sport and commercial fishing industries.

Its unique positioning near the Santa Barbara Channel has also made Port Hueneme the primary support facility for the offshore oil industry in California's Central Coast area. The Oxnard Harbor District, which is the port authority for Port Hueneme, is also the Grantee for the U.S. Foreign-Trade Zone #205, a trade enhancing program that is available to support global businesses operating in the Central Coast region.

In all, over $4 billion in cargo value moves through Port Hueneme each year. Top trading partners include Brazil, Costa Rica, Ecuador, Germany and Japan. Port related activities generate over $388 million for the local economy each year. Additionally 3,500 jobs in Ventura County are directly or indirectly related to Port Hueneme's operations.

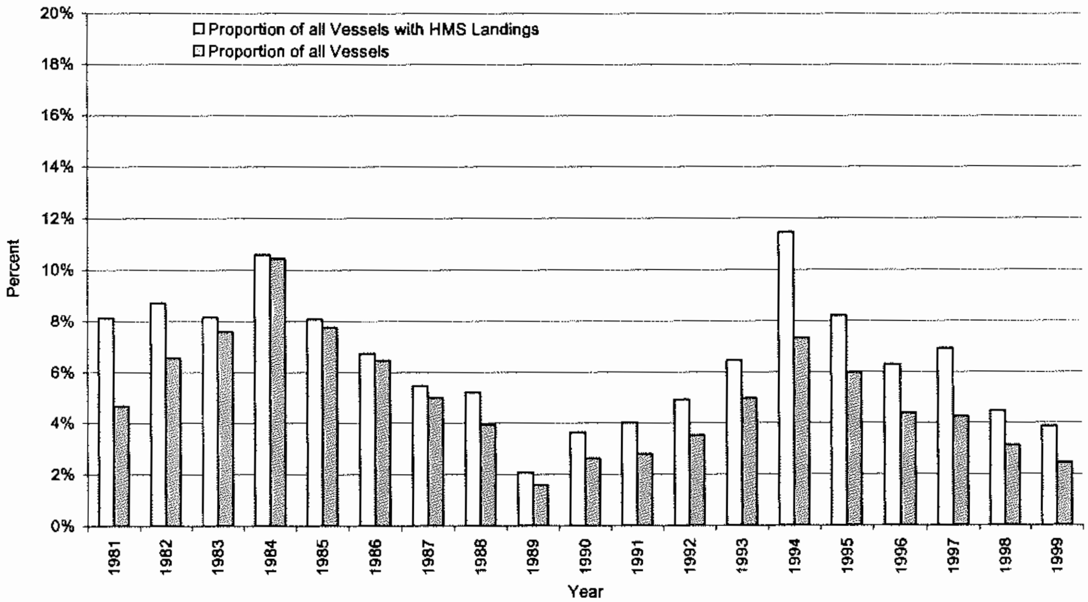
Number of vessels with HMS landings, for which the Santa Barbara area, CA is their principal port, by their principal species, 1981-99.

Year	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	4	0	0	4	17	0	61
1982	2	0	0	7	32	0	68
1983	3	0	0	3	30	1	66
1984	5	0	0	6	33	1	76
1985	2	0	0	1	30	0	68
1986	1	1	0	1	27	0	71
1987	0	0	0	6	18	0	71
1988	0	0	0	7	9	2	64
1989	0	0	0	4	4	0	62
1990	1	0	0	3	10	0	66
1991	1	0	0	5	9	0	54
1992	1	0	0	6	11	0	51
1993	1	0	0	7	17	0	47
1994	0	0	0	10	31	0	40
1995	1	0	0	5	26	0	35
1996	0	0	1	9	11	0	47
1997	4	0	0	4	11	1	55
1998	2	2	0	1	8	0	38
1999	4	0	0	4	3	0	49

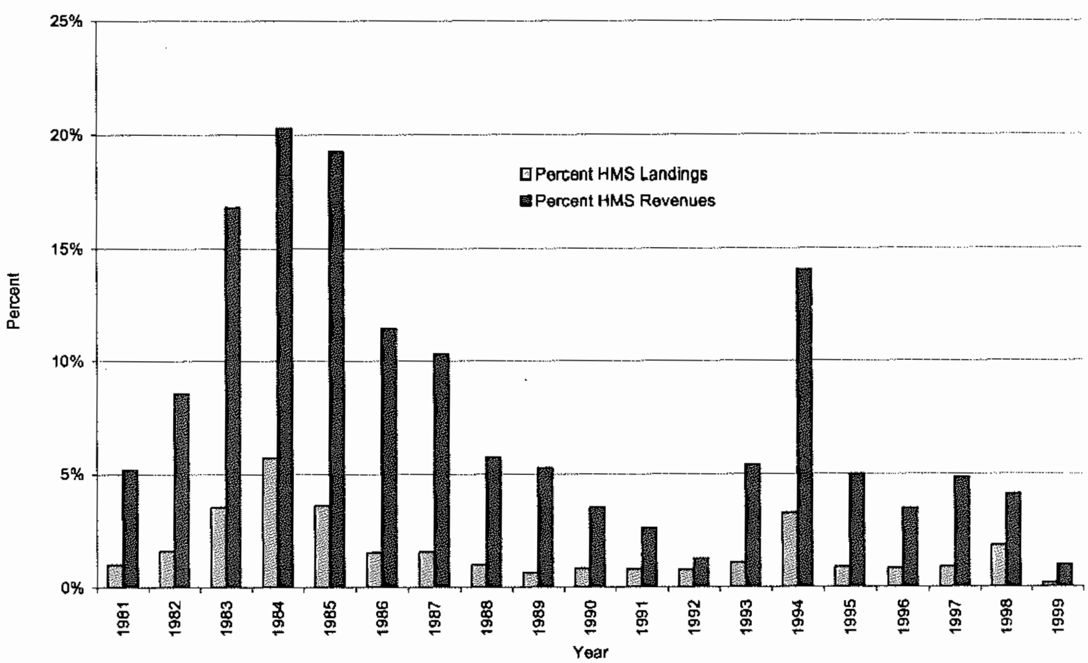
Number of vessels making HMS landings, and HMS landings (mt) and exvessel revenues (1999 $) by species group, Santa Barbara area, CA, 1981-99.

Landings (mt round weight)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	308	12	5		205	71	9	4348
1982	471	23			227	99		7075
1983	454	94			203	217	14	4174
1984	425	26			177	286	3	3524
1985	409	20			168	378		4636
1986	446	6			129	207		6091
1987	440	2			225	129		4631
1988	346	7			166	94		3722
1989	389	1			90	102		4531
1990	386	8			100	55	1	3941
1991	375	6			161	40		3936
1992	367	3			66	20		3796
1993	388	3	4	16	67	159	30	8599
1994	358	9	6	30	178	690	52	9139
1995	390	7	5	5	70	293	45	7637
1996	334	4	3	9	131	245	44	8714
1997	289	14	2		73	268	38	2682
1998	292	17			47	80	11	2082
1999	285	21	2		48	39		7863
Exvessel Revenues (1999 $)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	308	$40,483	$10,956		$331,554	$610,617	$20,065	$7,075,768
1982	471	$78,700			$407,337	$807,733	$2,123	$6,904,383
1983	454	$199,370	$1,029		$357,340	$1,403,916	$39,503	$5,436,412
1984	425	$62,298	$2,524		$396,416	$1,807,052	$9,583	$5,490,805
1985	409	$45,894	$1,521		$393,468	$2,248,663	$2,299	$6,582,947
1986	446	$15,095	$1,137		$331,023	$1,601,755	$3,643	$8,375,113
1987	440	$5,442	$416		$600,631	$1,139,261	$2,864	$7,704,720
1988	346	$76,853	$110		$445,709	$754,358	$1,538	$6,317,859
1989	389	$2,859	$984		$236,772	$879,516	$682	$8,639,658
1990	386	$29,299	$1,815	$38	$218,694	$473,062	$2,671	$8,608,706
1991	375	$22,471	$4,273		$336,231	$314,316	$1,824	$10,243,827
1992	367	$12,126	$1,176		$134,723	$142,993	$710	$10,149,200
1993	388	$6,161	$46,934	$43,556	$125,641	$971,065	$268,267	$10,521,185
1994	358	$9,890	$52,673	$56,793	$332,917	$3,622,926	$359,517	$9,397,491
1995	390	$15,242	$31,305	$5,192	$120,769	$1,291,638	$205,512	$8,742,373
1996	334	$5,428	$27,502	$8,823	$254,089	$859,917	$168,453	$8,862,548
1997	289	$29,006	$6,929	$520	$137,568	$899,548	$136,894	$7,083,213
1998	292	$33,967	$4,121	$528	$89,264	$309,577	$48,172	$6,247,670
1999	285	$59,143	$7,852	$362	$80,920	$183,549	$1,328	$9,374,583

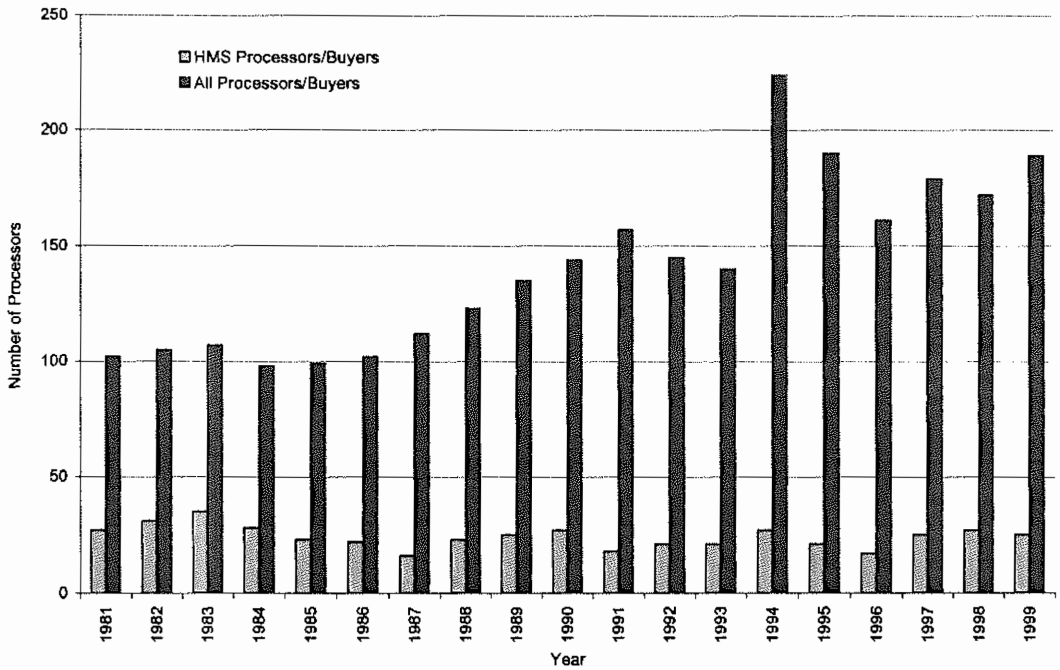
Proportion of vessels whose principal species is a HMS & whose principal port is Santa Barbara area, CA of all vessels making HMS landings, & the proportion of these vessels of the total number of vessels making landings in the Santa Barbara area,1981-99.



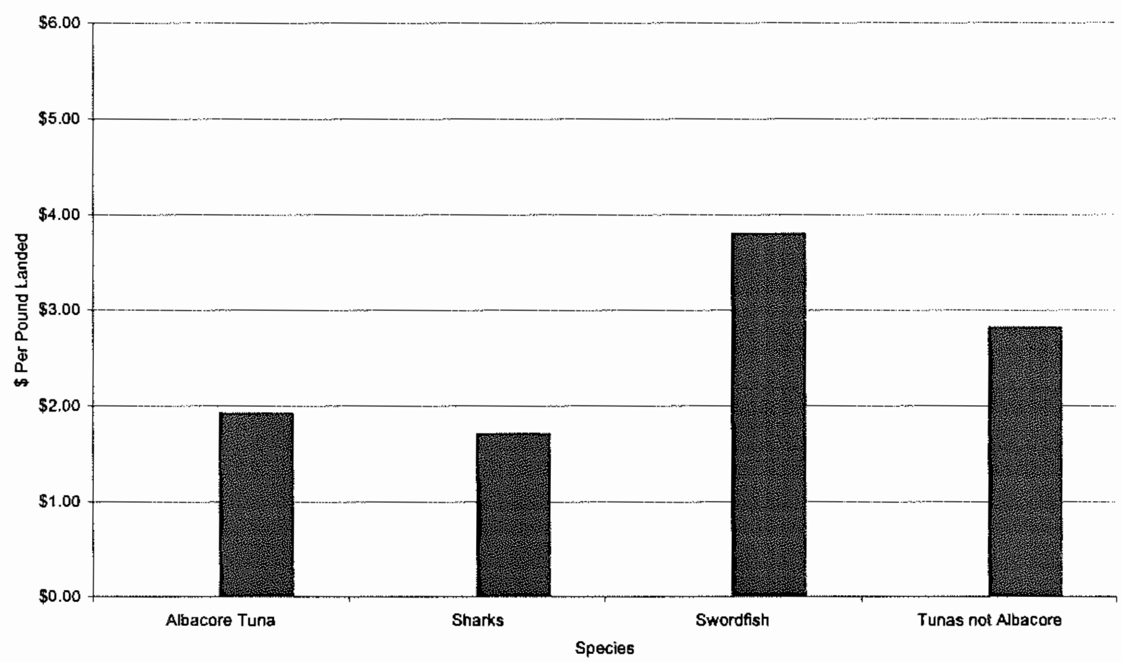
Proportion of HMS landings and exvessel revenues of total landings and exvessel revenues in Santa Barbara area, CA, 1981-99



Number of processors/buyers in the Santa Barbara area, 1981-99.



Total income multipliers for landings of HMS of species in the Santa Barbara area, based on 1996 landings and exvessel revenues.



Santa Barbara Area California HMS Communities Demographic Profiles

	County			
	Santa Barbara		Ventura	
	1990	2000	1990	2000
Population (numbers)	369,608	399,347	669,016	753,197
Gender (Percent total population)				
Male	50.2%	50.0%	50.4%	49.9%
Female	49.8%	50.0%	49.6%	50.1%
Race and Hispanic origin (Percent total population)				
White	77.2%	72.7%	79.1%	69.9%
Black	2.8%	2.3%	2.3%	1.9%
Native American	0.9%	1.2%	0.7%	0.9%
Asian or Pacific Islander	4.4%	4.3%	5.2%	5.6%
Other Race	14.6%	15.2%	12.7%	17.7%
Hispanic Origin (any race)	26.6%	34.2%	26.4%	33.4%
Age Structure (Percent total population)				
Under 5 years	7.3%	6.5%	8.0%	7.5%
5-9 Years	6.8%	7.4%	7.8%	8.4%
10-14 Years	5.8%	7.0%	7.2%	8.0%
15-19 Years	7.5%	8.0%	7.4%	7.4%
20-24 Years	10.5%	9.3%	7.6%	6.2%
25-34 Years	18.2%	13.9%	18.1%	13.8%
35-44 Years	14.5%	15.1%	16.4%	16.9%
45-54 Years	9.3%	12.3%	10.7%	13.6%
55-59 Years	3.9%	4.3%	3.9%	4.6%
60-64 Years	3.9%	3.5%	3.4%	3.4%
65-74 Years	6.9%	6.3%	5.5%	5.3%
75-84 Years	4.0%	4.6%	3.0%	3.6%
85 Years and greater	1.4%	1.7%	0.9%	1.2%
Median Age (years)	NA	33.4	NA	34.2
18 Years and greater	76.8%	75.1%	72.6%	71.6%
Male	38.3%	37.2%	36.4%	35.3%
Female	38.5%	37.9%	36.2%	36.2%
21 Years and greater	70.2%	68.7%	67.9%	67.4%
62 Years and greater	14.7%	14.8%	11.4%	12.2%
65 Years and greater	12.3%	12.7%	9.4%	10.2%
Male	5.1%	5.4%	3.9%	4.3%
Female	7.3%	7.3%	5.5%	5.9%
Educational Attainment (Persons 25 years and over)				
Graduate or professional degree	6.3%	NA	4.9%	NA
Bachelor's degree	10.4%	NA	9.4%	NA
Associate's degree	5.2%	NA	5.4%	NA
Some college no degree	15.0%	NA	15.9%	NA
High school graduate	13.2%	NA	13.7%	NA
9th to 12th no diploma	6.5%	NA	6.7%	NA
Less than 9th grade	6.0%	NA	6.1%	NA
		NA		NA
Economic Activity				
Labor Force by Gender (Persons 16 years and over)	52.6%	NA	53.7%	NA
Males	29.5%	NA	30.7%	NA
Females	23.1%	NA	22.9%	NA

Santa Barbara Area California HMS Communities Demographic Profiles

	County			
	Santa Barbara		Ventura	
	1993	1999	1993	1999
Economic Activity (cont'd)				
Employment (numbers)				
Agricultural Services, Forestry, and Fishing (SIC-07)	689		355	
Fishing, hunting and trapping (SIC-0900)	0-19		3,444	
Mining (SIC-10)	121		1,327	
Construction (SIC-15)	3,498		10,507	
Manufacturing (SIC-20)	14,235		33,026	
Transportation and Public Utilities (SIC-40)	2,250		10,495	
Wholesale Trade (SIC-50)	4,376		12,023	
Retail Trade (SIC-52)	18,476		44,581	
Finance, Insurance, and Real Estate (SIC-60)	3,701		11,253	
Services (SIC-70)	24,760		64,752	
Unclassified Establishments (SIC-99)	41		72	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		554		1,164
Fishing (NAICS-11411)		4		20-99
Finfish fishing (NAICS-114111)		0-19		0-19
shellfish fishing (NAICS-114112)		0-19		41
Mining (NAICS-21)		964		558
Utilities (NAICS-22)		257		532
Construction (NAICS-23)		8,273		16,557
Manufacturing (NAICS-31)		16,464		30,860
Wholesale trade (NAICS-42)		4,678		15,413
Retail trade (NAICS-44)		20,154		32,059
Transportation & warehousing (NAICS-48)		2,218		3,589
Information (NAICS-51)		5,189		7,384
Finance & insurance (NAICS-52)		6,191		13,898
Real estate & rental & leasing (NAICS-53)		3,067		3,509
Professional, scientific & technical services (NAICS-54)		7,929		12,973
Management of companies & enterprises (NAICS-55)		2,274		3,100
Admin, support, waste mgt, remediation services (NAICS-56)		9,148		20,084
Educational services (NAICS-61)		3,106		3,376
Health care and social assistance (NAICS-62)		16,737		22,778
Arts, entertainment & recreation (NAICS-71)		2,841		3,591
Accommodation & food services (NAICS-72)		18,340		21,312
Other services (except public administration) (NAICS-81)		6,411		11,069
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		501		633
Unclassified establishments (NAICS-99)		219		378
Labor and Proprietor Income ($1,000)				
Agricultural Services, Forestry, and Fishing (SIC-07)	11,519		54,413	
Fishing, hunting and trapping (SIC-0900)	0		0	
Mining (SIC-10)	5,561		50,121	
Construction (SIC-15)	85,082		269,639	
Manufacturing (SIC-20)	483,578		1,110,388	
Transportation and Public Utilities (SIC-40)	62,786		355,862	
Wholesale Trade (SIC-50)	122,675		396,306	
Retail Trade (SIC-52)	250,868		630,919	
Finance, Insurance, and Real Estate (SIC-60)	93,155		294,344	
Services (SIC-70)	638,954		1,471,403	
Unclassified Establishments (SIC-99)	786		1,125	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		26,816		28,124
Fishing (NAICS-11411)		15		0
Finfish fishing (NAICS-114111)		0		0
shellfish fishing (NAICS-114112)		0		546
Mining (NAICS-21)		44,793		27,622
Utilities (NAICS-22)		17,534		29,077
Construction (NAICS-23)		282,910		506,593
Manufacturing (NAICS-31)		679,229		1,229,030
Wholesale trade (NAICS-42)		209,700		737,555
Retail trade (NAICS-44)		435,202		740,914
Transportation & warehousing (NAICS-48)		55,317		97,592
Information (NAICS-51)		248,914		339,910
Finance & insurance (NAICS-52)		276,468		655,384
Real estate & rental & leasing (NAICS-53)		80,201		98,058
Professional, scientific & technical services (NAICS-54)		378,325		565,858
Management of companies & enterprises (NAICS-55)		125,009		243,105
Admin, support, waste mgt, remediation services (NAICS-56)		192,044		406,840

Santa Barbara Area California HMS Communities Demographic Profiles

	County			
	Santa Barbara		Ventura	
	1993	1999	1993	1999
Economic Activity (cont'd)				
Labor and Proprietor Income ($1,000) (cont'd)				
Educational services (NAICS-61)		66,749		68,712
Health care and social assistance (NAICS-62)		491,620		687,678
Arts, entertainment & recreation (NAICS-71)		71,088		71,177
Accommodation & food services (NAICS-72)		234,927		245,696
Other services (except public administration) (NAICS-81)		117,862		211,750
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		29,389		42,822
Unclassified establishments (NAICS-99)		4,989		10,415
Number of Establishments				
Agricultural Services, Forestry, and Fishing (SIC-07)	156		355	
Fishing, hunting and trapping (SIC-0900)	1		5	
Mining (SIC-10)	7		64	
Construction (SIC-15)	788		1,480	
Manufacturing (SIC-20)	409		975	
Transportation and Public Utilities (SIC-40)	176		548	
Wholesale Trade (SIC-50)	377		1,138	
Retail Trade (SIC-52)	1,528		3,314	
Finance, Insurance, and Real Estate (SIC-60)	559		1,369	
Services (SIC-70)	2,433		5,736	
Unclassified Establishments (SIC-99)	59		88	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		52		72
Fishing (NAICS-11411)		5		7
Finfish fishing (NAICS-114111)		3		3
shellfish fishing (NAICS-114112)		2		4
Mining (NAICS-21)		36		45
Utilities (NAICS-22)		13		41
Construction (NAICS-23)		1,036		1,760
Manufacturing (NAICS-31)		506		1,023
Wholesale trade (NAICS-42)		480		1,094
Retail trade (NAICS-44)		1,625		2,350
Transportation & warehousing (NAICS-48)		184		316
Information (NAICS-51)		226		326
Finance & insurance (NAICS-52)		555		962
Real estate & rental & leasing (NAICS-53)		583		709
Professional, scientific & technical services (NAICS-54)		1,154		1,908
Management of companies & enterprises (NAICS-55)		66		80
Admin, support, waste mgt, remediation services (NAICS-56)		568		950
Educational services (NAICS-61)		144		177
Health care and social assistance (NAICS-62)		1,160		1,862
Arts, entertainment & recreation (NAICS-71)		206		257
Accommodation & food services (NAICS-72)		968		1,203
Other services (except public administration) (NAICS-81)		935		1,378
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		23		19
Unclassified establishments (NAICS-99)		155		258

Santa Barbara Area California HMS Communities Demographic Profiles

Major HMS Ports	Santa Barbara, Santa Barbara Co.		Oxnard, Ventura Co.		Pt. Hueneme, Ventura Co.	
	1990	2000	1990	2000	1990	2000
Population (numbers)	85,571	92,325	142,216	170,358	20,319	21,845
Gender (Percent total population)						
Male	49.0%	49.2%	51.1%	51.1%	52.5%	50.3%
Female	51.0%	50.8%	48.9%	48.9%	47.5%	49.7%
Race and Hispanic origin (Percent total population)						
White	77.7%	74.0%	58.7%	42.1%	73.5%	57.3%
Black	2.2%	1.8%	5.2%	3.8%	5.5%	6.1%
Native American	0.9%	1.1%	0.8%	1.3%	1.0%	1.7%
Asian or Pacific Islander	2.3%	2.9%	8.6%	8.0%	6.8%	6.8%
Other Race	16.8%	16.4%	26.7%	40.4%	13.1%	21.8%
Hispanic Origin (any race)	31.5%	35.0%	54.4%	66.2%	29.8%	41.0%
Age Structure (Percent total population)						
Under 5 years	6.2%	5.6%	9.3%	8.9%	9.0%	8.6%
5-9 Years	5.2%	6.0%	8.8%	9.5%	8.5%	8.3%
10-14 Years	4.3%	5.2%	7.9%	8.4%	6.7%	6.9%
15-19 Years	5.4%	7.2%	8.2%	8.3%	7.0%	7.1%
20-24 Years	10.3%	9.5%	9.2%	8.5%	10.0%	9.7%
25-34 Years	20.6%	17.1%	19.1%	16.2%	21.9%	16.8%
35-44 Years	16.0%	15.2%	13.9%	14.7%	13.3%	15.2%
45-54 Years	8.5%	13.1%	8.7%	10.8%	7.2%	9.9%
55-59 Years	3.4%	4.2%	3.8%	3.6%	3.1%	3.5%
60-64 Years	3.8%	3.1%	3.4%	2.9%	3.3%	3.1%
65-74 Years	7.5%	5.8%	5.0%	4.7%	5.8%	5.6%
75-84 Years	6.0%	5.3%	2.2%	2.7%	3.2%	4.0%
85 Years and greater	2.7%	2.7%	0.6%	0.7%	0.9%	1.1%
Median Age (Years)	NA	34.6	NA	28.9	NA	30.3
18 Years and greater	81.7%	80.2%	69.3%	68.2%	72.5%	72.4%
Male	39.6%	39.1%	35.5%	34.8%	38.3%	36.3%
Female	42.1%	41.1%	33.8%	33.4%	34.2%	36.1%
21 Years and greater	76.9%	73.8%	64.0%	63.2%	66.8%	66.6%
62 Years and greater	18.5%	15.6%	9.7%	9.8%	12.0%	12.4%
65 Years and greater	16.2%	13.6%	7.7%	8.1%	9.9%	10.7%
Male	5.9%	5.4%	3.3%	3.6%	3.8%	4.3%
Female	10.3%	8.4%	4.4%	4.6%	6.1%	6.4%
						0.0%
Educational Attainment (Persons 25 years and over)						0.0%
Graduate or professional degree	8.8%	NA	2.3%	NA	3.1%	NA
Bachelor's degree	14.1%	NA	5.1%	NA	6.2%	NA
Associate's degree	5.0%	NA	4.0%	NA	4.9%	NA
Some college no degree	15.6%	NA	11.7%	NA	16.2%	NA
High school graduate	11.3%	NA	11.8%	NA	15.6%	NA
9th to 12th no diploma	7.5%	NA	8.5%	NA	6.9%	NA
Less than 9th grade	7.0%	NA	13.4%	NA	5.4%	NA
Economic Activity (Percent total population)						
Labor Force by Gender (Persons 16 years and over)	57.3%	NA	51.5%	NA	53.8%	NA
Males	31.8%	NA	30.0%	NA	32.8%	NA
Females	25.5%	NA	21.6%	NA	21.0%	NA

Source: U.S. Bureau of Census

2.4.3.15 HMS Community Profile: Los Angeles County, CA (San Pedro, Terminal Is. and Long Beach)

Los Angeles County

Los Angeles County has a relatively diverse economy. Agriculture accounted for less than one percent of total income in 1997. Manufacturing contributed the greatest share to the County's non-agricultural income in 1999, followed by health care and social assistance, finance and insurance, whole sale trade and information.

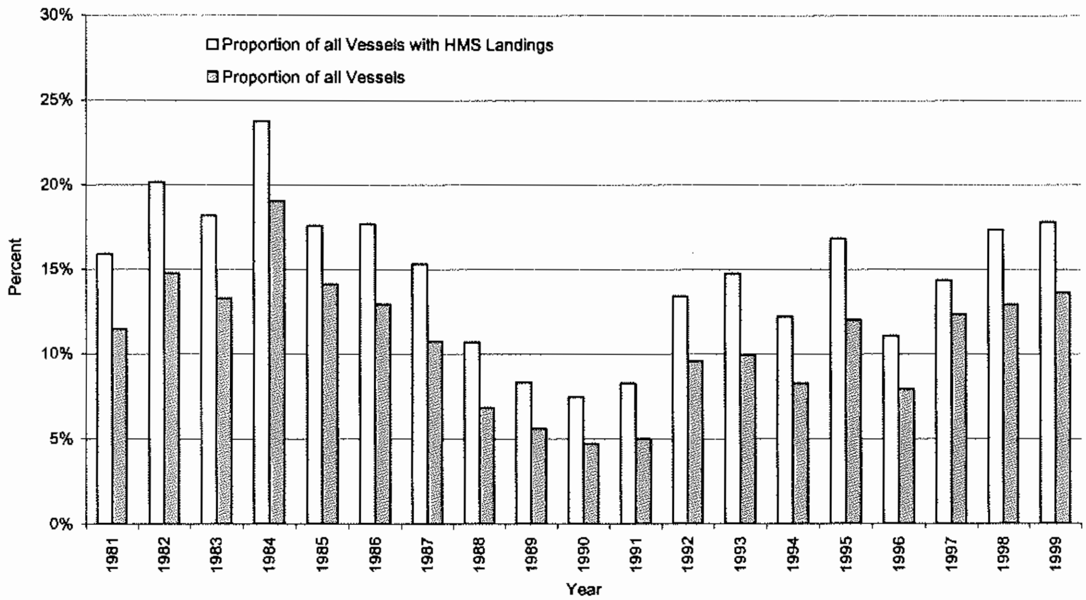
Number of vessels with HMS landings, for which San Pedro, CA is their principal port, by their principal species, 1981-99.

Year	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	18	0		7	35	1	67
1982	8	2		11	61	0	64
1983	7	2		1	51	1	32
1984	11	1		1	68	0	56
1985	6	3		5	41	0	48
1986	3	2		6	39	0	39
1987	6	2		4	29	2	48
1988	2	1		3	20	1	45
1989	1	0		1	16	1	33
1990	0	1		2	12	1	28
1991	5	0		4	6	1	20
1992	10	1		3	11	1	35
1993	10	0		8	12	3	35
1994	0	0		2	21	2	27
1995	6	2		3	19	6	31
1996	1	1		0	13	5	33
1997	8	0		3	20	2	41
1998	10	1		1	19	0	36
1999	11	0		0	21	0	29

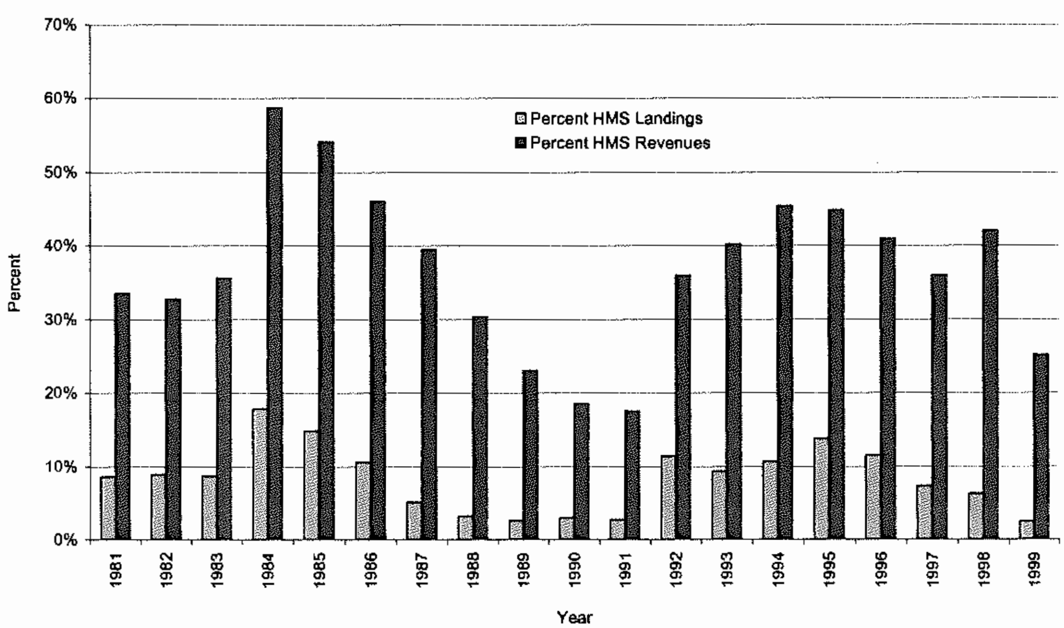
Number of vessels making HMS landings, and HMS landings (mt) and exvessel revenues (1999 $) by species group, San Pedro, CA, 1981-99.

Landings (mt round weight)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	384	144	107		639	244	615	16538
1982	407	94	148		859	429	107	14460
1983	341	56	228		365	539	160	12054
1984	341	166	336		415	1123	359	10147
1985	313	208	784		310	883	226	13543
1986	283	177	1179		172	543	250	18389
1987	281	26	539		119	278	325	21837
1988	253	63	349		115	267	130	24572
1989	229	4	237		106	158	199	25013
1990	215	21	426		57	114	144	23063
1991	194	176	100		61	95	278	23416
1992	194	366	830	2	87	97	1144	18333
1993	224	500	485		155	165	1789	27330
1994	205	52	729	10	116	170	2231	25690
1995	214	318	687		62	98	7313	49829
1996	181	34	2329		99	189	3162	40200
1997	230	441	893	2	71	471	1908	44959
1998	179	535	1175		85	279	498	37659
1999	180	408	10	7	110	559	350	49061
Exvessel Revenues (1999 $)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	384	$521,930	$434,509	$25	$1,029,953	$1,891,539	$1,846,905	$9,279,536
1982	407	$233,756	$466,037	$892	$1,449,187	$3,202,524	$366,710	$8,480,250
1983	341	$134,942	$747,229		$620,926	$3,318,453	$538,603	$6,957,906
1984	341	$344,562	$873,611		$765,809	$6,564,859	$928,581	$5,344,723
1985	313	$351,521	$1,324,880	$120	$626,649	$5,084,331	$491,406	$6,177,301
1986	283	$317,757	$2,892,637		$404,014	$3,935,876	$483,443	$7,322,992
1987	281	$60,879	$2,359,340		$280,127	$2,399,096	$1,370,237	$7,926,227
1988	253	$179,018	$2,092,683		$297,724	$2,096,235	$484,243	$8,752,359
1989	229	$11,133	$574,723		$226,470	$1,272,699	$509,433	$6,917,145
1990	215	$57,969	$811,362	$21	$111,965	$820,905	$325,186	$6,460,494
1991	194	$381,466	$118,548	$240	$111,306	$676,615	$735,209	$7,181,311
1992	194	$1,079,043	$982,892	$4,603	$157,316	$640,636	$1,229,772	$6,382,095
1993	224	$1,150,707	$633,044	$1,519	$280,908	$1,065,088	$2,865,076	$6,452,471
1994	205	$113,709	$1,448,275	$19,791	$209,031	$1,140,323	$2,061,457	$5,096,364
1995	214	$622,339	$1,011,673	$547	$108,320	$715,087	$6,153,052	$9,260,847
1996	181	$45,239	$2,092,217	$802	$186,672	$1,079,931	$2,811,341	$7,791,326
1997	230	$796,911	$1,228,263	$3,207	$137,126	$1,720,144	$1,853,753	$9,783,121
1998	179	$664,096	$1,699,546	$337	$141,466	$1,099,386	$692,053	$5,643,640
1999	180	$682,261	$95,402	$22,849	$204,788	$2,248,648	$708,912	$9,652,978

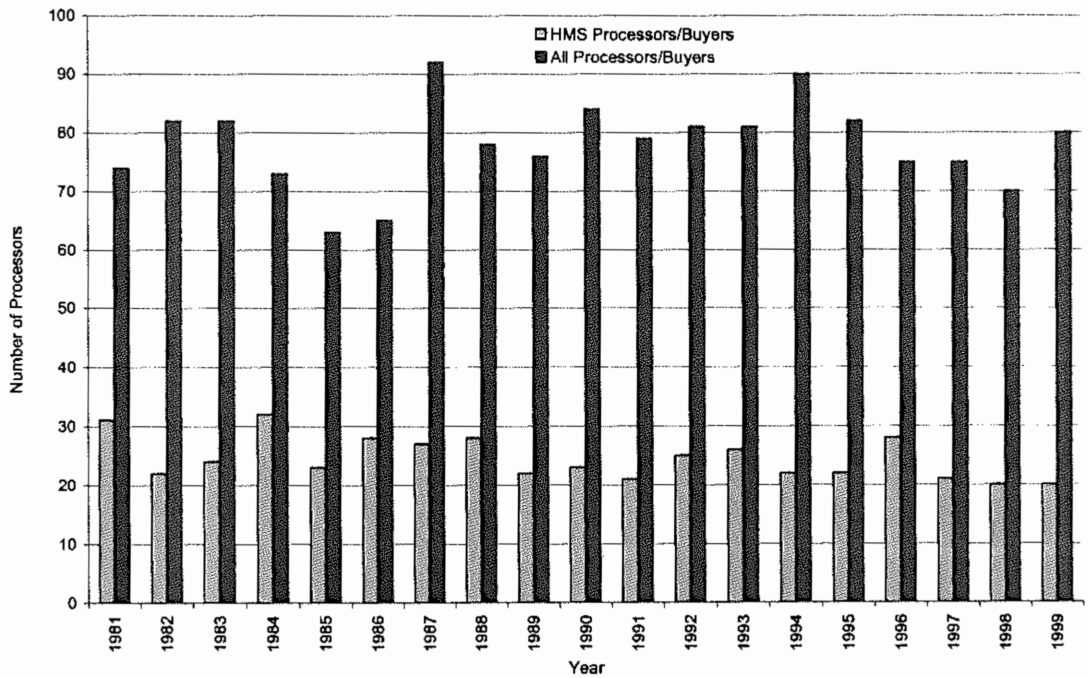
Proportion of vessels whose principal species is a HMS and whose principal port is San Pedro, CA of all vessels making HMS landings, and the proportion of these vessels of the total number of vessels making landings in San Pedro,1981-99.



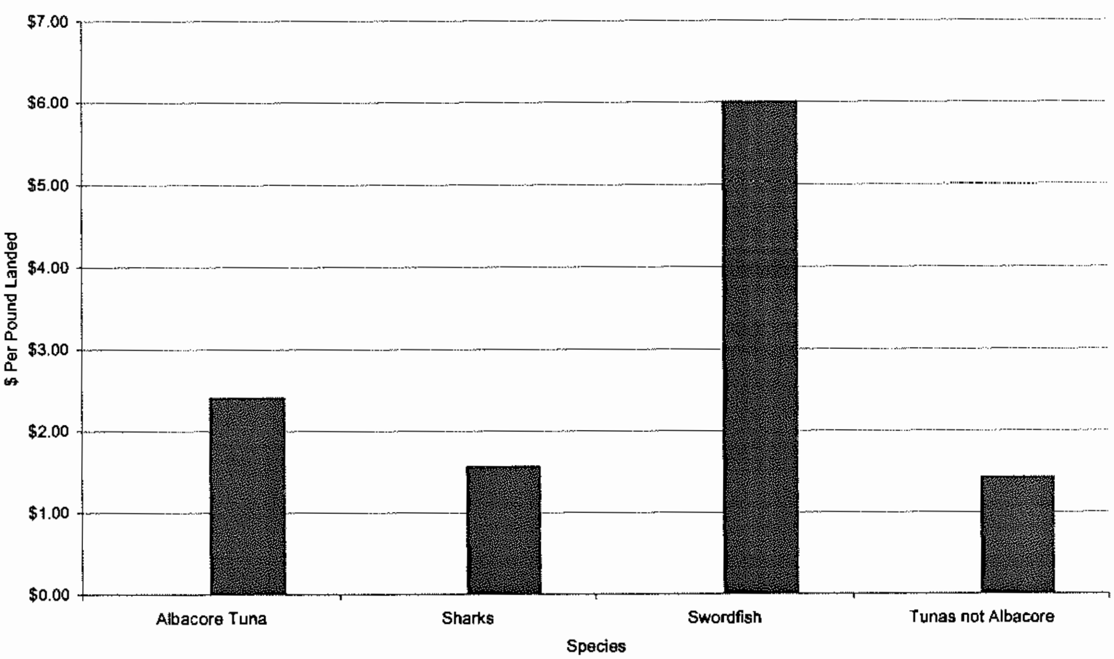
Proportion of HMS landings and exvessel revenues of total landings and exvessel revenues in San Pedro, CA, 1981-99



Number of processors/buyers in San Pedro CA, 1981-99.



Total income multipliers for landings of HMS of species in the port of San Pedro, CA, based on 1996 landings and exvessel revenues.



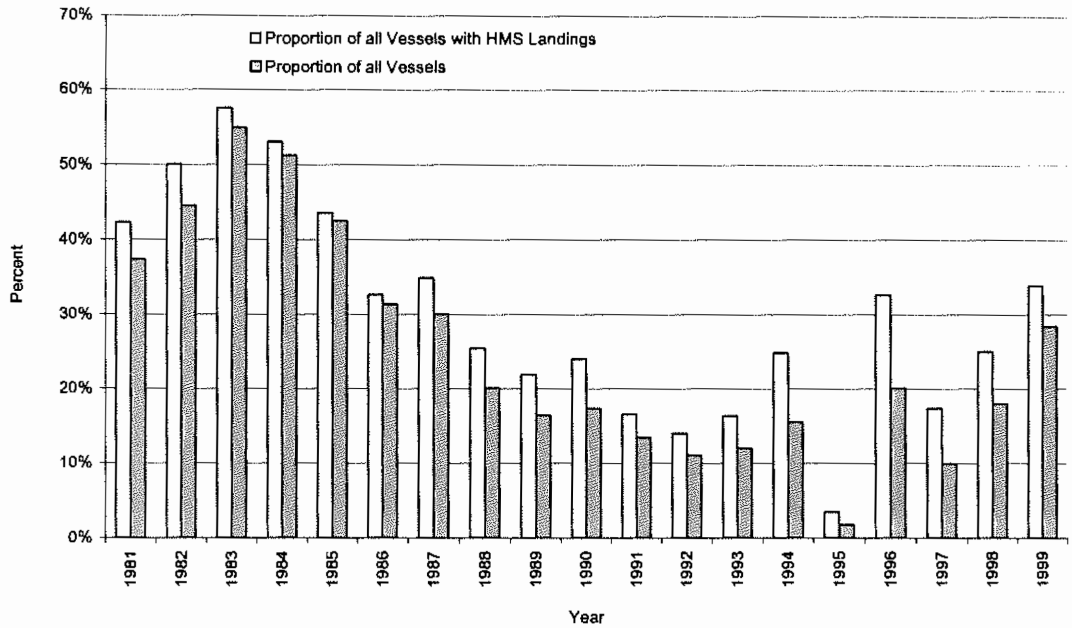
Number of vessels with HMS landings, for which Terminal Island, CA is their principal port, by their principal species, 1981-99.

Year	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	47	0		7	10	54	37
1982	88	1		0	0	57	24
1983	81	0		0	4	61	26
1984	163	0		1	10	37	37
1985	81	2		0	3	22	21
1986	28	3		0	1	16	14
1987	15	0		1	3	26	8
1988	4	1		3	7	26	30
1989	10	1		3	8	18	26
1990	8	2		6	6	13	20
1991	4	0		4	5	10	18
1992	5	0		1	6	7	19
1993	7	0		0	2	8	11
1994	23	0		1	6	8	8
1995	0	0		1	3	0	4
1996	47	2		1	4	5	7
1997	8	1		3	2	7	9
1998	18	1		0	5	14	17
1999	64	1		0	19	5	15

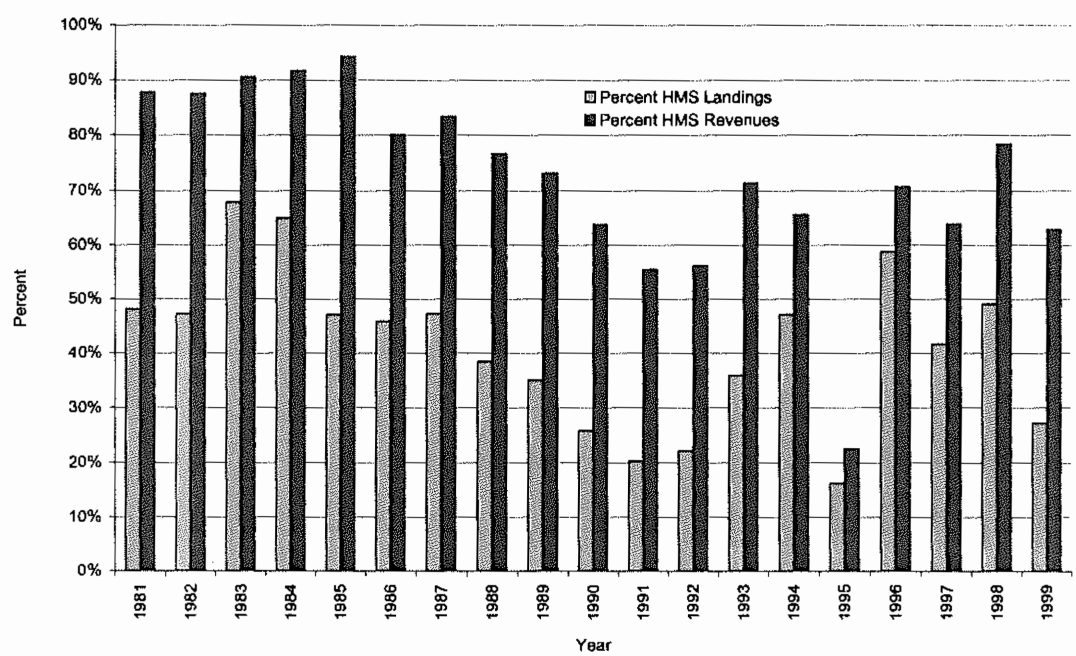
Number of vessels making HMS landings, and HMS landings (mt) and exvessel revenues (1999 $) by species group, Terminal Island, CA, 1981-99.

Landings (mt round weight)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	279	798	629		340	47	67886	74032
1982	292	2069	2132				57324	67525
1983	254	2359	504		2	23	64520	30956
1984	398	8439	287		30	47	50589	31397
1985	248	2904	2410		11	13	18201	26143
1986	147	1137	3536		7	8	22512	31881
1987	129	346	222		19	62	27308	30565
1988	161	397	446		90	93	26537	43439
1989	183	292	773		119	62	21986	41580
1990	146	405	460		83	48	10655	33014
1991	139	131			84	49	7315	29556
1992	136	281	217		16	23	4495	17440
1993	104	241	38			16	6539	12138
1994	153	2037	147		15	36	4317	6525
1995	116	4	4		9	8	2373	10488
1996	181	4119	2316		10	8	5592	6723
1997	121	25	1302		15	18	8682	13175
1998	152	1311	696		14	24	10050	12614
1999	263	3052	6	4	12	618	4852	21955
Exvessel Revenues (1999 $)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	279	$2,757,366	$1,425,867		$561,366	$344,575	$150,629,456	$21,234,234
1982	292	$5,034,551	$3,711,731	$78	$218	$4,444	$101,393,714	$15,110,520
1983	254	$5,059,385	$865,172		$4,064	$136,864	$99,145,118	$10,568,973
1984	398	$18,054,736	$459,391	$13	$57,839	$299,143	$77,763,570	$10,526,780
1985	248	$5,124,753	$2,685,582		$24,964	$94,198	$27,018,109	$7,321,771
1986	147	$1,967,124	$3,671,840		$15,429	$62,549	$25,917,090	$7,846,746
1987	129	$791,594	$270,773		$45,540	$506,160	$36,015,618	$7,395,509
1988	161	$977,855	$830,974		$241,965	$797,310	$41,269,832	$11,045,627
1989	183	$742,689	$921,517		$304,272	$503,318	$28,811,988	$10,370,109
1990	146	$944,131	$505,130		$193,342	$357,967	$12,562,091	$7,527,712
1991	139	$256,676	$2,047		$189,055	$365,748	$7,158,033	$5,768,133
1992	136	$821,439	$178,300		$30,427	$154,165	$3,514,932	$3,066,558
1993	104	$553,745	$32,345		$863	$103,482	$6,196,874	$2,128,505
1994	153	$4,438,703	$149,768	$959	$26,040	$245,048	$4,279,632	$2,604,497
1995	116	$9,248	$5,320		$13,586	$58,227	$2,000,830	$3,347,053
1996	181	$9,216,111	$1,985,066		$20,928	$46,747	$4,817,810	$2,987,631
1997	121	$46,799	$1,380,487	$83	$24,918	$93,502	$8,690,675	$3,437,633
1998	152	$1,679,438	$827,227		$23,549	$110,042	$9,481,354	$3,007,404
1999	263	$5,922,288	$34,610	$9,113	$17,121	$2,157,528	$4,025,438	$5,937,843

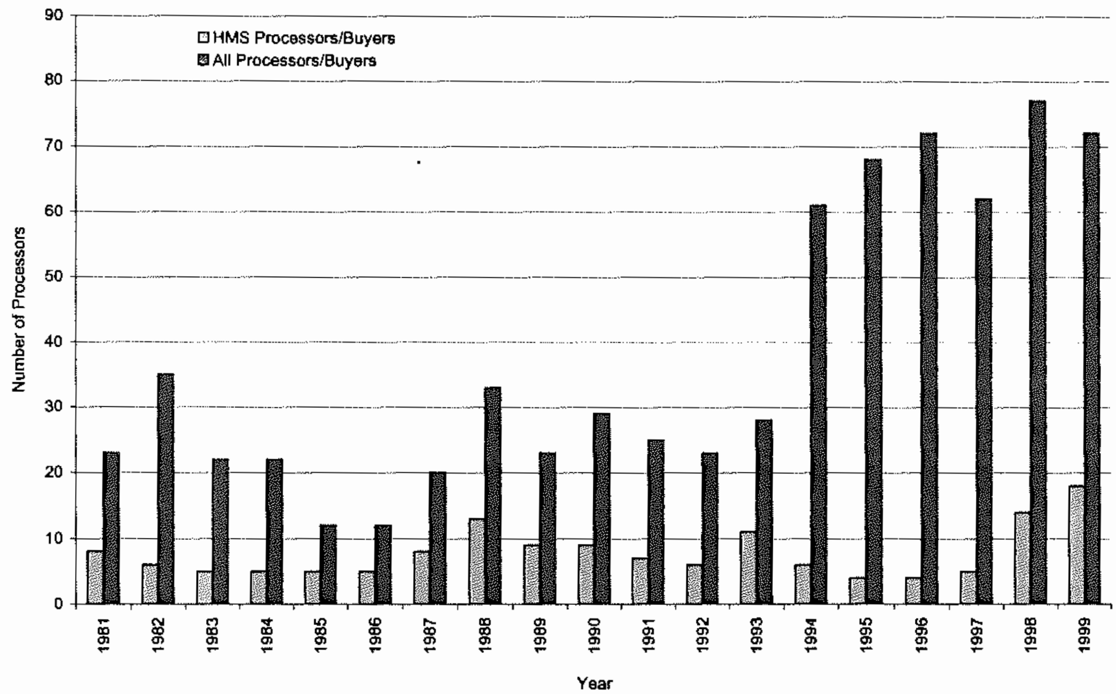
Proportion of vessels whose principal species is a HMS and whose principal port is Terminal Island CA, of all vessels making HMS landings, and the proportion of these vessels of the total number of vessels making landings in Terminal Island, 1981-99.



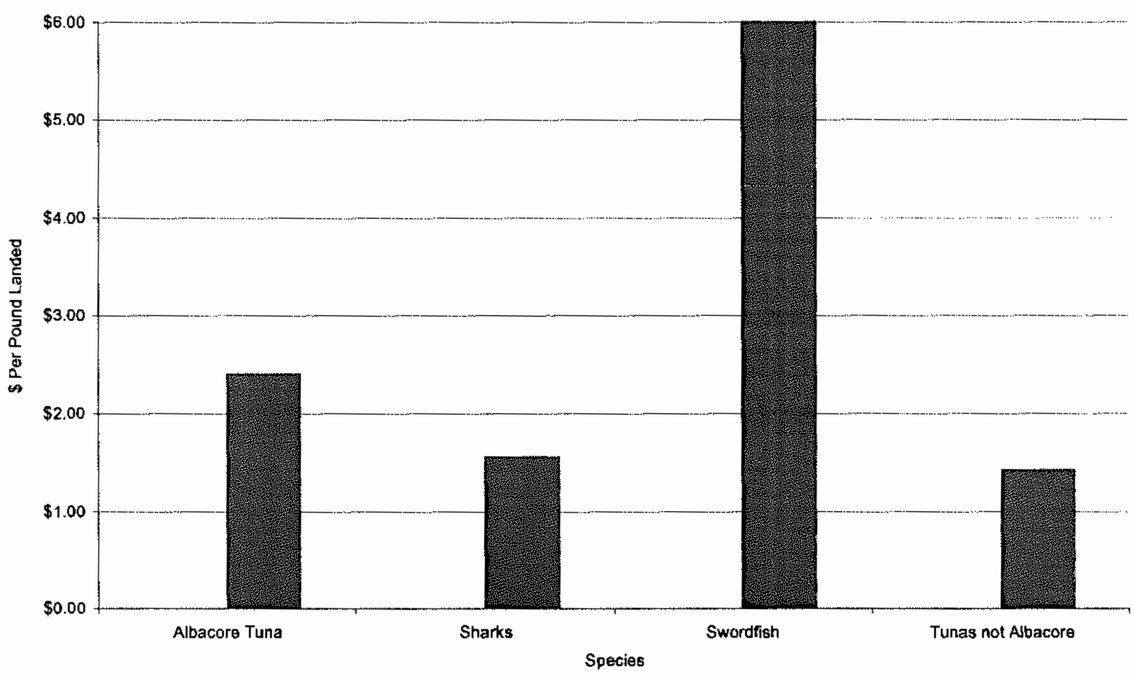
Proportion of HMS landings and exvessel revenues of total landings and exvessel revenues in Terminal Island, CA, 1981-99



Number of processors/buyers in Terminal Island, CA, 1981-99.



Total income multipliers for landings of HMS of species in the port of Terminal Island, CA, based on 1996 landings and exvessel revenues.



Los Angeles County California HMS Communities Demographic Profiles

	County	
	Los Angeles	
	1990	2000
Population (numbers)	8,863,164	9,519,338
Gender (Percent total population)		
Male	49.9%	49.4%
Female	50.1%	50.6%
Race and Hispanic origin (Percent total population)		
White	56.8%	48.7%
Black	11.2%	9.8%
Native American	0.5%	0.8%
Asian or Pacific Islander	10.8%	12.2%
Other Race	20.7%	23.5%
Hispanic Origin (any race)	37.8%	44.6%
Age Structure (Percent total population)		
Under 5 years	8.3%	7.7%
5-9 Years	7.3%	8.4%
10-14 Years	6.6%	7.6%
15-19 Years	7.2%	7.2%
20-24 Years	9.1%	7.4%
25-34 Years	19.8%	16.6%
35-44 Years	15.1%	15.9%
45-54 Years	9.5%	12.1%
55-59 Years	3.7%	4.1%
60-64 Years	3.6%	3.2%
65-74 Years	5.7%	5.2%
75-84 Years	3.0%	3.4%
85 Years and greater	1.0%	1.1%
Median Age (years)	NA	32.0
18 Years and greater	73.8%	72.0%
Male	36.4%	35.1%
Female	37.3%	36.9%
21 Years and greater	68.8%	67.6%
62 Years and greater	11.8%	11.6%
65 Years and greater	9.7%	9.7%
Male	3.9%	4.0%
Female	5.8%	5.7%
Educational Attainment (Persons 25 years and over)		
Graduate or professional degree	4.9%	NA
Bachelor's degree	9.0%	NA
Associate's degree	4.5%	NA
Some college no degree	12.2%	NA
High school graduate	12.8%	NA
9th to 12th no diploma	8.9%	NA
Less than 9th grade	9.6%	NA
Economic Activity		
Labor Force by Gender (Persons 16 years and over)	51.4%	NA
Males	29.2%	NA
Females	22.2%	NA

Los Angeles County California HMS Communities Demographic Profiles

	County	
	Los Angeles	
	1993	1999
Economic Activity (con'td)		
Employment (numbers)		
Agricultural Services, Forestry, and Fishing (SIC-07)	16,066	
Fishing, hunting and trapping (SIC-0900)	250-499	
Mining (SIC-10)	5,123	
Construction (SIC-15)	101,359	
Manufacturing (SIC-20)	690,622	
Transportation and Public Utilities (SIC-40)	200,740	
Wholesale Trade (SIC-50)	282,543	
Retail Trade (SIC-52)	585,600	
Finance, Insurance, and Real Estate (SIC-60)	261,081	
Services (SIC-70)	1,350,118	
Unclassified Establishments (SIC-99)	1,994	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		1,067
Fishing (NAICS-11411)		182
Finfish fishing (NAICS-114111)		100-249
shellfish fishing (NAICS-114112)		0-19
Mining (NAICS-21)		2,505
Utilities (NAICS-22)		8,774
Construction (NAICS-23)		133,103
Manufacturing (NAICS-31)		622,885
Wholesale trade (NAICS-42)		264,354
Retail trade (NAICS-44)		355,417
Transportation & warehousing (NAICS-48)		143,048
Information (NAICS-51)		165,873
Finance & insurance (NAICS-52)		179,710
Real estate & rental & leasing (NAICS-53)		83,203
Professional, scientific & technical services (NAICS-54)		394,384
Management of companies & enterprises (NAICS-55)		81,276
Admin, support, waste mgt, remediation services (NAICS-56)		322,551
Educational services (NAICS-61)		98,345
Health care and social assistance (NAICS-62)		359,599
Arts, entertainment & recreation (NAICS-71)		70,769
Accommodation & food services (NAICS-72)		269,701
Other services (except public administration) (NAICS-81)		165,061
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		21,855
Unclassified establishments (NAICS-99)		4,275
Labor and Proprietor Income ($1,000)		
Agricultural Services, Forestry, and Fishing (SIC-07)	291,207	
Fishing, hunting and trapping (SIC-0900)	0	
Mining (SIC-10)	246,949	
Construction (SIC-15)	2,938,405	
Manufacturing (SIC-20)	22,076,046	
Transportation and Public Utilities (SIC-40)	7,023,070	
Wholesale Trade (SIC-50)	9,622,001	
Retail Trade (SIC-52)	9,082,753	
Finance, Insurance, and Real Estate (SIC-60)	9,805,700	
Services (SIC-70)	38,386,407	
Unclassified Establishments (SIC-99)	41,354	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		26,390
Fishing (NAICS-11411)		5,688
Finfish fishing (NAICS-114111)		0
shellfish fishing (NAICS-114112)		0

Los Angeles County California HMS Communities Demographic Profiles

	County	
	Los Angeles	
	1993	1999
Economic Activity (cont'd)		
Labor and Proprietor Income ($1,000) (cont'd)		
Mining (NAICS-21)		123,678
Utilities (NAICS-22)		552,791
Construction (NAICS-23)		4,708,522
Manufacturing (NAICS-31)		22,226,682
Wholesale trade (NAICS-42)		10,387,402
Retail trade (NAICS-44)		8,193,505
Transportation & warehousing (NAICS-48)		5,197,841
Information (NAICS-51)		10,354,247
Finance & insurance (NAICS-52)		11,129,196
Real estate & rental & leasing (NAICS-53)		2,834,669
Professional, scientific & technical services (NAICS-54)		15,344,357
Management of companies & enterprises (NAICS-55)		5,969,314
Admin, support, waste mgt, remediation services (NAICS-56)		6,842,381
Educational services (NAICS-61)		2,676,351
Health care and social assistance (NAICS-62)		11,739,595
Arts, entertainment & recreation (NAICS-71)		4,306,204
Accommodation & food services (NAICS-72)		3,637,540
Other services (except public administration) (NAICS-81)		3,480,799
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		1,068,632
Unclassified establishments (NAICS-99)		118,648
Number of Establishments		
Agricultural Services, Forestry, and Fishing (SIC-07)	1,769	
Fishing, hunting and trapping (SIC-0900)	30	
Mining (SIC-10)	27	
Construction (SIC-15)	11,659	
Manufacturing (SIC-20)	18,381	
Transportation And Public Utilities (SIC-40)	7,564	
Wholesale Trade (SIC-50)	20,974	
Retail Trade (SIC-52)	42,798	
Finance, Insurance, And Real Estate (SIC-60)	20,792	
Services (SIC-70)	86,395	
Unclassified Establishments (SIC-99)	1,713	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		138
Fishing (NAICS-11411)		26
Finfish fishing (NAICS-114111)		22
shellfish fishing (NAICS-114112)		2
Mining (NAICS-21)		142
Utilities (NAICS-22)		176
Construction (NAICS-23)		12,100
Manufacturing (NAICS-31)		17,753
Wholesale trade (NAICS-42)		21,860
Retail trade (NAICS-44)		27,869
Transportation & warehousing (NAICS-48)		4,867
Information (NAICS-51)		8,076
Finance & insurance (NAICS-52)		10,655
Real estate & rental & leasing (NAICS-53)		11,006
Professional, scientific & technical services (NAICS-54)		24,453
Management of companies & enterprises (NAICS-55)		1,313
Admin, support, waste mgt, remediation services (NAICS-56)		10,649
Educational services (NAICS-61)		2,488
Health care and social assistance (NAICS-62)		22,516
Arts, entertainment & recreation (NAICS-71)		7,749
Accommodation & food services (NAICS-72)		15,839
Other services (except public administration) (NAICS-81)		18,917
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		428
Unclassified establishments (NAICS-99)		3,509

Los Angeles County California HMS Communities Demographic Profiles

Major HMS Ports	San Pedro, Los Angeles Co.		Terminal Island, Los Angeles Co.		Long Beach, Los Angeles Co.	
	1990	2000	1990	2000	1990	2000
Population (numbers)	NA	NA	NA	NA	429,433	461,522
Gender (Percent total population)						
Male					50.5%	49.1%
Female					49.5%	50.9%
Race and Hispanic origin (Percent total population)						
White					58.4%	45.2%
Black					13.7%	14.9%
Native American					0.6%	0.8%
Asian or Pacific Islander					13.6%	13.3%
Other Race					13.7%	20.6%
Hispanic Origin (any race)					23.6%	35.8%
Age Structure (Percent total population)						
Under 5 years					8.8%	8.4%
5-9 Years					7.4%	9.0%
10-14 Years					5.9%	7.7%
15-19 Years					6.4%	7.3%
20-24 Years					10.3%	7.7%
25-34 Years					21.2%	17.2%
35-44 Years					14.7%	15.7%
45-54 Years					8.2%	11.6%
55-59 Years					3.2%	3.7%
60-64 Years					3.2%	2.7%
65-74 Years					6.1%	4.4%
75-84 Years					3.5%	3.4%
85 Years and greater					1.3%	1.2%
Median Age (Years)					NA	30.8
18 Years and greater					74.5%	70.8%
Male					37.4%	34.2%
Female					37.1%	36.6%
21 Years and greater					69.4%	66.1%
62 Years and greater					12.8%	10.6%
65 Years and greater					10.8%	9.1%
Male					4.2%	3.7%
Female					6.6%	5.4%
Educational Attainment (Persons 25 years and over)						
Graduate or professional degree					4.5%	NA
Bachelor's degree					9.8%	NA
Associate's degree					5.1%	NA
Some college no degree					14.1%	NA
High school graduate					13.0%	NA
9th to 12th no diploma					8.0%	NA
Less than 9th grade					7.1%	NA
Economic Activity (Percent total population)						
Labor Force by Gender (Persons 16 years and over)					51.7%	NA
Males					30.1%	NA
Females					21.6%	NA

Source: U.S. Bureau of Census

2.4.3.16 HMS Community Profile: San Diego County, San Diego, CA

San Diego County

San Diego County is a leading producer of some specialized agricultural crops (e.g. avocados). However, because San Diego County's economy is quite diverse, agriculture's share of total County income is relatively small (about two percent in 1977). In 1999, the County's top five non-agricultural sectors in order of descending share of non-agricultural income were manufacturing, professional, scientific and technical services, wholesale trade, health care and social assistance, and retail trade.

San Diego http://www.sdchamber.org/

San Diego's gross regional product (GRP) is forecast to reach $117.3 billion in 2001, an increase of 6.5% over the estimated $110.2 billion in 2000. Adjusted for inflation, the "real" increase will be 3.5%. County population will reach 3.0 million during 2001, with an addition of 50,000 new residents. Payroll employment is forecast to increase by 35,000 to 1,243,300 total jobs.

San Diego continues to experience a gradual increases in agriculture due to specialization in the production of avocados, and nursery and decorative plants. San Diego county ranks as the 10th largest agriculture producer in the nation. It also has the second largest number of farms. Nursery and flower crops account for 62% of the total production.

Even with cuts in military spending, defense continues to play a major role in the economy. In 1997, San Diego received more than $9 billion in expenditures from the U.S. Department of Defense (DOD), a rate second only to Los Angeles County in DOD expenditures and obligations. Military installations include Marine Corps Base Camp Joseph H. Pendleton; the Marine Corps Recruit Depot (MCRD); Marine Corps Air Station at Miramar; Naval Air Station North Island; Naval Station San Diego; and Naval Submarine Base, San Diego. These facilities will continue to train recruits and maintain U.S. military ships and planes. Despite cutbacks in defense revenues, the military will once again become an economic stimulant to the region's growth and fortunes. Past downsizings will be more than recouped as the Navy consolidates to San Diego, and operations in other areas are closed and transferred to the Navy's San Diego mega-port headquarters.

The U.S. Space and Warfare Systems Command (SPAWAR) move from Virginia to San Diego will bring 800 to 1,000 jobs and an operating budget of $4 billion in 1998. The close of the Long Beach Naval Shipyard will transfer millions of dollars in shipbuilding and repair contracts to private San Diego companies. Coronado's North Island NAS will become homeport to three, massive, nuclear-powered aircraft carriers, entailing a substantial upgrading in facilities to accommodate these larger ships.

San Diego is beginning to be seen as an area for emerging technologies, and while aerospace jobs do not have the impact on San Diego like they did in past years, advances and growth in other technology areas, including biomedical, computers and more means there actually is a shortage of highly trained workers needed for high technology jobs. There are more than 100,000 high technology workers in over 500 companies in San Diego. Telecommunications, such as wireless phones, contributes more than $5 billion to the local economy each year.

International trade continues to be a major economic strength for the region. The border between San Diego and Mexico already is the busiest in the world. The San Diego-Tijuana binational economy is further enhanced by NAFTA. Goods moving through the San Diego customs district totaled $23 billion in 1997. Tijuana has become the television producing capital of North America, if not the world, as Asian manufacturers opened manufacturing facilities in the region because of the inducement of NAFTA advantages.

Manufacturing is the largest contributor to the county's gross regional product, accounting for $20.5 billion in 1997, an all-time high, according to the Economic Research Bureau of the San Diego Regional Chamber of

Commerce. Major manufacturing areas include ship building and repair, industrial machinery and computers, metals production, and the manufacture of toys and sporting goods.

San Diego County has many notable medical research institutions within its borders, and a variety of significant biomedical and biotechnological developments have emerged from these facilities. With a 22,000 bioscience employment in 239 companies, San Diego is the third largest concentration of bio-tech industry in the United States. Dr. Jonas Salk, founder of the Salk Institute for Biological Studies in La Jolla, developed the polio vaccine in 1955. Advances in health care and medicine continue to come from the Salk Institute, as well as the University of California San Diego, Scripps Clinic and the La Jolla Cancer Research Foundation.

Retail sales totaled nearly $18.4 billion in 1997. Retail, in general, is expected to continue to grow through the new millennium as millions of square feet of new retail space is projected to be built in the coming years.

San Diego is considered one of the most desirable year-round vacation spots in the nation, and it is regularly ranked in the top ten most popular destinations in the continental United States for international visitors. In 1998 total revenue from visitors topped $4.7 billion. As a result, service industries have seen continued growth in past years, specifically in areas such as dining, lodging, shopping and recreation services.

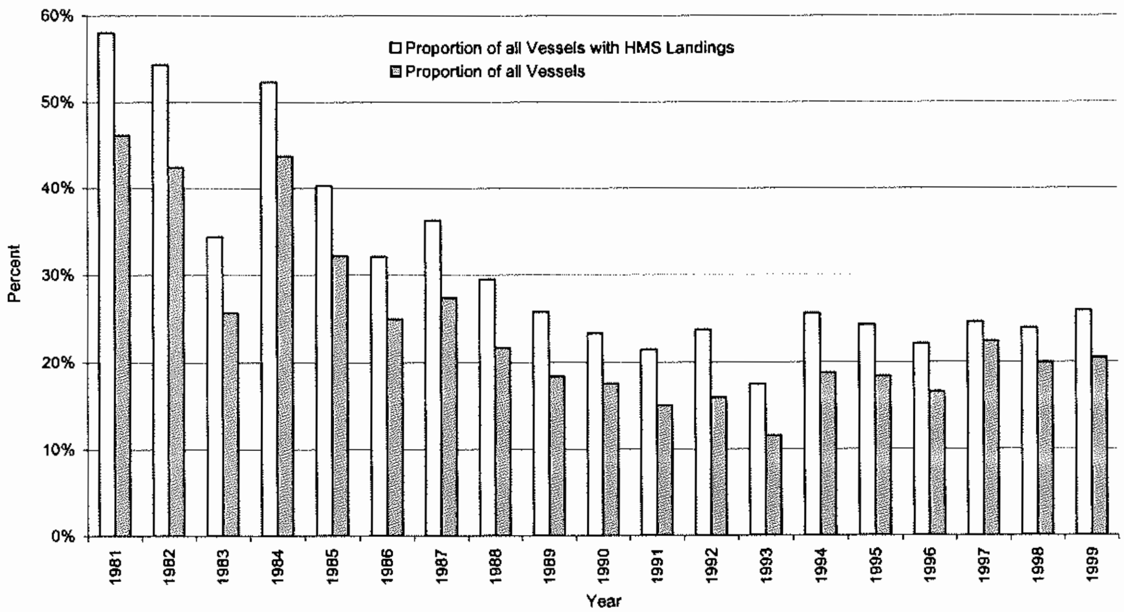
Number of vessels with HMS landings, for which San Diego, CA is their principal port, by their principal species, 1981-99.

Year	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	252	0	1	4	39	73	66
1982	147	1	0	6	58	50	66
1983	23	0	0	4	47	74	52
1984	183	0	0	4	71	16	60
1985	62	2	0	4	61	9	44
1986	7	2	0	3	60	20	36
1987	4	1	0	5	77	13	25
1988	1	6	0	3	63	3	28
1989	2	3	2	3	51	1	47
1990	3	1	0	6	41	6	37
1991	0	0	0	5	37	0	23
1992	1	2	1	2	33	6	24
1993	0	1	0	1	29	0	17
1994	1	1	0	0	42	0	8
1995	1	0	0	3	34	2	10
1996	0	0	0	2	30	2	11
1997	5	1	1	0	28	3	11
1998	2	1	0	0	30	3	19
1999	13	0	0	3	22	0	15

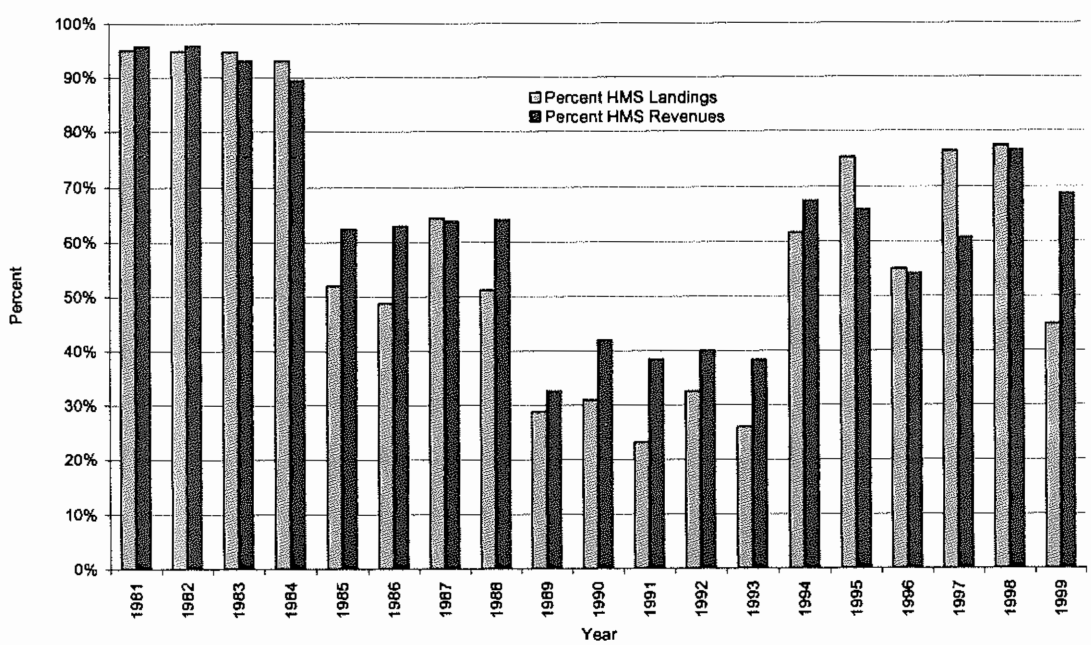
Number of vessels making HMS landings, and HMS landings (mt) and exvessel revenues (1999 $) by species group, San Diego, CA, 1981-99.

Landings (mt round weight)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	636	1305	127	4	559	301	66606	3027
1982	482	1052	125		927	480	47259	1972
1983	431	210	29		549	511	36093	1420
1984	524	1126	9	3	418	702	16497	1128
1985	343	482	4		451	687	31	1186
1986	287	86	4	2	286	788	272	1184
1987	276	33	62		222	533	1464	880
1988	258	13	8		203	505	457	640
1989	241	6	8		249	374	10	596
1990	245	3	5		254	273	7	736
1991	196	2	1		220	219	3	600
1992	190	3	2		91	157	304	666
1993	178	3	5		71	284	5	507
1994	172		8		115	333	115	273
1995	165	16	1		149	264	344	204
1996	154	1	3		123	224	68	254
1997	155	57	4		210	257	295	224
1998	151	51	19	2	155	307	1011	184
1999	147	135	7	2	102	366	12	170
Exvessel Revenues (1999 $)								
Year	Number of Vessels	Albacore	Bluefin Tuna	Dorado	Sharks	Swordfish	Tropical Tuna	Non-HMS
1981	636	$4,504,930	$287,310	$4,287	$943,463	$2,199,070	$137,801,467	$5,281,774
1982	482	$2,644,985	$231,496	$62	$1,563,121	$3,494,819	$89,193,904	$3,308,382
1983	431	$508,379	$49,657	$658	$916,626	$3,206,185	$51,238,257	$3,055,959
1984	524	$2,433,811	$28,618	$5,361	$816,879	$4,769,136	$19,127,914	$2,631,989
1985	343	$805,882	$14,484	$206	$979,953	$4,355,165	$87,875	$3,060,210
1986	287	$150,131	$14,805	$1,080	$631,011	$5,747,038	$421,946	$2,879,544
1987	276	$82,082	$202,303	$494	$582,323	$4,578,373	$2,011,033	$2,413,855
1988	258	$34,141	$38,900	$703	$546,995	$4,233,168	$676,791	$2,201,541
1989	241	$17,916	$49,737	$550	$629,644	$3,026,015	$39,505	$2,262,664
1990	245	$8,568	$24,951	$1,230	$612,640	$2,078,834	$21,406	$2,583,070
1991	196	$5,914	$5,797	$1,102	$516,252	$1,656,932	$12,204	$2,063,246
1992	190	$12,700	$5,641	$1,692	$174,599	$1,023,748	$1,081,977	$2,064,541
1993	178	$5,966	$19,248	$2,050	$149,682	$1,826,305	$16,120	$1,715,752
1994	172	$2,093	$28,771	$43	$217,987	$2,254,273	$127,999	$881,347
1995	165	$31,684	$2,437		$263,450	$1,788,637	$205,928	$811,437
1996	154	$1,116	$8,993	$269	$222,775	$1,319,663	$69,751	$964,854
1997	155	$108,750	$14,124	$1,661	$367,905	$1,378,787	$464,481	$1,242,518
1998	151	$124,381	$82,250	$5,757	$270,905	$1,453,812	$1,015,859	$772,949
1999	147	$220,464	$29,964	$5,759	$187,672	$1,797,294	$91,809	$716,347

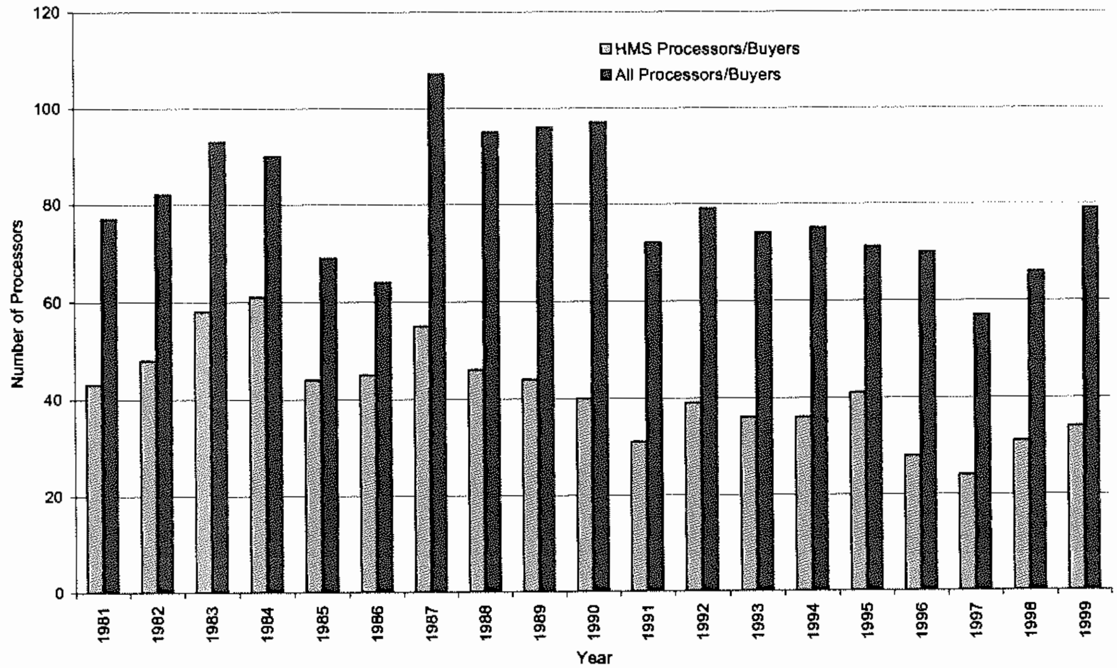
Proportion of vessels whose principal species is a HMS and whose principal port is San Diego, CA of all vessels making HMS landings, and the proportion of these vessels of the total number of vessels making landings in San Diego, 1981-99.



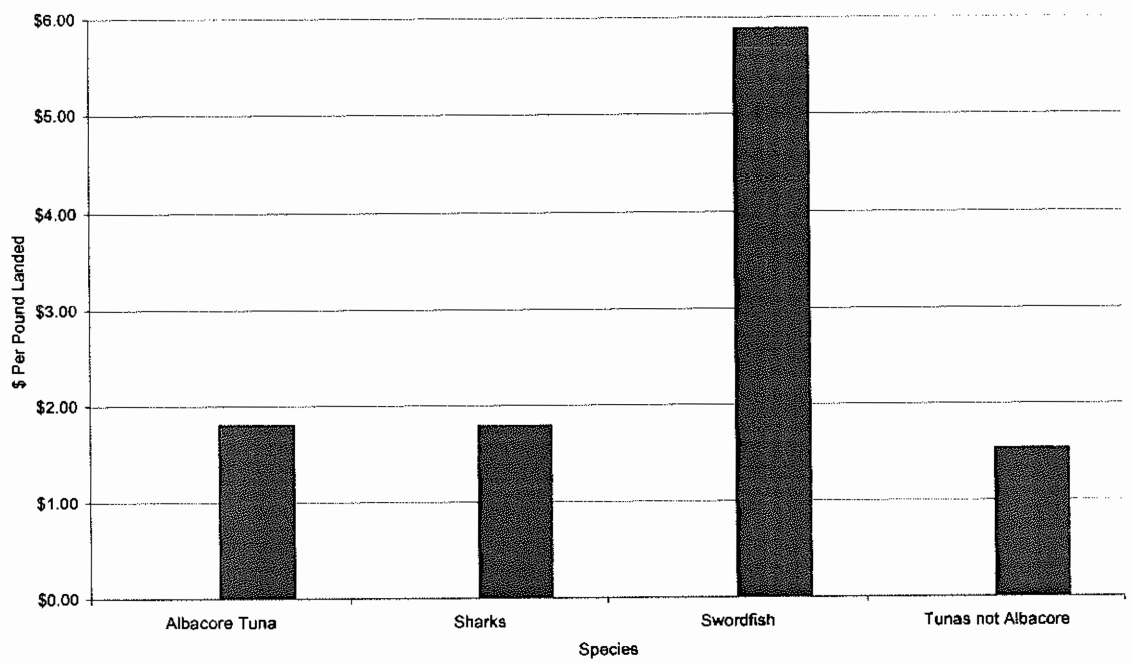
Proportion of HMS landings and exvessel revenues of total landings and exvessel revenues in San Diego, CA 1981-99



Number of processors/buyers in San Diego, CA, 1981-99.



Total income multipliers for landings of HMS of species in the port of San Diego, CA, based on 1996 landings and exvessel revenues.



San Diego County California HMS Communities Demographic Profiles

	County	
	San Diego	
	1990	2000
Population (numbers)	2,498,016	2,813,833
Gender (Percent total population)		
Male	51.0%	50.3%
Female	49.0%	49.7%
Race and Hispanic origin (Percent total population)		
White	74.9%	66.5%
Black	6.4%	5.7%
Native American	0.8%	0.9%
Asian or Pacific Islander	7.9%	9.4%
Other Race	9.9%	12.8%
Hispanic Origin (any race)	20.4%	26.7%
Age Structure (Percent total population)		
Under 5 years	7.8%	7.1%
5-9 Years	7.0%	7.6%
10-14 Years	6.1%	7.1%
15-19 Years	6.9%	7.1%
20-24 Years	10.1%	8.2%
25-34 Years	20.0%	15.8%
35-44 Years	15.2%	16.3%
45-54 Years	8.8%	12.5%
55-59 Years	3.5%	4.1%
60-64 Years	3.6%	3.2%
65-74 Years	6.5%	5.7%
75-84 Years	3.4%	4.2%
85 Years and greater	1.0%	1.3%
Median Age (years)	NA	33.2
18 Years and greater	75.5%	74.3%
Male	38.4%	37.1%
Female	37.1%	37.2%
21 Years and greater	70.0%	69.5%
62 Years and greater	13.1%	13.0%
65 Years and greater	10.9%	11.2%
Male	4.6%	4.7%
Female	6.4%	6.4%
Educational Attainment (Persons 25 years and over)		
Graduate or professional degree	5.5%	NA
Bachelor's degree	10.3%	NA
Associate's degree	5.1%	NA
Some college no degree	16.0%	NA
High school graduate	14.2%	NA
9th to 12th no diploma	6.5%	NA
Less than 9th grade	4.7%	NA
Economic Activity		
Labor Force by Gender (Persons 16 years and over)	53.3%	NA
Males	31.0%	NA
Females	22.2%	NA

San Diego County California HMS Communities Demographic Profiles

	County	
	San Diego	
	1993	1999
Economic Activity (cont'd)		
Employment (numbers)		
Agricultural Services, Forestry, and Fishing (SIC-07)	8,092	
Fishing, hunting and trapping (SIC-0900)	218	
Mining (SIC-10)	376	
Construction (SIC-15)	40,905	
Manufacturing (SIC-20)	123,824	
Transportation and Public Utilities (SIC-40)	35,084	
Wholesale Trade (SIC-50)	44,216	
Retail Trade (SIC-52)	189,414	
Finance, Insurance, and Real Estate (SIC-60)	66,960	
Services (SIC-70)	308,192	
Unclassified Establishments (SIC-99)	438	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		869
Fishing (NAICS-11411)		100-249
Finfish fishing (NAICS-114111)		173
shellfish fishing (NAICS-114112)		0-19
Mining (NAICS-21)		510
Utilities (NAICS-22)		3,733
Construction (NAICS-23)		69,633
Manufacturing (NAICS-31)		116,648
Wholesale trade (NAICS-42)		57,854
Retail trade (NAICS-44)		129,028
Transportation & warehousing (NAICS-48)		18,228
Information (NAICS-51)		34,685
Finance & insurance (NAICS-52)		47,963
Real estate & rental & leasing (NAICS-53)		26,458
Professional, scientific & technical services (NAICS-54)		83,377
Management of companies & enterprises (NAICS-55)		15,013
Admin, support, waste mgt, remediation services (NAICS-56)		96,805
Educational services (NAICS-61)		18,107
Health care and social assistance (NAICS-62)		107,615
Arts, entertainment & recreation (NAICS-71)		23,613
Accommodation & food services (NAICS-72)		111,243
Other services (except public administration) (NAICS-81)		48,939
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		4,165
Unclassified establishments (NAICS-99)		1,287
Labor and Proprietor Income ($1,000)		
Agricultural Services, Forestry, and Fishing (SIC-07)	136,836	
Fishing, hunting and trapping (SIC-0900)	12,427	
Mining (SIC-10)	14,860	
Construction (SIC-15)	1,120,303	
Manufacturing (SIC-20)	4,093,652	
Transportation and Public Utilities (SIC-40)	1,101,077	
Wholesale Trade (SIC-50)	1,379,777	
Retail Trade (SIC-52)	2,718,047	
Finance, Insurance, and Real Estate (SIC-60)	1,976,879	
Services (SIC-70)	7,512,006	
Unclassified Establishments (SIC-99)	9,186	

San Diego County California HMS Communities Demographic Profiles

	County	
	San Diego	
	1993	1999
Economic Activity (cont'd)		
Labor and Proprietor Income ($1,000) (cont'd)		
Forestry, fishing, hunting, and agriculture support (NAICS-11)		35,290
Fishing (NAICS-11411)		0
Finfish fishing (NAICS-114111)		17,152
shellfish fishing (NAICS-114112)		0
Mining (NAICS-21)		27,991
Utilities (NAICS-22)		226,859
Construction (NAICS-23)		2,437,233
Manufacturing (NAICS-31)		4,725,569
Wholesale trade (NAICS-42)		3,841,150
Retail trade (NAICS-44)		2,882,290
Transportation & warehousing (NAICS-48)		496,210
Information (NAICS-51)		1,729,346
Finance & insurance (NAICS-52)		2,387,976
Real estate & rental & leasing (NAICS-53)		754,028
Professional, scientific & technical services (NAICS-54)		4,365,894
Management of companies & enterprises (NAICS-55)		832,118
Admin, support, waste mgt, remediation services (NAICS-56)		2,127,205
Educational services (NAICS-61)		415,383
Health care and social assistance (NAICS-62)		3,235,241
Arts, entertainment & recreation (NAICS-71)		606,403
Accommodation & food services (NAICS-72)		1,476,769
Other services (except public administration) (NAICS-81)		978,818
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		239,521
Unclassified establishments (NAICS-99)		38,867
Number of Establishments		
Agricultural Services, Forestry, And Fishing (SIC-07)	1,172	
Fishing, hunting and trapping (SIC-0900)	50	
Mining (SIC-10)	39	
Construction (SIC-15)	5,052	
Manufacturing (SIC-20)	3,338	
Transportation And Public Utilities (SIC-40)	1,825	
Wholesale Trade (SIC-50)	4,099	
Retail Trade (SIC-52)	13,810	
Finance, Insurance, And Real Estate (SIC-60)	6,975	
Services (SIC-70)	23,065	
Unclassified Establishments (SIC-99)	521	
Forestry, fishing, hunting, and agriculture support (NAICS-11)		142
Fishing (NAICS-11411)		47
Finfish fishing (NAICS-114111)		43
shellfish fishing (NAICS-114112)		4
Mining (NAICS-21)		49
Utilities (NAICS-22)		68
Construction (NAICS-23)		5,665
Manufacturing (NAICS-31)		3,522
Wholesale trade (NAICS-42)		4,218
Retail trade (NAICS-44)		9,274
Transportation & warehousing (NAICS-48)		1,137
Information (NAICS-51)		1,173
Finance & insurance (NAICS-52)		3,749
Real estate & rental & leasing (NAICS-53)		3,982
Professional, scientific & technical services (NAICS-54)		8,343
Management of companies & enterprises (NAICS-55)		381
Admin, support, waste mgt, remediation services (NAICS-56)		3,828
Educational services (NAICS-61)		719
Health care and social assistance (NAICS-62)		6,502
Arts, entertainment & recreation (NAICS-71)		784
Accommodation & food services (NAICS-72)		5,430
Other services (except public administration) (NAICS-81)		5,713
Auxiliaries (exc corporate, subsidiary & regional mgt) (NAICS-95)		130
Unclassified establishments (NAICS-99)		1,096

San Diego County California HMS Communities Demographic Profiles

Major HMS Ports	San Diego, San Diego Co.	
	1990	2000
Population (numbers)	1,110,549	1,223,400
Gender (Percent total population)		
Male	51.0%	50.4%
Female	49.0%	49.6%
Race and Hispanic origin (Percent total population)		
White	67.1%	60.2%
Black	9.4%	7.9%
Native American	0.6%	0.6%
Asian or Pacific Islander	11.8%	14.1%
Other Race	11.1%	12.4%
Hispanic Origin (any race)	20.7%	25.4%
Age Structure (Percent total population)		
Under 5 years	7.3%	6.7%
5-9 Years	6.5%	7.1%
10-14 Years	5.8%	6.5%
15-19 Years	7.3%	7.0%
20-24 Years	10.9%	9.0%
25-34 Years	21.1%	17.7%
35-44 Years	15.3%	16.2%
45-54 Years	8.7%	12.1%
55-59 Years	3.4%	3.9%
60-64 Years	3.4%	3.1%
65-74 Years	6.1%	5.4%
75-84 Years	3.2%	3.9%
85 Years and greater	0.9%	1.2%
Median Age (Years)	NA	32.5
18 Years and greater	76.9%	76.0%
Male	39.2%	38.1%
Female	37.8%	37.9%
21 Years and greater	70.8%	70.8%
62 Years and greater	12.3%	12.3%
65 Years and greater	10.2%	10.5%
Male	4.2%	4.4%
Female	6.0%	6.0%
Educational Attainment (Persons 25 years and over)		
Graduate or professional degree	6.6%	NA
Bachelor's degree	12.0%	NA
Associate's degree	5.0%	NA
Some college no degree	15.1%	NA
High school graduate	12.6%	NA
9th to 12th no diploma	6.0%	NA
Less than 9th grade	5.1%	NA
Economic Activity (Percent total population)		
Labor Force by Gender (Persons 16 years and over)	54.7%	NA
Males	31.5%	NA
Females	23.2%	NA

Source: U.S. Bureau of Census

2.4.4 Estimation of Income Impacts

2.4.4.1 Total Income Multipliers

Economic impact assessments indicate the amount of economic activity, in terms of sales, income and employment, that is generated by the business operations of economic entities within a particular geographic region. The economic impacts associated with harvesting and processing of West Coast HMS can be gaged using the output multipliers from the Fishery Economic Assessment Model (FEAM).[9]

The FEAM model estimates provided here for ports, states and the West Coast region are for the amount of personal income generated within these respective areas associated with HMS commercial fishing activity. To the extent that processing activities, the vessel home port, and the homes of workers and employers in the industry are located within the area under consideration, the more likely the income impacts will occur in that area. To the degree that processing activities, the vessel home port, and the homes of workers and employers in the industry are located outside the area, the more likely the income impact estimates overstate income generated in the area. Where landings are made in one port and the vessel is home ported in another port, or the workers live in another area, or where processors transfer product from one area to another, there are likely some cross-impacts between areas that are not measured, or are attributed to the wrong geographic area. Some cross impacts may be offsetting.

The income impact tables and charts presented here and with the community profiles can be used to provide rough estimates of community income effects associated with HMS commercial landings. These income impact estimates should not be used to address issues requiring more precise estimates, such as allocation issues.

The FEAM model provides total income multipliers derived from 1996 landings of West Coast species by port and gear. In the FEAM model total income impacts account for:

Direct income - exvessel income generated in the region of interest by the harvesting sector of the fishing industry from landings by species, by port and by gear;

Indirect income - income generated in the region of interest by all industries, due to the iteration of industries purchasing from industries in response to landings of a particular species at the exvessel level;

Induced income - represents the expenditures from new household income within the region of interest, generated by the direct and indirect income effects of landings of a particular species.

The FEAM model derived, total income multiplier converts a pound of fish landed into the corresponding sum of direct, indirect and induced income. For example, based on 1996 landings and exvessel revenue data from PacFIN, each pound of albacore landed in Washington generated statewide average total income of $1.93 (see below).

[9] The Fishery Economic Assessment Model (FEAM) was developed by Dr. Hans Radtke and Dr. William Jensen to estimate local, state and regional marginal and average income impacts for West Coast fishery landings. The FEAM model is based on the U.S. Forest Service IMPLAN model enhanced with fishing sector coefficients specific to West Coast fisheries. Documentation of the FEAM model is available from the Pacific Fishery Management Council.

Statewide total income multipliers ($ per pound landed) for landings of HMS in Washington, Oregon and California based on 1996 landings and exvessel revenues.

Species	Washington	Oregon	California
Albacore Tuna	$1.93	$1.91	$2.40
Swordfish	NSL	NSL	$5.21
Shark	$1.51	$1.24	$1.67
Tuna (other than albacore)	NSL	$2.99	$1.42
Ave. Non-HMS Species	$1.87	$1.61	$3.01

NSL = no significant landings.

From a regional perspective, each pound of albacore landed in Washington during 1996 generated average total income of $2.39 along the entire West Coast (see below).

Coastwide total income multipliers ($ per pound landed) for landings of HMS in Washington, Oregon and California based on 1996 landings and exvessel revenues.

Species	Washington	Oregon	California
Albacore Tuna	$2.39	$2.33	$2.42
Swordfish	NSL	NSL	$5.26
Shark	$1.87	$1.51	$1.69
Tuna (other than albacore)	NSL	$3.64	$1.44
Ave. Non-HMS Species	$2.32	$2.03	$3.04

NSL = no significant landings

Swordfish, shark, albacore and other tunas command comparatively higher exvessel, wholesale and retail prices, since substantial quantities of these species enter the higher end fresh fish retail and restaurant trades. Accordingly, the FEAM model statewide total income multipliers for West Coast landings of HMS are relatively high compared to most other species (see below). Therefore, fishing communities that rely heavily on HMS will experience proportionally greater income impacts due to changes in fishing activity compared to those that are mostly dependent on other species. The bulk of swordfish, shark and other tuna landings occur in southern California ports, while landings of albacore are more evenly distributed by state.

Percentage of statewide total income impacts for HMS landings in Washington, Oregon and California based on 1996 landings and exvessel revenues.

Species	Washington	Oregon	California
Albacore Tuna	9.7%	8.7%	6.1%
Swordfish	NSL	NSL	3.1%
Shark	< 0.1%	< 0.1%	0.4%
Other Tuna	NSL	< 0.1%	9.9%
Ave. Non-HMS	1.8%	2.5%	2.1%

NSL = no significant landings

HMS recreational fishing also has an important impact on local, state and regional economies, although this information has not been as fully developed as that for commercial fisheries. In an investigation of the economic impacts of the San Diego Bay CPFV industry, the London Group (1999) found that in terms of total economic impacts this sector generated 1,200 jobs, $25.3 million in earnings, and $49 million in economic output making it a vital contributor to San Diego's economy in 1999 (Table 2-62).

2.4.4.2 Interpretation of Income Impact Estimates

Information provided in this and other sections of chapter two on exvessel revenues, numbers of participating vessels, and community income impacts are indicators of the amount of dislocation (expansion) and dislocational (expansionary) costs (benefits) which may occur in the event of reductions (expansions) of HMS fisheries, but are not indicators of the net loss (benefit) to the nation from such reductions (increases). Estimates of income impacts provide an indicator of one measure of value that is comparable to similar indicators often used to describe the value of activities in non-fishing sectors of the economy: the amount of personal income associated with that activity.

If the activity with which the estimated personal income is reduced, the personal income is not necessarily reduced by a proportional amount. The effect on personal income in the local and national economies will depend on alternative activities available and the location of these activities. If there were a reduction in HMS commercial fisheries, over the long run workers in the fishery, vessel and processing plant owners, and consumers of HMS would be expected to adjust to the reductions by changing the activities in which they engage. The net negative effect of a loss in personal income from a reduction in commercial HMS fishing activities would then have to be reduced by some portion of the value generated by the increased economic activity elsewhere in the economy. The effect on the local economy would differ from the effect on the national economy to the degree that the alternative activities were located outside the local community.

The total income multipliers presented here can be used to indicate the magnitude of the potential redirection of money between non-HMS fishing dependent and HMS fishing-dependent sectors that may occur with changes in HMS fisheries. However, the amount of redirection represents a dislocation which may have economic and social costs beyond those that would be captured by applying these total income multipliers or alternatively, by conducting a typical cost-benefit analysis.

2.5 International Fisheries

Numerous foreign fisheries target and catch species covered by this FMP. These fisheries operate throughout the range of the various stocks. With the exception of the Canadian troll fishery for albacore, no foreign fisheries operate in the U.S. EEZ under the jurisdiction of the Pacific Council. However, each of the foreign fisheries exploiting a common stock with U.S. fisheries may have a direct impact on the abundance of the species in question and may, under international management, affect domestic management measures. Because of the implications, an understanding of the major foreign fisheries is desirable.

2.5.1 Foreign Pelagic Longline Fisheries

Foreign longline fisheries in the context of this FMP can be categorized as industrial fisheries and small-scale or artisanal fisheries.

2.5.1.1 Description of Vessels, Gear and Area of Operations

Industrial Longline Fisheries

Currently, Japan, Korea and Taiwan, and to a lesser extent China, operate large, specialized, industrial longline fisheries for catching tropical tunas, temperate tunas and billfish, including swordfish throughout the Pacific Ocean. In the Pacific Ocean alone industrial longline fisheries operate more than 3,800 vessels fishing for HMS. By comparison the U.S. industrial longline fleet operating in the Pacific is estimated not to exceed 120 vessels with the vast majority operating out of Hawaii. The number of foreign vessels currently operating in the Pacific is not precisely known but are estimated for 1996 and 1997 to be (South Pacific Commission 11th SCTB meeting, WP #5):

Fleet	1996	1997
China	323	131
Japan	1,614	1,614
Korea	156	148
Taiwan	1,330	1,930

Both Spain and Chile operate small industrial longline fleets in the EPO. Spain is reported to have approximately 40 vessels operating throughout the mid-1990s with as few as 10 vessels at the end of the decade. Chile had about 120 vessels operating in the early 1990s in the EPO although the numbers declined to 40 or less by 1996.

Industrial longline vessels in the Pacific range in size from 30 to 1,000+ gross t with the smaller vessels being generally home-based. Larger vessels (50 - 1000+ gross t) may be foreign-based or deck-loaded motherships. Most of the larger vessels are modern, have super-cold (-40 to -60C) freezing capability and can remain at sea up to 3-4 months between fueling stops. These vessels may remain away from home port in excess of a year and return to land their frozen catch. Smaller vessels generally fish closer to home ports.

Longline gear consists of a 40 to 80 km long mainline supported by float lines with approximately 2000 baited hooks on branch lines evenly spaced along the mainline. The spacing of the supporting float lines determines the catenary the mainline assumes and hence the fishing depth of the hooks. Longlines can be selective for target species based principally on the depth of the fished hooks. Standard longlines fish at a maximum catenary depth of about 160 m and deep longlines fish at a maximum catenary depth of 300 m (all have a similar, much shallower minimum depth at buoys). Deep longlining is more effective for bigeye tuna (Sakagawa et al. 1987). Longlines are fished nearly around the clock with setting and retrieving operations taking 8 to 10 hours each. Operations centered on night hours generally target swordfish and day time operations target tunas.

In general, longline operations in the higher latitudes (30 to 50 degrees N & S) produce target catches of albacore and swordfish. Fishing in the subtropics produces a mix of yellowfin, bigeye and albacore tunas, marlins and swordfish. Fishing in tropical waters produces catches of bigeye and yellowfin tunas, marlins and limited amounts of swordfish and albacore. High catches of selected species such as bluefin tuna, marlins and swordfish occur in limited time/area strata on the order of 1 or 2 - 5x5 degree squares over a 2 or 3 month period. Industrial longline fisheries operate in the eastern Pacific Ocean (EPO) (east of 150° W longitude to the U.S. EEZ) and in the remainder of the Pacific Ocean (central-western Pacific or CWP).

Small-Scale Longline Fisheries

Small-scale and artisanal longline fisheries are conducted along the West Coast of Mexico, in the Sea of Cortez as well as around CWP islands. A few other small-scale fisheries may exist along the Central and South American coast line.

The fishery off Mexico is noted as the ponga fishery. Pongas may use longline or gillnet gears and frequently switch. Pongas are small, open, outboard powered vessels 6 to 10 m in length with no fixed facilities. Relatively short longlines of a few miles in length and several hundred hooks are fished on trips 1 or 2 days by 1 or 2 people. The number of pongas operating along the Mexican coast is unknown but likely exceeds 2000 vessels. The fleet is very mobile and often trailered between ports or fishing camps. Vessels seldom range farther than 40 km from shore with most operating closer than 25 km. The fishery targets large and small sharks, swordfish and tunas and lands almost everything caught.

Also operating off Baja California are Mexican longline vessels recently converted from drift gillnet vessels (see section 2.5.4 for a description of these vessels). Little is written about the operations of these longline vessels which are considerable bigger than pongas but smaller than high seas industrial longline vessels. Further south in the EPO Chile operates a small artisanal longline fleet in its EEZ. This fleet has declined from a high of 1,038 in 1991 to 40 in 1996 and as few as 14 in 1997.

The small-scale foreign longline fisheries operating in the CWP include fleets from Australia, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Indonesia, Marshall Islands, New Caledonia, New Zealand, Papua New Guinea, Philippines, Solomon Islands, Tonga, and Vanuatu. The aggregate number of vessels in these fleets has varied between 4,000 and 5,000 vessels in the past few years. These vessels in general are small, ranging between 8 and 33 m in length, and have limited or no freezing capacity and tend to operate relatively close to home ports. Fishing operations are the same as described for industrial longline vessels except that the line length and number of hooks is reduced.

2.5.1.2 Catches and Species Caught

The foreign longline fisheries target tunas, billfishes, swordfish, sharks and other species. Table 2-82 lists the catch of principal species by gear type by geographic area of the Pacific from 1990 to the present. Albacore are divided into north and south Pacific landings based on assumed stock structure. Bigeye, skipjack and yellowfin tunas are by CWP and EPO areas. In general, adequate statistics are kept for tunas and swordfish. Statistics for marlins, sharks and other species are problematic. Scientific estimates as opposed to official statistics are available in some cases (Table 2-82).

A qualitative listing of bycatch species caught in various foreign longline fisheries is generally unavailable. As reported by the SCTB, catch records are incomplete except for target species for many fisheries. However limited observer records are available for some fisheries. Reported catch of non-target and dependent species bycatch for the longline fishery in the CWP was high, at 42% of the total weight landed. Species caught included: blue shark, swordfish, striped marlin, wahoo, sailfish, black marlin, escolars, silky shark, thresher shark, oceanic whitetip shark, and others. No information is available on the catch of protected species.

2.5.2 Foreign Baitboat (Pole-and-line) Fisheries

Foreign baitboat fisheries in the context of this FMP can be categorized as small, or operating in coastal regions or in the vicinity of islands, and large which may also operate on the high seas.

2.5.2.1 Description of Vessels, Gear and Area of Operations

Foreign baitboat fisheries on HMS stocks exist in both the ETP and CWP. In both regions the vessels fish on schooling tropical and temperate tunas. Vessels are generally small with carrying capacities of 100 t or less. These vessels operate in coastal regions or in the vicinity of islands in both the ETP and CWP. The numbers of foreign small baitboats are estimated at 5 in the ETP and 1,550 in the CWP.

In both the ETP and CWP a limited number of large (100-200 plus t capacity) vessels participate in the HMS fishery. These larger vessels may operate on the high seas as well as near shore. Currently the number of these foreign large vessels is estimated at 6 in the ETP and 60 in the CWP.

Countries participating in the baitboat fishery in the ETP in 1996 and 1997 include Ecuador, Mexico, and the United States. Countries participating in the baitboat fishery in the CWP in 1996 and 1997 include Australia, Fiji, French Polynesia, Indonesia, Japan, New Zealand, Palau, Solomon Islands and the U.S.

In the ETP the fishery ranges from the U.S. southern border south to Ecuador in a year-round tropical tuna fishery. In the late spring or early summer baitboats catch bluefin tuna off northern Mexico. In the CWP the tropical tuna fishery operates year round in the tropics and subtropics. A major Japanese baitboat (pole-and-line) fishery for albacore operates in the north Pacific in the first and second quarters of the year extending from Japan across the transition zone to the international date line. Many of these vessels also fish for tropical tunas and the number of vessels fishing for albacore varies from year to year depending on economics, but may range from 80 to 100 in most years, and are included in the totals described above.

Baitboat fisheries for tuna use chummed live bait to attract and hold schools of tuna at the surface. Generally, feathered lures with barbless hooks are attached to sturdy poles, and tuna are lifted quickly from the water in a single smooth movement. The number of poles in action can range from 4 or 5 to more than 20 depending on the size of the vessel. Automatic fishing poles are used on approximately 80% of the largest vessels (200 plus t). Locating an adequate supply of bait fish is an operational limitation for baitboat fisheries. Most bait is caught near shore, "conditioned" to reduce future mortality and transported to the fishing grounds.

2.5.2.2 Catches and Species Caught

The foreign baitboat fisheries target skipjack tuna and to a lesser extent yellowfin, bigeye and albacore tunas. In the CWP, skipjack tuna baitboat catches exceed 200,000 t in recent years with yellowfin tuna catches a distant second at 12,000 t and bigeye tuna catches of 3,500 t. In the north Pacific, baitboat catches of albacore exceed 28,000 t. Table 2-82 lists the catch of principal species by gear type by geographic region from 1990 to the present.

Little documented information on bycatch in baitboat fisheries is available other than the description that bycatch levels are very low. Species specifically mentioned as bycatch include dolphinfish and small billfish.

2.5.3 Foreign Purse Seine Fisheries

2.5.3.1 Description of Vessels, Gear and Area of Operations

Both the ETP and the CWP support major tropical tuna purse seine fisheries. In 1997, 194 purse seine vessels operated in the ETP. Twenty five of this total were U.S. vessels. Of these 194 vessels, 120 (including 6 U.S. vessels) are large "class 6" vessels with carrying capacity of 363 t or greater, and many are 1000 t or more. The remainder ranged from 46 t carrying capacity to 363 t. The purse seine fishery operates year round from the U.S. border south to Peru and as far west as 140° W longitude at about 10° N latitude. In recent years the purse seine fishery has had participation from Colombia, Ecuador, Mexico, Panama, Vanuatu, Venezuela, Belize, Cyprus, Honduras, Spain, Taiwan, Costa Rica, Liberia, Bolivia and the U.S.

The CWP had 601 participants in the tropical tuna purse seine fishery in 1997, ranging in capacity from < 46 t to over 2,000 t. The number of large purse seine vessels (>363 t) is estimated to be more than 150, including 35 U.S. vessels. This fishery operates year-round throughout the CWP. Participants in recent years include Australia, Federated States of Micronesia, Japan, Kiribati, Korea, New Zealand, Papua New Guinea, Philippines, Solomon Islands, Taiwan, U.S. and Vanuatu.

Purse seines are variable in size from a few hundred meters to over 2000 m in length and from tens of meters to several hundred meters in depth. Despite size, all purse seines are generally operated in a similar fashion. The vessel rapidly steams around a school of fish paying out the net, often aided by a small skiff attached to the end of the net. The top of the net floats on the surface and bottom of the net is weighted to sink it rapidly. The bottom of the net encircling the fish school is drawn or "pursed" by cable forming a bag enclosing the fish. The net is drawn onboard and the fish removed to the hold. These vessels may range from approximately 20 to 30 m in length to over 80 m in length.

2.5.3.2 Catches and Species Caught

The international purse seine fishery targets yellowfin and skipjack tunas, although substantial quantities of bigeye tuna also are taken. Much smaller quantities of bonito, albacore and black skipjack also are taken. In the EPO in 1997, purse seine catches of yellowfin, skipjack and bigeye tunas exceeded 250,000 t , 150,000 t and 50,000 t, respectively. In the CWP in 1997, purse seine catches of yellowfin, skipjack and bigeye tunas exceeded 230,000 t , 600,000 t and 28,000 t, respectively. Table 2-81 lists the catch of principal species by gear type by geographic region from 1990 to present. The bycatch may be large for operations on floating objects and smaller for operations on free-swimming schools of fish, and includes small tunas, sea turtles, sharks, and other fishes. In the ETP there is a substantial bycatch of marine mammals which is currently regulated by international agreement.

Since 1976, aquaculture farms in various countries have been developed to raise bluefin tuna for a specific market. Port Lincoln, Australia is probably the best known bluefin aquaculture development, but there are several other operations around the world in Croatia, Malta, Morocco, Spain, Portugal and Mexico.

Mexico's first successful bluefin tuna farm was established in 1997. This farm has been supplied bluefin by U.S. vessels fishing off the coast of California and Mexican vessels fishing off Mexico. In 1998 and 1999, transhipment permits authorized under Section 204(d) of the Magnuson-Stevens Fishery Conservation Act were issued to three Mexican vessels for transhipping bluefin tuna caught by U.S. vessels. The permits were valid for the calendar year, but were never used; however, in those years U.S. vessels harvested bluefin emptied their catch into towing cages, which were then towed to Mexico. Towing fish from U.S. waters is a direct export to Mexico and does not fall within the purview of the U.S. Customs Service. There are no reporting requirements for U.S. vessels; however, in 1998 and 1999, information available indicates that less than 100 mt was delivered, and in 2001 and 2002, less than 200 mt. This was all live fish. The bluefin are fattened and sold at a premium price, mainly to Japan's sashimi market. Farmed bluefin get an average of $25,000 for 25 to 30 kg fish and $30,000 for 40-45 kg fish on the Japanese market. Ninety-five percent of the bluefin has been exported to Japan, while the other five-percent was sold primarily in San Diego and Los Angeles restaurants. Exported fish are commonly brought into the U.S. in bond, then flown to Japan.

In the Fall of 2001, a second farm was opened in Mexico, and Mexican fishing authorities have approved the building of four additional farms. These facilities have been granted a quota by Mexico of 120 mt each. Only three cages per farm will be allowed with a volume of 40 t per cage.

In July 2002 a transhipment permit was issued to one Mexican vessel for the purpose of transporting live tuna in a fish cage from U.S. waters south of 38° N. latitude (Pt. Reyes) to the Mexican Exclusive Economic Zone. Foreign vessels have reporting requirements. The permit is valid for calendar year 2002.

2.5.4 Foreign Gillnet Fisheries

Foreign gillnet fisheries in the context of this FMP can be categorized as drift gillnet and gillnet fisheries, the principal distinction being size of nets used (industrial vs artisanal).

2.5.4.1 Description of Vessels, Gear and Area of Operations

A ponga gillnet fishery for sharks and swordfish exists in Mexico's nearshore areas. The ponga fishery uses both longlines and gillnets and is described in 2.5.1.1. This fishery lands virtually all fish it catches, with sharks being the main target.

A small drift gillnet fishery operates in the EEZ of Mexico. Approximately 31 vessels participated in the fishery in 1993; no estimates of current participation levels are available, although it is likely to be lower than the 1993 level because the Mexican government is encouraging the conversion of these vessels to longline gear (see 2.5.1.1). These vessels are similar in description and operation to those in the California drift gillnet fishery described in section 2.2.4.1. Many of these Mexican vessels are reported to be skippered by U.S. fishers.

The drift gillnet fishery begins near Ensenada and the U.S. border in the late summer and moves south along the Baja California peninsula generally remaining within 100 miles of shore. The peak landings from the fishery occur October through February. The fishery operates year-round.

2.5.4.2 Catches and Species Caught

This fishery targets swordfish (12%), sharks (Alopias sp., Isurus oxyrinchus., unspecified spp; 25%), tunas (19%) and marlins (1%). Reported bycatch from this fishery includes sunfish (19%), sea turtles (2%) and other finfish (22%).

2.5.5 Foreign Troll Fisheries

Numerous troll fisheries exist for both tropical tunas and albacore in the north and south Pacific. Excepting the albacore troll fisheries, most of the troll fisheries are small-scale, and in some cases artisanal.

2.5.5.1 Description of Vessels, Gear and Area of Operations

A foreign troll fishery for north Pacific albacore exists within the EEZ along the U.S. West Coast and is comprised exclusively of Canadian vessels. This fishery is authorized by the U.S./Canada Albacore Treaty (section 1.5.2). The vessels, gear and area of operations are essentially identical to that of the U.S. albacore troll fleet (Section 2.2.1). In 1997, 1998 and 1999 approximately 200 Canadian troll vessels applied for permission to fish in U.S. EEZ waters under the U.S./Canada albacore Treaty, with about 20 vessels landing albacore in the U.S. and an unknown number of vessels (>20) actually fishing in the U.S. EEZ and landing in Canada. The total number of Canadian troll vessels fishing for north Pacific albacore both inside and outside the U.S. EEZ is estimated to be greater than 200 vessels.

In the south Pacific, albacore foreign troll fisheries include Australia, French Polynesia, New Zealand, Fiji, Cook Islands, Belize, Sweden, Tonga and Ecuador. The number of vessels participating is not available. Foreign troll fisheries for tropical tunas include Australia, Fiji and others. The number of vessels participating is not available.

2.5.5.2 Catches and Species Caught

Total catches of north Pacific albacore by the Canadian troll fishery were 3,034 mt in 1998. No other foreign troll fisheries reported north Pacific albacore catches.

Catches of south Pacific albacore by foreign troll vessels in 1998 included New Zealand (3,303 mt), French Polynesia (trace), Australia (35 mt) and other (129 mt). Table 2-82 lists the catch of principal species by gear type by geographic region from 1990 to the present.

Catches of tropical tunas (yellowfin, bigeye and skipjack tunas) by troll gear are generally small and unavailable or aggregated in reporting statistics. See Report of the 12th Meeting of the Standing Committee on Tuna and Billfish and the Annual Report of the Inter-American Tropical Tuna Commission for catches by miscellaneous gear types.

Bycatch for the north and south Pacific albacore troll fisheries are essentially the same as described for the respective U.S. fisheries. No specific bycatch information is available for the tropical troll fisheries.

2.6 Consumers

Seafood consumption in the U.S. increased 3.6% with Americans consuming 4.2 billion pounds of domestic and imported seafood in 1999, or 15.3 pounds per person; the per capita consumption level of 15.3 pounds per person represents an increase of 0.4 pound from the 1998 level (Figure 2-41 and Tables 2-83, 2-84 and 2-85)(NOAA, http://www.publicaffairs.noaa.gov/releases2000/aug00/noaa00r138.html).

Of the 15.3 pounds of seafood consumed per person, 10.4 pounds were fresh or frozen fish or shellfish, 4.6 pounds were canned seafood, and 0.3 pounds of seafood was cured. Compared to 1998 figures, that represents a 0.2 pound increase in both the fresh/frozen and canned products. The consumption of shrimp (all preparation) achieved a record 3.0 pounds consumed per person.

Total U.S. supply of edible fishery products on a round weight basis was down 1.3% in 1999. While U.S. landings for human consumption declined by 4.8%, imported fish and shellfish increased 9.0% in 1999, comprising 66% of the seafood consumed in the United States. U.S. exports increased by 11.3%. Inventories of frozen seafood in cold storage dropped slightly, declining 4.9% from the 1998 level. Tuna was the most heavily consumed fish by per capital consumption (Table 2-86) (http://www.annapolisseafoodmarket.com/toptenlist.htm).

Two studies indicate that California consumers are concerned about the safety and quality of the seafood they buy and prefer to purchase local products when available. The first study, summarized first below, indicates that California consumers are not only interested in the quality and safety of the seafood they eat but also place importance on where that seafood comes from. They are also willing to pay more for seafood labeled from California.

AUS Consultants/ICR Survey Research Group in cooperation with A.E. Sloan & Associates, Inc. sampled 804 California consumers in 1992 about their seafood consumption habits. The results of the survey are summarized below:

- 69% of consumers reported eating seafood at least once a month.
- Nearly one third ate seafood at least once a week.
- Only 6% never ate seafood.
- Household income was a strong determining factor in level of consumption, the higher the income, the more likely the respondent was to buy seafood.
- Of those who considered the seafood origin to be important or very important, the main reason given by 49% was safety. Safety considerations included fear of contamination in certain areas, and safety of the fish itself. 8% specifically said they believed that local seafood would be safer.

- Heavy seafood consumers were significantly more likely than non-users to cite freshness as their reason for considering seafood origin to be important (43% vs. 18%).
- Those with incomes of $25,000 per year or more were significantly more likely to feel the quality of the fish was an important consideration compared to those making less than $25,000 (13% vs. 2%).
- When asked about their preference of origin for fish in general, California was preferred more than any other origin, by one-third (33%) of the total respondents. Northern Californians were considerably more favorable toward fish caught in their own state than were those from the south with 41% preferring fish from California waters compared to 27% from the South. The reasons cited were: 25% because it is local and 13% because it supports California industry.
- The heaviest seafood consumers were also the most favorable toward California caught fish with 41% preferring California seafood.
- In total, half of the respondents (50%) indicated that they would purchase California seafood more frequently if it were clearly identified.
- Those living in rural areas were especially interested in the California label with 59% of them saying they would purchase California seafood more often compared to just 45% of suburban dwellers.
- Of those respondents who prefer seafood caught in California or who would purchase it more frequently if it were clearly identified, nearly 3 in 5 (59%) said they would be willing to pay a little more for California fish. In northern California 66% were willing to pay a little more.

The next study began in December 1994 and was a pilot program to determine California consumers willingness to buy California caught and identified or branded seafood product (Marciel A. Klenk pers. com. January 18, 2001). In the study, retailers tested this by placing two trays of the same species side by side and identifying the California catch with the California seafood hallmark. The results from the project indicate that, when clearly identified as local, California seafood generally sells out more quickly than unbranded seafood of the same type.

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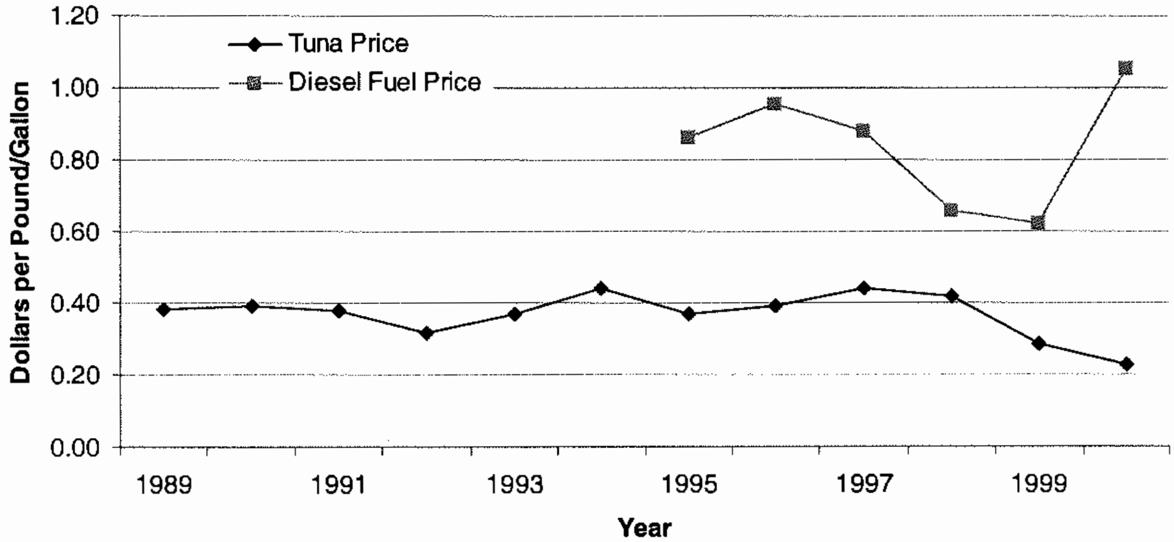


Figure 2-1. Average Samoa 4 to 7.5 pound Tuna and Diesel Fuel Prices, 1989-2000.

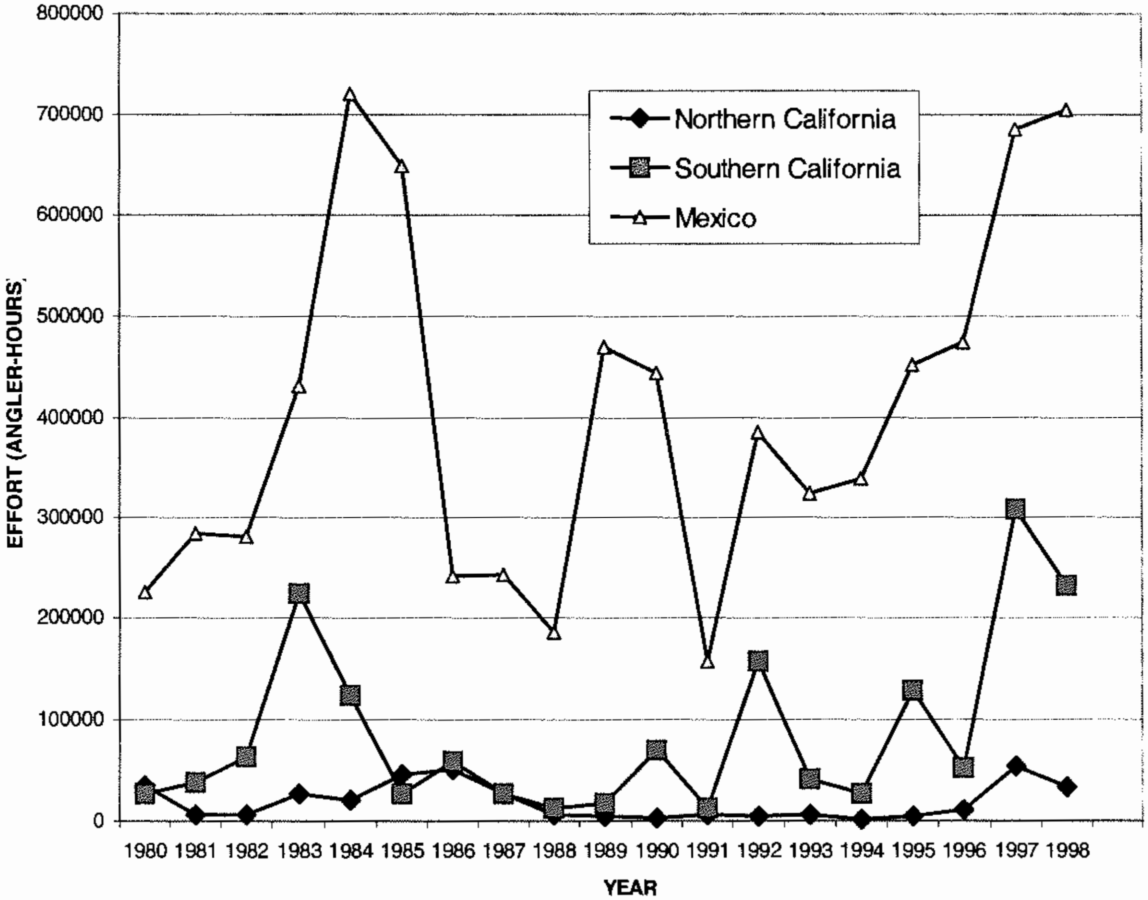


Figure 2-2. Total CPFV logbook reported HMS fishing effort, 1980 - 1998

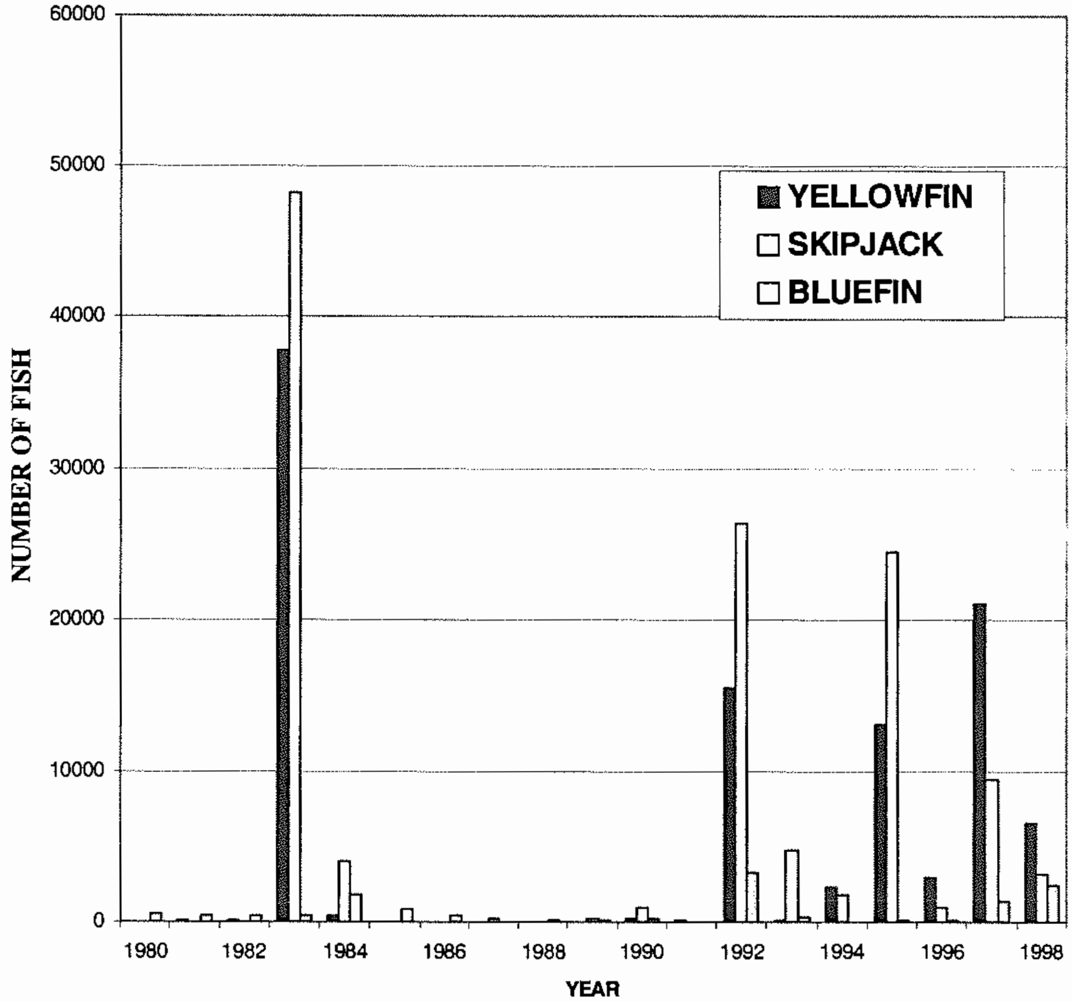


Figure 2-3. California CPFV Tuna Catch, 1980 - 1998

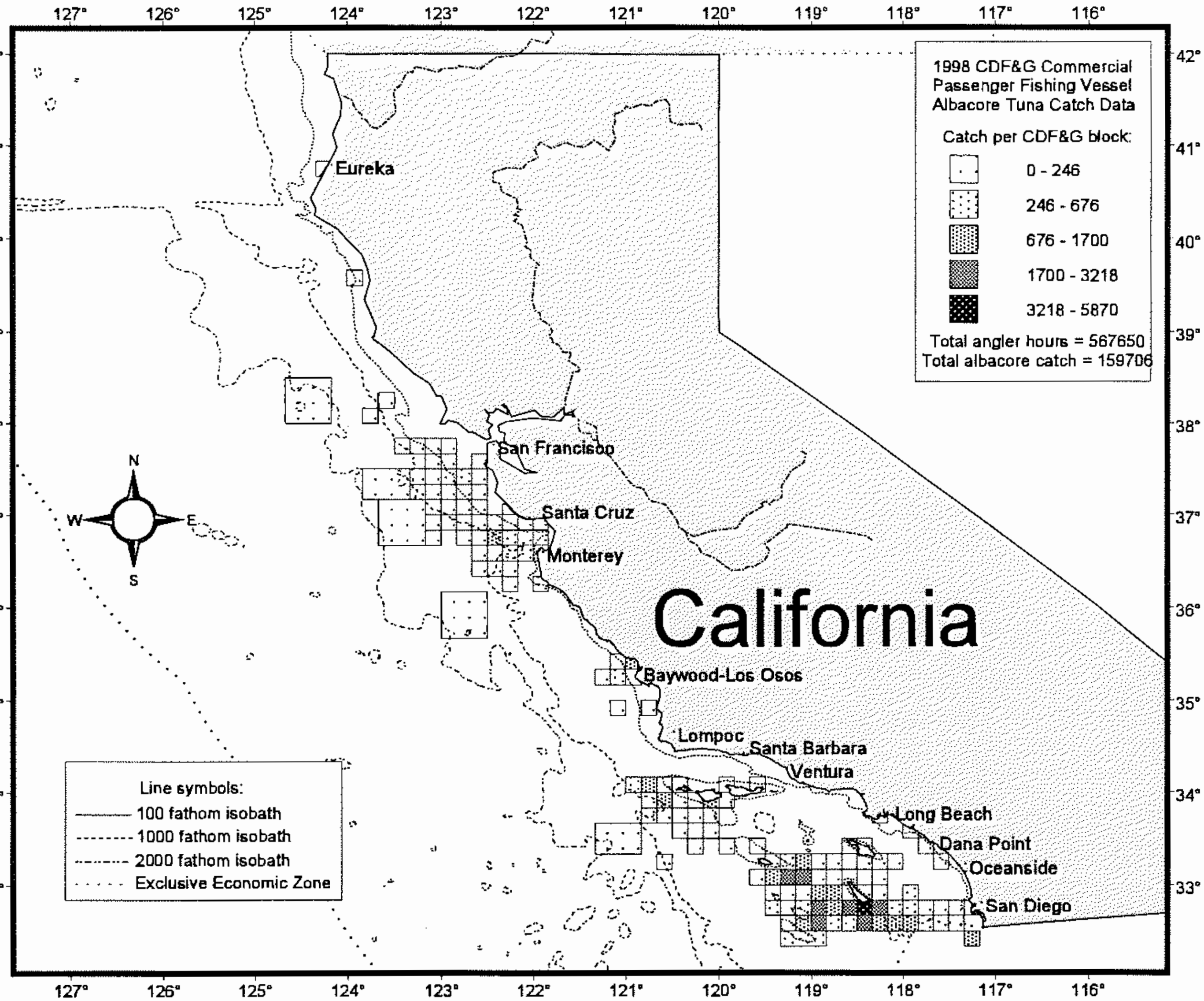


Figure 2-4. California CPFV catch for 1998, by CDFG block number for albacore.

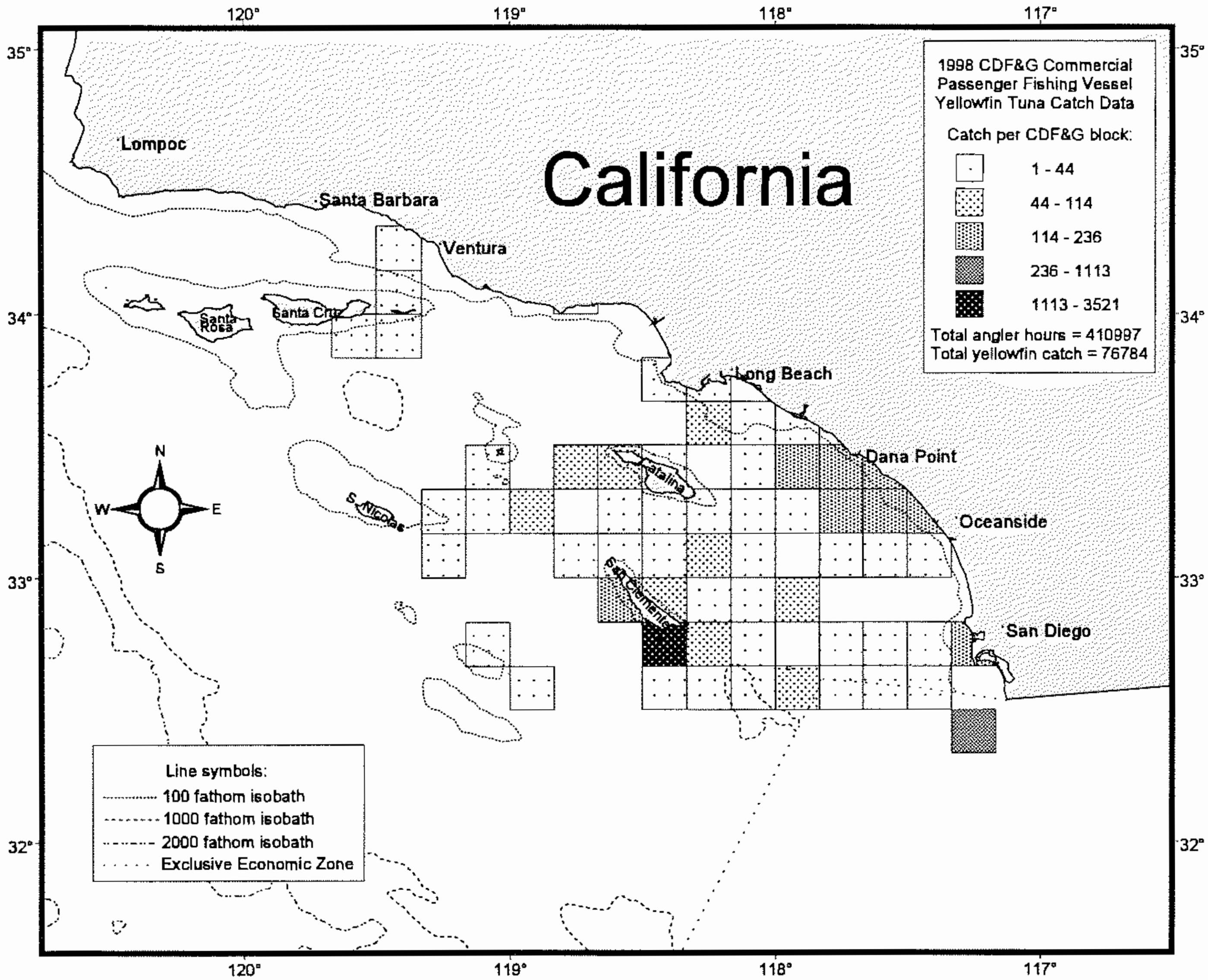


Figure 2-5. California CPFV catch for 1998, by CDFG block number for yellowfin tuna.

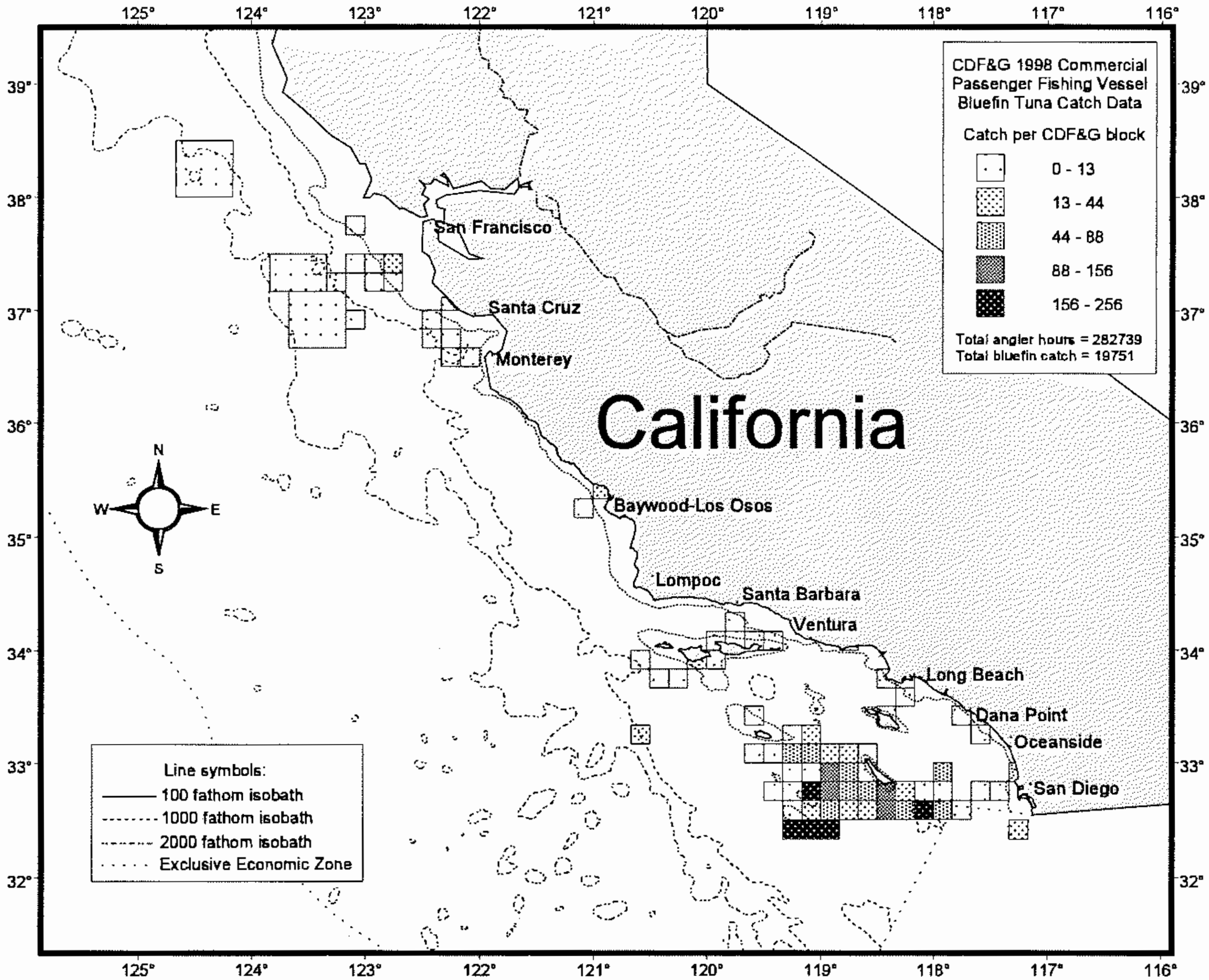


Figure 2-6. California CPFV catch for 1998, by CDFG block number for bluefin tuna.

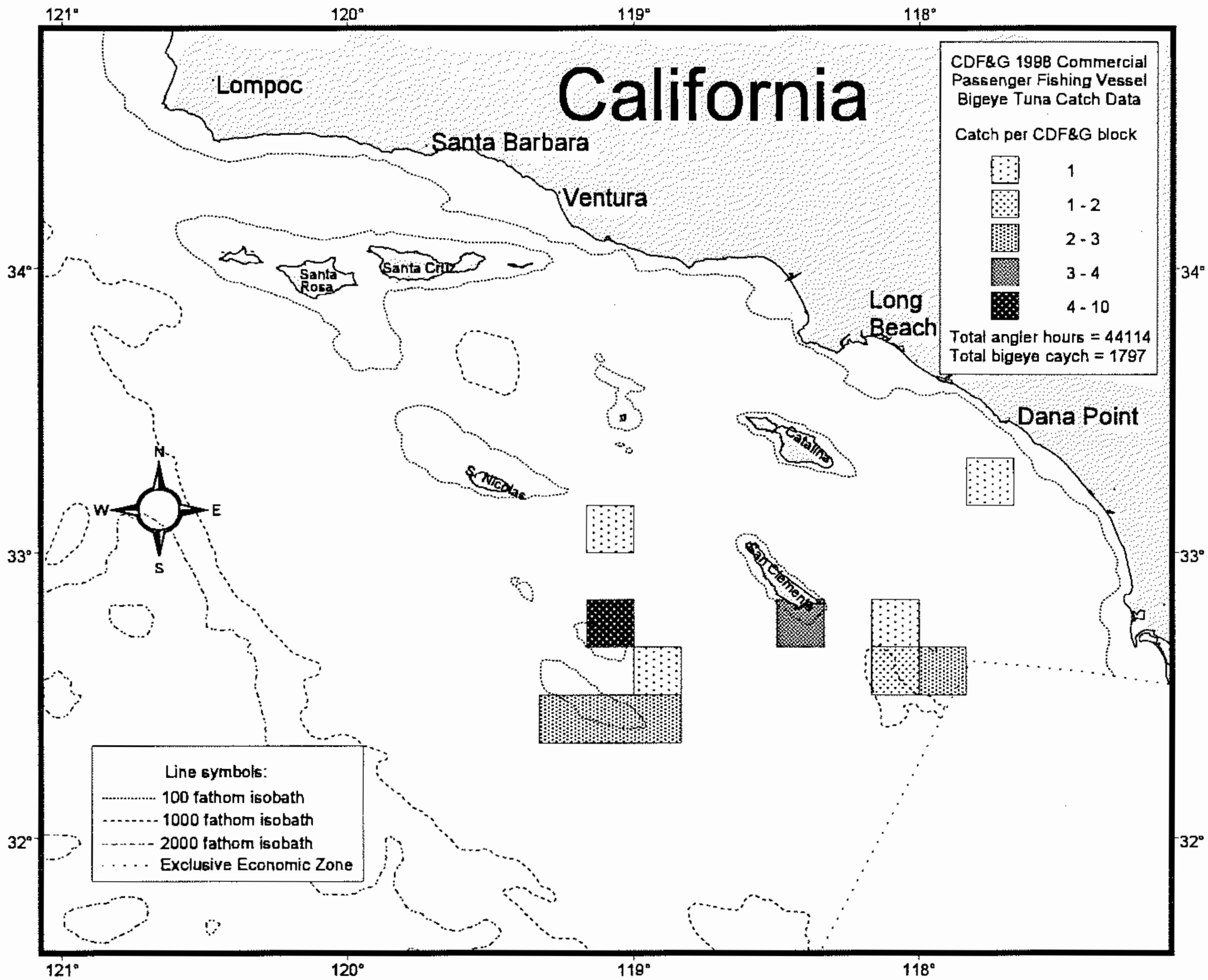


Figure 2-7. California CPFV catch for 1998, by CDFG block number for bigeye tuna.

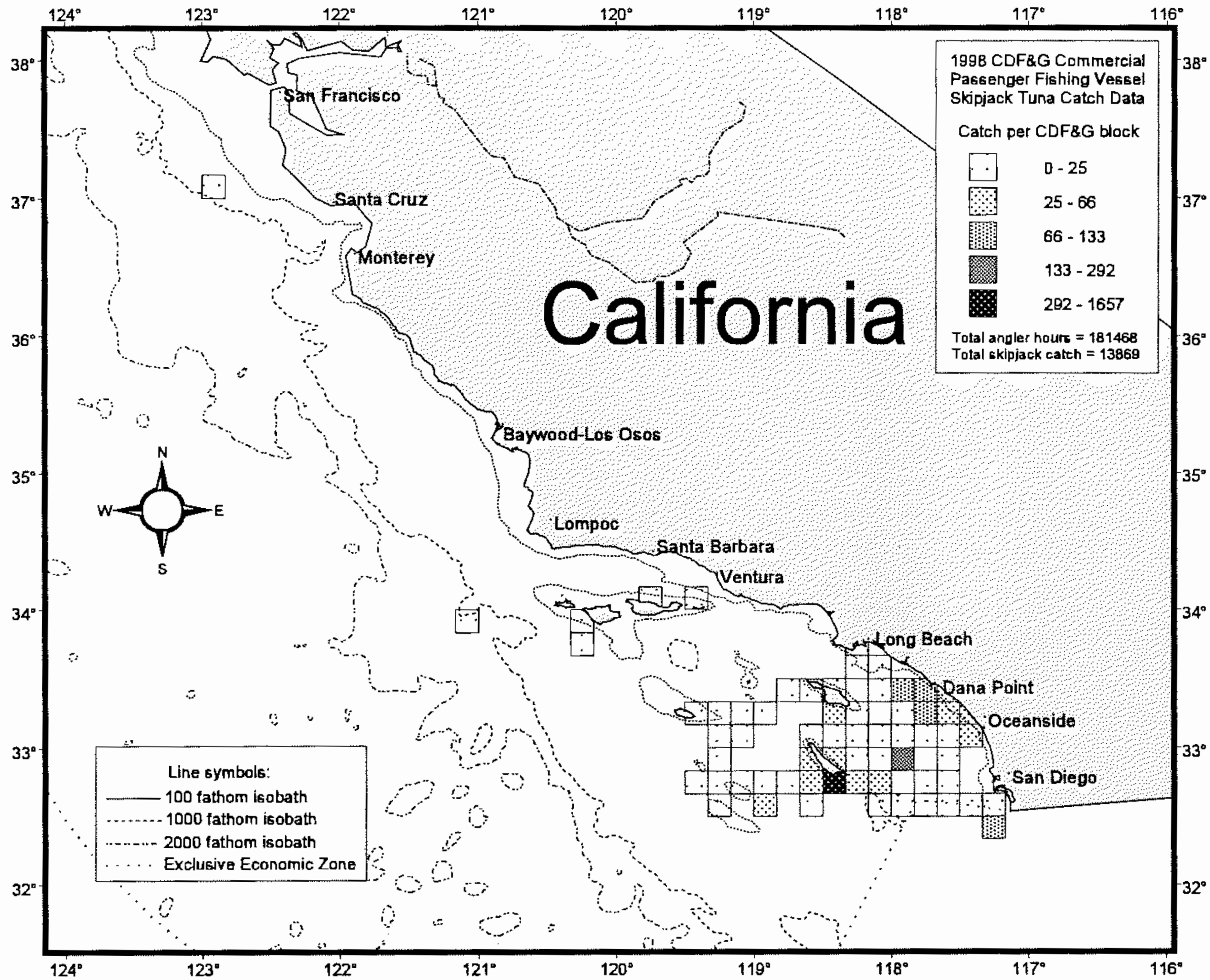


Figure 2-8. California CPFV catch for 1998, by CDFG block number for skipjack tuna.

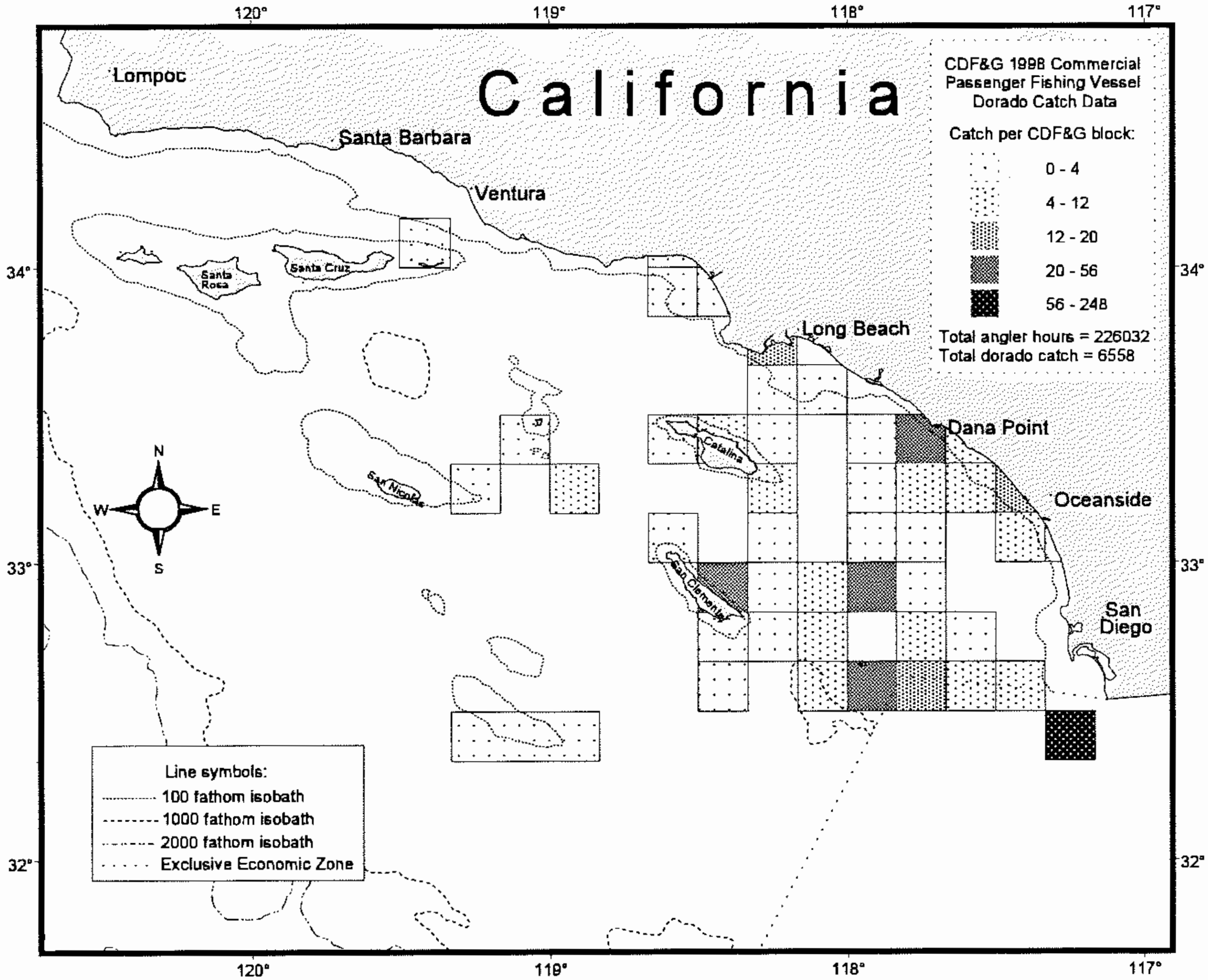


Figure 2-9. California CPFV catch for 1998, by CDFG block number for dorado.

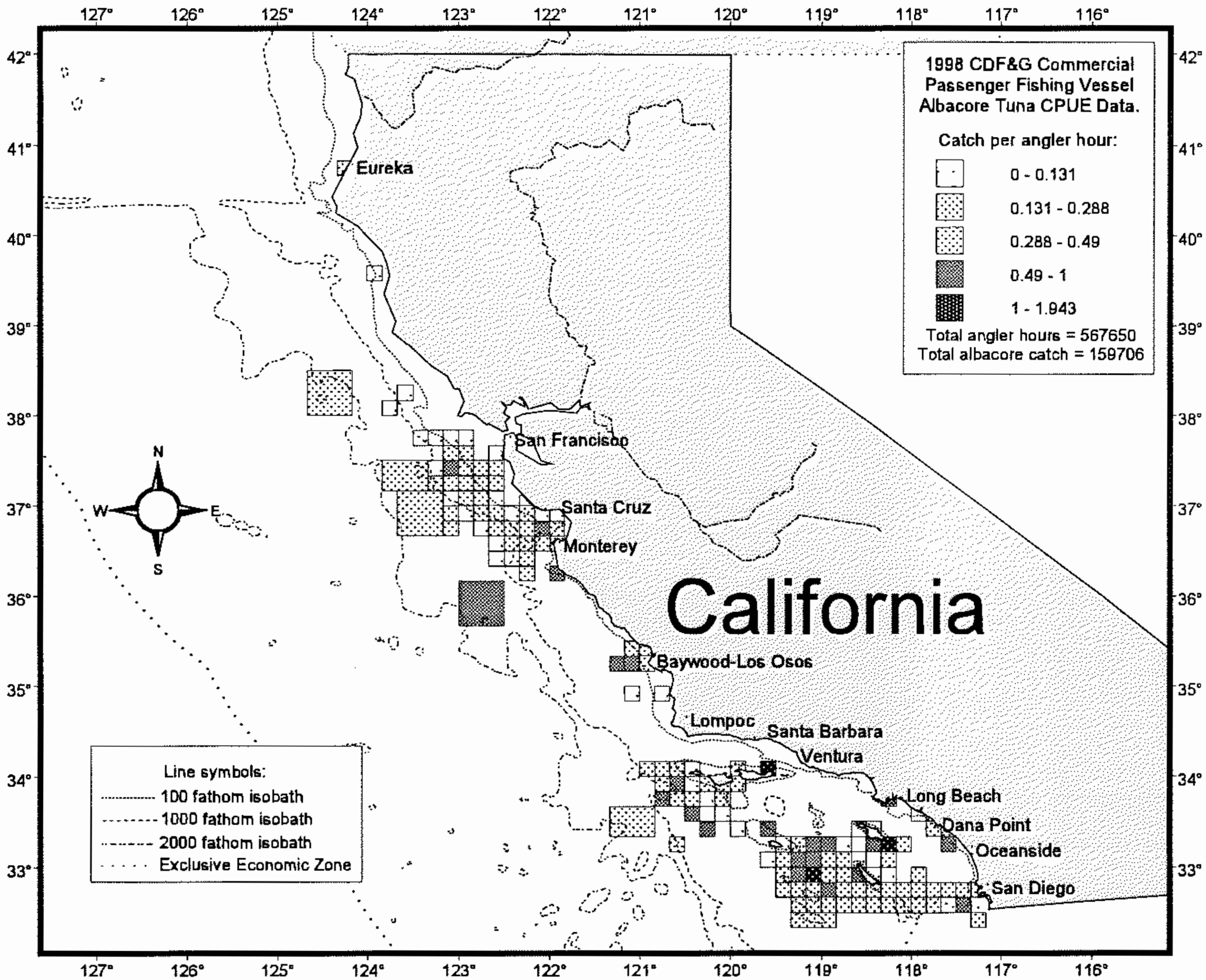


Figure 2-10. California CPFV catch-per-angler-hour for 1998, by block number for albacore.

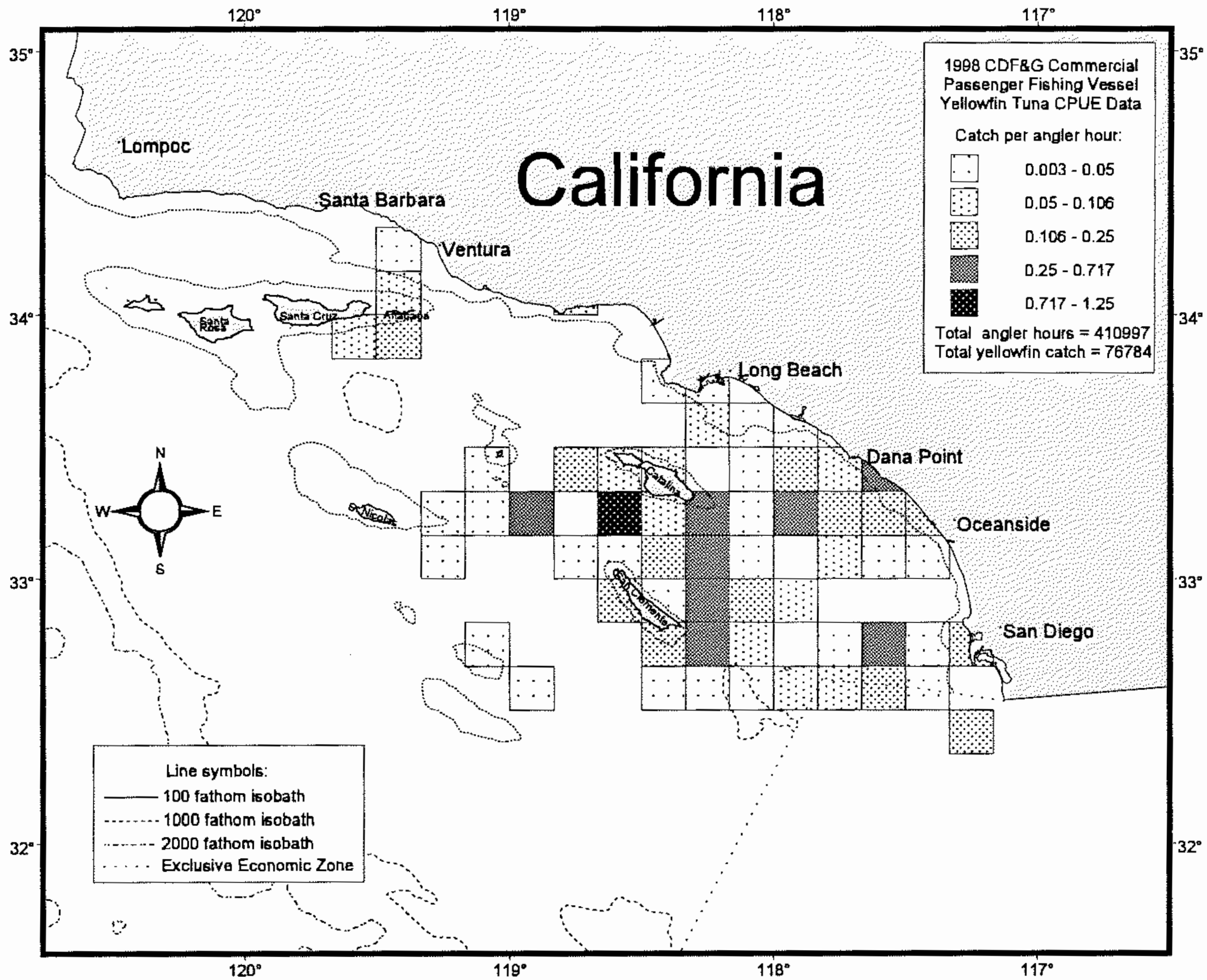


Figure 2-11. California CPFV catch-per-angler-hour for 1998, by block number for yellowfin tuna.

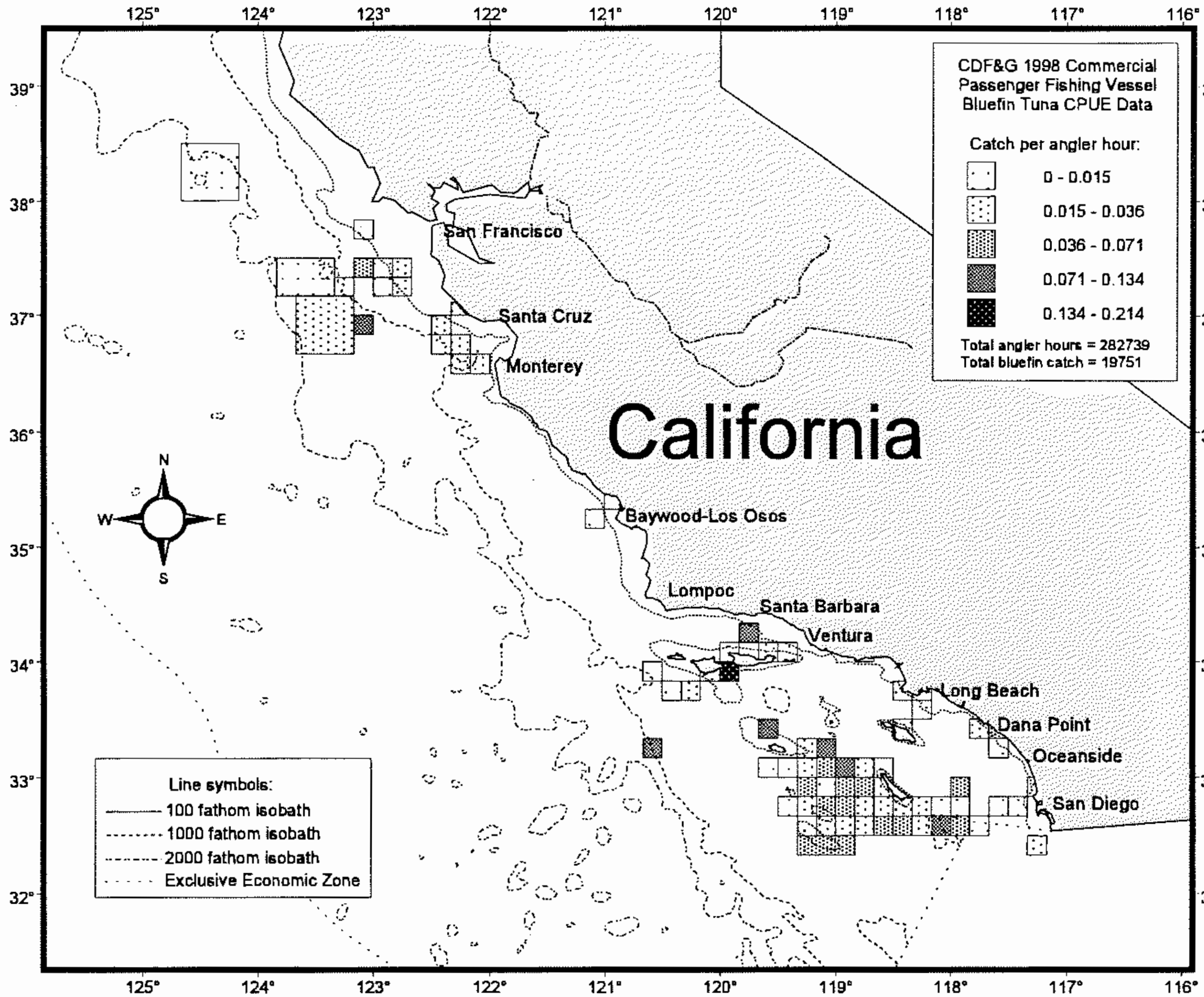


Figure 2-12. California CPFV catch-per-angler-hour for 1998, by block number for bluefin tuna.

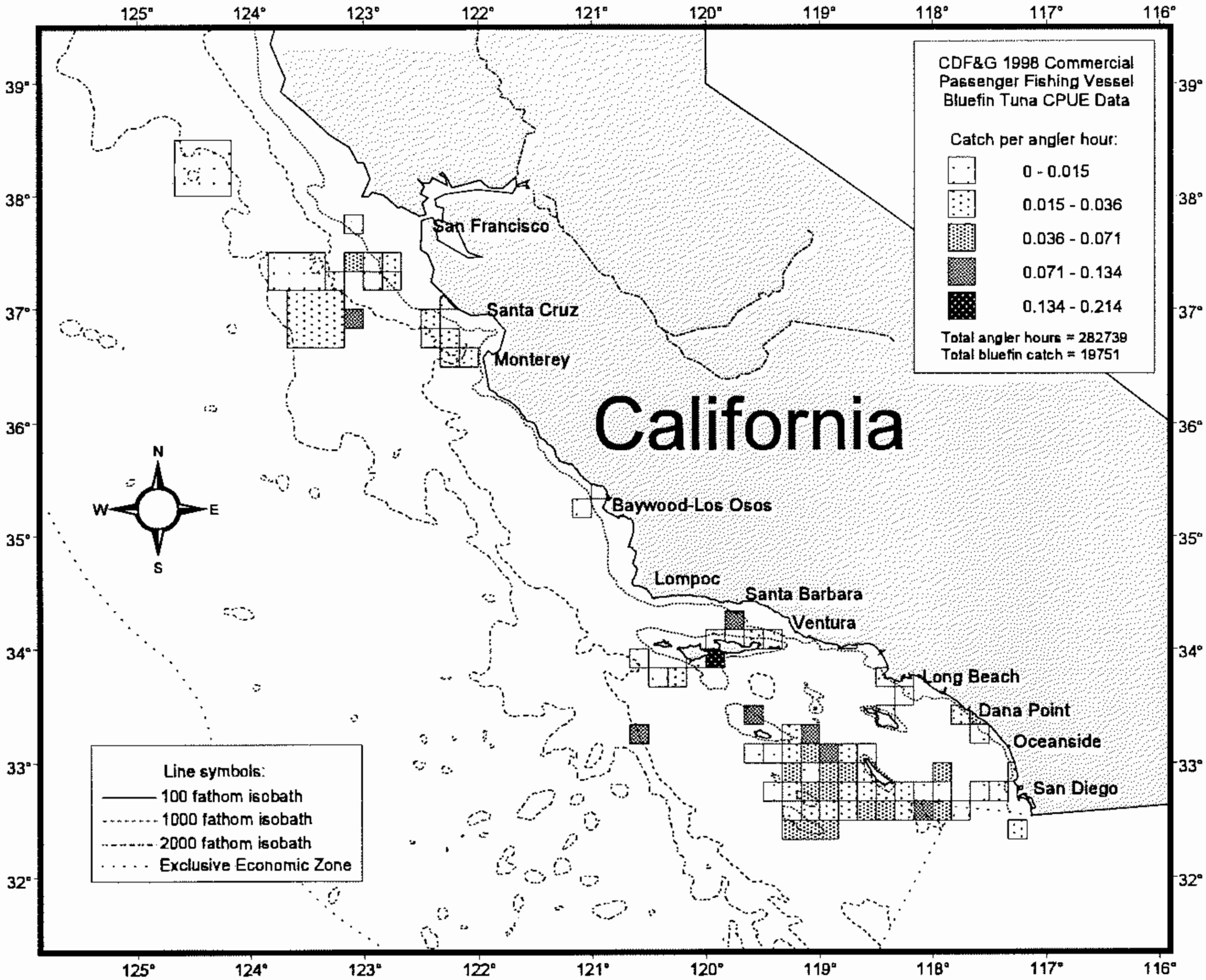


Figure 2-13. California CPFV catch-per-angler-hour for 1998, by block number for bigeye tuna.

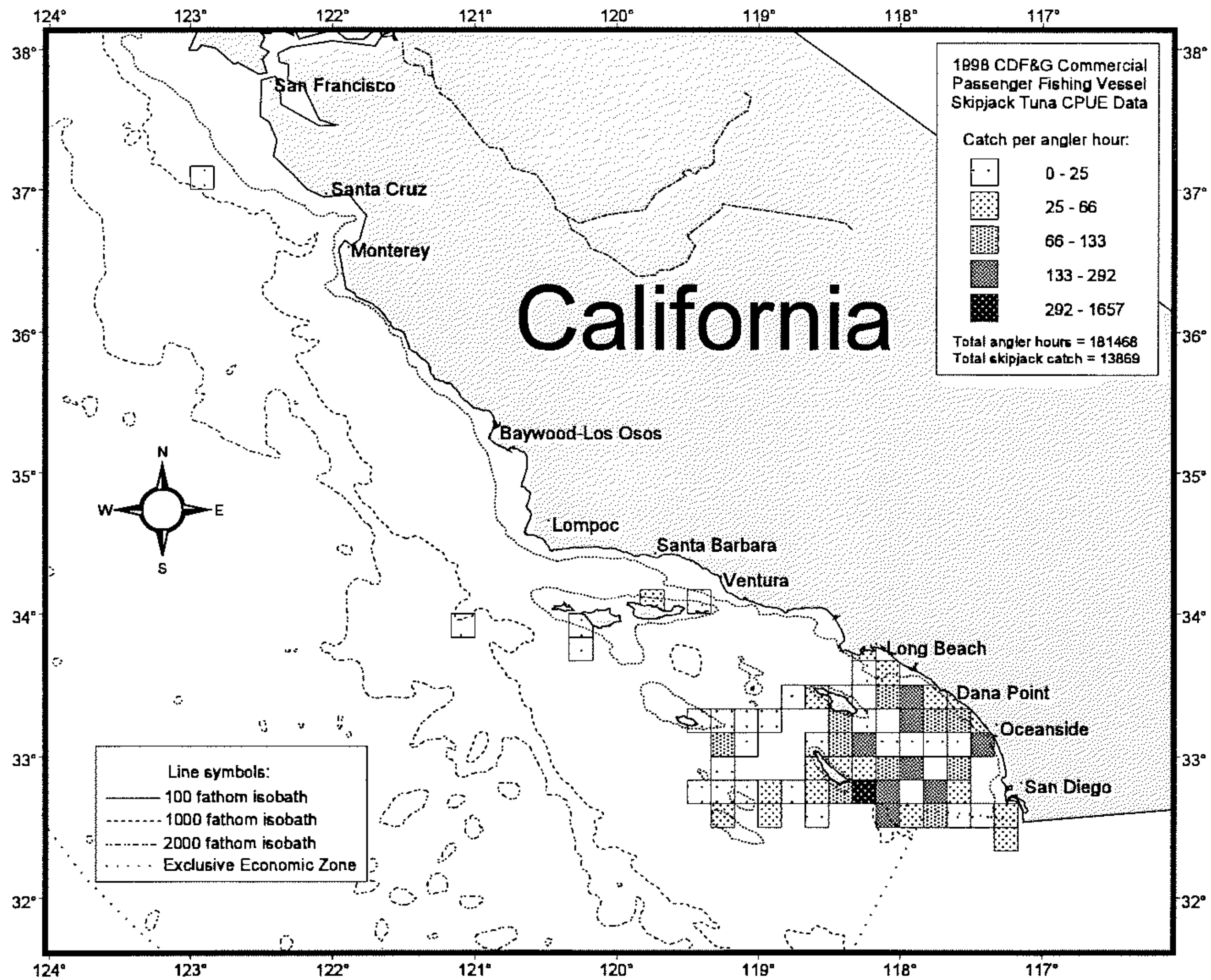


Figure 2-14. California CPFV catch-per-angler-hour for 1998, by block number for skipjack tuna.

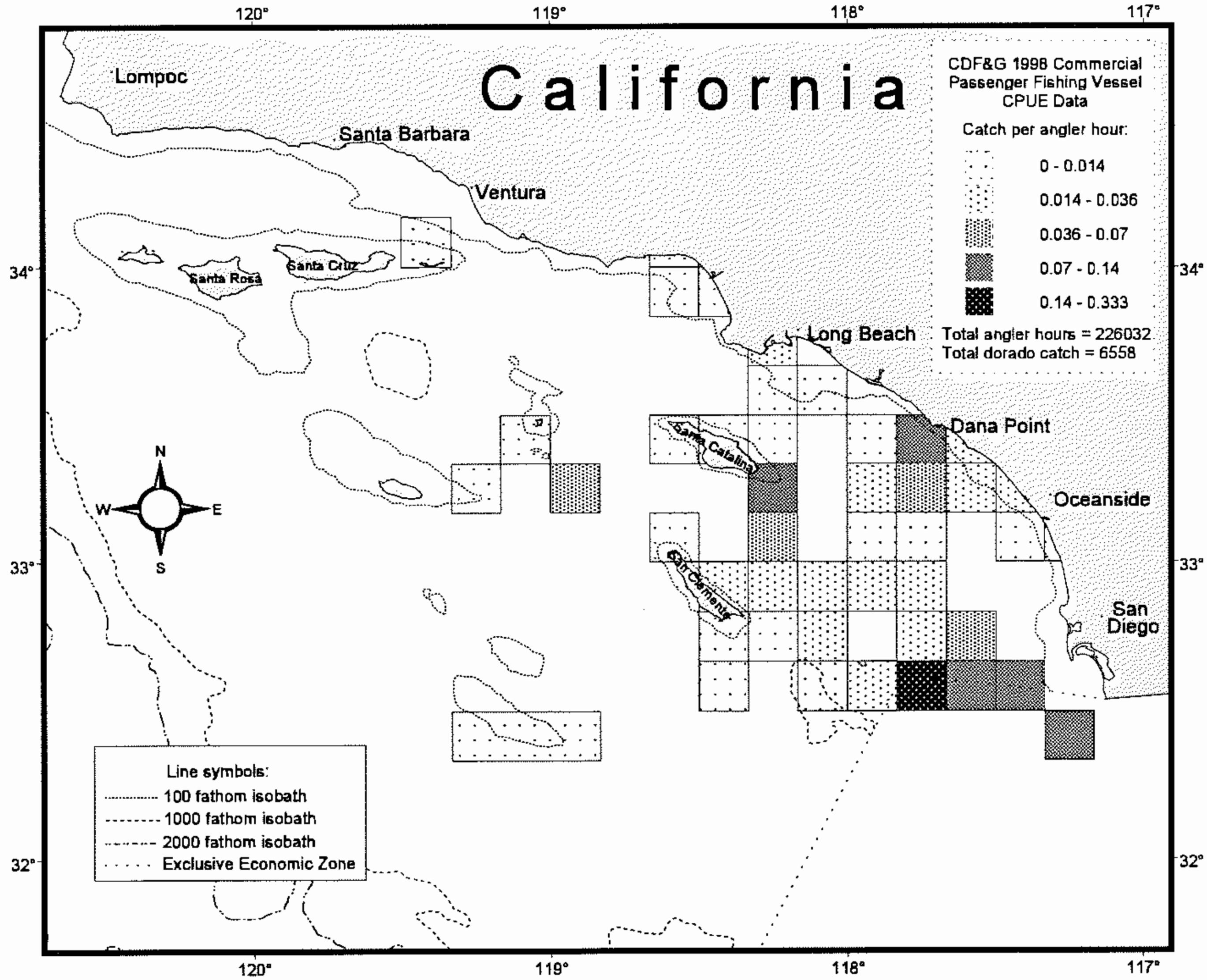


Figure 2-15. California CPFV catch-per-angler-hour for 1998, by block number for dorado.

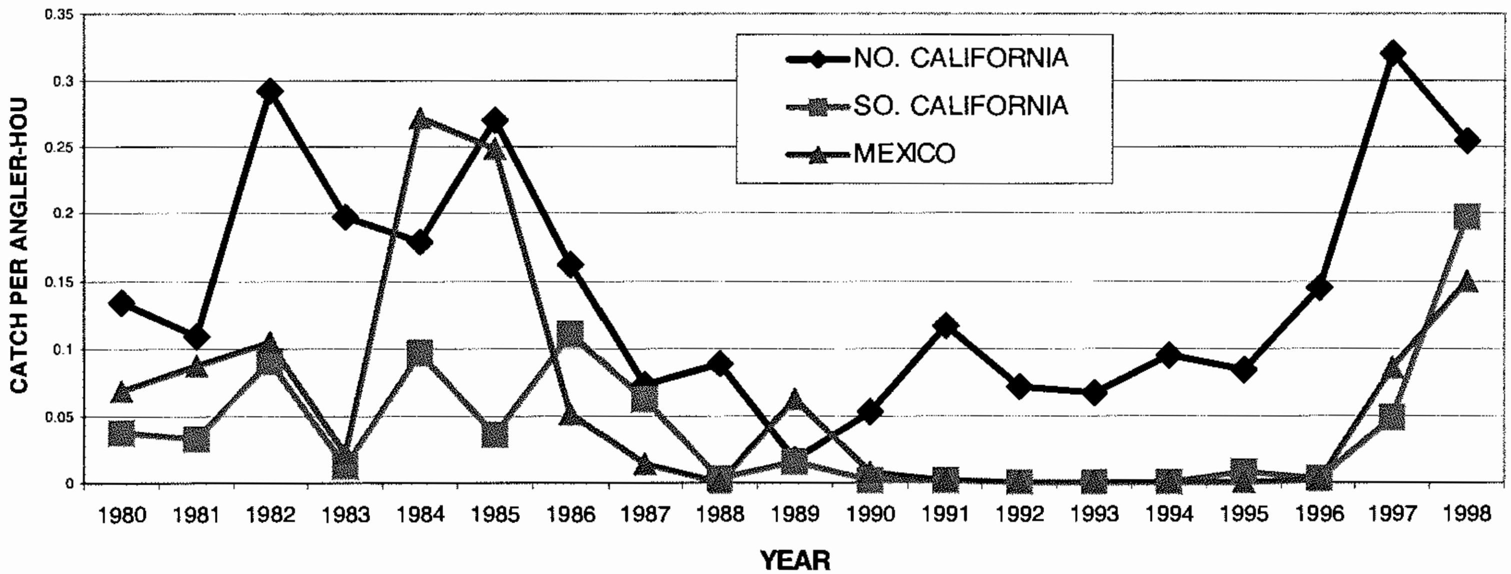


Figure 2-16. Reported Albacore recreational CPUE, 1980-1998.

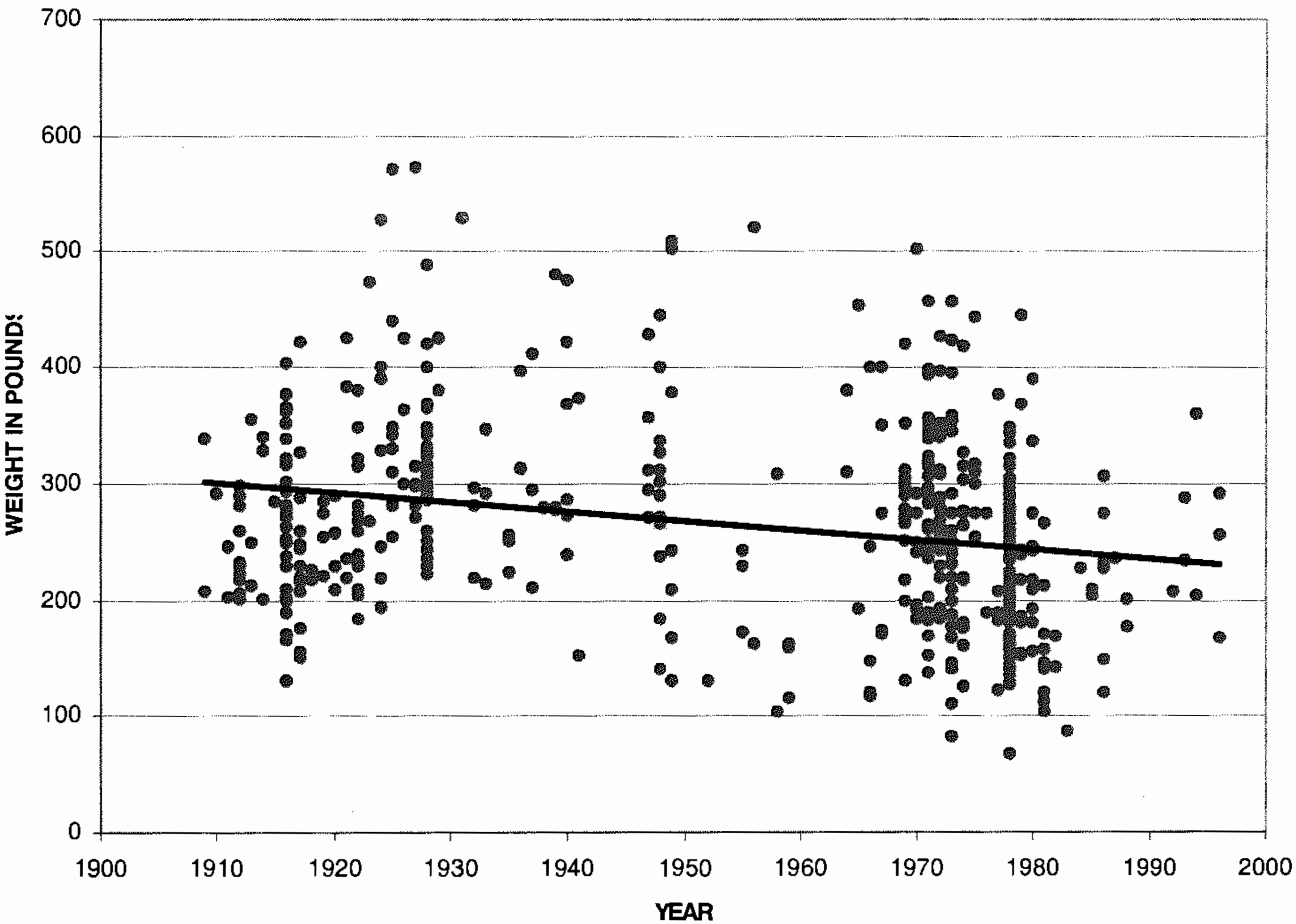


Figure 2-17. Weights of 522 swordfish weighed in at the Tuna Club, Balboa Angling Club, and the San Diego Marlin Club, 1909 - 1996. Data unavailable for some years.

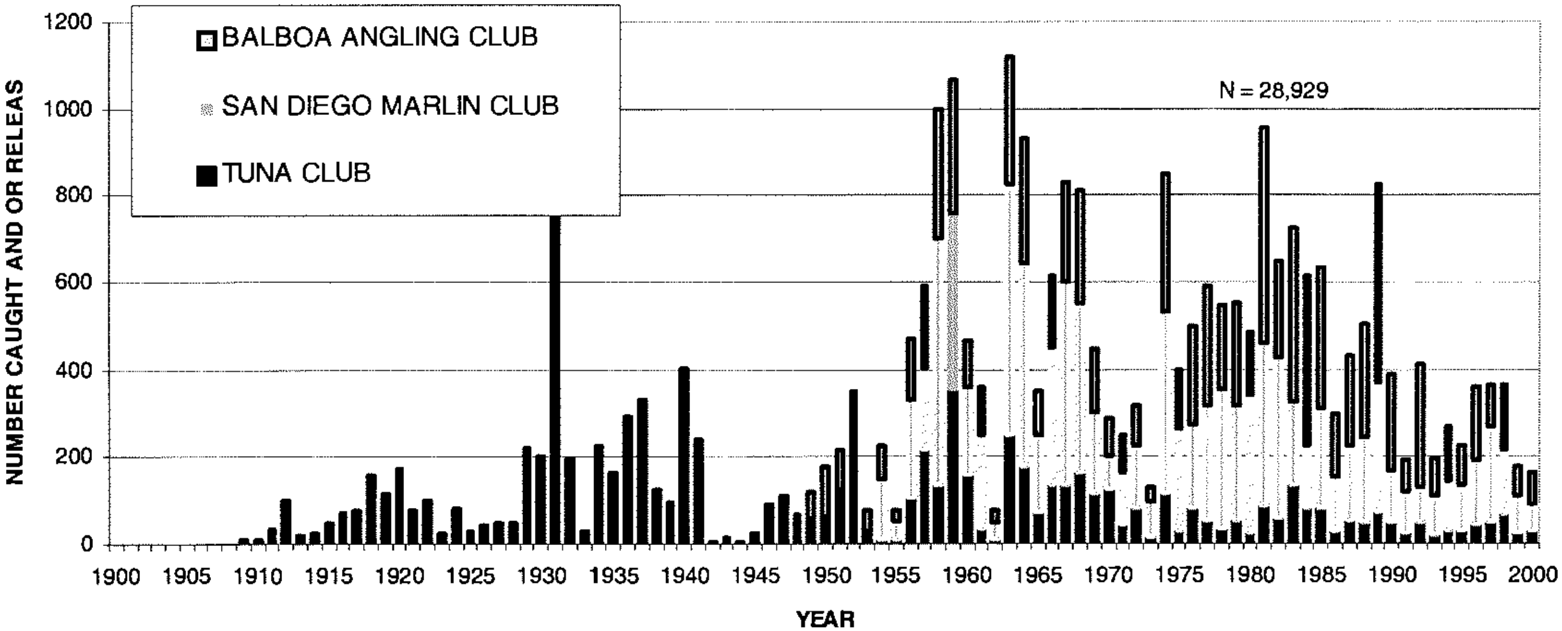


Figure 2-18. Southern California Marlin Catch, for selected angling clubs, 1900 - 2000. (Data unavailable for some years.)

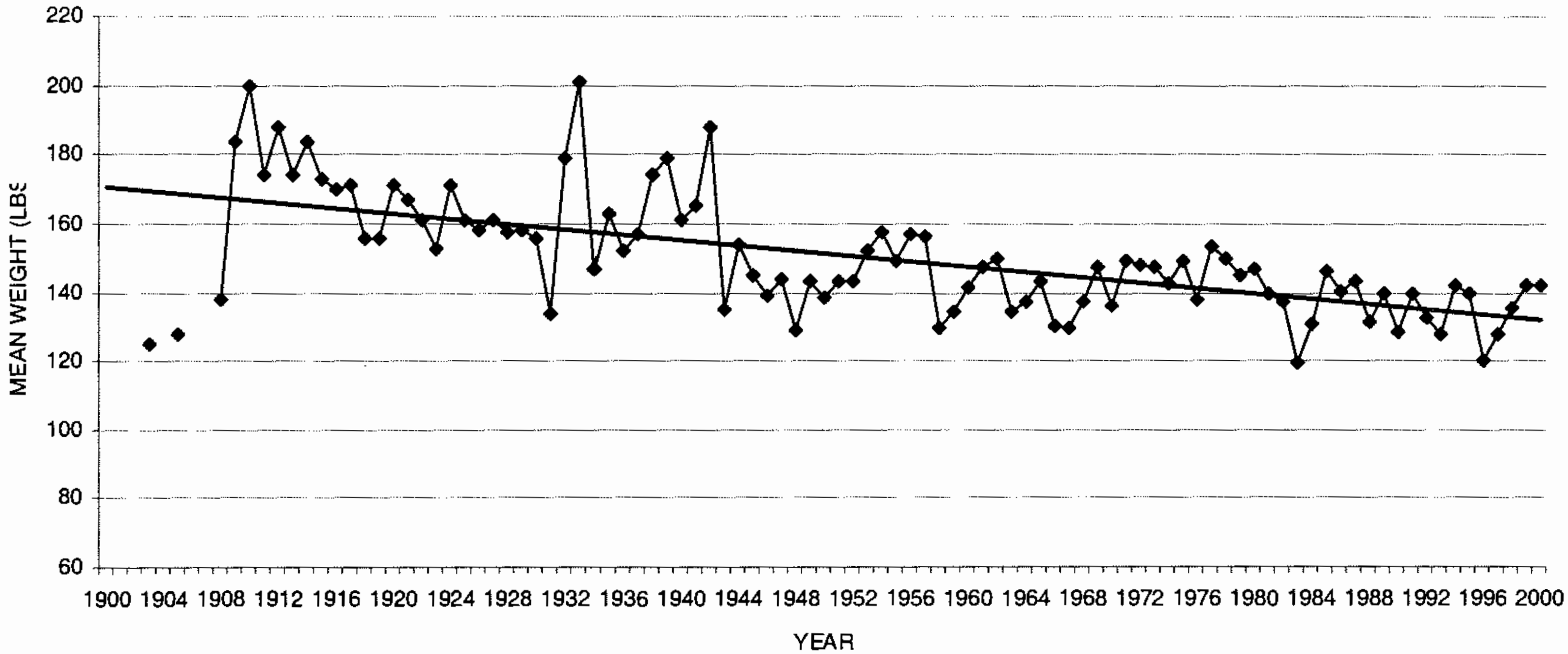


Figure 2-19. Average weight of striped marlin weighed in at selected southern California angling clubs, 1903 1998.

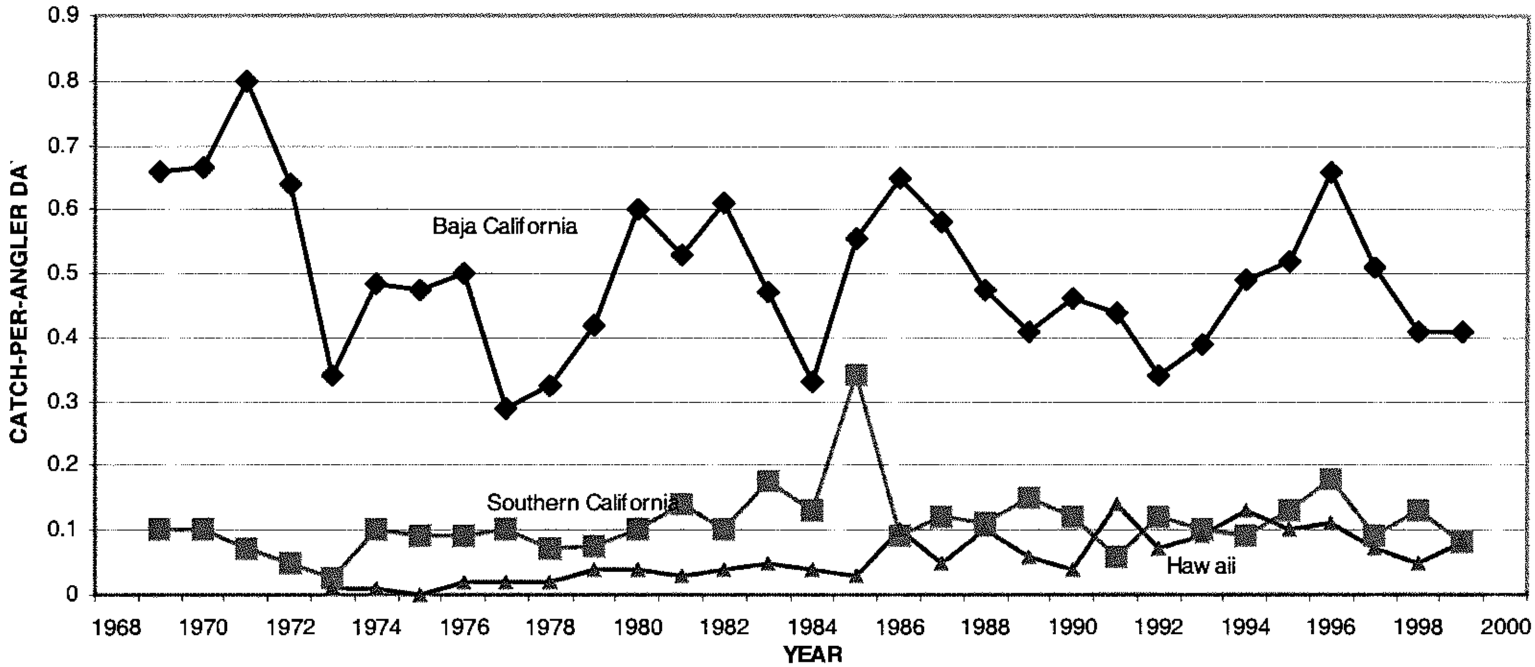


Figure 2-20. Catch rates for striped marlin in southern California, Baja California, and Hawaii, 1968 - 1999

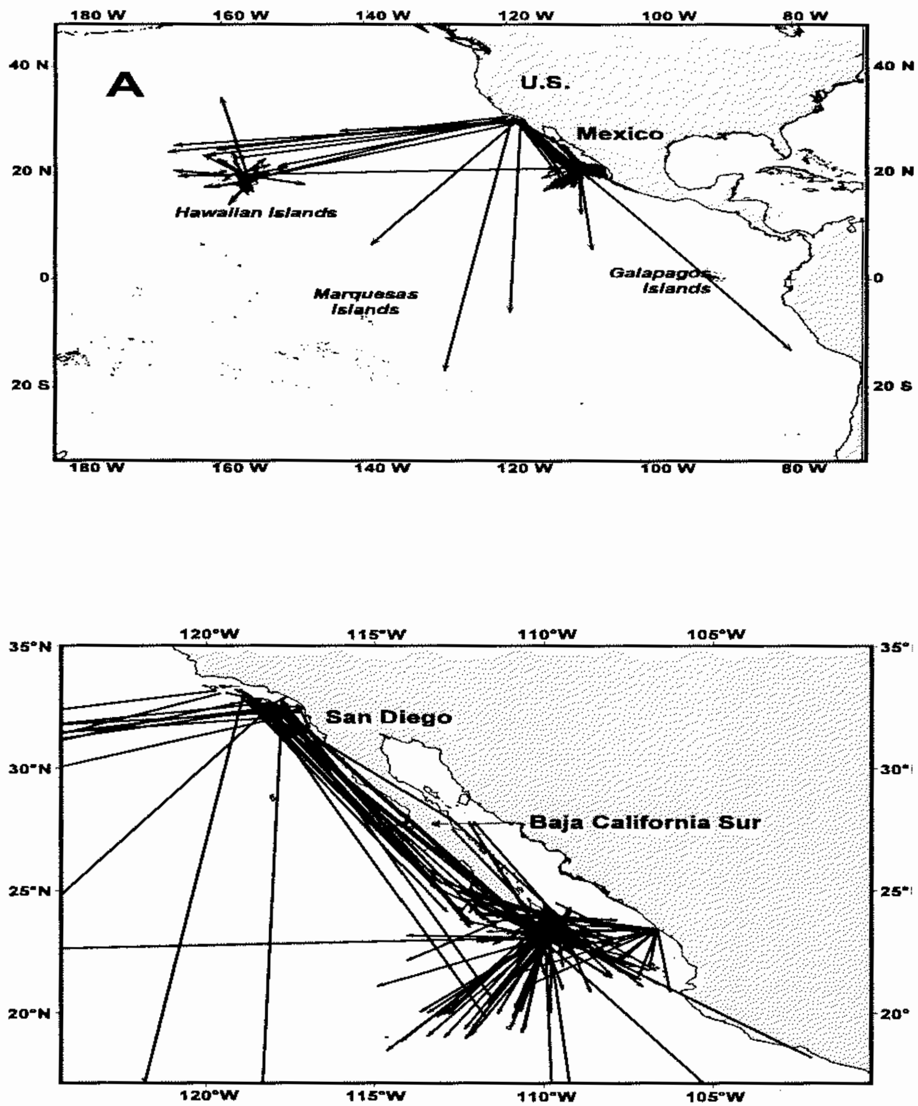


Figure 2-21. Striped marlin movements from tag recaptures in the north eastern Pacific (A) and detail of returns for southern California and Baja California, Mexico (B). Arrowheads indicate point of recapture and shaft point or release.

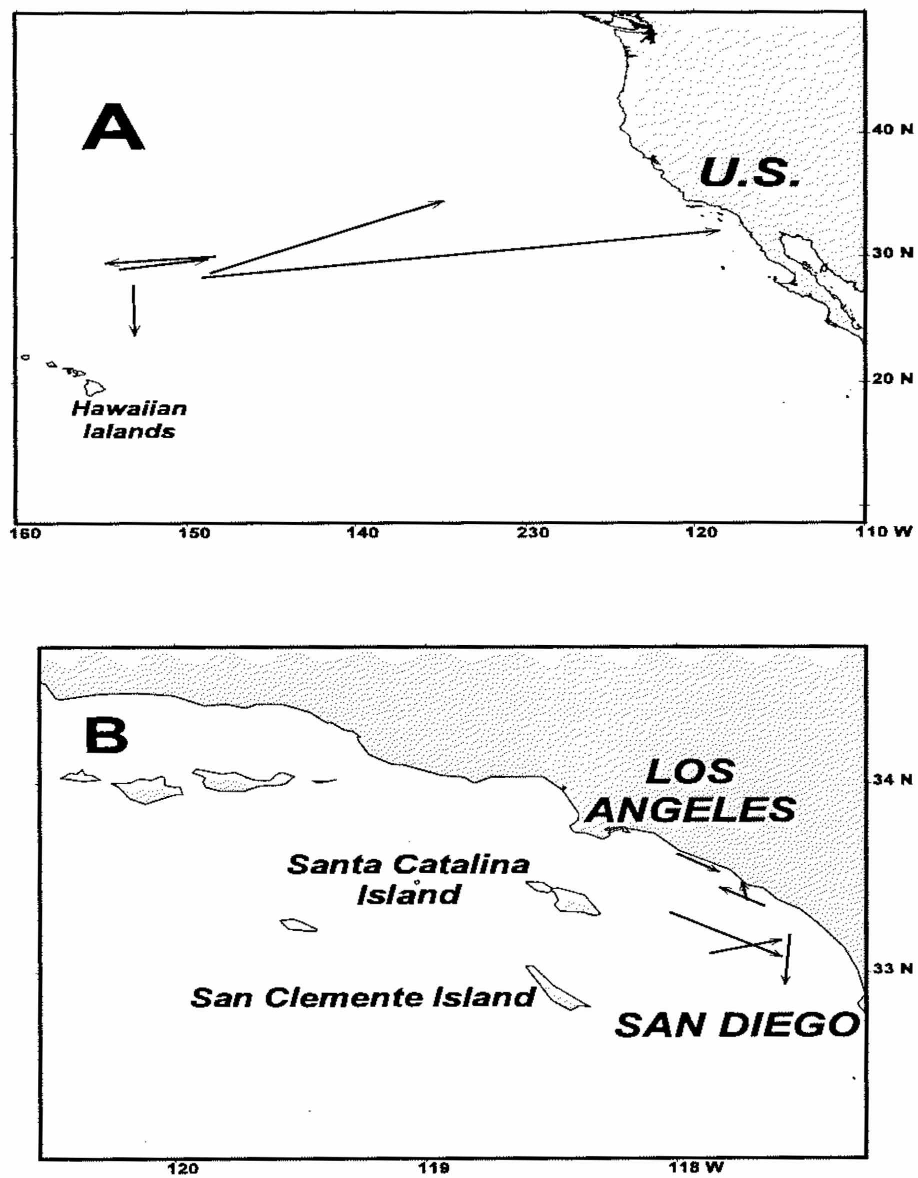


Figure 2-22. Broadbill swordfish movements from tag recaptures in the eastern North Pacific (A) and detail of southern California (B).

Figure 2-23. Number of commercial vessels with HMS landings 1981-99.

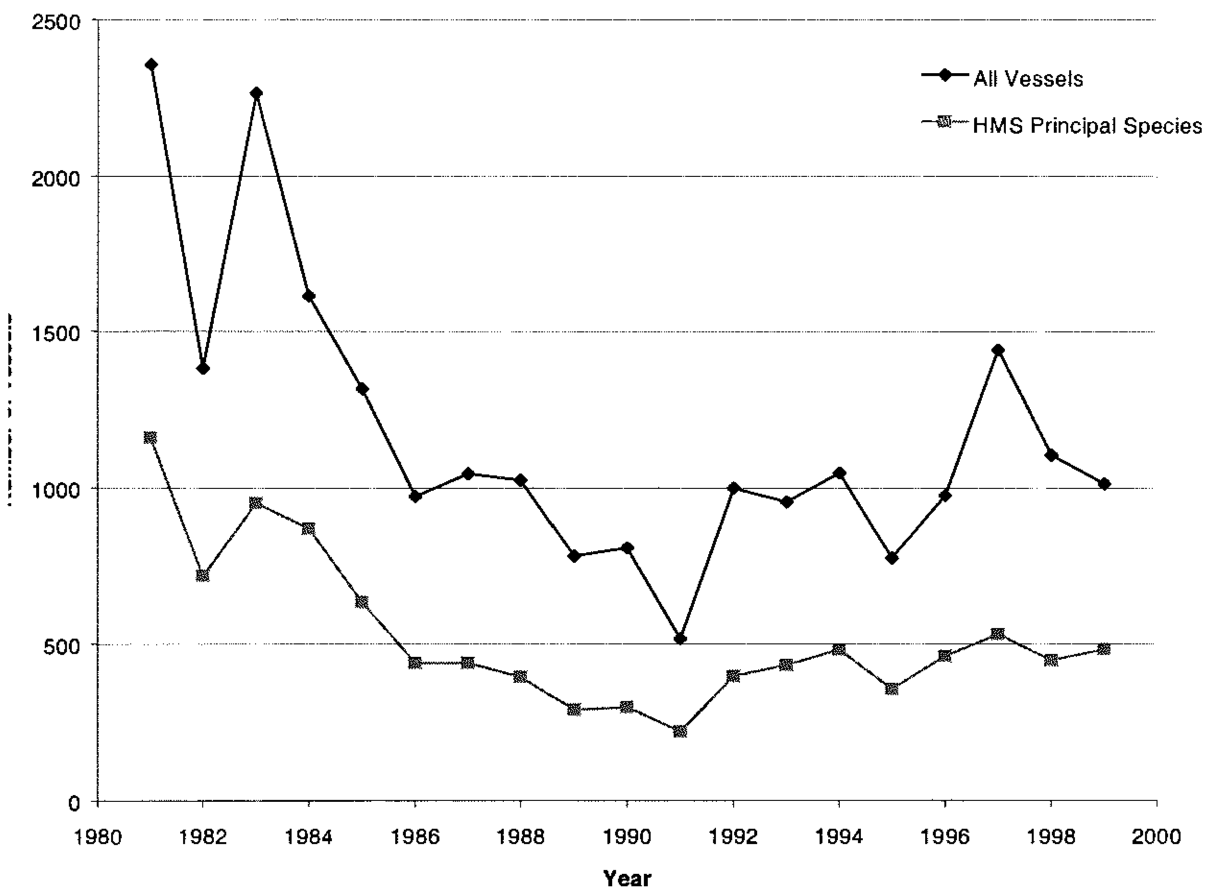


Figure 2-24. Number of HMS landings, 1981-99.

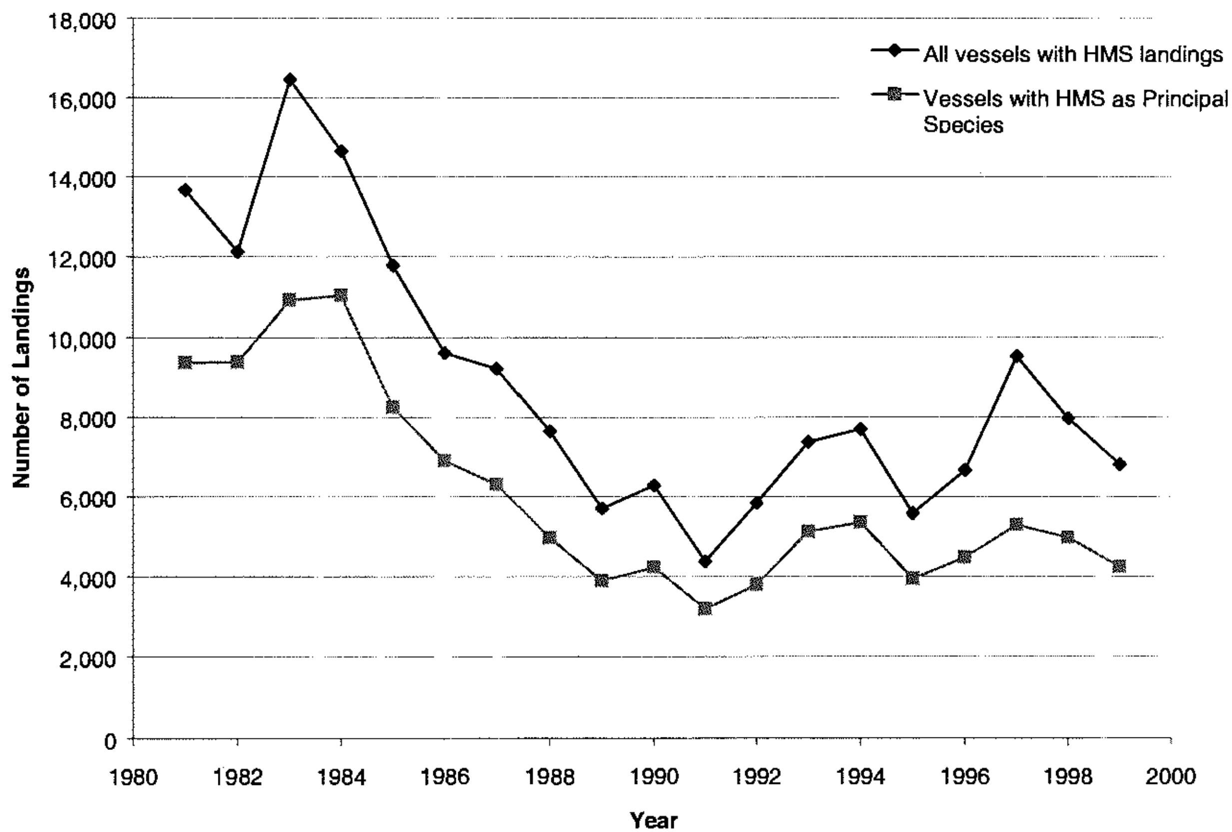


Figure 2-25. HMS landings, 1981-99.

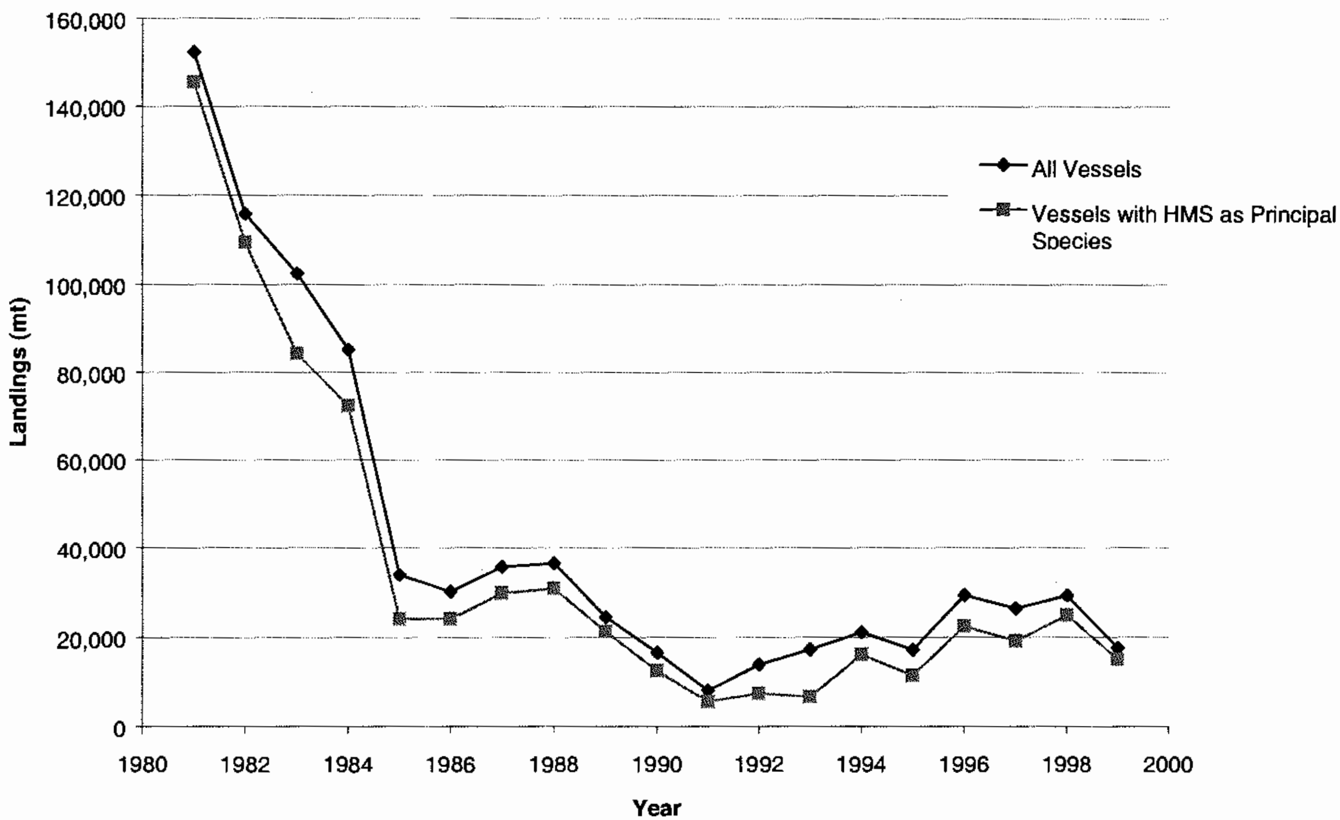


Figure 2-26. Real exvessel HMS revenues (1999 dollars), 1981-99.

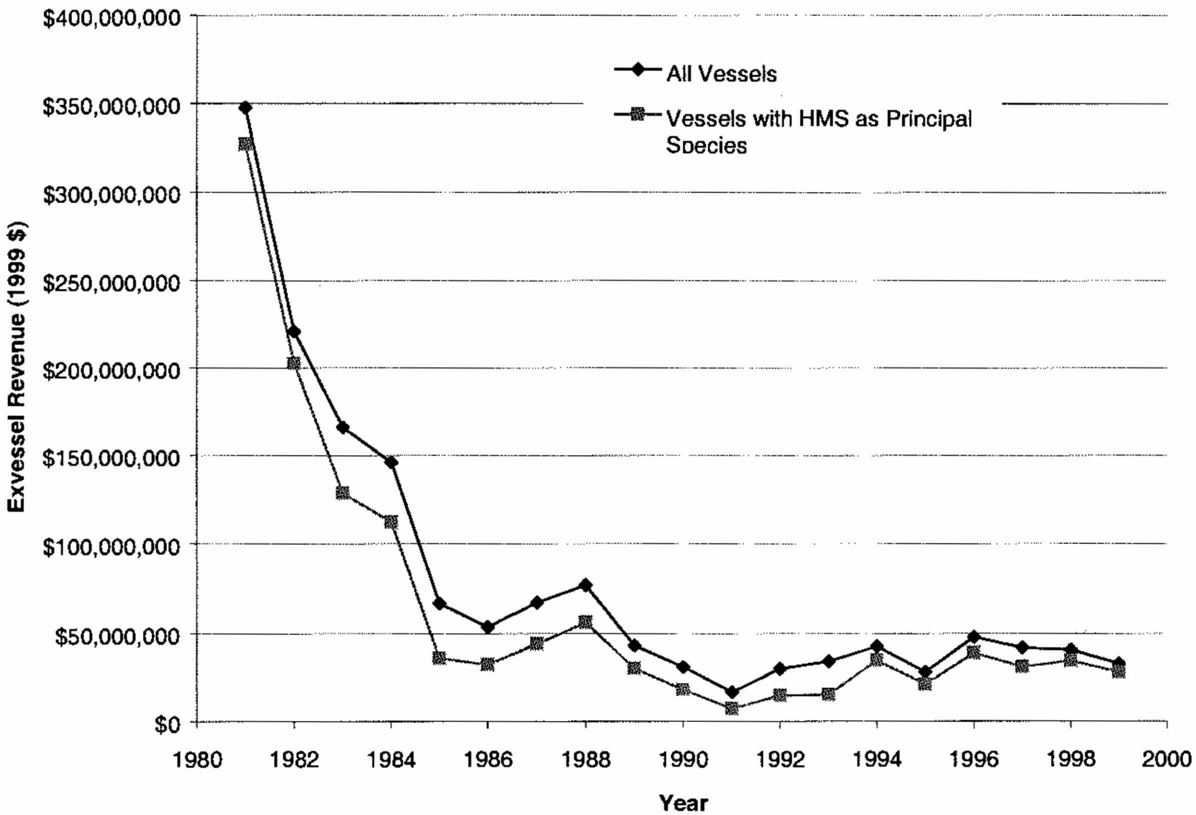


Figure 2-27. Vessel length distribution for vessels whose principal fishery was albacore surface hook-and-line by length category (ft) and selected years.

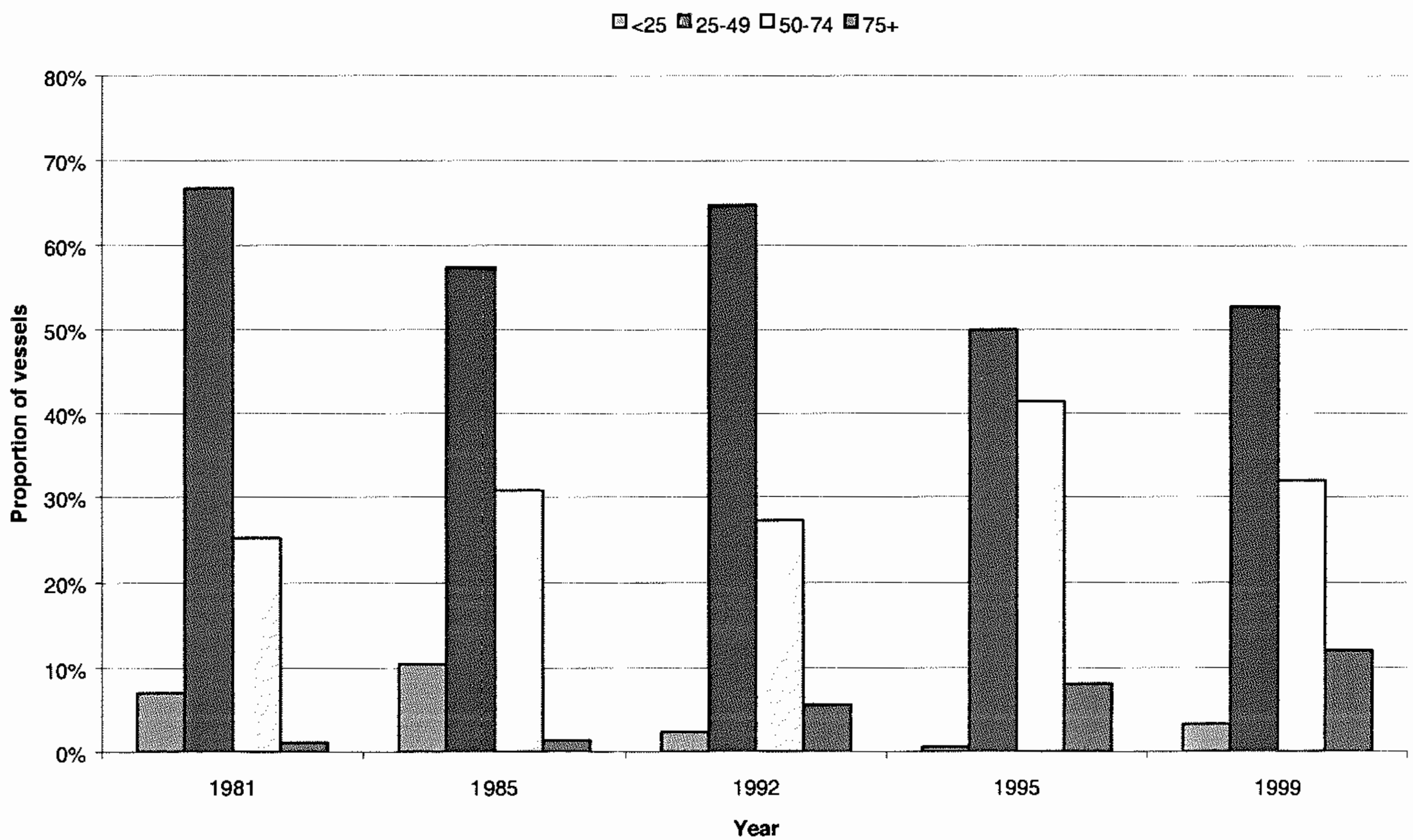


Figure 2-28. Vessel length distribution for vessels whose principal fishery was coastal purse seine by length category (ft) and selected years.

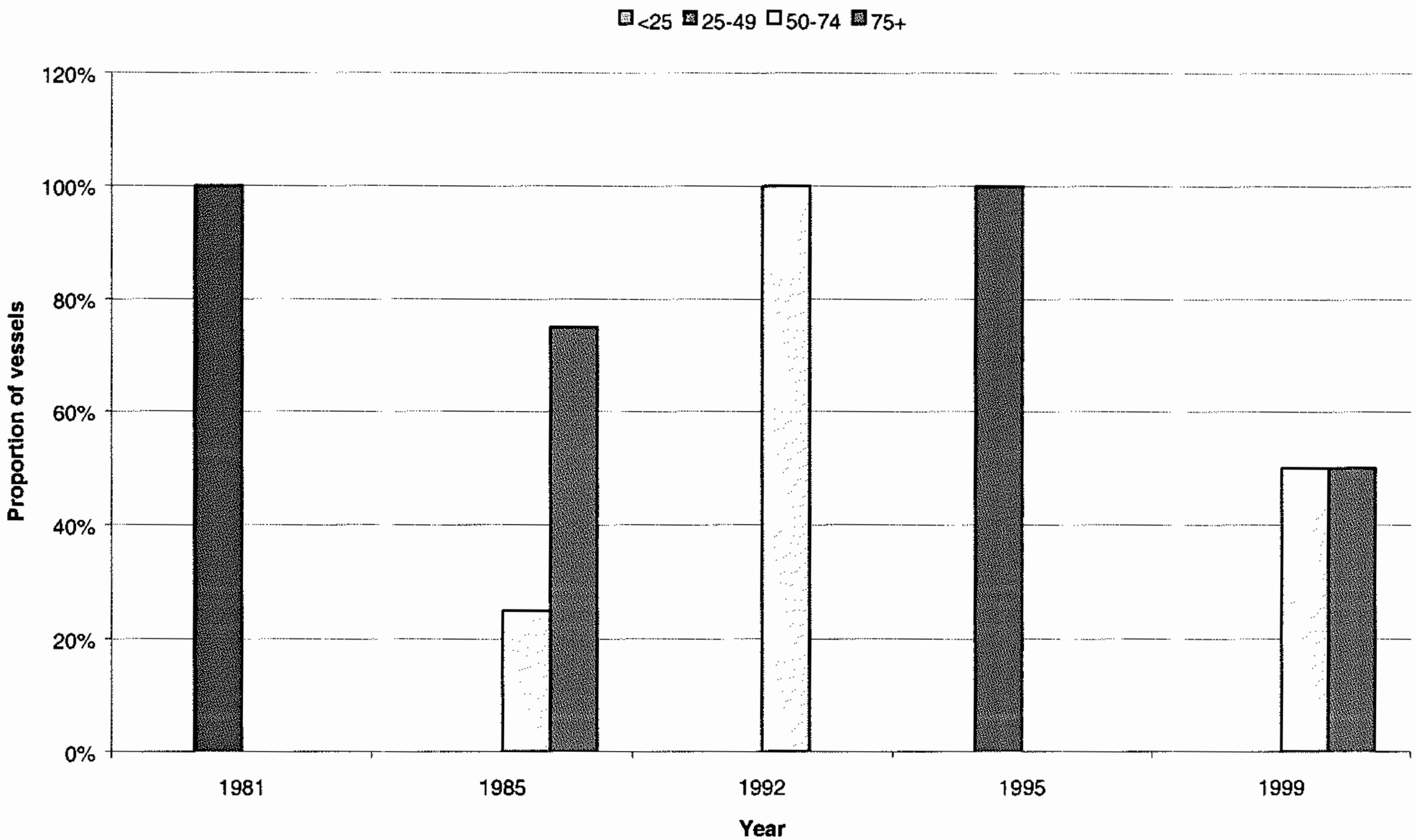


Figure 2-29. Vessel length distribution for vessels whose principal fishery was swordfish and shark drift gillnet by length category (ft) and selected years.

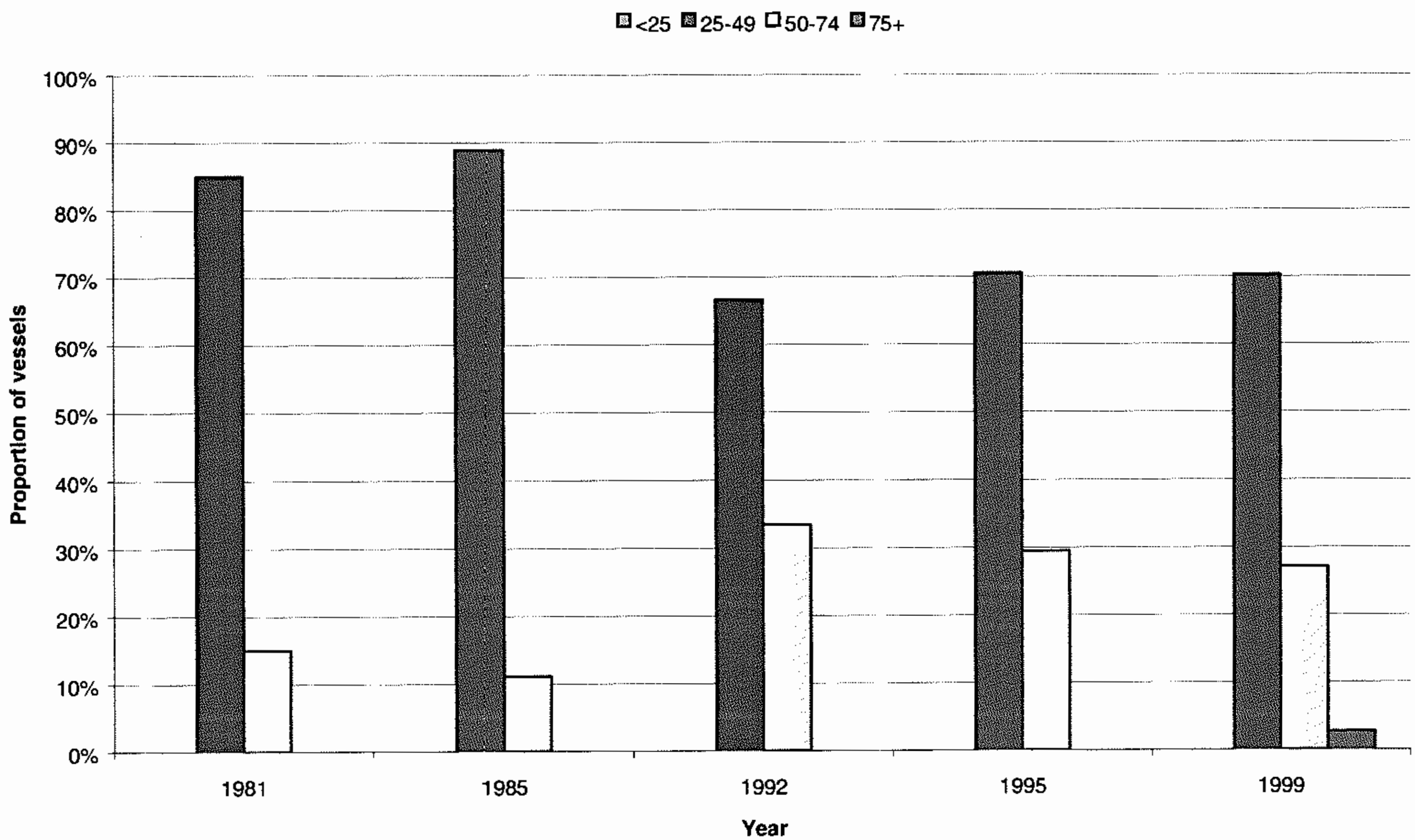


Figure 2-30. Vessel length distribution for vessels whose principal fishery was swordfish harpoon by length category (ft) and selected years.

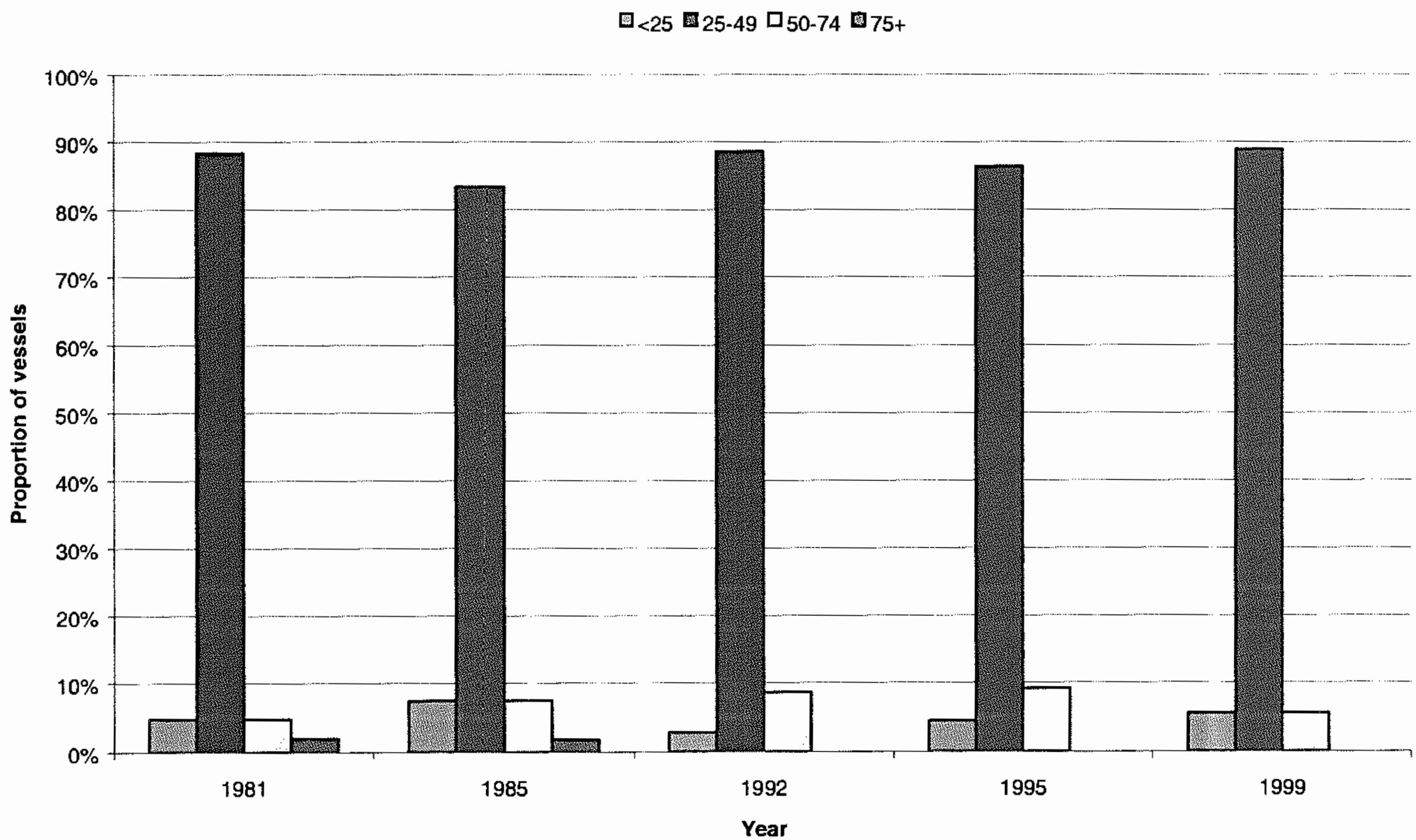


Figure 2-31. Vessel length distribution for vessels whose principal fishery was large purse seine by length category (ft) and selected years.

Figure 2-32. Vessel length distribution for vessels whose principal fishery was HMS longline by length category (ft) and selected years.

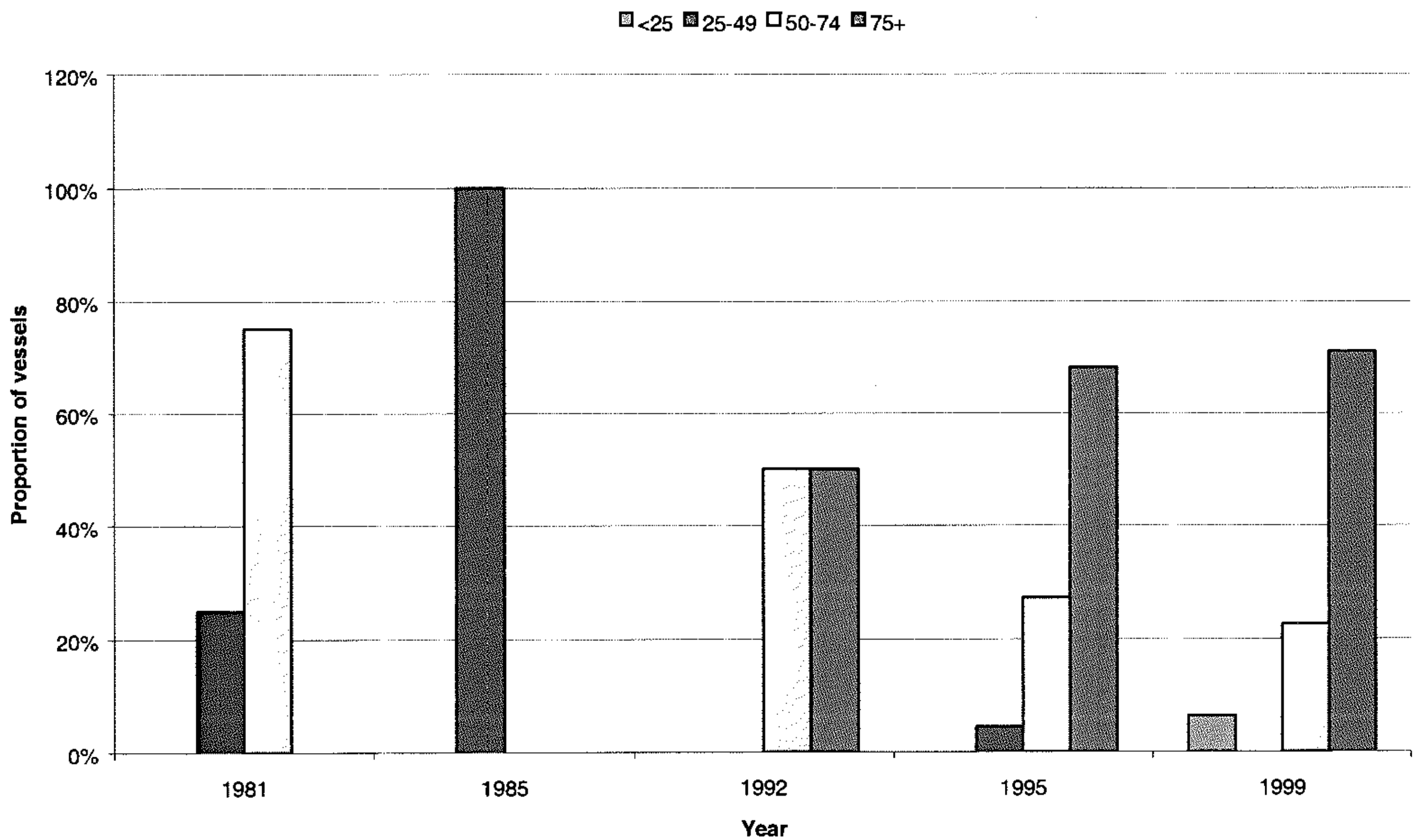


Figure 2-33. Vessel length distribution for vessels whose principal fishery was albacore surface hook-and-line and whose principal port was in Southern California by length category (ft) and selected years.

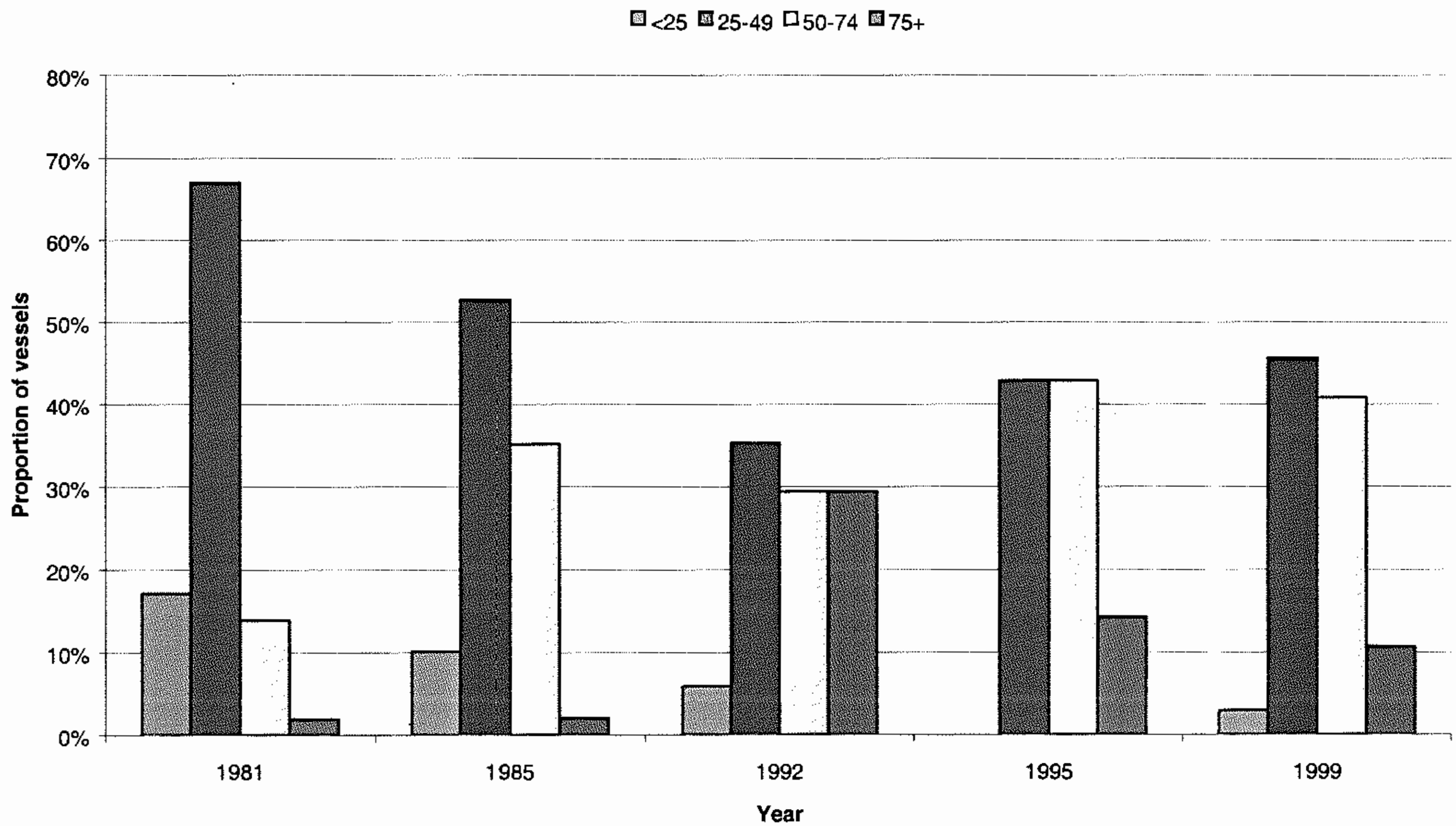


Figure 2-34. Vessel length distribution for vessels whose principal fishery was albacore surface hook-and-line and whose principal port was in Central California by length category (ft) and selected years.

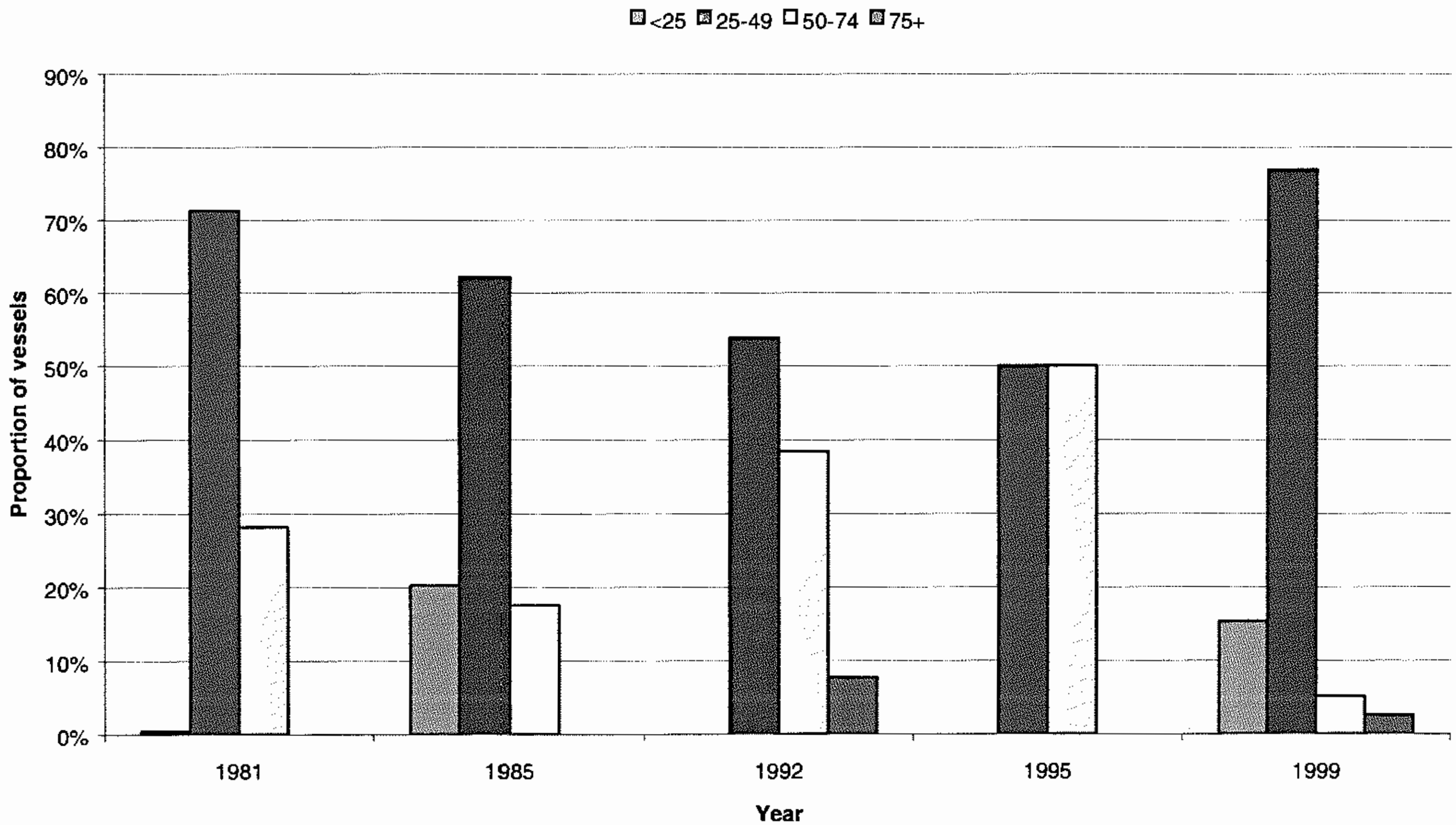


Figure 2-35. Vessel length distribution for vessels whose principal fishery was albacore surface hook-and-line and whose principal port was in Northern California by length category (ft) and selected years.

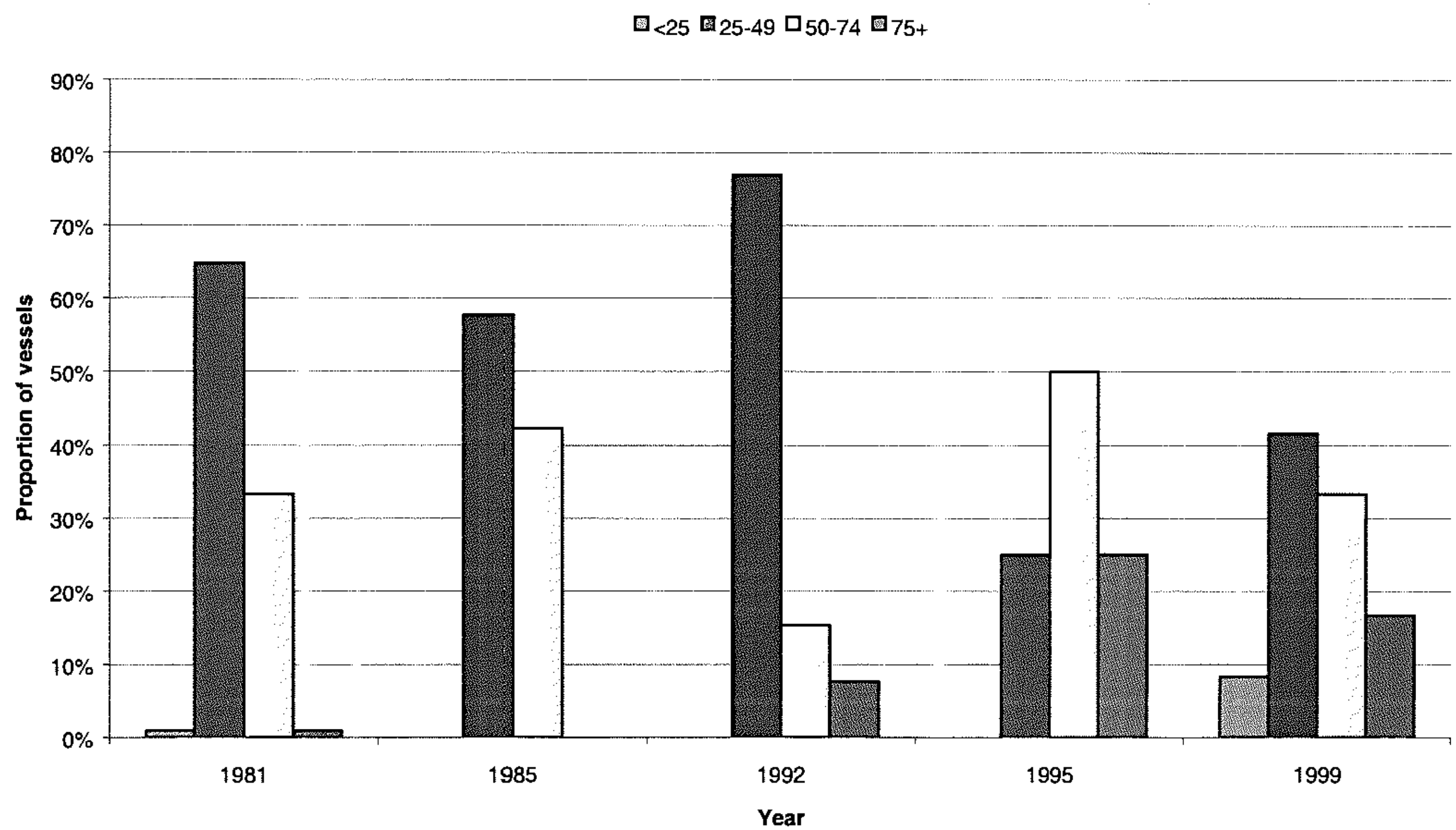


Figure 2-36. Vessel length distribution for vessels whose principal fishery was albacore surface hook-and-line and whose principal port was in Oregon by length category (ft) and selected years.

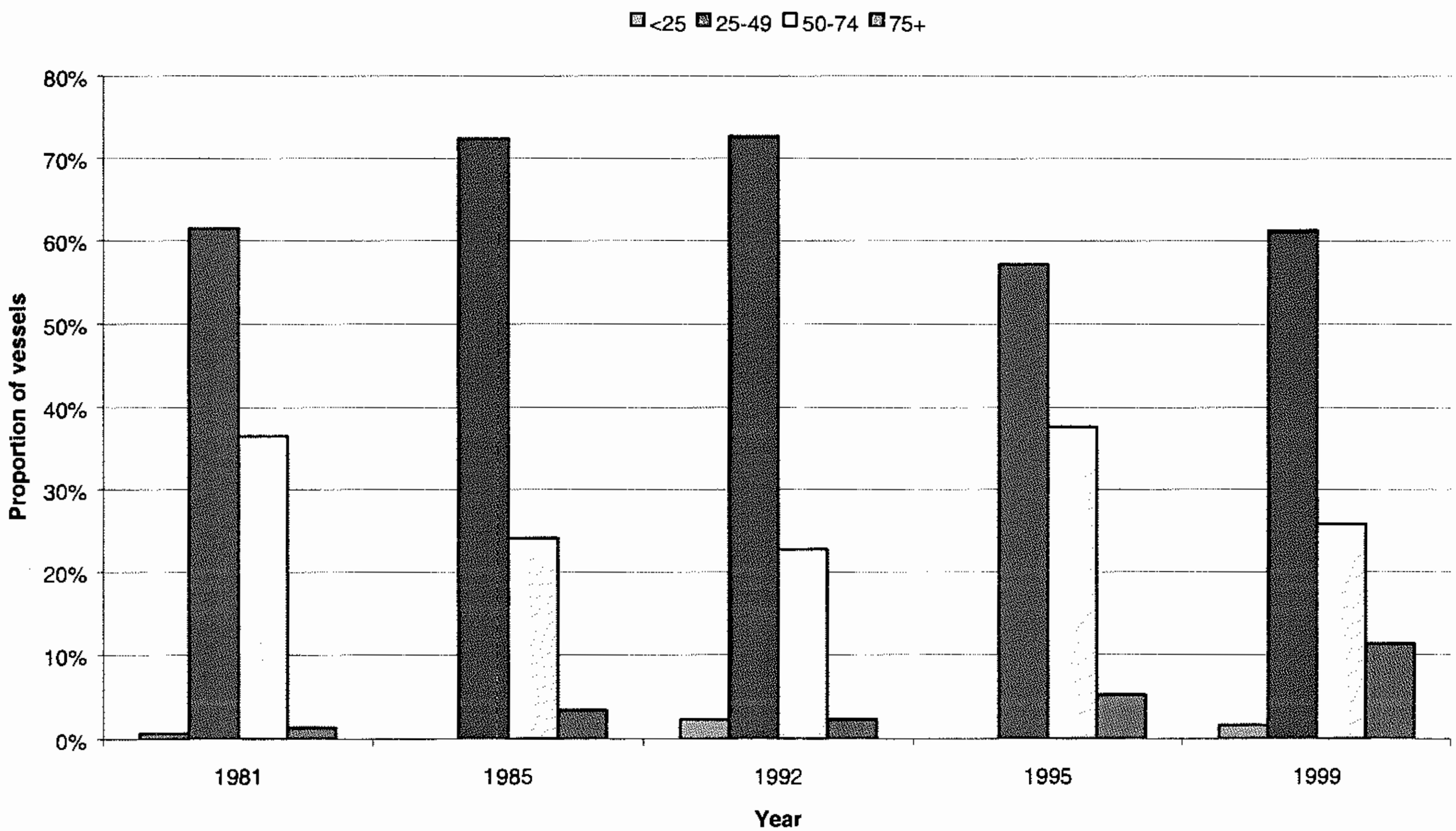


Figure 2-37. Vessel length distribution for vessels whose principal fishery was albacore surface hook-and-line and whose principal port was in Washington by length category (ft) and selected years.

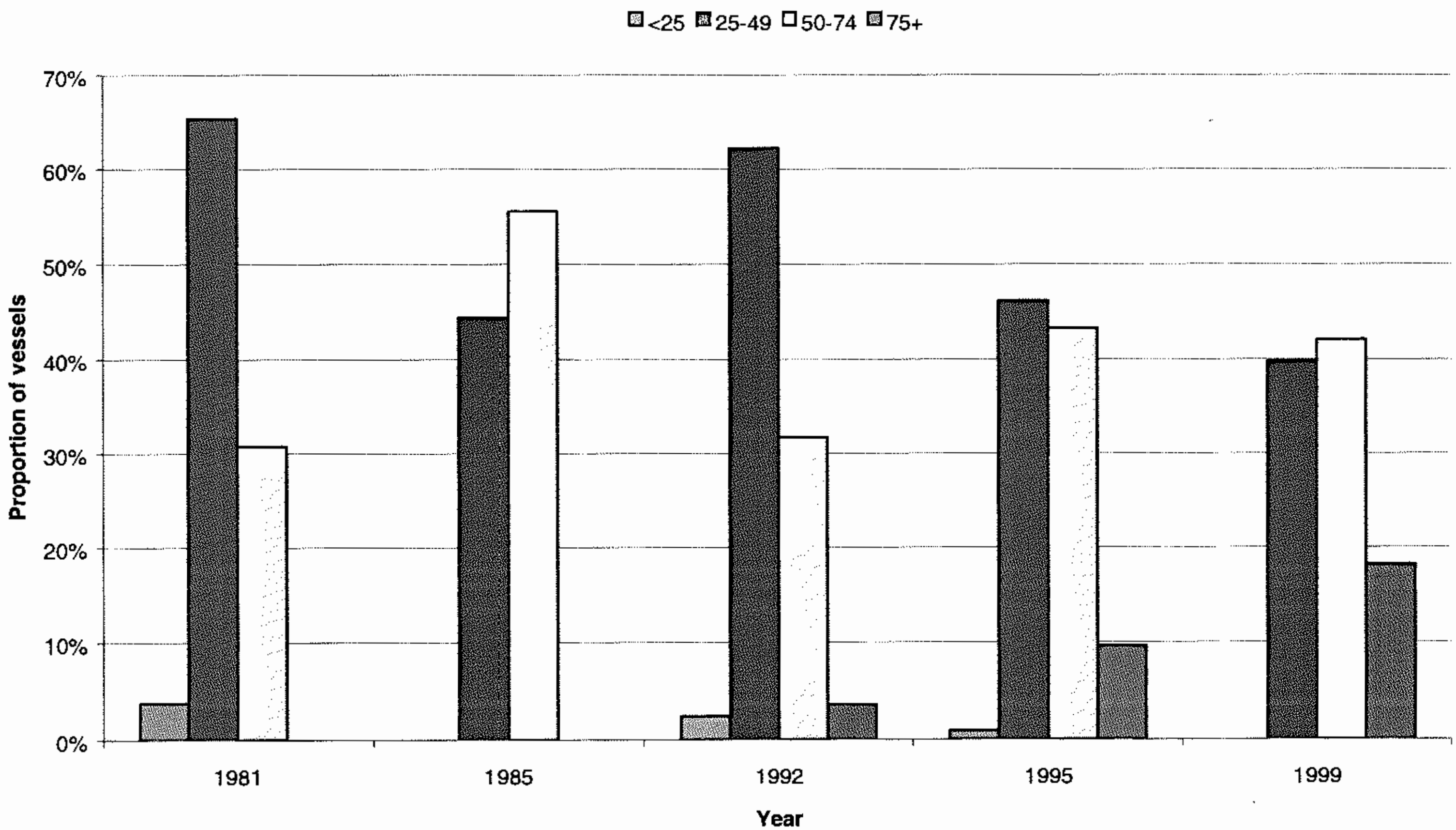


Figure 2-38. Vessel length distribution for vessels whose principal fishery was swordfish and shark drift gillnet and whose principal port was in Southern California by length category (ft) and selected years.

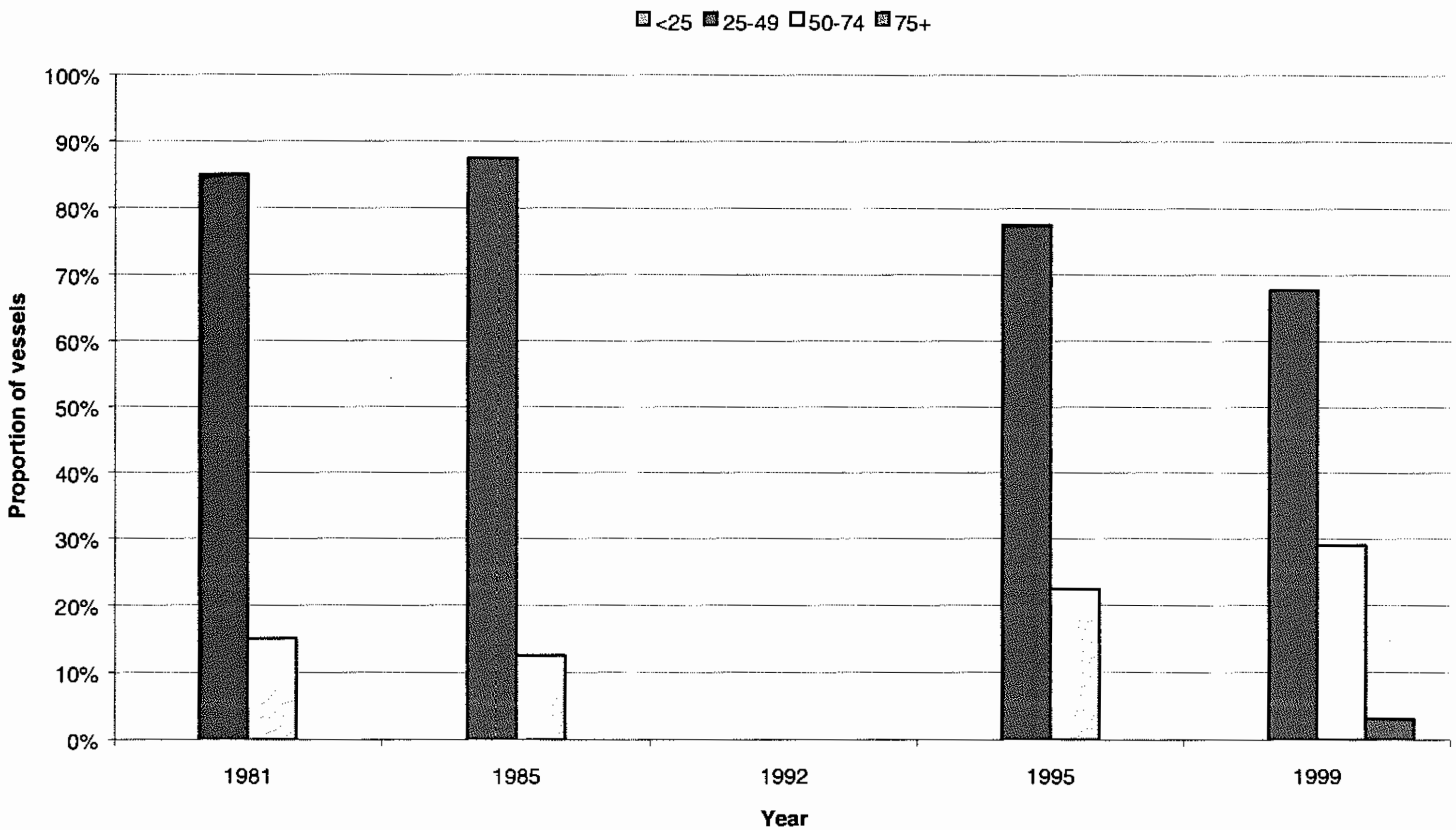


Figure 2-39. Vessel length distribution for vessels whose principal fishery was swordfish and shark drift gillnet and whose principal port was in Central California by length category (ft) and selected years.

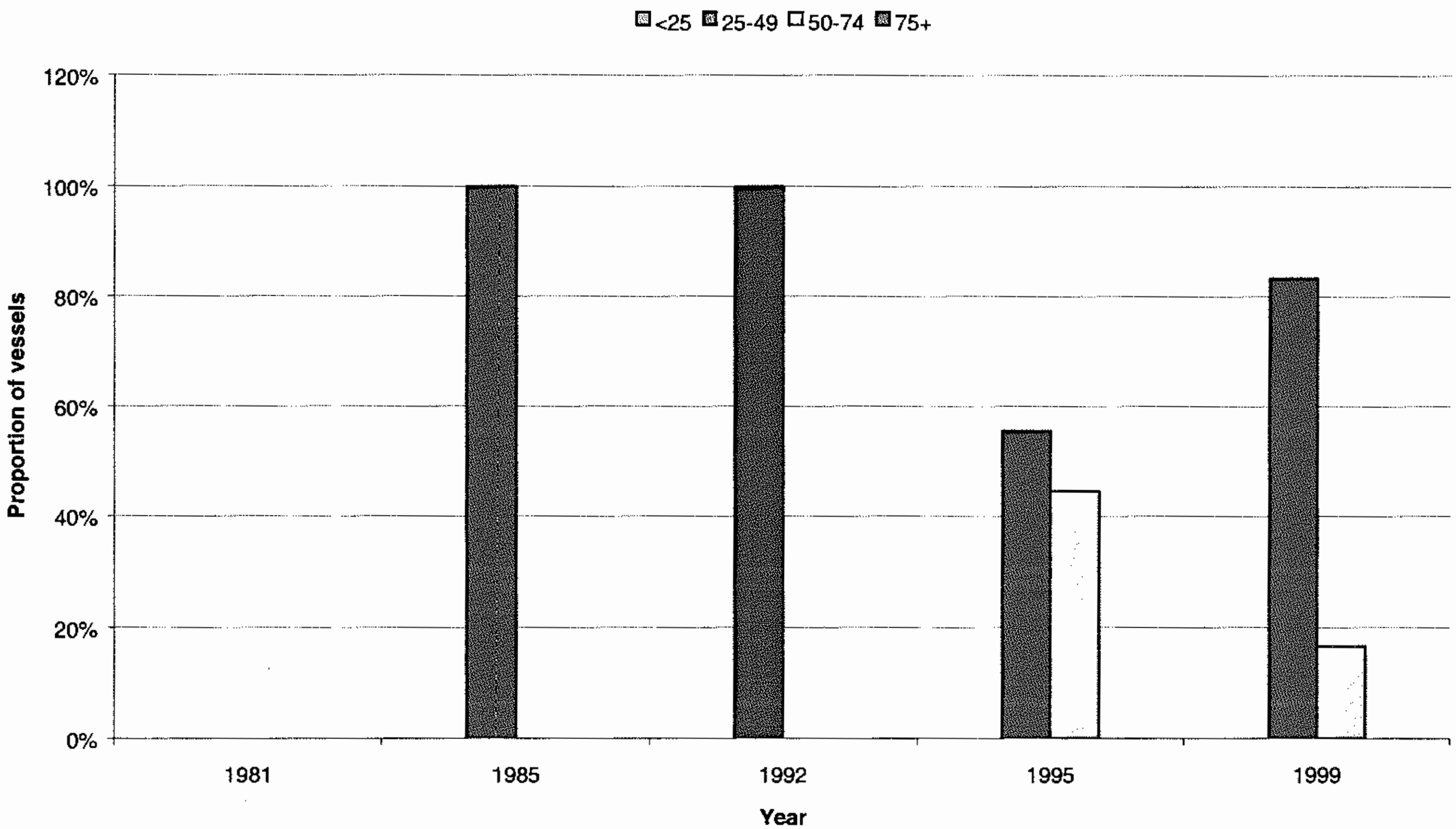


Figure 2-40. Vessel length distribution for vessels whose principal fishery was swordfish and shark drift gillnet and whose principal port was in Northern California by length category (ft) and selected years.

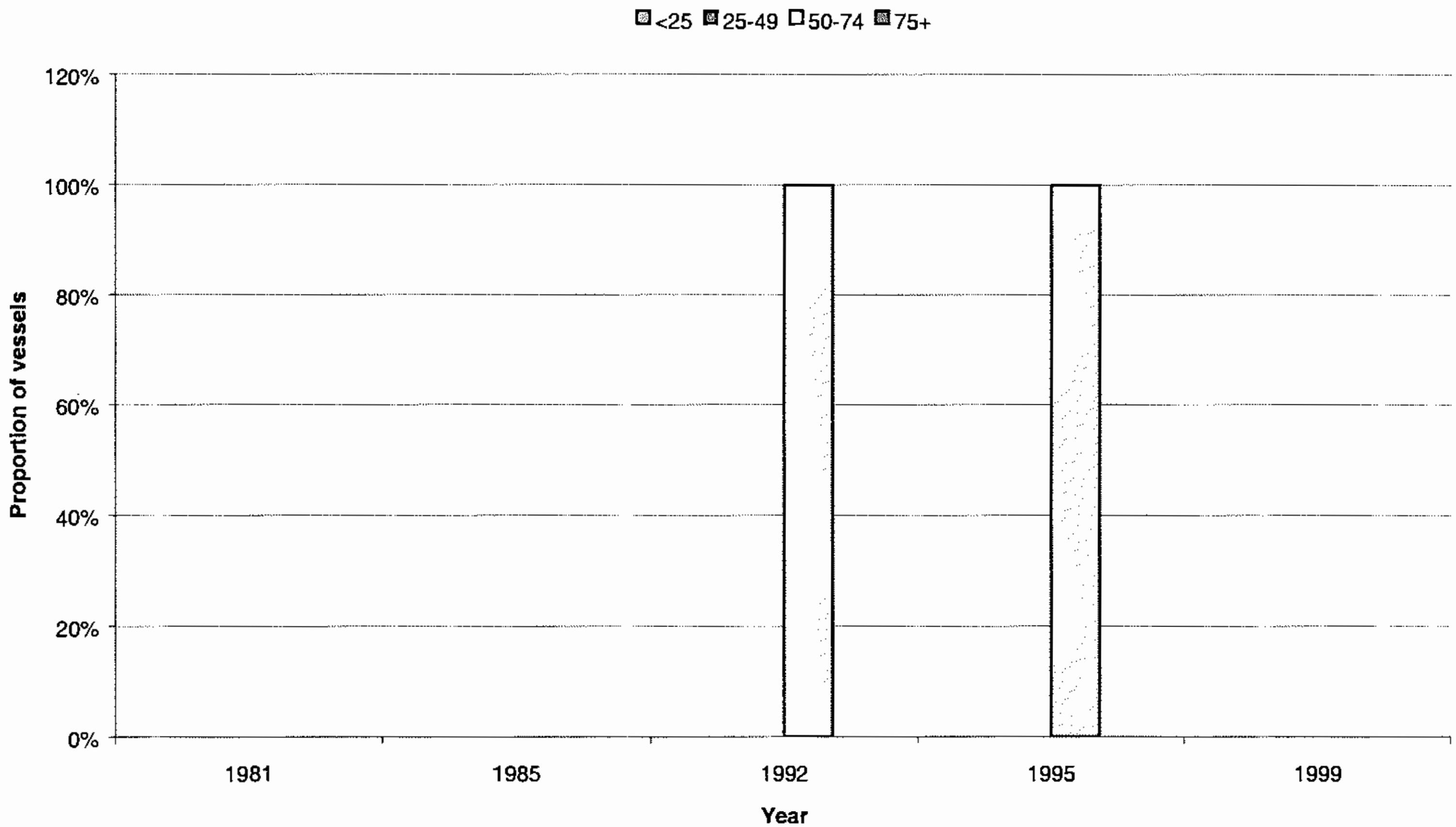
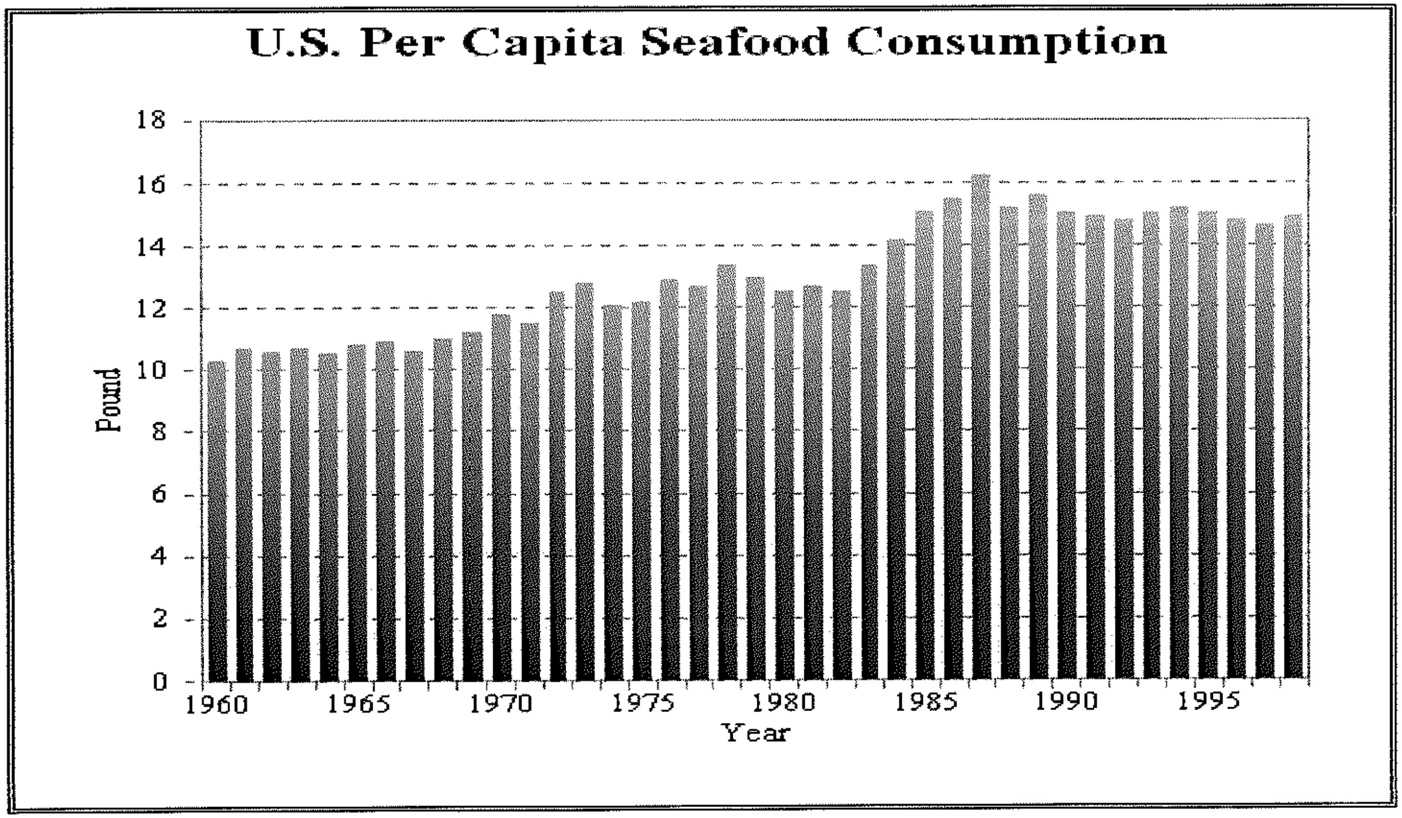


Figure 2-41. U.S. per capita seafood consumption, 1960-99.



Source of Raw Data: National Marine Fisheries Service - Fisheries Statistics and Economics Division
Source of Graph: http://www.msstate.edu/dept/crec/uspcsc.jpg

Table 2-1. Pacific coast commercial landings of highly migratory species by all gears, 1981-99.

Year	Landings (round mt)											
	Tunas						Sharks					
	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	Swordfish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Dorado
1981	13,712	76,091	57,869	1,168	868	749	1,521			182	92	4
1982	5,410	61,769	41,904	968	2,404	1,112	1,848		28	351	27	1
1983	9,574	55,741	44,995	21	764	1,758	1,331	9	96	217	7	1
1984	12,654	35,063	31,251	126	635	2,890	1,279	9	57	160	2	4
1985	7,301	15,025	2,977	7	3,254	3,418	1,190	< 0.5	95	149	1	< 0.5
1986	5,243	21,517	1,361	29	4,731	2,530	974	< 0.5	48	312	2	2
1987	3,160	23,201	5,724	50	823	1,803	562	2	20	403	2	< 0.5
1988	4,908	19,520	8,863	6	804	1,636	500	1	9	322	3	< 0.5
1989	2,214	17,615	4,505	1	1,019	1,357	504	< 0.5	17	255	6	< 0.5
1990	3,030	8,509	2,256	2	925	1,236	357	1	31	373	20	1
1991	1,676	4,178	3,407	7	104	1,029	584		32	219	1	< 0.5
1992	4,885	3,350	2,586	7	1,087	1,546	292	< 0.5	22	142	1	3
1993	6,151	3,795	4,539	26	559	1,771	275	1	44	122	< 0.5	17
1994	10,686	5,056	2,111	47	916	1,700	330	< 0.5	37	128	12	41
1995	6,528	3,038	7,037	49	714	1,161	270	5	31	95	5	5
1996	14,173	3,347	5,455	62	4,688	1,191	319	1	20	96	1	10
1997	11,292	4,775	6,070	82	2,251	1,456	320	35	32	132	1	5
1998	13,785	5,799	5,846	53	1,949	1,386	326	2	11	98	3	3
1999	9,746	1,353	3,759	106	186	2,018	320	10	5	63	< 0.5	17

Source: PacFIN, extracted February 2001.

Table 2-2. Pacific coast real commercial exvessel revenues (1999 $)[1] from highly migratory species landings by all gears, 1981-99.

	Revenues (1999 $)											
	Tunas						Sharks					
Year	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	Swordfish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Dorado
1981	46,214,203	172,003,933	115,565,817	2,734,919	2,158,763	5,845,295	2,573,703			282,851	102,904	4,471
1982	13,164,727	122,249,698	66,557,622	1,980,116	4,408,996	8,384,960	3,246,131		24,861	555,823	30,826	1,566
1983	19,115,067	93,000,460	57,781,773	72,226	1,670,878	10,668,432	2,317,362	13,282	143,288	361,292	7,178	1,092
1984	26,054,805	56,107,376	37,553,906	264,234	1,370,783	17,644,793	2,488,029	11,649	71,354	287,412	3,722	6,472
1985	12,145,002	21,513,776	3,102,042	25,911	4,129,010	19,642,082	2,659,869	1,049	140,316	283,209	3,268	551
1986	8,829,125	25,179,755	1,291,089	129,428	6,617,652	18,159,263	2,412,670	277	95,211	611,379	1,881	1,080
1987	7,086,028	32,263,343	6,290,665	244,391	2,834,411	15,402,799	1,639,072	2,560	30,564	989,633	2,566	494
1988	12,248,030	34,173,182	12,646,888	34,942	2,765,835	12,983,969	1,309,543	1,097	13,096	868,368	2,923	703
1989	4,859,892	24,113,379	5,088,028	3,069	1,549,116	10,608,024	1,210,414	191	31,554	707,833	4,433	550
1990	6,909,478	10,484,921	2,362,581	10,403	1,400,661	8,780,841	784,663	2,067	42,621	909,241	12,506	2,394
1991	3,346,296	4,722,698	3,130,813	50,591	137,695	7,487,593	1,143,997		29,384	490,548	1,098	1,350
1992	13,198,746	4,159,641	1,624,889	51,444	1,299,239	8,696,030	533,679	693	16,780	265,685	2,056	7,175
1993	13,070,995	5,402,677	3,678,301	236,998	843,847	10,064,131	513,892	519	31,587	248,329	681	47,311
1994	21,963,930	4,949,048	1,916,493	336,130	1,832,070	10,501,538	639,456	46	36,637	270,382	17,572	81,956
1995	12,377,132	3,256,937	5,084,676	276,767	1,131,717	7,025,216	511,068	9,389	26,632	176,736	2,991	5,861
1996	28,583,409	3,392,899	4,185,418	273,321	4,237,228	6,367,029	633,207	1,635	18,633	175,101	616	10,306
1997	20,537,572	5,144,801	5,674,073	370,862	2,859,139	6,340,221	609,480	64,421	35,838	232,826	287	11,193
1998	19,079,049	5,976,776	5,315,106	277,238	3,023,216	6,071,718	573,904	2,635	9,613	175,105	6,094	10,697
1999	17,722,077	1,468,210	2,748,208	644,775	1,061,726	8,405,938	616,963	18,424	5,876	110,480	73	47,854

[1]Real values are current values adjusted to eliminate the effects of inflation by dividing current values by the current year GDP implicit price deflator, with a base year of 1999.
Source: PacFIN, extracted February 2001.

Table 2-3. World catches of the principal market species of tunas, in thousands of metric tons (from FAO yearbooks of fisheries statistics, through the IATTC).

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Pacific Ocean																												
SKJ	308	350	344	445	519	463	555	503	692	594	627	566	568	712	827	658	814	754	939	867	942	1258	1011	1011	1057	1159	1122	1045
YFT	264	217	308	355	361	358	404	388	384	406	395	409	381	388	411	477	535	598	595	649	705	667	728	692	711	627	594	746
BET	84	66	88	90	88	103	129	145	122	129	132	104	109	111	103	124	150	149	121	126	163	143	158	130	142	128	114	147
ALB	85	116	134	136	133	103	147	102	136	103	120	111	110	89	106	107	110	127	131	143	139	98	118	100	118	108	114	137
PBF	21	25	19	16	16	17	16	18	19	23	17	27	26	16	8	11	14	12	7	9	6	6	7	7	9	7	15	11
SBF	21	20	20	14	9	10	11	5	8	10	14	11	7	5	3	3	2	2	2	2	3	2	5	5	4	3	3	2
Total	784	793	913	1056	1127	1054	1262	1160	1360	1265	1305	1229	1202	1319	1458	1381	1625	1642	1795	1797	1958	2174	2028	1946	2040	2032	1962	2089
Atlantic Ocean																												
SKJ	44	70	75	74	111	60	68	109	100	87	106	131	155	134	131	117	124	114	139	114	133	193	152	182	172	160	138	137
YFT	69	70	88	93	108	124	119	127	124	124	126	151	160	161	115	147	136	133	126	151	177	160	153	158	152	139	128	125
BET	41	54	45	55	62	63	48	55	54	48	63	66	73	60	69	75	60	49	57	69	68	70	76	108	114	111	104	87
ALB	70	83	85	76	73	60	78	75	72	74	62	60	73	68	58	76	78	68	69	87	73	56	80	76	68	66	53	52
ABF	15	16	13	14	22	26	28	25	20	17	20	20	24	24	26	26	20	19	25	23	23	23	27	30	36	38	39	36
SBF	4	5	11	8	7	2	5	8	10	12	9	7	6	5	5	4	3	4	2	2	2	3	3	4	2	2	3	<1
Total	244	299	317	320	383	334	347	399	381	362	385	434	491	452	404	444	421	387	418	447	477	507	490	557	543	516	466	438
Indian Ocean																												
SKJ	42	41	36	34	40	35	39	30	30	36	47	47	53	64	103	137	150	169	210	250	218	215	266	249	270	254	238	244
YFT	34	31	30	26	28	28	30	52	45	37	35	37	50	59	97	101	120	132	184	177	199	198	257	349	244	289	272	257
BET	18	17	15	11	21	31	24	32	47	31	31	32	39	44	36	43	47	51	54	45	46	46	39	59	69	94	91	98
ALB	14	6	7	14	15	5	6	10	17	16	12	13	21	17	15	9	28	28	28	16	21	16	20	19	18	17	21	19
SBF	22	26	25	27	31	21	27	26	17	17	24	26	29	37	30	29	22	19	19	14	11	6	5	4	6	7	9	5
Total	129	122	113	112	134	121	125	149	156	138	149	156	192	220	280	318	367	400	495	502	495	482	588	680	606	662	631	622
All oceans																												
SKJ	393	461	455	553	670	558	662	642	822	716	780	744	775	910	1061	912	1088	1037	1289	1231	1294	1667	1430	1442	1498	1573	1497	1426
YFT	368	319	426	474	497	510	554	566	553	567	556	597	591	608	623	724	791	864	904	978	1081	1025	1138	1199	1107	1055	994	1128
BET	143	137	148	157	171	197	201	231	223	208	226	202	222	215	208	242	257	248	232	240	277	260	274	298	324	334	310	332
ALB	169	205	226	225	221	168	230	187	225	193	193	184	205	173	179	193	216	223	228	246	233	170	218	195	204	190	189	208
ABF	15	16	13	14	22	26	28	25	20	17	20	20	24	24	26	26	20	19	25	23	23	23	27	30	36	38	39	36
PBF	21	25	19	16	16	17	16	18	19	23	17	27	26	16	8	11	14	12	7	9	6	6	7	7	9	7	15	11
SBF	47	51	55	49	46	33	43	39	35	39	47	45	41	46	38	35	27	26	23	18	16	12	13	13	11	13	15	8
Total	1156	1214	1343	1488	1644	1509	1734	1709	1897	1764	1840	1819	1884	1992	2143	2143	2413	2429	2707	2746	2930	3162	3106	3183	3190	3210	3059	3149

Table 2-4. Catches of bluefin, in metric tons, in the Pacific Ocean.

	Western Pacific nations			Eastern Pacific nations					
				Surface		Longline			
Year	Surface[1]	Longline[1]	Subtotal[1]	Commercial[2]	Recreational[3]	California[4]	Hawaii[5]	Subtotal	Total
1953	11,676	1,998	13,674	4,433	35			4,468	18,142
1954	14,953	1,588	16,541	9,537	8			9,545	26,086
1955	18,987	2,099	21,086	6,173	67			6,240	27,326
1956	27,430	1,242	28,672	5,727	279			6,006	34,678
1957	23,767	1,490	25,257	9,215	52			9,267	34,524
1958	12,330	1,429	13,759	13,934	7			13,941	27,700
1959	11,948	3,667	15,615	6,914	11			6,925	22,540
1960	14,214	5,784	19,998	5,422	1			5,423	25,421
1961	14,977	6,175	21,152	8,116	19			8,135	29,287
1962	14,764	2,238	17,002	11,125	20			11,145	28,147
1963	17,370	2,104	19,474	12,266	6			12,272	31,746
1964	14,603	2,379	16,982	9,211	6			9,217	26,199
1965	15,496	2,062	17,558	6,887	1			6,888	24,446
1966	12,080	3,388	15,468	15,881	16			15,897	31,365
1967	12,983	2,102	15,085	5,862	26			5,888	20,973
1968	14,171	2,340	16,511	5,966	10			5,976	22,487
1969	7,883	1,377	9,260	6,914	12			6,926	16,186
1970	7,505	1,152	8,657	3,951	15			3,966	12,623
1971	8,673	762	9,435	8,354	6			8,360	17,795
1972	7,951	755	8,706	13,335	12			13,347	22,053
1973	8,798	1,270	10,068	10,700	44			10,744	20,812
1974	14,773	3,546	18,319	5,570	47			5,617	23,936
1975	10,836	1,563	12,399	9,556	27			9,583	21,982
1976	9,199	580	9,779	10,628	17			10,645	20,424
1977	12,765	718	13,483	5,458	15			5,473	18,956
1978	21,362	1,074	22,436	5,393	4			5,397	27,833
1979	25,359	1,254	26,613	6,108	9			6,117	32,730
1980	18,488	1,194	19,682	2,933	6			2,939	22,621
1981	29,751	835	30,587	1,084	5			1,089	31,676
1982	24,273	897	25,170	3,145	5			3,150	28,320
1983	18,233	712	18,945	837	16			853	19,798
1984	11,045	363	11,408	858	23			881	12,289
1985	12,472	507	12,979	4,014	41			4,055	17,034
1986	14,599	276	14,875	5,079	6			5,085	19,960
1987	13,771	383	14,154	990	15		0	1,005	15,159
1988	7,677	256	7,933	1,421	3		0	1,424	9,357
1989	10,057	490	10,547	1,117	53		0	1,170	11,717
1990	7,132	409	7,541	1,511	31		0	1,542	9,083
1991	14,656	305	14,961	418	43	<1	0	461	15,422
1992	10,859*	600*	11,459*	1,929	70	<1	0	1,999	13,458*
1993	8,540*	1,283*	9,823*	581	298	4	0	883	10,706*
1994	10,839*	1,864*	12,703*	974	88	5	14	1,081	13,784*
1995	22,015*	593*	22,608*	629	245		27	901	23,509*
1996	10,121*	879*	11,000*	8,222	37		23	8,282	19,282*
1997	8,879*	1,044*	9,923*	2,636	151		24	2,811	12,734*
1998				814*	380*		16	1,210*	

[1] Sources: Data for Japan were obtained from the National Research Institute of Far Seas Fisheries of Japan. Data for Taiwan and the Republic of Korea were obtained from FAO yearbooks of fisheries statistics and data published by the Institute of Oceanography, National Taiwan University, Taipei, Taiwan, and the National Fisheries Research and Development Agency of Korea.

[2] Sources: 1952-1960, FAO Fish. Rep., 6 (2): 405; 1961-1998, Table 3, minus recreational catch.

[3] Sources: 1952-1990, California's Living Marine Resources and their Utilization, California Department of Fish and Game; 1991-1992, California Department of Fish and Game, unpublished data; 1993-1998, Calif. Coop. Ocean. Fish. Inves., Rep., 35-40.

[4] Source: NOAA Tech. Rep. NMFS 142: page 149 (These data are incomplete.)

[5] Source: Pelagic Fisheries of the Western Pacific Region, 1998 Annual Report, Western Pacific Fishery Management Council, Honolulu, Hawaii: page 3-57.

* preliminary data

Table 2-5. Pacific Ocean and world catches of swordfish (mt), 1971-97.

Year	Chile	Japan	Mexico	Philippines	Republic of China	USA	Other Pacific	Total Pacific	World
1971	200	10,400	-	1,500	1,033	100	200	13,433	26,742
1972	100	10,400	2	1,500	1,005	100	600	13,807	28,167
1973	400	11,100	4	1,700	1,987	300	1,900	17,391	31,983
1974	218	10,498	6	1,848	1,116	295	470	14,451	29,664
1975	137	12,361	-	1,976	1,239	393	158	16,264	31,918
1976	13	15,843	-	1,558	856	39	739	19,048	33,888
1977	32	13,997	-	2,103	902	220	685	17,939	33,357
1978	56	14,333	-	890	779	1,009	634	17,701	38,478
1979	40	13,091	7	3,845	1,060	249	553	18,845	39,368
1980	104	11,953	380	1,716	1,459	489	545	16,646	40,418
1981	294	13,078	1,575	1,940	909	443	348	18,587	39,878
1982	285	11,350	1,365	3,468	1,107	726	348	18,649	43,716
1983	342	12,511	120	2,974	1,268	1,195	360	18,770	46,608
1984	103	11,986	47	2,274	1,387	2,009	352	18,158	53,543
1985	342	13,083	18	2,036	1,429	2,370	148	19,426	59,127
1986	764	14,271	422	2,089	1,357	1,585	70	20,558	61,081
1987	2,059	14,867	550	2,137	744	1,221	184	21,762	67,196
1988	4,455	15,496	613	4,034	796	1,086	239	26,719	81,222
1989	5,824	12,367	690	3,756	2,810	588	258	26,293	79,188
1990	4,955	11,341	2,650	3,187	3,245	2,150	440	27,968	75,588
1991	7,255	9,936	861	3,139	581	4,597	601	26,970	68,048
1992	6,379	15,619	1,160	4,256	800	5,948	489	34,651	82,156
1993	4,712	14,073	806	4,627	1,535	6,981	185	32,919	86,097
1994	3,801	13,530	567	3,641	2,407	4,490	171	28,607	84,685
1995	2,594	11,619	424	4,202	1,671	3,431	416	24,357	92,334
1996	3,145	16,051	428	4,002	1,428	3,695	262	29,011	80,095
1997	4,040	12,200	2,351	5,554	2,349	4,122	1,006	31,617	97,698

Source: IATTC Annual Report 1996 (from FAO yearbooks of fisheries statistics).

Table 2-6. Commercial landings of highly migratory species in Washington, 1981-99.

	Landings (round mt)											
	Tunas						Sharks					
Year	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	Swordfish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Dorado
1981	875	N.A.		N.A.				N.A.	N.A.	N.A.	< 0.5	N.A.
1982	266	N.A.		N.A.				N.A.	N.A.	N.A.	< 0.5	N.A.
1983	530	N.A.		N.A.				N.A.	N.A.	N.A.	< 0.5	N.A.
1984	67	N.A.		N.A.				N.A.	N.A.	N.A.	< 0.5	N.A.
1985	172	N.A.		N.A.				N.A.	N.A.	N.A.	< 0.5	N.A.
1986	845	N.A.		N.A.			82	N.A.	N.A.	N.A.	< 0.5	N.A.
1987	529	N.A.		N.A.			65	N.A.	N.A.	N.A.	< 0.5	N.A.
1988	1,900	N.A.		N.A.		2	6	N.A.	N.A.	N.A.	< 0.5	N.A.
1989	855	N.A.		N.A.			3	N.A.	N.A.	N.A.		N.A.
1990	1,225	N.A.		N.A.			< 0.5	N.A.	N.A.	N.A.		N.A.
1991	428	N.A.	< 0.5	N.A.			< 0.5	N.A.	N.A.	N.A.	< 0.5	N.A.
1992	1,864	N.A.	< 0.5	N.A.			1	N.A.	N.A.	N.A.	< 0.5	N.A.
1993	2,167	N.A.		N.A.		1	< 0.5	N.A.	N.A.	N.A.	< 0.5	N.A.
1994	5,377	N.A.		N.A.			< 0.5	N.A.	N.A.	N.A.		N.A.
1995	3,413	N.A.		N.A.		< 0.5	5	N.A.	N.A.	N.A.	< 0.5	N.A.
1996	4,969	N.A.		N.A.			4	N.A.	N.A.	N.A.	< 0.5	N.A.
1997	3,775	N.A.		N.A.			2	N.A.	N.A.	N.A.	< 0.5	N.A.
1998	6,517	N.A.		N.A.			6	N.A.	N.A.	N.A.	< 0.5	N.A.
1999	2,081	N.A.		N.A.	12	4	65	N.A.	N.A.	N.A.		N.A.

Source: PacFIN, extracted February 2001.

Table 2-7. Real commercial exvessel revenues (1999 $)[1] from highly migratory species landings in Washington, 1981-99.

	Revenues (1999 $)											
	Tunas						Sharks					
							Common	Pelagic	Bigeye	Shortfin		
Year	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	Swordfish	Thresher	Thresher	Thresher	Mako	Blue	Dorado
1981	2,909,770	N.A.		N.A.				N.A.	N.A.	N.A.	169	N.A.
1982	596,514	N.A.		N.A.				N.A.	N.A.	N.A.	102	N.A.
1983	1,002,286	N.A.		N.A.				N.A.	N.A.	N.A.	201	N.A.
1984	137,861	N.A.		N.A.				N.A.	N.A.	N.A.	11	N.A.
1985	292,000	N.A.		N.A.				N.A.	N.A.	N.A.	183	N.A.
1986	1,348,513	N.A.		N.A.			303,270	N.A.	N.A.	N.A.	170	N.A.
1987	1,160,514	N.A.		N.A.			298,466	N.A.	N.A.	N.A.	580	N.A.
1988	4,666,429	N.A.		N.A.		13,526	31,385	N.A.	N.A.	N.A.	65	N.A.
1989	1,730,680	N.A.		N.A.			10,541	N.A.	N.A.	N.A.		N.A.
1990	2,693,806	N.A.		N.A.			33	N.A.	N.A.	N.A.		N.A.
1991	818,179	N.A.	17	N.A.			287	N.A.	N.A.	N.A.	52	N.A.
1992	5,014,569	N.A.	82	N.A.			655	N.A.	N.A.	N.A.	39	N.A.
1993	4,603,209	N.A.		N.A.		5,907	953	N.A.	N.A.	N.A.	34	N.A.
1994	10,609,267	N.A.		N.A.			102	N.A.	N.A.	N.A.		N.A.
1995	6,429,656	N.A.		N.A.		328	16,541	N.A.	N.A.	N.A.	16	N.A.
1996	9,515,982	N.A.		N.A.			11,619	N.A.	N.A.	N.A.	44	N.A.
1997	7,000,641	N.A.		N.A.			10,922	N.A.	N.A.	N.A.	10	N.A.
1998	8,962,842	N.A.		N.A.			19,243	N.A.	N.A.	N.A.	71	N.A.
1999	3,647,381	N.A.		N.A.	27,772	9,445	144,232	N.A.	N.A.	N.A.		N.A.

[1]Real values are current values adjusted to eliminate the effects of inflation by dividing current values by the current year GDP implicit price deflator, with a base year of 1999.
Source: PacFIN, extracted February 2001.

Table 2-8. Commercial landings of highly migratory species in Oregon, 1981-99.

	Landings (round mt)											
							Sharks					
	Tunas						Common	Pelagic	Bigeye	Shortfin		
Year	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	Swordfish	Thresher	Thresher	Thresher	Mako	Blue	Dorado
1981	3,505			N.A.				N.A.	N.A.			
1982	863	< 0.5	< 0.5	N.A.				N.A.	N.A.			
1983	1,541	< 0.5	< 0.5	N.A.				N.A.	N.A.			
1984	737	< 0.5		N.A.				N.A.	N.A.			
1985	692			N.A.			2	N.A.	N.A.			
1986	1,116	< 0.5	< 0.5	N.A.			424	N.A.	N.A.			
1987	1,038			N.A.	< 0.5		92	N.A.	N.A.			
1988	1,799			N.A.			81	N.A.	N.A.			
1989	490			N.A.			< 0.5	N.A.	N.A.			
1990	943			N.A.			< 0.5	N.A.	N.A.		< 0.5	
1991	571			N.A.				N.A.	N.A.		< 0.5	
1992	1,764			N.A.			1	N.A.	N.A.		< 0.5	
1993	2,157			N.A.			< 0.5	N.A.	N.A.		< 0.5	
1994	2,131			N.A.				N.A.	N.A.		< 0.5	
1995	2,283	< 0.5	< 0.5	N.A.	< 0.5	3	1	N.A.	N.A.		< 0.5	< 0.5
1996	4,059	< 0.5		N.A.	< 0.5	16	< 0.5	N.A.	N.A.		1	
1997	4,158	< 0.5	< 0.5	N.A.	1	6	< 0.5	N.A.	N.A.		< 0.5	< 0.5
1998	4,808			N.A.	3	35	< 0.5	N.A.	N.A.	1	2	
1999	2,064	< 0.5		N.A.	6	6	1	N.A.	N.A.	< 0.5	< 0.5	

Source: PacFIN, extracted February 2001.

Table 2-9. Real commercial exvessel revenues (1999 $)[1] from highly migratory species landings in Oregon, 1981-99.

	Revenues (1999 $)											
	Tunas						Sharks					
Year	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	Swordfish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Dorado
1981	11,649,142			N.A.				N.A.	N.A.			
1982	2,073,809	233	164	N.A.				N.A.	N.A.			
1983	2,961,338	118	13	N.A.				N.A.	N.A.			
1984	1,367,247	277		N.A.				N.A.	N.A.			
1985	1,204,367			N.A.			3,064	N.A.	N.A.			
1986	1,891,052	173	4	N.A.			874,406	N.A.	N.A.			
1987	2,319,249			N.A.	9		214,998	N.A.	N.A.			
1988	4,444,898			N.A.			180,477	N.A.	N.A.			
1989	1,142,060			N.A.			19	N.A.	N.A.			
1990	2,167,028			N.A.			664	N.A.	N.A.		69	
1991	1,166,314			N.A.				N.A.	N.A.		73	
1992	4,554,091			N.A.			1,228	N.A.	N.A.		99	
1993	4,350,334			N.A.			498	N.A.	N.A.		130	
1994	4,103,617			N.A.				N.A.	N.A.		93	
1995	4,332,302	336	9	N.A.	454	25,141	1,681	N.A.	N.A.		192	22
1996	7,801,152	9		N.A.	1,203	125,422	234	N.A.	N.A.		438	
1997	7,567,729	536	424	N.A.	3,332	51,790	199	N.A.	N.A.		209	224
1998	6,665,217			N.A.	15,783	263,820	114	N.A.	N.A.	2,726	5,628	
1999	3,782,057	198		N.A.	38,117	46,955	2,588	N.A.	N.A.	787	48	

[1]Real values are current values adjusted to eliminate the effects of inflation by dividing current values by the current year GDP implicit price deflator, with a base year of 199

Source: PacFIN, extracted February 2001.

Table 2-10. Commercial landings of highly migratory species in California, 1981-99.

	Landings (round mt)											
	Tunas						Sharks					
							Common	Pelagic	Bigeye	Shortfin		
Year	**Albacore**	**Yellowfin**	**Skipjack**	**Bigeye**	**Bluefin**	**Swordfish**	**Thresher**	**Thresher**	**Thresher**	**Mako**	**Blue**	**Dorado**
1981	9,333	76,091	57,869	1,168	868	749	1,521			182	92	4
1982	4,281	61,769	41,904	968	2,404	1,112	1,848		28	351	27	1
1983	7,503	55,740	44,995	21	764	1,758	1,331	9	96	217	7	1
1984	11,851	35,063	31,251	126	635	2,890	1,279	9	57	160	2	4
1985	6,437	15,025	2,977	7	3,254	3,418	1,188	< 0.5	95	149	1	< 0.5
1986	3,282	21,517	1,361	29	4,731	2,530	468	< 0.5	48	312	2	2
1987	1,592	23,201	5,724	50	823	1,803	405	2	20	403	2	< 0.5
1988	1,209	19,520	8,863	6	804	1,634	414	1	9	322	3	< 0.5
1989	870	17,615	4,505	1	1,019	1,357	501	< 0.5	17	255	6	< 0.5
1990	862	8,509	2,256	2	925	1,236	356	1	31	373	20	1
1991	677	4,178	3,407	7	104	1,029	584		32	219	1	< 0.5
1992	1,257	3,350	2,586	7	1,087	1,546	291	< 0.5	22	142	1	3
1993	1,826	3,795	4,539	26	559	1,770	275	1	44	122	< 0.5	17
1994	3,177	5,056	2,111	47	916	1,700	330	< 0.5	37	128	12	41
1995	832	3,038	7,037	49	714	1,159	264	5	31	95	5	5
1996	5,146	3,347	5,455	62	4,687	1,175	316	1	20	96	< 0.5	10
1997	3,358	4,774	6,070	82	2,250	1,451	317	35	32	132	< 0.5	5
1998	2,460	5,799	5,846	53	1,946	1,351	319	2	11	98	1	3
1999	5,601	1,353	3,759	106	168	2,008	253	10	5	62	< 0.5	17

Source: PacFIN, extracted February 2001.

Table 2-11. Real commercial exvessel revenues (1999 $)[1] from highly migratory species landings in California, 1981-99.

Year	Revenues (1999 $)											
	Tunas						Sharks					
	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	Swordfish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Dorado
1981	31,655,291	172,003,933	115,565,817	2,734,919	2,158,763	5,845,295	2,573,703			282,851	102,736	4,471
1982	10,494,404	122,249,465	66,557,458	1,980,116	4,408,996	8,384,960	3,246,131		24,861	555,823	30,724	1,566
1983	15,151,442	93,000,342	57,781,760	72,226	1,670,878	10,668,432	2,317,362	13,282	143,288	361,292	6,977	1,092
1984	24,549,696	56,107,098	37,553,906	264,234	1,370,783	17,644,793	2,488,029	11,649	71,354	287,412	3,712	6,472
1985	10,648,635	21,513,776	3,102,042	25,911	4,129,010	19,642,082	2,656,805	1,049	140,316	283,209	3,086	551
1986	5,589,560	25,179,582	1,291,085	129,428	6,617,652	18,159,263	1,234,993	277	95,211	611,379	1,711	1,080
1987	3,606,265	32,263,343	6,290,665	244,391	2,834,402	15,402,799	1,125,608	2,560	30,564	989,633	1,986	494
1988	3,136,703	34,173,182	12,646,888	34,942	2,765,835	12,970,443	1,097,681	1,097	13,096	868,368	2,858	703
1989	1,987,152	24,113,379	5,088,028	3,069	1,549,116	10,608,024	1,199,853	191	31,554	707,833	4,433	550
1990	2,048,645	10,484,921	2,362,581	10,403	1,400,661	8,780,841	783,966	2,067	42,621	909,241	12,437	2,394
1991	1,361,802	4,722,698	3,130,796	50,591	137,695	7,487,593	1,143,710		29,384	490,548	973	1,350
1992	3,630,086	4,159,641	1,624,806	51,444	1,299,239	8,696,030	531,795	693	16,780	265,685	1,918	7,175
1993	4,117,452	5,402,677	3,678,301	236,998	843,847	10,058,223	512,441	519	31,587	248,329	517	47,311
1994	7,251,046	4,949,048	1,916,493	336,130	1,832,070	10,501,538	639,353	46	36,637	270,382	17,479	81,956
1995	1,615,174	3,256,601	5,084,667	276,767	1,131,264	6,999,746	492,846	9,389	26,632	176,736	2,782	5,839
1996	11,266,275	3,392,890	4,185,418	273,321	4,236,024	6,241,607	621,354	1,635	18,633	175,101	135	10,306
1997	5,969,201	5,144,266	5,673,649	370,862	2,855,807	6,288,431	598,359	64,421	35,838	232,826	67	10,969
1998	3,450,990	5,976,776	5,315,106	277,238	3,007,433	5,807,898	554,547	2,635	9,613	172,379	395	10,697
1999	10,292,638	1,468,011	2,748,208	644,775	995,837	8,349,538	470,142	18,424	5,876	109,693	26	47,854

[1]Real values are current values adjusted to eliminate the effects of inflation by dividing current values by the current year GDP implicit price deflator, with a base year of 1999.

Source: PacFIN, extracted February 2001.

Table 2-12. Landings (round mt) in the Pacific coast albacore surface hook-and-line fishery, 1981-99.

Year	Albacore	Tropical Tunas & Bluefin	Swordfish	HMS Sharks	Dorado	Groundfish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	13,421	12		< 0.5	< 0.5	4	2		37	3	13,479
1982	4,974	3	4	2	1	4	< 0.5		3	1	4,992
1983	3,909	1	3	1	< 0.5	10	2		11	3	3,940
1984	7,028	6	< 0.5	< 0.5	< 0.5	4	1		1	1	7,041
1985	6,184	2	9	4	< 0.5	4	< 0.5		1	1	6,205
1986	4,479	2	1	< 0.5		20	< 0.5	< 0.5	2	< 0.5	4,504
1987	2,486	< 0.5	1	< 0.5		1	1		1	1	2,491
1988	4,274	< 0.5	13	2		1	< 0.5		2	< 0.5	4,292
1989	2,130	1	7	8	< 0.5	9		< 0.5	2	2	2,159
1990	2,926	< 0.5	2	< 0.5	< 0.5	3	< 0.5		1	1	2,933
1991	1,638	< 0.5				< 0.5		< 0.5	1	< 0.5	1,639
1992	4,675	< 0.5	13	2	< 0.5	6			1	1	4,698
1993	5,723	14	90	5	9	4			3	5	5,853
1994	10,557	< 0.5	1	< 0.5	< 0.5	1			< 0.5	< 0.5	10,559
1995	6,472	1	1	< 0.5	< 0.5	< 0.5	< 0.5		8	1	6,483
1996	14,075	42	< 0.5	< 0.5		< 0.5			10	1	14,128
1997	11,222	7	1	1	< 0.5	5	< 0.5		12	4	11,252
1998	13,557	115	4	3	< 0.5	2	< 0.5		5	2	13,688
1999	9,519	20	12	1	< 0.5	1	< 0.5		2	5	9,560

Source: PacFIN, extracted February 2001.

Table 2-13. Real exvessel revenues (1999 $)[1] for the Pacific coast albacore surface hook-and-line fishery, 1981-99.

Year	Albacore	Tropical Tunas & Bluefin	Swordfish	HMS Sharks	Dorado	Groundfish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	45,214,132	27,211		301	125	3,614	1,648		232,028	6,570	45,485,629
1982	12,034,627	7,673	21,666	4,541	913	8,847	20		22,674	1,745	12,102,706
1983	7,993,629	3,876	11,715	1,634	52	13,300	2,098		40,376	6,630	8,073,310
1984	15,037,144	14,824	2,018	592	334	8,557	694		7,334	2,547	15,074,044
1985	10,351,987	5,217	34,282	9,595	9	8,038	288		11,200	2,606	10,423,222
1986	7,490,115	8,701	9,172	257		26,315	151	37	13,082	773	7,548,603
1987	5,579,586	1,509	7,075	102		2,034	817		9,377	474	5,600,974
1988	10,606,528	917	93,430	4,194		1,024	820		12,694	874	10,720,481
1989	4,663,354	1,804	44,296	14,478	31	20,991		25	10,645	2,919	4,758,543
1990	6,649,931	97	16,381	688	21	7,572	105		3,430	1,660	6,679,885
1991	3,259,841	84				224		664	4,112	258	3,265,183
1992	12,483,181	599	61,928	2,715	323	6,997			7,039	2,605	12,565,387
1993	12,060,709	152,096	496,024	8,955	26,013	5,593			11,636	22,545	12,783,571
1994	21,721,048	660	7,439	330	197	646			588	376	21,731,284
1995	12,278,606	978	3,487	185	22	150	17		23,844	3,241	12,310,530
1996	28,434,020	40,526	2,738	309		462			27,851	1,047	28,506,953
1997	20,419,467	13,241	4,525	1,678	499	12,053	92		38,796	6,088	20,496,439
1998	18,784,010	140,645	17,457	5,117	535	4,882	284		16,659	5,562	18,975,151
1999	17,424,581	80,427	69,269	2,494	1,076	4,347	455		9,742	8,280	17,600,671

[1]Real values are current values adjusted to eliminate the effects of inflation by dividing current values by the current year GDP implicit price
Source: PacFIN, extracted February 2001.

Table 2-14. Fishery statistics for the U.S. South Pacific albacore troll fishery.

Fishing Season	No. Trips	Catch (mt)	Number of Days	Number of Vessels
1988-89	81	3,280	3,990	42
1989-90	76	3,922	3,686	39
1990-91	73	5,540	7,097	54
1991-92	56	3,055	6,553	54
1992-93	43	1,036	4,433	44
1993-94	12	530	1,043	13
1994-95	42	2,092	1,993	21
1995-96	48	2,186	4,378	53
1996-97	25	1,403	2,910	27
1997-98	39	1,764	5,379	37
1998-99	24	1,200	2,166	20

Source: Childers and Miller (2000)

Table 2-15. Canadian commercial albacore troll vessels, trips and landing at U.S. West Coast ports, 1995-99.

Year	No. of Vessels	Number of Trips[1]	Albacore Landings (mt)
1995	4	7	67
1996	66	178	1,261
1997	33	53	399
1998	29	67	961
1999	53	106	588

[1]Number of fishing trips denotes number of landings, i.e. it is assumed that each landing (transaction) represents a single trip.
Source: Southwest Fisheries Science Center

Table 2-16. Percentages of catch and effort by fishing areas (U.S. EEZ, Canada EEZ and high seas) for U.S. albacore troll vessels.

Year	Catch				Effort			
	U.S. EEZ	Canada EEZ	High Seas	Total	U.S. EEZ	Canada EEZ	High Seas	Total
1989	36	42	22	100	55	28	17	100
1990	9	42	49	100	21	44	35	100
1991	3	32	65	100	10	34	56	100
1992	59	8	33	100	60	8	32	100
1993	53	4	43	100	56	4	40	100
1994	22	11	67	100	35	13	52	100
1995	6	6	88	100	18	12	70	100
1996	14	<1	86	100	28	<1	72	100
1997	16	3	81	100	29	4	67	100
1998	15	<1	85	100	27	<1	73	100
1999	66	1	33	100	62	2	36	100

Source: Voluntary logbooks with trip coverage rates of 9-38% per year.

Table 2-17. Percentages of catch and effort by fishing areas (U.S. EEZ, Canada EEZ and high seas) for Canadian albacore troll vessels.

Year	Trips	Catch				Effort			
		U.S. EEZ	Canada EEZ	High Seas	Total	U.S. EEZ	Canada EEZ	High Seas	Total
1989	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0
1992	6	73	27	0	100	72	28	0	100
1993	*	*	*	*	*	*	*	*	*
1994	3	3	97	0	100	12	88	0	100
1995	4	4	30	66	100	10	43	47	100
1996	27	48	<1	52	100	65	2	33	100
1997	13	27	<1	73	100	44	<1	56	100
1998	26	17	1	82	100	22	5	73	100
1999	13	78	9	13	100	80	12	8	100

Note: * denotes < 3 trips and hence cannot be reported.
Source: Data are from voluntary logbooks with unknown coverage rate.

Table 2-18. Landings (round mt) of the albacore surface hook-and-line fishery in Washington, 1981-99.

Year	Albacore	Tropical Tunas & Bluefin	Swordfish	HMS Sharks	Dorado	Groundfish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	875				N.A.	1			9	< 0.5	885
1982	266				N.A.					< 0.5	266
1983	530				N.A.	1			4	< 0.5	535
1984	67				N.A.					< 0.5	67
1985	172				N.A.					< 0.5	172
1986	845				N.A.					< 0.5	845
1987	529				N.A.					< 0.5	529
1988	1,900		1		N.A.	< 0.5	< 0.5		< 0.5	1	1,902
1989	855				N.A.	< 0.5				< 0.5	855
1990	1,225				N.A.					< 0.5	1,225
1991	428	< 0.5			N.A.	< 0.5			< 0.5	< 0.5	428
1992	1,864	< 0.5			N.A.	< 0.5				< 0.5	1,864
1993	2,167		1	< 0.5	N.A.	< 0.5			< 0.5	1	2,169
1994	5,377				N.A.					< 0.5	5,377
1995	3,413		< 0.5		N.A.				1	< 0.5	3,414
1996	4,969				N.A.					< 0.5	4,969
1997	3,775				N.A.	< 0.5				< 0.5	3,775
1998	6,517				N.A.					< 0.5	6,517
1999	2,081	12			N.A.					< 0.5	2,093

Source: PacFIN, extracted February 2001.

Table 2-19. Real exvessel revenues (1999 $)[1] from albacore surface hook-and-line fishery landings in Washington, 1981-99.

Year	Albacore	Tropical Tunas & Bluefin	Swordfish	HMS Sharks	Dorado	Groundfish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	2,909,770				N.A.	549			50,661	34	2,961,014
1982	596,514				N.A.					< 0.5	596,514
1983	1,002,286				N.A.	596			6,889	< 0.5	1,009,771
1984	137,861				N.A.					< 0.5	137,861
1985	292,000				N.A.					< 0.5	292,000
1986	1,348,513				N.A.					< 0.5	1,348,513
1987	1,160,514				N.A.					49	1,160,563
1988	4,666,429		8,944		N.A.	38	820		68	69	4,676,368
1989	1,730,680				N.A.	19				< 0.5	1,730,699
1990	2,693,806				N.A.					< 0.5	2,693,806
1991	818,179	17			N.A.	5			1,034	1	819,236
1992	5,014,569	82			N.A.	7				64	5,014,722
1993	4,603,209		5,907	950	N.A.	187			31	73	4,610,357
1994	10,609,267				N.A.					< 0.5	10,609,267
1995	6,429,656		328		N.A.				1,903	38	6,431,925
1996	9,515,982				N.A.					< 0.5	9,515,982
1997	7,000,641				N.A.	13				< 0.5	7,000,654
1998	8,962,842				N.A.					< 0.5	8,962,842
1999	3,647,381	26,351			N.A.					153	3673885

[1]Real values are current values adjusted to eliminate the effects of inflation by dividing current values by the current year GDP implicit price deflator, with a base year of 1999.
Source: PacFIN, extracted February 2001.

Table 2-20. Landings (round mt) of the albacore surface hook-and-line fishery in Oregon, 1981-99.

Year	Albacore	Tropical Tunas & Bluefin	Swordfish	HMS Sharks	Dorado	Groundfish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	3,505					1			25	< 0.5	3,531
1982	863	< 0.5				< 0.5			1	1	865
1983	1,540	< 0.5				3	< 0.5		5	1	1,549
1984	736	< 0.5				< 0.5			1	< 0.5	737
1985	692					< 0.5			< 0.5	< 0.5	692
1986	1,116	< 0.5				< 0.5			1	< 0.5	1,117
1987	1,038								1	< 0.5	1,038
1988	1,795					< 0.5			2	< 0.5	1,797
1989	490					< 0.5			< 0.5	< 0.5	490
1990	943					< 0.5	< 0.5		1	< 0.5	944
1991	571								1	< 0.5	571
1992	1,764			< 0.5		< 0.5			1	< 0.5	1,765
1993	2,157					1			3	< 0.5	2,160
1994	2,131			< 0.5					< 0.5	< 0.5	2,131
1995	2,283	1			< 0.5	< 0.5			6	< 0.5	2,290
1996	4,059	< 0.5				< 0.5			10	< 0.5	4,069
1997	4,158	< 0.5			< 0.5	1			9	1	4,169
1998	4,808			< 0.5		1			4	< 0.5	4,813
1999	2,064	4		< 0.5		< 0.5			2	< 0.5	2,070

Source: PacFIN, extracted February 2001.

Table 2-21. Real exvessel revenues (1999 $)[1] from albacore surface hook-and-line fishery landings in Oregon, 1981-99.

Year	Albacore	Tropical Tunas & Bluefin	Swordfish	HMS Sharks	Dorado	Groundfish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	11,649,142					1,304			152,291	518	11,803,255
1982	2,073,809	397				8			6,282	332	2,080,828
1983	2,960,450	118				2,241	103		26,250	262	2,989,424
1984	1,365,399	277				140			6,467	1,090	1,373,373
1985	1,204,367					12			1,022	493	1,205,894
1986	1,891,052	177				118			4,484	1	1,895,832
1987	2,318,864								5,195	< 0.5	2,324,059
1988	4,435,567					98			12,626	87	4,448,378
1989	1,142,060					50			1,144	< 0.5	1,143,254
1990	2,167,028					128	3		3,383	< 0.5	2,170,541
1991	1,166,314								3,078	42	1,169,434
1992	4,554,091			46		153			5,591	< 0.5	4,559,881
1993	4,350,334					1,018			11,605	< 0.5	4,362,957
1994	4,103,617			29					9	21	4,103,676
1995	4,332,302	345			22	113			21,183	< 0.5	4,353,964
1996	7,801,152	51				399			26,205	< 0.5	7,827,807
1997	7,567,729	959			224	739			29,951	1	7,599,603
1998	6,665,217			< 0.5		824			12,435	49	6,678,525
1999	3,781,266	26,638		67		314			8,140	< 0.5	3,816,424

[1]Real values are current values adjusted to eliminate the effects of inflation by dividing current values by the current year GDP implicit price deflator,
Source: PacFIN, extracted February 2001.

Table 2-22. Landings (round mt) of the albacore surface hook-and-line fishery in California, 1981-99.

Year	Albacore	Tropical Tunas & Bluefin	Swordfish	HMS Sharks	Dorado	Groundfish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	9042	12		< 0.5	< 0.5	1	2		3	3	9063
1982	3,845	3	4	2	1	4	< 0.5		2	< 0.5	3,861
1983	1,838	1	3	1	< 0.5	7	2		1	3	1,856
1984	6,226	6	< 0.5	< 0.5	< 0.5	4	1		< 0.5	< 0.5	6,237
1985	5,321	2	9	4	< 0.5	4	< 0.5		1	< 0.5	5,341
1986	2,517	2	1	< 0.5		19	< 0.5	< 0.5	1	2	2,542
1987	919	< 0.5	1	< 0.5		1	1		< 0.5	1	923
1988	579	< 0.5	12	2		< 0.5				1	594
1989	786	1	7	8	< 0.5	9		< 0.5	2	1	814
1990	758	< 0.5	2	< 0.5	< 0.5	3	< 0.5		< 0.5	1	764
1991	639	< 0.5				< 0.5		< 0.5		1	640
1992	1,047	< 0.5	13	2	< 0.5	6			< 0.5	1	1,069
1993	1,399	14	89	5	9	3				5	1,524
1994	3,048	< 0.5	1	< 0.5	< 0.5	1			< 0.5	1	3,051
1995	777	< 0.5	< 0.5	< 0.5		< 0.5	< 0.5		< 0.5	2	779
1996	5,047	42	< 0.5	< 0.5		< 0.5			< 0.5	2	5,091
1997	3,289	7	1	1	< 0.5	5	< 0.5		3	1	3,307
1998	2,231	115	4	3	< 0.5	1	< 0.5		1	4	2,359
1999	5,374	4	12	1	< 0.5	1	< 0.5		< 0.5	4	5396

Source: PacFIN, extracted February 2001.

Table 2-23. Real exvessel revenues (1999 \$)[1] from albacore surface hook-and-line fishery landings in California, 1981-99.

Year	Albacore	Tropical Tunas & Bluefin	Swordfish	HMS Sharks	Dorado	Groundfish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	30,655,219	27,211		301	125	1,761	1,648		29,076	6,018	30,721,359
1982	9,364,304	7,276	21,666	4,541	913	8,839	20		16,392	1,413	9,425,364
1983	4,030,893	3,758	11,715	1,634	52	10,463	1,995		7,237	6,367	4,074,114
1984	13,533,884	14,546	2,018	592	334	8,417	694		867	1,457	13,562,809
1985	8,855,620	5,217	34,282	9,595	9	8,026	288		10,178	2,114	8,925,329
1986	4,250,550	8,524	9,172	257		26,196	151	37	8,598	773	4,304,258
1987	2,100,208	1,509	7,075	102		2,034	817		4,182	425	2,116,352
1988	1,504,533	917	84,486	4,194		887				718	1,595,735
1989	1,790,615	1,804	44,296	14,478	31	20,921		25	9,501	2,918	1,884,589
1990	1,789,098	97	16,381	688	21	7,444	102		47	1,660	1,815,538
1991	1,275,348	66				219		664		216	1,276,513
1992	2,914,521	517	61,928	2,669	323	6,837			1,448	2,541	2,990,784
1993	3,107,166	152,096	490,116	8,005	26,013	4,389				22,472	3,810,257
1994	7,008,164	660	7,439	301	197	646			579	355	7,018,341
1995	1,516,649	633	3,159	185		37	17		759	3,202	1,524,641
1996	11,116,886	40,475	2,738	309		63			1,645	1,048	11,163,164
1997	5,851,097	12,282	4,525	1,678	274	11,301	92		8,845	6,088	5,896,182
1998	3,155,951	140,645	17,457	5,116	535	4,057	284		4,225	5,514	3,333,784
1999	9,995,933	27,438	69,269	2,427	1,076	4,033	455		1,603	8,129	10,110,363

[1]Real values are current values adjusted to eliminate the effects of inflation by dividing current values by the current year GDP implicit price deflator, with a base year of 1999.

Source: PacFIN, extracted February 2001.

Table 2-24. Numbers and carrying capacities, in metric tons, of vessels of the eastern Pacific Ocean (EPO) tuna fleet. Information for 1950-1960 is given in Table 4 of the IATTC Annual Report for 1998. The data for 1999 are preliminary.

	Seiners		Baitboats		Trollers		Total	
Year	No.	Ton.	No.	Ton.	No.	Ton.	No.	Ton.
1961	125	27,250	93	9,544	0	0	218	36,794
1962	146	31,163	88	6,093	0	0	234	37,256
1963	159	36,550	108	5,425	3	50	270	42,025
1964	137	36,631	88	4,285	0	0	225	40,916
1965	163	38,728	109	5,249	7	166	279	44,143
1966	133	36,304	113	5,649	2	26	248	41,979
1967	130	36,650	108	5,326	0	0	238	41,976
1968	143	46,012	89	5,215	2	22	234	51,249
1969	153	51,807	69	4,501	3	64	225	56,372
1970	162	61,246	49	3,903	9	160	220	65,309
1971	191	80,668	102	5,054	66	1,375	359	87,097
1972	210	102,022	108	6,085	74	1,762	392	109,869
1973	219	119,734	106	6,219	28	660	353	126,613
1974	234	133,449	111	7,045	7	136	352	140,630
1975	253	148,667	102	6,717	9	165	364	155,549
1976	254	160,197	99	6,414	38	823	391	167,434
1977	253	162,294	79	4,926	37	866	369	168,086
1978	271	164,252	68	4,572	50	1,183	389	170,007
1979	282	167,016	45	3,608	5	101	332	170,725
1980	270	167,855	46	3,479	4	97	320	171,431
1981	251	167,862	39	2,776	2	50	292	170,688
1982	223	152,270	36	2,458	4	119	263	154,847
1983	215	127,640	52	3,145	8	221	275	131,006
1984	175	103,929	40	2,772	0	0	215	106,701
1985	178	117,738	25	2,199	0	0	203	119,937
1986	166	112,606	17	1,760	0	0	183	114,366
1987	178	130,240	28	1,948	0	0	206	132,188
1988	189	133,819	36	2,797	0	0	225	136,616
1989	178	121,277	30	2,678	0	0	208	123,955
1990	174	123,220	22	1,585	0	0	196	124,805
1991	155	106,365	19	1,392	0	0	174	107,757
1992	160	99,971	19	1,377	0	0	179	101,348
1993	152	101,434	15	1,318	0	0	167	102,752
1994	167	104,411	20	1,474	0	0	187	105,885
1995	175	106,019	20	1,524	0	0	195	107,543
1996	183	113,396	18	1,561	0	0	201	114,957
1997	194	125,187	23	1,798	0	0	217	126,985
1998	203	138,025	22	1,894	0	0	225	139,919
1999	202	148,630	14	1,404	0	0	216	150,034

Source: Background Paper A1, 66th IATTC meeting, June 2000

Table 2-25. Estimates of the numbers and carrying capacities, in metric tons, of vessels (exclusive of longliners and miscellaneous small vessels) of the EPO tuna fleet in 1998 by flag, gear, and IATTC size class. Each vessel is included in the totals for each flag under which it fished during the year, but is included only once in "Grand total." Therefore the grand totals may not equal the sums of the individual flag entries. PS = purse seiner; BB = baitboat.

		Size class							
		1	2	3	4	5	6	Total	
Flag	Gear	Number						Number	Capacity
Belize	PS			1		1	4	6	*
Colombia	PS			2		1	5	8	5,928
Cyprus	PS						1	1	*
Ecuador	PS		6	13	10	5	33	67	34,383
El	PS					1	1	2	*
Spain	PS						6	6	9,877
Hondura	PS						1	1	*
México	PS			9	1	3	40	53	40,323
	BB	1	4	7				12	1,283
Panamá	PS				3	1	2	6	2,774
Taiwan	PS			1				1	*
USA.	PS		13	4		2	6	25	8,934
	BB	4	5	2				11	772
Vanuatu	PS						12	12	11,769
Venezuel	PS						21	21	22,127
Undocum	PS						2	2	*
Others	-	-	-	-	-	-	-	-	8,664
		Number							
Grand	PS	-	19	30	14	13	127	203	
	BB	5	9	8				22	
	PS+BB	5	28	38	14	13	127	225	
		Capacity							
Grand	PS		1,530	4,286	3,078	4,327	124,804	138,025	
	BB	167	723	1,004				1,894	
	PS+BB	167	2,253	5,290	3,078	4,327	124,804	139,919	

Source: Background Paper A1, 66th IATTC meeting, June 2000

*Asterisks indicate data pooled to avoid revealing the operations of individual vessels or companies.

Table 2-26. Preliminary estimates of the numbers and carrying capacities, in metric tons, of vessels (exclusive of longliners and miscellaneous small vessels) of the EPO tuna fleet in 1999 by flag, gear, and IATTC size class. Each vessel is included in the totals for each flag under which it fished during the year, but is included only once in "Grand total." Therefore the "Grand totals" may not equal the sums of the individual flag entries. PS = purse seiner; BB = baitboat.

		Size Class							
Flag	Gear	1	2	3	4	5	6	Total	Capacity
		Number							
Belize	PS			1		1	3	5	*
Colombia	PS			2		1	5	8	5,928
Ecuador	PS		6	12	11	5	36	70	36,458
El Salvador	PS						2	2	*
Spain	PS						5	5	8,916
Guatemala	PS						4	4	*
Honduras	PS						2	2	*
México	PS			8	3	3	40	54	40,633
	BB	1	4	7				12	1,283
Nicaragua	PS						1	1	*
Panamá	PS			2	4	1	4	11	6,801
USA	PS		2	1		2	5	10	6,349
	BB	1	1					2	*
Vanuatu	PS						12	12	12,779
Venezuela	PS						23	23	23,139
Others	-								12,314
		Number							
Grand total--	PS		8	26	18	13	137	202	
	BB	2	5	7				14	
	PS +	2	13	33	18	13	137	216	
		Capacity							
Grand total--	PS		677	3,754	4,092	4,293	135,814	148,630	
	BB	81	412	911				1,404	
	PS +	81	1,089	4,665	4,092	4,293	135,814	150,034	

Source: Background Paper A1, 66th IATTC meeting, June 2000

* Asterisks indicate data pooled to avoid revealing the operations of individual vessels or companies.

Table 2-27. Estimated catches by surface gear, in metric tons, of the EPO tuna fleet. YFT = yellowfin; SKJ = skipjack; BET = bigeye; PBF = bluefin; BEP = bonito; ALB = albacore; BKJ = black skipjack; Misc. = other species, including sharks, other tunas, and miscellaneous fishes; CYRA = Commission's Yellowfin Regulatory Area; Outside = area between the CYRA and 150°W. The 1999 data are preliminary.

Year	YFT			SKJ	BET	PBF	BEP	ALB	BKJ	Misc.	Total
	CYRA	Outside	Total								
1961	102,643	0	102,643	68,461	213	8,135	2,908	2,422	0	214	184,996
1962	71,452	0	71,452	68,725	328	11,145	3,243	1,151	0	166	156,210
1963	62,028	0	62,028	95,557	75	12,272	3,123	3,422	0	240	176,717
1964	88,650	0	88,650	59,258	68	9,217	6,702	3,331	5	225	167,456
1965	78,898	0	78,898	78,194	117	6,888	4,049	644	16	155	168,961
1966	80,611	0	80,611	60,482	266	15,897	4,454	1,941	9	422	164,082
1967	79,959	0	79,959	120,655	1,664	5,888	10,044	3,750	0	115	222,075
1968	100,921	1,095	102,016	71,109	2,559	5,976	7,958	4,495	0	126	194,239
1969	111,424	17,434	128,858	59,068	576	6,926	2,950	2,944	0	1	201,323
1970	127,793	27,833	155,626	56,020	1,332	3,966	4,738	4,476	0	27	226,185
1971	102,194	20,645	122,839	104,721	2,566	8,360	9,600	2,490	6	61	250,643
1972	136,515	40,612	177,128	33,409	2,238	13,347	8,872	4,832	601	367	240,793
1973	160,341	44,912	205,253	43,954	1,979	10,744	7,864	2,316	1,674	355	274,139
1974	173,180	37,184	210,364	78,803	890	5,617	4,436	4,783	3,742	985	309,620
1975	158,843	43,299	202,142	123,868	3,723	9,583	16,838	3,332	511	277	360,274
1976	190,216	46,111	236,327	126,161	10,186	10,645	4,370	3,733	1,526	1,327	394,275
1977	182,676	16,140	198,816	86,337	7,055	5,473	11,275	1,963	1,458	1,950	314,327
1978	165,985	14,549	180,534	169,810	11,714	5,397	4,837	1,745	2,162	806	377,005
1979	175,906	13,768	189,674	132,024	7,532	6,117	1,805	327	1,366	1,249	340,094
1980	131,998	27,427	159,425	130,671	15,421	2,939	6,110	601	3,680	953	319,800
1981	157,733	24,080	181,813	119,606	10,091	1,089	5,918	739	1,911	1,010	322,177
1982	106,868	18,216	125,084	98,757	4,102	3,150	2,121	553	1,338	783	235,888
1983	82,026	12,230	94,256	58,142	3,260	853	3,829	456	1,236	1,709	163,741
1984	128,559	16,502	145,061	60,551	5,936	881	3,514	5,351	666	987	222,947
1985	192,543	24,449	216,992	49,460	4,532	4,055	3,604	919	296	536	280,394
1986	228,125	40,149	268,274	63,552	1,939	5,085	490	133	595	1,140	341,208
1987	248,153	24,094	272,247	62,345	776	1,005	3,326	417	557	1,612	342,285
1988	267,263	20,811	288,074	85,326	1,053	1,424	9,550	288	1,267	1,297	388,279
1989	242,342	47,033	289,375	92,374	1,470	1,170	12,095	1	783	1,072	398,340
1990	226,465	46,864	273,329	72,575	4,712	1,542	13,856	184	792	944	367,934
1991	219,525	19,596	239,121	63,260	3,740	461	1,288	834	446	649	309,799
1992	221,309	18,540	239,849	83,964	5,497	1,999	978	255	104	762	333,408
1993	213,258	18,813	232,071	87,357	8,069	879	599	1	104	314	329,394
1994	197,181	22,042	219,223	74,484	29,375	1,062	8,692	85	188	419	333,528
1995	196,220	27,556	223,776	138,239	37,328	874	8,009	465	187	172	409,050
1996	218,021	32,055	250,076	112,210	51,353	8,259	655	83	704	219	423,559
1997	214,277	43,554	257,831	161,809	51,619	2,807	1,104	60	101	148	475,479
1998	238,456	27,804	266,260	143,966	35,048	2,223	1,336	124	528	104	449,589
1999	268,748	29,581	298,329	269,335	35,857	2,742	1,573	167	148	230	608,381

Source: Background Paper A1, 66th IATTC meeting, June 2000

Table 2-27. (continued)

Year	Western Pacific			Atlantic and Caribbean				Total, all areas and species
	YFT	SKJ	Misc.	YFT	SKJ	BET	Misc.	
1961	0	0	0	12	101	0	0	185,109
1962	0	0	0	0	0	0	0	156,210
1963	0	0	0	12	1,658	0	2,708	181,095
1964	0	0	0	0	3,956	0	2,866	174,278
1965	0	0	0	45	157	0	1,261	170,424
1966	0	0	0	0	4	0	112	164,198
1967	0	0	0	1,136	491	0	778	224,480
1968	0	0	0	6,686	3,822	15	0	204,762
1969	0	0	0	18,363	4,719	148	0	224,553
1970	0	206	0	9,363	11,879	195	1,624	249,452
1971	0	0	0	4,118	18,286	589	1,651	275,287
1972	0	0	0	12,845	13,423	212	993	268,267
1973	0	0	0	3,852	23,128	114	677	301,910
1974	31	0	0	5,922	19,680	868	160	336,281
1975	0	329	0	14,410	7,537	67	825	383,442
1976	224	4,931	2	2,276	2,577	38	425	404,748
1977	143	6,189	4	8,002	6,400	331	117	335,514
1978	22	7,303	42	10,410	8,510	248	335	403,875
1979	0	4,378	0	3,167	2,809	213	598	351,259
1980	319	5,499	0	5,026	3,873	201	30	334,748
1981	4,870	5,991	0	3,992	4,579	128	169	341,906
1982	5,539	12,158	60	4,991	2,972	344	220	262,171
1983	25,338	50,190	355	9,316	6,116	0	250	255,306
1984	5,331	16,303	487	6,981	5,382	2	176	257,609
1985	900	4,870	7	7,123	3,716	0	37	297,047
1986	1,673	2,482	0	969	1,603	8	14	347,957
1987	1,390	3,109	14	3,632	2,196	24	97	352,746
1988	688	1,775	442	303	183	0	0	391,670
1989	0	0	326	2,682	1,599	0	2	402,949
1990	2,038	8,807	439	2,678	1,761	62	10	383,729
1991	4	1,625	7	5,001	3,412	0	35	319,884
1992	0	0	131	3,164	1,853	28	219	338,803
1993	0	0	150	4,580	4,915	0	83	339,122
1994	6,675	3,105	50	5,135	2,958	0	215	351,666
1995	0	12	609	1,039	594	0	0	411,303
1996	850	1,217	606	2,099	3,147	2	3	431,573
1997	277	1,185	684	2,497	2,978	21	17	483,138
1998	4,001	7,544	298	178	722	4	43	462,379
1999	1,939	8,132	1,529	1,384	670	-	-	622,035

Source: Background Paper A1, 66th IATTC meeting, June 2000

Table 2-28. Estimates of catches and landings (mt) of tunas caught by surface gear in the EPO in 1998, by species, vessel flag and location where landed.

Flag	YFT		SKJ	BET	PBF	BEP	ALB	BSJ	Misc	Total
	CYRA	Outside								
	Catches									
Colombia	13,314	1,101	4,066	526	-	-	-	-	-	19,007
Ecuador	33,053	6,408	68,876	20,178	-	-	-	261	23	128,799
Spain	1,789	3,877	19,273	5,225	-	-	-	-	-	30,164
México	97,223	11,339	18,226	135	1	412	8	85	61	127,490
Panamá	5,114	-	1,990	54	-	-	-	9	-	7,167
U.S.A.--	5,550	477	9,039	3,740	2,222	924	116	76	11	22,155
Vanuatu	16,736	1,863	11,119	3,590	-	-	-	7	-	33,315
Venezuela	60,887	2,467	5,646	237	-	-	--	72	9	69,318
Other-Otros[1]	4,790	272	5,731	1,363	-	-	-	18	-	12,174
Total	238,456	27,804	143,966	35,048	2,223	1,336	124	528	104	449,589
	Landings									
Colombia	47,898	2,589	14,118	2,900	-	-	-	-	20	67,525
Costa Rica	26,064	1,161	2,891	443	-	-	-	-	-	30,559
Ecuador	44,732	9,250	87,642	26,311	-	-	-	-282	22	168,239
Spain	5,037	820	4,905	1,956	-	-	-	-	-	12,718
Mexico	87,438	9,854	16,948	79	34	412	8	85	61	114,919
U.S.A.--	3,630	199	5,525	1,786	2,188	783	115	75	10	14,311
Venezuela	25,022	2,227	1,861	88	-	-	-	-	-	29,198
Other-Otros[1]	2,964	69	1,148	321	-	141	-	-	9	4,652
Total	242,785	26,169	135,038	33,884	2,222	1,336	123	442	122	442,121

Source: Background Paper A1, 66th IATTC meeting, June 2000

[1] Includes Belize, Cyprus, El Salvador, Honduras, Taiwan, and undocumented. This category is used to avoid revealing the operations of individual vessels or companies.

[2] Includes Peru and unidentified locations. This category is used to avoid revealing the operations of individual vessels or companies.

Table 2-29. Estimated Catch (mt) and Fleet Information for the Eastern Pacific Ocean[1] Tuna Fleet

	CYRA	CYRA	Outside[2]	Outside[2]	Total EPO	Total EPO	Total EPO	Atlantic	Atlantic
Species	2000	1999	2000	1999	2000	1999	Since 25 Dec	2000	1999
YFT	222734	268770	44150	21146	266884	289916	2793	718	1764
SKJ	182765	242886	25605	20512	208370	263398	3643	286	648
BET	50402	38034	19438	5364	69840	43398	1209	1	1
BFT	3655	2628	-	-	3655	2628	-	-	-
BEP	616	1473	-	-	616	1473	-	-	-
ALB	81	647	-	-	81	647	6	-	-
BKJ	129	145	-	-	129	145	2	-	-
Other	143	176	-	-	143	176	20	-	-
Total	460525	554759	89193	47022	549718	7672	1005	2413	

Source: Inter-American Tropical Tuna Commission

Notes: Included in the 69,840 mt of BET are 13,048 mt reported by observers (at sea and in-port but not yet unloaded), and 56,792 mt reported from all sources.

1. Eastern Pacific Ocean = east of 150°W

2. Outside = between 150° W and the CYRA

Table 2-30. Preliminary Estimates of the Catches (mt) of Tunas in the EPO 2000 by Species and Vessel Flag.

Flag	YFT: CYRA	YFT: Outside	SKJ	BET	BFT	BEP	ALB	BKJ	Other[1]	Total	% of Total
Columbia	13,126	3,292	6,375	1,056					2	23,851	4
Ecuador	32,284	3,997	107,788	27,730				105	48	171,952	31
Mexico	82,186	20,089	16,022	81	2,985	440	79	2	40	121,924	22
Panama	5,360	466	12,062	3,951				10	29	21,878	4
Spain	3,583	2,002	16,591	17,364						39,540	7
USA	2,999	1,105	10,729	2,025	670	176	2		24	17,730	3
Vanuatu	11,689	2,642	11,094	6,231						31,656	6
Venezuela	58,583	9,254	5,342	226				12		73,417	13
Other	12,924	1,303	22,367	11,176						47,770	9
Total	222,734	44,150	208,370	69,840	3,655	616	81	129	143	549,718	100

Source: Inter-American Tropical Tuna Commission, Report N° 2000-52: Jan 1 - Dec 31, 2000

Notes: Includes mackerel, sharks, other tunas, and miscellaneous fishes.

[1]Includes Belize, Bolivia, Guatemala, Honduras and Nicaragua: this category is used to avoid revealing the operations of individual vessels or companies.

Table 2-31. West coast landings (round mt) in the Pacific purse seine fishery, 1981-99.

	Tunas					Sword-	HMS		Ground-	Coastal				
Year	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	fish	sharks	Dorado	fish	Pelagics	Crab	Salmon	Other	Total
1981	181	75,046	54,338	1,156	853					198			5	131,777
1982	367	60,562	39,812	962	2,400					29			< 0.5	104,131
1983	11	46,556	37,478		629	1	< 0.5			25			5	84,705
1984	3,551	30,172	26,450	116	600	23	1			267			4	61,184
1985	17	14,560	2,498	< 0.5	3,098	1	< 0.5			252			1	20,427
1986	48	20,803	977	5	4,392	38	2			48			54	26,367
1987	27	19,507	4,801	42	708					13			9	25,107
1988	151	17,693	7,088	< 0.5	722					63			2	25,719
1989	23	15,308	3,463		954			< 0.5		29			< 0.5	19,776
1990	71	7,848	2,097		783					108			5	10,912
1991		3,463	2,867		95					94			3	6,522
1992	8	1,698	1,100	1	996	10	2	1	< 0.5	323			9	4,148
1993	1	951	1,619	2	497	17	1	< 0.5	< 0.5	91			11	3,190
1994		3,563	1,283		779					66			131	5,822
1995		2,788	5,488		689					38			39	9,042
1996	11	2,683	5,052		4,639					244			54	12,683
1997	2	4,659	5,843		2,189	1	1	1		33			81	12,810
1998	136	3,753	5,310		1,695					252			160	11,306
1999	47	1,297	3,742		99					56	1		88	5,330

Source: PacFIN, extracted February 2001.

Table 2-32. West coast real exvessel revenues (1999 $)[1] for the Pacific purse seine fishery, 1981-99.

	Tunas					Sword-	HMS		Ground-	Coastal				
Year	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	fish	Sharks	Dorado	fish	Pelagics	Crab	Salmon	Other	Total
1981	631,806	169,637,980	108,574,638	2,704,935	2,122,472					205,714			18,864	283,896,409
1982	943,614	119,770,656	63,476,091	1,961,558	4,393,095					8,448			2	190,553,464
1983	24,129	78,219,921	48,131,592		1,398,480	2,823	410			10,435			5,865	127,793,655
1984	7,301,453	49,959,323	32,524,190	214,242	1,260,029	131,937	985			90,795			9,971	91,492,925
1985	34,087	20,669,671	2,504,239	138	3,851,100	10,369	673			56,983			1,402	27,128,662
1986	82,432	24,232,616	919,003	10,636	5,719,860	240,981	3,667			7,586			127,643	31,344,424
1987	61,698	27,116,842	5,276,875	208,526	2,390,742					2,776			28,150	35,085,609
1988	356,261	31,265,084	10,228,235	908	2,337,898					33,854			< 0.5	44,222,239
1989	57,554	20,955,484	3,914,684		1,398,724			164		8,076			71	26,334,757
1990	171,845	9,665,852	2,196,596		1,135,968					37,099			13,642	13,221,002
1991		3,911,109	2,634,597		100,271					42,870			2,703	6,691,550
1992	22,186	1,881,758	619,288	3,366	1,095,944	59,657	4,053	2,987	253	71,408			13,926	3,774,826
1993	1,347	1,177,926	1,173,191	4,739	637,966	110,617	1,792	196	15	18,861			12,928	3,139,578
1994		3,421,538	1,179,959		1,398,177					39,771			140,857	6,180,302
1995		2,988,439	3,967,157		1,009,398					16,763			21,889	8,003,646
1996	919	2,802,860	3,828,518		4,059,268					73,457			26,511	10,791,533
1997	3,923	4,942,784	5,409,976		2,582,329	6,871	1,968	1,468		17,854			57,558	13,024,731
1998	166,112	3,883,123	4,809,357		2,290,429					165,680			111,399	11,426,100
1999	31,237	1,397,578	2,732,409		360,132					5,340	720		59,188	4,586,604

[1]Real values are current values adjusted to eliminate the effects of inflation by dividing current values by the current year GDP implicit price deflator, with a base year of 1999.
Source: PacFIN, extracted February 2001.

Table 2-33. Catch (t) by Purse Seine Vessels for the Central-Western Pacific Ocean, 1975-1999.

	Australia			Federated States of Micronesia			Japan		
Year	Skipjack	Yellowfin	Bigeye	Skipjack	Yellowfin	Bigeye	Skipjack	Yellowfin	Bigeye
1975	1,900	...					6,806	5,595	265
1976	...	...					17,741	7,649	390
1977	...	...					18,629	6,841	302
1978	113	0					25,821	8,523	609
1979	0	0					28,760	19,023	720
1980	17	0					48,820	20,077	564
1981	244	0					44,773	27,539	925
1982	31	0					75,141	31,088	1,129
1983	114	0					117,038	30,830	1,468
1984	56	0					128,975	38,662	702
1985	0	0					119,293	47,947	1,381
1986	-	-					130,900	44,467	1,531
1987	0	0					115,505	44,634	1,602
1988	-	-					183,584	30,119	606
1989	598	26					122,041	40,872	1528
1990	121	0					140,116	37,742	2122
1991	1,954	0		8,448	2624	243	149,987	48579	1951
1992	6,158	0		11,657	3,360	315	140,172	53088	2563
1993	3,855	6		11,585	4,035	383	137,066	57891	1,903
1994	3,219	0		17,531	4,299	320	160,152	39867	1676
1995	4,086	0		5,496	2,026	170	143,182	45160	1,639
1996	1,981	8		7,466	667	94	153,945	23284	1,419
1997	4,204	13		6,051	2,338	222	145,478	57050	8404
1998	1,014	0		10,649	2,393	164	230,294	37785	2,710
1999	4,756	0		6,585	2,801	321	143053	40,329	3,106

Source: South Pacific Commission Tuna Fishery Yearbook 1999. Noumea.

Table 2-33. Catch (t) by Purse Seine Vessels for the Central-Western Pacific Ocean, 1975-1999, Continued

	Indonesia			Kiribati			Korea		
Year	Skipjack	Yellowfin	Bigeye	Skipjack	Yellowfin	Bigeye	Skipjack	Yellowfin	Bigeye
1975									
1976									
1977									
1978									
1979									
1980							476	63	5
1981							1,462	539	43
1982							10,167	1,772	270
1983							15,417	699	100
1984							13,767	362	54
1985							9,655	1,463	161
1986	7,121	1366	75				25,305	2,263	164
1987	11,050	1,839	281				40,918	16,472	1,321
1988	11,050	1714	236				64,032	14,323	1,042
1989	10,313	2,141	402				80,903	32,897	1,869
1990							138,460	32,841	2,042
1991							171,951	52,994	2,426
1992							115,290	62,570	4,427
1993							73,989	50,178	2,481
1994				895	202	26	145,541	47,201	2,262
1995				1,961	975	65	137,848	35,310	2,306
1996				4,074	635	68	129,888	18,030	898
1997				2,385	2,000	117	115,927	40,525	2,522
1998				4,669	1,746	83	143,390	55,923	1,592
1999				3,080	888	115	109,773	30,523	1,550

Source: South Pacific Commission Tuna Fishery Yearbook 1999. Noumea.

Table 2-33. Catch (t) by Purse Seine Vessels for the Central-Western Pacific Ocean, 1975-1999, Continued.

	New Zealand			Papau New Guinea			Philippines		
Year	Skipjack	Yellowfin	Bigeye	Skipjack	Yellowfin	Bigeye	Skipjack	Yellowfin	Bigeye
1975									
1976									
1977									
1978									
1979									
1980									
1981									
1982							766	414	61
1983	5,581	239	0				-	-	-
1984	3,999	231	0				775	738	108
1985	2,289	170	0				9,148	2,890	441
1986	4,875	0	0				6,989	1,414	216
1987	3,763	...					12,035	3,355	512
1988	3,509	...					8,356	3,124	304
1989	5,769	...					16,668	6,435	1,221
1990	3,972	...					16,466	6,675	860
1991	5,371	...					17,529	8,103	910
1992	988	...					25,888	11154	1,797
1993	946	...					20,225	8,327	1,182
1994	3,136	...		1,483	253	15	14,742	4,347	570
1995	861	...		12,088	2,813	155	19,810	6,736	1,327
1996	4,520	...		9,461	1,329	63	24,767	8,070	1,203
1997	6,571	...		11,355	6602	1,008	22,553	10,825	1,640
1998	7,308	...		30,178	8,451	1,248	32,071	10,389	1,394
1999	5,261	...		20,515	5,410	826	...	...	...

Source: South Pacific Commission Tuna Fishery Yearbook 1999. Noumea.

Table 2-33. Catch (t) by Purse Seine Vessels for the Central-Western Pacific Ocean, 1975-1999, Continued

	Russia			Solomon Islands			Spain		
Year	Skipjack	Yellowfin	Bigeye	Skipjack	Yellowfin	Bigeye	Skipjack	Yellowfin	Bigeye
1975									
1976									
1977									
1978									
1979									
1980				497	393	56			
1981				1,486	1,173	169			
1982				1,598	1,263	181			
1983				2,800	2,212	318			
1984				3,050	2,096	301			
1985	35,254	59,615	1,670	2,824	2,507	375			
1986	3,743	428	4	3,267	1,978	280			
1987	5,614	3,351	30	3,580	3,329	508			
1988	5,339	843	7	6,467	3,867	377			
1989	3,400	1,521	14	5,923	3,607	688			
1990	1,505	616	5	4,417	3,242	426			
1991	2,601	1,104	10	7,056	3,271	368			
1992	1,689	433	4	5,993	4,384	709			
1993	5,499	3,187	28	4,655	4,930	733			
1994	3,310	3,382	30	7,648	4,527	593			
1995				11,212	5,524	1,091			
1996				7,270	8,328	973			
1997				15,947	7,103	1,054			
1998				15,521	5,556	824			
1999				22,563	14,251	2,115	5,670	1,506	1437

Source: South Pacific Commission Tuna Fishery Yearbook 1999. Noumea.

Table 2-33. Catch (t) by Purse Seine Vessels for the Central-Western Pacific Ocean, 1975-1999, Continued

	Taiwan			United States			Vanuatu		
Year	Skipjack	Yellowfin	Bigeye	Skipjack	Yellowfin	Bigeye	Skipjack	Yellowfin	Bigeye
1975									
1976				500	188	12			
1977				700	188	12			
1978				800	188	12			
1979				8,000	581	39			
1980				9,900	1,023	77			
1981				21,482	15,164	1,135			
1982				49,705	21,390	1,600			
1983	9,840	1884	276	124,697	49,718	4,950			
1984	20,160	3,413	427	113,755	41,370	4,442			
1985	23,520	3,972	508	83,763	22,422	1,769			
1986	34,400	4,876	724	87,983	30,577	2,591			
1987	44,720	6,325	955	77,575	59,416	4,212			
1988	66,880	8,341	779	93,636	18,832	1,948			
1989	84,800	13,732	2,268	95,027	42,886	2,421			
1990	104,960	20,494	2,546	110,044	52,089	1,762			
1991	140,800	32,026	3,174	177,389	37,330	1,550			
1992	169,400	46,275	4,325	155,898	43,693	3,480			
1993	109,324	58,642	2,733	148,419	46,011	3,731			
1994	134,736	43,061	1,762	151,486	56,426	1,711	656	154	10
1995	147,831	33,156	1,508	132,518	31,845	3,190	6,232	1,289	161
1996	161,407	17,381	817	120,127	19,417	9,860	9,575	1,027	123
1997	116,073	48189	2,934	79,386	54,638	10,058	15,896	8474	795
1998	193,728	63,581	1,384	131,564	37,501	5,561	28,869	9,061	501
1999	160,453	41,905	3,372	131,000	34,384	16,673	35,836	9,744	1,147

Source: South Pacific Commission Tuna Fishery Yearbook 1999. Noumea.

Table 2-34. Number of Purse Seine Vessels in Central-Western Pacific Tuna Fishery

Year	Australia-Domestic	Australia Distant-Water	Federated States of Micronesia	Indonesia	Japan Coastal	Japan Distant-Water	Kiribati
1973	-	-	-	-	56	6	-
1974	-	-	-	-	52	10	-
1975	-	-	-	-	52	12	-
1976	-	-	-	-	53	15	-
1977	-	-	-	-	50	14	-
1978	3	-	-	-	47	14	-
1979	2	-	-	-	46	17	-
1980	1	-	-	-	50	16	-
1981	2	-	-	-	50	23	-
1982	5	-	-	-	52	33	-
1983	6	-	-	-	59	36	-
1984	4	-	-	...	54	33	-
1985	2	-	-	...	47	35	-
1986	0	-	-	3	53	38	-
1987	1	-	-	3	47	34	-
1988	0	3	-	3	48	39	-
1989	3	1	-	3	43	37	-
1990	1	8	-	...	43	35	-
1991	6	6	6	-	38	35	-
1992	13	2	7	-	31	38	-
1993	7	1	7	-	27	36	-
1994	4	-	8	-	23	33	1
1995	3	-	6	-	20	31	1
1996	4	-	4	-	21	32	1
1997	5	-	4	-	20	35	1
1998	4	-	3	-	20	35	1
1999	7	-	4	-	20	35	1

Table 2-34 Number of Purse Seine Vessels in Central-Western Pacific Tuna Fishery, Continued

Year	Korea	Mexico	New Zealand	Papua New Guinea	Philippines Distant-Water
1973		-	-	-	-
1974	-	-	-	-	-
1975	-	-	-	-	-
1976	-	-	-	-	-
1977	-	-	-	-	-
1978	-	-	-	-	-
1979	-	-	-	-	-
1980	2	-	-	-	-
1981	3	-	-	-	-
1982	10	-	-	-	1
1983	11	-	7	-	-
1984	12	1	5	-	3
1985	11	5	5	-	5
1986	13	-	4	-	5
1987	20	-	3	-	5
1988	23	-	4	-	9
1989	30	-	5	-	13
1990	39	-	5	-	13
1991	36	-	5	-	15
1992	36	-	7	-	12
1993	34	-	5	-	12
1994	32	-	7	2	11
1995	30	-	5	3	13
1996	28	-	6	4	12
1997	27	-	7	10	12
1998	26	-	6	13	12
1999	26	-	6	13	12

Table 2-34. Number of Purse Seine Vessels in Central-Western Pacific Tuna Fishery, Continued

Year	Russia	Spain	Solomon Islands	Taiwan	United States	Vanuatu
1973	-	-	-	-	-	-
1974	-	-	-	-	-	-
1975	-	-	-	-	-	-
1976	-	-	-	-	3	-
1977	-	-	-	-	1	-
1978	-	-	-	-	2	-
1979	-	-	-	-	8	-
1980	-	-	1	-	14	-
1981	-	-	1	-	14	-
1982	-	-	1	-	24	-
1983	-	-	1	3	62	-
1984	-	-	1	6	61	-
1985	5	-	1	7	40	-
1986	8	-	1	10	36	-
1987	5	-	2	13	35	-
1988	5	-	4	19	31	-
1989	5	-	4	25	35	-
1990	5	-	4	32	43	-
1991	4	-	3	39	43	-
1992	3	-	3	45	44	-
1993	8	-	3	43	42	-
1994	4	-	3	43	49	1
1995	-	-	3	42	44	2
1996	-	-	3	42	40	2
1997	-	-	4	42	35	5
1998	-	-	4	42	39	5
1999	-	8	4	42	36	9

Source: South Pacific Commission Tuna Fishery Yearbook 1999. Noumea.

Table 2-35. Fleet Performance Statistics for U.S. Tuna Purse Seiners Fishing in the Central-Western Pacific

Year	Licensed Vessels	Vessels Fishing[1]	Total Trips[2]	Days / Trip[2]	Sets / Trip[2]	Trips / Vessel[2]	Carrying Capacity / Vessel (mt)[3]
1988	35	31	71	69.42	46.07	2.29	1164
1989	35	35	154	58.07	41.88	4.4	1148
1990	51	43	181	47.32	34.79	4.21	1131
1991	48	43	229	42.38	40.4	5.33	1138
1992	44	44	212	46.32	35.11	4.82	1144
1993	42	42	199	51.92	37.27	4.74	1144
1994	48	49	241	44.11	35.21	4.88	1142
1995	47	44	206	49.14	33.38	4.68	1138
1996	40	39	182	50.09	33.02	4.67	1122
1997	35	35	177	58.05	35.6	5.06	1128
1998	39	39	200	46.58	27.48	5.13	1167
1999	38	36	175	41.54	20.81	4.86	1184

Source: Coan et al. (1999)

1. The number of vessels that fished can be different from the number of licensed vessels because vessels are licensed from June 15 of one year to June 14 of the next year; whereas, a vessel fishing in a calender year is recorded as fished in that calender year.
2. Includes all trips that started or ended in the calender year.
3. Includes bigeye tuna catch.
4. Estimated from species composition sampling for 6 months (June to December 1988).
5. Data are preliminary.

Table 2-36. Catches (mt) and Catch-Per-Unit Effort (mt/day fished) for the U.S. Tuna Purse Seine Fishery in the Central-Western Pacific Ocean

Year	Yellowfin Catch[1]	Skipjack Catch[1]	Bigeye Catch[1]	Total Catch[1]	Yellowfin CPUE[3]	Skipjack CPUE[3]	Total CPUE[3]
1988	18,832	93,636	19,484	114,416	3.01	15.37	18.38
1989	42,886	95,027	2,421	140,334	7.26	14.59	21.85
1990	52,089	110,044	1,762	163,895	8.91	16.66	25.57
1991	37,330	177,389	1,550	216,269	5.7	24.78	30.48
1992	43,693	155,898	3,480	203,071	6.39	21.48	27.87
1993	46,011	148,419	3,731	198,161	6.46	18.29	24.75
1994	56,426	151,486	1,711	209,623	7.63	18.61	26.24
1995	31,845	132,518	3,190	167,553	4.68	17.39	22.07
1996	19,417	120,127	9,860	149,404	4.13	16.93	21.05
1997	54,638	79,386[2]	10,058	144,082	8.45	12.06	20.51
1998	37,501	131,564[2]	5,561	174,626	6.71	21.62	28.33
1999	34,384	131,000[2]	16,673	182,057	8.16	30.11	38.27

Source: Coan et al. (1999)

1. Includes reported discards in logbooks and cannery rejects.
2. Skipjack tuna species composition samples were used to separate the yellowfin and bigeye tuna from the reported skipjack tuna catch in 1997-1999.
3. Includes bigeye tuna catch.
4. Estimated from species composition sampling for 6 months (June to December 1988).
5. Data are preliminary.

Table 2-37. Imports of Canned Tuna for the U.S. (1000 mt)

	1994	1995	1996	1997	1998	1999
Whitemeat	8.1	8.8	9.3	10.1	14.1	17.6
Lightmeat	104.7	88.6	78	86.1	94.9	134.2
Thailand	73.7	51.3	38	38.5	41.4	75.1
Total	112.8	97.4	87.3	96.2	109	151.7

Source: NMFS; GLOBEFISH AN 11032 (*GLOBEFISH Highlights* 1/2000, p. 9)

Table 2-38. Average Exvessel Prices for Tuna Delivered to U.S. Canneries by U.S. Vessels, 1950-1997.

	ALBACORE	SKIPJACK	YELLOWFIN
YEAR	.......U.S. $/short ton........		
1950	$380	$287	$309
1951	$315	$286	$309
1952	$346	$257	$316
1953	$398	$276	$320
1954	$402	$304	$345
1955	$324	$269	$307
1956	$342	$230	$270
1957	$289	$220	$265
1958	$410	$230	$270
1959	$372	$212	$260
1960	$295	$207	$249
1961	$356	$221	$255
1962	$330	$257	$302
1963	$300	$214	$266
1964	$309	$201	$266
1965	$306	$210	$276
1966	$370	$265	$357
1967	$382	$203	$274
1968	$396	$262	$311
1969	$426	$268	$323
1970	$524	$316	$361
1971	$630	$372	$418
1972	$680	$405	$442
1973	$830	$451	$481
1974	$820	$544	$575
1975	$675	$471	$523
1976	$945	$553	$592
1977	$1,174	$710	$758
1978	$1,211	$788	$840
1979	$1,294	$735	$876
1980	$1,659	$1,063	$1,180
1981	$1,800	$1,030	$1,170
1982	$1,387	$965	$1,123
1983	$1,268	$799	$1,032
1984	$1,252	$760	$982
1985	$1,087	$622	$820

Table 2-38. Continued

1986	$1,108	$616	$743
1987	$1,496	$716	$892
1988	$1,680	$977	$1,094
1989	$1,799	$807	$963
1990	$1,765	$792	$982
1991	$1,530	$764	$853
1992	$2,114	$680	$766
1993	$2,014	$739	$835
1994	$1,906	$862	$975
1995	$2,012	$743	$907
1996	$2,019	$778	$916
1997	$1,900	$878	$1,127
1998*	$1,700	$750	$920
1999*	$1,580	$602	$720

*Preliminary
Source: USDOC, NOAA, NMFS, Southwest Region Statistics Program
Note: Nominal prices

Table 2-39. U.S. Catches (mt) of Bluefin Tuna in the North Pacific

Year	Baitboat	Purse Seine	Longline	Gillnet
1985	3	3,320	0	6
1986	1	4,851	0	15
1987	0	862	0	2
1988	4	923	0	4
1989	8	1,046	0	3
1990	62	1,380	0	10
1991	0	410	0	4
1992	1	1,828	9	21
1993	5	580	45	56
1994	1	906	24	27
1995	1	619	27	19
1996	2	4,523	53	42
1997	2	2,240	52	57
1998	48	1,771	56	40
1999	3	186	39	21

Source: Purse seine from IATTC

Baitboat from IATTC and PacFIN

Longline from Hawaii and PacFIN

Gillnet from PacFIN

Note: Excludes recreational fish catch.

Table 2-40. Landings (round mt) by the west coast drift gillnet fishery in Oregon, 1981-99.

Year	Sword-fish	Sharks					Tunas		Dorado	Ground-fish	Coastal Pelagics	Crab	Salmon	Other	Total
		Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Albacore	Tropical & Bluefin							
1981			N.A.	N.A.											
1982			N.A.	N.A.											
1983			N.A.	N.A.											
1984			N.A.	N.A.											
1985		2	N.A.	N.A.										< 0.5	2
1986		423	N.A.	N.A.										< 0.5	423
1987		92	N.A.	N.A.			< 0.5	< 0.5		2				1	95
1988		80	N.A.	N.A.			4			< 0.5				1	85
1989			N.A.	N.A.											
1990			N.A.	N.A.											
1991			N.A.	N.A.											
1992			N.A.	N.A.											
1993			N.A.	N.A.											
1994			N.A.	N.A.											
1995	3	< 0.5	N.A.	N.A.				< 0.5						< 0.5	3
1996	16		N.A.	N.A.				< 0.5						< 0.5	16
1997	6		N.A.	N.A.				1						< 0.5	6
1998	35		N.A.	N.A.	1	1		3						1	41
1999	6	< 0.5	N.A.	N.A.	< 0.5		< 0.5	1		< 0.5				1	8

Source: PacFIN, extracted February 2001.

Table 2-41. Real exvessel revenues (1999 $)[1] from drift gillnet fishery landings in Oregon, 1981-99.

		Sharks					Tunas								
Year	Swordfish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Albacore	Tropical & Bluefin	Dorado	Ground-fish	Coastal Pelagics	Crab	Salmon	Other	Total
1981			N.A.	N.A.											
1982			N.A.	N.A.											
1983			N.A.	N.A.											
1984			N.A.	N.A.											
1985		3,064	N.A.	N.A.										< 0.5	3,064
1986		872,984	N.A.	N.A.										2,009	874,993
1987		214,683	N.A.	N.A.			159	9		6,176				4,946	225,973
1988		179,894	N.A.	N.A.			9,332			616				106	189,948
1989			N.A.	N.A.											
1990			N.A.	N.A.											
1991			N.A.	N.A.											
1992			N.A.	N.A.											
1993			N.A.	N.A.											
1994			N.A.	N.A.											
1995	25,141	461	N.A.	N.A.				454						< 0.5	26,055
1996	125,422		N.A.	N.A.				1,159						205	126,786
1997	51,790		N.A.	N.A.				3,332						755	55,877
1998	263,820		N.A.	N.A.	2,726	4,904		15,783						1,876	289,109
1999	46,955	184	N.A.	N.A.	283		791	8,902		174				588	57,877

[1]Real values are current values adjusted to eliminate the effects of inflation by dividing current values by the current year GDP implicit price deflator, with a base year of 1999.

Source: PacFIN, extracted February 2001.

Table 2-42. Landings (round mt) of the drift gillnet fishery in California, 1981-99.

		Sharks					Tunas								
Year	Swordfish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Albacore	Tropical & Bluefin	Dorado	Groundfish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	270	808			91	9		2		6	7			92	1,285
1982	208	634		13	125	1	5	2		5	2			22	1,017
1983	242	150		17	38		6	7		< 0.5	7	< 0.5		24	491
1984	286	95		2	11		10	4		5	< 0.5			13	426
1985	197	108		2	15		7	< 0.5		1	< 0.5			14	344
1986	78	32		2	21		8	2		< 0.5	< 0.5			10	153
1987	6	3	< 0.5	1	2		1	< 0.5			< 0.5			1	14
1988	1	< 0.5					< 0.5							< 0.5	1
1989		< 0.5												< 0.5	< 0.5
1990															
1991	51	8		4	2		< 0.5	< 0.5						2	67
1992	60	2		< 0.5	5		1	1			< 0.5			3	72
1993	162	16	< 0.5	7	11		15	7		< 0.5				10	228
1994	760	268	< 0.5	32	70	< 0.5	52	25	< 0.5	4	2			115	1,328
1995	682	200	5	29	73	< 0.5	31	29	< 0.5	2	1	< 0.5		92	1,144
1996	708	240	1	19	79	< 0.5	63	40		1	6	< 0.5		133	1,290
1997	646	249	34	27	113	< 0.5	42	57	< 0.5	1	4			107	1,280
1998	845	249	2	9	77		61	40	< 0.5	2	2	< 0.5		145	1,432
1999	573	150	2	4	45	< 0.5	92	18		1	< 0.5	< 0.5		105	990

Source: PacFIN, extracted February 2001.

Note: Significant swordfish and shark landings by drift gillnet gear prior to 1994 may have been mis-assigned to California unknown or entangling net gear, and therefore are not reported here.

Table 2-43. Real exvessel revenues (1999)[1] from drift gillnet fishery landings in California, 1981-99.

		Sharks					Tunas								
Year	Swordfish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Albacore	Tropical & Bluefin	Dorado	Groundfish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	1,934,458	1,334,893			136,834	8,902		8,384		11,446	7,698			264,064	3,706,679
1982	1,639,245	1,106,777		11,206	190,823	1,070	12,014	7,717		9,539	1,481			53,798	3,033,670
1983	1,497,438	262,413		40,296	59,287		17,472	16,637		1,122	8,925	16		43,689	1,947,295
1984	1,661,125	218,727		3,677	20,659		23,089	8,921		12,740	444			14,567	1,963,949
1985	1,162,226	262,222		3,597	27,911		10,835	998		1,686	185			18,288	1,487,948
1986	538,142	88,345		3,933	42,288		12,550	6,819		444	93			13,070	705,684
1987	51,470	7,530	144	2,284	4,869		2,209	102			169			2,288	71,065
1988	4,440	349					142							81	5,012
1989		1,078												< 0.5	1,078
1990															
1991	427,285	14,052		2,184	3,826		1,005	932						1,329	450,613
1992	277,305	3,161		86	8,906		1,242	2,911			357			4,054	298,022
1993	1,029,090	28,108	132	5,850	23,883		26,804	25,041		1,141				13,575	1,153,624
1994	4,957,559	535,035	46	29,782	140,048	7	100,540	134,833	43	6,052	923			180,353	6,085,221
1995	4,344,700	369,273	9,286	24,519	137,258	112	53,383	88,993	14	2,098	541	16		147,927	5,178,120
1996	3,979,139	469,856	1,635	16,962	144,655	41	111,483	126,841		1,138	2,685	517		216,286	5,071,238
1997	3,155,767	450,991	63,719	25,745	196,036	6	69,778	261,971	509	2,337	3,614			146,538	4,377,011
1998	3,732,785	435,664	2,487	7,895	133,571		75,909	190,055	2,505	3,477	1,795	89		201,544	4,787,776
1999	2,670,385	273,976	2,553	3,781	79,363	19	99,944	86,620		1,108	128	715		189,486	3,408,078

[1]Real values are current values adjusted to eliminate the effects of inflation by dividing current values by the current year GDP implicit price deflator, with a base year of 1999.

Source: PacFIN, extracted February 2001.

Note: Significant swordfish and shark landings by drift gillnet gear prior to 1994 may have been mis-assigned to California unknown or entangling net gear, and therefore corresponding exvessel revenues are not reported here.

Table 2-44. Landings (round mt) in the Pacific coast drift gillnet fishery, 1981-99.

		Sharks					Tunas								
Year	Sword-fish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Albacore	Tropical & Bluefin	Dorado	Ground-fish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	270	808			91	9		2		6	7			92	1,285
1982	208	634		13	125	1	5	2		5	2			22	1,017
1983	242	150		17	38		6	7		< 0.5	7	< 0.5		24	491
1984	286	95		2	11		10	4		5	< 0.5			13	426
1985	197	110		2	15		7	< 0.5		1	< 0.5			13	345
1986	78	455		2	21		8	2		< 0.5	< 0.5			10	576
1987	6	94	< 0.5	1	2		1	< 0.5		2	< 0.5			3	109
1988	1	81					4			< 0.5				< 0.5	86
1989		< 0.5												< 0.5	< 0.5
1990															
1991	51	8		4	2		< 0.5	< 0.5						2	67
1992	60	2		< 0.5	5		1	1			< 0.5			3	72
1993	162	16	< 0.5	7	11		15	7		< 0.5				10	228
1994	760	268	< 0.5	32	70	< 0.5	52	25	< 0.5	4	2			115	1,328
1995	684	200	5	29	73	< 0.5	31	29	< 0.5	2	1	< 0.5		93	1,147
1996	724	240	1	19	79	< 0.5	63	41		1	6	< 0.5		132	1,306
1997	652	249	34	27	113	< 0.5	42	57	< 0.5	1	4			108	1,287
1998	880	249	2	9	78	1	61	43	< 0.5	2	2	< 0.5		146	1,473
1999	578	151	2	4	45	< 0.5	93	19		1	< 0.5	< 0.5		105	998

Source: PacFIN, extracted February 2001.

Note: Significant swordfish and shark landings by drift gillnet gear prior to 1994 may have been mis-assigned to California unknown or entangling net gear, and therefore are not reported here.

Table 2-45. Real exvessel revenues (1999)[1] for the Pacific coast drift gillnet fishery, 1981-99.

Year	Sword-fish	Sharks					Tunas		Dorado	Ground-fish	Coastal Pelagics	Crab	Salmon	Other	Total
		Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Albacore	Tropical & Bluefin							
1981	1,934,458	1,334,893			136,834	8,902		8,384		11,446	7,698			264,064	3,706,679
1982	1,639,245	1,106,777		11,206	190,823	1,070	12,014	7,717		9,539	1,481			53,798	3,033,670
1983	1,497,438	262,413		40,296	59,287		17,472	16,637		1,122	8,925	16		43,689	1,947,295
1984	1,661,125	218,727		3,677	20,659		23,089	8,921		12,740	444			14,567	1,963,949
1985	1,162,226	265,286		3,597	27,911		10,835	998		1,686	185			18,288	1,491,012
1986	538,142	961,328		3,933	42,288		12,550	6,819		444	93			15,080	1,580,677
1987	51,470	222,213	144	2,284	4,869		2,368	111		6,176	169			7,234	297,038
1988	4,440	180,243					9,473			616				189	194,961
1989		1,078												< 0.5	1,078
1990															
1991	427,285	14,052		2,184	3,826		1,005	932						1,329	450,613
1992	277,305	3,161		86	8,906		1,242	2,911			357			4,054	298,022
1993	1,029,090	28,108	132	5,850	23,883		26,804	25,041		1,141				13,575	1,153,624
1994	4,957,559	535,035	46	29,782	140,048	7	100,540	134,833	43	6,052	923			180,353	6,085,221
1995	4,369,842	369,734	9,286	24,519	137,258	112	53,383	89,446	14	2,098	541	16		147,926	5,204,175
1996	4,104,561	469,856	1,635	16,962	144,655	41	111,483	128,001		1,138	2,685	517		216,490	5,198,024
1997	3,207,557	450,991	63,719	25,745	196,036	6	69,778	265,304	509	2,337	3,614			147,292	4,432,888
1998	3,996,605	435,664	2,487	7,895	136,296	4,904	75,909	205,838	2,505	3,477	1,795	89		203,422	5,076,886
1999	2,717,340	274,160	2,553	3,781	79,646	19	100,734	95,522		1,282	128	715		190,075	3,465,955

[1]Real values are current values adjusted to eliminate the effects of inflation by dividing current values by the current year GDP implicit price deflator, with a base year of 1999.

Source: PacFIN, extracted February 2001.

Note: Significant swordfish and shark landings by drift gillnet gear prior to 1994 may have been mis-assigned to California unknown or entangling net gear, and therefore corresponding exvessel revenues are not reported here.

Table 2-46. Landings (round mt) in the Pacific coast harpoon fishery, 1981-99.

Year	Swordfish	HMS Sharks	Tunas: Albacore	Tunas: Tropical & Bluefin	Dorado	Other	Total
1981	265	5	2	< 0.5		5	277
1982	156	2		< 0.5		< 0.5	158
1983	58	1				43	102
1984	95	7	< 0.5	< 0.5		1	103
1985	210	1	< 0.5			1	212
1986	236	1	< 0.5			< 0.5	237
1987	211	3	1	< 0.5		40	255
1988	179	3	1			1	184
1989	54	1	< 0.5			< 0.5	55
1990	51	2				< 0.5	53
1991	16	1				< 0.5	17
1992	74	3	< 0.5			1	78
1993	168	1	1			1	171
1994	153	1	< 0.5			1	155
1995	96	2				< 0.5	98
1996	81	1	< 0.5			1	83
1997	84	3	< 0.5		< 0.5	< 0.5	87
1998	48	1				< 0.5	49
1999	80	< 0.5				2	82

Source: PacFIN, extracted February 2001.
Note: Some of the non-swordfish species may have been taken by dual-gear permit holders, who may have fished with drift gillnets but landed under harpoon.

Table 2-47. Real exvessel revenues (1999)[1] for the Pacific coast harpoon fishery, 1981-99.

Year	Swordfish	HMS Sharks	Tunas		Dorado	Other	Total
			Albacore	Tropical & Bluefin			
1981	2,336,486	8,668	6,885	397		21,230	2,373,666
1982	1,374,979	3,258		240		1,486	1,379,963
1983	493,186	3,084				15,623	511,893
1984	789,510	12,743	500	227		3,069	806,049
1985	1,363,656	2,143	330			2,338	1,368,467
1986	2,046,538	2,533	76			1,798	2,050,945
1987	2,011,286	6,619	5,747	260		116,820	2,140,732
1988	1,772,924	8,007	11,424			1,177	1,793,532
1989	554,052	1,424	2,700			172	558,348
1990	512,331	4,825				1,129	518,285
1991	174,931	1,963				143	177,037
1992	667,541	6,586	1,422			1,688	677,237
1993	1,262,329	2,118	8,661			1,121	1,274,229
1994	1,360,282	1,765	2,725			2,956	1,367,728
1995	804,638	4,363				1,879	810,880
1996	664,678	3,378	227			873	669,156
1997	704,930	5,739	206		93	695	711,663
1998	406,737	1,634				781	409,152
1999	602,195	811				5,850	608,856

[1]Real values are current values adjusted to eliminate the effects of inflation by dividing current values by the current year GDP implicit price deflator, with a base year of 1999.
Note: Some of the non-swordfish species may have been taken by dual-gear permit holders, who may have fished with drift gillnets but landed under harpoon.
Source: PacFIN, extracted February 2001.

Table 2-48. Landings (mt) by California-Based Longline Vessels Fishing Beyond the U.S. EEZ

Species\Year	1991	1992	1993	1994
Swordfish	27.5	28.8	101.3	496.7
Bigeye Tuna	4	4.7	27	31.5
Albacore	0.5	<0.1	2.6	20.3
Bluefin Tuna	0.1	0.5	3.5	5.1
Yellowfin Tuna	0.1	0	6.3	4
Unspecified Tuna	0.3	0.4	0.8	4.3
Mako Shark	0.9	3.6	6.3	13.3
Thresher Shark	0.1	0.6	1.4	12.8
Blue Shark	0	0	0	7.5
Unspecified Shark	0	0	0.7	1.4
Dorado	<0.1	0.7	16.1	27.6
Opah	0.8	0.5	3.9	7.3
Escolar	0.4	0.4	1.7	4.3
Total	34.7	40.2	171.6	636.1

Table 2-49. Percentage Species Composition (by Weight) of Landings by California-Based Longline Vessels Fishing Beyond the U.S. EEZ

Species\Year	1991	1992	1993	1994
Swordfish	79	72	59	78
Bigeye Tuna	12	12	16	5
Albacore	1	<1	2	1
Bluefin Tuna	<1	1	2	1
Yellowfin Tuna	<1	0	4	1
Unspecified Tuna	1	1	<1	1
Mako Shark	3	9	4	2
Thresher Shark	<1	2	1	2
Blue Shark	0	0	0	1
Unspecified Shark	0	0	<1	<1
Dorado	<1	2	9	4
Opah	2	1	2	1
Escolar	1	1	1	1

Note: Percentages may not equal 100% due to rounding

Table 2-50. Landings (round mt) in the Pacific coast pelagic longline fishery, 1981-99.

Year	Sword-fish	Sharks					Tunas		Dorado	Ground-fish	Coastal Pelagics	Crab	Salmon	Other	Total
		Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Albacore	Tropical & Bluefin							
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	2	< 0.5	< 0.5	< 0.5			8	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				1	2
1986		2			1					< 0.5	< 0.5			3	6
1987		< 0.5			3		< 0.5							3	6
1988	< 0.5	1			152	1		< 0.5		4	< 0.5			6	164
1989					5	1				< 0.5				< 0.5	5
1990		< 0.5			15	4	< 0.5			< 0.5	< 0.5			1	20
1991	27	< 0.5			23	< 0.5	< 0.5	2	< 0.5	3				1	56
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	721	18		3	19	12	49	51	32	4	< 0.5			20	929
1995	271	11		1	7	5	4	58	5	8	2			4	376
1996	346	2			5	< 0.5	3	66	9	5	< 0.5			7	443
1997	664	4		2	3	< 0.5	6	81	1	30	< 0.5			4	795
1998	411	3			4	< 0.5	8	87	1	8	1			13	536
1999	1,287	5			5		66	132	15	1				13	1524

Source: PacFIN, extracted February 2001.

Table 2-51. Landings (round mt) of the pelagic longline fishery in Oregon, 1981-99.

		Sharks						Tunas								
Year	Sword-fish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Albacore	Tropical & Bluefin	Dorado	Ground-fish	Coastal Pelagics	Crab	Salmon	Other	Total
1981			N.A.	N.A.											
1982			N.A.	N.A.											
1983			N.A.	N.A.											
1984			N.A.	N.A.											
1985			N.A.	N.A.											
1986			N.A.	N.A.											
1987		< 0.5	N.A.	N.A.			< 0.5							2	2
1988			N.A.	N.A.											
1989			N.A.	N.A.											
1990			N.A.	N.A.											
1991			N.A.	N.A.											
1992			N.A.	N.A.											
1993			N.A.	N.A.											
1994			N.A.	N.A.											
1995			N.A.	N.A.											
1996			N.A.	N.A.											
1997			N.A.	N.A.											
1998			N.A.	N.A.											
1999			N.A.	N.A.											

Source: PacFIN, extracted February 2001.

Table 2-52. Landings (round mt) of the pelagic longline fishery in California, 1981-99.

		Sharks					Tunas								
Year	Sword-fish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Albacore	Tropical & Bluefin	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	2	< 0.5	< 0.5	< 0.5			8	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				1	2
1986		2			1					< 0.5	< 0.5			3	6
1987					3									< 0.5	3
1988	< 0.5	1			152	1		< 0.5		4	< 0.5			6	164
1989					5	1				< 0.5				< 0.5	5
1990		< 0.5			15	4	< 0.5			< 0.5	< 0.5			1	20
1991	27	< 0.5			23	< 0.5	< 0.5	2	< 0.5	3				1	56
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	721	18		3	19	12	49	51	32	4	< 0.5			20	929
1995	271	11		1	7	5	4	58	5	8	2			4	376
1996	346	2			5	< 0.5	3	66	9	5	< 0.5			7	443
1997	664	4		2	3	< 0.5	6	81	1	30	< 0.5			4	795
1998	411	3			4	< 0.5	8	87	1	8	1			13	536
1999	1,287	5			5		66	132	15	1				13	1,524

Source: PacFIN, extracted February 2001.

Table 2-53. Real exvessel revenues (1999)[1] for the Pacific coast pelagic longline fishery, 1981-99.

		Sharks					Tunas								
Year	Sword-fish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Albacore	Tropical & Bluefin	Dorado	Ground-fish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	2,689				29,400	82,990	83,989	2,213		4,493	199			2,010	207,983
1982	502	2,331			8,919	19,803	120,325	3,207	514	39	34			381	156,055
1983	795	69			1,380	683	18,814	10,457	20	321	56			4,532	37,127
1984	95,137	6,028		507	5,037		4,289	10,758	4,079	2,810	4			8,660	137,309
1985	1,101	2,815			36		1,084			65				240	5,341
1986		5,485			2,332					345	48			11,294	19,504
1987		254			9,623		227							1,541	11,645
1988	2,139	3,101			430,037	707		528		2,617	33			7,399	446,561
1989					14,987	571				38				< 0.5	15,596
1990		657			38,280	2,862	55			239	6			5,177	47,276
1991	172,894	235			52,861	367	623	16,807	43	4,588				4,251	252,669
1992	343,699	3,797		420	3,850	187	2,059	5,985		33,887	3			3,173	397,060
1993	169,904	71			1,513	22	611	41,548	2,170	4,605	1,066			3,353	224,863
1994	3,713,003	14,469		3,866	34,470	17,304	88,176	350,547	63,185	12,969	131			41,114	4,339,234
1995	1,138,647	18,623		385	7,151	2,480	5,724	332,905	5,739	18,307	7,726			7,729	1,545,416
1996	1,385,861	4,467			6,667	2	3,887	300,010	9,531	11,300	92			32,277	1,754,094
1997	2,183,751	8,464		7,568	4,115	6	10,744	363,665	2,751	110,888	144			16,940	2,709,036
1998	1,460,268	5,390			9,542	51	20,916	493,564	4,003	23,826	1,030			55,302	2,073,892
1999	4,738,191	6,530			7,759		133,460	928,412	36,781	2,304				61,804	5,915,241

[1]Real values are current values adjusted to eliminate the effects of inflation by dividing current values by the current year GDP implicit price deflator, with a base year of 1999.

Source: PacFIN, extracted February 2001.

Table 2-54. Real exvessel revenues (1999)[1] from pelagic longline fishery landings in Oregon, 1981-99.

Year	Sword-fish	Sharks					Tunas		Dorado	Ground-fish	Coastal Pelagics	Crab	Salmon	Other	Total
		Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Albacore	Tropical & Bluefin							
1981			N.A.	N.A.											
1982			N.A.	N.A.											
1983			N.A.	N.A.											
1984			N.A.	N.A.											
1985			N.A.	N.A.											
1986			N.A.	N.A.											
1987		254	N.A.	N.A.			227							1,541	2,022
1988			N.A.	N.A.											
1989			N.A.	N.A.											
1990			N.A.	N.A.											
1991			N.A.	N.A.											
1992			N.A.	N.A.											
1993			N.A.	N.A.											
1994			N.A.	N.A.											
1995			N.A.	N.A.											
1996			N.A.	N.A.											
1997			N.A.	N.A.											
1998			N.A.	N.A.											
1999			N.A.	N.A.											

[1]Real values are current values adjusted to eliminate the effects of inflation by dividing current values by the current year GDP implicit price deflator, with a base year of 1999.
Source: PacFIN, extracted February 2001.

Table 2-55. Real exvessel revenues (1999)[1] from pelagic longline fishery landings in California, 1981-99.

Year	Sword-fish	Sharks					Tunas		Dorado	Ground-fish	Coastal Pelagics	Crab	Salmon	Other	Total
		Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Albacore	Tropical & Bluefin							
1981	2,689				29,400	82,990	83,989	2,213		4,493	199			2,010	207,983
1982	502	2,331			8,919	19,803	120,325	3,207	514	39	34			381	156,055
1983	795	69			1,380	683	18,814	10,457	20	321	56			4,532	37,127
1984	95,137	6,028		507	5,037		4,289	10,758	4,079	2,810	4			8,660	137,309
1985	1,101	2,815			36		1,084			65				240	5,341
1986		5,485			2,332					345	48			11,294	19,504
1987					9,623									< 0.5	9,623
1988	2,139	3,101			430,037	707		528		2,617	33			7,399	446,561
1989					14,987	571				38				< 0.5	15,596
1990		657			38,280	2,862	55			239	6			5,177	47,276
1991	172,894	235			52,861	367	623	16,807	43	4,588				4,251	252,669
1992	343,699	3,797		420	3,850	187	2,059	5,985		33,887	3			3,173	397,060
1993	169,904	71			1,513	22	611	41,548	2,170	4,605	1,066			3,353	224,863
1994	3,713,003	14,469		3,866	34,470	17,304	88,176	350,547	63,185	12,969	131			41,114	4,339,234
1995	1,138,647	18,623		385	7,151	2,480	5,724	332,905	5,739	18,307	7,726			7,729	1,545,416
1996	1,385,861	4,467			6,667	2	3,887	300,010	9,531	11,300	92			32,277	1,754,094
1997	2,183,751	8,464		7,568	4,115	6	10,744	363,665	2,751	110,888	144			16,940	2,709,036
1998	1,460,268	5,390			9,542	51	20,916	493,564	4,003	23,826	1,030			55,302	2,073,892
1999	4,738,191	6,530			7,759		133,460	928,412	36,781	2,304				61,804	5,915,241

[1]Real values are current values adjusted to eliminate the effects of inflation by dividing current values by the current year GDP implicit price deflator, with a base year of 1999.

Source: PacFIN, extracted February 2001.

Table 2-56. Reported catch in number of fish from california gillnet logbooks (drift only) for 2000 and 2001.

2001

Vessel	Days Fished (Sets)	Mesh Size - Inches	Albacore	Bluefin Tuna	Yellowfin Tuna	Mako Shark	Thresher Shark	Yellowtail	Pomfret	Louvar	Average Soak Time (Hours)	Areas Fished
1	8	6.75	97	243	109	60	1	100	0	0	9.4	Cortez Bank, 10-40 miles off San Diego
2	15	7.00	353	212	0	2	0	0	479	1	12.0	Morro Bay to Point Arguello 10 to 20 miles offshore
3	8	6.50	405	30	0	3	0	0	500	7	7.8	Morro Bay to San Miguel Isl. 20 to 50 miles offshore
4	9	6.00	406	78	0	33	1	0	200	0	10.3	Cortez Bank, 50 miles offshore from Point Arguello

2000

Vessel	Days Fished (Sets)	Mesh Size - Inches	Albacore	Bluefin Tuna	Yellowfin Tuna	Mako Shark	Thresher Shark	Yellowtail	Pomfret	Louvar	Average Soak Time (Hours)	Areas Fished
2	5	7.00	100	0	0	2	2	9	0	1	9.4	20 to 90 miles off San Diego
3	4	6.50	28	20	0	0	0	0	0	5	8.0	20 miles off San Miguel Island

Table 2-57. Imports of Swordfish Into The United States, 1975-1996 (kg)

Year	Imports (kg)
1975	11,558
1976	32,450
1977	79,753
1978	161,398
1979	157,427
1980	216,631
1981	580,668
1982	549,615
1983	648,787
1984	1,240,396
1985	4,114,675
1986	5,428,595
1987	4,066,840
1988	4,006,982
1989	6,813,093
1990	7,475,609
1991	7,170,861
1992	6,882,581
1993	5,838,149
1994	4,379,120
1995	4,681,267
1996	5,139,596

Source: U.S. Bureau of the Census (via World Swordfish Fisheries, Vol. V, U.S. Dept. of Commerce, 1997)

Table 2-58. California CPFV HMS catches (no. of fish) for the years 1980 to 1998.

California	Yellowfin	Skipjack	Bluefin	Albacore	Bigeye	Swordfish	Marlin	Mako	Thresher	Blue Shark	Dorado
1980	8	0	542	5,652	0	1	3	8	14	1,826	2
1981	81	17	419	1,946	25	0	37	34	7		35
1982	129	8	392	7,352	9	0	13	18	36	625	0
1983	37,816	48,254	443	7,833	176	0	28	28	136		1,258
1984	421	3,993	1,765	15,527	26	2	9	49	16	454	527
1985	43	40	850	13,309	10	0	7	18	29		5
1986	0	0	443	14,706	37	0	13	58	13		11
1987	1	167	5	3,580	7	0	8	296	15	364	0
1988	9	2	147	547	2	2	2	115	15	1,914	1
1989	17	165	88	367	2	0	7	302	45		1
1990	216	1,008	198	275	5	0	7	231	51		7,147
1991	60	18	0	741	0	0	1	129	50		0
1992	15,457	26,326	3,325	379	7	0	12	130	29		1,912
1993	73	4,743	316	393	0	3	1	297	163		707
1994	2,285	1,797	10	171	0	0	5	270	30		64
1995	13,096	24,436	93	1,341	1	0	6	147	59		12
1996	2,926	961	89	1,805	0	0	4	234	30		341
1997	21,069	9,504	1,397	31,985	28	0	13	115	46		5,730
1998	6,588	3,145	2,430	54,487	26	0	6	148	27	163	394
Mexico											
1980	11,229	3,891	187	15,657	8		55				8,843
1981	4,478	418	123	24,702	217	1	30	3			1,246
1982	1,906	24	273	29,338	129		20	8			1,099
1983	78,482	54,786	1,469	9,328	2,077		37	1			3,734
1984	8,227	26,364	1,069	195,758	511		278	13			6,005
1985	3,882	317	4,298	161,194	659		64	8			1,357
1986	5,505	2,249	250	12,616	1,478		30	8			1,855
1987	14,796	8,038	1,946	3,466	628		160	8			3,518
1988	20,056	1,896	183	12	426		132	17			3,348
1989	19,059	19,571	6,431	29,361	42		33	8	1		2,340
1990	49,524	15,523	3,558	3,568	2,191		101	12			24,574
1991	11,702	6,788	5,330	272	256		11	10			1,301
1992	58,282	25,976	5,261	1	42		13	6	1		10,815

Table 2-58. California CPFV HMS catches (no. of fish) for the years 1980 to 1998, continued.

1993	37,069	19,080	10,219	0	46		29	11			8,245
1994	44,546	13,530	2,299	0	15		37	17			5,254
1995	80,524	20,435	15,337	1	37	1	32	33			5,063
1996	76,365	5,882	2,660	390	126		13	55	1		24,494
1997	72,666	10,821	6,907	59,136	241		12	19	2		24,204
1998	70,166	10,699	17,321	105,219	1,771	3	10	28			6,164
% IN MEX	0.87	0.66	0.87	0.80	0.97	0.38	0.86	0.09	0.01		0.89

Source: California Department of Fish and Game, CPFV logbooks.

Table 2-59. Estimated west coast HMS recreational catches (1,000's of fish) and effort (1,000's of angler trips), 1981-98.

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Albacore																		
CPFV	2	39	18	104	73	39			0							2	3	73
Private Boats	2	8	6	123	58	27	2	1	5					3	5	1	88	98
Bigeye Tuna																		
CPFV			1															
Private Boats		3	1	1														
Bluefin Tuna																		
CPFV			3	12	1	0							7				0	2
Private Boats			1	1														2
Skipjack Tuna																		
CPFV			104	9		1							22				1	12
Private Boats			65	4			0		5				16	7	45	1	4	4
Yellowfin Tuna																		
CPFV			106										11					83
Private Boats			53	0					7				7	2	24	3	9	15
Dorado																		
CPFV			2	4									7					3
Private Boats			5	5									6	1	0	3	20	13
Shortfin Mako Shark																		
CPFV			0	0														
Private Boats	13	1	1	3	9	5	22	10	6				4	11	5	2	5	1
Thresher Shark																		
CPFV					0													
Private Boats		2	2	1	0	1	5		1				3	2	3	1	0	0
Striped Marlin																		
CPFV																		
Private Boats		1	0	1	1		1	1					0	0	0		0	
Effort (1000's of Angler Trips)																		
CPFV	1422	2252	1629	1348	1377	1537	1073	833	1350				1174	1201	1131	1080	966	698
Private Boats	2765	2544	2893	3198	2989	3798	3692	1925	2481				2681	2939	2780	1935	1919	1455
Total Boat Effort	4298	4898	4860	4787	4547	5463	4924	2890	3966				4017	4284	4167	3130	3130	2405

Source: Marine Recreational Fisheries Statistics Survey, NMFS.

Table 2-60. Estimated HMS recreational catches (1,000's of fish) by CPFVs and private boats from S. California waters, 1981-98.

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Albacore																		
CPFV	1.7	39.1	18.2	94.7	48.2	36.1												50.1
Private Boats	1.7	7.3	5.4	123.0	33.5	21.0	.9		4.7								7.4	23.6
Bigeye Tuna																		
CPFV			.7															
Private Boats		2.5	.6	.6														
Bluefin Tuna																		
CPFV			3.1	11.6	.7	.2							6.5					2.0
Private Boats			.6	.6														1.4
Skipjack Tuna																		
CPFV			104.1	9.3									21.9				.6	12.7
Private Boats			65.0	4.4			.5		5.0				15.6	6.5	45.1	1.0	4.3	1.5
Yellowfin Tuna																		
CPFV			106.5										11.4					43.0
Private Boats			51.3	.3					7.0				6.9	1.6	23.7	3.2	9.2	6.7
Dorado																		
CPFV																		
Private Boats																		
Shortfin Mako Shark																		
CPFV		.4	.4															
Private Boats	13.0	1.5	1.1	2.6	9.3	4.8	21.6	10.0	5.8				3.6	11.4	5.3	1.9	4.8	1.7
Thresher Shark																		
CPFV																		
Private Boats		2.2	2.4	.3		1.4	4.5		.8				1.5	1.3	2.7	.7	.5	.6
Striped Marlin																		
CPFV																		
Private Boats		.8	.4	1.2	.7		.9	.8					.3	.4	.3		.4	

Source: RecFIN

Table 2-61. West coast CPFV albacore catch, 1971 - 1984.

Year	California		Oregon		Washington		Total Catch	
	No. Fish	MT	No. Fish	MT	No. Fish	MT	No. Fish	MT
1971	160,361	1,175	-				160,361	1,175
1972	86,890	637	*				86,890	637
1973	9,858	72	*		1,648	12	11,506	84
1974	12,814	94	*				12,814	94
1975	81,562	595	*		5,494	45	87,056	640
1976	84,973	620	*		9,566	93	94,529	713
1977	70,274	513	*		4,275	24	74,549	537
1978	92,646	676	*		20,137	134	112,783	810
1979	10,196	74	*				10,196	74
1980	21,309	156	*		1,540	12	22,849	168
1981	26,648	195	*				26,648	195
1982	36,690	268	35	0	18	0	36,743	268
1983	17,161	125	0	0	0	0	17,161	125
1984	181,836	1,278	3	0	0	0	181,839	1,278

Source: Holts 1985.

Table 2-62. Total Economic Impact of San Diego Bay Sportfish Businesses

Economic Activity	Direct Impact	Total Impact	Percent of Total
Employment	544	1200	45%
Employment Earnings	7,715,878	25,326,802	30%
Business Output	30,752,613	48,950,394	63%

Source: London Group (1999)

Note: Pertains to San Diego Bay and excludes the rest of San Diego County. Direct impacts are related to employment, income and economic activity within the sportfishing industry; total impacts include the direct, indirect (impacts on industries that provide goods and services to the sportfishing industry) and induced (impacts due to the expenditures from household income generated by the direct and indirect industries associated with sportfishing)

Table 2-63. Summary of all fish tagged in 2000 with releases and recoveries for 1963-2000

Species Name	Releases 2000	Releases Total	Recoveries Total	Rate%
Striped Marlin	249	20503	327	1.59
Sailfish	128	7749	45	0.58
Blue Marlin, Pacific	148	5315	58	1.09
Billfish, unid.	14	4293	5	0.12
Black Marlin	5	3339	69	2.07
Shortfin Mako Shark	47	1165	27	2.32
Roosterfish		920	29	3.15
Short-billed Spearfish	85	967	1	0.10
Broadbill Swordfish	8	504	15	2.98
Yellowtail		492	36	7.32
Dorado		407	3	0.74
Yellowfin Tuna	3	345	25	7.25
Blue Shark		316	5	1.58
Skipjack Tuna		97	2	2.06
Thresher Shark	30	127	13	10.24
Bat Ray		84	0	0.00
Albacore Tuna	6	85	0	0.00
Bigeye Tuna	1	79	2	2.53
Hammerhead Shark		52	2	3.85
Bluefin Tuna		50	5	10.00
White Sturgeon		50	1	2.00
Black Sea Bass		40	8	20.00
Blue Marlin, Atlantic	2	42	0	0.00
Leopard Shark		39	1	2.56
Whitetip Shark		39	1	2.56
Wahoo		38	3	7.89
Bronze Whaler Shark	13	50	1	2.00
Jack Crevalle		32	0	0.00
Blue Crevalle		30	1	3.33
Shark, unid.		26	0	0.00
Barracuda	1	24	2	8.33
Tiger Shark		17	2	11.76
White Marlin	1	13	1	7.69
Whale Shark		4	1	25.00
All Others	2	278	10	3.60
TOTALS	743	47611	701	1.47

Source: Billfish Tagging Program, SWFSC.

Table 2-64. Number of vessels with Pacific coast HMS commercial landings by species, 1981-99.

	Tunas						Sharks						
							Common	Pelagic	Bigeye	Shortfin			Any
Year	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	Swordfish	Thresher	Thresher	Thresher	Mako	Blue	Dorado	HMS
1981	1,869	274	140	90	37	267	251			208	69	9	2354
1982	824	214	122	53	52	271	329		35	262	70	6	1,378
1983	1,732	376	362	113	64	255	418	19	105	272	37	15	2,258
1984	1,247	278	253	65	105	299	397	24	109	337	23	18	1,612
1985	898	197	22	56	109	298	389	5	135	301	26	6	1,314
1986	530	112	29	74	97	301	360	**	118	286	21	**	980
1987	563	98	41	61	57	277	333	15	76	360	23	**	1,045
1988	604	90	43	38	70	228	316	4	42	278	26	4	1,027
1989	382	57	65	11	83	194	291	**	61	250	18	8	780
1990	413	63	50	23	98	187	271	10	73	260	22	22	811
1991	223	39	41	33	54	152	247		59	208	17	5	517
1992	634	66	52	12	81	168	234	3	53	244	22	17	999
1993	644	47	41	13	108	166	231	3	72	209	25	22	966
1994	756	68	40	27	96	201	206	**	80	226	12	26	1,048
1995	525	85	86	27	99	174	188	5	70	184	17	16	790
1996	758	77	57	18	110	152	174	6	40	173	22	18	985
1997	1,224	106	60	29	115	153	174	36	52	173	25	49	1,452
1998	921	112	63	34	135	146	154	10	34	166	31	30	1,116
1999	864	38	26	39	105	141	164	10	22	128	11	29	1,025

Source: PacFIN, extracted February 2001.

**Fewer than three vessels in this category.

Table 2-65. Number of vessels with Pacific coast HMS commercial landings by gear type and species, 1981-99.

	Species							
	Albacore	**Bluefin**	**Dorado**	**Sharks**	**Swordfish**	**Tropical Tunas**	**Any HMS**	**Non-HMS**
Year	**Gear Type - Surface Hook-and-Line**							
1981	1,828	4	6	98	3	225	1,932	2,871
1982	757	8	3	141	8	112	909	2,815
1983	802	9	8	61	5	228	972	2,587
1984	878	16	10	61	8	175	933	1,899
1985	675	18	3	102	21	89	771	2,231
1986	356	11	**	82	10	52	458	2,301
1987	431	9		153	12	40	596	2,270
1988	502	11	**	120	10	35	646	2,290
1989	324	14	**	119	13	37	470	2,313
1990	365	18	13	113	11	41	503	2,159
1991	170		3	96	11	17	271	1,957
1992	605	9	12	137	19	38	757	1,561
1993	609	21	17	128	19	29	753	1,575
1994	715	10	**	87	14	31	825	1,248
1995	473	11	**	77	10	55	577	1,359
1996	728	14	9	62	6	32	803	1,305
1997	1,196	28	32	64	7	60	1,264	1,241
1998	868	43	18	56	8	72	926	1,122
1999	828	29	12	44	6	26	863	1,062
	Gear Type - Drift Gillnet							
Year	**Albacore**	**Bluefin**	**Dorado**	**Sharks**	**Swordfish**	**Tropical Tunas**	**Any HMS**	**Non-HMS**
1981		5		126	94	33	130	108
1982	28	3		124	93	31	130	76
1983	34	5		116	98	51	121	92
1984	47	5		94	80	26	104	71
1985	35	3		78	74	4	96	59
1986	9	7		31	25	7	36	57
1987	3	**		14	15		18	26
1988	3			**	**		3	7
1989				**			**	
1990								**
1991	6	**		12	10	3	14	9
1992	**	6		16	17	5	19	15
1993	27	30		65	70	7	76	58
1994	44	59	**	136	137	28	151	136
1995	64	65	**	121	114	56	136	119
1996	64	71		124	109	30	135	120
1997	50	62	8	116	106	36	121	120
1998	69	63	4	109	97	38	111	116
1999	63	55	**	94	86	18	104	98

Table 2-65. Number of vessels with Pacific coast HMS commercial landings by gear type and species, 1981-99, continued.

	Gear Type - Pelagic Longline							
Year	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Any HMS	Non-HMS
1981	12			12	**	**	27	200
1982	13		**	14	**	3	28	238
1983	8		**	9	**	3	19	114
1984	7	3	**	7	7	4	14	56
1985	**			4	**		6	29
1986				4			4	10
1987				3			3	6
1988		**		12	**		12	17
1989				4			4	14
1990	**			4		**	5	55
1991	**	**	**	10	3	**	11	147
1992	5	**		13	8	**	19	195
1993	**	**	4	7	6	5	11	122
1994	23	17	22	35	32	28	43	201
1995	12	10	13	31	24	20	35	266
1996	10	13	9	14	19	19	27	344
1997	17	8	6	19	24	28	50	326
1998	24	18	11	29	33	37	69	262
1999	27	26	14	12	37	37	52	242
	Gear Type - Purse Seine							
Year	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Any HMS	Non-HMS
1981	29	26	**	5	**	128	137	145
1982	22	34		7	**	115	127	76
1983	8	27		6	3	105	112	110
1984	37	17		6	3	70	78	91
1985	6	28		5	8	31	55	66
1986	15	28	**	13	13	40	54	68
1987	3	15		4	3	37	47	77
1988	5	22		**	**	36	45	77
1989	**	23	**	6	5	26	41	96
1990	7	21		**		22	31	76
1991		6		**	**	15	19	70
1992	**	17	**	8	5	24	31	70
1993	4	18	**	8	5	22	30	77
1994		13	**	4		24	29	77
1995		12		**		22	23	95
1996	**	17		3		23	24	98
1997	6	20	**	3	**	31	35	93
1998	15	19		**	**	28	35	64
1999	4	4		**		12	16	97

Table 2-65. Number of vessels with Pacific coast HMS commercial landings by gear type and species, 1981-99, continued.

	Gear Type - Harpoon							
Year	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Any HMS	Non-HMS
1981	**			17	187	5	187	22
1982				14	158	**	159	6
1983				5	88		88	16
1984	4			20	107	**	111	12
1985	**			11	96		98	9
1986	**			20	112		113	7
1987	3	**		23	97		97	8
1988	**			21	82		82	7
1989	**			5	44		44	**
1990				18	49	**	50	3
1991				12	32		32	**
1992	**			18	47	**	47	4
1993	**			12	42		42	3
1994	**			8	49		50	5
1995				14	39		39	4
1996	**			12	30		31	3
1997	**		**	18	31		32	**
1998				5	26		27	5
1999				4	31		31	5
	Gear Type - Other							
Year	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Any HMS	Non-HMS
1981	10			9	28		47	479
1982	4			13	97	**	115	253
1983	345	**		4	123	11	484	627
1984	121	**		10	157	3	292	402
1985	55	**		12	155	4	227	354
1986	26	**		10	136	3	177	263
1987	18	**		9	142	3	173	270
1988	8	**		12	102	**	124	305
1989			**	6	104		112	243
1990	**			17	100	**	120	284
1991	**			16	87		104	178
1992	5	**		12	84	3	105	388
1993	5			10	87	6	108	335
1994	**			3	5		10	405
1995				6	7	**	15	246
1996				**			**	353
1997	**			3	**		6	534
1998		**		**			3	388
1999	**	**					**	320

Note: One vessel can harvest more than one HMS and use more than one HMS gear.

Source: PacFIN, extracted February, 2001.

**Fewer than three vessels in this category.

Table 2-66. Number of vessels with HMS landings by their principal port[1], 1981-99.

Year	Westport	Ilwaco	Astoria	Newport	Coos Bay	Crescent City	Eureka	Ft. Bragg	Bodega Bay	San Fran/Oak	Moss Land.	Monterey	Morro/Avila	S. Barbara Area	San Pedro	Terminal Is.	San Diego	Other
1981	102	45	106	106	140	77	116	93	73	125	94	16	117	86	128	155	435	343
1982	22	22	32	38	41	29	20	43	20	39	40	10	70	109	146	170	328	201
1983	60	23	70	87	50	107	78	70	45	166	169	73	154	103	94	172	200	469
1984	21	9	34	52	14	28	38	21	53	59	58	46	89	121	137	248	334	252
1985	12	7	17	24	7	19	57	31	40	52	70	74	114	101	103	129	182	275
1986	13	18	22	23	10	21	14	13	20	31	43	35	105	101	89	62	128	192
1987	29	27	16	59	22	12	15	17	45	32	53	32	84	95	91	53	125	238
1988	89	42	17	103	28	23	22	13	21	19	38	23	42	82	72	71	104	216
1989	27	23	11	34	20	10	7	14	20	40	26	15	56	70	52	66	109	161
1990	29	21	20	50	42	17	13	7	19	26	20	7	51	80	44	55	94	201
1991	18	7	13	25	10	9	6	4	8	26	27	10	30	69	36	41	65	93
1992	106	33	51	157	37	38	25	10	11	21	27	8	41	69	61	38	69	197
1993	43	85	44	130	42	67	35	6	17	13	37	7	38	72	68	28	48	176
1994	67	99	28	115	36	93	48	5	17	14	20	5	32	81	52	46	52	238
1995	71	60	36	79	25	17	13	7	4	15	36	11	38	67	67	8	50	172
1996	77	77	47	128	71	56	21	5	6	16	32	12	30	68	53	66	45	167
1997	106	72	104	158	63	69	40	19	33	41	83	35	72	75	74	30	49	317
1998	39	101	78	111	63	29	12	3	18	46	29	21	79	51	67	55	55	247
1999	48	82	67	109	27	17	28	15	9	29	36	14	57	60	61	104	53	198

[1]A vessel's principal port is the port that accounts for the largest proportion of its total exvessel revenues.
Source: PacFIN, extracted February, 2001.

Table 2-67. Number of vessels with HMS landings by principal species[1] and principal gear[2] categories, 1981-99.

	Principal Species						
	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Non-HMS[3]
Year	Principal Gear - Surface Hook-and-Line						
1981	843		**	3	3	29	676
1982	374	**		14	**	14	379
1983	260	**	**	6	**	75	585
1984	438		**	8	4	15	307
1985	288	3		17	3	10	298
1986	135	**		17	**	22	215
1987	119			36	3	17	321
1988	146	5		20	6	12	304
1989	100	3		17	3	9	207
1990	109	**		14	**	8	196
1991	76			9		5	92
1992	217	**	**	13	4	8	189
1993	257	**		19	8	5	165
1994	295	**		16	**	9	127
1995	201	**		8	**	8	135
1996	332			9	**	10	115
1997	392		3	11	**	6	297
1998	311	**		**	**	13	205
1999	373			5	**	**	168
	Principal Gear - Drift Gillnet						
Year	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Non-HMS[3]
1981				8	12		10
1982				**	12		**
1983				**	15		
1984				6	17		**
1985				**	7		
1986				**	3		
1987					**		**
1988							
1989					**		
1990							
1991					**		
1992					4		
1993					5		**
1994				7	75		4
1995	3			3	67		9
1996	**			7	55		6
1997	5			5	52		5
1998	**			**	61		4
1999	**	**		5	35		3

Table 2-67. Number of vessels with HMS landings by principal species[1] and principal gear[2] categories, 1981-99, continued.

	Principal Gear - Pelagic Long Line						
Year	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Non-HMS[3]
1981				3		**	4
1982				**			6
1983	**			**	**		**
1984					**		**
1985	**						**
1986				**			
1987				**			
1988				8			
1989				**			**
1990				**		**	**
1991				**	**		**
1992					**		10
1993							4
1994	**			**	26		7
1995				**	21		14
1996			**		15		19
1997		**		**	17	**	47
1998	**	**			23		38
1999					32		23
	Principal Gear - Purse Seine						
Year	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Non-HMS[3]
1981	**					101	27
1982		3				93	21
1983						63	23
1984	3	**				40	30
1985		4				18	25
1986		4			**	13	22
1987	3	**				22	13
1988		**				20	20
1989		**				13	20
1990	**	**				11	15
1991						6	7
1992	**	**				4	15
1993							16
1994						4	17
1995		**				**	16
1996		3				5	22
1997		**				7	24
1998		**				7	19
1999		**				5	14

Table 2-67. Number of vessels with HMS landings by principal species[1] and principal gear[2] categories, 1981-99, continued.

	Principal Gear - Harpoon						
Year	**Albacore**	**Bluefin**	**Dorado**	**Sharks**	**Swordfish**	**Tropical Tunas**	**Non-HMS[3]**
1981	**				105		
1982					88		
1983					39		
1984					46		
1985					54		**
1986					61		**
1987					62		**
1988					51		**
1989					30		
1990					28		
1991					14		
1992					35		
1993					29		**
1994					34		
1995					22		
1996					21		
1997					22		
1998					18		
1999					19		**
	Principal Gear - Other						
Year	**Albacore**	**Bluefin**	**Dorado**	**Sharks**	**Swordfish**	**Tropical Tunas**	**Non-HMS[3]**
1981	10			9	28		479
1982	4			13	97	**	253
1983	345	**		4	123	11	627
1984	121	**		10	157	3	402
1985	55	**		12	155	4	354
1986	26	**		10	136	3	263
1987	18	**		9	142	3	270
1988	8	**		12	102	**	305
1989			**	6	104		243
1990	**			17	100	**	284
1991	**			16	87		178
1992	5	**		12	84	3	388
1993	5			10	87	6	335
1994	**			3	5		405
1995				6	7	**	246
1996				**			353
1997	**			3	**		534
1998		**		**			388
1999	**	**					320

[1]The principal species is the species that accounted for the largest proportion of the vessel's total exvessel revenues.

[2]The principal gear is the gear that accounted for the largest proportion of the vessel's total exvessel revenues.

[3]Number of vessels whose principal species is not an HMS, but whose principal gear is that indicated.

**Fewer than three vessels in this category.

Source: PacFIN, extracted February, 2001.

Table 2-68. Number of HMS vessels[1] with HMS landings by their principal port[2], 1981-99.

Year	Westport	Ilwaco	Astoria	Newport	Coos Bay	Crescent City	Eureka	Ft. Bragg	Bodega Bay	San Fran/Oak	Moss Land.	Monterey	Morro/Avila	S. Barbara Area	San Pedro	Terminal Is.	San Diego	Other
1981	31	17	76	20	35	8	63	26	12	75	57	8	63	19	50	110	354	88
1982	**	15	21	5	19	13	6	3		9	9	**	16	27	40	146	210	63
1983	23	8	55	23	11	3	4	4	**	8	6		10	25	22	108	92	65
1984	7	2	24	9	7	**	2	**	3	4	15		7	25	25	201	191	55
1985	3	**	13	8	5		21	2	3	6	14	11	38	22	14	105	69	72
1986	2	12	20	6	4	**	6			3	6	**	27	17	15	47	38	57
1987	10	13	9	22	6		2			**	14	**	15	15	16	38	35	69
1988	46	27	11	22	11	2	4			**	5		7	15	7	33	24	55
1989	21	10	8	6	7	**	2			8	4		5	4	5	31	16	49
1990	17	14	16	14	4		5	**		4	3			10	4	28	9	49
1991	15	4	8	12	5		3			8	2		**	5	8	13	**	29
1992	55	18	21	49	7	3	6	4	**	8	5		3	8	15	13	11	64
1993	13	71	26	53	14	2	16	**	4	4	13		5	19	25	6	3	49
1994	27	85	15	50	14	17	17	**	2	3	8	2	9	40	25	38	42	77
1995	39	51	22	38	7	**	2	2		2	15	3	6	29	36	3	37	47
1996	35	69	28	66	42	7	6	2	**	6	19	2	5	21	20	59	33	39
1997	49	59	59	56	12	11	12		**	9	47	11	19	19	31	21	38	71
1998	13	91	50	26	23	6	2		3	17	12	7	18	13	31	38	36	59
1999	16	63	47	50	14	**	9	2		5	20	2	23	11	32	89	37	60

[1]HMS vessels are those whose principal species is an HMS species.

[2]A vessel's principal port is the port that accounts for the largest proportion of its total exvessel revenues.

**Fewer than three vessels with port as principal port.

Source: PacFIN, extracted February, 2001.

Table 2-69. Number of vessels with HMS landings -- whose principal species[1] is a non-HMS species -- by principal species group and all gears, 1981-99.

	Principal Species Group					
Year	**Coastal Pelagics**	**Crab**	**Groundfish**	**Salmon**	**Shrimp**	**Other**
1981	37	179	130	288	88	476
1982	38	58	144	167	7	247
1983	38	217	179	352	10	442
1984	42	109	149	183	11	249
1985	41	78	115	211	7	228
1986	28	52	79	149	12	181
1987	18	51	74	199	13	251
1988	30	90	81	153	18	259
1989	25	53	73	110	11	200
1990	20	94	80	81	9	214
1991	12	33	49	47	10	128
1992	17	137	168	46	45	190
1993	21	158	127	47	29	142
1994	24	215	121	50	33	123
1995	22	111	80	66	16	126
1996	28	181	91	51	27	138
1997	33	246	224	127	48	231
1998	24	188	138	79	33	194
1999	21	165	102	72	16	155

[1]The principal species is the species that accounted for the largest proportion of the vessel's total exvessel revenues.

Source: PacFIN, extracted February, 2001.

Table 2-70. Number of annual landings by HMS vessels[1] by principal species[2] and principal gear[3] categories, 1981-99.

	Principal Species						
	Albacore	**Bluefin**	**Dorado**	**Sharks**	**Swordfish**	**Tropical Tunas**	**Non-HMS[4]**
Year	**Principal Gear Type - Surface Hook-and-Line**						
1981	3,426		1	7	18	173	1,384
1982	1,506	1		54	21	135	888
1983	1,274	5	1	22	93	490	1,839
1984	2,187		1	58	35	83	841
1985	1,409	22		65	39	35	901
1986	549	2		157	18	103	638
1987	505			239	51	91	954
1988	578	14		83	145	81	867
1989	308	28		144	47	71	459
1990	331	7		110	26	53	530
1991	276			37		23	210
1992	723	6	2	77	61	46	424
1993	1,083	4		70	355	60	424
1994	1,273	2		56	16	70	328
1995	617	3		16	35	49	310
1996	1,333			25	34	75	226
1997	1,828		4	41	36	20	1,292
1998	1,545	4		7	16	114	613
1999	1,824			16	79	1	565
	Principal Gear Type - Drift Gillnet						
Year	**Albacore**	**Bluefin**	**Dorado**	**Sharks**	**Swordfish**	**Tropical Tunas**	**Non-HMS[4]**
1981				216	422		194
1982				89	452		20
1983				74	510		
1984				142	4,598		2
1985				4	161		
1986				1	78		
1987					29		28
1988							
1989					26		
1990							
1991					47		
1992					91		
1993					156		3
1994				155	2,306		273
1995	81			65	2,226		128
1996	2			136	2,234		109
1997	171			37	2,493		99
1998	29			50	2,644		137
1999	11	5		65	1,483		113

Table 2-70. Number of annual landings by HMS vessels[1] by principal species[2] and principal gear[3] categories, 1981-99, continued.

	Principal Gear Type - Pelagic Long Line						
Year	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Non-HMS[4]
1981				41		2	11
1982				11			11
1983	7			2	11		4
1984					62		4
1985	1						2
1986				6			
1987				5			
1988				124			
1989				8			2
1990				14		3	19
1991				16	25		22
1992					31		58
1993							9
1994	1			2	751		48
1995				59	225		48
1996			4		177		38
1997		2		3	113	5	185
1998	1	71			118		94
1999					334		65
	Principal Gear type - Purse Seine						
Year	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Non-HMS[4]
1981	8					3,138	297
1982		69				1,913	168
1983						821	315
1984	37	3				509	438
1985		46				167	268
1986		92			71	227	269
1987	6	44				253	88
1988		39				261	130
1989		7				201	131
1990	5	43				167	74
1991						53	53
1992	1	1				139	120
1993							84
1994						129	137
1995		10				57	154
1996		89				84	230
1997		3				105	264
1998		5				110	138
1999		11				56	91

Table 2-70. Number of annual landings by HMS vessels[1] by principal species[2] and principal gear[3] categories, 1981-99, continued.

	Principal Gear type - Harpoon						
Year	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Non-HMS[4]
1981	3				953		
1982					442		
1983					171		
1984				3	352		
1985					549		4
1986					713		3
1987					660		21
1988					659		3
1989					262		
1990					243		
1991					86		
1992					300		
1993					385		16
1994					503		
1995					297		
1996					269		
1997					343		
1998					235		
1999					295		1
	Principal Gear type - Other						
Year	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Non-HMS[4]
1981	18			152	796		2,379
1982	22			365	4,301	2	1,635
1983	2,031	5		13	5,306	85	3,359
1984	602	4		115	6,353	27	2,299
1985	350	2		119	5,268	15	2,346
1986	728	7		47	4,089	16	1,800
1987	42	1		96	4,292	10	1,823
1988	17	1		100	2,859	2	1,671
1989			2	49	2,764		1,217
1990	9			102	3,116	1	1,431
1991	1			152	2,484		905
1992	45	12		110	2,137	16	1,444
1993	13			236	2,683	106	1,711
1994	7			21	62		1,536
1995				79	111	9	982
1996				9			1,574
1997	39			44	2		2,388
1998		2		19			1,995
1999	1	55					1732

[1]HMS vessels are those whose principal species is an HMS species and whose principal gear is an HMS gear.
[2]The principal species is the species that accounted for the largest proportion of the vessel's total exvessel revenues.
[3]The principal gear is the gear that accounted for the largest proportion of the vessel's total exvessel revenues.
[4]Number of HMS landings by vessels whose principal species is non-HMS, but whose principal gear is that indicated.
Note: Each entry in the table is the number of **all** HMS landings for the vessels with that combination of principal species and principal gear, and not the number of landings of that species for those vessels.
Source: PacFIN, extracted February, 2001.

Table 2-71. Number of HMS landings by vessels whose principal species[1] is a non-HMS, by principal species group and all gears, 1981-99.

Year	Coastal Pelagics	Crab	Groundfish	Salmon	Shrimp	Other
1981	397	477	437	593	188	2,190
1982	253	116	524	420	43	1,382
1983	327	878	689	1,207	36	2,395
1984	489	343	510	457	199	1,604
1985	313	356	489	632	52	1,695
1986	290	292	310	499	166	1,153
1987	91	167	388	628	58	1,582
1988	177	290	236	506	76	1,399
1989	161	142	235	235	86	956
1990	90	299	264	246	36	1,123
1991	57	77	163	110	62	721
1992	128	385	505	69	135	829
1993	129	609	485	98	109	830
1994	181	770	481	116	129	660
1995	186	318	258	156	57	665
1996	268	580	256	105	108	882
1997	295	921	711	707	261	1,346
1998	162	713	385	202	117	1,416
1999	116	680	256	239	93	1,189

[1]The principal species is the species that accounted for the largest proportion of the vessel's total exvessel revenues.

Source: PacFIN, extracted February, 2001.

Table 2-72. Annual landings all HMS (mt)[1] by HMS vessels[2] by principal species[3] and principal gear[4] categories, 1981-99

	Principal Species						
	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Non-HMS[5]
Year	Principal Gear - Surface Hook-and-Line						
1981	10,929		1	<.5	2	4,329	1,014
1982	3,991	<.5		4	8	2,705	626
1983	3,286	12	<.5	1	243	5,801	611
1984	7,027		<.5	3	16	2,127	524
1985	5,689	4		7	142	408	516
1986	3,785	<.5		40	12	898	332
1987	1,777			98	23	2,325	805
1988	2,455	3		27	216	2,490	1,100
1989	1,423	3		91	110	1,892	286
1990	2,097	23		88	23	97	291
1991	1,286			2		756	137
1992	3,031	<.5	<.5	3	37	994	287
1993	4,191	<.5		7	245	2,034	208
1994	8,356	<.5		10	27	1,953	263
1995	4,866	<.5		3	50	1,396	306
1996	11,608			2	89	741	153
1997	7,936		<.5	5	48	232	620
1998	10,535	1		<.5	21	2,723	442
1999	7,545			1	97	1	273
	Principal Gear - Drift Gillnet						
Year	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Non-HMS[5]
1981				186	360		191
1982				63	254		9
1983				26	233		
1984				32	450		1
1985				4	102		
1986				<.5	49		
1987							24
1988							
1989							
1990							
1991					29		
1992					71		
1993					93		1
1994				94	989		47
1995	138			63	1,169		16
1996	<.5			64	1,099		24
1997	190			9	971		45
1998	54			21	1,744		34
1999	3	1		28	1,009		33

Table 2-72. Annual landings all HMS (mt)[1] by HMS vessels[2] by principal species[3] and principal gear[4] categories, 1981-99, continued.

	Principal Gear - Pelagic Long Line						
Year	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Non-HMS[5]
1981				90		1	7
1982				1			1
1983	12			<.5	2		<.5
1984					35		<.5
1985	<.5						<.5
1986				1			
1987	12			<.5			
1988				172			
1989				2			1
1990				8		1	8
1991				11	28		10
1992					95		12
1993	3						6
1994	19			8	996		51
1995				5	364		10
1996			2		491		4
1997		<.5		2	594	4	250
1998	2	151			466		13
1999					1,541		18
	Principal Gear - Purse Seine						
Year	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Non-HMS[5]
1981	15					129,264	1,967
1982		562				101,694	1,114
1983						74,587	1,578
1984	429	6				62,171	4,081
1985		2,598				14,890	1,919
1986		2,846			70	16,165	2,102
1987	32	278				25,060	608
1988		196				25,112	805
1989		64				17,628	856
1990	75	175				9,980	397
1991						3,466	588
1992	8	6				3,179	1,542
1993							1,366
1994						3,533	2,344
1995		111				3,289	3,746
1996		3,593				4,614	4,236
1997		939				8,131	3,512
1998		225				8,879	1,554
1999		180				4,562	500

Table 2-72. Annual landings all HMS (mt)[1] by HMS vessels[2] by principal species[3] and principal gear[4] categories, 1981-99, continued.

	Principal Gear - Harpoon						
Year	**Albacore**	**Bluefin**	**Dorado**	**Sharks**	**Swordfish**	**Tropical Tunas**	**Non-HMS[5]**
1981	1				289		
1982					95		
1983					30		
1984				<.5	77		
1985					186		3
1986					198		1
1987					221		12
1988					206		1
1989					51		
1990					43		
1991					14		
1992					66		
1993					153		5
1994					143		
1995					81		
1996					70		
1997					80		
1998					50		
1999					83		1

	Principal Gear - Other						
Year	**Albacore**	**Bluefin**	**Dorado**	**Sharks**	**Swordfish**	**Tropical Tunas**	**Non-HMS[5]**
1981	37			112	481		3,023
1982	10			304	2,420	194	1,820
1983	3,485	5		5	2,840	7,258	2,363
1984	697	<.5		70	4,360	888	2,149
1985	235	2		52	4,526	1,461	1,138
1986	275	68		57	2,494	1	781
1987	171	<.5		61	2,154	1,562	561
1988	275	<.5		49	1,944	3	1,450
1989			<.5	66	1,607		419
1990	<.5			22	1,639	<.5	1,603
1991	13			74	1,561		242
1992	284	<.5		94	1,644	1,237	1,341
1993	191			73	1,820	4,888	2,029
1994	4			3	37		2,219
1995				23	85	277	1,199
1996				<.5			2,575
1997	45			17	25		2,771
1998		1		5			2,350
1999	<.5	87					1,613

1Landings of **all** HMS, not just of the principal species.

[2]HMS vessels are those whose principal species is an HMS species and whose principal gear is an HMS gear.

[3]The principal species is the species that accounted for the largest proportion of the vessel's total exvessel revenues.

[4]The principal gear is the gear that accounted for the largest proportion of the vessel's total exvessel revenues.

[5]HMS landings by vessels whose principal species is not an HMS but whose principal gear is that indicated.

Source: PacFIN, extracted February, 2001.

Table 2-73. Annual real exvessel revenues all HMS (1999 dollars)[1] by HMS vessels[2] by principal species[3] and principal gear[4] categories, 1981-99.

	Principal Species						
	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Non-HMS[5]
Year	Principal Gear - Surface Hook-and-Line						
1981	36,178,249		793	298	14,471	8,984,648	3,413,138
1982	9,534,582	44		6,781	39,216	4,161,276	1,565,291
1983	6,619,683	40,784	93	2,998	514,577	8,327,583	1,168,651
1984	14,031,365		120	7,245	59,481	2,868,846	1,009,898
1985	9,481,244	12,425		20,593	336,274	569,319	860,161
1986	6,392,643	904		87,659	67,532	1,041,492	648,918
1987	3,883,675			257,388	163,535	3,068,363	2,047,598
1988	6,077,710	14,703		68,824	942,724	3,629,825	2,955,801
1989	3,134,448	33,722		271,265	424,081	2,400,658	733,645
1990	4,606,642	33,785		226,104	138,796	125,893	766,432
1991	2,567,470			7,190		750,194	331,571
1992	8,316,289	878	250	9,948	207,702	1,385,806	722,319
1993	9,040,828	486		18,192	1,419,100	3,200,480	436,624
1994	17,825,191	971		25,882	90,304	1,879,273	502,183
1995	8,975,377	832		7,311	138,346	1,326,002	604,846
1996	23,824,774			5,495	269,341	713,778	305,219
1997	14,793,500		382	12,312	124,317	319,167	1,121,832
1998	14,678,830	1,137		1,106	52,086	2,703,036	661,544
1999	13,922,550			2,835	252,881	864	509,830
	Principal Gear - Drift Gillnet						
Year	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Non-HMS[5]
1981				385,978	1,295,617		647,448
1982				148,046	1,001,908		32,457
1983				64,271	928,089		
1984				115,719	1,914,616		3,538
1985				9,215	415,107		
1986				461	232,429		
1987							111,076
1988							
1989							
1990							
1991					148,668		
1992					314,020		
1993					470,025		3,306
1994				196,181	4,493,086		140,767
1995	331,557			147,843	4,846,823		58,171
1996	61			131,569	4,089,316		48,700
1997	480,257			16,173	3,222,268		128,652
1998	112,828			39,541	4,969,979		122,227
1999	6,973	6,573		51,444	3,116,595		105,873

Table 2-73. Annual real exvessel revenues all HMS (1999 dollars)[1] by HMS vessels[2] by principal species[3] and principal gear[4] categories, 1981-99, continued.

	Principal Gear - Pelagic Long Line						
Year	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Non-HMS[5]
1981				110,767		2,213	22,012
1982				1,848			2,913
1983	29,813			71	1,553		162
1984					145,521		1,016
1985	991						163
1986				1,654			
1987	25,815			1,045			
1988				485,679			
1989				6,379			2,403
1990				20,431		5,368	31,130
1991				22,612	185,118		24,223
1992					530,076		29,541
1993	9,473						11,642
1994	37,360			14,915	4,843,966		164,019
1995				10,639	1,497,111		46,221
1996			2,428		1,872,221		10,701
1997		221		9,321	1,957,619	19,663	659,635
1998	2,661	547,101			1,655,052		23,448
1999					5,808,981		28,805
	Principal Gear - Purse Seine						
Year	Albacore	Bluefin	Dorado	Sharks	Swordfish	Tropical Tunas	Non-HMS[5]
1981	48,541					278,047,171	4,845,982
1982		1,131,192				185,725,205	2,273,343
1983						111,602,449	2,916,268
1984	785,421	20,053				91,621,830	7,882,739
1985		3,224,231				20,716,285	2,659,315
1986		3,361,078			406,725	18,954,032	3,431,868
1987	72,741	945,010				33,539,315	2,393,904
1988		993,718				42,020,112	2,213,823
1989		85,461				23,442,578	1,325,243
1990	121,566	287,922				12,066,413	621,036
1991						3,391,576	633,219
1992	22,186	4,218				3,296,577	1,132,663
1993							1,186,700
1994						4,159,841	2,214,632
1995		93,288				2,979,710	3,012,493
1996		3,438,508				4,121,458	3,241,304
1997		962,325				8,458,185	3,439,450
1998		245,633				9,116,564	1,567,160
1999		229,234				3,920,616	507,125

Table 2-73. Annual real exvessel revenues all HMS (1999 dollars)[1] by HMS vessels[2] by principal species[3] and principal gear[4] categories, 1981-99, continued.

	Principal Gear - Harpoon						
Year	**Albacore**	**Bluefin**	**Dorado**	**Sharks**	**Swordfish**	**Tropical Tunas**	**Non-HMS[5]**
1981	2,483				1,850,846		
1982					725,010		
1983					222,808		
1984				416	539,527		
1985					1,187,893		13,648
1986					1,693,527		4,848
1987					2,063,910		87,663
1988					1,898,636		5,243
1989					519,195		
1990					432,731		
1991					143,712		
1992					582,870		
1993					1,155,582		39,225
1994					1,214,988		
1995					665,146		
1996					541,738		
1997					638,006		
1998					409,225		
1999					603,283		4,050
	Principal Gear - Other						
Year	**Albacore**	**Bluefin**	**Dorado**	**Sharks**	**Swordfish**	**Tropical Tunas**	**Non-HMS[5]**
1981	124,101			264,832	1,791,300		9,561,826
1982	25,426			739,653	8,705,587	720,121	4,241,005
1983	6,972,634	12,589		7,826	10,588,008	10,990,822	4,798,012
1984	1,361,193	1,833		211,166	18,412,872	896,852	3,905,150
1985	403,258	3,162		141,449	19,701,002	3,990,841	2,906,226
1986	530,580	128,789		194,117	13,539,168	5,415	2,819,890
1987	383,018	829		254,380	13,467,987	2,144,151	2,282,603
1988	705,235	437		171,240	11,135,624	17,444	3,635,231
1989			31	231,991	9,396,611		1,208,927
1990	548			52,311	8,479,267	88	3,008,350
1991	25,602			172,319	7,576,888		662,857
1992	633,119	1,015		206,106	7,354,917	1,306,586	3,822,636
1993	553,001			167,916	7,937,025	4,843,577	3,725,430
1994	5,966			6,886	142,227		4,645,779
1995				46,525	490,700	164,773	2,617,326
1996				440			5,287,854
1997	111,863			38,586	84,152		5,181,406
1998		13,095		8,706			3,644,821
1999	58	596,417					3,194,277

[1]Exvessel revenues from **all** HMS, not just of the principal species. Real exvessel revenues are nominal revenues converted to 1999 dollars using the Gross Domestic Product implicit price deflator, to adjust for inflation.

[2]HMS vessels are those whose principal species is an HMS species and whose principal gear is an HMS gear.

[3]The principal species is the species that accounted for the largest proportion of the vessel's total exvessel revenues.

[4]The principal gear is the gear that accounted for the largest proportion of the vessel's total exvessel revenues.

[5]HMS exvessel revenues for vessels whose principal species is not an HMS but whose principal gear is that indicated.

Source: PacFIN, extracted February, 2001.

(BLANK)

Table 2-74. Total HMS landings (mt) for vessels' with a non-HMS principal species[1] by principal species, all gears, 1981-99.

	Principal Species					
Year	Coastal Pelagics	Crab	Groundfish	Salmon	Shrimp	Other
1981	1,985	707	271	493	500	2,246
1982	1,187	235	161	356	61	1,569
1983	1,605	705	224	394	59	1,566
1984	4,095	577	206	298	1,223	357
1985	1,956	593	122	351	39	513
1986	2,107	328	51	240	126	364
1987	509	281	115	502	36	567
1988	822	604	171	608	138	1,013
1989	863	205	60	152	24	257
1990	411	420	103	157	34	1,174
1991	126	83	65	82	31	591
1992	1,564	689	388	17	231	292
1993	1,964	924	292	25	152	258
1994	2,345	1,377	567	111	106	417
1995	3,747	891	124	142	77	298
1996	4,239	1,813	270	71	86	514
1997	3,518	1,821	513	312	408	625
1998	1,554	1,880	147	45	195	572
1999	502	1,324	99	121	60	333

[1]The principal species is the species that accounted for the largest proportion of the vessel's total exvessel revenues.
Source: PacFIN, extracted February, 2001.

Table 2-75. HMS real exvessel revenues (1999 dollars)[1] for vessels whose principal species[2] is a non-HMS, by principal species, all gears, 1981-99.

	Principal Species					
Year	**Coastal Pelagics**	**Crab**	**Groundfish**	**Salmon**	**Shrimp**	**Other**
1981	4,955,046	2,374,364	923,418	1,650,871	1,655,566	6,931,141
1982	2,437,045	569,950	488,838	873,886	221,360	3,523,930
1983	2,922,912	1,359,634	569,933	747,935	131,011	3,151,668
1984	7,925,593	1,131,425	431,103	533,081	1,888,826	892,313
1985	2,714,228	1,051,985	306,650	578,828	197,316	1,590,506
1986	3,459,575	793,172	249,988	495,637	685,062	1,222,090
1987	2,123,046	764,070	546,462	1,380,918	253,387	1,854,961
1988	2,250,467	1,573,505	626,761	1,752,294	401,238	2,205,833
1989	1,360,760	501,492	249,116	320,435	109,817	728,598
1990	640,303	1,056,235	371,032	422,283	147,556	1,789,539
1991	179,402	178,727	173,319	196,229	178,958	745,235
1992	1,224,839	1,829,790	1,140,375	43,118	708,672	760,365
1993	1,767,452	1,945,408	740,190	49,717	299,627	600,533
1994	2,217,993	2,649,336	1,268,965	205,889	319,335	1,005,862
1995	3,015,764	1,791,493	383,073	291,935	226,294	630,498
1996	3,246,652	3,578,149	577,937	141,177	230,913	1,118,950
1997	3,453,416	3,318,103	911,690	569,145	808,724	1,469,897
1998	1,567,664	2,751,758	280,715	76,488	357,595	984,980
1999	510,739	2,584,145	173,489	212,584	170,016	698,987

[1]Real exvessel revenues are nominal revenues converted to 1999 dollars using the Gross Domestic Product implicit price deflator, to adjust for inflation.

[2]The principal species is the species that accounted for the largest proportion of the vessel's total exvessel revenues.

Source: PacFIN, extracted February, 2001.

Table 2-76. Number of HMS vessels by principal HMS fishery[1] that had available length data[2], 1981-99.

Year	Albacore Surface Hook-and-Line	Coastal Purse Seine	Swordfish & Shark Drift Gillnet	Swordfish Harpoon	Large Purse Seine	HMS Longline
1981	826	2	20	103	100	4
1982	373	3	14	87	93	**
1983	266		17	39	70	4
1984	436	4	20	44	40	**
1985	286	4	9	54	18	**
1986	136	5	4	63	14	**
1987	119	5		61	22	**
1988	146	**		50	20	8
1989	100	**		32	14	**
1990	108	3		29	11	**
1991	76		**	14	9	3
1992	213	**	3	35	4	**
1993	254		4	29		**
1994	285		75	31	4	26
1995	198	**	68	22	3	22
1996	327	3	55	21	3	16
1997	382	**	57	22	7	19
1998	305	**	62	18	7	26
1999	366	**	37	18	5	31

[1]The principal fishery is the species and gear that accounted for the largest proportion of the vessel's total exvessel revenues.

[2]98.64% of these annual vessel records had length data.

**Less than three vessels in this cell.

Source: PacFIN, extracted July 2001.

Table 2-77. Number of HMS vessels by principal HMS fishery[1] whose principal port[2] was in Southern California, 1981-99.

Year	Albacore Surface Hook-and-Line	Coastal Purse Seine	Swordfish & Shark Drift Gillnet	Swordfish Harpoon	Large Purse Seine	HMS Longline
1981	309	**	20	103	100	3
1982	245	3	14	87	93	**
1983	85		17	38	70	3
1984	337	4	20	44	40	**
1985	148	4	8	54	18	**
1986	41	5	4	63	14	**
1987	19	5		61	22	**
1988	5	**		49	20	8
1989	13	**		32	14	**
1990	9	3		29	11	**
1991	10		**	14	9	3
1992	17	**		35	4	**
1993	17			29		
1994	22		57	31	4	24
1995	7	**	49	22	3	22
1996	47	3	33	21	3	16
1997	23	**	40	22	7	19
1998	35	**	43	17	7	17
1999	103	**	31	18	5	27

[1]The principal fishery is the species and gear that accounted for the largest proportion of the vessel's total exvessel revenues.

[2]The principal port is the port that accounted for the largest proportion of the vessel's total exvessel revenues.

**Less than three vessels in this cell.

Source: PacFIN, extracted July 2001.

Table 78. Number of HMS vessels by principal HMS fishery[1] whose principal port[2] was in Central California, 1981-99.

Year	Albacore Surface Hook-and-Line	Coastal Purse Seine	Swordfish & Shark Drift Gillnet	Swordfish Harpoon	Large Purse Seine	HMS Longline
1981	209					**
1982	38					
1983	25			**		**
1984	36					
1985	74		**			
1986	40					
1987	31					
1988	10			**		
1989	20					
1990	8					
1991	11					
1992	13		**			**
1993	20		**			
1994	10		11			
1995	6		18			
1996	17		18			
1997	85		12			
1998	38		10	**		9
1999	39	**	6			3

[1]The principal fishery is the species and gear that accounted for the largest proportion of the vessel's total exvessel revenues.

[2]The principal port is the port that accounted for the largest proportion of the vessel's total exvessel revenues.

**Less than three vessels in this cell.

Source: PacFIN, extracted July 2001.

Table 2-79. Number of HMS vessels by principal HMS fishery[1] whose principal port[2] was in Northern California, 1981-99.

Year	Albacore Surface Hook-and-Line	Coastal Purse Seine	Swordfish & Shark Drift Gillnet	Swordfish Harpoon	Large Purse Seine	HMS Longline
1981	108					
1982	22					
1983	14					
1984	7					
1985	26					
1986	7					
1987	**					
1988	6					
1989	3					
1990	7					
1991	3					
1992	13		**			
1993	21		**			
1994	22		7			**
1995	4		**			
1996	14		**			
1997	21		3			
1998	6		5			
1999	12					

[1]The principal fishery is the species and gear that accounted for the largest proportion of the vessel's total exvessel revenues.

[2]The principal port is the port that accounted for the largest proportion of the vessel's total exvessel revenues.

**Less than three vessels in this cell.

Source: PacFIN, extracted July 2001.

Table 2-80. Number of HMS vessels by principal HMS fishery[1] whose principal port[2] was in Oregon, 1981-99.

Year	Albacore Surface Hook-and-Line	Coastal Purse Seine	Swordfish & Shark Drift Gillnet	Swordfish Harpoon	Large Purse Seine	HMS Longline
1981	148					
1982	47					
1983	107					
1984	46					
1985	29					
1986	33					
1987	37					**
1988	47					
1989	26					
1990	43					
1991	31					
1992	88					
1993	110					**
1994	111					
1995	77					
1996	140		**			
1997	144		**			
1998	116		**			
1999	124					**

[1]The principal fishery is the species and gear that accounted for the largest proportion of the vessel's total exvessel revenues.

[2]The principal port is the port that accounted for the largest proportion of the vessel's total exvessel revenues.

**Less than three vessels in this cell.

Source: PacFIN, extracted July 2001.

Table 2-81. Number of HMS vessels by principal HMS fishery[1] whose principal port[2] was in Washington, 1981-99.

Year	Albacore Surface Hook-and-Line	Coastal Purse Seine	Swordfish & Drift Gillnet	Swordfish Harpoon	Large Purse Seine	HMS Longline
1981	52					
1982	21					
1983	35					
1984	10					
1985	9					
1986	15					
1987	30					
1988	78					
1989	38					
1990	41					
1991	21					
1992	82					
1993	86					
1994	120					
1995	104					
1996	109					
1997	109		**			
1998	110		**			
1999	88					

[1]The principal fishery is the species and gear that accounted for the largest proportion of the vessel's total exvessel revenues.

[2]The principal port is the port that accounted for the largest proportion of the vessel's total exvessel revenues.

**Less than three vessels in this cell.

Source: PacFIN, extracted July 2001.

Table 2-82. Total catches (ton) of tunas in the Pacific Ocean by species, by gear. Symbols: '...' = missing data; '-' = no effort, hence no catch; '0' = effort, but no catch; estimates in parentheses have been carried over from previous or subsequent years. Data from SPC 1999 yearbook (albacore, bigeye, skipjack, yellowfin) and ISC bluefin working group.

ALBACORE

YEAR	SOUTH PACIFIC					NORTH PACIFIC					TOTAL
	LONGLINE	POLE-AND-LINE	TROLL	OTHER	SUB-TOTAL	LONGLINE	POLE-AND-LINE	TROLL	OTHER	SUB-TOTAL	
1990	22532	3	7150	5635	35320	16403	8647	2905	26332	54287	89607
1991	24741	5	7930	80	32756	17712	7103	1984	11104	37903	70659
1992	30088	5	6373	58	36524	19824	13888	4935	16909	55556	92080
1993	29886	14	4193	59	34152	30593	12809	6748	4410	54560	88712
1994	33000	5	5549	78	38632	30787	26391	11814	3950	72942	111574
1995	25453	3	8134	94	33684	32507	20981	9898	3639	67025	100709
1996	24388	4	8147	105	32644	37313	20272	16948	1751	76284	108928
1997	32250	21	4793	94	37158	46595	32250	15196	3972	98013	135171
1998	35178	35	7078	55	42346	46682	28518	17059	4212	96471	138817
1999	33353	38	3641	48	37080	47077	28563	14203	5031	94874	131954

BIGEYE

YEAR	WCPO					EPO						TOTAL
	LONGLINE	POLE-AND-LINE	PURSE SEINE	OTHER	SUB-TOTAL	LONGLINE	POLE-AND-LINE	PURSE SEINE	TROLL	OTHER	SUB-TOTAL	
1990	66801	3868	12143	8895	91707	89600	-	4701	-	11	94312	186019
1991	51251	1909	13406	10289	76855	95400	25	3702	-	13	99140	175995
1992	63177	1631	19384	7357	91549	69700	-	5488	-	9	75197	166746
1993	57042	2360	14286	7392	81080	62200	-	8043	-	26	70269	151349
1994	64879	2805	11178	8724	87586	60300	-	28683	692	-	89675	177261
1995	53426	3807	14222	10408	81863	47800	-	36155	1154	-	85109	166972
1996	48242	3861	18244	11601	81948	37900	-	50728	-	625	89253	171201
1997	56883	3706	31637	11660	103886	38600	-	51617	-	2	90219	194105
1998	60139	2473	18342	11639	92593	36000	-	35036	-	12	71048	163641
1999	56402	(2473)	34937	11553	105365	(36000)	-	42574	-	607	79181	184546

Table 2-82, continued.

SKIPJACK										
	WCPO					EPO				
YEAR	LONGLINE	POLE-AND-LINE	PURSE SEINE	OTHER	SUB-TOTAL	POLE-AND-LINE	PURSE SEINE	OTHER	SUB-TOTAL	TOTAL
1990	1292	225868	604460	60883	892503	835	69927	1883	72645	965148
1991	1541	289288	773784	65552	1130166	1670	59707	1900	63277	1193443
1992	1063	224813	706514	76183	1008573	1860	81026	1092	83978	1092551
1993	940	270163	580717	55785	907605	3633	81500	2256	87389	994994
1994	1793	220319	720394	48269	990774	3110	71449	896	75457	1066231
1995	1390	271445	727433	60644	1060912	5237	130974	2038	138249	1199161
1996	1112	233559	739757	57348	1031776	2583	108444	1328	112355	1144131
1997	1411	225716	641974	78074	947175	3292	158398	119	161809	1108984
1998	1572	235176	929492	78109	1244349	1642	142160	164	143966	1388315
1999	1650	241081	780853	78033	1101617	1938	259066	1899	262903	1364520

YELLOWFIN											
	WCPO					EPO					
YEAR	LONGLINE	POLE-AND-LINE	PURSE SEINE	OTHER	SUB-TOTAL	LONGLINE	POLE-AND-LINE	PURSE SEINE	OTHER	SUB-TOTAL	TOTAL
1990	72295	14271	175239	91171	352976	30000	2664	268871	1751	303286	656262
1991	59427	13013	211043	102536	386019	25400	2909	234974	1069	264352	650371
1992	69008	15745	240852	69007	394612	16100	3885	232811	3153	255949	650561
1993	64379	14385	243108	73086	394958	24600	5089	223519	3463	256671	651629
1994	67128	14614	223584	85859	391185	24700	3755	213177	1455	243087	634272
1995	73524	16868	188395	102067	380854	16900	1284	220486	2047	240717	621571
1996	71220	17432	122754	110853	322259	11940	3733	245313	1056	262042	584301
1997	67477	14610	263744	112278	458109	15240	4386	252214	1231	273071	731180
1998	55586	13520	258433	112317	439856	14640	5126	260804	330	280900	720756
1999	52580	13643	218177	112347	396747	(14640)	1888	285782	2330	304640	701387

Table 2-82, continued.

BLUEFIN														
YEAR	WPO								EPO					TOTAL
	LONGLINE	POLE-AND-LINE	PURSE SEINE	TROLL	SET NET	DRIFTNET	OTHER	SUB-TOTAL	LONGLINE	POLE-AND-LINE	PURSE SEINE	DRIFTNET	SUB-TOTAL	
1990	585	536	2827	1756	768	256	151	6879	0	62	1430	10	1502	8381
1991	627	286	8522	3015	1734	236	291	14711	0	0	419	4	423	15134
1992	1037	166	6319	1331	1227	888	290	11258	9	1	1828	21	1859	13117
1993	1328	68	5754	895	899	159	43	9146	45	5	580	56	686	9832
1994	1521	302	7150	2988	434	126	53	12574	24	1	971	27	1023	13597
1995	920	427	16668	3506	1281	110	833	23745	27	1	630	19	677	24422
1996	1873	217	6713	2561	480	67	110	12021	53	2	8223	42	8320	20341
1997	2823	77	11585	1611	311	109	1064	17580	52	2	2567	57	2678	20258
1998	3134	108	4860	1749	381	91	200	10523	56	48	1772	40	1916	12439
1999	3490	124	14238	1601	377	59	469	20358	39	3	2513	21	2576	22934

Table 2-83. Per Capita U.S. Fish Consumption

Year	Civilian Resident Population July 1 Million Persons	Fresh and Frozen	Canned	Cured	Total
Pounds, Edible Meat					
1995	261.4	10.0	4.7	0.3	15.0
1996	264.0	10.0	4.5	0.3	14.8
1997	266.4	9.9	4.4	0.3	14.6
1998	269.1	10.2	4.4	0.3	14.9
1999	271.5	10.4	4.6	0.3	15.3

Table 2-84. U.S. Annual Per Capita Consumption of Canned Fishery Products, 1995-99

Year	Salmon	Sardines	Tuna	Shellfish	Other	Total
Pounds						
1995	0.5	0.2	3.4	0.3	0.3	4.7
1996	0.5	0.2	3.2	0.3	0.3	4.5
1997	0.4	0.2	3.1	0.3	0.4	4.4
1998	0.3	0.2	3.4	0.3	0.2	4.4
1999	0.3	0.2	3.4	0.4	0.3	4.6

Table 2-85. U.S. Annual Per Capita Consumption (lbs per person) of Certain Fishery Items, 1995-99

Year	Fillets and Steaks	Sticks and Portions	Shrimp All Preparations
1995	2.9	1.2	2.5
1996	3.0	1.0	2.5
1997	3.0	1.0	2.7
1998	3.2	0.9	2.8
1999	3.2	1.0	??

Table 2-86. Most Popular Seafood Consumption per Capita in USA

Rank	Species	Pounds per Capita
1	Tuna	3.5
2	Shrimp	3
3	Salmon	1.7
4	Alaska Pollock	1.57
5	Catfish	1.16
6	Cod	0.77
7	Crabs	0.54
8	Clams	0.46
9	Flatfish	0.39
10	Scallops	0.2

Source: National Fisheries Institute (http://www.annapolisseafoodmarket.com/toptenlist.htm)

Chapter 3
STATUS OF FISH STOCKS

3.0 STATUS OF FISH STOCKS (BIOLOGICAL ENVIRONMENT)

This chapter includes a description of the species in the management unit as well as other species harvested by HMS fisheries, defines overfishing, summarizes the current status of the management unit species and describes the annual stock assessment and fishery evaluation (SAFE) report.

3.1 Species Addressed by the FMP

HMS fishing gears catch an assortment of tunas, billfish, sharks and other fishes, and some protected species as well. Important species, which meet certain criteria described below, are designated as management unit species, that is, they are subject to active management by the FMP. The management unit species are addressed in section 3.1.1 and the alternative options considered are listed in Table 3-1.

In addition to management unit species, over fifty other fish species are caught. It is recommended that data be collected for these and any others caught by HMS gears to assess the amount and type of bycatch as required by the Magnuson-Stevens Act. Table 3-2 identifies which species are 1) proposed for inclusion in the management unit, 2) recommended for monitoring, 3) covered by other Pacific FMPs, 4) considered for 'Prohibited' designation, 5) caught outside the EEZ on the high seas by West Coast-based HMS vessels, 6) classified as 'Incidental' (retained or recorded as being landed), and 7) known to be discarded dead or released alive at sea. The list was compiled after reviewing analyses of PacFIN landings (D. Dealy, pers. comm. 1/01, NMFS, SWFSC, La Jolla, CA), catch and bycatch data from the NMFS Driftnet Observer Program, and various literature sources such as Au (1991); Hanan et al. (1993); Holts et al. (1998); and Vojkovich and Barsky (1998).

Species included for monitoring purposes are discussed in section 3.1.2. One or more of these species could be added to the management unit by action of the Council. This requires a plan amendment. Bycatch is addressed in Chapter 5 and in Chapters 8 and 9, sections 8.4.4 and 9.2.4.4, respectively.

A few species are designated by this FMP as prohibited because of their special status. These species, if intercepted, must be released immediately, unless there are other provisions for their disposition, or unless permits are held for their capture. Prohibited species are addressed in section 3.1.3, Chapter 8 section 8.4.7, and Chapter 9 section 9.2.4.7.

Protected species caught incidentally to HMS fisheries include various species of birds, turtles and mammals. Protected species are addressed in Chapter 6 by fishery, and in Chapter 8 section 8.4.6 and Chapter 9 section 9.2.4.6.

3.1.1 Management Unit Species (Actively Managed)

Background

The Plan Development Team and the Council examined a number of different criteria and alternatives for species to be included in the management unit. Public testimony covered a wide range of alternatives, from a relatively short list of target species in West Coast HMS fisheries, to a long list of species harvested by HMS fisheries. The Council assumed that species placed in the management unit would be candidates for active management, i.e., the fisheries for these species may need to be regulated by the federal government. The Council also understood that maximum sustainable or optimum yield (bio-analytically-based or proxy) is the basis of management and would have to be specified for each species in the management unit, and that a definition of overfishing is required. The Council considered various combinations of the following criteria for including species in the management unit, with the stipulation that any species that met the first three criteria would be strongly considered for inclusion:

1. *the species occurs in the Pacific Council management area*
2. *the species occurs in west coast HMS fisheries*
3. *the species is defined as highly migratory in the Magnuson-Stevens Act or the Law of the Sea Convention*
4. the species is important (moderate to high value) in the landings or to the fishery
5. the species is managed by the Western Pacific Region Council
6. sufficient data exists to calculate a bio-analytically based MSY, including a reasonable MSY proxy that is based, e.g., on catches and yields that are stable over time
7. the species occurs in fisheries which the Pacific Council wants to actively manage
8. the species possesses special biological characteristics (e.g., low productivity)

The Magnuson-Stevens Act defines "highly migratory species" as tuna species, marlin (*Tetrapturus* spp. and *Makaira* spp.), oceanic sharks, sailfishes (*Istiophorus* spp.) and swordfish (*Xiphias gladius*). The term "tuna species" includes albacore tuna (*Thunnus alalunga*), bigeye tuna (*T. obesus*), bluefin tuna (*T. thynnus* and *T. orientalis*), skipjack tuna (*Katsuwonus pelamis*) and yellowfin tuna (*T. albacares*). The inclusion of these definitions establishes the authority of the Secretary of Commerce to manage directly the above species in the Atlantic Ocean and Gulf of Mexico, without the need for a regional fishery management council FMP.

The United Nations Convention on the Law of the Sea, Annex I, defines "highly migratory species" to include: albacore tuna, bluefin tuna, bigeye tuna, skipjack tuna, yellowfin tuna, blackfin tuna (*Thunnus atlanticus*), little tuna (*Euthynnus alletteratus; E. affinis*), southern bluefin tuna (*T. maccoyii*), frigate mackerel (*Auxis thazard; A. rochei*), pomfrets (family Bramidae), marlins (*Tetrapturus angustirostris; T. belone; T. pfluegeri; T. albidus; T. audax; T. georgei; Makaira mazara; M. indica; M. nigricans*), sailfishes (*Istiophorus platypterus; I. albicans*), swordfish, sauries (*Scomberesox saurus; S. saurus scombroides; Cololabis saira; C. adocetus*), dorado (*Coryphaena hippurus; C. equiselis*), oceanic sharks (*Hexanchus griseus; Cetorhinus maximus; Rhincodon typus*; family Alopiidae; family Carcharhinidae; family Sphyrnidae; family Lamnidae), cetaceans (family

Physeteridae; family Balaenopteridae; family Balaenidae; family Eschrichtiidae; family Monodontidae; family Ziphiidae; family Delphinidae).

Species in the management unit of the Pelagic Fisheries FMP adopted by the Western Pacific Region Fishery Management Council are listed in Chapter 1 section 1.6.6.

Management Unit Species (MUS) Alternatives

The Council and the Plan Development Team considered 6 alternatives for MUS, based on different combinations of criteria. These alternatives are presented in Table 3-1, and discussed further here and also in Chapter 9, section 9.2.2.1.

Alternative 1 (No Action) lists no species as MUS. This is not a viable alternative, because this FMP is predicated on the need to actively manage certain HMS species.

Alternative 2 (Proposed Action) lists species that are at least moderately important or of special conservation concern in West Coast HMS fisheries, and also managed by the WPRFMC (see Table 3-1 for the species and other criteria). It includes tunas, swordfish, striped marlin, and sharks, variously important to commercial and sports interests, and dorado (dolphinfish) that is of growing importance in the Southern California recreational fishery. All are also of concern to conservationists, particularly the sharks.

Alternative 3 is the species list of Alternative 2, but excluding dorado that is important mainly in the recreational fishery.

Alternative 4 keeps only species from the list of Alternative 2 for which an analytically-based MSY, or MSY proxy, can presently be determined (deletes dorado, bigeye thresher, and pelagic thresher which would become monitored species (section 3.1.2)).

The Magnuson-Stevens Act requires that species in FMPs be managed to not exceed MSY or OY catch levels. There is a quandary if no catch data are available for estimating a species' sustainable production and where proxies, such as average landings, could be misleading. But to not include species whose production potential is unknown is unmindful of the fact that there is much uncertainty in MSY estimates regardless. It could set a precedent for delaying or avoiding management of species on the basis of uncertainty.

Alternative 5 adds to the list of Alternative 2 species having special biological characteristics. The sixgill shark is thus added. It is a species of low productivity that, while of low importance in landings, has moderately high market value. This shark may not truly be "highly migratory."

Alternative 6 deletes all shark species from the list of Alternative 2. The FMP would be restricted to a suite of teleost species (bony fishes) that, except for dorado, are now managed internationally for maximum sustainable yield.

Removing sharks would simplify management of the remaining species which are much less sensitive to fishing pressure. Industry is concerned that because sharks have low productivity and are sensitive to even moderate rates of exploitation, their management might drive most of the regulatory adjustments of the HMS fisheries. Optimal exploitation of the more productive billfishes and tunas could simultaneously overfish the shark species taken incidentally, which could result in overall harvest restrictions or closures. Nonetheless, where HMS fishing gears, both within and outside the EEZ, simultaneously take low-productivity sharks and high-productivity teleost HMS fishes, both need to be managed in the same fishery context. Separate management of the species complexes would be inefficient, costly, and duplicative, and would ignore the fundamental fact that how one complex is fished affects the other. Separate management would also promote managing fisheries by only their most resilient species component, to the detriment of the vulnerable species be they teleosts or elasmobranchs. Neither the Western Pacific nor the Atlantic FMPs treat sharks separately.

Preferred Management Unit Species (MUS)

The preferred action is **Alternative 2**, which includes dorado (dolphinfish). The preferred management unit includes:

Tunas:
- North Pacific albacore (*Thunnus alalunga*)
- yellowfin tuna (*Thunnus albacares*)
- bigeye tuna (*Thunnus obesus*)
- skipjack tuna (*Katsuwonus pelamis*)
- northern bluefin tuna (*Thunnus orientalis*)

Sharks:
- common thresher shark (*Alopias vulpinus*)
- pelagic thresher shark (*Alopias pelagicus*)
- bigeye thresher shark (*Alopias superciliosus*)
- shortfin mako or bonito shark (*Isurus oxyrinchus*)
- blue shark (*Prionace glauca*)

Billfish/Swordfish:
- striped marlin (*Tetrapturus audax*)
- swordfish (*Xiphias gladius*)

Other:
- dorado or dolphinfish (*Coryphaena hippurus*)

The preferred alternative is intermediate in terms of the number of species subject to active management. It includes more species than Alternatives 1, 3, 4 and 6, but fewer than Alternative 5. The preferred alternative includes all five species of tuna which are important to commercial and recreational fisheries in the north Pacific (albacore, bluefin) and eastern tropical Pacific (yellowfin, bigeye, skipjack). Striped marlin is included because of its importance to the recreational fishery in California. Swordfish is a major target in commercial drift gillnet, harpoon and longline fisheries, and is pursued by anglers. Blue shark is an abundant bycatch species in drift gillnet and longline fisheries. It has been the target of some directed shark fisheries in the past, and currently is caught by anglers. Common thresher shark and shortfin mako shark are important species in the drift gillnet fishery and also are targeted by recreational fishers. Bigeye and pelagic thresher sharks are landed by the drift gillnet fishery but in small amounts compared to common thresher and mako sharks. They are included in the preferred alternative largely because of concern that they have poor resilience to fishing. Dorado is an important component of the suite of species targeted by recreational fishers, especially in southern California.

The species are to be managed aiming for consistency in both regional and international management. Since the MUS tunas and billfishes are fished ocean-wide and are already assessed or reviewed regularly at international forums, the Council's main task would be to ensure that their local management is neither inconsistent with, nor is abrogated by, international management. The more regionally distributed sharks not currently under international management require more direct, regional or local assessments of stock status and possibly regional management (common thresher and shortfin mako sharks). Where production potentials cannot be estimated accurately (e.g., because only small fractions of the stocks are taken), the species, as MUS, will still be regularly reviewed under Council guidance (e.g., pelagic and bigeye thresher sharks; dorado).

3.1.2 Species Included in the FMP for Monitoring Purposes

The criteria for species included in the FMP for monitoring purposes are:

- species having a record of being caught in an HMS fishery

and

Table 3-1. Alternatives for management unit species.

Alt.	Definition/Criteria	Species
#1	No action	
#2	***Preferred Alternative*** Include species identified in PFMC 1999 with the addition of Dorado (Dolphinfish) as approved by the Council; these species meet the following criteria: • occur in the Pacific Council's management area, and • occur in West Coast highly migratory species fisheries, and • are defined as highly migratory species in the Magnuson-Stevens Fishery Conservation and Management Act or the Law of the Sea Annex I, and • have importance (moderate to high value) in the landings or to a fishery, and • **are managed by the Western Pacific Fishery Management Council** (Note: Adds dorado, which is an important species for the California recreational fishery)	Albacore tuna Bigeye tuna Bluefin tuna Skipjack tuna Yellowfin tuna Striped marlin Swordfish Blue shark Bigeye thresher shark Common thresher shark Pelagic thresher shark Shortfin mako shark **Dorado (Dolphinfish)**
#3	Include species identified in PFMC 1999; these species meet the following criteria: • occur in the Pacific Council's management area, and • occur in West Coast highly migratory species fisheries, and • are defined as highly migratory species in the Magnuson-Stevens Fishery Conservation and Management Act or the Law of the Sea Annex I, and • have importance (moderate to high value) in the landings or to a fishery, and • **are managed by the Western Pacific Fishery Management Council**	Albacore tuna Bigeye tuna Bluefin tuna Skipjack tuna Yellowfin tuna Striped marlin Swordfish Blue shark Bigeye thresher shark Common thresher shark Pelagic thresher shark Shortfin mako shark
#4	Include species which meet all of the following criteria: • occur in the Pacific Council's management area, and • occur in West Coast highly migratory species fisheries, and • are defined as highly migratory species in the Magnuson-Stevens Fishery Conservation and Management Act or the Law of the Sea Annex I, and • have importance (moderate to high value) in the landings or to a fishery, and • **sufficient data exists to calculate a bio-analytically based MSY for the stock, including a reasonable MSY proxy.** (Note: Eliminates bigeye and pelagic thresher sharks and dorado. Data for these species are currently inadequate for calculating MSY).	Albacore tuna Bigeye tuna Bluefin tuna Yellowfin tuna Skipjack tuna Swordfish Striped marlin Blue shark Common thresher shark Shortfin mako shark
#5	Include species which meet all of the following criteria: • occur in the Pacific Council's management area, and • occur in West Coast highly migratory species fisheries, and • are defined as highly migratory species in the Magnuson-Stevens Fishery Conservation and Management Act or the Law of the Sea Annex I, and • have importance (moderate to high value) in the landings or to a fishery • **Have special biological characteristics (e.g., low productivity)** (Note: Adds sixgill shark to list. This species has low importance in the landings or to a fishery, but has relatively high market value and has been taken incidentally in the drift gillnet fishery)	Albacore tuna Bigeye tuna Bluefin tuna Skipjack tuna Yellowfin tuna Striped marlin Swordfish Blue shark Bigeye thresher shark Common thresher shark Pelagic thresher shark Shortfin mako shark Dorado (Dolphinfish) **Sixgill shark**
#6	Include **non-shark species** which meet the following criteria: • occur in the Pacific Council's management area, and • occur in West Coast highly migratory species fisheries, and • are defined as highly migratory species in the Magnuson-Stevens Fishery Conservation and Management Act or the Law of the Sea Annex I, and • have importance (moderate to high value) in the landings or to a fishery, and • are managed by the Western Pacific Fishery Management Council (Note: This alternative eliminates shark species that are either targeted or incidentally caught in HMS fisheries.	Albacore tuna Bigeye tuna Bluefin tuna Skipjack tuna Yellowfin tuna Striped marlin Swordfish Dorado (Dolphinfish)

- not covered by another FMP or state management regime

or

- of special concern (e.g., elasmobranchs, which have relatively low productivity).

These species (see Table 3-2), which often comprise a fishery's bycatch, should be monitored on a consistent and routine basis to the extent practicable. Sampling periodicity and coverage fraction will depend upon the take rates of the species that are of most concern. This monitoring is needed to evaluate the impact of HMS fisheries on incidental and bycatch species (as well as MUS), and to track the effectiveness of bycatch reduction methods (see Chapter 5).

As outlined in section 3.4 of this draft FMP, each year, e.g., in March, the HMS Management Team will deliver one combined SAFE report for all species in this FMP to the Council. The SAFE report will follow the guidelines specified in National Standard 2 (of 10) and will be used by the Council and NMFS to develop and evaluate regulatory adjustments under the framework procedure or the FMP amendment process. This information will document significant trends or changes in monitored species over time, and assess the relative success of existing state and federal fishery management programs. The SAFE report will also make recommendations to the Council concerning bycatch and incidental catch.

3.1.3 Prohibited Species

Background. A few species are considered for inclusion under the category 'Prohibited Species' in this Plan (Table 3-2). In general, prohibited species must be released immediately if caught, unless other provisions for their disposition are established, including for scientific study. Striped marlin, now allowed for sport-only and not commercial fishing by California, is prohibited by specific allocation and is discussed separately in Chapter 8 section 8.5.4. Pacific halibut and salmon are managed separately from this Plan, but are important in some HMS fisheries and so are provided for here with respect to how they can be caught. Species recommended for prohibited status in HMS fisheries are:

Great White Shark, *Carcharodon carcharias*. Oceanic and coastal in the eastern Pacific from the Gulf of Alaska to Gulf of California; also Panama to Chile, although it appears to prefer temperate waters (Eschmeyer et al. 1983). Occurs as bycatch in the CA/OR DGN fishery. As a large, true apex predator, this species is relatively rare. Its low productivity, accessibility in certain localized areas (e.g., near pinniped colonies), and its appeal to trophy hunters and for the curio trade, make it especially vulnerable (Fergusson, Compagno and Marks, *In press*, cited in Camhi et al. 1998). Klimley (1994), studying records of capture off California since 1955, i.e., the pattern of size, sex, season and location of capture, deduced that adults off northern California originate from southern California, and that the northward migration may be triggered by a shift in dietary preference toward seals and sea lions as the sharks grow large. 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 in the State of California since 1995 where it may not be taken except for scientific and educational purposes under permit issued by the California Department of Fish and Game. The sale of incidentally-caught specimens, live or dead, to recognized scientific and educational organizations for research or display purposes is allowed.

Basking shark, *Cetorhinus maximus*. In the eastern Pacific, occurs in temperate and boreal waters from the Gulf of Alaska to Gulf of California. A small fishery took place off Monterey Bay during 1924-1950s for fish meal and liver oil; it is still taken as bycatch in the area, although it has not been observed in the CA/OR drift gill net fishery. The species is highly migratory and noteworthy for seasonal appearance in certain localities and subsequent disappearance. In the eastern Pacific occurs in greatest numbers during autumn and winter off California, but may shift to northern latitudes in spring and summer, along the coasts of Washington and British Columbia. The large fins of this species are valuable in the East Asian market; its liver oil is used in the cosmetic and aviation industries (Fowler *In press*). This species has not been allowed by California since 2000, and its coast-wide protection is recommended here because it is thought to be among the least productive of shark species (Smith et al *In press*).

Megamouth Shark, *Megachasma pelagio*. Four specimens of this rare species have been taken in fall months in the California DGN fishery in recent years (11/29/84, Catalina Is., M 449 TL; 10/21/90, Dana Pt., M 494 cm TL; 10/1/99, 30 nm west San Diego, F ~519 cm TL; and 10/19/01, 42 nm NW San Diego, M ~549 cm FL). Only 11 other records of this species have been recorded from Hawaiian, Australian, Japanese, Brazilian, Philippine, Senegalese, and Indonesian waters; thus the 4 southern California records represent 27% of worldwide distributional records. An immature specimen was recently taken off Brazil. Protection is recommended because of extreme rarity and uniqueness. Incidentally-caught specimens that would not survive if released should be made available to recognized scientific and educational organizations for research or display purposes.

Pacific halibut, *Hippoglossus stenolepis*. This large flatfish occurs from the Sea of Japan to the Bering Sea and south to Santa Rosa Island, Southern California. It is wide ranging and often migratory, occurring on a variety of bottom types, with the young occurring nearshore and the adults deeper to at least 1097 m. It is an important commercial and sport species in the Pacific Northwest, and fished commercially by longlines. Commercial stocks declined in the 1920s but have increased under regulation by the International Pacific Halibut Commission (Eschmeyer et al. 1983). The IPHC, originally called the International Fisheries Commission, was established in 1923 by the governments of Canada and the United States of America. Its mandate is to study and preserve the stocks of Pacific halibut within the territorial waters of both nations. Answerable to the Federal Governments of Canada and the United States, the Commission is advised by the Conference Board and the Processor Advisory Group (PAG). An average of 10 mt per year (1995-99) is landed in HMS fisheries, mostly in the albacore bait fishery with halibut gear. Prohibited status would forbid landing of this species unless using authorized gears during authorized seasons.

Pacific salmon species, *Oncorhynchus gorbuscha, O. tshawytscha, O. keta, O. nerka, O. kisutch*. These five Pacific salmon species - pink, king (chinook), chum, sockeye, and coho (silver) - are anadromous, spending 1 to several years at sea depending on the species and often migrating great distances before returning to spawn in their natal streams. Distributions of species range from Japan to the Bering Sea south to San Diego, California, although most occur north of Santa Cruz, California. Adult Pacific salmons, except for some yearling chinook salmon males, die after spawning in bottom gravel of cold water streams and lakes. The young of some salmon species move to the ocean soon after emerging, but others may remain in fresh water for several years (Eschmeyer et al. 1983). Recent decades have seen sharp declines in many salmon stocks, attributed to freshwater habitat degradation, hatchery practices, over-harvest, and long-term environmental change. Pacific salmon are taken with salmon gear in HMS fisheries. Prohibited status would forbid landing of these species unless using authorized gears during authorized seasons.

The specific alternatives for prohibited species are given in Chapter 8, section 8.4.7 and discussed below as well. There is further analysis in Chapter 9, section 9.2.4.7. The rationale for protecting these species includes benefits ranging from existence value to management consistency.

Prohibiting the taking of white, basking, and megamouth sharks would extend coast-wide the present California prohibition on white and basking sharks, and would similarly protect the megamouth shark. Donation or sale of incidentally-caught specimens of these sharks to recognized scientific and educational institutions will be encouraged, especially the rare megamouth. Such specimens are most valuable whole, without parts missing.

Protecting these vulnerable sharks would have virtually no effect on existing fisheries or their management, since white and basking sharks are less abundant north of California waters and the megamouth is very rarely taken anywhere. There would be scientific benefits from obtaining specimens of these species, especially the rare and little known megamouth shark. Coast-wide protection would reduce regulatory inconsistencies among States, while supporting U.S. obligations to protect vulnerable species, in particular, the National and International Plans of Action for sharks (IPOA and NPOA for Sharks). On the other hand, it continues coast-wide the management that forgoes controlling or harvesting white and basking sharks. There would be net National benefits, however, from the resulting greater awareness and thus valuation of these sharks in the

Table 3-2. Fish Species Caught in West Coast HMS Fisheries
Based on catch data from the Pacific Driftnet Observer Program 1995-98, PACFIN, and selected literature sources.

SPECIES	MUS	MONITOR[1]	OTHER FMP COVERAGE	PROHIB[2]	HIGH SEAS[3]	INCIDENTAL[4]	DISCARDS[5]
SHARKS AND RAYS							
Bigeye thresher shark, *Alopias superciliosus*	X	X	**WP Pelagics[6]**		X	X	E
Common thresher shark, *A. vulpinus*	X	X	**WP Pelagics**			X	E
Pelagic thresher shark, *A. pelagicus*	X	X	**WP Pelagics**		X	X	E
Shortfin mako shark, *Isurus oxyrinchus*	X	X	**WP Pelagics**		X	X	E
Blue shark, *Prionace glauca*	X	X	**WP Pelagics, AK Groundfish[7]**		X	X	E
White shark, *Carcharodon carcherias*		X		X		X	R
Megamouth shark, *Megachasma pelagios*		X		X	X	X	R
Basking shark, *Cetorhinus maximus*		X		X		X	R
Whale shark, *Rincodon typus*		X			X		E
Prickly shark, *Echinorhinus cookei*		X			X		E
Salmon shark, *Lamna ditropis*		X	**AK Groundfish**		X	X	E
Leopard shark, *Triakis semifasciata*		X	**P Groundfish**			X	E
Hammerhead sharks, Sphyrnidae		X	**WP Pelagics**		X		E
Soupfin shark, *Galeorhinus galeus*		X	**AK & P Groundfish**			X	E
Silky shark, *Carcharhinus falciformis*		X	**WP Pelagics**		X		E
Oceanic whitetip shark, *C. longimanus*		X	**WP Pelagics**		X		E
Blacktip shark, *C. limbatus*		X			X		E
Dusky shark, *C. obscurus*		X				X	E
Sixgill shark, *Hexanchus griseus*		X	**AK Groundfish**			X	E
Spiny dogfish, *Squalus acanthias*		X	**AK& P Groundfish**		X	X	E
Pelagic stingray, *Dasyatis violacea*		X			X		E
Manta/Mobula rays, Mobulidae		X			X		E
Bat ray, *Myliobatis californica*		X					E
TUNAS & MACKERELS							
Albacore tuna, *Thunnus alalunga*	X	X	**WP Pelagics**		X	X	E
Bigeye tuna, *T. obesus*	X	X	**WP Pelagics**		X	X	E
Bluefin tuna, *T. orientalis*	X	X	**WP Pelagics**		X	X	E
Yellowfin tuna, *T. albacares*	X	X	**WP Pelagics**		X	X	E
Skipjack tuna, *Katsuwonus pelamis*	X	X	**WP Pelagics**		X	X	E
Black skipjack, *Euthynnus lineatus*		X	**WP Pelagics**		X	X	E
Pacific bonito, *Sarda chiliensis*		X			X	X	E
Wahoo, *Acathocybium solandri*		X	**WP Pelagics**		X	X	E
Bullet mackerel (tuna), *Auxis rochei*		X	**WP Pelagics**		X	X	E
Frigate mackerel (tuna), *A. thazard*			**WP Pelagics**		X		E
Pacific mackerel, *Scomber japonicus*			**P Coastal Pelagics**		X	X	E
BILLFISHES AND SWORDFISH							
Swordfish, *Xiphias gladius*	X	X	**WP Pelagics**		X		E
Blue marlin, *Makaira nigricans*		X	**WP Pelagics**		X	X	R (comm.)
Black marlin, *M. indica*		X	**WP Pelagics**		X		R (comm.)
Pacific sailfish, *Istiphorus platypterus*		X	**WP Pelagics**		X		E
Striped marlin, *Tetrapterus audex*	X	X	**WP Pelagics**	X	X	X	R (comm.)
Shortbill spearfish, *T. angustirostris*		X	**WP Pelagics**		X	X	E
JACKS, BARRACUDAS, AND POMFRETS							
Pacific moonfish, *Selene peruviana*		X			X	X	E
Yellowtail, *Seriola lalandi*						X	E
Jack mackerel, *Trachurus symmetricus*			**P Coastal Pelagics**			X	E
Rainbow runner, *Elagatis bipinnulata*		X			X	X	E
Pacific pomfret, *Brama japonica*		X	**WP Pelagics**		X	X	E
California barracuda, *Sphyraena argentea*						X	E
OTHER FISHES							
Pacific whiting, *Merluccius productus*			**P Groundfish**			X	E
Pacific halibut, *Hippoglossus stenolepis*			**(Halibut Comm.)**	X	X	X	R
Misc. *Sebastes* spp.			**AK & P Groundfish**			X	E
Lingcod, *Ophiodon elongatus*			**P Groundfish**			X	R
Pacific saury, *Cololabis saira*		X			X	X	E
Pacific salmon, *Oncorhynchus* spp.			**AK & P Salmon**	X	X	X	R
Common mola, *Mola mola*		X			X		E
Dorado (dolphin), *Coryphaena hippurus*	X	X	**WP Pelagics**		X	X	E
Louvar, *Luvarus imperialis*		X			X	X	E
Oarfish, *Regalecus glesne*		X			X	X	E
Lancetfishes, Alepisauridae		X			X	X	E
Triggerfishes, Balistidae					X		E
Sablefish, *Anoplopoma fimbria*			**AK & P Groundfish**			X	E
Escolar, *Lepidocybium flavobrunneum*		X	**WP Pelagics**		X	X	E
Oilfish, *Ruvettus pretiosus*		X	**WP Pelagics**		X	X	E
Opah, *Lampris guttatus*		X	**WP Pelagics**		X	X	E
White seabass, *Atractoscion nobilis*						X	E
Northern anchovy, *Engraulis mordax*			**P Coastal Pelagics**			X	E
Pacific sardine, *Sardinops sagax*			**P Coastal Pelagics**			X	E
California sheephead, *Semicossyphus pulcher*						X	E

[1] Preferred option for Monitoring Status, Sec. 3.1.2
[2] Preferred option for 'Prohibited' Status, see Section 8.5.9.
[3] Species caught on high seas outside West Coast EEZ by West Coast-based vessels fishing in the Eastern Pacific Ocean.
[4] Landed or retained as incidental catch
[5] Bycatch as Regulatory (R) or Economic (E) discards.
[6] WP Council specifies only shark families Alopiidae, Carcharhinidae, Lamnidae and Sphyrnidae. Listed are principal oceanic species in Hawaii's pelagic fisheries; shark species such as megamouth shark, white shark and others, occur rarely or less frequently.
[7] AK Groundfish includes Gulf of Alaska and Bering Sea/ Aleutian Islands groundfish fisheries mangement plans.

sea. And although fishers could be endangered from handling and releasing any of these sharks, they are also seldom taken.

Prohibiting the taking of Pacific halibut and Pacific salmons in the West Coast EEZ, unless caught using authorized gears during authorized seasons, is to ensure that their harvest in HMS fisheries is consistent with regulations set by their separate management. Pacific halibut fisheries are managed by the International Pacific Halibut Commission, and the Council has a catch sharing plan for halibut which specifies the allocations and seasons for the various halibut fisheries. Some salmon species are managed under the Council's salmon FMP and are subject to various regulations.

3.2 Overfishing Criteria

These criteria are guideposts for managing exploited stocks and require being able to determine and monitor the effects of fishing. But such effects are not always clear, e.g., catch per unit of effort trends may not only reflect the abundance of HMS, but also how fishing success is affected by schooling or wide-ranging behaviors, fishing efficiency, and environmental effects on the availability of species. Estimated population status of management unit species is discussed in section 3.3 and summarized in Tables 3-4 and 3-5.

Many of the more productive species support large and widespread international fisheries that are best managed cooperatively with other nations. In particular, rebuilding programs, required unilaterally by the Magnuson-Stevens Act for overfished stocks, would be ineffective without international cooperation, especially if domestic catches are only small fractions of the stock-wide harvest (see Table 3-5 for West Coast catch fractions). For such species, regional remedial actions must be concurrent with recommendations at international forums for cooperative action (see section 3.2.4 and Chapter 8 section 8.2 on stock rebuilding).

Still other HMS species possess life histories characterized by low productivity, thus supporting smaller fisheries that tend to be more regional than international. They have more localized distributions and life stage needs, often within the EEZ. Not only are they more easily overfished, but recovery takes longer, i.e., the species are less resilient to overfishing. Their management should be more conservative, and may require strong regional leadership.

Managing conservatively means being precautionary, especially when there are large uncertainties in how a stock is being affected by fishing. Besides lowering the threshold for taking remedial action, it could mean preventing rapid growth of fisheries to prevent overshooting of management goals, or taking steps to protect the reproductive potential of stocks.

3.2.1 Control Rules for Management

The goal of the Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act of 1996, is to ensure the long term sustainability of fisheries and fish stocks by halting or preventing overfishing and by rebuilding overfished stocks. The Act requires developing fishery management plans for exploited species of U.S. seas including shelf, anadromous, and highly migratory species whose ranges extend beyond the EEZ. By its National Standard 1, optimum yield is the ultimate goal for each fishery.

National Standard Guidelines, as required by the Magnuson-Stevens Act and published in the *Federal Register* (*Code of Federal Regulations, 50 CFR §600, 305 et. seq.*) were developed to assist implementing the Act and introduced the terms **"Control Rule"** and **"Status Determination Criteria" (SDC)** relative to the requirements of National Standard 1 (NS 1). The control rule specifies how a fishery is to be managed depending upon stock status relative to the SDCs, which are biological benchmarks or thresholds. There are two SDCs: the **Maximum Fishing Mortality Threshold (MFMT)** and the **Minimum Stock Size Threshold (MSST)**. By control rule definition, **over*fishing*** occurs when fishing mortality F is greater than the MFMT mortality. Similarly, a stock is **over*fished*** when its size falls below the MSST stock biomass. The Magnuson-Stevens Act (§304,e) requires NMFS to notify Congress when the stock is approaching the overfished condition (i.e., if there is overfishing and the stock is expected to be overfished within two years) and when it is overfished. Fishery managers must then take appropriate remedial action: in the case of approach to being overfished, harvest rates must be reduced below MFMT; in the case of being overfished, a rebuilding plan must be prepared within one year to rebuild the stock. The rebuilding plan must bring the stock back to the level producing maximum (or optimal) sustainable yield within a specified time period. The Guidelines call for precautionary management, i.e., use of conservative control rules with remedial action to begin even if the overfishing/overfished status cannot be established with certainty.

3.2.2 Default Control Rules

The general model for a control rule is the default **Maximum Sustainable Yield Control Rule** suggested in the Technical Guidance by Restrepo et al. (1998), and it is the model for this FMP. This control rule is a procedure for maintaining MSY, and is like that being considered by the Western Pacific Region Fishery Management Council. It is illustrated schematically in Figure 3-1, where the x and y axes are in relative measure, the biomass and fishing mortality ratios **B/B_{MSY}** and **F/F_{MSY}**, respectively. Here, the **MFMT mortality threshold** is the ratio $F_{MFMT}/F_{MSY} = 1.0$; it is the mortality threshold for all stock levels above the MSST threshold (described below). With this MFMT ceiling emplaced, a stock would not be reduced to levels any lower than **B_{MSY}** that produces MSY (on average). It is to be noted, however, that the Technical Guidance for precautionary compliance with NS 1 (Restrepo et al. 1998) allows that MFMT can be occasionally and temporarily exceeded at some level of probability that depends upon the variability of fishing mortality. The **MSST biomass threshold**, the minimum biomass at which recovery measures are to begin, is the ratio B_{MSST}/B_{MSY}. It specifies a lower biomass level that allows remedial action not to be triggered each time B drops below B_{MSY}, simply from natural variation. In terms of B_{MSY}, the recommended level of **B_{MSST}** is:

$B_{MSST} = (1\text{-}M)B_{MSY}$ when M (natural mortality) ≤ 0.5, and
$B_{MSST} = 0.5B_{MSY}$ when $M > 0.5$

(i.e., whichever is greater). B_{MSST} must not be less than **B_{MIN}** $= 0.5B_{MSY}$ and should allow recovery back to B_{MSY} within 10 years when F is reduced to zero (to the extent possible).

An example of an **Optimum Yield (OY) Control Rule** is also shown in Figure 3-1, it being the Restrepo et al. (1998) recommended, precautionary default of 0.75MFMT of the MSY control rule (the lower dashed horizontal and slope line). This rule is for maintaining OY, which is defined as MSY reduced by relevant socioeconomic factors, ecological considerations, and fishery-biological constraints so as to provide the greatest long-term benefits to the Nation. Simulation studies have indicated that management according to the OY default rule will often allow biomasses (**B_{OY}**) to be maintained at about $1.25B_{MSY}$ (as shown), with yields of about 95% of MSY. Like for MSST of the MSY Control Rule, there is a **Minimum Biomass Flag (B_{FLAG})** for the OY Control Rule equal to $(1\text{-}M)B_{OY}$ or $0.5B_{OY}$ (whichever is greater)(Boggs et al. 2000). B_{FLAG}, which would then be equivalent to $1.25(B_{MSST}/B_{MSY})$, serves as a warning call to halt biomass reduction that would jeopardize obtaining OY on average.

The OY control rule has a more conservative range of restraints that may be appropriate for more vulnerable species. The more vulnerable a species is to being overfished, the more conservative should management be. And since the maximum value of OY is MSY, then the more should the catch ratio OY/MSY be reduced from unity (while B_{OY}/B_{MSY} is increased from unity).

These control rules involve the concept of target and limit reference points. It can be seen that B_{MSY} and B_{OY} are target reference points for the long term management goals of MSY or OY. But B_{MSST} and B_{FLAG} are limit thresholds for the respective control rules that should not be exceeded, or exceeded only at some level of probability. A stock that is reduced below those biomass limits would normally require remedial action, because the target goals would then be jeopardized. Similarly, F_{OY} is a target reference point. However, F_{MSY} could be a target reference point *or* a limit threshold; it could be the target point for the MSY control rule or

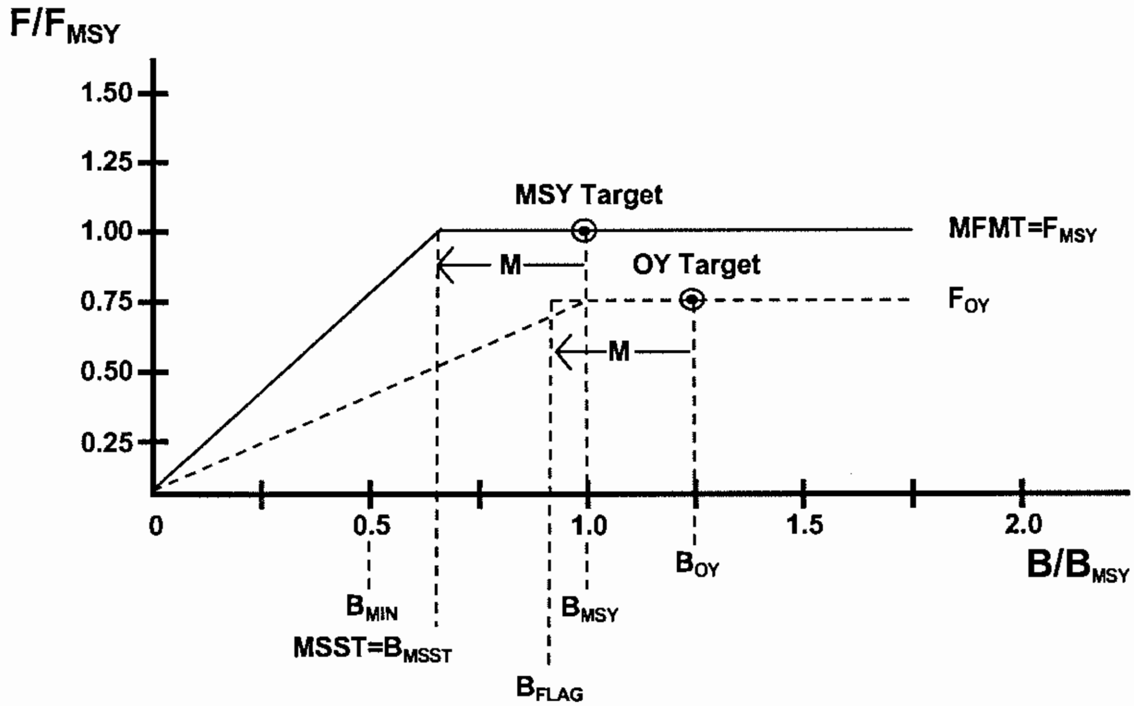


Figure 3-1. General model of maximum sustainable yield and optimum yield control rules, according to Restrepo et al.(1998).

it could be the limit threshold for the OY control rule. If $B < B_{FLAG}$ is expected with the latter rule, remedial action may be recommended even though the stock could still be far above B_{MSST}.

3.2.3 Proposed Management Control Rule

Default Alternative Rule: Since the management unit species vary from vulnerable to very productive, the following control rule, stated as a default alternative, is recommended: *Adopt the default MSY control rule for MUS, but additionally, use an OY target for "vulnerable" species.* (See the specific alternative in Chapter 8 section 8.3.2.)

Vulnerability of species can stem from many reasons, and any species that has been depleted to 50% below B_{MSY} (for the logistic production model, to 25% of unfished level B_0) that is incapable of recovering back to that B_{MSY} level within 10 years (with fishing removed) is to be considered vulnerable in this FMP. The productivities (potential per capita rates of population increase *r*) of such species would have to be 5% or less per year, assuming recovery time is determined by a linear compensatory increase in *r* with population decline (logistic model). Only the sharks among the MUS, including common thresher, are likely to have such low rates and long recovery times (see Table 3-3), and they are therefore considered vulnerable by this criterion. Vulnerable OYs are also appropriate for other fish species for other reasons of stock health concern (see bluefin tuna, section 3.3.1, and striped marlin, section 3.3.3).

In this FMP, where OY is not determined analytically, an OY proxy is defined according to vulnerability, as follows:

OY(proxy) = MSY or MSY(proxy)	for species not considered vulnerable
OY(proxy) = 0.75*(MSY or MSY(proxy))	for species considered vulnerable

The rationale for the vulnerable species OY follows from the recommended $F_{OY} = 0.75F_{MSY}$ (see Fig. 3-1). Then since $MSY = F_{MSY}B_{MSY}$, $OY=0.75F_{MSY}B_{MSY}= 0.75MSY$ when estimated from the same B_{MSY} biomass.

Since the default alternative rule is defined with MFMT and MSST as ratios relative to MSY (as in Fig. 3-1), its resulting generality allows management according to specific criteria even without estimates of the absolute biomass or exploitation status of a stock. This allows all the MUS, diverse with respect to productivity, scientific understanding, and stock status, to be managed by the same rule and in accordance with the requirements of the Magnuson-Stevens Act. This control rule is the most straight-forward of the possible rules discussed by Restrepo et al. (1998) and is the one they recommend. The reduction in fishing mortality it calls for to rebuild depleted populations is intermediate with respect to the degree of depletion that can be remedied at acceptable rates of recovery. It is the same rule being considered for the Western Pacific Region Fishery Management Council's FMP for pelagic fisheries (but with the additional stipulation for vulnerable species).

3.2.4 Stock Rebuilding

When stock size B falls below its MSST level, F must be reduced below its fishing mortality threshold to allow stock rebuilding at least back to B_{MSY}. The amount of mortality reduction would depend upon the severity of stock depletion below MSST, the stock's capacity to rebound, and the desired recovery time of the stock. In rebuilding according to the default MSY control rule (Fig. 3-1), F is reduced linearly by the amount that B is determined to be below MSST. After the stock has been rebuilt back to MSST, maintaining F at the MFMT level will allow the stock to continue its increase until at equilibrium at B_{MSY}. With the OY Control Rule, the decrease from F_{OY} is shown beginning at B_{MSY}, rather than at B_{FLAG}, to enable faster rebuilding back to B_{OY}.

Under NMFS's National Standard Guidelines, a number of factors enter into the specification of the time period for rebuilding. The lower limit of the specified time period for rebuilding is determined by the status and biology of the stock or stock complex and its interactions with other components of the marine ecosystem, and is defined as the amount of time that would be required for rebuilding if fishing mortality were eliminated entirely. If the lower limit is less than 10 years, then the specified time period for rebuilding may be adjusted upward to the extent warranted by the needs of fishing communities and recommendations by international organizations in which the United States participates, except that no such upward adjustment can result in the specified time period exceeding 10 years, unless management measures under an international agreement in which the United States participates dictate otherwise. If the lower limit is 10 years or greater, then the specified time period for rebuilding may be adjusted upward to the extent warranted by the needs of fishing communities and recommendations by international organizations in which the United States participates, except that no such upward adjustment can exceed the rebuilding period calculated in the absence of fishing mortality plus one mean generation time or equivalent period based on the species' life-history characteristics. Overfishing restrictions and recovery benefits must also be fair and equitable among fishery sectors. Rebuilding of internationally managed fisheries must reflect traditional U.S. participation in those fisheries relative to that of other nations.

Fishery management councils actually have considerable latitude in how they rebuild depleted stocks. The rebuilding rules illustrated in Figure 3-1 and also Figures 3-2 and 3-3 (the F ramps) are examples of just some of the possible approaches to F-reduction. Actual rebuilding could proceed through a combination of ways, e.g. a series of stepped increases in F or series of increasing catch quotas as the biomass rebuilds back toward B_{MSY} (such quotas can be shown only indirectly in terms of the F and B dimensions of Figure 3-1).

Rebuilding of overfished stocks is a unilateral requirement by the Magnuson-Stevens Act, but, as already noted, internationally fished stocks require cooperative catch reductions among the fishing nations for this rebuilding to be effective. U.S. responsibility in the rebuilding, however, will be greater the more localized the stock and the greater the domestic take of the stock's production (see unilateral/international management, Chapter 8, section 8.2).

In general, rebuilding is to remedy stock depletion, but there can also be rebuilding to remedy **local depletion**. The latter rebuilding could be domestic and unilateral. Local depletion occurs when localized catches are in excess of replacement from local and external (via net immigration) sources of production. As such, it can occur independently of the status of the overall stock. The local depletion of abundance can be stronger than the concurrent stock-wide decrease (Squire and Au 1990). In all cases, the degree and extent of this depletion must be assessed relative to the health of the overall stock and the resiliency of the species.

3.2.5 Assessment of Stock Status

National Standard 2 requires using the best scientific information in managing management unit species. This requires periodic updating of stock status for comparing against their control rules. Status updating will be through Stock Assessment and Fishery Evaluation (SAFE) reports (section 3.4). In the case of species under international management, the control rule approach must be promoted so that status in terms of SDCs (e.g., F/F_{MSY}, B/B_{MSY}) can be described (see also Chapter 8 section 8.2).

The control rule approach implies an ability to determine the level of biomass B relative to its initial level B_0 and (at least conceptually) relative to B_{MSY}, and to determine the level of mortality F relative to some target level like F_{MSY}. Relative biomass level could be estimated by the decline in catch rate (CPUE) or, with sufficient information on stock and recruitment, by percent spawning potential ratio (SPR), or proxies based on SPR, e.g., $B_{50\%}$ or $F_{50\%}$. Non-empirical MSY levels of B or F can be estimated as fractions of B_0 or multiples of M, respectively, e.g., B_{MSY}=0.5B_0 or F_{MSY}=1.0M.

In many cases estimates of MSY or OY themselves are the only information available for management, and the F/F_{MSY} and B/B_{MSY} ratios must be derived from those estimates. This does not abrogate the control rule, because MSY and OY *are* the management goals. Where MSYs have not been determined, average stock-wide catch levels over appropriate time periods can be proxies.

Both MSY and OY refer to a species' sustainable catch, stock-wide. For some species there is no stock-wide catch information, and some (e.g., pelagic thresher shark, mako shark, dorado) occur within the management area as the edges of wider distributions, so even their maximum, regional catch levels are unlikely to reflect stock production. While MSYs remain unknown for those species, the local catches can be used to estimate a local or regional level of MSY.

3.3 Status of Management Unit Stocks

The health status of management unit stocks is determined mainly by use of standard stock assessment techniques found in the scientific literature, but also from examination of their fisheries. The conclusions, summarized in Tables 3-4 and 3-5, should be reasonably accurate, but should also to be taken with caution. Assessments of stock status always involve assumptions, use of uncertain parameters, and particular interpretations of fishery statistics. There are no universally-accepted standards by which to determine confidence for particular assessments, and "ground truthing" will probably never be possible for HMS species. Confidence arises mainly from long management experience with ample perspective from long time-series of the fishery trends.

Management will involve comparing a stock's recent catch levels against its target reference levels, in most cases, MSY. These catch guideposts are listed in Table 3-5. For some stocks or populations, a **harvest guideline** is also listed. A harvest guideline if surpassed, calls for review of the stock/population and its fishery. The purpose is to alert the Council to the possibility that catches under its jurisdiction are at or near a particular target level.

Basic life history characteristics and other important stock indicators for HMS MUS are provided in Table 3-3 for a comparative overview of the spectrum of productivities, exploitation limitations, and recovery capabilities of those species. The productivity estimate *r*, the potential, fractional rate of population growth, is central, and is calculated as the rate at which a population, initially at equilibrium with some total mortality, could rebound if the fishing mortality were removed (Smith et al. 1998). These productivities are comparable among species and approximately the productivity at MSY, because for each the total mortality used in the calculation is the

Table 3-3. Demographic and productivity comparisons of highly migratory MUS and selected prohibited species.

Species	Age at Maturity (yrs)	Fecundity (yr^{-1})	M [1/] (yr^{-1})	Max. Age (yrs)	Productivity (r) at B_{MSY} [2/] (yr^{-1})	PGR_{MAX} [3/] (yr^{-1})	T_D [4/] (yrs)
TUNAS							
Skipjack	1	Millions (eggs)	1.50	5	0.16-0.34	0.68	2.1
Yellowfin	2.5	"	0.90	8	0.11-0.18	0.34	3.4
Bigeye	3	"	0.40	10	0.10-0.16	0.30	3.7
Albacore	4.5	"	0.30	12	0.07-0.11	0.20	5.2
Bluefin	5	"	0.25	20	0.07-0.10	0.19	5.6
BILLFISHES							
Str. Marlin	4	"	0.47	9	0.08-0.13	0.23	4.6
Swordfish	5	"	0.21	20	0.07-0.10	0.18	5.8
SHARKS							
Com.Thresh.	5	4 (pups)	0.234	19	0.04-0.07	0.12	9.2
S.F. Mako	7	6	0.160	14	0.04-0.06	0.10	10.2
Blue	6	23	0.223	20	0.04-0.06	0.10	10.4
Pel.Thresh.	9	2	0.155	29	0.02-0.04	0.07	15.0
White	9	7	0.126	36	0.02-0.04	0.07	15.8
B.E.Thresh.	13	2	0.223	20	0.02-0.03	0.05	22.7
Basking	18	3	0.136	50	0.01-0.02	0.04	27.4
OTHER							
Dorado	0.6	240K+ (eggs)	1.060	4	>0.34	0.97	1.4

Footnotes:

1. M is instantaneous natural mortality. All life history parameters are from Smith et al. (1998), Smith et al. (*In press* 2003), Au et al. (*In press*).
2. Productivity r is the potential per-capita rate of population growth per year, here at B_{MSY}. Estimated *for Tunas and Billfishes* assuming that at B_{MSY}, F_{MSY} =1.0M and initial fecundity increases by factor 1.00-1.25 [after Au et al. (*In press*)]; *for Sharks* assuming that at B_{MSY}, F_{MSY} = 0.5M-1.0M with fecundity not increased [after Smith et al. (*In press*)]. All figures are rounded.
3. PGR is the fractional Population Growth Rate per year. PGR_{MAX} is the maximum rate calculated as (e^{2r} - 1). Exploitation of the population (fraction of total population caught) greater than PGR_{MAX} should bring population collapse, hence PGR_{MAX} estimates maximum sustainable exploitation. The logistic model is assumed. Based on range of *r*.
4. T_D is the doubling time for populations depleted to 50% of B_{MSY} (hence the recovery time), calculated as (ln 2)/1.5r (the r is assumed to have increased linearly with the depletion, as per the logistic model). Based on range of *r*.

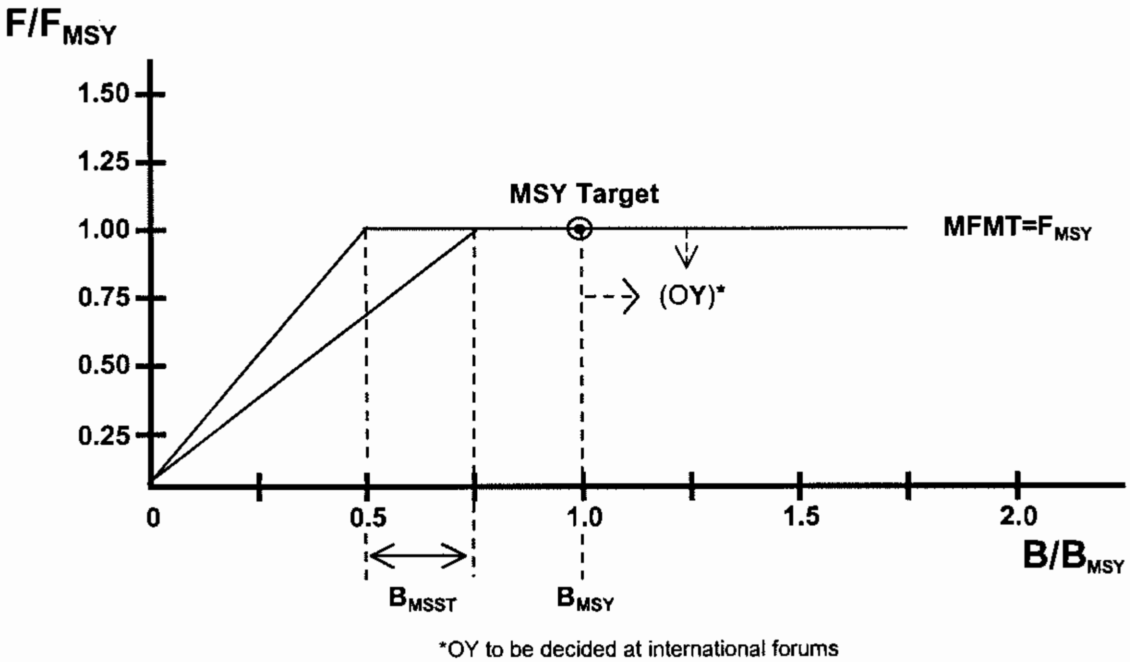


Figure 3-2. MSY control rules for tunas and billfishes.

same multiple of natural mortality (M) that produces MSY (approximately). The procedure thus standardizes productivity estimates of all the species to that at B_{MSY}. Accuracy depends mainly upon the precision of the age-at-maturity estimate, which is the parameter that drives *r* (Smith et al. 1998). Uncertainty in *r* is greater for high productivity species (but they are more accurately aged as they are short-lived), and less for low productivity species (their productivities are less sensitive to age at maturity). The derived statistics of maximum rate of population growth and doubling time are standardized similarly, by assuming a same production function - for simplicity, the logistic model. In Table 3-3, age at maturity, fecundity, M, and maximum age are given for each species, from which are estimated productivity *r* (at B_{MSY}), maximum annual fractional Population Growth Rate (PGR_{MAX}) (which exploitation should not exceed to prevent population collapse), and the time needed (T_D) for a population to double (recover) after being depleted to $0.5B_{MSY}$ (see Table 3-3 footnotes for details). The productivity parameter *r* affects growth rate exponentially, so moderate changes in its value have large effects, as reflected in the PGR_{MAX} and T_D statistics. The statistics indicate that the billfishes and tunas (each as populations in their entirety), with $r > 0.10$, can withstand > 20% exploitation rates (PGR_{MAX} rates) and can recover from depletion within 6 years, while the sharks (similarly considered), with $r < 0.07$, can withstand no more than 12% exploitation (on average), and their recovery time is 1-2 decades, or more.

3.3.1 Tunas

Tuna fisheries in the Pacific are currently managed by international bodies according to stock distinctions that generally coincide with the distribution of the major fisheries. For example, yellowfin, bigeye, and skipjack tunas have been assessed as eastern Pacific (EPO) and central-western Pacific (CWP) stocks (separated at 150° W), while the more temperate albacore and bluefin tunas have each been separated into two stocks - north and south Pacific.

The international fisheries organizations that manage various stocks are listed in Table 3-6. In the EPO, the IATTC assesses and manages species stocks with the goal of maintaining average MSY (AMSY). In the past there have been quotas emplaced for yellowfin and also for bigeye that are caught associated with floating objects. The responsibility of complying with such quotas is incumbent on member nations. In the north Pacific, the Interim Scientific Committee (ISC) is advised by international and national organizations, including the North Pacific Albacore Workshop, and in turn advises countries with interests in temperate tunas. There have been no quotas set for albacore and bluefin tuna.

The general control rule for tunas and billfishes is shown in Figure 3-2. B_{MSST} is shown as a range based on M of the different species ($B_{MSST}/B_{MSY} = 1\text{-}M \geq 0.5$). As indicated in the figure, no OY rule has yet been specified at international forums for these more productive species. However, in this FMP, a proxy OY is set for the tunas equal to MSY (i.e., the maximum value OY can take), except for bluefin tuna, which is treated as a vulnerable species; its OY is thus 0.75MSY.

North Pacific Albacore Tuna. Total annual catch from the northern stock is now approximately 100K mt, about half taken by surface gear (especially U.S. troll and Japanese baitboat) and half by longline gear (especially Japan). The longline gear takes mainly adult fish from temperate waters nearly all across the north Pacific. The surface gear takes mainly juveniles and subadults in the Transition Zone waters bordering the Subarctic Front. A high seas driftnet fishery for albacore and other tunas operated in the north Pacific between 1975 and 1993, but was terminated.

Longlining has recently become the fastest growing fishing mode exploiting the north Pacific stock. Previously, when Japan began targeting bigeye tuna after 1970, the effective effort on albacore had decreased and catches varied little at 10-18K mt/yr up to 1993. But catches rose to 30K mt in 1993 and then to 41K mt in 1997 as small longliners expanded Japan's coastal fishery. The longline CPUEs indicated that the adult stock had been increasing since the late 1980s (NPALB 1999).

The highly variable surface catch of juvenile and subadult albacore has been mostly taken by the Japanese baitboat (pole and line) fleet that operates mainly west of the International Dateline. Both its catch and effort expanded into the 1970s, with 85K mt taken in 1976. Then through the mid 1980s catch and effort declined (Bartoo and Foreman 1993), the catches reducing to 6K mt by 1988. But a new trend of increasing catches and CPUE began after 1992, which has continued to the present (NPALBW 1999, 2000).

The U.S. troll fishery, operating mainly east of the Dateline, is the other major surface fishery exploiting immature albacore, and its history is similar. Troll catch and effort, after a long period of expansion that produced 25K mt in 1963, declined after 1976 (as in the Japanese baitboat fishery), reducing to 2K mt in 1989. CPUEs declined too (unlike in the baitboat fishery), beginning in the early 1970s and lasting into the late 1980s (Bartoo and Foreman 1993). But like in the Japanese fishery, catch and CPUE both began increasing after 1992, the catches reaching approximately 11K mt by 1999 (NPALBW 1999, 2000).

The abundance of surface albacore decreased during the 1970s and 1980s (Kleiber and Perrin 1991), but that trend, which was reflected in the catches, has since reversed. Total population biomass is now increasing, a trend that began by 1989 or earlier, which is shown by age-structured and other analyses from both the surface and subsurface fisheries (NPALBW 1999, 2000).

Environmental change rather than fishing mortality may be driving the population (NPALBW 2000), as the above decline and recovery in the surface fishery phase-matches a similar decadal-scale change in the severity of north Pacific winter conditions (Au and Cayan 1998). Such a response would make it important that sufficient reproducing stock be maintained to enable robust recovery of production during favorable periods. The recent large catches by longliners, beginning about 1997, should therefore be monitored carefully.

Stock-wide MSY has been estimated at 80K-110K mt (Bartoo and Shiohama 1985; NPALBW 1999), and as much as 115-184K mt (NPALBW 2000), with present catches entering that range. The different MSY estimates pertain to what appears to be a low-productivity period (1952-1988) and a high-productivity period (1989-1998). The stock has been growing, and the biological ratios $F/F_{MSY} = 0.9$ and $B/B_{MSY} = 1.1$ determined for 1995 (Bartoo et al. 1997) have recently been estimated as 0.5 and 1.1 respectively (NPALBW 2000). The

Bartoo and Shiohama (1985) estimate appears not to be biased upwards [as could result from the effort averaging procedure used (Polacheck et al. 1993)], considering other results from studies using non-equilibrium production models for that same period and the overall, long term production cycle (NPALBW 2000). The present, high production period began about 1989, and total catches are now over 100K mt with the stock still increasing. By all indications, the north Pacific stock is healthy and not over exploited, at least for the present environmental regime. In recent years, West Coast catches have accounted for about 16% of the total north Pacific harvest.

U.S. troll fishers also fish south Pacific albacore, but that stock does not reach the West Coast EEZ. Only about 11% of the total catch from the south Pacific stock (1998=42K mt) is taken by trollers, of which the U.S. catch (1998) was approximately 1.8 K mt (Childers and Miller 2000). Recent assessments indicate the south Pacific stock is healthy. This FMP treats only the North Pacific stock as an MUS.

Status Summary: Stock status of albacore is reviewed at 1-2 year intervals by the North Pacific Albacore Workshop (members: United States, Japan, Canada, Taiwan). The workshop has no formal procedures for agreement or for management. Presently the albacore stock is healthy and not being overfished (F/F_{MSY}= 0.5-0.9; B/B_{MSY}= 1.10 > MSST), even though present catches are in the estimated MSY (overall mean 120K mt) and OY range (Table 3-5). Stock and catches are both increasing as the high productivity regime continues. No quotas are contemplated, and no regional harvest guideline is recommended for the present 16% regional take of stock-wide production.

Yellowfin Tuna. In the eastern Pacific Ocean (EPO) yellowfin are caught by both surface and subsurface gears, but purse-seining dominates. Both immature and mature fish are taken. The Inter-American Tropical Tuna Commission (IATTC) regularly assesses the status of the EPO stock that is discussed below.

Purse-seining increased rapidly from the late 1950s and through the early 1980s as baitboats were replaced and fishing on dolphins became the dominant mode for capturing yellowfin. The expansion was interrupted by poor catches during the 1982-1983 El Niño that, in conjunction with the "dolphin safe" policy of U.S. canners, forced many U.S. seiners to the western Pacific. International fleet carrying capacity decreased through 1992 as the fleet re-structured, but has since increased. In 2000 there were 205 seiners totaling 181K mt carrying capacity, 52% being of Mexican and Ecuadorian flag and 5 % U.S. (IATTC 1999).

Catches declined slowly through and after the mid-1970s, culminating in the above 1983 low of 94K mt. Since then, catches have increased markedly, to 288K mt in 1989, and after a moderate decline, to 304K mt in 1999 (IATTC 2002).

CPUEs and estimates from cohort and other analyses show that, like the catches, the exploited yellowfin biomass decreased during the 1973-1982 period (up to the 1983 El Niño year), and then recovered. The recovery appears to have been due to a better recruitment regime and reduced fishing mortality upon young fish. Yellowfin abundance apparently reached its historical highest in 1986, and has since declined only slightly.

Production analysis indicates MSY is about 270K mt in the EPO, which includes the relatively small longline catch (Tomlinson 2001, IATTC 2000). The present fishing effort is near to or greater than that for MSY, as also indicated by yield-per-recruit analysis.

The stock appears near that for producing MSY, but with F higher than for MSY. Biological reference points were initially determined from the data presented in the IATTC 1999 Annual Report (Boggs et al. 2000), and fishing mortality appeared to have been just above that needed to produce MSY, while stock biomass was very close to B_{MSY}, but well above the MSST limit (B_{MSST}/B_{MSY}=0.50) [Biomass B_{97} was the product of the abundance-at-age from the cohort analysis and weight-at-age; F_{97} was estimated as current catch divided by B_{97}; F_{MSY} was estimated as 0.8M (Restrepo et al. 1998), with M=0.8; B_{MSY} was estimated as MSY (270K mt) divided by F_{MSY}. Then F_{97}/F_{MSY} = 1.08 and B_{97}/B_{MSY} = 0.95]. The equilibrium stock size, but not the catch, owing to strong recruitment during 1998-2000, appears to have declined slightly since. Presently (1998-99), the production model estimate of B/B_{MSY} averages about 0.86 (IATTC 2000) and the F/F_{MSY} ratio is about 1.30 (Tomlinson 2001). By control rule definition, overfishing is still occurring, although the stock is not overfished as the biomass ratio remains far above MSST (Table 3-4). With the IATTC actively managing this stock through quotas and other measures, the overfishing is not expected to result in an overfished stock. Moreover, recent age-structured analyses suggest a healthy stock at non-equilibrium level possibly 41% above that for producing average MSY and with fishing mortality 89% of that for MSY (this assumes no stock-recruitment relationship) (Maunder 2002). Thus no Council action is needed to address overfishing.

The IATTC continues to manage this stock with quotas and other measures. Quotas on surface catches began in 1966, but not all were implemented over the years. The 1998 quota of 225K mt was the first emplaced since 1979. The 2001 quota was 250K mt, with provision for up to 3 added increments of 20K mt each if there is evidence for increased production, and the increments are thought to pose no danger to the stock. The quota was reached at the end of October 2001. A one month closure of all purse seine fisheries is proposed for December 2002 to limit total effort and fishing mortality on surface tunas.

Yellowfin catch from the West Coast EEZ, under 6K mt/yr in recent years, counts toward this quota, but is a minuscule fraction of the EPO catches. West Coast yellowfin catches from the EEZ are availability-driven and have no effect on the fishing mortality upon the EPO stock.

Status Summary: Stock status of yellowfin in the EPO is reviewed annually by the 10 member nation IATTC, and a quota for the EPO is now in place. MSY is estimated at 270K mt. Although the stock presently (1998-99) could be 14% below B_{MSY} with fishing mortality above F_{MSY} (B/B_{MSY}~0.86 > MSST; F/F_{MSY}~1.30), it is being managed for the MSY biomass, taking into account recruitment changes that vary actual stock levels. As a member nation, the U.S. must abide by IATTC measures. While OY has not been specified internationally, its proxy value is placed at MSY here (Table 3-5). In view of the small catch fraction taken by West Coast fishers (1%), no regional harvest guideline is recommended at this time.

Bigeye Tuna. Bigeye are caught in tropical to temperate waters throughout the Pacific. Catches are relatively minor in comparison to that of the tropical tunas, but are particularly valuable for the fresh-fish market. Until recently, bigeye was caught primarily by longline gear fishing the mainly mature, deep-dwelling population.

In the EPO, longline catches of bigeye have decreased while purse-seine catches of younger, surface-dwelling fish have increased. The 1999 longline catch was 36K mt, down from the 102K mt peak during 1986. But the purse seine catches, historically less than 10K mt/yr, increased rapidly after 1993 as fishing switched to target the immature bigeye under FADs. The new fishing mode developed mainly west and southwest of the Galapagos Islands. Recently (1996, 1997), purse-seine catches of bigeye reached 51K mt, of which 90% was from FAD fishing. Total EPO catch by all gears in 1999 was 64K mt (IATTC 2002).

A Pacific-wide assessment of bigeye was conducted by Japan's National Research Institute of Far Seas Fisheries (Miyabe 1995) on the premise of a single stock. Little is known about exchange between eastern and the central-western Pacific bigeye populations, however, and there may be an eastern and a western stock. Information from this assessment provided estimates of the ratios F_{94}/F_{MSY}=1.09 and B_{94}/B_{MSY} = 0.99 (Boggs et al. 2000). There is large uncertainty in these estimates, in part because of the recent increase in purse-seine catches of juveniles, but they suggested an overall, healthy population being fished near B_{MSY}.

The bigeye stock/population in the eastern Pacific also appears near that for MSY, but with F above F_{MSY} and with evidence for a recent downturn of the spawning stock due to low recruitment. CPUEs from the EPO longline fishery and also cohort analyses indicate the EPO biomass had been declining since the mid-1980s (IATTC 1999). Production model analyses showed either over- or underfishing, depending upon the model, but with the non-equilibrium biomass still above that for MSY (IATTC 2000). MSY is approximately 66-92K mt (IATTC 2000). More recent age-structured analyses suggest (for the conservative case assuming a stock recruitment relationship) a healthy stock biomass (B/B_{MSY}=1.11) (Table 3-4), but with F/F_{MSY}=1.11 that was supported, until recently, by large cohorts recruited during 1995-1997. Further, analyses showed that the spawning stock (age 3+ years) could have been reduced in 2002 to 74% of that for MSY due to low recruitment during 1998-2001 (Watters and Maunder 2002, Maunder and Harley 2002). There is much uncertainty in these findings, but the situation is being addressed by IATTC management measures that resulted from the concern over the catches of juveniles under FADs. The IATTC also adopted in 1998 a 45K mt quota on bigeye caught by purse seine, after which fishing on FADs is prohibited. That quota was not reached and has since been lowered to near the catch level of 1999, 40K mt. The one month December closure of purse seine fishing (see yellowfin tuna) will further limit the risk of excessive fishing mortality. No additional management action needs to be adopted by the Council to address overfishing in the eastern Pacific.

Present catches within the West Coast EEZ are too small to have any impact on the bigeye stock in the EPO or Pacific-wide, and are limited by local availability. The maximum catch during the 1990s was just over 100 mt.

Status Summary: The bigeye stock in the EPO appears near that for producing MSY, possibly with B/B_{MSY}=1.11, but there is concern over the increased fishing on juveniles and recent low recruitment which may have reduced the 2002 spawning stock to below that for MSY. Fishing mortality appears to be above that for MSY (F/F_{MSY}=1.11). IATTC reviews the status of bigeye in the EPO annually and emplaced in 1999 a 40K mt quota on juvenile fish caught associated with floating objects. As a member nation, the U.S. abides by that quota affecting floating object fishing. MSY is estimated at approximately 79K mt and is in the range of present catches (Table 3-5). A proxy OY is placed here at the same level. In view of IATTC management and the small catch fraction taken by West Coast fishers (< 1%), no regional harvest guideline is recommended at this time.

Skipjack Tuna. Over half the tuna catch from the Pacific is skipjack, presently about 190K mt/yr from the EPO and 1,200K mt/yr from the CWP. The majority is caught by purse seiners, but also by baitboats, especially in the western Pacific. Catches have risen since 1995 due to the increased fishing with FADs. Skipjack catches are notably variable among years (IATTC 2000).

Population reduction from exploitation appears minimal for both eastern and western stocks, with abundance highly variable. CPUE seems affected more by environment or inherent population instability than by exploitation. Consistent downward trends in catch rate have not been demonstrated in either the EPO or CWP.

First estimates of the B and F ratios relative to MSY were obtained, in part, from these minimal fishing effects that indicate a healthy Pacific stock (Boggs et al. 2000). Assuming from the lack of CPUE decline that B/B_o is near 1.0 in both the EPO and CWP, and that B_{MSY}/B_o =0.4 (Restrepo et al. 1998), then B/B_{MSY} = 2.5 for both the eastern and western stocks of skipjack. There is no estimate of F/F_{MSY} for the eastern stock, although Hampton et al. (1999) estimated it to be 0.25 for the western stock. While the above ratios suggest a better understanding of this species' dynamics than is the case, both stocks do appear to be far above the biomass and below the mortality levels requiring remedial management action. West Coast landings are a minuscule fraction of the EPO catches.

Status Summary: The EPO skipjack stock appear healthy (Table 3-4) with no indication of the upper limit to sustainable catches. The IATTC reviews the status of skipjack annually. Neither an MSY or an OY has been determined for EPO skipjack, but here proxies for both are taken as the average level of recent catches (190K mt) (Table 3-5). In view of the small catch fraction taken by West Coast fishers (3%), no regional harvest guideline is recommended at this time.

Bluefin Tuna. North Pacific bluefin are mainly caught in the western Pacific principally by purse seine and troll gears, but also by longline and other gears, the catches averaging 20K mt/yr stock-wide (1995-1999). In the eastern Pacific, catches are much less, averaging 3.5K mt/yr (1990-1997) and taken primarily by purse seiners (IATTC 1999). The latter fishing occurs off southern California and especially Baja California Mexico, mainly between spring and fall and within 100 miles of shore.

There is probably a single north Pacific stock with trans-Pacific migratory patterns. Spawning appears restricted to waters between Japan and the Philippines, in contrast to the other tunas like yellowfin, bigeye, and skipjack that are reported to spawn over vast areas of the Pacific. In the eastern Pacific, bluefin are nearly always immatures, 1 and 2 years of age. These fish migrate from the western Pacific in temperate latitudes as 1 year olds, and probably begin returning as 2 year olds. Some linger longer before returning. Fluctuations in the eastern Pacific catch, from 0.4K to 8K mt/yr during the 1990s, appear to be related to varying proportions of western Pacific fish involved in this migration (Bayliff 2001).

The vital rates and abundance trends of bluefin are poorly known, especially in the western Pacific. The adult stock fished by the international longline fleet appears to have declined between the 1950s and mid-1980s (Tomlinson 1996), but there may also have been changes in migratory patterns and in stock availability. Total catches from all fisheries have decreased since the 1950s, but with large, temporal fluctuations and a recovery during the 1990s (Itoh 2001, IATTC 2000). While the decrease is more apparent in the eastern than in the western Pacific, recent catch rates from the eastern Pacific surface fishery have been high, although erratic (IATTC 1999). While bluefin spawning is restricted and localized in the western Pacific, there is no evidence for a reduced adult biomass having an effect on recruitment. Overall, the effects of exploitation are inconclusive because of lack of reliable abundance indexes for the western fisheries. No biomass and fishing mortality ratios relative to MSY have been determined.

Bluefin catches by West Coast fishers constitute a small, but not insignificant fraction (10%) of the stock-wide catch. West Coast catches would need to be figured into catch reductions, should such be recommended at international forums.

Status Summary: IATTC reviews the status of north Pacific bluefin tuna occasionally. Catches have decreased since the late 1950s, but now appear to be in recovery. West Coast fishers take about 10% of total catches, mainly the juveniles that migrate irregularly to the eastern Pacific. Evidence for overfishing or for persisting decline in the stock, which is mainly in the western Pacific, is lacking. There are no standardized effort measures for the western fisheries for developing abundance indexes. An MSY has not been determined, but a proxy value is taken here to be the average level of recent catches (20K mt), with a proxy OY 75% of that MSY. The bluefin tuna is thus treated as a vulnerable species. It is the least productive and with the most restricted spawning among the tunas. Its population status is also problematic because there are no indexes that reliably reflect overall stock abundance. But in view of the stock being primarily in the western Pacific, the lack of international agreement on stock status relative to MSY, and the West Coast fishery not directly affecting the spawning stock, no regional harvest guideline is recommended at this time.

3.3.2 Pelagic Sharks

Sharks need to be managed with special care because their productivities are low compared to most exploited teleost fishes - a result of late ages at maturity and low fecundities (Table 3-4). The common thresher is slightly more productive than the other sharks, yet its population is capable of increasing by only 4-7% per year when at its MSY-producing size (productivity r=0.04-0.07, with annual Population Growth Rate (PGR=e^r-1) the same, 4-7%). The PGR represents the annual surplus fraction of the standing population, and the catch fraction from the population should not exceed this rate for the corresponding catch to be sustainable (assuming the exploited segment also grows at this rate). The maximum catch fraction beyond which this shark's population should collapse ($PGR_{MAX}=e^{2r}-1$ for the logistic model) averages 12%, still a small fraction of the population. If depleted to 50% below the biomass that produces MSY, the time needed to recover with fishing eliminated (the doubling time $T_D = \ln 2/1.5r$ for the logistic model) is about 9 years (range:7-12 yrs). The less productive sharks require smaller catch fractions and have longer doubling times.

Thus even low overall exploitation rates, in terms of catch fractions of populations, could overfish these sharks, or even collapse their populations, and expected recovery times can be 1-2 decades or more. And since individuals that have not yet reproduced will often be taken (they are already large-sized as immatures), conservation of reproductive potential should be a continuing concern. Fisheries for such sharks thus require

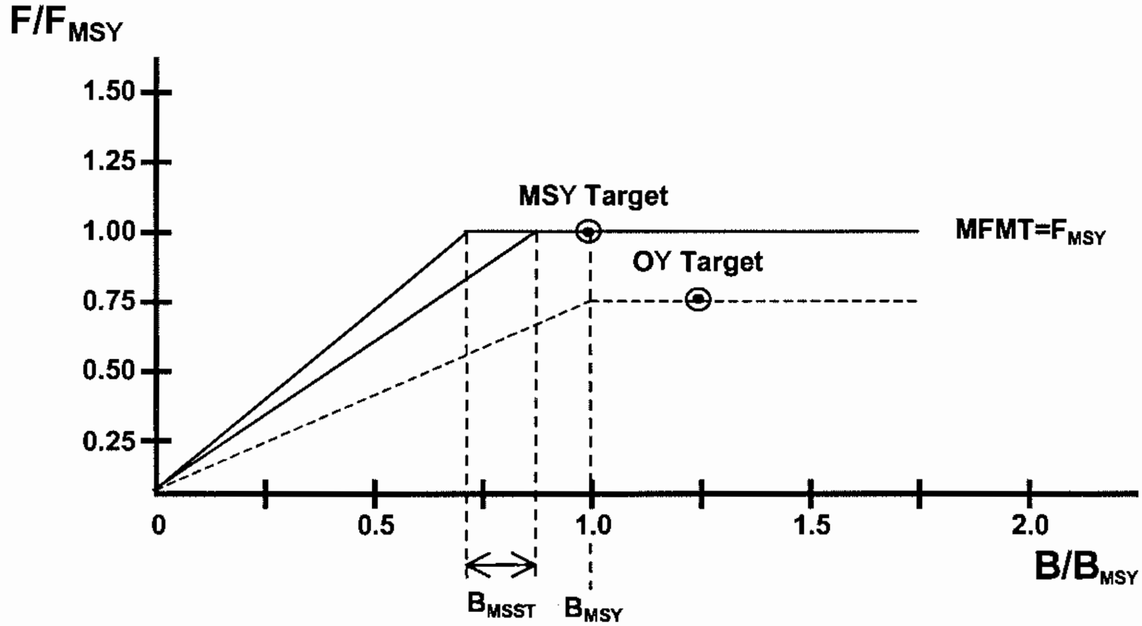


Figure 3-3. General MSY control rule for sharks, with an OY example.

preventive, conservative management, i.e., development under protective regimes. At the least, protection of reproducing females and prevention of rapid expansion of fishing effort are needed.

None of the HMS sharks of this FMP is now actively managed internationally, and pelagic sharks are not assessed regularly by international fishery management organizations. There is, however, international and national concern over the health of shark populations, which has resulted in guidelines contained in the International and National Plans of Action for the Conservation and Management of Sharks (Chapter 1, section 1.6.4). Presently there are no international or regional quotas for the HMS MUS sharks in the Pacific, but there is a tri-state harvest guideline for the common thresher of 578 mt (340 mt dressed weight; PSMFC 1990), which has been exceeded once.

Figure 3-3 illustrates the general control rule for sharks. B_{MSST} is closer to B_{MSY} than is the case for teleosts because of lower natural mortality M (cf. Fig. 3-2). As vulnerable species, HMS sharks should be managed for some precautionary OY target. The example shown in Figure 3-3 corresponds to that used here as the proxy OY for vulnerable species, viz., OY=0.75MSY. Harvest guidelines (section 3.3) are set equal to this OY.

Common Thresher. Most commercial landings of common thresher are presently taken in the California-Oregon drift gillnet fishery for swordfish, where this shark is the second most valuable species landed. Some are also caught by setnets and small-mesh drift nets. Adults as well as immatures are taken, although less adults than in previous years prior to the springtime area/season closures. The drift gillnet fishery began in 1977-78 in the Southern California Bight (SCB), with the thresher specifically targeted. From early on and amid signs of population decline, various season and area restrictions were implemented by the State of California to protect reproducing females, marine mammals, and the increasingly targeted swordfish; there was also concern over possible takes of striped marlin.

The spring-season directed fishery originally began February 1, but by 1990, drift gillnet fishing was either entirely prohibited, or restricted to distances greater than 75 miles from shore up through mid-August (Hanan et al. 1993). Drift gillnetting was allowed inshore the rest of the year (August 15 to January 31), but with various time and area limits. These closures strongly reduced fishing effort, especially within 20 miles of shore where most threshers were caught.

Catches peaked early in the California drift gillnet fishery with approximately 1000 mt taken in 1982 (Hanan et al. 1993), then declined sharply in 1986, and have been moderately low since. CPUE also declined. Since 1990 annual catches have averaged 200-300 mt (1990-1998 period), and appear to have stabilized (Holts et al. 1998).

The early increase to peak catches with a strong decline thereafter, along with declining fishing effort and CPUE, is symptomatic of the "fishing-up" effect (Ricker 1975), i.e., early elevated catches from unsustainable fishing that produces strong stock reduction and fishery contraction. This is an expected exploitation pattern for low productivity species that have nevertheless accumulated sizable, fishable biomasses.

Exploitation reduced the common thresher population as indicated by the decline in CPUE (Holts et al.1998), but the magnitude of decline was also affected by the various area and time closures, the offshore expansion, and the shift in emphasis within the fishery from shark to swordfish. The closures initially reduced annual catches by approximately 50% of the peak years (Hanan et al. 1993; Cailliet et al. 1991), and likely altered catchabilities by size and reproductive behavior. Reduction of the population indicated that this thresher shark stock was substantially regional, with rather limited interchange with populations elsewhere.

Present levels of fishing effort appear to have allowed stock regrowth, as seen in the rise of CPUEs in certain areas (Hill et al.1997). Catches should continue to increase as the population recovers, but sustainable levels will always be much less than the unsustainable catches of the early years (MSY is equivalent to as little as 4-7% of the standing population that supplied the initial fishing-up catches). While present fishing effort in the California drift gillnet fishery has been decreasing, and permits are not being re-issued, continued recovery is not necessarily assured. Future fishing effort could increase and become concentrated in the Southern California Bight due to new regulations restricting fishing during a portion of the season north of Point Sur to protect the leatherback turtle (Chapter 6 section 6.1.2).

Common thresher populations off Baja California are thought to be of the same stock as fished off the U.S. West Coast (Eitner 1999). Transboundary movements of tagged specimens have been observed between California and off Mexico. Little is known about the fisheries off Mexico, however, since the shark landings there are not routinely reported by species, and the pelagic thresher shark is also common off Mexico.

A harvest guideline is proposed here based on estimates of local maximum sustainable yield (LMSY), i.e., as obtained from the stock portion presently accessed by the West Coast drift gillnet fishery (LMSYs necessarily underestimate stock-wide MSY). The LMSY, as estimated here (Au and Show, SWFSC, La Jolla, work in progress), is actually a proxy for true LMSY, as the method does not use exploitation rate based on mortality rates (yet undetermined) to estimate size of the locally exploited population from the catch. Rather, it uses the population growth rate (PGR) as determined from the thresher's rebound potential *r* (Smith et al. *In press*). PGR is less than true local exploitation rate ($=(F/Z)(1-e^{-Z})$) (A.E. Punt, Univ. Washington, pers. comm. 11/9/01), as it refers to the total population rather than the exploited ages only, and it is specifically the *sustainable* rate. It is thus a conservative estimate of exploitation rate. The PGR method estimates sustainable production in terms of potential surplus population growth.

Since the population recovery began when relative population size was $0.32\text{-}0.33B_0$ (from CPUE trend), and when the sustainable (equilibrium) catch was between 500 mt (recovery began after the catch fell below this level), and 306 mt (recovery is continuing under this nearly level catch of recent years), dividing a catch within that range by the PGR then, which is assumed to just sustain that catch, gives an estimate of the overall local population size at that time. That population size, incorporated in the logistic production model with *r*, provided an estimate of B_{LMSY} and LMSY (see Fig. 3-4). Assuming the equilibrium catch to be 350, 400, or 450 mt at time of recovery (between 1992-1993), the method determined proxy LMSYs of 390, 450, or 510 mt, respectively. These are minimal estimates of LMSY and especially MSY, since there is no adjustment for the unknown production off Mexico.

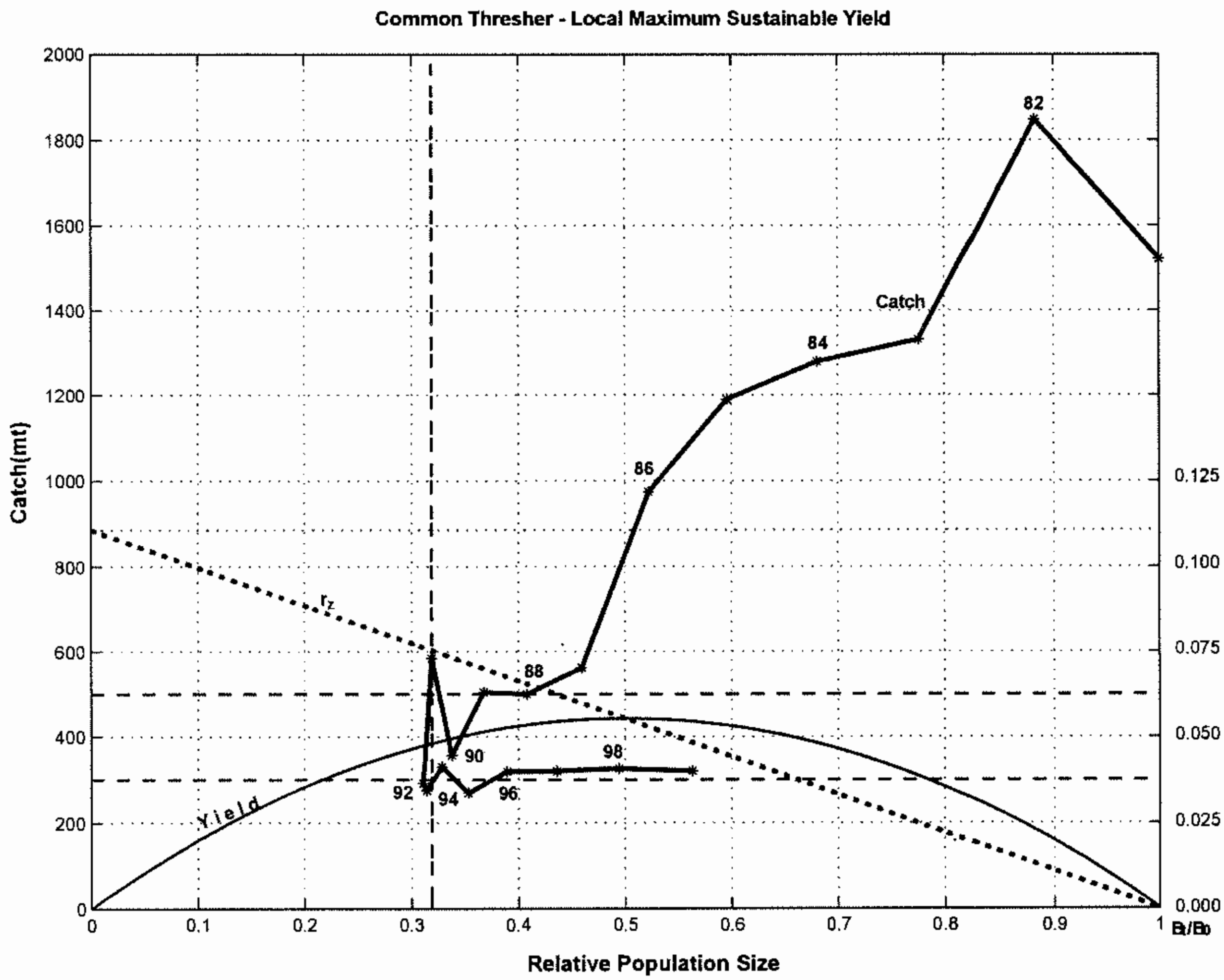


Figure 3-4. A proxy estimate of local maximum sustainable yield (LMSY) for the common thresher shark. The 1981-1999 catch vs. relative population size (B_t/B_o) trajectory shows population recovery beginning at 1992-93 (trajectory moves to right) at a relative population size of 0.32 (vertical line) and between sustainable catch levels (horizontal lines) that, along with the productivity at that population size (r_Z at intersection with vertical line), together determine a production function as shown (parabola). In this example, the LMSY proxy estimate is 450 mt.

The proposed harvest guideline, 340 mt, is the proxy OY equal to 75% of the mid-point LMSY, 450 mt (Table 3-5). It is less than the present 578 mt coast-wide guideline adopted by the Pacific States Marine Fisheries Commission in 1990 (PSMFC 1990).

Present available biomass appears to be just above B_{MSY} (~1.10B_{MSY}, see Fig. 3-4) and therefore above the Biomass Flag Ratio (= 0.96 B_{MSY}), and much above B_{MSST} (=0.77B_{MSY}) (Table 3-4). Exploitation is presently producing about 300 mt (rw) from the available stock. Since the CPUE trend shows stock recovery, overfishing is not likely occurring, and F/F_{MSY} is < 1.0. The common thresher is no longer a primary target for most commercial fishers, so if catches could be held to present levels, the recovery could reach over 75% of B_o (according to the above logistic production-biomass relationship).

Status Summary: The common thresher occurs throughout the tropical and temperate Pacific but is not managed internationally and there are no quotas. It is more abundant near coasts, and there appears to be a regional stock off southern California and Baja California, judging by how that population declined after fishing began off California in the early 1980s (plus fishing off Mexico) and the results of tagging experiments. With time and area restrictions emplaced since 1990, the population now appears to be in recovery (B/B_{MSY}~1.10; $F/F_{MSY} < 1.0$), which should continue as long as present catch levels do not increase. Based on the midpoint proxy estimate of local maximum sustainable yield from the population available to the West Coast gillnet fisheries, 450 mt, a new regional harvest guideline equal to OY, 340 mt, is recommended. The harvest guideline is conservative, because it is reduced from LMSY, which itself underestimates stock-wide MSY as it does not include production from off Mexico.

Pelagic Thresher and Bigeye Thresher. Little is known of the biology and status of these sharks, and especially of their reproductive requirements. Individuals taken within the management area are thought to be on the edges of their habitat ranges, including depth-wise for the bigeye thresher which ranges into mesopelagic waters. They are minor components of West Coast fisheries, taken incidentally and presumably not overexploited, at least locally. The bigeye thresher occurs regularly but in low numbers (~9% of common thresher catch) in drift gillnet catches, whereas the pelagic thresher is taken mainly in warm-water years. Both species are caught off Mexico, and the pelagic thresher is reported to be an important component of Mexican shark catches. These species appear to have thin or semi-isolated populations Pacific-wide. Present West Coast catches total under 50 mt/yr.

MSYs, biomasses, or fishing mortalities relative to MSY of these sharks are unknown, but local proxy MSYs (LMSY) are estimated here from average catch levels (Table 3-5). At the regional or local level, LMSY for the pelagic thresher is estimated as 20 mt, the average catch during the El Niño years of 1983,1984, and 1997 when catches more likely reflected the potential for West Coast fishers. The bigeye thresher's LMSY is estimated as 40 mt, the average catch for 1982 to 1999. The proxy OYs are 75% of these values.

Status Summary: Pelagic and bigeye threshers populations occur throughout the tropical and temperate Pacific but are not managed internationally, and there are no quotas. They are thought to be more vulnerable to overfishing than the common thresher shark (Table 3-3). Little is known of their abundance and stock structure. Considering their minor importance in West Coast catches and their proxy LMSYs (average catch levels are 20 and 40 mt respectively) that are likely substantial underestimates of stock-wide MSYs, no harvest guidelines are recommended at this time.

Shortfin Mako. This shark is taken primarily by the California drift gillnet fishery for swordfish, but also in smaller amounts by California-based longliners operating outside the EEZ (Vojkovich and Barsky 1998). It is also sought by sport anglers. Although present (1994-99) commercial catches are only ~60-130 mt/yr, the mako is still the third most valuable species taken in the drift gillnet fishery. Pacific coast catches peaked early at 400 mt in 1987, then declined especially during the 1990s. During 1988-1992, there was an experimental longline fishery for makos and blue sharks in the SCB.

The drift gillnet fishery primarily takes juveniles and subadults age 3 or less, the SCB evidently being an important nursery and feeding area for immatures (Hanan et al. 1993, Cailliet et al. 1991). Catch localities are like that of the common thresher, but with less nearshore concentration (unpublished Observer Data, SWFSC/NMFS, La Jolla, CA).

The shortfin mako is an oceanic shark widespread throughout the tropical and temperate Pacific. It is regularly taken by longline gear on the high seas. Off the West Coast, warmer years are associated with more northward movement. Makos off Mexico are likely of the same stock fished in U.S. waters, and makos tagged in the SCB have been recaptured as far south as Acapulco. Most makos caught off California are juveniles 1-3 years of age. Adults are infrequently taken and mature females are very rare. Presumably, makos move offshore as they mature.

Considering the mako's tropical to warm-temperate, ocean-wide range and the low availability of adults to the fishing gear (Cailliet et al. 1991), it seems unlikely that this species has been depleted off the West Coast. Still, the mako's productivity is low (0.04-0.06/yr), and the SCB is undoubtedly important as a nursery/growing area. A reasonable assumption is that present time-area restrictions on drift gillnet fishing provide valuable protection for immature makos, at least for the regional stock. The longline experimental fishing program (1988-1992) was terminated in part because of the high catch rate of these immature fish. Catch statistics suggest this shark was not overexploited like the common thresher, though the studies are not yet complete (D.W. Au and C. Show, SWFSC/NMFS, La Jolla, CA). The CPUE rates, while variable and affected by the changes in the drift gillnet fishery and the effects of warm-water years, indicate a possible overall decrease not yet near B_{MSY}. But it is difficult to reconcile the decrease with the fishing effort that has been decreasing, the very narrow age span in the fishery, and the adult portion of the stock that is largely inaccessible. Abundance changes in the exploited immature fish that gather in the SCB may not reflect the effects of local fishing or the whole stock, which is thought to be wide-ranging and possibly EPO wide, or greater. The ratios B/B_{MSY} and F/F_{MSY} are here tentatively estimated to be > 1.0 and < 1.0 for the stock, respectively, and the 1981-1999 average catch of 200 mt is the present estimate for the LMSY proxy; 75% of that value is vulnerable species OY and the recommended harvest guideline, 150 mt (Table 3-5).

Status Summary: The shortfin mako occurs throughout the tropical and temperate Pacific but is not managed internationally, and there are no quotas. It 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. West Coast HMS fisheries take mainly juveniles, of unknown proportion to the overall stock. Clear effects of exploitation have not been shown, and the local stock is tentatively taken to be not overfished (B/B_{MSY}> 1.0; F/F_{MSY} < 1.0). But it is important to protect critical life stages of sharks, and so a harvest guideline of 150 mt, 75% of the 1981-99 average catch in the EEZ, is recommended pending better information, especially from the fisheries off Mexico.

Blue Shark. This is probably the most commonly caught shark in the EEZ and Pacific- wide. It is usually not landed because of low market value. West Coast catches are estimated from observer data. Up to about 300 mt may be caught, but most are discarded (Holts 1988; Holts et al. 1998). It is taken in both the drift gillnet and longline fisheries. Experimental longlining for blue sharks was conducted in California waters in 1979-1980 and again in 1988-1992 (the latter was the mako-blue shark experiment) in attempts to develop markets. Peak reported landings were 87 and 92 mt in 1980 and 1981 respectively. Since 1985, landings have averaged less than 5 mt (Holts et al. 1998).

The blue shark is extensively distributed from tropic to temperate, and coastal to oceanic waters of all oceans. It may be the most abundant of all large marine, top predators. Its northern reproducing/nursery areas appear to be the subtropic-subarctic transition waters spanning the entire north Pacific, including southerly extensions along the Pacific rim coasts (Nakano 1994). Based on distribution, there appears to be a single, Pacific-wide stock. Comparison of the disparate size distributions from the drift gillnet fishery off California and the longline fishery operating north of Hawaii indicates that subadults move out from West Coast waters to join the oceanic, adult portion of their population as they approach maturity, females leaving at younger ages than the males.

There is some evidence for stock decline in the central Pacific (Nakano 1996), but not yet evidence of overfishing. The north Pacific blue shark stock appears healthy (Kleiber et al. MS[1]). Their results indicate the population is above B_{MSY} with F/F_{MSY} < 0.5, and that MSY could be 1.7-3.0 X Catch (1993-98 average). Applying that factor to the estimated > 50K mt catch for the north Pacific (after Nakano and Seki MS[2]), MSY was estimated as ~120K mt (Table 3-5). There is insufficient information from coastal drift gillnet and longline fisheries to infer local stock status, because the extent of exchange between coastal and oceanic populations of blue sharks is unknown. But present catch levels off the West Coast, while poorly documented, are very

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[1] Kleiber, P, Y. Takeuchi, and H. Nakano. MS. Calculation of plausible maximum sustainable yield (MSY) for blue shark *(Prionace glauca)* in the north Pacific, SWFSC Admin. Rep. H-01-02; also Dept. of Commerce 2001.

[2] Nakano, H., and M.P. Seki, MS, Synopsis of biological data on the blue shark *Prionace glauca* Linnaeus, Nat. Res. Inst. Far Seas Fish., Japan.

likely sustainable, given the apparent health of the Pacific stock. Also, constraints on the drift gillnet fishery and the U.S. anti-finning law afford added protection for these sharks, which are mostly juveniles and subadults.

Status Summary: Blue shark, the most oceanic of the HMS MUS sharks, occurs throughout the Pacific from tropic to temperate seas. It is not actively managed internationally and there are no quotas. Recent studies indicate the species, which may comprise a single Pacific-wide stock, is abundant and healthy ($F/F_{MSY} < 0.5$), in spite of being incidentally fished by high-seas, longline fleets for over 50 years. MSY for the north Pacific stock is tentatively estimated to be approximately 120K mt. Therefore, no harvest guideline is recommended at this time.

3.3.3 Billfishes/Swordfish

The primary billfishes caught in West Coast EEZ waters are swordfish by drift gillnet and longline and striped marlin by sportfishing (commercial marlin fishing is not allowed in California). Both species are widespread and oceanic in distribution. Their population biology and behavior are not well known. Based on life history characteristics, they are at least moderately productive (Table 3-3).

Management of marlins and swordfish is under the purview of the same international fisheries organizations as for the tunas. Presently, there are no quotas. The general management control rule for billfishes is the same as for tunas (Fig. 3-2). In this FMP, OY is taken to be the same as MSY (or proxy) for swordfish but a precautionary 0.75MSY for striped marlin. There is much uncertainty over the catches and stock structure of both these species, but especially for the latter, which is therefore treated as vulnerable.

Swordfish. Longline fleets from Hawaii and Japan have harvested most of the swordfish from the north Pacific, over 17K mt in 1997 (FAO Areas 61 and 77). Hawaii-based effort and landings escalated in the early 1990s with arrival of swordfish boats from the U.S. Atlantic. This fleet averaged 5.4K mt/yr or 37% of the central-eastern north Pacific catch during its peak 1991-1993 years (Skillman 1998), but then shifted emphasis toward bigeye tuna (the actual target of the Japanese fleet). Some of the boats subsequently withdrew, but the catch was still nearly 3.3K mt in 1998 (WPRFMC 1999). The Hawaiian fleet worked the eastern end of the area fished by Japan, the waters north of Hawaii to 50° N latitude. This fleet is now prohibited (since June 12, 2001) from longlining for swordfish north of the equator by the NMFS Emergency Interim Rule for the protection of sea turtles (see Chapter 1, section 1.6.6 for current restrictions on this fishery).

Off the U.S. and Mexican West Coasts, drift gillnetters, harpooners, and longliners (the latter fishing outside the US EEZ) take 1-2K mt per year (Holts and Sosa-Nishizaki 1998). The West Coast catch, primarily from the California drift gillnet fishery, peaked in 1984-1985 at 2.9-3.4K mt. Catches declined following driftnet restrictions (see Common Thresher Shark) and now average about 1.4K mt annually (1995-1999). The West Coast catch amounts to about 12% of the EPO catch. The driftnet fishery is now restricted (since August 24, 2001) from fishing basically north of Point Sur, California from August 15 through November 15 to protect leatherback turtles (Chapter 1, section 1.6.6).

Swordfish occur throughout the tropical-temperate Pacific with concentrations in the north Pacific from east of Japan to northeast of Hawaii, and also off central Mexico, South America, and in tropical waters of the central and western Pacific. The stock structure appears complex and there may be more than one stock in the Pacific.

The species should be relatively productive and resilient to fishing (Ward and Elscot 2000; also Table 3-3). Females are estimated to mature at 144 cm eye-FL (DeMartini et al. 2000), probably at 5-6 years of age (Sosa-Nishizaki 1990), and spawning probably occurs all year in the tropics and at least seasonally in temperate waters. But immatures (both sexes) comprise about 50% of the catch (by number) in both the oceanic longline and coastal driftnet fisheries, and the vital rates of the species are poorly known. Estimates of growth rate, summarized by Boggs (1989), have been obtained from a few small samples and are to be considered provisional (Skillman 1998). In particular, the growth of large individuals remains poorly defined. Thus there is considerable uncertainty in aging the catches, and fishing and natural mortality rates are questionable (Skillman 1998).

Various trend analyses have been conducted and a new assessment model has been developed to determine the status of Pacific swordfish. No evidence could be found, up through 1992, of any effect from fishing by the Japanese fleets (Uosaki 1998, Nakano 1998, Bartoo and Coan 1989). A more up-to-date assessment using age-structured models and including both Japanese and Hawaiian fishery data was inconclusive due to uncertainties on stock structure, size composition in catches, and population parameters (ISC 1999, Bartoo and Hinton 1999). The new simulation assessment model developed at NMFS SWFSC-Honolulu Laboratory, in conjunction with the WPRFMC, used a best amalgamation of data, parameter estimates, and hypotheses to conclude that F_{96}/F_{MSY} = 0.10 and B_{96}/B_{MSY} = 2.47, indicating that north Pacific swordfish had not been overfished. The level of uncertainly for these ratios is considered high however (Boggs et al. 2000).

Standardized CPUE from off Mexico and the western U.S. show swordfish in the EPO (east of 150°W) either increasing or with level time trend and at levels greater than for MSY (Hinton and Bayliff 2002b). The present ban against swordfish fishing for the Hawaii longline fleet should also be benefitting the stock. Continued monitoring is imperative, however, as both immature and mature ages of this top predator are exploited.

Status Summary: Pacific swordfish are widely distributed in the Pacific and may comprise one or more stocks. In the EPO, its status is regularly reviewed by the IATTC. No quotas have been set and no MSY has been estimated. But recent NMFS and IATTC assessments indicate the EPO stock or population is healthy with respect to fishing mortality and biomass relative to MSY ($B/B_{MSY} > 1.0$; $F/F_{MSY} < 1.0$). Here, proxy MSY and OY are taken as the average recent catch level, 12.5K mt (Table 3-5), noting also the assessment uncertainties and the need for careful monitoring in the international fisheries. In view of the stock's apparent health in the EPO and the relatively small catch fraction taken by West Coast fishers (12%), no regional harvest guideline is recommended at this time.

Striped Marlin. This tropical-subtropical species is taken importantly by tuna longliners and by sportfishers. In 1997 the Pacific-wide, commercial catch (mainly by Japan) was at least 7.4K mt of which approximately 3.6K mt was from the eastern Pacific (FAO Area 77). These catches are almost certainly under-reported as they are taken incidentally. The West Coast sports catch occurs during spring-summer when striped marlin move into southern California waters. This catch averages about 300 fish annually (20-50 mt).

The seasonal marlin that occur in California waters appear to originate primarily from high-density areas off the southern end of Baja California Sur, part of the species' horseshoe-shaped distribution spanning the Pacific (Squire and Suzuki 1990). North, south, and eastern and western Pacific stocks have been proposed for assessing the status of striped marlin.

Regionally, CPUEs from eastern and central North Pacific sportfishing localities have shown no particular trend during the last 25 years (Billfish Newsletter 1999; Ch. 2, Fig. 2-20), although increased angler efficiency and oceanographic or other effects on fish behavior could be masking declines. But notably, the recreational catch off California has decreased since the mid-1960s (Ch. 2, Fig. 2-18), and average fish size has also declined (Ch. 2, Fig. 2-19). Major problems in interpreting these trends is lack of comparable data on angler effort and efficiency over the same period. The above decrease in average size indicates that mortality could have increased 1.8 times the initial rate in 1900, based on the relationship between mortality rate and average size in an equilibrium population (D.W. Au, SWFSC/NMFS, La Jolla, CA). This increase suggests exploitation approaching the level for MSY, assuming that a mortality twice that of natural mortality (assumed prevailing in 1900) produces MSY. But this result may not reflect the dynamics of the population if the size of marlin entering the EEZ is not representative of the population as a whole, or is affected by long-term environmental or other factors.

Decrease in average size is also seen in EPO fisheries data for north of 10°N, but the stock in the entire EPO presently appears to be healthy (Hinton and Bayliff 2000a). In their analysis, fishing effort was standardized for depth preference of the fish before determining a relationship to stock production. They concluded that during 1991-98 F/F_{MSY} decreased from 1.4 to 0.7 and B/B_{MSY} increased from 0.62 to 1.07, i.e., a good recovery from a precautionary overfished (but not depleted) condition (Table 3-4). MSY was estimated to be 4.5K mt (Table 3-5). Striped marlin seem not to be now overfished Pacific-wide as well. Longline catch and effort series did not indicate stock-wide overfishing through the mid 1980s (Suzuki 1989, Skillman 1989), and presently, the Standing Committee on Tuna and Billfish (SCTB 1999) does not consider striped marlin to be overfished. It recognized, however, the poorly known vital rates, catches and catch rates, the latter from catches that are incidental to targeted tunas. Overall, the fishing pressure on striped marlin should have decreased since the mid 1970s, because of the shift in longline fishing to target deep-dwelling bigeye tuna and because of fleet-size reductions (Hinton and Bayliff 2002a).

Striped marlin show significant genotypic heterogeneity by area, indicating that management at regional levels might be particularly appropriate (Graves and McDowell 1994). However, Hinton and Bayliff (2000a), while acknowledging the uncertainty of stock structure, concluded there was insufficient evidence, including the genetic, to reject the hypothesis of a single EPO stock. Still, localized substocks could be strongly impacted by fisheries, and if in fact there are northern and southern stocks, the northern stock could be not much recovered beyond the overfished condition. At more localized levels, Squire and Au (1990) showed that local depletion can quickly result from nearby commercial longlining. The Council should be alert for regional effects of fishing.

Status Summary: The status of striped marlin is reviewed occasionally to regularly by the IATTC and ISC. The overall EPO stock appears now healthy and not overfished (B/B_{MSY}=1.07; F/F_{MSY}=0.70). There are no international quotas. MSY has been estimated as 4.5K mt. In view of the catch and stock structure uncertainties the striped marlin is treated as a vulnerable species here, and its OY is thus placed at 75% of MSY. But since commercial harvest of striped marlin is presently prohibited by California, no West Coast harvest guideline is recommended for the seasonal influx of fish, which occurs in the U.S. EEZ at the edge of the species' range.

3.3.4 Others

Dorado (Dolphinfish). This tropical species has increasingly appeared in the SCB, especially in recent years. Up through the early 1970s only a few hundred were caught by summertime sport anglers, but by 1997 28,600 fish were taken (~186 mt). Increase of dorado may be the result of decadal-scale, poleward warming of eastern Pacific surface waters that is extending the species' habitat (Norton 1999).

The dorado is at least seasonally abundant in all warm Pacific waters and a fast-growing, extremely productive species. Females are mature at an early 4-7 months, and spawning occurs all year, at least in the tropics. Based on life history, the species' rate of population increase could be more than 34 percent per year, and the recovery time from depletion (doubling time) less than 1.5 years (Table 3-3). But adult natural mortality (M) must also be very high, the life span being only 2-4 years (Oxenford 1999). The ability of species to sustain added fishing mortality is related to the productivity - natural mortality ratio, not just productivity (Caddy and Csirke 1983). Thus with high M, dorado production may be limited even while the species is resilient. Dorado are not typically in huge schools, unlike the tropical tunas.

While dorado occur throughout the tropical Pacific, their migrations are more localized in comparison to that of the large, truly oceanic billfishes and tunas (Oxenford 1999), and thus management of regional substocks is pertinent. Seasonal dorado caught in the SCB are thought to be from populations reproducing off Mexico, the fish entering the West Coast EEZ from the edge of their range. Total catches from such regional populations are poorly documented since much of the fishing is artisanal. There are no estimates of MSY for the eastern Pacific, or of biomass or fishing mortalities relative to it. However, if reported catches from off California to Peru (FAO Area 77) are viewed as underestimated MSY and OY, West Coast catches are a small fraction of those levels (Table 3-5).

Status Summary: The dorado is a fast-growing, widespread species of tropical seas that occurs seasonally in the SCB. Regional populations are not regularly reviewed by the IATTC or SPC and presently there is no management and no quotas. The population is presumed to be healthy. The recent average catch level, 450 mt, is taken here as a proxy MSY and OY for the EPO. Considering that West Coast fishers are accessing only the northern fringe of an extensive regional population, a population that should be able to rebound quickly from exploitation even if significantly reduced, and that its West Coast fishing is primarily recreational, no harvest guideline is recommended at this time.

3.3.5 Summary of Management Unit Species' Overfishing/Overfished Status

Table 3-4 summarizes the overfishing/overfished status of HMS management unit species in terms of the proposed default control rule (section 3.2.3), i.e., with SDC reference points expressed as ratios: $F/F_{MSY} > 1.0$ for overfishing; $B/B_{MSY} < B_{MSST}/B_{MSY}$ for the overfished condition; and the particular conservative Flag Ratio shown in Figure 3 -1 ($=1.25(B_{MSST}/B_{MSY})$). Values for these ratios are estimated as described under each species in section 3.3, which discusses additional evidence for health status beyond the ratios themselves.

The MUS appear generally healthy, although understanding of the pelagic and bigeye thresher shark populations is poor. *Overfishing* appears to be occurring only with bigeye and yellowfin tuna in the EPO, possibly with F/F_{MSY} amounts 11% and 30% greater than for producing MSY for the two species, respectively (Table 3-4, cols. 3, 4). This overfishing is not expected to reduce those stocks below MSST, since strong recruitment supported those fishing levels, the equilibrium catch levels at those rates are not much different from MSY, and the stocks are being actively managed for average MSY by the IATTC. Thus no remedial actions are required by the Council. The criterion for being *overfished* is not met for bigeye and yellowfin tuna (and the other species as well), B/B_{MSY} being either substantially above MSST or there being other information not supporting that condition (Table 3-4, cols. 6, 7; also Maunder and Harley 2002, Maunder 2002). Again, no management actions, even for the conservative limit $B/B_{MSY} <$ Flag Ratio, are called for. That none of the species is presently in clear need of management action stems from two facts: 1) the widespread, extensively exploited species are productive species (see Table 3-3) long monitored by international organizations; 2) species of lower productivity are either not commercially targeted or have had adequate controls enforced by the states.

3.3.6 Summary of the Catch/Sustainability Status of Management Unit Species

Stock-wide and regional (West Coast) catches of management unit species are summarized in Table 3-5, with estimates of regional catch fractions and their sustainability. All present West Coast catches of MUS are thought to be sustainable. Estimates of MSY or proxies are given, as are regional harvest guidelines where appropriate. The overfishing/overfished status of these MUS were summarized in Table 3-4.

Presently, there are stock-wide MSY estimates for only four MUS and no stock-wide OY estimates for any MUS of this FMP (Table 3-5). The MSYs are for albacore, yellowfin and bigeye tuna whose fisheries have long been tracked, and for striped marlin (the MSY listed for blue shark is tentative, based on incomplete catches). For the other MUS, stock-wide, or local, recent average catch levels are used as MSY or LMSY proxies. For now and as described in section 3.2.3, the OY proxies are set by the formulae OY=MSY for non-vulnerable species and OY=0.75MSY for vulnerable species (here, for the sharks and for bluefin tuna and striped marlin). As better estimates of MSY become available, and if OY levels themselves are not estimated, the proxy OYs can be updated using the formulae.

Stock-wide catches for common, pelagic, and bigeye thresher sharks, shorfin mako shark, and for dorado are poorly known if at all. The MSY entries for the above sharks in Table 3-5 are actually local MSY proxies (LMSY proxies), and therefore minimal estimates of MSY. The pelagic and bigeye threshers are minor, incidentally caught species in West Coast fisheries. Distribution-wise, they are fringe species for the fisheries, especially the pelagic thresher shark. Even the maximum historical catch levels of these sharks could be misleading estimates of their stock-wide MSYs. The dorado is similarly a fringe species although it is targeted

Table 3-4. Summary of population status of management unit species (see text under species descriptions for details).

Species (Stock)	F/ F_{MSY}	Over-fishing? (>1.0?)	B_{MSST}/ B_{MSY} (1-M)	B/ B_{MSY}	Over-fished? (<1-M?)	MinBiomass Flag Ratio (1.25(B_{MSST}/B_{MSY}))	Need Action? (B/B_{MSY}<FlagRatio?)
1. TUNAS							
Albacore (NP)	0.50	N	0.70	1.10	N	0.88	N[1/]
Bluefin (NP)	Unkn	n	0.75	Unkn	n	0.94	n[2/]
Bigeye (EPO)	1.11	y	0.60	1.11	N	0.75	N[3/]
Skipjack (EPO)	Unkn	n	0.50	2.50[4/]	N	0.63	N
Yellowfin (EPO)	~1.30[5/]	Y	0.50	~0.86[5,6/]	N	0.63	N
2. BILLFISHES							
Str. Marlin (EPO)	0.70	N	0.50	1.07	N	0.63	N[7/]
Swordfish (EPO)	<1.00	N	0.70	>1.00	N	0.88	N[8/]
3. SHARKS							
C.Thresher(EPO)	<1.00[9/]	N	0.77	~1.10[9/]	N	0.96	N[10/]
P.Thresher(EPO)	Unkn	?	0.85	Unkn	?	1.05	?[11/]
BE Thresh.(EPO)	Unkn	?	0.78	Unkn	?	0.97	?[12/]
Mako (EPO)	<1.00	N	0.71	>1.00	N	0.88	N[13/]
Blue (EPO)	<0.50	N	0.78	>1.00	N	0.97	N[14/]
4. OTHER							
Dorado (EPO)	Unkn	Unlikely	0.50	Unkn	Unlikely	0.63	N[15/]

Note: Overfishing, Overfished, and Need Action columns ask if previous column value meets criterion; e.g., under Overfishing, is the previous fraction >1.0? Less certain Y/N is y/n.

Footnotes:
1. Note that stock is now in high productivity period (NPALW 2000).
2. No evidence of stock ill health, but abundance indexes are inconclusive (Bayliff 2001).
3. Assuming a stock-recruitment relationship (Maunder and Harley 2002). See text for caveats.
4. Boggs et al. 2000.
5. From production model (Tomlinson 2001, IATTC 2000).
6. Assuming a stock-recruitment relationship, B/B_{MSY} for 2001 could be 1.09 (Maunder 2002).
7. EPO stock has recovered (Hinton and Bayliff 2002a).
8. Per cpue patterns in EPO (Hinton and Bayliff 2002b).
9. Work in progress, D.W. Au and C. Show, SWFSC/NMFS, La Jolla, CA
10. Stock in recovery with positive population growth since 1992-94.
11. Status unknown, but catches incidental and on edge of species' broad range.
12. Status unknown, but catches incidental and possibly on edge of species' habitat.
13. Fishery takes mostly juveniles on edge of range; adults largely unavailable.
14. See text re Kleiber et al. stock assessment.
15. Highly productive and widely distributed throughout tropical/subtropical Pacific.

Table 3-5. Stockwide and regional (CA, OR, WA) catches in thousand (K) mt for management unit species, with respect to MSY, sustainability, and regional harvest guidelines.

			Catches (K mt round wgt, 1995-99 period)			Status		
			Stock-	Regional		Regional Catch		
Species (Stock)	MSY (or proxy)	OY (or proxy)	wide	Comm'l	Rec'l	Fract'n	Sust'l?	Harvest Guideline
1. TUNAS								
Albacore (NP)	120[1]	(120)	67-128[2]	10-18	<0.05-1.31	0.16	Y	
Bluefin (NP)	(20)[3]	(15)	13-24[4]	<1-5	<0.05	0.10	Y	
Bigeye (EPO)	79[5]	(79)	64-94[4]	≤0.1		<0.01	Y	
Yellowfin (EPO)	270[6]	(270)	244-306[4]	1-6	0.12-0.84	0.01	Y	
Skipjack (EPO)	(190)[3]	(190)	137-295[4]	4-7	<0.1	0.03	Y	
2. BILLFISHES								
Str. Marlin (EPO)	4.5[7]	(3.4)	2-4[7]	<0.02	0.03	0.01	Y	
Swordfish (EPO)	(12.5)[8]	(12.5)	8-15[4]	1-2	<0.01	0.12	Y	
3. SHARKS								
Cm Thresher(Reg'l)	(0.45)[9]	(0.34)	Unkn	0.27-0.33	0.01-0.06	?	Y	0.34[10]
Pl Thresher(Reg'l)	(0.020)[11]	(0.015)	Unkn	0.004[12]		?	y	
BE Thresher(Reg'l)	(0.04)[13]	(0.03)	Unkn	0.01-0.03		?	y	
Mako/Bonito(Reg'l)	(0.20)[14]	(0.15)	Unkn	0.06-0.13	0.01-0.08	?	Y	0.15[10]
Blue (NP)	~120[15]	(90)	>50[16]	0.08-0.17[17]	<0.03	<0.01	Y	
4. OTHER								
Dorado (EPO)	(0.45)[3]	(0.45)	0.22-0.56[18]	<0.01-0.04	<0.01-0.08	0.04	Y	

MSY: from catch-effort relationships, unless a proxy. **Proxy MSY:** average stock-wide catches over appropriate years or (minimal) local (West Coast) MSYs (LMSY) including local average levels of catch. **OY:** equal to MSY or to 0.75MSY (bluefin tuna, str. marlin, sharks). **Stock-wide Catch:** 1995-99 catches. **Regional Commercial Catches:** 1995-99 West Coast catches from PacFIN data base (Table 2-1); also drift gillnet catches (str. marlin, blue shark) extrapolated from SWFSC Observer Records, 1995-99. Except for albacore, these catches are mainly from within the EEZ. **Regional Recreational Catch:** CPFV (Table 2-57) and RECFIN (Table 2-58) data, and assuming 12.9kg/bluefin, 7.1kg/yellowfin, 2.4kg/skipjack, 7.3kg/albacore, 6.5kg/dorado,113kg/swordfish, 16.7kg/mako, and 28.1kg/thresher; also, assuming 59kg/str. marlin, 300 sport-caught fish/yr. **Status:** Less certain Y/N is y/n re sustainability. **Harvest Guideline:** for shark species of regional/local concern; equal to the OY proxy.

Footnotes:

1. Average MSY over low and high productivity periods (Bartoo and Shiohama 1985, NPALW 2000). See text.
2. NPALW 2000
3. Mean of 1995-99 stock-wide catches.
4. IATTC 2001
5. MSY between 66 and 92 K mt from production models (IATTC 2000).
6. From production model (Tomlinson 2001, IATTC 2000).
7. MSY and catches from Hinton and Bayliff (2002a).
8. Average of 1995-99 catches; an analytically derived MSY is pending.
9. LMSY proxy by Population Growth Rate (PGR) method; is a minimal estimate of MSY (see text).
10. The OY proxy = 0.75MSY.
11. LMSY proxy as average catch during strong El Niño years (here 1983, 1984, and 1997) when species presence became significant.
12. Average catch 1995-99 excluding 1997 (strong El Niño year).
13. Average catch 1982-99.
14. LMSY proxy as average 1981-1999 regional catch; is a minimal estimate of MSY (see text).
15. After Kleiber et al. (see text).
16. Estimated N. Pacific catches after Nakano and Seki (MS) (see text).
17. Catches from SWFSC DGN observer data base, plus other fisheries landings (Tables 2-1,2-40, 2-42). No data on LL bycatches.
18. FAO Area 77 catches.

by sport fishers. Because its West Coast catches have been increasing, it is actually premature to determine its catch maximum; even the latest catch levels could be misleading for MSY.

In this FMP, harvest guidelines are recommended only for the regional portion of the common thresher and shortfin mako shark stocks, which appear to be in at least fair condition, but are vulnerable because of their life histories. Regional or local harvest guidelines are pending guideposts for addressing regional or local management concerns, and may be independent of the overall stock status relative to MSY or OY. They are set equal to these species' OY values for now. By establishing a harvest guideline based on current regional catch levels, expansion of fishing effort and capacity is contained to a degree, thus providing stability to the fisheries and protection of the regional stocks. The guideline catch level is for triggering a review of the fishery should the level be surpassed.

Table 3-6 summarizes present stock assessment protocols for management unit species. All but the sharks are regularly assessed and managed through international fisheries organizations.

3.4 Stock Assessment and Fishery Evaluation Report

National Standard 2 of the Magnuson-Stevens Act requires that the best scientific information available be used in developing FMPs and implementing regulations. For HMS, except dorado and sharks, NMFS and the Pacific Council rely on analyses and assessments adopted by various international bodies (of which U.S. is an active participant), such as the Inter-American Tropical Tuna Commission (IATTC), Interim Scientific Committee for Tuna and Tuna-like Species in the North Pacific (ISC), Standing Committee on Tuna and Billfish (SCTB) and others. For other species such as dorado and sharks, the HMS Management Team and NMFS develops stock and fishery assessments, provides peer reviews and presents the results to the Council. The guidelines for implementation of NS 2 require preparation of an annual Stock Assessment and Fishery Evaluation (SAFE) report. The SAFE report will largely rely on international body assessments, NMFS directed assessments, and any new fishery information. The NS 2 guidelines for a SAFE report, adapted for this FMP, are below.

The SAFE report is a document or set of documents that provides the Council with a summary of information concerning the most recent biological condition of stocks and the marine ecosystems in the management unit and the social and economic condition of the recreational and commercial fishing interests, fishing communities, and the fish processing industries. It summarizes, on a periodic basis, the best available scientific information concerning the past, present, and possible future condition of the stocks, marine ecosystems, and fisheries being managed under federal regulation.

The Secretary of Commerce has the responsibility to assure that a SAFE report or similar document is prepared, reviewed annually, and changed as necessary. The Secretary or Council may utilize any combination of talent from Council, state, Federal, university, or other sources to acquire and analyze data and produce the SAFE report.

The SAFE report provides information to the Council and Southwest Region of NMFS for determining annual harvest levels from each stock, documenting significant trends or changes in the resource, marine ecosystems, and fishery over time, and assessing the relative success of existing state and Federal fishery management programs. Information on bycatch and safety for each fishery should also be summarized. In addition, the SAFE report may be used to update or expand previous environmental and regulatory impact documents, and ecosystem and habitat descriptions.

Each SAFE report must be scientifically based, and cite data sources and interpretations.

Each SAFE report should contain information on which to base harvest specifications.

Each SAFE report should contain a description of the maximum fishing mortality threshold and the minimum stock size threshold for each stock or stock complex, along with information by which the Council may determine:

- Whether overfishing is occurring with respect to any stock or stock complex; if any stock or stock complex is overfished; if the rate or level of fishing mortality applied to any stock or stock complex is approaching the maximum fishing mortality threshold, and if the size of any stock or stock complex is approaching the minimum stock size threshold.

- Any management measures necessary to provide for rebuilding an overfished stock or stock complex (if any) to a level consistent with producing the maximum sustainable yield in such fishery.

Each SAFE report may contain additional economic, social, community, essential fish habitat, and ecological information pertinent to the success of management or the achievement of objectives of each FMP.

Each year, in June and September, the HMS Management Team will deliver one combined SAFE report for all species in this FMP to the Council. The SAFE report will follow the guidelines specified in NS 2 and will be used by the Council and NMFS to develop and evaluate regulatory adjustments under the framework procedure or the FMP amendment process. This information will provide the basis for determining annual harvest levels from each stock, documenting significant trends or changes in the resource, the bycatch, and the fishery over time, and assessing the relative success of existing state and federal fishery management programs. In addition, the SAFE report will be used to update or expand previous environmental and regulatory impact documents, and ecosystem and habitat descriptions, including EFH. The SAFE report will also make recommendations to the Council on matters concerning bycatch and incidental catch.

Table 3-6. Formal HMS stock assessment protocols and status overview.

SPECIES/STOCK:	**Albacore**
ASSUMED STOCK:	North & South Pacific
ASSESSING ORGANIZATION/FORUM:	North Pacific Albacore Workshop. Informal international forum of Laboratories from 4 countries. Shared data. Individual/collaborative efforts reviewed/discussed at workshop. South - working group of Standing Committee on Tuna and Billfish (SCTB)
STOCK ASSESSED?	North - yes: South - yes
ASSESSMENT FREQUENCY?	North - one to two year intervals; South - intermittent
ASSESSMENT MODEL(S):	North - MSY, Biomass and F ratios for surplus production, others; South - variable.
RISK/UNCERTAINTY MODEL(S):	North - yes variable; South - yes variable
MODELS SUITABLE TO ESTIMATE CONTROL RULES:	North: MSY, Overfishing, Overfished. South : None
SCIENTIFIC REVIEW:	North & South - Internal review at authors laboratories, group review at presentation.
REPORTING:	North Workshop - Published report, presentation to Interim Scientific Committee for Tuna and Tuna-like Species in the North Pacific (ISC) at BI-annual meetings. SCTB - annual report, working papers at meetings.

CURRENT CONSERVATION MANAGEMENT:	International: None. No international forum currently exists. Domestic: None. Western Pacific Fishery Management Council lists species in Pelagics FMP. Pacific Fishery Management Council considering species in Highly Migratory Species FMP.
SPECIES/STOCK:	**Yellowfin Tuna**
ASSUMED STOCK:	Eastern Pacific Ocean (EPO) east of 150 West Long. and Central-Western Pacific (CWP) west of 150 West Long.; Pacific-wide
ASSESSING ORGANIZATION/FORUM:	EPO - Inter-American Tropical Tuna Commission (IATTC). Analyses presented to Members annually. CWP - Standing Committee on Tuna and Billfish (SCTB). Annual meeting open to all scientists.
STOCK ASSESSED?	EPO - Yes ; CWP - Yes
ASSESSMENT FREQUENCY?	EPO - annually; CWP & Pacific- wide - intermittent
ASSESSMENT MODEL(S):	EPO - MSY, Yield-per-Recruit, cohort, others. CWP - MSY, tagging, CPUE; complex model in development.
RISK/UNCERTAINTY MODEL(S):	EPO - variable; CWP - variable
MODELS SUITABLE TO ESTIMATE CONTROL RULES:	EPO: MSY, Overfishing, Overfished. CWP : MSY, Overfishing, Overfished.
SCIENTIFIC REVIEW:	EPO - Internal IATTC review. CWP - (SCTB) Internal review at authors laboratories, group review at presentation.
REPORTING:	Annual published report, available to public; documents presented at Members meeting. SCTB - annual report, working papers at meetings.
CURRENT CONSERVATION MANAGEMENT:	International: EPO - annual catch quota corresponding to MSY, implemented by member countries. CWP - none. Domestic: None. Western Pacific Region Fishery Management Council lists species in Pelagics FMP. Pacific Fishery Management Council considering species in Highly Migratory Species FMP.
SPECIES/STOCK:	**Skipjack Tuna**
ASSUMED STOCK:	Eastern Pacific Ocean (EPO) east of 150 West Long. and Central-Western Pacific (CWP) west of 150 West Long.; Pacific-wide
ASSESSING ORGANIZATION/FORUM:	EPO - Inter-American Tropical Tuna Commission (IATTC). Analyses presented to Members annually. Pacific-wide and CWP - Standing Committee on Tuna and Billfish (SCTB). Annual meeting open to all scientists.
STOCK ASSESSED?	EPO - Yes; CWP - Yes
ASSESSMENT FREQUENCY?	EPO - annually; CWP & Pacific- wide - intermittent.

ASSESSMENT MODEL(S):	EPO - Yield-per-Recruit, CPUE, others. CWP - tagging, CPUE.
RISK/UNCERTAINTY MODEL(S):	Unknown
MODELS SUITABLE TO ESTIMATE CONTROL RULES:	EPO: Overfished. CWP: Overfishing, Overfished.
SCIENTIFIC REVIEW:	EPO - Internal IATTC review. CWP - (SCTB) Internal review at authors laboratories, group review at presentation.
REPORTING:	IATTC - Annual published report, available to public; documents presented at Members meeting. SCTB - annual report, working papers at meetings.
CURRENT CONSERVATION MANAGEMENT:	International: EPO - None. CWP - none; Pacific-wide - none. Domestic: None. Western Pacific Region Fishery Management Council lists species in Pelagics FMP. Pacific Fishery Management Council considering species in Highly Migratory Species FMP.

SPECIES/STOCK:	**Bigeye Tuna**
ASSUMED STOCK:	Eastern Pacific Ocean east of 150 West Long.; Pacific-wide
ASSESSING ORGANIZATION/FORUM:	EPO - Inter-American Tropical Tuna Commission (IATTC). Analyses presented to Members annually. Pacific-wide - Standing Committee on Tuna and Billfish (SCTB) and Bigeye Working Group of ISC. Annual meeting open to all scientists.
STOCK ASSESSED?	EPO - Yes: Pacific-wide - Yes.
ASSESSMENT FREQUENCY?	EPO - annually; Pacific- wide - intermittent.
ASSESSMENT MODEL(S):	EPO: Age-structured cohort, Yield-per-Recruit; Pacific-wide: age-structured cohort, Yield-per-Recruit, others under development.
RISK/UNCERTAINTY MODEL(S):	Unknown
MODELS SUITABLE TO ESTIMATE CONTROL RULES:	EPO: Overfished. Pacific-wide: Overfishing, Overfished.
SCIENTIFIC REVIEW:	EPO - Internal IATTC review. CWP and Pacific-wide - (SCTB & ISC) Internal review at authors laboratories, group review at presentation
REPORTING:	IATTC - Annual published report, available to public; documents presented at Members meeting. SCTB - annual report, working papers at meetings. ISC - Working papers at Bi-annual meeting.

CURRENT CONSERVATION MANAGEMENT:	International: EPO - quota by IATTC with restrictions on area and method of fishing for Y/R management, implemented by member countries. Stock-wide - none, no forum exists. Domestic: None. Western Pacific Region Fishery Management Council lists species in Pelagics FMP. Pacific Fishery Management Council considering species in Highly Migratory Species FMP.
SPECIES/STOCK:	**Northern Bluefin Tuna**
ASSUMED STOCK:	Pacific-wide
ASSESSING ORGANIZATION/FORUM:	IATTC. Bluefin Working Group of ISC.
STOCK ASSESSED?	Yes, intermittently
ASSESSMENT FREQUENCY?	Intermittent (1999 most recent)
ASSESSMENT MODEL(S):	Models in development
RISK/UNCERTAINTY MODEL(S):	Unknown
MODELS SUITABLE TO ESTIMATE CONTROL RULES:	Pacific-wide: None
SCIENTIFIC REVIEW:	Pacific-wide - IATTC - Internal review; ISC - Internal review at authors laboratories, group review at presentation.
REPORTING:	IATTC: Annual published report, available to public; documents presented at Members meeting. ISC: Working papers at Bi-annual meeting.
CURRENT CONSERVATION MANAGEMENT:	International: none, no forum exists. Domestic: None. Western Pacific Region Fishery Management Council lists species in Pelagics FMP. Pacific Fishery Management Council considering species in Highly Migratory Species FMP.
SPECIES/STOCK:	**Swordfish**
ASSUMED STOCK:	North Pacific-wide (uncertain)
ASSESSING ORGANIZATION/FORUM:	Pacific-wide: Swordfish Working Group of ISC.
STOCK ASSESSED?	Yes, not current (new assessment underway)
ASSESSMENT FREQUENCY?	Intermittent (last published - 1989 stock-wide); currently underway (ISC).
ASSESSMENT MODEL(S):	CPUE, surplus production
RISK/UNCERTAINTY MODEL(S):	Unknown
MODELS SUITABLE TO ESTIMATE CONTROL RULES:	Pacific-wide: Overfishing, Overfished.
SCIENTIFIC REVIEW:	Pacific-wide - (ISC) Internal review at authors laboratories, group review at presentation.
REPORTING:	ISC: Working papers at Bi-annual meeting. IATTC.

CURRENT CONSERVATION MANAGEMENT:	International: Stock-wide - none, no forum exists. Domestic: None. Western Pacific Region Fishery Management Council lists species in Pelagics FMP. Pacific Fishery Management Council considering species in Highly Migratory Species FMP.
SPECIES/STOCK:	**Striped Marlin**
ASSUMED STOCK:	Pacific-wide (uncertain)
ASSESSING ORGANIZATION/FORUM:	Pacific-wide: Marlin Working Group of ISC. EPO: IATTC
STOCK ASSESSED?	Yes, not current
ASSESSMENT FREQUENCY?	Intermittent
ASSESSMENT MODEL(S):	MSY, CPUE, others
RISK/UNCERTAINTY MODEL(S):	Unknown
MODELS SUITABLE TO ESTIMATE CONTROL RULES:	Pacific-wide: Overfishing, Overfished.
SCIENTIFIC REVIEW:	Pacific-wide - IATTC - Internal review; ISC - Internal review at authors laboratories, group review at presentation.
REPORTING:	ISC: Working papers at Bi-annual meeting.
CURRENT CONSERVATION MANAGEMENT:	International: Stock-wide - none, no forum exists. Domestic: None. Western Pacific Region Fishery Management Council lists species in Pelagics FMP. Pacific Fishery Management Council considering species in Highly Migratory Species FMP.
SPECIES/STOCK:	**Common Thresher Shark**
ASSUMED STOCK:	Eastern Pacific Ocean, U.S. EEZ.
ASSESSING ORGANIZATION/FORUM:	EPO - none; U.S. EEZ - NMFS
STOCK ASSESSED?	EPO - no; U.S. EEZ - yes.
ASSESSMENT FREQUENCY?	EPO - none; U.S. EEZ - intermittent
ASSESSMENT MODEL(S):	Demographic; models in development
RISK/UNCERTAINTY MODEL(S):	Unknown
MODELS SUITABLE TO ESTIMATE CONTROL RULES:	EPO: None; U.S. EEZ: MSY, Overfishing, Overfished.
SCIENTIFIC REVIEW:	PFMC
REPORTING:	FMP
CURRENT CONSERVATION MANAGEMENT:	International: none, no forum exists. Domestic: None. Pacific Fishery Management Council considering species in Highly Migratory Species FMP.
SPECIES/STOCK:	**Pelagic Thresher Shark**
ASSUMED STOCK:	Eastern Pacific Ocean
ASSESSING ORGANIZATION/FORUM:	None

STOCK ASSESSED?	No
ASSESSMENT FREQUENCY?	None
ASSESSMENT MODEL(S):	Demographic; models in development
RISK/UNCERTAINTY MODEL(S):	Unknown
MODELS SUITABLE TO ESTIMATE CONTROL RULES:	EPO: None
SCIENTIFIC REVIEW:	Unknown
REPORTING:	None
CURRENT CONSERVATION MANAGEMENT:	International: none, no forum exists. Domestic: None. Pacific Fishery Management Council considering species in Highly Migratory Species FMP.
SPECIES/STOCK:	**Bigeye Thresher Shark**
ASSUMED STOCK:	Eastern Pacific Ocean
ASSESSING ORGANIZATION/FORUM:	None
STOCK ASSESSED?	No
ASSESSMENT FREQUENCY?	None
ASSESSMENT MODEL(S):	Demographic; models in development
RISK/UNCERTAINTY MODEL(S):	Unknown
MODELS SUITABLE TO ESTIMATE CONTROL RULES:	EPO: None
SCIENTIFIC REVIEW:	Unknown
REPORTING:	None
CURRENT CONSERVATION MANAGEMENT:	International: none, no forum exists. Domestic: None. Pacific Fishery Management Council considering species in Highly Migratory Species FMP.
SPECIES/STOCK:	**Shortfin Mako Shark**
ASSUMED STOCK:	Eastern Pacific Ocean
ASSESSING ORGANIZATION/FORUM:	NMFS
STOCK ASSESSED?	Partially
ASSESSMENT FREQUENCY?	None
ASSESSMENT MODEL(S):	Demographic; survey; models in development
RISK/UNCERTAINTY MODEL(S):	Unknown
MODELS SUITABLE TO ESTIMATE CONTROL RULES:	EPO: Overfishing, Overfished.
SCIENTIFIC REVIEW:	PFMC
REPORTING:	FMP
CURRENT CONSERVATION MANAGEMENT:	International: none, no forum exists. Domestic: None. Pacific Fishery Management Council considering species in Highly Migratory Species FMP.
SPECIES/STOCK:	**Blue Shark**
ASSUMED STOCK:	Pacific-wide; north Pacific

ASSESSING ORGANIZATION/FORUM:	Cooperative NMFS-Japan Working Group
STOCK ASSESSED?	No
ASSESSMENT FREQUENCY?	In process
ASSESSMENT MODEL(S):	Models in development
RISK/UNCERTAINTY MODEL(S):	Unknown
MODELS SUITABLE TO ESTIMATE CONTROL RULES:	Unknown
SCIENTIFIC REVIEW:	Center of Independent Experts (U of Miami)
REPORTING:	Through WPRFMC.
CURRENT CONSERVATION MANAGEMENT:	International: none, no forum exists. Domestic: None. Western Pacific Region Fishery Management Council lists species in Pelagics FMP. Pacific Fishery Management Council considering species in Highly Migratory Species FMP.

SPECIES/STOCK:	**Dorado (Dolphinfish)**
ASSUMED STOCK:	Pacific-wide
ASSESSING ORGANIZATION/FORUM:	NMFS
STOCK ASSESSED?	No
ASSESSMENT FREQUENCY?	None
ASSESSMENT MODEL(S):	None
RISK/UNCERTAINTY MODEL(S):	None
MODELS SUITABLE TO ESTIMATE CONTROL RULES:	Unknown
SCIENTIFIC REVIEW:	PFMC
REPORTING:	FMP
CURRENT CONSERVATION MANAGEMENT:	International: none, no forum exists. Domestic: None. Western Pacific Region Fishery Management Council lists species in Pelagics FMP. Pacific Fishery Management Council considering species in Highly Migratory Species FMP.

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Chapter 4
ESSENTIAL FISH HABITAT (EFH)

4.1 INTRODUCTION AND NEED FOR ACTION

Section 303(a)(7) of the Magnuson-Stevens Act, 16 U.S.C. §§ 1801 et seq., as amended by the Sustainable Fisheries Act in 1996, requires that fishery management plans (FMPs):

> *Describe and identify essential fish habitat, minimize to the extent practicable adverse effects on such habitat caused by fishing and identify other actions to encourage the conservation and enhancement of such habitat.*

The Magnuson-Stevens Act provides the following definition:

> *"The term 'essential fish habitat' means those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity."* (16 U.S.C. § 1802 (10)).

The essential fish habitat (EFH) regulations (at 50 C.F.R. 600 Subpart J) provide additional interpretation of the definition of essential fish habitat:

> *"'Waters' include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include aquatic areas historically used by fish where appropriate; 'substrate' includes sediment, hard bottom, structures underlying the waters, and associated biological communities; 'necessary' means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and 'spawning, breeding, feeding, or growth to maturity' covers a species' full life cycle."*

The NMFS guidelines intended to assist councils in implementing the EFH provision of the Magnuson-Stevens Act set forth the following four broad tasks:

- Identify and describe EFH for all species managed under an FMP;
- Describe adverse impacts to EFH from fishing activities;
- Describe adverse impacts to EFH from non-fishing activities; and
- Recommend conservation and enhancement measures to minimize and mitigate the adverse impacts to EFH resulting from fishing and non-fishing related activities

The EFH regulations require that EFH be described and identified within the U.S. Exclusive Economic Zone (EEZ) for all life stages of each species in a fishery management unit if they occur within that zone. FMPs must describe EFH in text and/or tables and figures which provide information on the biological requirements for each life history stage of the species. According to the EFH regulations, an initial inventory of available environmental and fisheries data sources should be taken to compile information necessary to describe and identify EFH and to identify major species-specific habitat data gaps. The EFH regulations also suggest that where possible, FMPs should identify Habitat Areas of Particular Concern (HAPCs) within EFH for habitats which satisfy the criteria of being 1) sensitive or vulnerable to environmental stress, 2) are rare, or are 3) particularly important ecologically.

Conservation and enhancement measures may be recommended by the National Marine Fisheries Service (NMFS) during consultation with federal agencies, as required by section 305(b) of the Magnuson-Stevens Act, on projects which may potentially impact HMS EFH. Specific conservation measures, however, will be developed on a case-by-case basis. NMFS' authority includes the direct management of activities associated with fishing for marine, estuarine, and anadromous resources; NMFS' role in federal interagency consultations with regard to non-fishing threats is, more often than not, advisory. This document does not assume any new authority or regulatory role for NMFS in the control of non-fishing activities beyond the statutory requirements to recommend measures to conserve living marine resources, including their habitats.

4.1.1 EFH Final Rule Effective 19 Feb 2002

This chapter describes proposed actions and alternatives for describing habitats, including EFH and considers HAPCs for highly migratory species (HMS) covered by this FMP, in accordance with the Magnuson-Stevens Act. It describes how each of the regulatory requirements for EFH provisions have been addressed and presents the distribution of HMS habitats within the jurisdictional area. Development of the mandatory EFH provisions of this FMP follows requirements of an Environmental Impact Statement (EIS), and are pursuant to section 303(a)(7) of the Magnuson-Stevens Act. Content was also developed in accordance with the final rule (67 FR 2343, effective February 19, 2002) providing guidance for identification and specification of EFH for implementing the EFH provisions of the Magnuson-Stevens Act.

The final rule for EFH published on 17 Jan 2002 replaces an interim final rule that had been in effect since January 1998. Although the overall structure of the rule has remained the same, changes were made to the regulations based on public comments and almost four years of experience implementing EFH through the interim rule. The revised regulations provide clearer standards for the councils to use in identifying EFH, additional guidance to help councils evaluate whether fishing activities may adversely affect EFH, and clearer procedures for federal agency consultations with NOAA Fisheries on actions that may impact EFH. During the FMP drafting and review process in spring of 2002, this EFH section was completely revised to come into compliance with the new final rule guidance for identification and specification of EFH.

Section 4.2 describes methods and data sources used for identifying EFH and considering HAPCs, and for determining adverse effects from both fishing and non-fishing related activities. EFH proposed actions and alternatives are presented in section 4.3, and section 4.4 discusses Habitat Areas of Particular Concern. section 4.5 describes the physical and biological environment within the U.S. West Coast EEZ, possible threats to EFH from fishing and non-fishing activities and potential threats to EFH within that environment, and discusses mitigation measures that might be considered when reviewing projects that may adversely affect those habitats. Section 4.6 provides the legal description of designated EFH for each management unit species, section 4.7 provides a summary, and section 4.8 recommendations for EFH research. Life history descriptions and EFH maps for each managed species are also contained in Appendix A of this FMP.

4.2 METHODS AND DATA SOURCES

4.2.1 Methods and Data Sources Used to Determine EFH and HAPCs

A wide range of basic information was needed to identify EFH of the Management Unit Species, including data on current and historic stock size, geographic range, and habitat requirements by life history stage and the distribution and characteristics of those habitats. Since EFH has to be identified for each major life history stage, information about a species' distribution, density, growth, mortality and production within all habitats it occupies, or formerly occupied, was also investigated.

The quality of available data was evaluated through a hierarchical analysis based on the following four-level system:

- Level 1: All that is known is where a species occurs based on distribution data for all or part of the geographic range of the species (presence/absence)
- Level 2: Data on habitat-related densities or relative abundance of the species are available.
- Level 3: Data on growth, reproduction or survival rates within habitats are available.
- Level 4: Habitat-dependent production rates are available (quantified by habitat quantities, qualities and specific locations).

This information was interpreted with a risk-adverse approach to ensure that adequate areas are protected as EFH for the managed species. Habitats which satisfy the criteria in the Magnuson-Stevens Act and HMS EFH regulations have been identified and described as EFH in Appendix A and in this chapter, section 4.6. The verbal accounts for each species serve as the legal description of EFH, and where environmental characterizations are known, they have been included. Life history descriptions and EFH maps are provided as supplemental material in Appendix A. Maps include, where available, information on the length frequency of the observed, sex (sharks only), and locations of observed catches by life stage to help facilitate visualization of boundaries and catch and habitat use densities. Inner and outer boundaries of designated EFH were determined by examining the isobaths within which 95% of observed catches have been recorded, modified where necessary to incorporate other fishery dependent and independent catch distribution and occurrence data.

At present, there is not enough data on the relative productivity of different habitats to develop EFH designation based on Level 3 or Level 4 data for any of the Pacific Council's management unit species. Wherever possible, an effort was made to obtain at least Level 2 data from fisheries-dependent and fisheries-independent sources.

Some of the highly migratory species included in this FMP traverse large expanses of the Pacific Ocean, straddling jurisdictional boundaries. Although many of the species frequent other areas of the world, the Magnuson-Stevens Act only authorizes the description and identification of EFH in federal, state, or territorial waters to the seaward limit of the U.S. EEZ. Analysis of life histories, catch patterns and scientifically observed spacial distributions of the HMS managed under this FMP led to the identification of various habitats essential to the species. These have been highlighted whenever possible as EFH in the text descriptions found in Appendix A.

In determining EFH for HMS, consideration was given to habitat associations for all life stages. Although they typically range throughout open ocean waters, many HMS also move inshore, including semi-protected bays at some time during their life cycles. For example, some sharks are broadly distributed as adults but have been found to utilize specific bays and shallow coastal areas during the first few years of life. Many of these bays and shallow coastal areas used for nursery habitats have been characterized in general terms. Associations with particular water types or bottom types or topographies are undefined, and this lack of information has been identified as an important research need.

Where expert opinion was available and data points were scarce, areas were defined as EFH based on the best interpretation of available life history and range information; this was especially important for spawning areas, nursery grounds and eggs and larvae, since limited data are available in some cases. Only those habitats which occur within the delineated boundaries within the U.S. West Coast EEZ as they are interpreted through the text, maps, and tables in conjunction are considered EFH. Where the text description of EFH and the map supporting that description conflict, the legal definition of EFH lies within the text.

Careful judgment was used in determining the extent of the EFH that should be designated to ensure that sufficient habitat in good condition is available to maintain a sustainable fishery and the managed species' contribution to a healthy ecosystem. Because there are large gaps in scientific knowledge about the life histories and habitat requirements of many management unit species in the eastern Pacific region, the Council recommends adopting a precautionary approach in designating EFH to ensure that enough habitat is protected to sustain managed species.

In addition to the narratives, the general distribution and geographic limits of EFH for each life history stage are presented in the form of maps. More detailed and informative maps will be produced as more complete information about population responses to habitat characteristics (e.g., growth, survival, or reproductive rates) becomes available.

The Council used the best available scientific information to describe EFH in text and tables that provide information on the biological requirements for each life stage (egg, larvae, juvenile, adult) of all management unit species. The HMS Plan Team used information available from the scientific literature; the Atlantic Tunas, Swordfish, and Sharks FMP; the Western Pacific Fishery Management Council's Pelagic FMP; other Pacific Council FMPs; and worked in close cooperation with the scientists in the NMFS Southwest Fisheries Science Center, La Jolla Laboratory and the Inter-American Tropical Tuna Commission, La Jolla, CA; the states of Washington, Oregon, and California, and the NMFS Southwest Regional Office.

EFH designations for the proposed action are based largely on presence/absence and relative abundance data from fishery and fishery-independent sources, supplemented by other environmental information if available, such as preferred temperature ranges and water depths; current associations; centers of known target prey distribution; and other environmental preference information reported in the literature. The foundation of much of this material is catch data recorded by skippers in commercial fishing vessel logbooks (1990-1999)[1], recreational commercial passenger fishing vessels logbook information[2]; and data collected by federal observers aboard drift net and set net vessels fishing off California and Oregon. Some of the observer data allow us to analyze species distribution by size and sex and often by depth preference. Plots of drift net and set net observer effort are provided in Appendix A, Figs. 1 and 2. Where data were available, catch frequency distribution by bottom depth were also analyzed to determine isobath boundaries of designated EFH (see Fig. 2 for bathymetry configuration within the U.S. West Coast EEZ). In the case of HMS species or life stages whose distributions were deemed coastal or where insufficient documentation exists as to the oceanic nature of their distribution, outer boundaries of EFH reflect the isobaths within which 95% of observed catches were recorded. Thus EFH designations represent the most important areas occupied, even though about 5% of individuals observed to utilize EEZ waters may occur infrequently in other areas within the zone. The textual accounts serve as the legal description of EFH, maps are provided as supplemental material, with observed catch locations by sex, size frequency and life stage to help facilitate visualization of boundaries. In general, designations of EFH are a combination of data from fishery and fishery-independent sources, life history information, expert opinion regarding the importance of certain areas, tagging and tracking data, and other pertinent information related to the environmental ecology of each species.

4.2.1.1 Fixed (Static) Versus Dynamic EFH Boundaries

Although some HMS MUS may frequent the neritic waters over the continental shelf, sometimes relatively close to shore, they are primarily blue-water (i.e., open-ocean) species. Their distributions are usually not correlated with the areas or features one commonly thinks of as fish habitat and for which one can describe parameters such as bottom sediment type or vegetative density (e.g., seagrass beds or estuarine subtidal rocky bottoms). These oceanic fishes most often associate with shifting physiographic features of the water column (such as oceanic fronts, current boundaries, temperature discontinuities, or water masses with particular physical characteristics). For HMS, these dynamic habitat associations may be just as important

[1] National Marine Fisheries Service. Unpub. California-Oregon Skipper Logbook and Drift Net Observer Program data and analyses for years 1990-1999, Rand Rasmussen, Southwest Fisheries Science Center, La Jolla, CA 92038.

[2] California Department of Fish and Game, 2000. Debbie Aseltine-Nielsen, California Commercial Passenger Fishing Vessel data, preliminary data analysis, unpub., CDF&G P.O. Box 271, La Jolla, CA, 92038.

as more tangible fixed features such as shelf edges and sea mounts. Nonetheless, for the purposes of this FMP and EIS, proposed EFH designations for all management unit species are fixed or static, as recommended by the new guidance for the EFH final rule effective 19 Feb 2002. These areas, described in section 4.7, therefore represent the range of habitat occupied during various oceanic regimes and conditions, based on data collection primarily during the last two decades, as documented by fishers, anglers, federal observers, and researchers. Within these fixed boundaries also exist dynamic boundaries that shift temporally and spatially, shaped by a species' physiological tolerances for certain water temperatures, salinity or oxygen levels. An ideal model might incorporate both fixed and dynamic boundaries; however, development of such a model may not be practical at this time, and would be time-consuming and costly for species for which these data exists, and impossible for species for which data are incomplete. Certain tolerances, such as preferred sea temperatures, are well known for some species or stages, and essentially can be used to define the actual limits of habitat within EFH fixed boundaries for a particular species or life stage at any given time. Where applicable, we include these temperature preferences in the EFH legal descriptions so that managers can consider this dynamic aspect of EFH that is contained within the fixed EFH boundaries, when assessing possible impacts. Preferred temperatures are also provided for consideration of the potential physiological boundaries of a species within its fixed EFH boundaries. Additionally, detailed life history information and EFH descriptions for the management unit species, by life stage, are contained in Appendix A.

4.2.1.2 Identifying EFH of Tunas, Marlin, Swordfish and Dorado

In general, EFH designations for tunas, marlin, swordfish and dorado are a combination of life history information, expert opinion regarding the importance of certain areas, and presence/absence and relative abundance information from fishery dependent and independent sources, and published information on major oceanographic patterns within the EEZ. The life history accounts in Appendix A. detail what is known about each species' life history, distribution and ecological roles as they relate to habitat use.

Spawning grounds for these species are generally beyond the EEZ waters of the U.S. contiguous West Coast. Thus it is presumed that most habitat occupied within the EEZ is for feeding or growth. These species tend to associate with water column structures because they offer prime feeding opportunities; these structural habitats tend to coincide with areas of upwelling, convergence zones, and other hydrographic features.

Based on the available data and scientific knowledge, EFH has been identified for each species of tuna, marlin, swordfish and dorado managed by this FMP. Life history stages have been combined into ecological groupings indicative of habitat use:

- Spawning, eggs, and larvae: Although most spawn outside of the EEZ, spawning locations were reviewed based on published accounts that have identified concentrations of spawning activity or have extrapolated probable spawning locations from egg and larval distributions.

- Juveniles and subadults: Defined as advanced beyond the larval stage and under the size at first maturation of females. These are swimming stages that show increased mobility patterns and develop transient lifestyles.

- Adults: Fish sexually mature; the size criterion is "those fish greater than or equal to the size at first maturation of females."

The current EFH descriptions for tuna, marlin and swordfish conform to the standards proposed by the EFH regulations. Because data are lacking for these species, EFH is based on presence/absence and relative abundance data, as available. To the extent that environmental information is available, it has been included in the EFH descriptions. The most common factors included are temperature and salinity ranges, depths, and association with particular water masses or currents.

4.2.1.3 Identifying EFH of Sharks

Essential habitat has been identified for each MUS of shark, largely based on presence/absence and relative abundance data. Where environmental information was available, it has been included in the EFH descriptions. In general, the designations of EFH for sharks are a combination of life history information, expert opinion regarding the importance of certain areas, environmental data, and presence/absence and relative abundance information from fishery dependent and independent sources. The life history accounts in Appendix A detail what is known about each species' life history, distribution and ecological roles as they relate to habitat use. Without more basic research on life history, habitat use, behavior and distribution of all life stages of these species, defining EFH for these species will continue to be difficult. Where possible, life history stages have been combined into ecological groupings indicative of habitat use as follows:

- Neonate and small juveniles: Post-partum and young pups estimated to be under 2 yrs old. Occurrence of these stages indicate possible pupping grounds and early juvenile feeding areas.
- Large juveniles and sub-adults: Immature fish which may show increased mobility patterns and more migratory behavior.
- Adults: Fish that are sexually mature, the size criterion being fish greater than or equal to the size at first maturation.

4.2.1.4 Identifying Habitat Areas of Particular Concern (HAPCs)

In the process of reviewing the literature and available data on habitat use and preferences of the MUS, an effort was made to determine specific areas within U.S. West Coast EEZ EFH that satisfied the criteria of being 1) sensitive or vulnerable to environmental stress, 2) rare, or 3) particularly important ecologically.

Because of the general lack of information regarding specific habitat associations for many species, it was not possible at this time to identify HAPCs for the HMS managed under this FMP. Many HMS, because of their migratory nature, utilize the EEZ intermittently and only during certain life stages. For many, the extent of habitat use is not entirely clear, and apparent scarcity of certain life stages (e.g., larger-sized shortfin mako, albacore and bluefin tuna) may to some extent be related to inaccessibility of certain stages to traditional fishing or sampling gear. As information becomes available in the future, it may become possible to identify HAPCs within HMS EFH.

The mostly likely candidates for HAPCs in the near future are shark pupping grounds and core nursery areas, and areas where adult female sharks may congregate to release their young. Experimental sampling and coordination with commercial fishers and anglers is needed to help delineate these areas. In particular, there is a need to define the neonate nursery and feeding areas of the common thresher shark. From limited inshore catch data, these areas are presumed to be in relatively shallow water coastal areas of southern and possibly central California--areas that may be the most vulnerable to anthropogenic disturbance.

4.2.2 Methods Used to Determine Adverse Effects From Fishing Activities

The EFH regulations and the Magnuson-Stevens Act require the fishery management councils and NMFS, on behalf of the Secretary of Commerce, minimize adverse effects on EFH from fishing activities to the extent practicable. Adverse effects from fishing may include physical, chemical, or biological alterations of the substrate, and loss of or injury to benthic organisms, prey species and their habitat, and other components of the ecosystem. Based on an assessment of the potential adverse effects of all fishing equipment types used within an area designated as EFH, the Council should act if there is evidence that a fishing practice is having an identifiable adverse effect on the EFH.

In order to determine whether HMS fishing causes adverse impacts on EFH, an assessment was made of the gears and practices. Impacts of HMS and non-HMS fishing gears and practices were analyzed by examining published literature and anecdotal evidence of potential impacts or comparable impacts from other fisheries. Effects of fishing on fish habitat is discussed in section 4.5.6.

4.2.3 Methods to Determine Adverse Effects From Non-Fishing Related Activities

Section 600.815 (a)(4) of the EFH regulations requires that FMPs identify non-fishing related activities that may adversely affect EFH of managed species, either quantitatively or qualitatively, or both. In addition, section 600.815 (a)(6) requires that FMPs recommend conservation measures describing options to avoid, minimize, or compensate for the adverse effects identified.

Broad categories of activities which may adversely affect HMS EFH include, but are not limited to: 1) actions which physically alter structural components or substrate which may affect MUS or their prey (e.g., dredging, filling, excavations, water diversions, impoundments and other hydrologic modifications); and 2) actions that result in changes to habitat quality (e.g., point source discharges, activities that contribute to non-point source pollution and increased sedimentation, introduction of potentially hazardous materials, or activities that diminish or disrupt the functions of EFH). If these actions are persistent or intense enough, they can result in major changes in habitat quantity as well as quality, conversion of habitats, or in complete abandonment of habitats by some species.

As required under the EFH regulations, section 4.5.7 identifies non-fishing activities having the potential to adversely affect HMS EFH. In many cases, these activities are regulated by particular statutory authorities. As long as they are regulated within those guidelines, their potential to adversely affect EFH may be reduced, although not necessarily eliminated. Many of the standards that are used to regulate these activities are based on human health needs and do not consider long-term impacts on fish and fish habitats. Additionally, if the activity fails to meet or is operated outside its permitted standards, it may adversely affect EFH. The EFH regulations require NMFS and the Councils to identify actions with the potential to adversely affect EFH, including its biological, chemical, and physical characteristics. The EFH regulations also recommend the examination of cumulative impacts on EFH. It is possible that many permitted actions operating within their regulatory bounds may cause adverse impacts on EFH.

Although most HMS tend to be oceanic and more distant from shore and anthropogenic effects, these offshore habitats can be affected by actions that occur in coastal habitats (both terrestrial and aquatic) and in adjacent estuaries. Additionally, the young of some HMS species commonly occur in inshore zones. Many HMS aggregate over submarine canyons or in areas of upwelling, which can serve as conduits for currents moving from inshore out across the continental shelf and slope, redistributing contaminants from the nearshore realm to offshore habitats. Until the precise zones of influence from various river and coastal discharges can be delineated, a precautionary approach should be taken in order to protect the integrity of HMS EFH and the sustainability of HMS fisheries.

Each activity discussed in section 4.5.7 is followed by suggested conservation measures to avoid, minimize, or mitigate its adverse effects on HMS EFH. These include examples of both general and specific conservation measures which may be appropriate for NMFS to recommend when consulting on similar proposed activities. During EFH consultations, NMFS will evaluate each project based on its merits and potential threat to EFH, and the appropriate conservation recommendations will be assessed at that time. The federal action agency with the statutory authority to regulate the proposed action must consider all comments and decide on the appropriate action, modifications or mitigation before proceeding with a project. The conservation measures included in this FMP provide examples of NMFS' recommendations that potentially could be made regarding particular projects. They are intended to assist federal and state agencies and other entities during the planning process when minimization of adverse impacts to EFH can most effectively be incorporated into project designs.

Maps geographically depicting threats to EFH should be included in an FMP. At the present time, however, the information for producing accurate maps depicting threats to HMS EFH is not available. The use of GIS for mapping EFH distributions will allow the addition of this information as it becomes available.

The EFH regulations require that to the extent feasible and practicable, FMPs should analyze how fishing and non-fishing activities influence habitat function on an ecosystem or watershed scale. At this time, the technology is not available to provide a site-specific analysis of cumulative impacts for each area that has been identified as EFH for HMS, although the use of geographic information systems (GIS) technology to map EFH for this FMP will facilitate the investigation of cumulative impacts in the future.

4.3 ANALYSES OF EFH ALTERNATIVES

4.3.1 Introduction

One of the purposes of the MSFCMA is to promote the protection of EFH by requiring Federal agencies to consult with NOAA Fisheries regarding any of their actions authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken that may adversely affect EFH. Once EFH areas are designated, EFH provisions are a proactive means of addressing threats to these areas. Before a Federal agency proceeds with an activity that may adversely affect EFH, the agency must:

- Consult with NOAA Fisheries and, if requested, the appropriate Council for recommended measures to conserve EFH.

- Reply within thirty days of receiving EFH Conservation Recommendations. The agency response must include proposed measures to avoid or minimize adverse impacts on the habitat and an explanation if the agency cannot adhere to the recommendations from NOAA Fisheries.

For example, prior to the establishment of a federal fishing regulation or for granting federal fishing licenses, NOAA Fisheries has to make a determination if this action or activity may have an adverse impact on designated EFH of HMS species or that of any other federally managed species.

If a project may adversely affect EFH, NOAA Fisheries will utilize one of five types of consultations for agency actions that may adversely affect EFH. These consultations range in approach depending on the nature and scope of the action that might adversely affect EFH.

- Existing Procedures - NOAA Fisheries will use existing environmental review procedures, such as those contained the National Environmental Policy Act and the Endangered Species Act, to streamline the consultation requirements of the Magnuson-Stevens Act whenever possible.

- Programmatic Consultation - NOAA Fisheries and the respective Council will make EFH conservation recommendations for the program. When recommendations are accepted by the action agency, no further consultation may be required.

- General Concurrence - Once assured the agency actions may cause only minimal adverse effects, either individually or cumulatively, NOAA Fisheries may not require further consultation. NOAA Fisheries or the agency will track the projects to ensure adverse impacts do not occur. The tracking information will be made available to NOAA Fisheries, the Councils, and the public on an annual basis.

- Abbreviated Consultation - To ensure timely processing, the action agency will initiate consultation with NOAA Fisheries if the proposed action may adversely affect EFH. The agency will submit an EFH Assessment summarizing the proposed project, its expected impacts, and if warranted, supportive scientific information and proposed mitigation. NOAA Fisheries will review the EFH Assessment and any other relevant information and make EFH Conservation Recommendations.

- Expanded Consultation - The action agency will initiate consultation with NOAA Fisheries when the proposed action may result in *substantial* adverse effects to EFH. NOAA Fisheries will review the agency's EFH Assessment and provide Conservation Recommendations.

State Agencies - NOAA Fisheries is required by the MSFCMA to make EFH Conservation Recommendations to state agencies if their actions may adversely impact EFH. However, the state agencies are not legally required to consult with NOAA Fisheries or respond to any recommendations.

4.3.2 Alternative 1: (No Action): EFH would not be designated and described by this FMP.

Analysis. This is not a viable alternative, since the Magnuson-Stevens Act requires that FMPs describe and identify EFH, minimize to the extent practicable adverse effects on such habitat caused by fishing and identify other actions to encourage the conservation and enhancement of such habitat. If the Plan is not adopted, it would represent the baseline condition, which is evaluated in Chapter 9 section 9.1.4.5. NMFS and the states of Washington, Oregon and California presumably would continue to review programs and projects of other agencies under such laws as the Fish and Wildlife Coordination Act and make recommendations to protect habitat, including HMS habitat, but EFH consultations would not be required and the focus that is provided by the EFH designation would not be available. Given the distribution of habitat and the limited degree to which there are known or expected activities by federal agencies that could adversely affect EFH for HMS, there might not be much effective difference in protection for the species without the FMP. Nonetheless, there would presumably be a greater risk that adverse impacts would not be identified due to the lack of designated EFH areas and a mechanism with which to address and mitigate such impacts in a timely manner. This may be especially important for such vulnerable species as thresher and shortfin mako shark.

Methodology Used: The baseline (No Action) condition described in Ch. 9 section 9.1.4.5 was considered in relation to Magnuson-Stevens requirements and also analyzed in comparison to the available data and analyses conducted on EFH for all Management unit species for this FMP.

Geographic Scope: The area within the U.S. West Coast EEZ and throughout the Pacific Ocean with emphasis on the north Pacific, based on fishery-dependent and fishery-independent information.

Habitat Types: The habitat is the epipelagic and mesopelagic waters of temperate, subtropical and tropical waters above the continental shelf, slope, and deep basins and sea mounts of the Pacific Ocean. The shoreward extension of HMS habitat extends into certain shallow coastal and semi-enclosed bays frequented by neonate thresher sharks in central and southern California. It includes shifting oceanic currents, fronts and areas of biological and oceanographic convergence, and encompasses a major eastern boundary current system that supports resident as well as migratory species during various life cycle stages. More detailed description of the physical and biological aspects of this habitat is provided in sections 4.5.1 and 4.5.2.

Environmental Consequences of this Alternative: Designation of EFH should have no direct impact on the environment, but without designations and a focused process to address and mitigate potential negative impacts, there is a greater risk that detection and mitigation of adverse impacts to the offshore pelagic environment may not occur or might be delayed.

Cumulative Environmental Effects of Alternative: The lack of EFH designations for these species should have no direct environmental impact. Large scale natural environmental and climatological perturbations likely have more effect on most HMS and associated species than protection of all or part of their EFH within the U.S. EEZ. However, no EFH protection under this alternative would not provide the added degree of environmental insurance for these species, especially populations more heavily dependent on the EEZ for breeding and/or feeding (e.g., the common thresher shark, shortfin mako).

4.3.3 Alternative 2: (Proposed Action): Adopts species and stage-specific Essential Fish Habitat designations for individual management unit species (MUS) as described in section 4.6 and in Appendix A.

Analysis. This would adopt EFH designations for MUS as described in section 4.6 and Appendix A. It establishes and provides legal definitions of EFH for all MUS covered by this plan, in compliance with the MSFCMA. It also defines EFH based not only on known capture locations and depths of each species and life stage within the EEZ, but also on biological information on their migration and environmental ecology. For example, for species with known oceanic distributions, latitudinal boundaries are generally dictated by the distribution of historical catches, whereas longitudinal boundaries reflect known migratory ranges, oceanic distribution and high seas catch locations. This approach was favored over restricting EFH boundaries only to inshore waters, and reflected only U.S. fishing and sampling effort that has occurred to date within the U.S. West Coast EEZ, as in Alternative 3. In the case of HMS species or life stages whose distributions were determined to be more coastal, outer boundaries reflect the isobaths within which 95% of observed catches were recorded.

Adoption of EFH designations should have no immediate effect on management costs, although such costs may be incurred in the future if an activity is identified as having a deleterious effect on EFH, thus setting in motion the consultation process. But because of the diffuse, offshore and pelagic nature of HMS MUS habitat, damage to which is thought to be much less likely than in the more inshore and benthic habitats of other fishes. No appreciable effects are expected on fishing mortality, community socio-economics, community integrity, protected species interactions, bycatch, user conflicts, or safety of life at sea. Treatment of HMS MUS EFH designation differs from that of the Western Pacific Pelagics FMP, but these mainly have to do with regional differences in habitat utilization between the Western Pacific Council area of jurisdiction and that of the Pacific Council. Additional data needs may be required, relating to the consultation process, should consultations be required in the future. This option reflects compliance with the Magnuson-Stevens Act, which requires designation and description of EFH for FMP MUS, addresses HMS FMP Management Objective 14 to maintain the current quantity and productive capacity of HMS habitats, and is consistent with the International and U.S. National Plans of Action for Conservation and Management of Sharks (IPOA-Sharks goal 2, and its implementation in the U.S. NPOA -Sharks).

<u>Methodology Used</u>: Examination and analysis of presence/absence and relative abundance data from fishery and fishery-independent sources, supplemented by other environmental information, such as preferred temperature ranges and water depths; current associations; centers of known target prey distribution; and other environmental preference information reported in the literature. Methods are explained in more detail in section 4.2, Methods and Data Sources.

<u>Geographic Scope</u>: Specific habitat designations refer to area within the U.S. West Coast EEZ only, but are also based on fishery-dependent and fishery-independent information from throughout the Pacific Ocean with emphasis on the north Pacific.

<u>Habitat Types</u>: Epipelagic and mesopelagic waters of temperate, subtropical and tropical waters above the continental shelf, slope, and deep basins and sea mounts of the Pacific Ocean. The shoreward reaches of HMS habitat extends into certain shallow coastal and semi-enclosed bays frequented by neonate thresher sharks in central and southern California. It includes shifting oceanic currents, fronts and areas of biological and oceanographic convergence, and encompasses a major eastern boundary current system that supports resident as well as migratory marine species during various life cycle stages. More detailed description of the physical and biological aspects of this habitat is provided in sections 4.5.1 and 4.5.2.

<u>Environmental Consequences of this Alternative</u>: Designation of EFH should not have any direct environmental impact, and habitat for many of the MUS includes much of the Pacific Ocean Basin, thus the proportional impact to the marine environment from these and most other HMS FMP alternatives would be similar to the No Action alternative. However, species and stage-specific designations of EFH, by providing more comprehensive and the most detailed descriptions of each species' EFH requirements, should provide more focused attention to their environmental needs and protection, and, by association, that of co-occuring species.

<u>Cumulative Environmental Effects of Alternative</u>: Large scale natural environmental and climatological perturbations likely have more effect on most HMS and associated species than protection of all or part of their EFH within the U.S. EEZ. However, protection of EFH under this alternative would provide an added

degree of environmental insurance for these species, especially populations more heavily dependent on the EEZ for breeding and feeding (e.g., the common thresher shark).

4.3.4 Alternative 3: Adopts a broad designation of EFH to apply to all MUS collectively, i.e., all surface waters of the ocean in the EEZ down to 1000 m depth (the lower bound of the mesopelagic zone).

Analysis. Adopting a general, collective EFH designation for MUS recognizes that most of these species are widely distributed in the pelagic zone over vast regions of the Pacific. In one sense it is more precautionary because it is all-inclusive, covering all oceanic and inshore waters throughout the EEZ down to 1000 m. On the other hand, it tends to overgeneralize EFH and MUS dependence on it, masks interspecific differences in habitat preferences, and makes it more difficult to identify possible impacts on those habitats on a more specific level. Additionally, these thirteen MUS are highly varied in their respective distributions within the U.S. West Coast EEZ. Some utilize the EEZ on the fringe of their more tropical ranges (e.g., dolphinfish, pelagic thresher shark, striped marlin, yellowfin tuna, bigeye tuna, skipjack tuna), others move into the zone periodically as part of a more basin-wide migratory pattern primarily to forage (e.g., swordfish, albacore, bluefin tuna, bigeye thresher, blue shark), while others may be more regionally dependent on specific areas within the zone for certain critical stages of their life histories (e.g., common thresher shark, shortfin mako shark). Because of this varied habitat use among MUS and their life stages, the preferred alternative 2 was chosen over this more generalized alternative, since the former provides a more detailed species- and stage-specific approach to EFH designation within the U.S. West Coast EEZ.

Methodology Used: Consideration of factors revealed by the more detailed examination of EFH by species and their life stages for the proposed alternative were compared with EFH designations for same species/stocks by the Western Pacific Regional Fishery Management Council in their Pelagics FMP. One rationale was that applying this broader definition of EFH (throughout the EEZ down to 1000 m) would make designations in this FMP more consistent with those of the WPRFMC for HMS.

Geographic Scope: The Council considered habitat areas for MUS in both Hawaii and U.S. West Coast EEZ water, as well as habitat occupied on the high seas, in analyzing this alternative.

Habitat Types: Same as described in section 4.3.1

Environmental Consequences of this Alternative: Designation of EFH should not have any direct environmental impact, and habitat for many of the management unit species includes much of the Pacific Ocean Basin, thus the proportional impact to the marine environment from these and most other HMS FMP alternatives would be minimal. However, as a management tool, this alternative will probably have the same effect as the No Action alternative because of its lack of focus on specific environmental preferences of the different management unit species.

Cumulative Environmental Effects of Alternative: Large scale natural environmental and climatological perturbations likely have more effect on HMS and associated species than protection of all or part of their EFH within the U.S. EEZ, especially sharks. But a broad designation may provide some degree of protection for these species, although the general designation makes it more difficult to assess possible impacts that relate to interspecific or life stage differences in habitat preference. Increases in mortality on certain life stages of some species have more may have more impact on population growth and health than others.

4.3.5 Alternative 4: Adopts designations of EFH for individual Management Unit Species in the surface waters of the ocean in the EEZ down to 1000 m depth (the lower depth of the mesopelagic zone), but restricts EFH areas to documented capture locations only.

Analysis. This alternative would adopt designations based on documented occurrences of a given species or life stage in the U.S. West Coast EEZ. It is more strongly linked to the distribution of sampling or fishing effort, which has taken place largely in the inshore half of the EEZ. This alternative has the advantage of basing EFH on fully documented distributional data representing actual geographic occurrences. It was not the preferred alternative, however, because it largely ignores offshore areas where little if any sampling effort has been expended, but where these species likely occur given similarities in habitat, their migratory capabilities and oceanic ranges, and their occurrence in high seas catches in adjacent areas just outside the EEZ.

Methodology Used: Data and information used was a subset of that used for the preferred alternative (consisting of documented occurrences only).

Geographic Scope: Scope is more narrow in that it considers only those geographic areas for which a specific catch or collection of a species was recorded, rather than extrapolating geographic area occupied also from information on known species' ranges, migrations, water quality preference, and presumed migratory routes from tagging data.

Habitat Types: This alternative considers habitat only in the sense of association with known catch localities or points.

Environmental Consequences of this Alternative: Designation of EFH should not have any direct environmental impact, and habitat for many of the management unit species includes much of the Pacific Ocean Basin, thus the proportional impact to the marine environment from these and most other HMS FMP alternatives would be similar to the No Action alternative. However, this alternative would provide an added degree of environmental protection, but less than alternatives 2 and 3 because of the smaller area designated.

Cumulative Environmental Effects of Alternative: Again, large scale natural environmental and climatological perturbations likely have more effect on HMS and associated species than protection of all or part of their EFH within the U.S. EEZ. However, protection of EFH under this alternative would provide some degree of added protection for these species, especially sharks, although protection would be less than alternatives 2 and 3 because of the smaller area designated.

4.4 HABITAT AREAS OF PARTICULAR CONCERN (HAPCs)

There are no HAPCs designated at this time, but through this FMP, a framework is authorized to ensure review and updating of EFH based on new scientific evidence or other information as well as incorporation of new information on HMS HAPCs as it becomes available in the future.

Reviewing and identifying HAPCs would entail additional management costs and an increase in data needs to survey and determine HAPC (such as shark pupping grounds), and for periodically reviewing and updating EFH designations. But incorporating a framework should save costs in the long run by avoiding the necessity of having to go through the amendment process every time new data necessitated revision. There may be some inconsistency with the Western Pacific FMP, which has a different type of framework relating to EFH, but the WPFMC management area also has regional differences in habitat utilization and a different plan development design and history.

Research is needed to identify HAPCs, such as shark pupping grounds, key migratory routes, feeding areas, and areas of concentration of large adult females. The Council recommends adoption of EFH designations as presented without identification of HAPCs at this time, because of lack of information on specific habitat dependencies for species that may occupy critical habitat in the EEZ, such as the more coastal-occupying sharks. Some of the more transitory MUS that invade the region only at the far fringes of their distributions (e.g., the tropical tunas and dorado), probably do not occupy habitat within the EEZ essential to the health and survival of their populations. If HAPCs of these species, and those of others that have more regional distributions, become identified in the future (such as pupping areas of thresher and mako sharks), it is recommended that the Council make every effort to protect them, especially if found to be concentrated in localized definable areas.

4.5 AFFECTED ENVIRONMENTS

4.5.1 Physical Environment

The west coast of North America from the Strait of Juan De Fuca to the tip of Baja California is part of an eastern boundary current complex known as the California Current System (Hickey 1998). The U.S. West Coast EEZ encompasses one of the major coastal upwelling areas of the world, where waters provide a nutrient-rich environment and high densities of forage for HMS species, especially from the Columbia River Plume south to the southern California Bight. The region is influenced by various currents and water masses, the shifting nature of which affects the occurrence and distribution of HMS at particular times of the year and from year to year (Figure 1). Diverse bathymetric features also influence current patterns and concentrations of HMS prey and their predators (Figure 2). Large-scale currents within this region include the surface-flowing California Current and Inshore Countercurrent (Davidson Current), and the subsurface California Undercurrent. The region includes two major river plumes (Columbia River and San Francisco Bay), several smaller estuaries, numerous submarine canyons (especially in the north), and the complex borderland of the Southern California Bight with its offshore islands, undersea ridges and deep basins. The system generally contains waters of three types: Pacific Subarctic, North Pacific Central and Southern (or Subtropical Equatorial) (Hickey 1998). Pacific subarctic water, characterized by low salinity and temperature and high oxygen and nutrients is advected equatorward along the coast by the California Current.

The California Current forms the eastern limb of a large clockwise circulation pattern in the North Pacific Ocean, being broader in the north and narrower in the south, extending approximately to the outer EEZ boundary south 40° N latitude (Figure 1). The cold, low salinity water of the California Current dominates much of the EEZ. Its position and intensity changes seasonally and from year to year with shifts in the southeastern extension of the Subarctic Frontal Zone (California Front). Shoreward it mixes with plumes of cold, more saline upwelled water in the north, or warm countercurrent and gyre water of the Southern California Bight in the south.

Seaward, the California Current mixes with the more oceanic waters of the Transition Zone. This zone lies between the Subarctic and Subtropical fronts, separating the Subarctic Water Mass and North Pacific Central Water Mass (Saur 1980; Lynn 1986; Smith et al. 1986). During the winter and spring, westerlies in the denser portion of this Transition Zone and trade winds to the south create convergent fronts where colder water from the north meets warmer, less dense water from the south. In this area, extending across northern the Pacific, is a chlorophyll front located at the boundary between the low chlorophyll subtropical gyres and the high chlorophyll subarctic gyres. This chlorophyll front is distinct from the subtropical and subarctic fronts, but seasonally migrates through these two features (Polovina 2001). Areas of convergence along this front concentrate phytoplankton and other organisms (shrimps, squids and other fishes), serving as forage habitat for higher trophic level predators, such as albacore, skipjack tuna, bluefin tuna, swordfish, marlin, blue shark and dolphinfish (Pearcy 1991; Polovina et al. 2000; Polovina et al. 2001).

Physical oceanographic features of the environment change seasonally and also during periods of large scale, oceanic regime shifts such as El Niño. The California Current generally flows southward year round, with strongest flows in spring and summer. Inshore, these flows may be reversed by the seasonal appearance in fall and winter of the surface poleward-flowing Inshore Countercurrent (Lynn and Simpson 1987). The California Undercurrent primarily intensifies in late spring and summer as a narrow ribbon of high-speed flow which presses northward at depth against the continental slope, generally beneath the equatorward flowing upper layers (Lynn and Simpson 1987). Coastal upwelling of cold, salty and nutrient-rich water to the surface occurs primarily in spring and summer in California and into early fall off Oregon, driven by prevailing seasonal winds. Upwelling is often most intense near such promontories as Cape Mendocino and Point Conception. During El Niño events, flow in the California Current is anomalously weak, the California Undercurrent is anomalously strong, and the water in the upper 500 m of the water column is anomalously warm (Chelton et al. 1982).

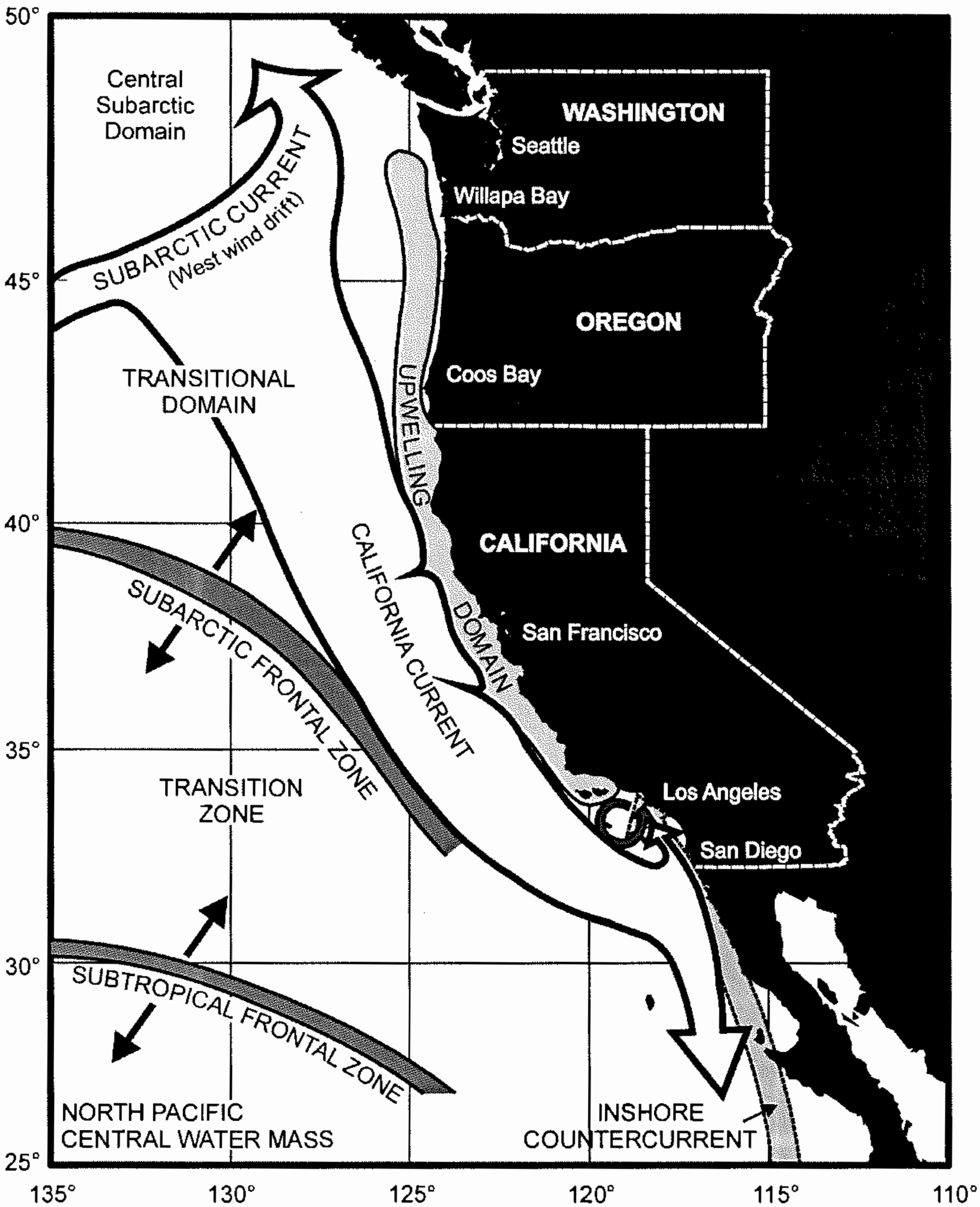

Figure 1. Major current and water mass systems that influence essential fish habitat of highly migratory management unit species in the U.S. West Coast EEZ.

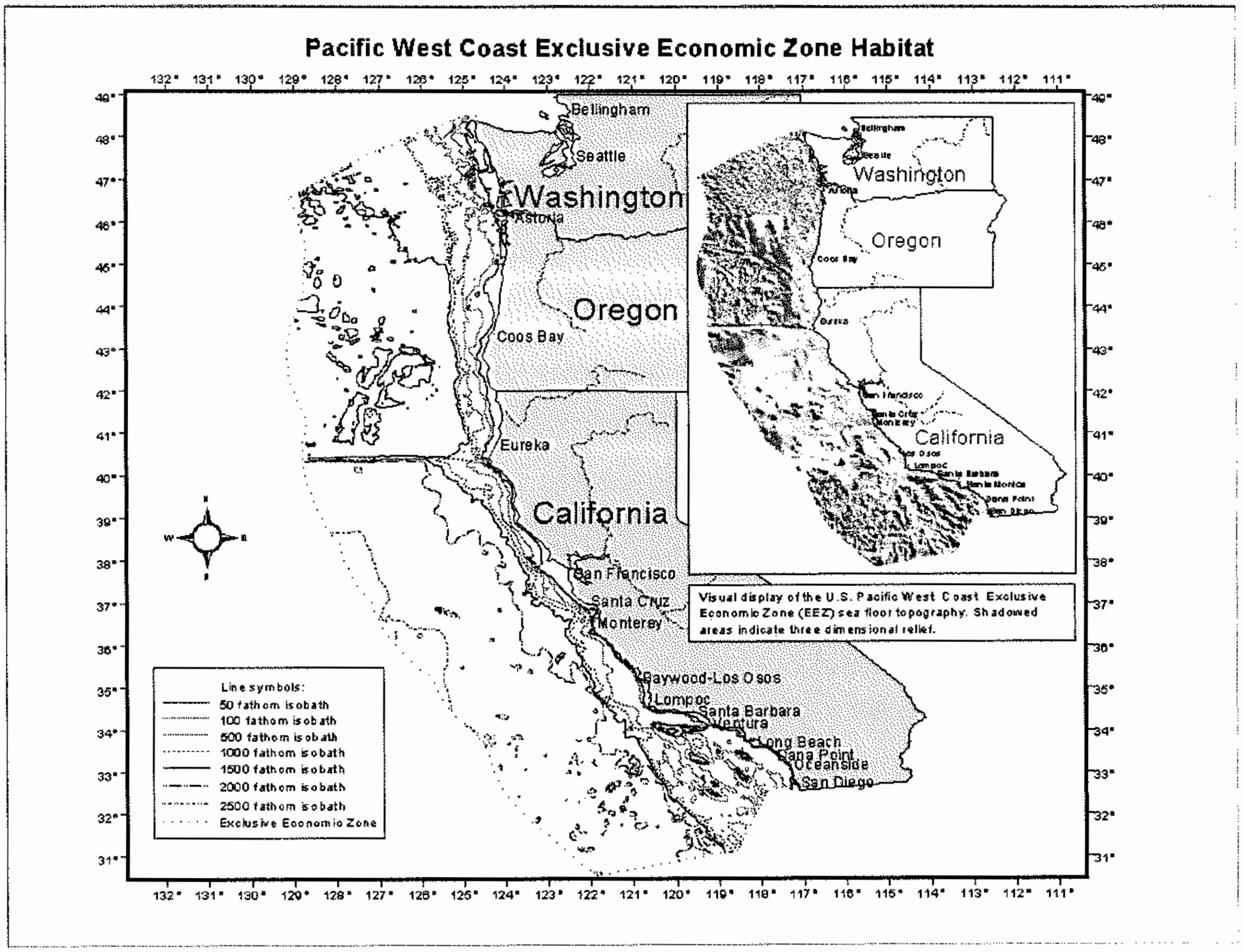

Figure 2. U.S. West Coast sea floor bathymetric features within the U.S. West Coast EEZ, which in turn influence current patterns and concentrations of HMS prey and thus distribution of highly migratory management unit species.

Although the coastline is relatively straight between the Strait of Juan de Fuca and Baja California, a large bend occurs from Point Conception to San Diego. This region, called the Southern California Bight (SCB), differs dramatically from regions to the north and south (Hickey 1998). The shelves in this area are generally very narrow (< 10 km), but can also be relatively wide in certain areas such as Santa Monica Bay and the San Pedro Shelf south of Long Beach. The sea bed offshore is cut by a number of deep (> 500 m) basins. South of Point Conception a portion of the California Current turns in a counterclockwise gyre. This feature is called the Southern California Countercurrent during years when the northward flow successfully rounds Point Conception, or the Southern California Eddy, when the flow recirculates within the Bight (Hickey 1998). The ocean is generally warmer and more protected here than areas to the north, especially inshore of a line roughly drawn from San Miguel Island to San Clemente Island.

Within the EEZ south of Point Conception, the California Current serves as a cold water barrier between the warmer, more tropical waters of the Southern California Bight inshore of the Santa Rosa-Cortes Ridge, and the warmer, higher salinity oceanic waters to the west beyond the outer EEZ boundary (Hickey 1998; Lynn and Simpson 1990; Lynn et al. 1982, Norton 1999). The pattern and intensity of the California Current and of upwelled waters, can influence habitats by serving as a cool barrier, preventing incursion of warm water into more northerly EEZ waters. Conversely, relaxation of these cold-water barriers can increase habitat in the EEZ for warm water tunas and billfishes from the west and south. Additionally, intensification of the northerly flowing Davidson Current, or other incursion of warm, southerly waters from Mexico, can enhance and extend habitat for warm water tunas and billfish into the inshore waters of the U.S. EEZ.

From Point Conception northward to off Cape Flattery, Washington, the coastline is relatively unprotected from the force of the sea and prevailing northwest winds. In contrast to the Southern California Bight, rugged water and sea state conditions are common north of Point Conception. During much of the year, the coastal waters of central Oregon to offshore central Washington are under the influence of the eastern portion of the eastward flowing Subarctic Current or West Wind Drift. The current has a moderating influence on coastal temperatures during the summer, when sea surface temperatures may be several degrees warmer from off northern Oregon to central Washington than to the south off California and the north off British Columbia (Squire and Smith 1977). In this region the Columbia River freshwater plume also has a considerable effect on oceanographic features along the northwest coast. The plume flows poleward over the shelf and slope in fall and winter, and equatorward well offshore of the shelf in spring and summer, extending its influence as far south as Cape Mendocino, California (Hickey 1998).

4.5.2 Biological Environment

In addition to highly migratory species, the marine ecosystem offshore Washington, Oregon and California is home to groundfish species (shelf and slope rockfishes, Pacific whiting, flatfishes, sablefish, lingcod, greenlings, sturgeon; sharks; skates, rays); four species of Pacific salmon; steelhead; small coastal pelagic species (sardines, herring, anchovy, mackerels, smelts, and squid); marine mammals (California sea otter and various whales, porpoises and dolphins, sea lions, and seals); pelagic seabirds (including northern fulmar, brown pelican, albatrosses, shearwaters, loons, murres, auklets, storm petrels and others) (Leet et al. 2001).

The California Current system is particularly rich in microscopic organisms (diatoms, tintinnids and dinoflagellates) which form the base of the food chain, especially in upwelling areas. This rich supply of diatoms and other small plankters also provides food for many zooplanktonic organisms such as euphausiids, shrimps, copepods, ctenophores, chaetognaths, oceanic squids, salps, siphonophores, amphipods, heteropods, and various larval stages of invertebrates and fishes. Grazers like small coastal pelagic fishes and squid depend on this planktonic food supply, and in turn provide forage for larger species nearer the apex of the food chain, such as highly migratory tunas, marlin, swordfish, sharks and dorado. Certain seabirds and turtles and also baleen whales also depend on the planktonic food supply, and many fishes, seabirds and toothed cetaceans feed on fishes that are plankton feeders. In the outer EEZ and to the west also lies the rich chlorophyll front that moves seasonally through the subtropical and subarctic fronts, serving as a rich forage habitat for a variety of organisms (Polovina 2001). In the more coastal areas, multi-celled alga like the giant kelp also provide temporary refuge and foraging opportunities for HMS such as dorado and juvenile tunas. The kelp also provides food, shelter, substrate and nursery areas for nearly 800 animal and plant species (Bedford 2001). In addition to the thirteen HMS management unit species and species mentioned above, many other species inhabit the oceanic pelagic zone and are taken by HMS gear in waters of the EEZ and beyond. These include louvar, oarfish, lancetfishes, escolar, oilfish, opah, saury, common mola, spearfish, sailfish, blue marlin, wahoo, bonito, black skipjack, and 18 species of sharks and rays (Table 3-2, Chapter 3).

Episodic oceanographic events such as El Niño (warm water incursion) and La Niña (cooler water incursion) may effect the occurrence and distribution of organisms and the short-term productivity of the system. Longer periods of certain ocean temperature regimes that persist for decades can also affect reproduction and recruitment of marine species (e.g., sardine, rockfish) for several generations and result in substantial changes in abundance over time (Leet et al. 2001). During episodic or persistent warm periods, the more tropical species (such as striped marlin, pelagic thresher shark, dorado, tropical tunas, loggerhead sea turtles) may become more abundant within the EEZ, along with some of the more tropical prey species upon which they feed (e.g., pelagic red crab).

4.5.2.1 Fishery Resources

According to the NMFS (1999), the Pacific Coast fisheries resources have a prorated U.S. long term potential yield of approximately 852,263 mt. The major species are Pacific salmon, Pacific groundfish, coastal pelagic species, Pacific halibut, highly migratory species, and nearshore resources.

The chinook (king) and coho (silver) salmon are the main salmon species taken in the ocean management area off California, Oregon and Washington. In odd-numbered years, the Council may manage special fisheries near the Canadian border for pink salmon. Sockeye, chum and steelhead are rarely caught in the ocean fisheries within the Pacific Council's jurisdiction, where there are no directed ocean fisheries for these species. All five salmon species are fully or overutilized. Depressed production is thought to be due to a combination of factors, including habitat degradation and generally unfavorable ocean conditions for salmon off the Pacific coast since the late 1970's. Some stocks are depleted and have triggered ESA designations and status. Of the 51 distinct populations of west coast salmon and steelhead identified by NMFS, 26 have been listed as threatened or endangered under the ESA. Since 1977, salmon fisheries in the EEZ off Washington, Oregon, and California have been managed under salmon fishery management plans of the Pacific Fishery Management Council, in cooperation with commercial, recreational and tribal interests. The Council annually develops recommendations for managing over 50 populations of hatchery and naturally spawning salmon. The recommendations are reviewed for consistency with applicable law and implemented in the EEZ by the National Marine Fisheries. The states of Washington, Oregon and California implement their own regulations in state waters (0-3 nm) which comport with the federal management measures.

Coastal pelagic species such as sardine, herring, anchovy, mackerels, smelts, and squid, typically fluctuate widely in abundance, and some stocks are low in abundance relative to historical levels and are fully utilized. The Pacific sardine population, forage of many HMS, has been increasing after decades of low abundance, and in 1999 accounted for about 50% of the recent average yield for the coastal pelagic FMP complex of species. Jack mackerel and northern anchovy are underutilized in a fishery sense, but are also important forage of certain HMS. Northern anchovy, Pacific and jack mackerels, market squid and Pacific sardine are managed under the Council's Coastal Pelagic Species Fishery Management Plan. Along the U.S. West Coast, the commercial fishery for herring takes place primarily in California waters and is managed by the State of California with catch quotas based on population and spawning escapement estimates. Since 1973, herring in California have been harvested primarily for their roe for export to the Japanese market. Smelts are managed by the states.

Most groundfish are managed under the Council's Groundfish Management Plan. The groundfish fishery harvests a vast array of bottom-dwelling species off Washington, Oregon and California (e.g., shelf and slope rockfishes, Pacific whiting, flatfishes, sablefish, lingcod, greenlings, dogfish shark, skates, rays). Pacific halibut, an economically important flatfish, is managed by the United States and Canada in a bilateral commission known as the International Pacific Halibut Commission, which sets total allowable catch levels. Regulations for the U.S. portion of the fishery are set in place by NMFS, and the PFMC describes this halibbut catch division each year in a Catch Sharing Plan. The average yield of groundfishes was approximately 76% of the West Coast long term potential fishery yield in the late 1990s (NMFS 1999). Some species are overexploited, some have experienced periods of low recruitment, and some are underutilized. Pacific whiting dominates the commercial catch, accounting for about 78% of the west coast groundfish catch. Rockfish and lingcod also support popular recreational fisheries. Certain stocks, such as Pacific ocean perch, need rebuilding following overutilization and a period of poor recruitment. Shortbelly rockfish is underutilized because of a lack of market, but this pelagic rockfish is also an important prey species for a variety of fish, bird and mammal predators in the California Current system.

Pacific coast invertebrate resources are diverse and important both commercially and recreationally. Shrimp, sea urchin, crab, clam, lobster, sea cucumber and abalone fisheries are relatively small in terms of tonnage landed, but they contribute substantially to the value of Pacific coast fisheries, due to the high prices they command. Most shellfish species are fully utilized (NMFS 1999).

Marine recreational fisheries are important along the Pacific Coast and especially so in southern California. A wide variety of species is taken, and the recreational catch of some species greatly exceeds the commercial catch. Salmon, rockfish and HMS species such as the tunas, billfish, and pelagic sharks are highly prized. In coastal waters, especially in California, anglers fish for California halibut, Pacific barracuda, bonito, smelts, white sea bass, sand basses, California sheephead, and croakers. There is also bay, lagoon and slough angling for striped bass, sturgeon, leopard and sevengill sharks, surfperch, starry flounder, jacksmelt and topsmelt, and beach netting for smelts. Recreational crabbing, clamming and abalone diving activities are also popular along the Pacific Coast.

Marine Mammals and Sea Turtles. See next section, Threatened or Endangered Species and Marine Mammals and Their Habitats, 4.5.2.2.

Seabirds, General. Over seventy species of pelagic seabirds occur in the pelagic environment offshore Washington, Oregon and California. These include Northern Fulmar, Brown Pelican, albatrosses, shearwaters, loons, grebes, murres, auklets, murrelets, storm petrels, phalaropes, skuas, gulls, terns, puffins, and guillemots (Ainley and Leet 2001). Some, like the albatrosses, use the wind and their gliding abilities to search vast expanses of the ocean for food. Others have more restricted foraging ranges, taking their prey (e.g., small fishes and/or invertebrates) from at or near the sea surface by dabbing or making shallow dives. Still others (e.g., murres, loons) dive to depths greater than 300 feet in pursuit of prey. Often birds seek areas where ocean processes concentrate their prey along fronts and areas of convergence, similar to areas where highly migratory species congregate to feed. Thus like large pelagic fish, seabird distribution at sea is often heavily influenced by the changing physical oceanography of the area that affects the distribution of prey. According to Anderson et al. (1992) and others, seabird populations have a number of characteristics in common which make them susceptible to harm caused by environmental and human-induced changes in their habitat. Resident seabirds concentrate their nesting efforts over several months at small areas, and they traditionally use the same nesting areas year after year, where they can be susceptible to predation and other coastal disturbances. Some birds (e.g., pelican, cormorants, gulls) also concentrate in roosts or resting sites when not at sea. Many seabirds depend on concentrated food supplies, where food and game fish also concentrate and where the birds may compete or interact with fishers or anglers and their operations. Some seabirds, like albatrosses, cormorants and pelicans also tend to scavenge food from the surface so may opportunistically scavenge bait from hooks or nets and then become snagged or entangled and drown. Seabirds also tend to be closely dependent on prey resources that are highly effected by oceanic regime shifts. Many, like the albatrosses, tend to be long-lived with low annual reproductive rates, and cannot usually recover rapidly from large impacts on their populations.

4.5.2.2 Threatened or Endangered Species and Marine Mammals and their Habitats

This section summarizes information about the marine species that occur in or near the management area that are listed under the ESA and for which assessments of potential impacts from the fisheries are necessary. Potential impacts of specific proposed actions and alternatives are also assessed separately, by alternative, in Chapter 9. More detail about these species can also be found in Appendix E of this FMP.

4.5.2.2.1 Marine Mammals

Southern Sea Otter (*Enhydra lutris nereis*). The southern (California) sea otter was listed as threatened in 1977 under the Endangered Species Act of 1973, as amended. This species generally forages over rocky or soft-sediment ocean bottom, primarily in water depths 82 ft deep or less within 1.2 miles of shore. The population historically ranged from Northern California and Oregon south to Punta Abreojus, Baja California, Mexico. The southern sea otter population now contains about 2,000 individuals and ranges between Half Moon Bay south to Gaviota, California. Approximately 14-20 otters, including pups, are at San Nicolas Island as a result of translocation efforts to establish an experimental population. Estimates of carrying capacity in California range between 13,500 to 30,000 individuals. The population is recognized as depleted pursuant to the Marine Mammal Protection Act. Reduced range and population size, vulnerability to oil spills, and the oil spill risk from coastal tanker traffic were the primary reasons for the threatened status. Incidental drowning in set gill nets and trammel nets was once considered a problem, but since the early 1990s, State restrictions on inshore netting have removed these operations from otter areas. HMS fishing operations, which take place primarily offshore and outside otter areas, are not considered a significant threat to this species.

Humpback whale (*Megaptera novaeangliae*). The humpback whale has been listed as an endangered species under the United States Endangered Species Act (ESA) since 1970. There appear to be multiple populations of humpback whales in the North Pacific (Carretta et al. 2002; Forney et al. 2000). Aerial, vessel and photo-identification surveys and genetic analyses indicate that within the U.S. West Coast and Alaska EEZ, there are at least three relatively separate populations that migrate between their respective summer/fall feeding areas and winter/spring calving and mating areas, with some limited interchange among certain breeding areas. The stock that primarily occurs off the U.S. West Coast spends winter/spring in coastal Central America and Mexico and migrates to off California, Oregon and Washington in summer and fall. Another winter-spring population that originates in Japan, also migrates to areas west of Kodiak, Alaska in summer/fall. Overall, the eastern Pacific stock appears to be increasing in abundance. The Alaska feeding population migrates to its breeding grounds in Hawaii and offshore islands in Mexico. The California feeding population is thought to consist of about 1,000 animals. The California population appears to be growing at about eight percent per year. In California, Oregon, and Washington, most survey sightings occur in the inshore third of the EEZ. During their seasonal migrations, humpback whales may frequently be seen along the California coast from April through November. Some individuals appear to remain in California year-round. In the Gulf of the Farallones, humpbacks may be observed feeding during May and November. They obtain their food by straining krill (small shrimp-like crustaceans) and schools of small fish with their baleen. Off southern California, humpbacks often migrate along submarine ridges (*e.g.,* Santa Rosa-Cortez Ridge) and occasionally enter the coastal waters of the San Pedro and Santa Barbara Channels. In 1997, one humpback whale was snagged by a central California troller, and the animal swam away with the hook and many feet of trailing monofilament; though this type of injury is not considered serious (Carretta et al. 2002 ibid, citing NMFS Southwest Region unbublished data). One humpback of the central north Pacific stock was observed entangled by a Hawaii longlininer in 1991, but due to the low level of observer coverage that year, an extrapolated mortality estimate for the fishery could not be calculated (NMFS Honolulu Laboratory, HI unpub data 7/20/01). In the past, drift gill net operations contributed to fishery mortality in the U.S. West Coast EEZ, but after the 1997 implementation of a Take Reduction Plan, which included skipper education workshops and required the use of pingers and minimum 6-fathom extenders, overall cetacean entanglement rates in the DGN fishery dropped considerably. Recent (1997-2000) estimated annual take rates have averaged zero. Some gillnet mortality of large whales may go unobserved because whales may swim away with a portion of the net, but the fate of these animals in not known. The deaths of two humpback whales that stranded in the Southern California Bight have been attributed to entanglement in fishing gear (Heyning and Lewis 1990), and a humpback whale was observed off Ventura, CA in 1993 with a 20-ft section of netting wrapped around and trailing behind. During the period 1996-2000, a humpback cow-calf pair was seen entangled in a net off Big Sur, CA in 1999, and another lone humpback was seen entangled in line and fishing buoys of Grover City ,CA but the fate of these animals is not known (Carretta et al. 2000 citing Cordero, NMFS, SWR unpub. data). Based on strandings and gill net observations, annual humpback whale mortality and serious injury in California-based DGN fishery is probably greater than 10% of the PBR; therefore total fishery mortality may not be approaching zero mortality and serious injury rate. Additionally, increasing levels of anthropogenic noise in the world's oceans have been suggested to be habitat concern for whales, particularly for baleen whales that may communicate using low-frequency sound. (Caretta et al. 2002)

Blue whale (*Balaenoptera musculus*). The blue whale has been listed as endangered under the ESA since 1970. The majority of the eastern north Pacific population spends the summer on feeding grounds between central California, the Gulf of Alaska and the Aleutian Islands. Like all baleen whales, the blue whale seasonally migrates to lower latitudes in the winter to calve and breed. Historically, the North Pacific population may have been comprised of over 5,000 individuals before its severe depletion by modern whaling operations. An estimated 1,700 to 1,900 blue whales currently inhabit the eastern North Pacific Ocean. It is estimated that the California feeding population is comprised of at least 1,700 whales. No information exists on the rate of growth of blue whale populations in the Pacific. Migratory routes generally follow the continental shelf and slope, but blue whales are occasionally found in deep oceanic zones and shallow inshore areas. Blue whales are usually seen off the California coast traveling alone or in pairs, from May to January, although they have been observed in every month of the year. They frequently may be seen feeding in the Farallon Islands between July and October and occasionally are sighted in Monterey Bay and over deep coastal submarine canyons off central and southern California. There are no reports of fishery-related mortality or serious injury in any of the world-wide blue whale stocks, although it is possible that some may carry away gear undetected. The offshore DGN fishery is the only fishery that is likely to take blue whales in the action area, but no fishery mortalities or serious injuries have ever been observed (Forney et al. 2000). Blue whale longline takes are not expected, although the species does occur in the proposed fishing area, and float lines from longlines have the potential to occasionally entangle whales (Perrin et al. 1994). The increasing level of anthropogenic noise in the world's oceans has been suggested to be a habitat concern for blue whales (Forney et al. 2000). Ship strikes have been implicated in the deaths of blue whales and additional mortality from strikes probably goes unreported because the whales do no strand, or if they do, they do not always have obvious signs of trauma. But the average observed annual mortality due to ship strikes was estimated at zero per year for the period 1994-98.

Fin whale (*Balaenoptera physalus*). This species has been listed as endangered under the ESA since 1970. It is a relatively common, large cetacean occurring off the U.S. West Coast. The species is distributed throughout the world's oceans, but little is known of its seasonal movements in the North Pacific. The North Pacific population reportedly winters between central California southward to 20° N latitude and summers from Baja California to the Chukchi Sea. This species uses its baleen to filter krill, capelin, sand lance, squid, herring, and lanternfish from the water. Approximately 1,000 fin whales are estimated to be off California. There is some indication that fin whales have increased in abundance in California coastal waters, but the trends are not statistically significant. Fin whales are a deep-diving, temperate coastal species and have been observed in every month of the year in California, with an increase in abundance during summer. They tend to be distributed further offshore than humpback or grey whales, but are both a nearshore and offshore species, sometimes occurring in water as shallow as 30 meters. Underwater sills or ledges may be an important feature of fin whale feeding habitat, as are areas of upwelling and interfaces between mixed and stratified waters. The offshore DGN fishery is the only fishery that is likely to take fin whales in the action area, but no fishery mortalities or serious injuries have ever been observed. There is also a possibility of entanglement in longlines, but no such interactions have ever been documented, and it is unknown whether such 'takes' would result in mortality or serious injury. Ship strikes have been known to kill fin whales in the action area, and additional mortality from strikes probably goes unreported because the whales do no strand, or if they do, they do not always have obvious signs of trauma. The average observed annual mortality due to ship strikes has been estimated at 0.4 fin whales per year for the period 1994-98 (Forney et al. 2000).

Sperm whale (*Physeter macrocephalus*). The sperm whale has been listed as an endangered species under the ESA since 1970. It is widely distributed across the entire North Pacific, occurring off all three Pacific Coast states, and is found year-round in California waters. Unlike the other large whales, the sperm whale does not feed with baleen, but is a toothed whale. It is the largest of the toothed cetaceans with males reaching a length of 60 feet and females 40 feet. Sperm whales are noted for their ability to make deep dives, which can last up to an hour and a half and can be as deep as two miles below the surface. They feed mainly on squid, including the giant squid. Abundance appears to be fairly stable with approximately 1,000 to 1,200 sperm whales estimated to be off the coast of California (Forney et al. 2000). They reach peaks in abundance from April through mid-June and from the end of August through mid-November. Their distribution off our coast appears to be continuous with animals observed farther west out to Hawaii. Sperm whales are thought to shift poleward in spring and summer, returning to temperate and tropical portions of their range in fall. Their habitat may be as deep as 1,000 m or more. Sperm whales usually live offshore, but may occur close to coasts where water depths exceed 200 m. They are most common in submarine canyons at the edges of the continental shelf, but also occur in mid-ocean. The sperm whale is known to interact with longline gear, and may actively seek out vessels and gear in its search for food. In 1997, the first entanglement of a sperm whale in Alaska's longline fishery was recorded, although the whale was not seriously injured. No takes have been documented in the Hawaiian longline fishery (Forney et al. 2000) or in the California-based longline fishery, although the latter fishery has only recently begun to carry observers. Observers aboard Alaska sablefish and Pacific halibut longline vessels have documented sperm whales feeding on longline-caught fish in the Gulf of Alaska (Perry et al. 1999 citing Hill and Mitchell). Similar behavior has been reported in longline fisheries off South America, where sperm whales have become entangled in gear, have been observed feeding on fish caught with the gear, and have been reported following vessels for days (ibid.). In the past, drift gill net operations contributed to fishery mortality within the U.S. West Coast EEZ, and the average annual rate of mortality and serious injury from the offshore drift gillnet fishery from 1991 to 1995 was estimated at nine sperm whales (Perry et al. 1999). After the 1997 implementation of a Take Reduction Plan, which included skipper education workshops and required the use of pingers and minimum 6-fathom extenders, overall cetacean entanglement rates in the DGN fishery dropped considerably. Nonetheless, two sperm whales were taken in nets with pingers (1996 and 1998). Because entanglement is rare and because nets that took sperm whales did not have a full mandated complement of pingers, it is difficult to evaluate whether pingers have any effect of sperm whale entanglement in drift nets. Mean annual takes based on 1997-98 data were estimated to be 2.5 mortalities per year. The increasing level of anthropogenic noise in the world's oceans has been suggested to be another habitat concern, particularly for deep-diving whales like sperm whales that feed in the ocean's 'sound channel.' (Forney et al. 2000)

Northern Right Whale (*Eubalaena glacialis*). Right whales are listed as endangered under the ESA. Historically, in addition to occurring in the southern hemisphere, right whales ranged across the entire North Pacific north of 35° N latitude (Perry et al. 1999). These whales were heavily fished by the whaling industry until legally protected in 1935. After over 65 years of protection, sightings are still scarce and geographically scattered in the North Pacific. Since 1998, the North Pacific stock has been divided into eastern and western management units. Right whales prefer shallow coastal waters, but their distribution is strongly correlated with the distribution of their zooplankton prey. In both hemispheres, they have been observed in low latitudes and nearshore waters during winter, where calving takes place, then tend to migrate to higher latitudes in summer. There are no data on trends in abundance, but the paucity of sightings in the North Pacific strongly suggests there has been little or no growth in this population (Perry et al. 1999). Although there have been sightings in recent years, this may only be linked to increased survey effort. The only population estimate from the North Pacific is for the Okhotsk Sea, a northern right whale summering area. Preliminary data have indicated this population likely includes only a few hundred animals (Perry et al. 1999 citing Brownell). A lone right whale was sighted off San Clemente Island, CA in 1992, which was only the twelfth reliable right whale sighting of this century in the eastern North Pacific. Other sightings have been made recently in the Bering Sea and elsewhere, but the species is still considered extremely rare (Carretta et al. 1994). These whales are plankton feeders, and swim through patches of zooplankton with their large mouths open. Before they were heavily exploited by commercial whalers, northern hemisphere concentrations of northern right whale were found off Alaska with sightings reported as far south as cental Baja California. Off the coasts of Oregon, Washington and California, there have been extremely few sightings of this species since the mid 1950s. Data are scant for fisheries interactions with North Pacific right whales. Although there are two fishery-related mortalities reported from Russian waters, fishery-related interactions are not known to be a problem in the eastern North Pacific. In the Atlantic, gillnets, lobster pots, seines, longlines and fish weirs are reportedly the main gear types that are known to entangle right whales. Vessel strike-related mortality rates for stocks in the North Pacific are unknown (Perry et al. 1999).

Sei Whale (*Balaenoptera borealis*). These baleen whales are distributed far out to sea in temperate regions and do not appear to be associated with coastal features. The sei whale is listed as endangered under the ESA and rare in West Coast EEZ waters. Sei whales feed near the surface of the ocean, swimming on their sides through swarms of prey. They are among the fastest of cetaceans, swimming at speeds of up to 50 kilometers per hour. They are found predominantly in temperate oceanic waters, and in the eastern Pacific they occur in summer from central California north through the entire Gulf of Alaska. At least some of those off California are thought to migrate to the waters off British Columbia. They reportedly winter from at least Piedras Blancas, CA south to near the Revillagigedos Islands off Mexico (Leatherwood and Reeves 1983). There are no data on trends in sei whale abundance in the eastern North Pacific (Forney et al. 2000). Although the population in the North Pacific is thought to have grown since given protected status in 1976, the possible effects of continued take elsewhere in the Pacific and incidental ship strikes and net mortality are unknown (Forney et al. 2000). In our EEZ, the offshore drift gillnet fishery is the only fishery in the EEZ that is likely to take sei whales, but no fishery mortalities or serious injuries have been observed. It is also possible that they may become entangled in float lines from California-based longliners on the high seas, but no interactions of this type have been reported and the probability of encounter would be extremely rare. Ship strikes occasionally kill sei whales, but no ship strikes have been reported for this species in the area.

Guadalupe fur seal (*Arctocephalus townsendi*). This seal is a protected species in California and the ESA lists it as a threatened species. The population has been estimated to be growing at approximately 13.7 % per year. The Guadalupe fur seal has a limited range along the Pacific Coast, extending from San Nicolas Island off southern California to Guadalupe Island off Baja California. Before the sealers of the nineteenth century nearly exterminated it, the Guadalupe fur seal was common on the Farallon Islands off the central California coast and south to the Mexican coast. The species was extirpated from California waters by 1825, with commercial sealing continuing in Mexican waters through 1894. After that, it was thought to be extinct, until a lone male was found on San Nicolas Island in the 1950s. An expedition from Scripps Institution of Oceanography discovered a small breeding colony on Guadalupe Island in 1954. Current populations are thought to number 200-500, mostly on islands off the Mexican coast. Its habit of keeping to sea caves may have saved it from extinction. These seals now primarily breed and pup at Isla Guadalupe, Mexico. In our region, a few Guadalupe fur seals are known to inhabit southern California sea lion rookeries in the Channel Islands. It is possible that drift and set gillnets may cause incidental mortality of Guadalupe fur seals in Mexico and the United States, but in the U.S. there have been no reports of mortalities or injuries in these observed net fisheries. Juvenile female Guadalupe fur seals have stranded in central and northern California with net abrasions around the neck, fish hooks and monofilament line, and polyfilament string (Fourney et al. 2000 citing Hanni et al. 1997). But with existing mitigation measures in place, there is no evidence that HMS fisheries currently have had more than a rare interaction with any listed pinniped. The species occurs inshore of the high seas California-based longline fishery.

Steller Sea Lion (*Eumetopias jubatus*). This species, listed as endangered, ranges along the North Pacific Ocean rim, from northern Japan, to a centered abundance and distribution in the Gulf of Alaska and the Aleutian Islands, south to California, with the southernmost rookery being Año Nuevo Island (37° N latitude). Steller sea lions are not known to migrate, but they do disperse widely during the breeding season. Males breeding in California appear to spend the non-breeding months (September - April) in Alaska and British Columbia. Steller sea lion numbers in California, especially southern and central California, have declined significantly, from 5,000-7,000 non-pups from 1927-1947, to 1,500-2,000 non-pups between 1980-1998. While overall counts of non-pups in northern California and Oregon have been relatively stable since the 1980s, counts of non-pups in Southeast Alaska and British Columbia have increased by an average of 5.9% (1979-97) and 2.8% (1971-98), respectively. Steller sea lions have been reclassified into two separate stocks within U.S. waters: an eastern U.S. stock, which includes animals east of Cape Suckling, Alaska (144° W longitude), and a western U.S. stock, which includes animals at and west of Cape Suckling. The western U.S. stock is considered endangered and the eastern stock is threatened on the ESA list. Steller sea lions are highly gregarious on land and use the same sites for breeding, pupping, and resting year after year. The most well known Steller sea lion habitats are rookeries, where adult animals gather to breed and give birth from late May to early July. Rookeries and haulouts are usually located on relatively remote islands where access by predators is limited. Steller sea lions prey primarily upon schooling fishes, such as pollock and herring, as well as invertebrates, such as squid and octopus. They can be found throughout the North Pacific Ocean from the Kuril Islands and Okhotsk Sea, through the Aleutian Islands and Bering Sea, and south along the North American coast to central California. About 70% of the worldwide Steller sea lion population resides in Alaska. Of the listed species that occur in the HMS fishing area, the Stellar sea lion is the only for which Critical Habitat has officially been designated. This habitat includes the area 0.9 km above the areas historically occupied by the species at each major rookery in California and Oregon, measured vertically from sea level. Also, an aquatic zone that extends 0.9 km seaward in State or Federally managed waters from the baseline or base point of each major rookery in California and Oregon. These rookeries are those at Pyramid Rock on Rogue Reef and Long Brown Rock and Seal Rock on Orford Reef in Oregon; and Ano Nuevo Island, Southeast Farallon Island, Sugarloaf Island and Cape Mendocino in California. Like other pinnipeds, this species has been vulnerable to set net and drift gillnet fishery in the past. Observers reported one Stellar sea lion mortality in the swordfish-shark drift gillnet fishery in 1992 and another in 1994; and total take estimated to be 7 and 6 animals respectively for those years (Julian and Beeson 1998; Cameron and Forney 1999). With existing mitigation measures in place, there is no evidence that HMS fisheries currently have had more than a rare interaction with any listed pinniped.

4.5.2.2.2 Sea Turtles

Turtles, General: Of HMS gears, the most significant threat in our region observed in the past has been from shark/swordfish drift gillnet gear, and to some extent, the longline fishery (although serious injury and mortality are thought to be less in the latter). Conservation and management measures proposed in this FMP for the swordfish-shark drift gillnet fishery are identical to those now in place under federal regulations issued under the MMPA and ESA, the latter stemming from a recent Biological Opinion (NMFS 2000) and NMFS' reasonable and prudent alternative (RPA) to protect sea turtles (NMFS 2001), stemming from this Biological Opinion. Existing and proposed measures in this FMP (Chapter 8, section 8.5.1) should ensure that this fishery poses no jeopardy for any sea turtle. The following listed species occupy habitat in the management area:

Green Turtle (*Chelonia mydas*). This species is listed as threatened except for breeding populations found in Florida and the Pacific coast of Mexico, which are listed as endangered. The genus *Chelonia* is generally regarded as comprising two distinct subspecies, the eastern Pacific (so-called "black turtle," *C. mydas agassizii*), which ranges from Baja California south to Peru and west to the Galapagos Islands, and the nominate *C. m. mydas* in the rest of the range. Green turtles are declining virtually throughout the Pacific Ocean, with the possible exception of Hawaii. This is a circumglobal and highly migratory species, nesting mainly in tropical and subtropical regions. It prefers waters that usually remain about 20°C in the coldest month. It is also presumed that drift lines or surface current convergences are preferential zones due to increased densities of likely food items. The primary green turtle nesting grounds in the eastern Pacific are located in Michoacán, Mexico, and the Galapagos Islands, Ecuador. Tag returns of eastern Pacific green turtles (often reported as black turtles) establish that these turtles travel long distances between foraging and nesting grounds. The northernmost reported resident population of green turtles occurs in San Diego Bay, where about 30-60 mature and immature turtles concentrate in the warm water effluent discharged by a power plant. The species has not been observed in the California-based longline fleet, but the observer program has only been operating at a low coverage level during the past few years. One green turtle mortality was observed in the drift gill net fishery in November 1999, with an estimated total mortality at 5. The entanglement, which occurred south of Point Conception, is considered a rare event--1 turtle in 6,025 observed sets. This species is more likely to occur in the U.S. EEZ during warm water El Niño events. With enaction of the recent turtle RPA (NMFS 2001a) in the drift net fishery, NMFS does not anticipate there to be more than 6 takes, or more than 2 mortalities henceforth in the DGN fishery over a three year period (NMFS 2000, NMFS 2001).

Leatherback Turtle (*Dermochelys coriacea*). This species is listed as endangered throughout its range. Leatherbacks are the largest of the sea turtles, have a circumglobal distribution and commonly range farther north than other sea turtles, probably because of their ability to maintain warmer body temperature over longer time periods and the widely dispersed nature of their primary food source (e.g., jellyfish, siphonophores, salps, and pyrosomas). Leatherbacks are considered the most common sea turtle north of Mexico and their appearance in southern California coincides with the summer arrival of the 18-20° C isotherms. Their occurrence further north off the Pacific Northwest usually coincides with the arrival of albacore during late summer months. Leatherbacks are sometimes seen in coastal waters, but they are essentially pelagic. Current evidence suggests that adults migrate between temperate and tropical waters to optimize foraging and nesting, however, specific leatherback foraging grounds have not been identified. The Pacific coast of Mexico is generally regarded as the most important leatherback breeding ground in the world. Nesting in Mexico extends from November to February. Aerial surveys in California, Oregon, and Washington have shown that most leatherbacks occur in slope waters, while fewer occur over the continental shelf. Leatherbacks occur north of central California during the summer and fall when sea surface temperatures are highest. Leatherback sightings peak in August along the coast of California, which may reflect a southward movement of adults for winter breeding in Mexico. Leatherbacks are the most frequently sighted marine turtle off the northern and central California coastline, and takes of this species is of considerable concern in the drift gillnet and high seas longline fisheries, where takes are known to occur (See analyses of driftnet and longline alternatives in Chapter 9 and also Chapter 6 section 6.1.2). In the driftnet fishery, NMFS developed a reasonable and prudent alternative that consists of two management measures designed to avoid the likelihood of jeopardizing leatherback turtles, effective 2001 (see Chapter 6 section 6.1.2; and NMFS 2001). An observer program has begun for the California-based high seas longline fishery to document takes of turtles and other bycatch and protected species.

Loggerhead Turtle (*Caretta caretta*). The loggerhead is a circumglobal species and is listed as threatened under the ESA. In the eastern Pacific, loggerheads are reported as far north as Alaska, and as far south as Chile. Occasional sightings are also reported from the coast of Washington, but most records are of juveniles off the coast of California. Southern Japan is the only known breeding area in the North Pacific. The loggerhead inhabits continental shelves, bays, estuaries and lagoons in subtropical, temperate and occasionally tropical waters. Although life history information is limited, habitats where Pacific basin loggerheads develop and grow appear to be widely separated from rookery sites. One hypothesis is that west Pacific hatchlings may become entrained in the central ocean gyre, and ultimately drift south with the California Current to Mexico. Juvenile and subadult loggerheads are omnivorous, foraging on pelagic crabs, molluscs, jellyfish, and vegetation captured at or near the surface. In the eastern Pacific, the largest known aggregations of loggerheads are juveniles off the west coast of Baja California, Mexico. Southern California is apparently the northern extent of its range, however, in 1991 a loggerhead stranded dead in Alaska and occasional sightings occur off Washington although most sightings are from off California. Takes of this species have been of concern in the drift gillnet and high seas longline fisheries, especially during warm water El Niño years, when takes in the drift gillnet fishery are known to occur (See analyses of driftnet and longline alternatives in Chapter 9 and also Chapter 6 section 6.1.2). In the driftnet fishery, in order to avoid jeopardy for the loggerhead, NMFS developed an RPA that consists of a management measure designed to avoid the likelihood of jeopardizing loggerhead turtles effective 2001 (see Chapter 6 section 6.1.2, NMFS 2001). An observer program has begun for the California-based high seas longline fishery to document takes of turtles and other bycatch and protected species.

Olive Ridley Turtle (*Lepidochelys olivacea*). This is the smallest living sea turtle with populations nesting on the Pacific coast of Mexico listed as endangered under the ESA (all other populations are listed as threatened). Its range is essentially tropical. In the eastern Pacific, nesting takes place from southern Sonora, Mexico, south at least to Colombia. Non-nesting individuals occasionally are found in waters of the southwestern United States. They occur regularly off Colombia and Ecuador, but only in small numbers off Peru and Chile. The olive ridley has been recorded occasionally from Galapagos waters, but it is essentially very rare throughout the islands of the Pacific, and indeed even in the western Pacific it is scarce everywhere, although widespread low-density nesting occurs. Olive ridleys appear to forage throughout the eastern tropical Pacific Ocean, often in large groups, or flotillas. They are occasionally found entangled in scraps of net or other floating debris. Young turtles may move offshore and occupy areas of surface current convergences to find food and shelter among aggregated floating objects until they are large enough to recruit to the nearshore benthic feeding grounds of the adults. Olive ridleys feed on tunicates, salps, crustaceans, other invertebrates and small fish. Although they are generally thought to be surface feeders, olive ridleys have been caught in trawls at depths of 80-110 m. While they generally have a tropical range, individuals do occasionally venture north, some as far as the Gulf of Alaska. Stranding records from 1990-99 indicate that olive ridleys are rarely found off the U.S. West Coast (off California). With enaction of the recent turtle RPA in the drift net fishery, NMFS does not anticipate there to more than 6 takes, or more than 2 mortalities henceforth in the DGN fishery over a three year period (NMFS 2001).

4.5.2.2.3 Salmonids

Pacific salmonids in their oceanic habitat are vulnerable to incidental catch in almost all types of HMS gear except for harpoon, but existing laws are already in place to control take, and additionally, this FMP proposes to designate Pacific salmon as a prohibited species group. The proposed action prohibits retention of salmon except with authorized gear during authorized seasons (See Chapter 9 section 9.2.4.7 Prohibited Species).

Coho Salmon (*Oncorhynchus kisutch*). Three Evolutionarily Significant Units (ESUs) of coho are listed as threatened--Southern Oregon/Northern California Coasts, Oregon Coast ESU (Threatened), and Central California ESU. Coho spend approximately the first half of their life cycle rearing in streams and small freshwater tributaries. The remainder of the life cycle is spent foraging in estuarine and marine waters of the Pacific Ocean prior to returning to their stream of origin to spawn and die. Most adults are three-year-old fish, however, some precocious males known as "jacks" return as two-year-old spawners. *Ocean Habitat*: Coded-wire and high-seas tag data for Washington and Oregon suggest that oceanic migration for these coho stocks can extend as far south and west as 43° N latitude and 175° E longitude around the Emperor Sea Mounts, believed to be an area of high prey abundance. While juvenile and maturing coho are found in the open north Pacific, the highest concentrations appear to be found in more productive waters of the continental shelf within 60 km of the coast. Coho salmon have been occasionally reported off the coast of southern California near the Mexican border.

Chinook Salmon (*O. tshawytscha*). Nine chinook salmon ESUs are identified as either endangered or threatened. These include Sacramento River Winter-run (Endangered), Snake River Fall-run (Threatened), Snake River Spring/Summer-run (Threatened), Central Valley Spring-run (Threatened), California Coastal (Threatened), Puget Sound (Threatened), Lower Columbia River (Threatened), Upper Willamette River (Threatened), and Upper Columbia River Spring-run (Endangered). Chinook are easily the largest of any salmon, with adults often exceeding 40 pounds; individuals over 120 pounds have been reported. They are prized by commercial, sport, and tribal fishers alike. Chinook salmon have two distinct races: stream-type and ocean-type fish which relates to the duration of their freshwater residence as juveniles. *Ocean Habitat*: Available research suggests that ocean-type juvenile chinook salmon are found in highest concentration over the continental shelf. Ocean-type juvenile chinook appear to utilize different marine areas for rearing than stream-type juvenile chinook that are believed to migrate to ocean water further offshore early in the ocean residence. Coded-wire-tag recoveries of chinook salmon from high-seas fisheries and tagging programs provide evidence that chinook salmon utilize areas outside the continental shelf. Catch data and interviews with commercial fishers indicate that maturing chinook salmon are found in highest concentrations along the continental shelf within 60 km of the Washington, Oregon, and California coast lines.

Chum Salmon (*O. keta*). Two ESUs of chum are listed, the Hood Canal (Threatened) and Columbia River (Threatened) ESUs. Chum spawn in the lowermost reaches of rivers and streams. They migrate almost immediately after hatching to estuarine and ocean waters, in contrast to other salmonids, which migrate to sea after months or even years in fresh water. The species has only a single, sea-run form, and does not live in fresh water. *Ocean Habitat*: Studies of juvenile chum salmon (300-400 mm FL) captured and tagged in June in central Puget Sound, found that juveniles moved northward to the Strait of Georgia and the west coast of Vancouver Island shortly after release. They appear to migrate northward along the coast in a narrow band about 32 km in width. Available data on the distribution, migration, and growth of chum salmon in their first year at sea and indicates that chum, pink and sockeye salmon juveniles tended to group together and remain nearer shore (within 36 km) than juvenile coho and chinook salmon and steelhead. It has been hypothesized that some chum salmon may not make an extended northwest migration along the British Columbia/Alaska coast, but may instead proceed directly offshore into the north Pacific Ocean. It has been reported that North American chum salmon are rarely found west of the mid-Pacific Ocean (beyond 175° E longitude). Limited information exists on stock- or population-specific migrational patterns, and distributions of chum salmon during their oceanic phase are limited. Maturing chum salmon in the North Pacific begin to move coastward in May and June and enter coastal waters from June to November. No region-specific information on chum salmon migrations to Washington and Oregon has been reported.

Sockeye Salmon (*O. nerka*). The Ozette Lake ESU (Threatened) and Snake River (Endangered) ESU of sockeye salmon are protected under the ESA. Sockeye is one of the most complex of any Pacific salmon species because of its variable freshwater residency (one to three years in fresh water), and because the species has several different forms: fish that go to the ocean and back, fish that remain in fresh water, and fish that do both. Sockeye is the only Pacific salmon that depends on lakes as spawning and nursery areas. The primary spawning grounds in North America extend from the tributaries of the Columbia River to the Kuskokwim River in western Alaska. *Ocean Habitat:* Ocean distribution of sockeye salmon has been studied using tagging, morphological, parasitological, serological, and scale pattern analyses. Season, temperature, salinity, age, size, and prey distribution also affect sockeye salmon movements in the open ocean. Initially, sockeye salmon juveniles travel northward from Washington and British Columbia to the Gulf of Alaska staying in a migratory band relatively close to the coast. Once in the Gulf of Alaska, offshore movement of juveniles is conjectured to occur in late autumn or winter. In general, the center of North American fish abundance is east of 175° E longitude. Although there is also considerable overlap in distribution among sockeye salmon originating all the way from the Alaska Peninsula to the Columbia River, scale pattern analyses indicate that sockeye salmon from central Alaska are distributed much further to the west than populations from southeast Alaska, British Columbia, and Washington. British Columbian and Washington populations of sockeye salmon utilize the area east and south of Kodiak Island in concert with Alaskan stocks, but tend to be distributed further to the south than the Alaskan stocks (down to 46° N latitude).

Steelhead (*O. mykiss*). Ten ESUs of steelhead are listed on the ESA including Upper Willamette River (Threatened), Middle Columbia River (Threatened), Southern California (Endangered), South-Central California Coast (Threatened), Central California Coast (Threatened), Upper Columbia River (Endangered), Snake River Basin (Threatened), Lower Columbia River, (Threatened), Central Valley, California (Threatened), and Northern California (Threatened). Steelhead are considered by many to have the greatest diversity of life history patterns of any Pacific salmonid species, including varying degrees of anadromy, differences in reproductive biology, and plasticity of life history between generations. *Ocean Habitat:* Steelhead habitat requirements change as they go through different life phases, but the most critical are thought to be related to watershed habitat (rivers, bays, estuaries throughout Washington, Oregon, California and Idaho. Adult steelhead in their oceanic existence also need adequate forage and productive environmental conditions in order to grow and survive and return to natal rivers and streams to spawn. They also need access to and through these rivers and streams. This means that waterways must be free of barriers to migration, as the majority of spawning occurs in the upper reaches of tributaries. Adults also need access to spawning gravel in areas free of heavy sedimentation with adequate flow and cool, clear water. Steelhead utilize gravel that is between 0.5 to 6 inches in diameter, dominated by 2 to 3 inch gravel. Escape cover for spawning adults is also important. Cool, clean water is essential for the survival of steelhead during all portions of their life cycle.

4.5.2.2.4 Seabirds

Over seventy species of pelagic birds occur in the management area, but only a few are listed under the ESA, under jurisdiction of the U.S. Fish and Wildlife Service. They are as follows:

Short-tailed Albatross (*Phoebustria albatrus*). This species is listed as endangered. It is the largest and, as adults, the only white-backed albatross in the north Pacific. Length: 84-91 cm (33.6-36.4 in); wingspan: 213-229 cm (7-7.5 ft); average life span: 12-45 yrs. Short-tails breed on Torishima, an island owned and administered by Japan. They have also been observed (non-breeding behavior) on Minami-Kojima in the Senkaku Islands of Southern Ryukyu Islands, also owned and administered by Japan. The Short-tail population dropped dramatically due to feather hunters in the late nineteenth century. Over 5 million adults were hunted and killed. In 1939, their breeding grounds in Torishima were buried under 10-30 meters of lava as a result of a volcanic eruption. Population numbers dropped to 10 nesting pairs. The world population of Short-tailed Albatross is currently estimated at approximately 1,500 individuals, of which approximately 45% are currently breeding birds (K. Rivera, NMFS, AR, Juneau, AK and H. Hasegawa, Toho Univ., Chiba, Japan, pers. commun. 12 Dec 2002) with only 180 birds mature enough to breed (Cousins, 1999). The average age of first breeding is 6 years. Short-tailed Albatross are monogamous and have known to create a new pair bond if original mate disappears or dies. Return to natal colony or may disperse to breed (e.g., adults on Midway Atoll). The first adults return to the colony in late October. Short-tails build their nests with surrounding sand, shrubbery or volcanic debris. Lays one egg. Incubation lasts approximately 65 days and is shared by both parents. Both adults feed the chick by regurgitating a mixture of flying fish eggs and squid oil. Sometime between late May and mid-June, chicks are almost full-grown and adults begin to abandon their nests. Chicks fledge soon after the adults leave the colony. The historic range is the North Pacific Ocean and Bering Sea, Canada, China, Japan, Mexico, Russia, Taiwan, U.S.A. (AK, CA, HI, OR, WA). Date first listed June 2, 1970. Current range: AK, CA, HI, OR, WA; Northern Pacific Ocean, Japan, U.S.S.R. In the eastern North Pacific it is currently most abundant off British Columbia and Alaska, being sighted only rarely off the Pacific coasts of the United States and Mexico in recent history. But since it has historically occupied U.S. West Coast EEZ waters, it will likely return to its former range as its population recovers (and may have already begun to do so). In spite of recent favorable recruitment at the only extant colony in Tori Shima, Japan, the world population is estimated at less than 1,000 birds. Of the 23 sightings of this species within the CA/OR/WA EEZ since 1947, 74% have been made in the last two decades (1983-2000) with 88% occurring from August through January. Six short-tailed albatrosses have been killed by the Alaska bottom longline fleet and it is possible that interactions could occur within the U.S. West Coast EEZ, as has been postulated for the Hawaii-based longline fishery, where reportedly two individuals visit the Northwestern Hawaiian Islands each year. The species is a surface feeder and the diet consists of flying fish eggs, shrimp, squid, and crustaceans. Birds feed primarily during daybreak and twilight hours and have been known to forage as far as 3,200 km (1,988 miles) from their breeding grounds. Like other albatrosses, their surface feeding, scavenging habits makes them susceptible to hooking and drowning by longline gear. The possibility of HMS gear interaction with this species, though remote, does exist and may warrant further examination.

Bald Eagle (*Haliaeetus leucocephalus*). Bald Eagles, listed as threatened under the ESA, range from Alaska south to Baja California, Mexico, living near large bodies of open water such as lakes, marshes, seacoasts and rivers. Recently (July 2002) eight bald eagles were re-introduced to Santa Cruz Island, California, which was once home to one of the heaviest concentrations of Bald Eagles in the United States (Whitaker 2002). They feed on fishes (usually freshwater or nearshore salt water or anadromous species). They also feed on carrion. Off Washington, Oregon and California, eagles are generally not known to feed offshore of the open ocean coast, thus HMS fishing operations, which take place outside enclosed bays and nearshore areas, are not considered a significant threat to this species.

Marbled Murrelet (*Brachyramphus marmoratus marmoratus*). The Marbled Murrelet, listed as threatened under the ESA, is a small seabird found in coastal areas of the eastern Pacific Ocean from Alaska to central California. It spends the majority of its time at sea, where it feeds on small ocean fish such as sand lance and herring. Unlike other members of the family Alcidae, the marbled murrelet nests on branches of old growth trees. The reproductive rate of this species is extremely low as only one egg is laid each year and nest predation by jays, crows and ravens is high. Marbled Murrelets fly up to 50 miles inland to nest in the canopy of ancient trees. It is a ground-nesting bird in Alaska, and it was not known where Murrelets nested in California until the 1980s. Researchers discovered that females do not build nests, but lay a single egg directly in a natural depression of a large, moss-covered limb, which is the reason they are dependent on large, old growth trees. During incubation, the female and male take turns sitting on the egg for 24-hour shifts, making sure the egg is attended at all times. Pairs return to the same forest grove year after year and sometimes nest repeatedly in the same tree. When these trees are cut down, they may never successfully relocate or nest again. Drastic logging of old growth redwood forests is thought to have greatly diminished nesting habitat, and fluctuations in ocean productivity and vulnerability to nearshore gill nets have also been identified as sources of murrelet mortality. The U.S. Fish and Wildlife Service Marbled Murrelet Recovery Plan stresses that the species' survival depends on the protection of all occupied nesting habitat that currently exists. It also stresses there should be very little loss of forests that could develop into Murrelet habitat over the next 100 years. At the present time, the bulk of the North American marbled murrelet population is located in Alaska, where their numbers reach 250,000. British Columbia holds an estimated 45,000-50,000 birds, located in highest density on the west coast of Vancouver Island. In Washington, murrelet numbers decrease to approximately 5,000 birds that are concentrated in northern Puget Sound; and in Oregon, only 2000-4000 birds remain, mostly in the central coast region. The smallest population of murrelets exists in northern coastal California, where there are only 1400-1700 birds left. The Marbled Murrelet is currently considered to be *endangered* in California and *threatened* in Oregon, Washington and British Columbia. When not nesting, the birds live at sea, spending their days feeding nearshore and then moving several kilometers offshore at night. In general, however, they feed relatively close to shore, their distribution related to food supplies and proximity to suitable nesting habitat. Aerial surveys off Oregon and California are being conducted to better define murrelet at-sea distribution. Most HMS fishing operations, which take place offshore and outside Marbled Murrelet feeding areas, are not considered a significant threat to this species.

Of the murrelets, only Xantus' (*Synthliboramphus hypoleucus*) is most likely to range far enough offshore into HMS fishing areas, but its small size, and agile diving characteristics make it a low risk for interacting with gears such as HMS longline, troll, purse seine, or large mesh gill net. Of all pelagic gears, it is probably the most vulnerable to small mesh drift gillnets and setnets, especially near colonies. This murrelet is not listed, but is under consideration for threatened status. The species persists in very low numbers with an estimated population of less than 10,000 breeding individuals (Drost and Lewis 1995; Whitworth et al. 1995). A significant portion of this small population nests on the southern California Channel Islands, while the remainder nests on islands along the northwest coast of Baja California, Mexico. The small (25 cm) diving seabird occurs in a very narrow range along the Pacific Coast of North America, from the southern tip of Baja California Mexico, north to about San Francisco CA, and as far north as Washington during post-breeding dispersal. It usually occurs a few miles offshore, but is known also to feed 60 or so miles out on the ocean, returning to land only to breed. Nests in colonies on rocky sea islands and ledges, although occasionally amid dense vegetation. At sea, it does not occur in flocks, and adults are rarely found in groups larger than two. Numbers breeding at the largest colony at Santa Barbara Island probably have declined between the mid-1970s and 1991. The decline may have occurred because of many factors, including census differences. Poor reproduction, however, has occurred because of high levels of avian and mammalian predation that has probably led to this decline. Other suspected threats, especially for members of the smaller colonies, are oil spills from offshore platforms in Santa Barbara Channel and oil tanker traffic into Los Angeles harbor. Nonetheless, the primary threats to this species still appear to be rodents and feral cats. Larger numbers of nesting birds are now suspected in southern California than previously thought, but the population is still relatively small with a limited range. This candidate species may be considered for federal and state listing in the near future.

California Least Tern (*Sterna antillarium (=albifrons) browni*). This species is listed as endangered. These terns traditionally nest on open, sandy, ocean-fronting beaches that are often near the mouths of estuaries; they seldom occur far out to sea, away from their lagoon or estuary with its dependable food supply. During the breeding season the birds can be found in Baja California, Mexico and California. It is believed they spend winter along the Pacific coast of Central America. They usually live in colonies of 30-50 nesting pairs. Once nested widely along the central and southern California coast and the Pacific coast of Mexico. Now nesting is limited to San Francisco Bay, and various areas along the coast from San Luis Obispo County to San Diego County. Largest concentrations of breeding pairs nest in Los Angeles, Orange, and San Diego counties. Sometimes seen around Salton Sea. Primary threats and reasons implicated in decline are dredging, filling and water pollution that degrade estuarine and coastal foraging areas, shoreline development, and predation by domestic and wild animals. Least terns are opportunistic feeders known to capture more than 50 species of fish, however, these birds feed predominately on small schooling fishes near the surface in relatively shallow, nearshore waters and coastal brackish/ freshwater ponds, channels, and lakes, so are unlikely to interact with HMS fishing operations. They do feed on the young of certain epipelagic prey species taken by HMS species (e.g., northern anchovy, topsmelt, saury), so may be affected by the same prey fluctuations and destruction of prey habitat.

Snowy Plover (*Charadrius alexandrinus nivosus*). Western Snowy Plovers, listed as threatened, are small shorebirds that breed along the Pacific coast of the United States and northern Mexico, and interior sites in several western states. The population nests in Washington, Oregon, California, and Baja California, Mexico, and is associated with coastal wetlands and coastal dune habitat. They prefer coastal beaches that area relatively free from human disturbance and predators. In California, these plovers also breed on San Nicolas and Santa Rosa Islands. As much as half of the Pacific coast population may breed in Mexico. This population winters along the coasts of southern Oregon, California, and Baja California, Mexico. Some Snowy Plovers that nest along the coast of California do not migrate in winter but remain on their breeding grounds. The decline and loss of Western Snowy Plover populations along the Pacific coast have been attributed to habitat loss and habitat and nesting disturbance caused by urbanization. At northern sites, the invasion of non-indigenous beach grasses has reduced available breeding habitat, including dunes with scant vegetation, dredge-spoil islands, natural salt panne, and salt evaporation pond levees. The greatest loss of plover habitat has occurred along the southern California coast. In southern California, many of the plover's nesting sites are associated with breeding colonies of California Least Terns. The breeding range along California's coast has been significantly interrupted by the loss of all historical breeding sites in Los Angeles County and most of

Orange County. Loss of habitat in these areas has been attributed to high levels of recreational beach use and the raking of beach sand (for removal of debris) on a regular basis, and predation by coyotes, foxes, skunks, ravens, gulls and raptors. Only one site in Orange County has supported a few nesting pairs in recent years. Snowy Plovers are not known to feed in or traverse the marine pelagic environment except in areas immediately adjacent to the coast, therefore they are not likely to be affected by HMS fishing practices or proposed actions, being primarily affected by disturbance of shore beach/dune habitat and by predation.

Brown Pelican (*Pelecanus occidentalis*). The species, listed as endangered, occurs along the coast in Oregon and Washington in summer and in California year round, especially south of Point Conception, CA. It ranges south to Brazil and Chile. After the breeding season, flocks move north along the coast and return southward by winter. Small numbers of immature birds wander inland in summer, especially in California. Habitat is salt bays, beaches and the nearshore ocean. It occurs mostly over shallow waters along the immediate coast, especially in sheltered bays, although occasionally is seen well out to sea. Nests in colonies on islands. Diet is almost entirely fish and includes smelt and anchovy; also crustaceans. Forages by diving from the air, plunging onto the water headfirst and coming to the surface with fish in its large expandable bill. It tilts the bill down to drain water out of its pouch, then tosses its head back to swallow prey. Sometimes scavenges and will become tame, approaching anglers for handouts or attempting to steal bait from hooks. Incubation by both sexes is roughly 28-30 days. Both parents feed young. Young may leave ground nests after about 5 weeks and gather in groups, where returning parents apparently can recognize own offspring. Age at first flight varies, reportedly 9-12 weeks or more. Adults continue to feed young for some time after they leave colony. 1 brood per year. This species declined drastically in mid-20th century, as pesticides caused eggshell thinning and failure of breeding. After banning of DDT, the species made a strong recovery; now common and increasing on southeast and west coasts. Of the HMS fisheries, pelicans are thought to interact most often with the inshore recreational fishery, becoming hooked when scavenging bait or hooked fish, and have been seen occurring and interacting with purse seine operations during setting and retrieval on schools of fish. These birds are not common in most offshore areas where HMS fishing takes place. Most birds that interact with the recreational and purse seine fishery are thought to be released alive and unharmed, but more documented observations are needed to confirm this. Education on live release of birds may improve what is already thought to be high survivability.

4.5.2.2.5 Invertebrates

White abalone, (*Haliotis sorenseni*). The white abalone, listed as endangered, is the only mollusk currently listed under the Endangered Species Act by the National Marine Fisheries Service. NMFS designated the white abalone as a candidate for listing in 1997 for the California region south to Baja California, Mexico. A short-lived commercial fishery began in the early 1970s, peaked mid-decade and collapsed in the 1980s. Only occasional landings occurred after that time. It was also sought after by recreational divers, but actual landings are unknown. Recent studies suggest that this species has likely suffered reproductive failure resulting from severe over-harvest. The fishery was closed in 1996. The white abalone dwells in deep waters - 80 to over 200 feet from Point Conception (southern California) southward to Baja California. Because of its depth range, this abalone was only described scientifically in 1940. It lives on rocky substratum such as pinnacles, rock piles, and deep reefs. Once occurring in numbers as high as 1 per square meter of suitable habitat, they now can be found only occasionally. Recent surveys found that densities average 1 per hectare in the Channel Islands off southern California. The white abalone is a herbivorous, marine, rocky-benthic, broadcast-spawning gastropod. Because populations are only small fractions of former numbers, recovery is thought to be complicated by loss of genetic diversity from genetic bottlenecks, genetic drift and founder effects. Abalones are also vulnerable to various bacterial and parasitic infections. The fishery was historically managed using size limits and seasons, but such methods failed because they did not account for density dependent reproduction and assumed regular successful settlement of the larvae. Because of its deepwater, benthic habitat, and position outside the HMS food web, HMS fishing activities or alternatives proposed in this FMP are not expected to impact this species or its habitat.

4.5.2.3 EFH for Other Fisheries

Pacific Groundfish: The Pacific Coast Groundfish FMP manages 82 species over a large and ecologically diverse area. These 82 groundfish species occur throughout the EEZ and occupy diverse habitats at all stages in their life histories. Some species are widely dispersed during certain life stages, particularly those with pelagic eggs and larvae and the EFH for these species/stages is correspondingly large. On the other hand, the EFH of some species/stages may be comparatively small, such as that of adults of many nearshore rockfishes which show strong affinities to a particular location or type of substrate. Descriptions of groundfish fishery EFH for each of the 82 species and their life stages result in over 400 EFH identifications. When these EFHs are taken together, the groundfish fishery EFH includes all waters from the mean higher high water line, and the upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon, and California seaward to the boundary of the U.S. EEZ.

The various EFH descriptions are grouped into seven units called "composite" EFHs. The seven "composite" EFH identifications are: 1) *Estuarine* - Those waters, substrates and associated biological communities within bays and estuaries of the coasts of Washington, Oregon, and California, seaward from the high tide line (MHHW) or extent of upriver saltwater intrusion. These areas are delineated from the U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI) and supplemented from NOAA's Coastal Assessment Framework for the water portion of the Estuarine Drainage Areas for two small estuaries (Klamath River and Rogue River), the Columbia River, and San Francisco Bay. NWI defines estuaries as areas with water greater than 0.5 ppt ocean-derived salt. 2) *Rocky Shelf* - Those waters, substrates, and associated biological communities living on or within ten meters (5.5 fathoms) overlying rocky areas, including reefs, pinnacles, boulders and cobble, along the continental shelf, excluding canyons, from the high tide line (MHHW) to the shelf break (~200 meters or 109 fathoms). 3) *Non-Rocky Shelf* - Those waters, substrates, and associated biological communities living on or within ten meters (5.5 fathoms) overlying the substrates of the continental shelf, excluding the rocky shelf and canyon composites, from the high tide line (MHHW) to the shelf break (~200 meters or 109 fathoms). 4) *Canyon* - Those waters, substrates, and associated biological communities living within submarine canyons, including the walls, beds, sea floor, and any outcrops or landslide morphology, such as slump scarps and debris fields. 5) *Continental Slope/Basin* - Those waters, substrates, and biological communities living on or within 20 meters (11 fathoms) overlying the substrates of the continental slope and basin below the shelf break (~200 meters or 109 fathoms) and extending to the westward boundary of the EEZ. 6) *Neritic Zone* - Those waters and biological communities living in the water column more than ten meters (5.5 fathoms) above the continental shelf. 7) *Oceanic Zone* - Those waters and biological communities living in the water column more than 20 meters (11 fathoms) above the continental slope and abyssal plain, extending to the westward boundary of the EEZ.

Coastal Pelagic Species: The specific description and identification of EFH for CPS finfish (northern anchovy, Pacific sardine, Pacific (chub) mackerel, and jack mackerel) and market squid accommodates the fact that the geographic range of all CPS finfish varies widely over time in response to the temperature of the upper mixed layer of the ocean, particularly in the area north of Point Arena, California (39° N latitude). This generalization is probably also true for market squid but few data are available. Adult CPS finfish are generally not found at temperatures colder than 10°C or warmer than 26°C and preferred temperatures and minimum spawning temperatures are generally above. The east-west geographic boundary of EFH for each individual CPS finfish and market squid is defined to be all marine and estuarine waters from the shoreline along the coasts of California, Oregon, and Washington offshore to the limits of the EEZ and above the thermocline where sea surface temperatures range between 10°C to 26°C. The southern boundary of the geographic range of all CPS finfish is consistently south of the U.S.-Mexico border, indicating a consistency in sea surface temperatures at below 26°C, the upper thermal tolerance of CPS finfish. Therefore, the southern extent of EFH for CPS finfish is the United States-Mexico maritime boundary. The northern boundary of the range of CPS finfish is more dynamic and variable due to the seasonal cooling of the sea surface temperature. The northern EFH boundary is, therefore, the position of the 10°C isotherm which varies both seasonally and annually.

Sea surface temperatures and habitat boundaries for CPS finfish vary seasonally and from year to year. Year to year variation in temperature and habitat boundaries is most pronounced during the summer. Additionally, variation in the boundaries of preferred habitat are more pronounced than variation in the boundaries of thermal tolerance. These relationships mean that highly mobile mackerels and sardine are seasonally much more abundant in the Oregon to Alaska region during the summer and warm water years (e.g., El Niño) than during the winter and cold water years due to increased habitat availability.

In years with cold winter sea surface temperatures, the position of the 10°C isotherm (a rough estimate of the lower thermal and northern geographic bound for CPS finfish) during February is near Cape Mendocino along the coast (about 40° N latitude) and at about 43° N latitude further offshore. In warm years, the 10°C isotherm during February is further north along the coast but still at about 43° N latitude offshore. The 14°C isotherm (a rough measure of the location of preferred temperatures) during February is near the U.S.-Mexico border (about 31° N latitude) in cold years and near Point Arena (about 39° N latitude) in warm years.

Sea surface temperatures and habitat boundaries for CPS finfish extend farther to the north during the summer than during the winter. The position of the 10°C isotherm during August is off Canada and Alaska in years with both cold and warm summer sea surface temperatures. The 14°C isotherm during August is off Cape Flattery (about 43° N latitude) in cold years and off Canada above 53° N latitude in warm years. As described above, sea surface temperatures of 14°C to 16°C are generally preferred for spawning. The 16°C isotherm, and preferred spawning habitat for CPS finfish, is south of the 14°C isotherm, but shows the same patterns of variability.

Pacific salmon: In the PFMC Salmon Fishery Management Plan, the identification of EFH is based on the descriptions of habitat utilized by coho, chinook, and pink salmon. EFH for the Pacific coast salmon fishery means those waters and substrate necessary for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to a healthy ecosystem. In addition to all currently viable freshwater bodies and most of the habitat historically accessible to salmon in Washington, Oregon, Idaho, and California, salmon EFH in the estuarine and marine areas extends from the nearshore and tidal submerged environments within state territorial waters out the full extent of the exclusive economic zones (370.4 km) offshore of Washington, Oregon, and California north of Point Conception, California. Foreign waters off Canada, while still salmon habitat, are not included in salmon EFH, because they are outside United States jurisdiction. The Pacific coast salmon fishery EFH also includes the marine areas off Alaska designated as salmon EFH by the North Pacific Fishery Management Council.

4.5.3 Description of the Fisheries

Descriptions of the HMS Fisheries are provided in Chapter 2.

4.5.4 Administrative Content

4.5.4.1 How the Fishery is Managed Under the FMP

HMS fisheries will be managed as described within this FMP, which includes some fixed elements and a process for implementing or changing regulations without amending the plan (flexible measures). The plan is a combined Environmental Impact Statement and Fishery Management Plan, and applies to all U.S. vessels that fish for management unit species within the EEZ off California, Oregon or Washington ocean waters. It also applies to U.S. vessels that fish for MUS on the high seas (seaward of the EEZ) and land their fish in California, Oregon or Washington. The history of this management plan, its purpose, and its management context are provided in Chapter 1 Introduction.

The EFH regulations and the MSFCMA require that fishery management councils and NMFS, on behalf of the Secretary of Commerce, describe and identify EFH, minimize adverse effects on EFH from fishing and non-fishing activities to the extent practicable, and to take action to encourage and enhance identified EFH. Adverse effects may include physical, chemical, or biological alterations, loss of or injury to prey species and their habitat or to other components of the ecosystem.

4.5.5 Existing Management Measures That Minimize Adverse Effects on EFH

The following management measures already in place that help to minimize adverse effects on EFH include:

1. Area and season restrictions within the EEZ on drift gillnet, longline and purse seine operations protect inshore nursery and possibly pupping habitat of sharks and coastal migratory routes of large sharks off the U.S. West Coast. State closures in the north allow for protection of the reproductively valuable adult thresher sharks during periods when and in areas where they are most abundant off Oregon and Washington

2. Shark size and bag limits--California recreational pelagic shark sub-limit now in effect in California imposes a daily bag limit of two blue sharks, two thresher sharks and two mako sharks, and a minimum size limit for shortfin mako and thresher sharks less than 40" FL south of Point Conception, CA, year-round. This has the effect of protecting adults and juveniles in their habitats off California.

3. State and federal agencies now regulate industrial discharges of mercury, and mercury use in agriculture, to provide an increased margin of safety (R.J. Price. 1995. Mercury in Seafood. California Sea Grant College Program U.C.). Preventative measures include compliance with emission-related legislation to lower or eliminate incineration of mercury-bearing materials and industrial processes that promote removal of mercury from the waste stream.

4. Fishers are required to save plastics for disposal on land as required by the International Convention of the Prevention of Pollution from Ships, or MARPOL established in 1973. Annex V of the Protocol deals with plastics and garbage disposal from ships and prohibits dumping of all ship-generated plastics. The Coast Guard is in charge of enforcing MARPOL Annex V within the U.S. EEZ. All vessels, regardless of nationality, are bound by these MARPOL restrictions within the territorial waters of the treaty nations.

5. On December 20, 1991, the United Nations adopted General Assembly Resolutions (UNGAs) 44-225, 45-197, and 46-215, thereby establishing a worldwide moratorium on all large-scale, high seas drift net fishing, which became effective December 31, 1992. The ban is in force in all the world's oceans, enclosed seas, and semi-enclosed seas. Has led to a decrease in mortality of HMS and associated bycatch and protected species, as well as a decrease in marine debris pollution and ghost fishing in the oceanic habitat caused by loss/discard of net gear at sea. When high seas squid nets were operating in the Pacific, NMFS estimated in 1991 that .06% of driftnets were lost each time they were set (Davis L.A., cited in Paul 1994).

6. Establishment of the NMFS' Driftnet Observer Program in 1990, developed to monitor interactions with federally-protected marine mammals and endangered species, has also yielded valuable information on the essential fish habitat of highly migratory management unit species, and thus made state and federal managers better able to pre-empt and minimize adverse effects on that habitat. Inception of a voluntary high seas longline fishery observer program in 2001, has also begun to accumulate similar information on the high seas habitat of MUS.

7. Existing State laws in Oregon, California and Washington effectively prohibit shark finning, and are more stringent than existing federal law. In addition to prohibiting the landing of fins, the prohibition prevents discards of large numbers of finned carcasses as offal, which might otherwise alter habitat quality as well as contribute to fishing mortality.

4.5.6 Effects of Fishing Activities on Fish Habitat

Section 600.815(a)(2) of the final rule lists the mandatory contents of FMPs regarding fishing activities that may adversely affect EFH. The adverse effects from fishing activities may include physical, chemical, or biological alterations of the substrate, and loss of, or injury to, benthic organisms, prey species and their habitat, and other components of the ecosystem. FMPs must include management measures which minimize adverse effects on EFH from fishing, to the extent practicable, and identify conservation and enhancement measures.

FMPs must also contain an assessment of the potential adverse effects of all fishing activities in waters described as EFH. In completing this assessment, councils should use the best scientific information available, as well as other appropriate information sources, as available. This assessment should consider the relative impacts of all fishing gears and practices used in EFH on different types of habitat found within EFH. The assessment should also consider the establishment of research closure areas and other measures to evaluate the impact of any fishing activity that alters EFH.

Councils must act to minimize, prevent, or mitigate any adverse effects from fishing activities, to the extent practicable, if there is evidence that a fishing activity is having an identifiable adverse effect on EFH. In determining whether it is practicable to minimize an adverse effect from fishing, councils should consider whether, and to what extent, the fishing activity is adversely impacting EFH, including the fishery; the nature and extent of the adverse effect on EFH; and whether the management measures are practicable, taking into consideration the long- and short-term costs and benefits to the fishery and EFH, along with other appropriate factors, consistent with national standard 7 (conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication).

In general, fishing gear is not known to directly alter HMS water column habitat, but habitat can be affected by inadvertent loss of gear that is left to "ghost fish," or to create marine debris that can cause harm to other species in the pelagic environment (e.g., light sticks from swordfish longlining are known to be mistaken for food by abatrosses). Also, fishing activities also affect the water column through discharge of offal from fish processed at sea. These discards may redistribute prey food or attract bycatch and protected species, which then become susceptible to capture or entanglement by the gear.

Fishing activity can also cause harm when it takes place in areas where HMS congregate and are thus highly susceptible to capture during a critical life history period, e.g., when they form spawning/pupping aggregations, when adults are concentrated inshore during seasonal migration, or when young are concentrated in core nursery areas.

4.5.6.1 Physical Impacts of Fishing Gears on HMS EFH

HMS fisheries are associated with hydrographic structures of the water column (e.g., the marine pelagic and mesopelagic zone and convergence boundary areas between currents and major features such as the thermocline). Thus the approved gears that are used in the HMS fisheries do not contact the bottom substrate; therefore, the only opportunity for damage to benthos or EFH for any species in fishing for HMS is from lost gear. If gear is lost, diligent efforts should be made to recover the lost gear to avoid further disturbance of the underwater habitat through "ghost fishing." Under federal law, it is illegal for any vessel to discharge plastics or garbage containing plastics into any waters, but plastic buoys, light sticks, monofilament line and netting, and other plastic items have been known to enter the system from fishing operations, mostly as a result of damage to gear. The full extent of this problem in our HMS fisheries is not known, but is not thought to have a significant impact on HMS EFH because of the agility of these large pelagic species in avoiding debris in the open ocean, and the tendency of at least some of this material to sink to the bottom, and the relatively inert nature of plastic. These materials may have a far greater impact on benthic and intertidal environments, or on seabirds and turtles which may ingest floating plastics mistaking them for food. Intact sections of gillnets have the potential to continue fishing in the pelagic environment for some time. When high seas squid nets were operating in the Pacific, NMFS estimated in 1991 that .06% of driftnets were lost each time they were set (Davis L.A., cited in Paul 1994). It has been reported that lost and discarded sections of driftnet ball up fairly quickly and cease to ghostfish in a short period of time(Mio et al. 1990), but these loose balls may trail streaming sections of net that may continue to fish for extended periods (Ignell et al. 1986; von Brandt 1984). It is most likely, however, that HMS, particularly tunas and billfish are less vulnerable to the ghost fishing effects of streaming sections of netting than are less mobile or scavenging species which may blunder into the net (e.g. *Mola mola*) or become entangled in attempts to feed on remains of the catch (e.g. seabirds and pinnipeds). Nonetheless, sharks may be more vulnerable, and blue shark and pelagic hammerhead shark have been reported as caught in four sections of derelict squid driftnet retrieved by U.S. observers in 1985 (Ignell et al. 1986).

There are other fishery operations off the Pacific coast which may alter species complexity in the water column. There is a large mid-water trawl fishery for Pacific whiting, primarily occurring north of 39° N latitude. Discharge of offal and processing slurry may affect EFH for HMS. Prolonged offal discards from some large-scale fisheries have redistributed prey food away from mid-water and bottom-feeding organisms to surface-feeding organisms, such as tuna, usually resulting in scavenger and seabird population increases. Offal discards in low-current environments can collect and decompose on the ocean floor, creating anoxic bottom conditions which may affect HMS. Pacific coast marine habitat is generally characterized by strong current and tide conditions, but there may be either undersea canyons affected by at-sea discard, or bays and estuaries affected by discard from shoreside processing plants. As with bottom trawling off the Pacific coast, little is known about the environmental effects of mid-water trawling and processing discards on habitat conditions.

4.5.6.2 Mitigation Considerations for Fishing Effects

Fishery management options to prevent, mitigate, or minimize adverse effects from fishing activities may include, but are not limited to:

> Fishing gear restrictions: Seasonal and areal restrictions on the use of specified gear; gear modifications to allow escapement of particular species or particular life stages (e.g., juveniles); prohibitions on the use of explosives and chemicals; prohibitions on anchoring or setting gear in sensitive areas; and prohibitions on fishing activities that cause significant physical damage in EFH.
>
> Time/area closures: Closing areas to all fishing or specific gear types during spawning, migration, foraging, and nursery activities; and designating zones for use as marine protected areas to limit adverse effects of fishing practices on certain vulnerable or rare areas/species/life history stages.
>
> Harvest limits: Limits on the take of species that provide structural habitat for other species assemblages or communities, and limits on the take of prey species.
>
> Compliance and Enforcement of Marine Pollution Laws: Fishers are required to save light sticks for disposal on land as required by the International Convention of the Prevention of Pollution from Ships, or MARPOL established in 1973. Annex V of the Protocol deals with plastics and garbage disposal from ships and prohibits dumping of all ship-generated plastics. The Coast Guard is in charge of enforcing MARPOL Annex V within the U.S. EEZ. All vessels, regardless of nationality, are bound by these MARPOL restrictions within the territorial waters of the treaty nations.
>
> Compliance and Enforcement of Seabird Mitigation Measures Related to Strategic Offal Discards. This includes, but is not limited to, strategic release of offal from vessels to distract seabirds and other protected species away from longline hooks during setting and retrieval.

There is an increasing amount of research to measure the effects of fishing activities on marine habitat, and some general conclusions about the effects of some gear types on marine habitat may be drawn from this research. However, as noted above, there has been little research on Pacific coast fisheries EFH and into the fishing effects on such habitat, especially HMS EFH, which is generally less associated with the sea bottom topography and inshore waters, as the habitats of most other species managed by the Council. Implementing measures to mitigate gear impacts on habitat may require research that specifically describes the effects of the fishing gear used in Pacific coast fisheries on marine habitat utilized by HMS. The Council may weigh the magnitude of this potential impact and develop appropriate recommendations for addressing them.

In addition to suggesting measures to restrict fishing gears and/or methods, NMFS' regulatory guidance on EFH also suggests time/area closures as possible habitat protection measures. These measures might include, but would not be limited to: closing areas to all fishing or specific gear types during spawning, migration, foraging, and nursery activities; and designating zones for use as marine protected areas to limit adverse effects of fishing practices on certain vulnerable or rare areas/species/life history stages (e.g., to protect early life stages of sharks). Some of these closures may already exist, such as the exclusion of trawling within three miles of the California coastline and areas closed to commercial fishing (e.g., Santa Monica Bay). The Council may examine whether such opportunities exist for HMS and make appropriate recommendations for addressing them. The proposed action to require West Coast -based high seas longliners to abide by the same regulations restricting the targeting of swordfish north of the equator west of 150° W longitude will undoubtedly reduce significantly the number of lightsticks that may be inadvertently lost during fishing operations, since this gear is primarily used in swordfish longlining.

Beyond protecting natural reserves and areal closures for particular species, the Council may consider creating marine reserves closed to all fishing, should certain critical habitat areas be identified in the future, although it is recognized that most HMS move widely throughout and beyond the EEZ and reserves tend to be more practical for more sedentary species. Several no-fishing zones have been created in the North Pacific Fishery Management Council for the waters off Alaska, generally for the purposes of protecting either crab or marine mammal rookeries.

Additional research is recommended to identify adverse impacts and to quantify impacts currently occurring. Any inshore areas that are closed to fishing in order to conserve pupping and juvenile habitats would be ideal locations to study the effects of fishing gear impacts on EFH. Research in these areas is strongly advocated, and further evaluations of fishing impacts on HMS habitat will be undertaken as more research is conducted and information becomes available. Information will be reviewed annually to assess the state of knowledge in this field; the annual Stock Assessment and Fishery Evaluation (SAFE) report (see section 3.4) will include any new information on the impacts of fishing activities on HMS EFH.

4.5.6.3 Findings

As of this writing (January 16, 2003), there is no evidence that HMS fishing practices or gear are causing identifiable adverse impacts on HMS EFH, or that other FMP fishing practices are causing identifiable adverse effects on HMS EFH. Therefore, the West Coast HMS FMP meets the Magnuson-Stevens Act requirement to minimize to the extent practicable, the adverse effects of fishing on EFH, and no further action is recommended at this time.

4.5.7 Effects of Non-Fishing Activities on Fish Habitat

Section 600.815(a)(4) of the EFH regulations pertains to identifying non-fishing related activities that may adversely affect EFH. The section states that FMPs must identify activities that have the potential to adversely affect, directly or cumulatively, EFH quantity or quality, or both. Broad categories of activities which can adversely affect EFH include, but are not limited to: dredging, filling, excavation, mining, impoundment, discharge, water diversions, thermal additions, actions that contribute to non-point source pollution and sedimentation, introduction of potentially hazardous materials, introduction of exotic species, and the conversion of aquatic habitat that may eliminate, diminish, or disrupt the functions of EFH. For example, Sheehan and Tasto (2001) provide a good summary of various sources of impairment of water quality and habitats in California waters. FMPs should describe known and potential adverse impacts to EFH. These descriptions should explain the mechanisms or processes that may cause adverse effects and how these may affect habitat function. A GIS or mapping system should be used to support analyses of data and to present these data in an FMP in order to geographically depict impacts identified in this paragraph.

The Magnuson-Stevens Act requires federal agencies undertaking, permitting, or funding activities that may adversely affect EFH to consult with NMFS. Under section 305(b)(4) of the Magnuson-Stevens Act, NMFS is required to provide EFH conservation and enhancement recommendations to federal and state agencies for actions that adversely affect EFH; however, state agencies and private parties are not required to consult with NMFS. EFH consultations will be combined with existing interagency consultations and environmental review procedures that may be required under other statutes, such as the Endangered Species Act, Clean Water Act, the National Environmental Policy Act, the Fish and Wildlife Coordination Act, the Federal Power Act, or the Rivers and Harbors Act.

EFH consultation may be at either a broad programmatic level or project-specific level. Programmatic is defined as "broad" in terms of process, geography, or policy (e.g., "national level" policy, a "batch" of similar activities at a "landscape level", etc.). Where appropriate, NMFS will use a programmatic approach designed to reduce redundant paperwork and to focus on the appropriate level of analysis whenever possible. The approach would permit project activities to proceed at broad levels of resolution so long as they conform to the programmatic consultation. The wide variety of development activities over the extensive range of EFH, and the Magnuson-Stevens Act requirement for a cumulative effects analysis warrants this programmatic approach.

The following are general descriptions of non-fishing activities which may directly or cumulatively, temporarily or permanently, threaten the physical, chemical, and biological properties of the habitat utilized by HMS and/or their prey. The direct result of these threats is that EFH may be eliminated, diminished, or disrupted. The list includes common activities with known or potential impacts to EFH; it is not prioritized nor is it to be considered all-inclusive. The potential adverse effects described below, however, do not necessarily apply to the described activities in all cases, as the specific circumstances of the proposed activity or project must be carefully considered on a case-by-case basis. Furthermore, some of the activities described below may also have beneficial effects on habitat, which need to be considered in any analysis.

Non-fishing related effects on EFH for HMS may not be as adverse relative to other EFH types, because adults and juveniles are highly mobile, and all life stages are pelagic (in the water column near the surface and not associated with substrate) and dispersed in a wide band along the West Coast. Table 4-1 summarizes the potential adverse impacts of these non-fishing activities and conservation/enhancement measures to minimize those effects.

Dredging

Dredging navigable waters has a periodic impact on benthic and adjacent habitats during construction and operation of marinas, harbors and ports. Periodic or constant dredging is required to maintain or create ship (e.g., ports) and boat (e.g., marinas) access to docking facilities. Dredging is also used to create navigable channels or to maintain existing channels which periodically fill with sediments from rivers, or transported by wind, wave, and tidal processes. In the process of dredging, large quantities of the seafloor are removed, disturbed, and resuspended and the biological characteristics of the seafloor are changed, and turbidity plumes may arise.

Dredging events using certain types of dredging equipment can result in increased levels of fine-grained mineral particles, usually smaller than silt, and organic particles in the water column habitat utilized by HMS. These turbidity plumes of suspended particles may reduce light penetration and decrease the rate of photosynthesis, and lower the primary productivity of an aquatic area if suspended for variable periods of time. HMS may suffer reduced feeding ability if suspended particles persist. The contents of the suspended material may react with the dissolved oxygen in the water and result in short-term oxygen depletion to aquatic resources. Toxic metals and organics, pathogens, and viruses absorbed or adsorbed to fine-grained particles in the material may become biologically available to organisms either in the water column or through food chain processes.

Dredging, as well as the equipment used in the process (e.g., pipelines), may damage or destroy spawning, nursery habitat and other sensitive areas important to HMS, particularly sharks, or the habitat of coastal pelagic forage fish and invertebrates that are important prey of HMS. Within bays and harbors, dredging may also modify current patterns and water circulation of the habitat by changing the direction or velocity of water flow, or otherwise changing the dimensions of the water body potentially utilized by HMS.

Dredged Material Disposal/Fills

The disposal of dredged materials resulting from dredging operations or the use of fill material in the development of harbors results in sediments (e.g., dirt, sand, mud) covering or smothering existing substrates. Usually these covered sediments are of a soft-bottom nature as opposed to rock or hard-bottom substrates.

The disposal of dredged or fill material can result in varying degrees of change in the physical, chemical, and biological characteristics of the substrate. Subsequent erosion or lateral displacement of such deposits can also adversely affect the substrate outside the perimeter of the disposal site by changing or destroying benthic habitat. The amount and composition of the discharged material and the location, method, and timing of discharges may all influence the degree of impact on potential HMS EFH or that of HMS prey species. The discharged material can also alter the chemistry of the receiving water at the disposal site by introducing chemical constituents in suspended or dissolved form.

The discharge of dredged or fill material can result in greatly elevated levels of fine-grained mineral particles, usually smaller than silt, and organic particles in the water column thereby affecting HMS. These suspended particles may reduce light penetration and decrease the rate of photosynthesis and lower the primary productivity of an aquatic area if suspended for lengthy intervals. HMS or their prey may suffer reduced feeding ability leading to limited growth and reduced resistance to disease if high levels of suspended particles persist. The contents of the suspended material may react with the dissolved oxygen in the water and result in oxygen depletion. Toxic metals and organics, pathogens, and viruses absorbed or adsorbed to fine-grained particles in the material may become biologically available to organisms either in the water column or through food chain processes.

Fossil Fuel Production and Exploration

Oil exploration/production occurs at a wide range of water depths and usually over soft-bottom substrates, although hard-bottom habitats may also be present in the general area. Oil exploration/production areas are vulnerable to an assortment of physical, chemical, and biological disturbances as oil and gas deposits are located using high energy seismic surveys. EFH may be disrupted by the use and/or installation of anchors, chains, drilling templates, dredging, pipes, and platform legs. During actual operations, chemical contaminants may also be released into the aquatic environment.

The impacts of oil exploration-related seismic energy release may interrupt and cause HMS to disperse which may disrupt feeding. Exploratory activities may also result in resuspension of fine-grained mineral particles, usually smaller than silt, in the water column. These suspended particles may reduce light penetration and decrease the rate of photosynthesis and lower the primary productivity of the aquatic area especially if suspended for lengthy intervals. The contents of the suspended material may react with the dissolved oxygen in the water and result in oxygen depletion.

The discharge of oil drilling muds can change the chemistry and physical characteristics of the receiving water at the disposal site by introducing toxic chemical constituents thereby potentially affecting HMS EFH. Changes in the clarity and the addition of contaminants can reduce or eliminate the suitability of water bodies for habituation by fish species and their prey.

Water Intake Structures

Withdrawing ocean water through the use of offshore water intake structures is a common occurrence coastwide. Water may be withdrawn to provide cooling water for coastal power generating stations or as a source of potential drinking water as in the case of desalinization plants. If not properly designed, these structures may create unnatural and vulnerable conditions to various fish life stages and their prey. Various life stages of HMS can be affected by water intake operations by entrapment through water withdrawal, impingement on intake screens, and entrainment through the heat-exchange systems or discharge plumes of both heated and cooled effluent.

Aquaculture

The culture of marine and freshwater species in coastal areas can reduce or degrade the habitats used by native stocks. The location and operation of these facilities will determine the level of impact on the marine environment.

A major concern of aquaculture operations is the discharge of organic waste from the farms. Wastes are composed primarily of feces and excess feed, and the buildup of waste products into the receiving waters depends on water depths and circulation patterns. The release of these waters may introduce nutrients or organic materials into the surrounding water body and lead to a high biochemical oxygen demand which may reduce dissolved oxygen, thereby potentially affecting the survival of many aquatic organisms in the area. Net effects to HMS may be either positive or negative.

Aquaculture operations also have the potential to release high levels of antibiotics and disease, as well as allowing cultured organisms to escape into the environment. These events have unknown but potential adverse impacts on fish habitat.

Wastewater Discharge

The discharge of point and non-point source wastewater from activities including municipal wastewater treatment plants, power generating stations, industrial plants (e.g., pulp mills, desalination plants) and storm drains into open ocean waters, bays or estuaries can introduce pollutants detrimental to estuarine and marine habitats. These pollutants include pathogens, nutrients, sediments, heavy metals, oxygen-demanding substances, hydrocarbons and other toxins. Historically, wastewater discharges have been one of the largest sources of contaminants into coastal waters. However, wastewater discharges have been regulated under increasingly more stringent requirements over the last 25 years, while non-point source/stormwater runoff has not, and continues to be a significant remaining source of pollution to the coastal areas and ocean. Outfall-related changes in community structure and function, health and abundance may result; many of these changes can be long-lasting.

Wastewater effluent and non-point source/stormwater discharges may affect the growth and condition of fish associated with wastewater outfalls when high contaminant levels (e.g., chlorinated hydrocarbons; pesticides; herbicides) are discharged. In addition, the high nutrient levels downcurrent of these outfalls may also be a concern. If contaminants are present, they may be absorbed across the gills or accumulate as a result of consuming contaminated prey. This is especially true for benthic-feeding fish frequenting wastewater discharge outfalls. Due to turbation, diffusion, and other upward transport mechanisms, buried contaminants may migrate to surface layers and become available.

Localized sources of pollution which may affect HMS in bays and harbors along the coast may not affect HMS stocks as a whole because HMS are distributed over large areas of the open coast and respond quickly to adverse changes in their environment by moving away.

The use of biocides (e.g., chlorine; heat treatments) or the discharge of brine as a byproduct of desalinization may reduce the suitability of water bodies for populations of fish species and their prey within the general vicinity of the discharge pipe. The impacts of chlorination and heat treatments, if any, are minimized as a result of their intermittent use and regulation pursuant to state and/or federal national pollutant discharge elimination system (NPDES) permit requirements. These compounds may change the chemistry and the physical characteristics of the receiving water at the disposal site by introducing chemical constituents in suspended or dissolved form. In addition to chemical and thermal effects, discharge sites may adversely impact sensitive areas such as emergent marshes, seagrasses, and kelp beds if located improperly.

High discharge velocities may cause scouring at the discharge point as well as entrainment of particles with resulting turbidity plumes. Turbidity plumes may reduce light penetration and decrease the rate of photosynthesis and lower the primary production in an area if suspension persists. Fish may suffer reduced feeding ability, especially if suspended particles persist. The contents of the suspended material may react with the dissolved oxygen in the water and result in oxygen depletion.

A significant portion of impacts to coastal waters may also be caused by non-point source pollution from agriculture and urban runoff. Other significant sources include faulty septic systems, forestry, marinas and recreational boating, physical changes to stream channels, and habitat degradation, especially the destruction of wetlands and vegetated areas near streams. Runoff can include heavy metals, pesticides, fertilizers, synthetic and petroleum hydrocarbons, and pet droppings. Unless proper management measures are incorporated, these contaminants can find their way into the food web through benthic infaunal communities and subsequently accumulate in numerous fish species.

Discharge of Oil or Release of Other Hazardous Substances

The discharge of oil or release of hazardous substances into estuarine and marine habitats, or exposure to a product of reactions resulting from such discharge can have both acute and chronic effects on fish resources and their prey.

Exposure to petroleum products and hazardous substances from spills or other unauthorized releases can also potentially reduce the marketability of target species. Direct contact with discharged oil or released hazardous substances (e.g., toxins; oil dispersants; mercury) or indirect exposure through from food chain processes can produce a number of biological responses in fish resources and their prey; these responses can occur in a variety of habitats including the water column, seafloor, bays, and estuaries. Chronic and large oil spills have a significant impact on fishery populations.

Mercury contamination of EFH is a potential concern because higher level predators such as HMS contaminated with this neurotoxin tend to accumulate mercury in their tissues either directly or through the food chain. Mercury is a natural occurring element, but an estimated two-thirds of environmental mercury is the result of human activities. It is a by-product of gold and zinc mining and the fossil fuel, solid waste management, and smelting industries. Other sources include cement plants and gasoline combustion. Primary sources of mercury in the U.S. are the combustion of fossil fuels (notably coal) and municipal waste incinerators. Like water, mercury can evaporate and become airborne, and because it is an element, does not break down into other substances. Once mercury escapes from the environment, it circulates in and out of the atmosphere into lakes and oceans. Harbor dredging can mix mercury contaminated sediments into the water column. Bacteria and chemical reactions in wetlands change mercury into a much more toxic form known as methylmercury. In this form it undergoes biomagnification toward the upper ends of the aquatic food chain, with HMS species such as swordfish and tunas at times known to exceed the 1 ppm action level of acceptability state and federal agencies now regulate industrial discharges of mercury, and mercury use in agriculture, to provide an increased margin of safety (R.J. Price. 1995. Mercury in Seafood. California Sea Grant College Program U.C.). Preventative measures include compliance with emission-related legislation to lower or eliminate incineration of mercury-bearing materials and industrial processes that promote removal of mercury from the waste stream. Little work has been done on the direct effect of mercury contamination on HMS except there is recent evidence that this toxin can effect the nervous system of fish by circumventing the blood-brain barrier that usually prevents toxins from entering the brain. Fish depend on their nervous systems to find food, communicate, migrate, orient themselves and to recognize predators. In addition to uptake through the food chain, dissolved mercury is taken in by fish through their gills and dispersed by blood as it circulates through the body. (Environmental News Service 9/8/99 citing C. Rouleau, Environment Canada).

Other related issues include efforts to cleanup spills or releases that in themselves can create serious harm to the habitat. For example, the use of potentially toxic dispersants to break up an oil spill may adversely affect various life stages of HMS.

Coastal Development Impacts

Coastal development involves changes in land use by the construction of urban, suburban, commercial, and industrial centers and the corresponding infrastructure. Vegetated and open forested areas are removed to enhance the development potential of the land. Portions of the natural landscape are converted to impervious surfaces resulting in increased runoff volumes. Runoff from these developments include heavy metals, sediments, nutrients and organics, including synthetic and petroleum hydrocarbons, yard trimmings, litter, debris, and pet droppings. As residential, commercial, and industrial growth continues, the demand for water escalates. As ground water resources become depleted or contaminated, greater demands are placed on surface water through dam and reservoir construction or other methods of freshwater diversion. The consumptive use of redistribution of significant volumes of surface freshwater causes reduced river flows that can affect salinity regimes as saline waters intrude further upstream.

Development activities within watersheds and in coastal marine areas may impact fish habitat on both long-term and short-term scales. Runoff of toxins reduces the quality and quantity of water column and benthic EFH for HMS by the introduction of pesticides, fertilizers, petrochemicals, and construction chemicals (e.g., concrete byproducts, seals, and paints).

4.5.7.1 Mitigation Considerations for Non-Fishing Effects

Section 600.815(a)(6) of the EFH regulations states that FMPs must describe options to avoid, minimize, or compensate for the adverse effects and promote the conservation and enhancement of EFH. Generally, non-water-dependent actions should not be located in EFH if such actions may have adverse impacts on EFH. Activities which may result in significant adverse effects on EFH should be avoided where less environmentally harmful alternatives are available. If there are no alternatives, the impacts of these actions should be minimized. Environmentally sound engineering and management practices should be employed for all actions which may adversely affect EFH. Disposal or spillage of any material (dredge material, sludge, industrial waste, or other potentially harmful materials) which may destroy or degrade EFH should be avoided. If avoidance or minimization is not possible, or will not adequately protect EFH, compensatory mitigation to conserve and enhance EFH should be recommended. FMPs may recommend proactive measures to conserve or enhance EFH. When developing proactive measures, the Council may develop a priority ranking of the recommendations to assist federal and state agencies undertaking such measures.

Established policies and procedures of the Council and NMFS provide the framework for conserving and enhancing essential fish habitat. This framework includes components to avoid and minimize adverse impacts; provide compensatory mitigation whenever the impact is significant and unavoidable; and incorporate enhancement. New and expanded responsibilities contained in the Magnuson-Stevens Act will be met through appropriate application of these policies and principles. In assessing the potential impacts of proposed projects, the Council and NMFS are guided by the following general considerations:

- The extent to which the activity would directly and indirectly affect the occurrence, abundance, health, and continued existence of fishery resources.
- The extent to which the potential for cumulative impacts exists.
- The extent to which adverse impacts can be avoided through project modification, alternative site selection or other safeguards.
- The extent to which the activity is water dependent if loss or degradation of EFH is involved.
- The extent to which mitigation may be used to offset unavoidable loss of habitat functions and values.

The following activities have been identified as potentially, directly or indirectly, affecting the habitat utilized by all or some HMS: dredging, fills/dredge material disposal, oil/gas exploration/production, water intake structures, aquaculture, wastewater discharge, discharge of oil or release of hazardous substances, and coastal development. While we recognize that HMS, because of their more pelagic, oceanic and migratory habits, may be less vulnerable to coastal development and degradation than more coastal and benthic fishes, they are not immune. They may be indirectly affected by the disruption or tainting of key organisms within the food web upon which they depend; and being upper level predators, are also especially efficient at accumulating various toxins within their tissues. The following measures are suggested in an advisory, not mandatory, capacity as proactive conservation measures which would aid in minimization or avoidance of the adverse effects of these non-fishing activities on essential fish habitat.

Dredging

1. To the maximum extent practicable, new, as opposed to maintenance dredging, should be avoided. Activities which require dredging (such as placement of piers, docks, marinas, etc.) should be sited in deep water areas or designed in such a way as to alleviate the need for maintenance dredging. Projects should be permitted only for water dependent purposes, when no feasible alternatives are available. Open coast dredging and beach replenishment should be conducted in a manner that minimizes disruption of existing surf grass beds, which provide habitat for certain HMS prey species.

2. Where the dredge equipment employed could cause significant long-term impacts due to entrainment of prey species, dredging in estuarine waters shallower than 20 feet in depth should be performed during the time frame when prey species are least likely to be entrained.

3. All dredging permits should reference latitude-longitude coordinates of the site so information can be incorporated into GIS for tracking cumulative impacts. Inclusion of aerial photos may also be required to help geo-reference the site and evaluate impacts over time.

4. Sediments should be tested for contaminants as per the Environmental Protection Agency and U.S. Army Corps of Engineers requirements to determine proper removal and disposal procedures.

5. The cumulative impacts of past and current dredging operations on EFH should be considered and described by federal, state, and local resource management and permitting agencies and considered in the permitting process.

6. Where a dredging equipment type is used that is expected to create significant turbidity (e.g., clamshell), dredging should be conducted using adequate control measures to minimize turbidity.

Fills/Dredge Material Disposal

1. Upland dredge disposal sites should be considered as an alternative to offshore disposal sites. Fills should not be allowed in areas with subaquatic vegetation or other areas of high productivity. Surveys should be undertaken to identify least productive areas prior to disposal. Use of clean dredge material meeting Army Corps of Engineers and state water quality requirements for beach replenishment and other beneficial uses (e.g., creation of eelgrass beds/surf grass beds) is encouraged, but dredging itself must be carried out along the coast so as to have minimum impact on open coast surf grass beds, which provide habitat for certain prey species.

2. The cumulative impacts of past and current fill operations on EFH should be addressed by federal, state, and local resource management and permitting agencies and considered in the permitting process.

3. Any disposal of dredge material in EFH should meet applicable state and/or federal quality standards for such disposal.

4. When reviewing open water disposal permits for dredged material, state and federal agencies should identify the direct and indirect impacts such projects may have on EFH. Benthic productivity should be determined by sampling prior to any discharge of fill material. Sampling design should be developed with input from state and federal resource agencies.

5. The areal extent of the disposal site should be minimized. However, in some cases, thin layer disposal may be less deleterious. All non-avoidable, adverse impacts (other an insignificant impacts) should be fully mitigated.

6. All spoil disposal permits should reference latitude-longitude coordinates of the site so information can be incorporated into GIS systems. Inclusion of aerial photos may also be required to help geo-reference the site and evaluate impacts over time.

Oil/Gas Exploration/Production

1. Benthic productivity should be determined by sampling prior to any exploratory operations. Areas of high productivity should be avoided to the maximum extent possible. Sampling design should be developed with input from state and federal resource agencies.

2. Mitigation should be fully addressed for impacts.

3. Containment equipment and sufficient supplies to combat spills should be on site at all facilities that handle oil or hazardous substances.

4. Each facility should have a "Spill Contingency Plan" and all employees should be trained in how to respond to a spill.

5. To the maximum extent practicable, storage of oil and hazardous substances should be located in an area that would prevent spills from reaching the aquatic environment.

Water Intake Structures

1. New facilities which rely on surface waters for cooling should be located in areas of low productivity or areas not prone to congregating HMS and their prey. New discharge points should be located in areas which have low concentrations of living marine resources, or they should incorporate cooling towers that employ sufficient safeguards to ensure against release of blow-down pollutants into the aquatic environment in concentrations that exceed state and/or federal limits established pursuant to state and/or federal NPDES regulations.

2. All intake structures should be designed to minimize entrainment or impingement of prey species. Power plant intake structures should be designed to meet the "best technology available" requirements as developed pursuant to section 316b of the Clean Water Act.

3. Discharge temperatures (both heated and cooled effluent) should comply with applicable temperature limits established pursuant to state and/or federal NPDES regulations.

Aquaculture Facilities

1. Facilities should be located in upland areas as often as possible. Tidally influenced wetlands should not be enclosed or impounded for mariculture purposes. This includes hatchery and grow-out operations. Siting of facilities should also take into account the size of the facility, the presence or absence or submerged aquatic vegetation, proximity of wild fish stocks, migratory patterns, and competing uses. Areas of high productivity should be avoided to the maximum extent possible.

2. Water intakes should be designed to avoid entrainment and impingement of fish species.

3. Water discharge should be treated to avoid contamination of the receiving water, and should be located only in areas having good mixing characteristics.

4. Where cage mariculture operations are undertaken, water depths and circulation patterns should be investigated and should be adequate to preclude the buildup of waste products, excess feed, and chemical agents.

Table 4-1. Adverse non-fishing activities, impacts and conservation/enhancement measures for HMS EFH.

ACTIVITY	**IMPACTS** (Potential)	**CONSERVATION MEASURES** (Advisory)
1. Dredging	• Bottom-dwelling organisms • Turbidity plumes • Toxins becoming biologically available • Damage to sensitive habitats	• Curtail/minimize new dredging activities as practicable • Take actions to prevent impacts to flora/fauna • Geo-reference all dredge sites • Containment assays • Address cumulative impacts • Minimize turbidity
2. Dredge Material Disposal/Fills	• Bottom-dwelling organisms • Turbidity plumes • Toxins becoming biologically available • Damage to sensitive habitats • Loss of habitat function	• Place dredge spoils upland if possible; avoid fills in productive areas • Address cumulative impacts • Meet applicable quality requirements for disposal of dredge material in EFH • Identify direct and indirect impacts on EFH • Minimize areal extent of the disposal site • Geo-reference the site
3. Oil/Gas Exploration Production	• Seismic energy release • Discharge of exploratory drill muds and cuttings • Resuspension of fine-grained mineral particles • Composition of the substrate altered	• Avoid areas of high productivity • Provide mitigation • On-site containment equipment • Maintain "spill contingency plan" • Keep oil and hazardous substances from reaching the aquatic environment
4. Water Intake Structures	• Entrapment, impingement, and entrainment • Loss of prey species	• Locate new facilities away from productive areas • Minimize entrainment or impingement of prey species per CWA 316(b) • Discharge temperature to meet applicable discharge limits
5. Aquaculture	• Discharge of pollutants from the facility • Escapement	• Minimize water/habitat quality impacts • Avoid entrainment and impingement losses • Treat and mix water discharges • Preclude waste product buildup • Prevent entanglement of prey species • Prevent escapement • Mitigate impacts
6. Wastewater Discharge	• Wastewater effluent with high contaminant values • High nutrient levels downcurrent of outfall • Biocides to prevent biofouling • Thermal effects • Turbidity plumes • Stormwater runoff	• Avoid areas of high productivity with new discharge points • Watershed management programs
7. Oil Discharge/ Hazardous Substances Release	• Direct physical contact • Indirect exposure resulting • Cleanup • Mercury Contamination	• Maintain on-site containment equipment and supplies • On-site "spill contingency plan" • Prevent spills from reaching the aquatic environment • Compliance with industrial mercury discharge standards
8. Coastal Development Impacts	• Contaminant runoff • Sediment runoff • Filling of aquatic areas	• Shoreline construction should avoid productive areas • Prevent fuel spillage • Curtail fills in estuaries, wetlands, and bays

5. Any net pen structure should have small enough webbing to prevent entanglement by prey species.

6. Measures should be taken to avoid escapement of farmed animals.

7. Mitigation should fully address all impacts.

Wastewater Discharge

1. New outfall structures should be placed offshore sufficiently far enough to prevent discharge water from impacting productive areas. Discharges should be managed to comply with applicable state and/or federal NPDES permit requirements, including compliance with applicable technology-based and water quality-based effluent limits.

2. The establishment of management programs to address non-point source/stormwater pollution water quality issues on a watershed basis is supported and encouraged.

Discharge of Oil or Release of Hazardous Substances

1. Containment equipment and sufficient supplies to combat spills should be on-site at all facilities that handle oil or hazardous substances.

2. Facilities should have a "Spill Contingency Plan" where required by applicable local, state, federal requirements, and employees identified in the plan as having responsibility for responding to a spill should receive appropriate training.

3. To the maximum extent practicable, storage of oil and hazardous substances should be located in an area which would prevent spills from reaching the aquatic environment.

Coastal Development Impacts

1. Prior to installation of any piers or docks, benthic productivity should be determined and areas with high productivity avoided. Sampling design should be developed with input from state and federal resource agencies.

2. Fueling facilities should be equipped with all necessary safeguards to prevent spills. A spill response plan should be developed and gear necessary for combating spills should be located on site.

3. Filling of any aquatic areas should be curtailed as much as reasonably possible.

4.5.7.2 Findings

Federal action agencies must consult with NOAA Fisheries regarding any of their actions authorized, funded or undertaken, or proposed to be authorized, funded or undertaken, that may adversely affect EFH. For actions that were completed prior to the approval of these EFH designations for HMS, consultation is not required.

4.6 DESCRIPTION OF DESIGNATED EFH BY SPECIES

In general, the management unit species are found in temperate waters within the Pacific Council's region. Variations in the distribution and abundance of the management unit species are affected by ever-changing oceanic environmental conditions including water temperature, current patterns and the availability of food. Sea surface temperatures and habitat boundaries vary seasonally and from year to year, with some HMS much more abundant from northern California to Washington waters during the summer and warm waters years than during winter and cold water years, due to increased habitat availability within the EEZ. There are large gaps in the scientific knowledge about basic life histories and habitat requirements of a few management unit species. The migration patterns of the stocks in the Pacific Ocean are poorly understood and difficult to categorize despite extensive tagging studies for many species. Little is known about the distribution and habitat requirements of the juvenile life stages of tuna and billfish after they leave the plankton until they recruit to fisheries. Very little is known about the habitat of different life stages of most highly migratory species which are not targeted by fisheries (e.g., certain species of sharks). For these reasons, the Council recommends a precautionary approach in designating EFH for the management unit species

4.6.1 Essential Fish Habitat for Common Thresher Shark: (Based on California drift gill net logbook (1981-1991); drift net observer data (1990-1999); Oregon driftnet logbook data 1991-2001. Food habit information from Stick and Hreha (1989), Bedford (1992) Preti et al. (2001).

- Neonate/early juveniles (< 102 cm FL): Epipelagic, neritic and oceanic waters off beaches, in shallow bays, in near surface waters from the U.S.-Mexico EEZ border north to off Santa Cruz (37° N latitude) over bottom depths of 6 to 400 fm, particularly in water less than 100 fm deep and to a lesser extent further offshore between 200-300 fm. Little known of the food of early juveniles; presumably feeds on small northern anchovy and other small, schooling fishes and invertebrates.

- Late juveniles/subadults (> 101 cm FL and < 167 cm FL): Epipelagic, neritic and oceanic waters off beaches and open coast bays and offshore, in near-surface waters from the U.S.-Mexico EEZ border north to off Pigeon Point, California (37° 10' N latitude) from the 6 fm to 1400 fm isobaths. Known to feed primarily on northern anchovy, Pacific hake, Pacific mackerel and sardine; secondarily on a variety of other fishes, squid and pelagic red crab (warm water years). Northern anchovy especially important for juvenile fish < 160 cm FL.

- Adults (> 166 cm FL): Epipelagic, neritic and oceanic waters off beaches and open coast bays, in near surface waters from the U.S.-Mexico EEZ border north seasonally to Cape Flattery, WA from the 40 fm isobath westward to about 127° 30' W longitude. north of the Mendocino Escarpment and from the 40 to 1900 fm isobath south of the Mendocino Escarpment. Known to feed primarily on northern anchovy, Pacific hake, Pacific mackerel and sardine; secondarily on a variety of other fishes, squid and pelagic red crab (warm water years).

4.6.2 Essential Fish Habitat for Pelagic Thresher Shark: (Based on California drift gill net logbook (1981-1991) and drift net observer data (1990-1999).

- Neonate/early juveniles (< 137 cm FL): There is no evidence of successful nursery habitat within the EEZ, presumably pupping takes place to the south off Mexico closer to the center of this species' distribution. Nothing known of diet; presumably feeds on small schooling fishes and squids

- Late juveniles/subadults (> 136 cm FL and < 162 cm FL): Epipelagic and predominantly oceanic waters along coastal California from the U.S.-Mexico border as far north as 34° N latitude, from the 100 fm isobath about out to the Santa Rosa-Cortes Ridge, particularly between San Diego and Long Beach, California. (Line extends south from Ridge to a point on the EEZ boundary at 31° 36' N latitude and 118° 45' W longitude). Associates with sea surface temperatures of 21°C or warmer; nothing known of diet; presumably feeds on small schooling fishes and squids

- Adults (≥ 161 cm FL, predominantly adult females): Epipelagic and predominantly oceanic waters along coastal California from the U.S. Mexico border as far north as 34° N latitude, from the 100 fm isobath about out to the Santa Rosa-Cortes Ridge, particularly between San Diego and Long Beach, California. (Line extends south from Ridge to a point on the EEZ boundary at 31° 36' N latitude and 118° 45' W longitude). Associates with sea surface temperatures of 21°C or warmer. Nothing known of diet; presumably feeds on small pelagic schooling fishes and squids e, in near surface waters from the U.S.-Mexico EEZ border north to off Pigeon Point, California.

4.6.3 Essential Fish Habitat for Bigeye Thresher Shark: (Based on California drift gill net logbook (1981-1991); drift net observer data (1990-1999); Nakano and Matsunaga, 1997, unpub. ibid.). Diet information from Fitch and Craig (1964) and Ramon and Preti (SWFSC, NMFS, pers. commun., unpub. data, 9/2000).

- Neonate/early juveniles (~ 90 to 115 cm FL, 0 to 2 and 3 yr olds): These size classes are not known to occur in U.S. West Coast EEZ.

- Late juveniles/subadults (> 115 cm FL and < 155 cm FL males and < 189 cm females): Coastal and oceanic waters in epi- and mesopelagic zones from the U.S.-Mexico border north to 37° N latitude off Davenport, California. South of 34° N latitude from the 100 fm isobath to the 2000 fm and north of 34° N latitude the 800 fm isobath out to the 2200 fm isobath. Nothing known of diet in our region; presumably feeds on pelagic fishes and squids.

- Adults (> 154 cm FL males and > 188 cm FL females): Coastal and oceanic waters epi-and mesopelagic zones from the U.S.-Mexico border north to 45° N latitude off Cascade Head, Oregon. In southern California south of 34° N latitude from the 100 fm isobath out to the 2000 fm isobath. North of 34° N latitude from the 800 fm isobath out to the outer EEZ boundary. Little known of the diet in our region; presumably feeds on pelagic fishes and squids, including Pacific hake and king-of-the-salmon.

4.6.4 Essential Fish Habitat for Shortfin Mako Shark: (Based on California drift gill net logbook (1981-1991); drift net observer data (1990-1999); Oregon driftnet logbook data 1991-2001; longline and gillnet catch data from Nakano (1994); California Department of Fish and Game tagging data; Holts and Bedford (1993); and Casey and Kohler (1992)) Food habits information from Hannan et al. (1993); Eschmeyer et al. (1983); D. Holts (NMFS, SWFSC La Jolla, pers. comm. 10/16/2000).

- Neonate/early juveniles (< 101 cm FL): Oceanic and epipelagic waters of the U.S. West Coast from the 100 fm isobath out to the 2000 fm isobath (and possibly beyond) from the Mexico border to Point Pinos, CA, especially the Southern Calif. Bight, from the 1000 fm isobath out to 2000 fm isobath from Monterey Bay north to Cape Mendocino; and from the 1000 fm isobath out to the EEZ boundary north of Cape Mendocino to latitude 46° 30' N latitude. Occupies northerly habitat during warm water years. Nothing documented on food of neonates; presumably feeds on small pelagic fishes.

- Late juveniles/subadults (> 100 cm FL and < 180 cm FL males and < 249 cm FL females): Oceanic and epipelagic waters from the U.S.-Mexico EEZ border north to 46° 30' N latitude from the 100 fm isobath out to the EEZ boundary north to San Francisco (38° N latitude), and from 1000 fm out to the EEZ boundary north to San Francisco (38° N latitude) and from 1000 fm out to the EEZ boundary north of San Francisco. Shortfin mako off the West Coast reportedly feed on mackerel, sardine, bonito, anchovy, tuna, other sharks, swordfish and squid. Since the large majority of makos within the EEZ are juveniles, presumably this diet refers to primarily to juveniles and subadults.

- Adults (> 179 cm FL males and > 248 cm FL females--Most adults within the U.S. West Coast EEZ are males.): Epipelagic oceanic waters from the U.S.-Mexico EEZ border north to 46° 30' N latitude extending from the 400 fm isobath out to the EEZ boundary south of Point Conception, from 1000 fm isobath out to the EEZ boundary and beyond north of Point Conception, and from the 1000 fm isobath out to the EEZ boundary and beyond, North of Point Conception, CA. Little is known of diet of large adults. Two adult shortfin mako over 250 cm TL were found to contain remains of a harbor seal, common dolphin, small sharks, and marlin (D. Holts, NMFS, SWFSC La Jolla, pers. comm. 10/16/2000). As with juveniles, presumably mackerel, sardine, bonito, anchovy, tunas, squid and swordfish may also be taken by adults, but existing published information on diet in our region is not broken down by mako size.

4.6.5 Essential Fish Habitat for Blue Shark: (Based on California drift gill net logbook (1981-1991); drift net observer data (1990-1999); Nakano and Nagasawa (1996); and Nakano (1994)). Diet information based on Tricas 1979; Harvey 1989; and Brodeur et al. 1987.

- Neonate/early juveniles (< 83 cm FL): Epipelagic, oceanic waters from the U.S.-Mexico border north to the U.S.-Canada border from the 1000 fm isobath seaward to the outer boundary of the EEZ and beyond; extending inshore to the 100 fm isobath south of 34° N latitude. Size-specific information on diet of neonates is not available for our region.

- Late juveniles/subadults (> 82 cm FL and < 167 cm FL males and < 153 cm FL females): Epipelagic, oceanic waters from the U.S.-Mexico border north to 37° N latitude (off Santa Cruz, CA) from the 100 fm isobath seaward to the outer boundary of the EEZ and beyond; and north to the U.S.-Canada border from the 1000 fm isobath seaward to the EEZ outer boundary. Within the U.S. West Coast EEZ known to feed on northern anchovy, Pacific hake, squid, spiny dogfish, Pacific herring, flatfishes, and opportunistically on surface-swarms of the euphausiid, *Thysanoessa spinifera*, and inshore spawning aggregations of market squid, *Loligo opalescens*.

- Adults (> 166 cm FL males and > 152 cm FL females): Epipelagic, oceanic waters from the U.S.-Mexico border north to the U.S.-Canada border from the 1000 fm isobath seaward to the outer boundary of the EEZ and beyond; extending inshore to the 200 fm isobath south of 37° N latitude off Santa Cruz, CA. Although diet information is lacking for fish of this specific size group, blue sharks in coastal waters off the U.S. West Coast reportedly feed on northern anchovy, Pacific hake, squid, spiny dogfish, herring, flatfishes, and opportunistically on surface-swarms of the euphausiid, *Thysanoessa spinifera*, and inshore spawning aggregations of market squid, *Loligo opalescens*.

4.6.6 Essential Fish Habitat for Albacore Tuna: (Based on drift net observer data (1990-1999); California Commercial Passenger Fishing Vessel data; and Saito (1973); Laurs et al. (1974); Laurs and Lynn (1991); Bartoo and Forman (1994); and Hanan et al. (1993). Diet information from Iverson (1962) and Pinkas et al. (1971).

- Eggs and Larvae - No habitat within the U.S. West Coast EEZ.

- Juvenile < 85 cm FL. Oceanic, epipelagic waters generally beyond the 100 fm isobath from the U.S.-Mexico EEZ border north to U.S.-Canada border, and westward to the outer edge of the EEZ boundary. Habitat concentrations off southern and central California and the area of the Columbia River Plume area. Reported to feed opportunistically, predominantly on fishes (e.g., Pacific saury) and squids. Associated with SSTs between 10°C and 20°C in waters of the North Pacific Transition Zone in dissolved oxygen saturation levels greater than 60%. Smaller (younger) fish are known to have a higher proportion of squid in their diet. In our region, may aggregate in the vicinity of upwelling fronts to feed on small fishes (northern anchovy, saury, rockfish spp., Myctophids, barracudina), squids (e.g., *Loligo, Gonatus* and *Onychoteuthis* sp.) and crustaceans (Sergestid shrimp, pelagic red crab, *Phronima* amphipods, euphausiids).

- Adult > 84 cm FL. Oceanic, epipelagic waters generally beyond the 100 fm isobath from the U.S.-Mexico EEZ border north to U.S.-Canada border, and westward to the outer edge of the EEZ boundary. Associated with SSTs between 14°C and 25°C in waters of the North Pacific Transition Zone in dissolved oxygen saturation levels greater than 60%. Reported to feed opportunistically, predominantly on fish (e.g., Pacific saury) and squid. Large fish tend to prey increasing more on fish and less on squid.

4.6.7 Essential Fish Habitat for Bigeye Tuna: (Based on California drift gill net observer data (1990-1999); California Commercial Passenger Fishing Vessel data; Kikawa (1957, 1961); and Alverson and Peterson (1963).

- Eggs and Larvae - No habitat within the U.S. West Coast EEZ.

- Juvenile - < 100 cm FL. Oceanic, epipelagic and mesopelagic waters beyond the 200 fm isobath out to the EEZ boundary from the U.S.-Mexico EEZ border north to Point Conception, CA, some years extending northward to Monterey Bay (37° N latitude). Associated with SSTs between 13°C and 29°C with optimum between 17°C and 22°C. Habitat concentrated in the Southern California Bight primarily south of 34° N latitude from the 100 fm isobath out to the 1000 fm isobath. Nothing is known of the diet of juvenile bigeye in the U.S. West Coast EEZ.

- Adult - > 100 cm FL. Oceanic, epipelagic and mesopelagic waters beyond the 200 fm isobath out to the EEZ boundary from the U.S.-Mexico EEZ border north to Point Conception, CA, some years extending northward to Monterey Bay (37° N latitude). Associated with SSTs between 13°C and 29°C with optimum between 17°C and 22°C. Habitat concentrated in the Southern California Bight primarily south of 34° N latitude from the 100 fm isobath out to the 1000 fm isobath. Nothing is known of diet of adult bigeye in the U.S. West Coast EEZ.

<u>4.6.8 Essential Fish Habitat for Northern Bluefin Tuna</u>: Based on California drift gill net observer data (1990-1999); Oregon driftnet logbook data, 1992-2001; Uosaki and Bayliff (1999); Bayliff (1994); Harada 1980). Food habits based on Pinkas et al. (1971) and Bayliff (1994).

- Eggs and Larvae - No habitat within the U.S. West Coast EEZ.

- Juvenile - < 150 cm FL and 60 kg, Bayliff 1994; Harada 1980). Oceanic, epipelagic waters beyond the 100 fm isobath from the U.S.-Mexico EEZ border north to U.S.-Canada border, and westward to the outer edge of the EEZ boundary. Associated with SST between 14°C and 23°C. Northerly migratory extension appears dependent on position of the North Pacific Subarctic Boundary. A major prey item of juvenile bluefin in our region is the northern anchovy; other food items reported from off southern California include saury, market squid, (up to 80% of stomach contents by volume), saury, squid, and hake. May feed on pelagic red crab when this species occurs in the EEZ, since it is a significant component of the diet off Mexico.

- Adult - (≥ 150 cm FL and 60 kg, Bayliff 1994; Harada 1980). No regular habitat within the U.S. West Coast EEZ, although large fish are occasionally caught in the vicinity of the Channel Islands off Southern California and rarely off the central California coast. Adult prey items are squids and a variety of fishes including anchovies, herring, pompanos, mackerel, and other tunas.

<u>4.6.9 Essential Fish Habitat for Skipjack Tuna</u>: (Based on California drift gill drift net observer data (1990-1999); California Commercial Passenger Fishing Vessel data; Matsumoto et al. 1984 and IATTC 2001). Diet information based largely on Alverson (1963).

- Eggs and Larvae - No habitat within the U.S. West Coast EEZ.

- Juvenile - No habitat within the U.S. West Coast EEZ.

- Adult - Oceanic, epipelagic waters beyond the 400 fm isobath out to the EEZ boundary from the U.S.-Mexico EEZ border northward to Point Conception, CA, and northward beyond the 1000 fm isobath north to about 40° N latitude. Associated with SSTs between 18°C and 20°C and dissolved oxygen level ≥ 3.5 ppm. Habitat concentrated, esp. in warm years, in the Southern California Bight primarily south of 33° N latitude. Off Baja California, Mexico and southern California, pelagic red crab and northern anchovy are important constituents of the diet. Euphausiids, Pacific saury and squid are also taken.

<u>4.6.10 Essential Fish Habitat for Yellowfin Tuna</u>: (Based on California Commercial Passenger Fishing Vessel data; drift gill net observer data (1990-1999); Uosaki and Bayliff (1999); Block et al. (1997); IATTC (1990; 2000e); Schaefer (1998); N. Bartoo, SWFSC, NMFS, La Jolla, CA pers. comm.). Diet information based largely on Alverson (1963).

- Eggs and Larvae - No habitat within the U.S. West Coast EEZ.

- Juvenile - females: < 92 cm FL; males: < 69 cm FL. Oceanic, epipelagic waters from the U.S.-Mexico EEZ border north to Point Conception, CA, some years extending northward to Monterey Bay (37° N latitude).

South of Pt Conception from the 100 fm isobath out to the EEZ boundary; north of Point Conception from 300 fm isobath out to the EEZ boundary. Associated with SSTs between 18° to 31°C. Pelagic red crab is an important constituent of the diet off the west coast of Baja California, Mexico, and southern California (warm water years), and, secondarily, northern anchovy. Cephalopods also occur in the diet less frequently.

- Adult - females: ≥ 92cm FL; males: ≥ 69 cm FL. Adult yellowfin tuna do not regularly occupy habitat within the U.S. West Coast EEZ.

<u>4.6.11 Essential Fish Habitat for Striped Marlin</u>: (Based on Uosaki and Bayliff (1999); California drift net observer data (1990-1999 and angler tag-release data (D. Holts and D. Prescott, pers. comm. NMFS, SWFSC, La Jolla, CA, and diet information from Hubbs and Wisner (1953), Nakamura (1985), Ueyanagi and Wares (1975), and Holts *in press* (2001).

- Eggs and Larvae - No habitat within the U.S. West Coast EEZ.

- Juvenile - No regular habitat within the U.S. West Coast EEZ.

- Adult - > 150 cm EFL or 171 JFL. Oceanic, epipelagic waters of the Southern California Bight, above the thermocline, from the 200 fm isobath from the U.S.-Mexico EEZ border to about 34° 09' N latitude (Pt. Hueneme, CA), east of the Santa Rosa-Cortes Ridge (a line from South Point, Santa Rosa Island, southeast to the EEZ boundary at approx. 31° 36' N latitude and 118° 45' W longitude). Preferred water temperature bounded by 68° to 78°F (20-25°C). Food species off California include Pacific saury, northern anchovy, Pacific sardine, jack mackerel, squid and pelagic red crab.

<u>4.6.12 Essential Fish Habitat for Swordfish</u>: (Based on California drift gill net observer data (1990-1999); Oregon driftnet logbook data , 1991-2001; and DeMartini et al. (2000); diet information from Fitch and Lavenberg (1971) Mearns et al. (1981) and Markaida and Sosa-Nishizaki (1998).

- Eggs and Larvae - No habitat within the U.S. West Coast EEZ.

- Juvenile - (Males < 102 EFL or 118 cm JFL; females < 144 cm EFL or < 163 JFL). Oceanic, epipelagic and mesopelagic waters from the U.S.-Mexico EEZ border north to 41° N latitude. In the Southern California Bight primarily south of the Santa Barbara Channel Islands from the 400 fm isobath out to the EEZ boundary. North of Point Conception from the 1000 fathom isobath westward to the EEZ outer boundary and northward to 41° N latitude. Food species within the U.S. West Coast EEZ have not been documented for this size category. Diet is thought to be largely opportunistic on suitable-sized prey. Off southern California, swordfish of unspecified size are reported to feed on Pacific hake, northern anchovy, squid, Pacific hake, jack mackerel, and shortbelly rockfish; squids are also important prey off western Baja California, Mexico

- (Males > 102 cm EFL or 117 JFL; females > 144 cm EFL or 162 JFL): Oceanic, epipelagic and mesopelagic waters out to the EEZ boundary inshore to the 400 fm isobath in southern and central California from the U.S.-Mexico EEZ border north to 37° N latitude; beyond the 1000 fm isobath northward to 46° 40' N latitude. Food species within the U.S. West Coast EEZ have not been documented for this size category. Off southern California, swordfish of unspecified size are reported to feed on Pacific hake, northern anchovy, squid, Pacific hake, jack mackerel, and shortbelly rockfish; squids are also important prey off western Baja California, Mexico. Large swordfish are capable of foraging in deep water and may also feed on mesopelagic fishes.

<u>4.6.13 Essential Fish Habitat for Dorado or Dolphinfish</u>: (Based on California Commercial Passenger Fishing Vessel catches; Norton (1999); and Ambrose (1996). Diet information based on Eschmeyer et al. (1983) and Palko at al. (1982).

- Spawning, eggs and larvae - (< 13.7 cm FL): Primarily outside of the U.S. West Coast EEZ. Spawning restricted to water ≥ 24°C; off southern Baja California, Mexico, with peak larval production in August and September (Ambrose 1996).

- Juveniles and subadults - (> 13.6 cm FL and < 35 cm FL): Epipelagic (≤ 30 m deep) and predominantly oceanic waters offshore the 6 fm isobath along coastal California from the U.S.-Mexico border generally as far north as Point Conception, CA (34° 34' N latitude) and within the U.S. West Coast EEZ primarily east of the Santa Rosa-Cortes Ridge. (Line extends from Point Conception south-southeast to a point on the EEZ boundary at 31° 36' N latitude and 118° 45' W longitude). Prefers sea surface temperatures 20°C and higher during warm water incursions. Nothing documented on the diet of juvenile dolphin within the EEZ; presumably feeds on other epipelagic fishes (e.g, small flying fish), crustaceans and squids.

- Adults - (> 34 cm FL): Epipelagic (≤ 30 m deep) and predominantly oceanic waters offshore the 6 fm isobath along coastal California from the U.S.-Mexico border generally as far north as Point Conception, CA (34° 34' N latitude) and within the U.S. West Coast EEZ primarily east of the Santa Rosa-Cortes Ridge. (Line extends from Point Conception south-southeast to a point on the EEZ boundary at 31° 36' N latitude and 118° 45' W longitude). Prefers sea surface temperatures 20°C and higher during warm water incursions. Nothing is known of the diet of adult dolphin within the U.S. EEZ, but in the Pacific, adult common dolphin are reportedly mainly piscivorous, with flying fish being the most important in volume and occurrence.

4.7 SUMMARY

- The proposed action is to adopt species- and stage-specific EFH designations for the thirteen individual management unit species as described in section 4.6 and Appendix A. This FMP identifies and describes EFH for all MUS managed under this FMP based on available Level 1 and Level 2 data from the fisheries and from the literature on distribution and habitat preference. Some of these important habitat areas are already protected to some extent by regulatory season and area closures now in effect.

- No specific EFH problem areas were identified at this time that could be addressed by management actions to protect and enhance EFH. After conducting a review and analysis of new and existing data on MUS' habitat and possible sources of disturbance in these habitats, the Council found no clear evidence of significant adverse impacts on HMS EFH. Thus no new EFH management measures, and therefore no regulations, are proposed.

- At this time, there is no evidence that HMS fishing practices or non-fishing activities are causing adverse impacts on HMS EFH, although EFH Conservation Recommendations are included to mitigate the possible effects of these practices.

- Current management measures to protect fishery habitat appear to be adequate, but should future research demonstrate a need, the Council will act accordingly to protect habitat necessary to maintain a sustainable and productive fishery in the eastern Pacific region.

- No HAPCs have been designated at this time, but the FMP provides a framework which will ensure review and updating of EFH based on new scientific evidence or other information as well as incorporation of new information on HMS HAPCs as it becomes available in the future. The Council is authorized to proceed with establishing such a framework procedure for reviewing EFH and identifying HAPCs, particularly critical areas such as shark pupping and core nursery areas.

4.8 RECOMMENDATIONS FOR EFH RESEARCH

Very little specific information is known about the migratory corridors and habitat dependency of these large mobile fishes, how they are distributed by season and age throughout the Pacific and within the West Coast EEZ, and how oceanographic changes in habitat affect production, recruitment and migration. More research is needed in these areas to better define EFH and HAPCs. Also, research is needed to identify specific shark habitat areas of particular concern, such as pupping grounds, key migratory routes, feeding areas, and areas of concentration of large adult female sharks. Pupping grounds and core nursery areas have not yet been identified and need further study. These areas may not only concentrate pups, but also the highly valuable pregnant females at certain times of the year. Reproductive female sharks, having run and survived the gauntlet of many years of natural and fishing mortality, are extremely valuable to the continued growth of their populations, and if concentrated in certain areas at pupping times, would be highly vulnerable to habitat perturbations. Of special relevance are thresher and mako shark pupping areas, the locations of which are currently unknown but must occur somewhere within the southern portion of the U.S. West Coast EEZ, judging from the presence of post-partum pups in the area (NMFS Driftnet Observer data; Bedford 1992).

4.9 LITERATURE CITED

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Chapter 5
BYCATCH OF FISH IN HMS FISHERIES

5.0 BYCATCH OF FISH IN HMS FISHERIES

5.1 Introduction

Bycatch has become a central concern of fishing industries, resource managers, scientists, and the public, both nationally and globally. A 1994 report of the Food and Agriculture Organization (FAO) of the United Nations estimated that the nearly one-quarter (27 million mt) of the total world catch by commercial fishing operations was discarded (Alverson *et al.*, 1994). Bycatch from recreational fisheries was not quantified in the FAO report, but anglers also discard (dead and alive) millions of fish each year. Bycatch can result in death or injury to the discarded fish, and it is essential that this component of total fishing-related mortality be incorporated into fish stock assessments and evaluation of management measures.

Bycatch precludes other more productive uses of fishery resources; it is particularly important to minimize the waste associated with bycatch when so many of the world's fisheries are either fully exploited or overexploited. Although not all discarded fish die, when bycatch becomes a source of fishing mortality it can slow the rebuilding of overfished stocks. Bycatch imposes direct and indirect costs on fishing operations by increasing sorting time and decreasing the amount of gear available to catch target species. Incidental catch concerns also apply to populations of marine mammals, sea turtles, seabirds and other components of ecosystems for which there are no commercial or recreational uses. Interactions with protected species are addressed in Chapter 6.

In 1998, NMFS developed a national bycatch plan, *Managing the Nation's Bycatch* (NMFS, 1998), which includes programs, activities, and recommendations for federally managed fisheries. That plan establishes a definition of bycatch as fishery discards, retained incidental catch, and unobserved mortalities resulting from a direct encounter with fishing gear.

5.2 Bycatch Reduction and the Magnuson-Stevens Act

National Standard 9 of the Magnuson-Stevens Act requires that fishery conservation and management measures shall, to the extent practicable, minimize bycatch and minimize the mortality of bycatch that cannot be avoided. In many fisheries, it is not practicable to eliminate all bycatch and bycatch mortality. The Magnuson-Stevens Act defines bycatch as fish that are harvested in a fishery, but are not sold or kept for personal use, and includes economic discards and regulatory discards. Bycatch does not include fish released alive under a recreational catch and release fishery management program.

Some relevant examples of fish caught in West Coast HMS fisheries that are included in the Magnuson-Stevens Act's definition of bycatch are marlin caught and discarded by commercial fishing gear; tunas caught and discarded by recreational or commercial fishers; species for which there is little or no market and are therefore discarded, such as blue sharks; and most sharks that are not landed (including fish hooked and lost, or fish released at the boat - whether or not the fish was tagged).

There are many benefits associated with the reduction of bycatch, including the reduction of uncertainty concerning total fishing-related mortality, which improves the ability to assess the status of stocks, to determine the appropriate relevant controls, and to ensure that overfishing levels are not exceeded. It is also important to consider bycatch of HMS, especially sharks, as a source of mortality from fisheries that target species other than HMS. To maintain sustainable fisheries, it makes sense to work with fishery constituents on an effective, flexible bycatch strategy. This strategy may include a combination of management measures in the domestic fishery, and if appropriate, will incorporate multi-lateral measures recommended by international fora (e.g., MHLC, FAO Shark Global Plan of Action). The bycatch in each fishery will be summarized annually in the SAFE report for HMS fisheries. The effectiveness of the bycatch reduction measures will be evaluated based on this summary. Any regulatory changes will be made using a framework procedure.

A limited number of options are currently available for bycatch reduction in HMS fisheries, some of which are being used. These are the measures:

Commercial
1. Gear Modifications
2. Time/Area Closures
3. Full Retention of Catch
4. Performance Standards
5. Education
6. Effort Reduction
7. Limited Soak Time
8. Forbidden to Set on Floating Objects

Recreational
1. Use of Dehooking Devices (Mortality Reduction Only)
2. Use of Circle Hooks (Mortality Reduction Only)
3. Full Retention of Catch
4. Formal Voluntary Catch-and Release Program for all Fish
5. Formal Voluntary Catch-and Release Program for Striped Marlin Only

There are probably no fisheries in which there is no bycatch because none of the currently legal fishing gears are perfectly selective for the target of each fishing operation (with the possible exception of the swordfish harpoon fishery). Therefore, to eliminate bycatch of every species in HMS fisheries would require eliminating fishing. That is not practicable. The challenge becomes one of managing the kinds of gear, their configuration, and how, when, and where they are operated; and the disposition of each species caught in such a way that the unintended catch is reduced, the survival of the released fish is maximized, and the sustainable use of bycatch is achieved where appropriate. HMS fisheries are currently limited to the following gear types: rod and reel and other handheld gear, surface hook and line, purse seine, harpoon, longline, and drift gillnets. Possible gear modifications that may reduce bycatch and bycatch mortality are being researched and considered (e.g., circle hooks, artificial baits).

Managing when and where fisheries operate can be an effective tool for reducing bycatch. Recent attempts to close important habitats to protect fish from directed and incidental fishing gear have been successful. Southern California and inshore areas off Oregon are closed to drift gillnet fishing to protect pregnant thresher sharks and their pups (Stick *et al.*, 1990).

Establishing uses for bycatch species may encourage fishers to retain such species. Often, catch is discarded in a fishery because of undesirable species, size, sex, or quality, or for other reasons, including economic discards (e.g., blue sharks). If certain species could be marketed, then they would be retained, not discarded, and therefore would not be considered bycatch.

A recreational catch and release fishery management program is one in which the retention of a particular species caught with recreational fishing gear is prohibited (Title 50, Code of Federal Regulations, Section 600.350). However, since this is a guideline and not a regulation, it may be modified to accommodate a voluntary catch and release program. Amendment 1 to the Atlantic Billfish Fishery Management Plan has instituted a voluntary catch and release program to allow anglers to release their billfish without classifying those fish as bycatch. A similar program can be used in West Coast recreational fisheries.

5.3 Evaluation and Monitoring of Bycatch

The identification and quantification of bycatch in HMS fisheries is the first step in reducing bycatch and bycatch mortality. In the following subsections, bycatch is examined on a fishery by fishery basis.

Bycatch will be monitored on a continuing basis, and bycatch information will be summarized in the annual SAFE report (see Chapter 3, section 3.4). Bycatch reporting is addressed in Chapter 5, section 5.5.

5.3.1 Drift Gillnet Fishery

The drift gillnet fishery for swordfish and sharks, using stretched mesh nets with a diameter greater than 14 inches, has existed off the West Coast since 1977 (Hanan *et al.*, 1993). Beginning in 1980, CDFG started collecting logbooks, a practice which continues to the present. The logs are released to NMFS for analysis. Since 1980, with the exception of a few years, either CDFG or NMFS has fielded an observer program to record catch and the impact on protected species. These observer programs have also provided data on bycatch.

With the implementation of the Pacific Offshore Cetacean Take Reduction Plan in 1997 that required changes in drift gillnet fishing methods to reduce the take of marine mammals, NMFS observer data from 1998-99 through the 2001-02 seasons provides the most reliable picture of bycatch from the current fishery. Data from 1991-92 through 1997-98 seasons are presented for comparison with post Take Reduction Plan catches. Data from the 1990-91 season are presented in Table 5-1 but were omitted from the analysis because all fish were returned as unknown, not alive, dead or unknown as in subsequent observer reports.

Tables 5-1 through 5-12 (NMFS, unpublished data) present catch and bycatch data for observed sets in the fishery from the start of the observer program in 1990 to present. The tables list all fish observed during each set. During the twelve year period the following species, in addition to the proposed management unit species, were observed in the drift gillnet fishery: blue marlin, black marlin, sailfish, Pacific angel shark, prickly shark, salmon shark, six gill shark, seven gill shark, smooth hammerhead shark, soupfin shark, spiny dogfish shark, bay pipefish, bat ray, big skate, blacksmith, bullet mackerel, California barracuda, California needlefish, common mola, jack mackerel, louvar, manta, mobula, northern anchovy, oarfish, opah, Pacific bonito, Pacific electric ray, Pacific hake, Pacific herring, Pacific mackerel, Pacific pomfret, Pacific sardine, pelagic stingray, remora, round stingray, white seabass, and yellowtail. In addition, the three sharks proposed as prohibited species, basking, white, and megamouth sharks were also taken.

Table 5-1 NMFS California/Oregon observer program, observed catch - 1990/1991 fishing season, May 1, 1990, through January 31, 1991

	Total		Returned			Number	Catch
Species	Caught	Kept	Alive	Dead	Unknown	Damaged	per Set
Swordfish	509	494			15	56	2.610
Striped Marlin	13	2			11	2	0.067
Albacore	62	45			17	20	0.318
Bluefin Tuna	54	41			13	19	0.277
Skipjack Tuna	40	37			3	3	0.205
Yellowfin Tuna	1				1	1	0.005
Common Thresher Shark	330	329			1	26	1.692
Bigeye Thresher Shark	18	16			2		0.092
Pelagic Thresher Shark	1	1					0.005
Shortfin Mako Shark	245	243			2	6	1.256
Blue Shark	759	13			746	71	3.892
Bay Pipefish	1				1		0.005
Bullet Mackerel	216	112			104	48	1.108
Common Mola	1234	1			1233	7	6.328
Louvar	19	17			2	9	0.097
Opah	75	75				6	0.385
Other Identified Fish	2				2		0.010
Pacific Bonito	67	50			17	21	0.344
Pacific Electric Ray	2				2		0.010
Pacific Hake	1				1		0.005
Pacific Mackerel	58	37			21	2	0.297
Pacific Pomfret	1				1		0.005
Pelagic Stingray	2				2		0.010
Unidentified Fish	28	10			18	5	0.144
Unidentified Ray	1				1		0.005
Yellowtail	3	2			1		0.015

The above table summarizes the total catch and final disposition, by species, of all fish observed caught in the California/Oregon drift gillnet fishery during the 1990/1991 fishing season. Data were collected at sea by NMFS observers, and represents a total of 195 sets. Estimated total fishing effort for the season is 4,327 sets

Table 5-2 NMFS California/Oregon observer program, observed catch - 1991/1992 fishing season, May 1, 1991, through January 31, 1992

	Total		Returned			Number	Catch
Species	Caught	Kept	Alive	Dead	Unknown	Damaged	per Set
Swordfish	753	749		4		44	1.579
Striped Marlin	40	19		21		1	0.084
Albacore	307	288		19		56	0.644
Bigeye Tuna	8	8				1	0.017
Bluefin Tuna	25	20		5		8	0.052
Skipjack Tuna	392	325	2	65		101	0.822
Yellowfin Tuna	38	38				5	0.080
Common Thresher Shark	412	403	1	8		23	0.864
Bigeye Thresher Shark	65	62		3			0.136
Shortfin Mako Shark	501	495	4	2		6	1.050
Blue Shark	716	44	218	423	31	22	1.501
Pacific Angel Shark	3		1		2	1	0.006
Salmon Shark	1			1			0.002
Unidentified Shark	1				1		0.002
Bat Ray	3		2		1	1	0.006
Bullet Mackerel	71	26		43	2	19	0.149
Common Mola	2090	6	1957	49	78	3	4.382
Jack Mackerel	33	30		3			0.069
King of the Salmon	1	1					0.002
Louvar	49	47		2		9	0.103
Northern Anchovy	1			1			0.002
Opah	111	108	1	1	1	9	0.233
Other Identified Fish	34	6	26	2		1	0.071
Pacific Bonito	5	4		1			0.010
Pacific Electric Ray	1				1		0.002
Pacific Hake	12			12		2	0.025
Pacific Herring	2	2					0.004
Pacific Mackerel	813	522	14	277		36	1.704
Pacific Pomfret	19	16		3			0.040
Pacific Sardine	4	2		2		1	0.008
Pelagic Stingray	1			1			0.002
Remora	3		3				0.006
Unidentified Fish	12		1	11		5	0.025
Unidentified Ray	4			3	1		0.008
Unidentified Skate	1		1				0.002
Yellowtail	4	4					0.008

The above table summarizes the total catch and final disposition, by species, of all fish observed caught in the California/Oregon drift gillnet fishery during the 1991/1992 fishing season. Data were collected at sea by NMFS observers, and represents a total of 477 sets. Estimated total fishing effort for the season is 4,652 sets.

Table 5-3 NMFS California/Oregon observer program, observed catch - 1992/1993 fishing season, May 1, 1992, through January 31, 1993

	Total		Returned			Number	Catch
Species	Caught	Kept	Alive	Dead	Unknown	Damaged	per Set
Swordfish	1891	1877		14		116	2.865
Striped Marlin	13	2		11		2	0.020
Shortbill Spearfish	1	1				1	0.002
Albacore	1071	906		165		260	1.623
Bluefin Tuna	131	108		23		35	0.198
Skipjack Tuna	251	143		108	87		0.380
Yellowfin Tuna	23	19		4		5	0.035
Common Thresher Shark	383	382		1		4	0.580
Bigeye Thresher Shark	38	35		3			0.058
Shortfin Mako Shark	483	474	4	4	1	1	0.732
Blue Shark	2373	5	746	1578	44	89	3.595
Prickly Shark	1		1				0.002
Salmon Shark	9	9					0.014
Smooth Hammerhead Shark	6	1		5			0.009
Soupfin Shark	2	2					0.003
Bat Ray	2		2				0.003
Bullet Mackerel	175	119		56		18	0.265
Common Mola	3513		3390	97	26	4	5.323
Jack Mackerel	6	3		3		1	0.009
Louvar	97	85		12		32	0.147
Manta	1		1				0.002
Oarfish	1	1					0.002
Opah	290	285		5		33	0.439
Other Identified Fish	11		5	6		2	0.017
Pacific Bonito	36	26		10		5	0.055
Pacific Electric Ray	5		4		1		0.008
Pacific Hake	39	2	12	25		6	0.059
Pacific Mackerel	510	17	15	476	2	2	0.773
Pacific Pomfret	67	19	1	47		4	0.102
Pelagic Stingray	16		9	5	2		0.024
Remora	3		3				0.005
Unidentified Fish	9	2	2	5		5	0.014
Unidentified Ray	2	1	1				0.003

The above table summarizes the total catch and final disposition, by species, of all fish observed caught in the California/Oregon drift gillnet fishery during the 1992/1993 fishing season. Data were collected at sea by NMFS observers, and represents a total of 660 sets. Estimated total fishing effort for the season is 4,634 sets.

Table 5-4 NMFS California/Oregon observer program, observed catch - 1993/1994 fishing season, May 1, 1993, through January 31, 1994

Species	Total Caught	Total Kept	Returned Alive	Returned Dead	Returned Unknown	Number Damaged	Catch per Set
Swordfish	1696	1690		6		88	2.240
Striped Marlin	44	7	1	36		1	0.058
Blue Marlin	2	1		1			0.003
Black Marlin	4			4			0.005
Albacore	3432	2919		513		663	4.534
Bigeye Tuna	2	2					0.003
Bluefin Tuna	196	187		9		33	0.259
Skipjack Tuna	1083	207		876		282	1.431
Yellowfin Tuna	3	3					0.004
Common Thresher Shark	503	503				3	0.664
Bigeye Thresher Shark	45	37		8			0.059
Pelagic Thresher Shark	1	1					0.001
Shortfin Mako Shark	294	287	3	4		3	0.388
Blue Shark	1648	13	507	1087	41	48	2.177
Basking Shark	1			1			0.001
Salmon Shark	2	1		1			0.003
Smooth Hammerhead Shark	15	2		13			0.020
Unidentified Hammerhead	1	1					0.001
Bat Ray	1		1				0.001
Bullet Mackerel	4	3		1			0.005
Common Mola	4969	2	4668	265	34	3	6.564
Jack Mackerel	5	2		3			0.007
Louvar	35	31		4		13	0.046
Mobula	1		1				0.001
Oarfish	1			1			0.001
Opah	344	341		3		27	0.454
Other Identified Fish	12	1		7	4		0.016
Pacific Bonito	3			3		2	0.004
Pacific Electric Ray	1		1				0.001
Pacific Hake	119		6	113		10	0.157
Pacific Mackerel	79	10	1	68			0.104
Pacific Pomfret	38	6		21	1	2	0.050
Pacific Sardine	11	1		10		2	0.015
Pelagic Stingray	22	1	15	6		1	0.029
Remora	1		1				0.001
Unidentified Fish	72		1	71		60	0.095
Yellowtail	4	4					0.005

The above table summarizes the total catch and final disposition, by species, of all fish observed caught in the California/Oregon drift gillnet fishery during the 1993/1994 fishing season. Data were collected at sea by NMFS observers, and represents a total of 757 sets. Estimated total fishing effort for the season is 5,696 sets.

Table 5-5 NMFS California/Oregon observer program, observed catch - 1994/1995 fishing season, May 1, 1994, through January 31, 1995

Species	Total Caught	Total Kept	Returned Alive	Returned Dead	Returned Unknown	Number Damaged	Catch per Set
Swordfish	977	974		3		46	1.476
Striped Marlin	65	14	2	48	1	4	0.098
Blue Marlin	4			4			0.006
Black Marlin	1			1			0.002
Sailfish	1			1			0.002
Other Identified Billfish	1			1			0.002
Albacore	659	592		67		123	0.995
Bluefin Tuna	161	161				7	0.243
Skipjack Tuna	54	48		6		3	0.082
Yellowfin Tuna	6	6					0.009
Common Thresher Shark	585	583		2		8	0.884
Bigeye Thresher Shark	48	41	1	6			0.073
Pelagic Thresher Shark	1			1			0.002
Shortfin Mako Shark	334	328	3	3			0.505
Blue Shark	993	16	272	683	22	20	1.500
Prickly Shark	1		1				0.002
Salmon Shark	1	1					0.002
Sevengill Shark	1	1					0.002
Smooth Hammerhead Shark	2	2					0.003
Big Skate	1		1				0.002
California Barracuda	2	2					0.003
Common Mola	2218	13	2087	90	28	5	3.350
Jack Mackerel	24	9	1	14		3	0.036
Louvar	38	35		3		8	0.057
Northern Anchovy	2		1	1			0.003
Oarfish	3			3		2	0.005
Opah	222	215		6	1	13	0.335
Other Identified Fish	22	5	2	14	1	1	0.033
Pacific Bonito	2	2				1	0.003
Pacific Electric Ray	3	1	1	1			0.005
Pacific Hagfish	1			1			0.002
Pacific Hake	47	4		43		3	0.071
Pacific Mackerel	1151	225	11	914	1	61	1.739
Pacific Pomfret	73	66		7		2	0.110
Pacific Sardine	2			2		1	0.003
Pelagic Stingray	31		25	4	2		0.047
Remora	12		11		1		0.018
Round Stingray	2		1	1			0.003
Unidentified Fish	18			18		16	0.027
Unidentified Ray	1		1				0.002
Yellowtail	3	2		1			0.005

The above table summarizes the total catch and final disposition, by species, of all fish observed caught in the California/Oregon drift gillnet fishery during the 1994/1995 fishing season. Data were collected at sea by NMFS observers, and represents a total of 662 sets. Approximate total fishing effort for the season is 4,248 sets.

Table 5-6 NMFS California/Oregon observer program, observed catch - 1995/1996 fishing season, May 1, 1995, through January 31, 1996

Species	Total Caught	Total Kept	Returned Alive	Returned Dead	Returned Unknown	Number Damaged	Catch per Set
Swordfish	1265	1252		13		136	2.155
Striped Marlin	21	5		16			0.036
Blue Marlin	5	1		4			0.009
Albacore	434	369		65		105	0.739
Bigeye Tuna	2	2					0.003
Bluefin Tuna	450	373		77		164	0.767
Skipjack Tuna	1947	906	1	1040		784	3.317
Yellowfin Tuna	23	22		1		5	0.039
Common Thresher Shark	130	130				1	0.221
Bigeye Thresher Shark	55	48	1	6		2	0.094
Shortfin Mako Shark	466	460	4	1	1	5	0.794
Blue Shark	2655	7	630	1972	46	119	4.523
Bat Ray	1		1				0.002
California Barracuda	9	9					0.015
Common Mola	3668	14	3549	97	8	15	6.249
Louvar	57	44		13		32	0.097
Oarfish	1			1		1	0.002
Opah	301	291		10		30	0.513
Other Identified Fish	28	1	18	8	1		0.048
Pacific Bonito	59	11		48		43	0.101
Pacific Electric Ray	1				1		0.002
Pacific Hake	6	3		3			0.010
Pacific Mackerel	514	133	9	372		2	0.876
Pacific Pomfret	8	2		5	1	1	0.014
Pelagic Stingray	22		19	2	1	1	0.037
Remora	24		24				0.041
Unidentified Fish	121	1	1	119		119	0.206
Unidentified Ray	1		1				0.002
White Seabass	5	4		1		1	0.009
Yellowtail	1	1					0.002

The above table summarizes the total catch and final disposition, by species, of all fish observed caught in the California/Oregon drift gillnet fishery during the 1995/1996 fishing season. Data were collected at sea by NMFS observers, and represents a total of 587 sets. Approximate total fishing effort for the season is 3,673 sets.

Table 5-7 NMFS California/Oregon observer program, observed catch - 1996/1997 fishing season, May 1, 1996, through January 31, 1997

Species	Total Caught	Total Kept	Returned Alive	Returned Dead	Returned Unknown	Number Damaged	Catch per Set
Swordfish	817	813		4		50	1.749
Striped Marlin	15	10	1	4			0.032
Blue Marlin	9			9			0.019
Albacore	747	672		75		186	1.600
Bluefin Tuna	553	541		12		94	1.184
Skipjack Tuna	130	82		48		41	0.278
Yellowfin Tuna	21	19		2		6	0.045
Common Thresher Shark	535	534		1		8	1.146
Bigeye Thresher Shark	29	28		1			0.062
Shortfin Mako Shark	483	466	10	6	1	4	1.034
Blue Shark	1691	4	477	1189	21	62	3.621
Salmon Shark	8	2		6			0.017
Smooth Hammerhead	5	5					0.011
Unidentified Shark	1			1			0.002
White Shark	1	1					0.002
Bay Pipefish	2			2			0.004
Bullet Mackerel	13	9		4			0.028
California Barracuda	1	1					0.002
Common Mola	2302	2	2244	46	10	11	4.929
Jack Mackerel	6	5		1		1	0.013
Louvar	51	44	1	6		13	0.109
Northern Anchovy	1			1			0.002
Opah	571	554		16	1	35	1.223
Other Identified Fish	2			2			0.004
Pacific Bonito	6	4		2		1	0.013
Pacific Electric Ray	3		3				0.006
Pacific Hake	16			16		2	0.034
Pacific Mackerel	688	145	4	539		15	1.473
Pacific Pomfret	25	13	1	11		1	0.054
Pacific Sardine	2			2		1	0.004
Pelagic Stingray	20		11	8	1		0.043
Remora	21		19	2			0.045
Unidentified Fish	13	4	1	8		12	0.028
Unidentified Ray	1		1				0.002
Yellowtail	4	4					0.009

The above table summarizes the total catch and final disposition, by species, of all fish observed caught in the California/Oregon drift gillnet fishery during the 1996/1997 fishing season. Data were collected at sea by NMFS and contract observers, and represents a total of 467 sets. Approximate total fishing effort for the season is 3,246 sets.

Table 5-8 NMFS California/Oregon observer program, observed catch - 1997/1998 fishing season, May 1, 1997, through January 31, 1998

	Total		Returned			Number	Catch
Species	Caught	Kept	Alive	Dead	Unknown	Damaged	per Set
Swordfish	1809	1766		43		296	2.418
Striped Marlin	76	1		75		10	0.102
Blue Marlin	14			13	1		0.019
Other Identified Billfish	2		1	1		1	0.003
Albacore	1293	1141		152		272	1.729
Bigeye Tuna	8	8				1	0.011
Bluefin Tuna	676	639		37		139	0.904
Skipjack Tuna	1407	700		707		461	1.881
Yellowfin Tuna	88	77		11		29	0.118
Common Thresher Shark	628	628				16	0.840
Bigeye Thresher Shark	76	76				2	0.102
Pelagic Thresher Shark	73	72		1			0.098
Shortfin Mako Shark	940	916	9	14	1	7	1.257
Blue Shark	2319	2	737	1549	31	133	3.100
Prickly Shark	1		1				0.001
Smooth Hammerhead Shark	6			6			0.008
Soupfin Shark	1	1					0.001
White Shark	2	1		1			0.003
Bat Ray	1		1				0.001
Bullet Mackerel	1917	512	5	1400		133	2.563
California Barracuda	11	3	1	7		3	0.015
Common Mola	2112	2	2003	89	18	6	2.824
Dolphinfish	1	1					0.001
Jack Mackerel	16	3	1	12		7	0.021
Louvar	59	48		10	1	21	0.079
Manta	9		2	6	1		0.012
Mobula	3	2	1				0.004
Oarfish	2			2			0.003
Opah	495	473	1	21		79	0.662
Other Identified Fish	43	8	2	33		3	0.057
Pacific Bonito	95	55		40		29	0.127
Pacific Electric Ray	5		4	1			0.007
Pacific Hake	1			1			0.001
Pacific Mackerel	444	222	8	212	2	35	0.594
Pacific Pomfret	28	26		2		3	0.037
Pacific Sardine	20	2		18		5	0.027
Pelagic Stingray	36		29	6	1		0.048
Remora	22		21		1		0.029
Round Stingray	1		1				0.001
Unidentified Fish	89		7	82		77	0.119
Unidentified Mackerel	26	7		19		5	0.035
Yellowtail	7	7					0.009

The above table summarizes the total catch and final disposition, by species, of all fish observed caught in the California/Oregon drift gillnet fishery during the 1997/1998 fishing season. Data were collected at sea by contract observers, and represents a total of 748 sets. Approximate total fishing effort for the season is 3,039 sets.

Table 5-9 NMFS California/Oregon observer program, observed catch - 1998/1999 fishing season, May 1, 1998, through January 31, 1999

	Total		Returned			Number	Catch
Species	Caught	Kept	Alive	Dead	Unknown	Damaged	per Set
Swordfish	1069	1051		18		112	2.147
Striped Marlin	2			2		1	0.004
Albacore	1918	1652		266		424	3.851
Bluefin Tuna	342	308		34		77	0.687
Skipjack Tuna	1814	499	1	1314		430	3.643
Yellowfin Tuna	16	13		3		3	0.032
Common Thresher Shark	393	391	2			1	0.789
Bigeye Thresher Shark	15	14		1			0.030
Pelagic Thresher Shark	1	1					0.002
Shortfin Mako Shark	312	302	8	2		5	0.627
Blue Shark	2260	1	761	1472	26	70	4.538
Salmon Shark	1			1			0.002
Smooth Hammerhead Shark	1			1			0.002
Soupfin Shark	1	1					0.002
Spiny Dogfish	1			1			0.002
Unidentified Shark	1			1			0.002
Bat Ray	1		1				0.002
Blacksmith	1		1				0.002
Bullet Mackerel	444	70		374		6	0.892
California Barracuda	6	6					0.012
California Needlefish	2		1	1			0.004
Common Mola	4397	1	4266	119	11	8	8.829
Louvar	47	39	1	7		17	0.094
Manta	4		2	2			0.008
Northern Anchovy	1			1			0.002
Opah	303	293		10		40	0.608
Other Identified Fish	15	4	8	3		1	0.030
Pacific Bonito	64	47		17		17	0.129
Pacific Electric Ray	3		3				0.006
Pacific Hake	2			2			0.004
Pacific Mackerel	65	33	2	29	1	2	0.131
Pacific Pomfret	19	12		7		2	0.038
Pelagic Stingray	21		18	3			0.042
Remora	3		2		1		0.006
Round Stingray	1		1				0.002
Unidentified Fish	38			37	1	37	0.076
Unidentified Rockfish	2		1	1			0.004
Yellowtail	12	12					0.024

The above table summarizes the total catch and final disposition, by species, of all fish observed caught in the California/Oregon drift gillnet fishery during the 1998/99 fishing season. Data were collected at sea by contract observers, and represents a total of 498 sets. Approximate total fishing effort for the season is 2,951 sets.

Table 5-10 NMFS California/Oregon observer program, observed catch - 1999/2000 fishing season, May 1, 1999, through January 31, 2000

Species	Total Caught	Total Kept	Returned Alive	Returned Dead	Returned Unknown	Number Damaged	Catch per Set
Swordfish	1070	1060		10		95	2.027
Striped Marlin	12			12			0.023
Blue Marlin	4			4			0.008
Albacore	2903	2111	13	779		763	5.498
Bluefin Tuna	208	189		19		47	0.394
Skipjack Tuna	26	20		6		5	0.049
Yellowfin Tuna	4	3		1		2	0.008
Common Thresher Shark	146	144	1		1	7	0.277
Bigeye Thresher Shark	10	9		1			0.019
Shortfin Mako Shark	374	358	8	8		2	0.708
Blue Shark	2559	2	1131	1379	47	100	4.847
Megamouth Shark	1		1				0.002
Pacific Angel Shark	1		1				0.002
Prickly Shark	1			1			0.002
Salmon Shark	61	8		53			0.116
Soupfin Shark	1			1			0.002
Spiny Dogfish	2		2				0.004
Bullet Mackerel	45	8		37		7	0.085
Common Mola	1739	51	1669	13	6	2	3.294
Jack Mackerel	2	1		1			0.004
Louvar	61	43		18		32	0.116
Northern Anchovy	1	1					0.002
Opah	289	270	3	16		39	0.547
Other Identified Fish	2			2		1	0.004
Pacific Bonito	9	7	1	1			0.017
Pacific Electric Ray	5		3	2			0.009
Pacific Hake	1			1		1	0.002
Pacific Mackerel	19	2	1	16		1	0.036
Pacific Pomfret	106	83		22	1	9	0.201
Pacific Sardine	1			1			0.002
Pelagic Stingray	42		33	8	1		0.080
Remora	6	1	5				0.011
Round Stingray	3		3				0.006
Unidentified Fish	4			4		4	0.008
Unidentified Mackerel	67			67			0.127
Unidentified Ray	1			1			0.002
Unidentified Skate	1			1			0.002

The above table summarizes the total catch and final disposition, by species, of all fish observed caught in the California/Oregon drift gillnet fishery during the 1999/2000 fishing season. Data were collected at sea by contract observers, and represents a total of 528 sets. Approximate total fishing effort for the season is 2,375 sets.

Table 5-11 NMFS California/Oregon observer program, observed catch - 2000/2001 fishing season, May 1, 2000, through January 31, 2001

	Total		Returned			Number	Catch
Species	Caught	Kept	Alive	Dead	Unknown	Damaged	per Set
Swordfish	985	971		14		103	2.218
Striped Marlin	6			6		1	0.014
Blue Marlin	2			2			0.005
Albacore	1524	1294		230		414	3.432
Bluefin Tuna	427	395		32		96	0.962
Skipjack Tuna	17	1		16		11	0.038
Yellowfin Tuna	51	39		12		23	0.115
Common Thresher Shark	327	326	1			7	0.736
Bigeye Thresher Shark	9	9					0.020
Shortfin Mako Shark	391	365	8	18		8	0.881
Blue Shark	1452	3	637	793	19	66	3.270
Salmon Shark	1			1			0.002
Sixgill Shark	1		1				0.002
Smooth Hammerhead	7			7			0.016
Unidentified Shark	1				1		0.002
Big Skate	1		1				0.002
Bullet Mackerel	56	4		52		18	0.126
Common Mola	4003	24	3881	84	14	2	9.016
Dolphinfish	1	1					0.002
Jack Mackerel	43	41		2		2	0.097
Louvar	57	46	1	10		27	0.128
Northern Anchovy	1		1				0.002
Opah	170	161	2	7		22	0.383
Other Identified Fish	4		1	3			0.009
Pacific Bonito	5	5				1	0.011
Pacific Electric Ray	3		1		2		0.007
Pacific Hake	10			10			0.023
Pacific Mackerel	433	106	5	322		103	0.975
Pacific Pomfret	50	33	1	16		1	0.113
Pelagic Stingray	27	1	21	3	2		0.061
Remora	4		4				0.009
Unidentified Fish	21			21		20	0.047
White Seabass	2	2					0.005
Yellowtail	9	9				1	0.020

The above table summarizes the total catch and final disposition, by species, of all fish observed caught in the California/Oregon drift gillnet fishery during the 2000/2001 fishing season. Data were collected at sea by contract observers, and represent a total of 444 sets. Approximate total fishing effort for the season is 1,948 sets.

Table 5-12 NMFS California/Oregon observer program, observed catch - 2001/2002 fishing season, May 1, 2001, through January 31, 2002

Species	Total Caught	Total Kept	Returned Alive	Returned Dead	Returned Unknown	Number Damaged	Catch per Set
Swordfish	364	353		11		51	1.127
Striped Marlin	15			15		1	0.046
Blue Marlin	9			9			0.028
Unidentified Billfish	1			1			0.003
Albacore	1214	1070		143		170	3.759
Bluefin Tuna	32	23		9		15	0.099
Skipjack Tuna	109	60		49		33	0.337
Yellowfin Tuna	189	159		30		48	0.585
Unidentified Tuna	3			3		3	0.009
							0.000
Common Thresher Shark	316	313	1	2		6	0.978
Bigeye Thresher Shark	5	4		1			0.015
Shortfin Mako Shark	347	303	11	33		2	1.074
Blue Shark	553	17	218	315	3	28	1.712
Megamouth Shark	1		1				0.003
Salmon Shark	15	1	3	11		2	0.046
Sevengill Shark	1		1				0.003
Bullet Mackerel	21	1	1	19		2	0.065
Common Mola	2459		2265	180	14	4	7.613
Jack Mackerel	6		2	4			0.019
Louvar	37	32		5		14	0.115
Opah	235	224		11		35	0.728
Other Identified Fish	2	2					0.006
Pacific Bonito	6	2		4			0.019
Pacific Electric Ray	1			1			0.003
Pacific Hake	1			1			0.003
Pacific Mackerel	60	5	2	53		2	0.186
Pacific Pomfret	19	10		9		1	0.059
Pelagic Stingray	13		11	2			0.040
Remora	2		2				0.006
Round Stingray	1		1				0.003
Unidentified Fish	1				1		0.003
Yellowtail	4	4					0.012

The above table summarizes the total catch and final disposition, by species, of all fish observed caught in the California/Oregon drift gillnet fishery during the 2001/2002 fishing season. Data were collected at sea by contract observers, and represent a total of 323 sets. Preliminary estimated total fishing effort for the season is 1,486 sets.

During the eleven year period from 1991-2002, observer data (Tables 5-1 through 5-12) shows that albacore, skipjack tuna, blue shark, and common mola were the major bycatch species taken in drift gillnets. Bullet mackerel occasionally were taken in large numbers in the fishery during El Nino events, but not on a sustained basis as with other species. While not shown in the summary table, the bycatch of albacore is associated with economic discards; the fish are either small or heavily damaged by sharks and/or sea lions (NMFS, unpublished data). The high total discard rates (discards/total catch) for significant bycatch species such as common mola (> 99%), blue shark (> 99%), and skipjack (> 60%) are associated with the lack of marketability or low prices paid for the fish. Under current conditions, there is little or no market for common mola or whole blue sharks while skipjack commands a low price. An estimated 97% of the common mola and 36% of the blue sharks were released alive.

The effects of the Take Reduction Team's recommendations on the discarded dead rate in the DGN fishery are shown in Table 5-13. The Take Reduction Team's recommendations have been successful in reducing overall marine mammal bycatch and the number of dead fish discarded per set for major bycatch species except for albacore, which showed over a twofold increase. However, none of the catch rates either before or after implementation appear high enough to be a management problem or a threat to the resource. Using an average thrown back dead rate of 1.819 albacore per set for the period after take reduction regulations were implemented, 1,488 total sets in 2001/02 and an average weight of 20 pounds, 25.0 mt were thrown back dead during the past season. The higher catch rate may reflect the rebuilding of the stock in the 1990's (See Chapter 3, section 3.3.1). With observer coverage providing good estimates of bycatch, the amount discarded dead can be used in stock assessments. Using the same expansion method for skipjack, but with an average weight of 10 pounds, yields an estimated 12.0 mt of fish discarded dead. Again, using the same expansion method for blue sharks, but with an average weight of 50 pounds, yields an estimated 171.0 mt of discarded dead fish. Finally, expanding the discarded dead catch rate for common mola yields an estimated 372 fish thrown back dead.

The catch of striped marlin by the drift gillnet fishery averaged 29.8 fish per year after implementation of the take reduction regulations. Lowering drift gillnets to 6 fms may be responsible for the lower catch since striped marlin spend most of their time very near the surface. While this number of discards is not biologically significant, there may be some concerns with intercepting fish which might contribute to the sport fishery in southern California (Squire and Suzuki, 1990). Blue marlin catches were noted although there are few verified reports of fish taken off California.

Table 5-13 Average dead discards per set from the DGN fishery - pre and post Take Reduction Team recommendations

Species	1992-1998 Seasons	1998-2002 Seasons
Striped Marlin	0.155	0.045
Albacore	0.774	1.819
Skipjack Tuna	2.152	1.776
Blue Shark	6.213	5.076
Common Mola	0.537	0.508
Total Fish	9.831	9.223

5.3.2 Surface Hook & Line Fishery (troll and live bait)

The surface hook-and-line fishery targets albacore primarily in the eastern and central Pacific ocean. Few data are available on bycatch in the fishery. What is available comes from either logbooks or an extremely limited observer program run by NMFS (27 trips in 8 years). Since observers were not required to collect bycatch data and observer placement was not made in a systematic fashion, a complete analysis of bycatch is not possible. However, albacore, skipjack tuna, bluefin tuna, dorado, and billfish were observed as bycatch.

Preliminary analysis of the bycatch data (Norm Bartoo, NMFS La Jolla, pers. comm.) indicated 10% of the albacore less than 59 cm in length were immediately thrown back upon landing. Overall, albacore less than 59 cm in length account for 5% of total catch so the bycatch is low (< 0.5% of total catch). These fish were considered economic discards since they did not command the higher price associated with larger fish. The few remaining fish were either eaten by the crew or discarded.

There are no observer data or logbook data for live bait boats fishing for albacore off the West Coast. However, because the fishery focuses on larger fish, economic discards are probably not a bycatch issue. While fishing for albacore, other species of tuna may be taken which would not be considered bycatch if landed.

Bycatch mortality in the surface troll fishery is unknown but observations by NMFS personnel conducting tagging studies in the 1980s did differentiate survival rate of tagged fish depending on whether the hook was in the upper or lower jaw. Early results showed the tag recovery rate, and hence survival of the fish, was doubled for albacore hooked in the lower jaw. The results were so dramatic that once the trend was apparent, no further tagging took place when the fish was hooked in the upper jaw. Unfortunately, 85% of the fish were hooked in the upper jaw, the result of the fact that traditional double jig hooks travel with the point on the top.

5.3.3 Pelagic Longline Fishery

Pelagic longline vessels have operated out of West Coast ports for many years. Because of state prohibitions in California and Washington, there has been no authorized commercial longline fishery within the EEZ except for the area greater than 25 miles from the coast of Oregon. Even though authorized by Oregon, there has been no longline fishing out of Oregon ports. There have been limited attempts through experimental fishing to determine what might be taken in a fishery within the EEZ. NMFS conducted a limited night time experimental fishery (11 sets, 3,856 hooks) in 1968 off southern California and caught 2 swordfish, 1,530 blue sharks and 2 mako sharks. No striped marlin were taken. CDFG authorized an experimental fishery by the F/V Tiffany Vance in 1987. The vessel fished off Point Arguello and Monterey during a 19 day period. There were 400 to 600 hooks per set but the number of sets is unknown. The vessel caught 32 swordfish, 2,360 blue sharks, 78 pelagic stingrays and 4 bigeye threshers. The Department also authorized an experimental cable longline fishery for sharks inside the Channel Islands from 1988 through 1991 (O'Brien and Sunada, 1994). During the first two years observers were placed aboard the vessels. Results from the first year showed blue sharks accounted for 62% of the catch, mako sharks 29% and pelagic stingrays 8%. Some sea lions, turtles, giant sea bass and hammerhead sharks were also hooked. The second year produced similar results with blue sharks accounting for 62% of the catch, mako sharks 29% and pelagic stingrays 9%. A few hammerheads were also taken. No trips were observed after the second year and the experimental fishery was terminated in 1991.

The scientific staff of NMFS in Hawaii has analyzed part of their longline fishery logbook data base (which includes some vessels that fished in the WPFMC area and landed in California) to provide a picture of bycatch in the central Pacific. The data have been combined into Table 5-14. Although the number of individual boats was not tracked from year to year (the maximum in any year was 31 vessels) the vessels did report fishing 3,662 days and setting 2,892,759 hooks (Ito and Machado, 1999).

Table 5-14 Western Pacific longline logbook summary from January 1995 through December 1999 (3,662 sets and 2,892,759 hooks)

Species	Kept	Released	Species	Kept	Released
albacore	6,468	6,219	striped marlin	4	89
bigeye tuna	11,247	576	swordfish	43,044	2,239
bluefin tuna	2,409	43	blue marlin	4,292	187
yellowfin tuna	620	279	black marlin	0	0
other tuna	5	4,046	spearfish	74	19
dorado	7,300	1,933	other billfish	2	34
blue shark	787	32,315	opah	2,478	633
mako shark	503	853	wahoo	109	15
thresher shark	1,048	242	oilfish	423	478
other shark	581	1,167	other fish	-	-

In an effort to gain better knowledge about longline catches in the eastern Pacific, Dr. Chris Boggs, NMFS, Hawaii Laboratory, generated Table 5-15. The table is a combination of four different logbooks covering the period from 1997 through 1999.

The most striking difference in the table is the ten-fold decrease in longline effort as you move east of 150° W longitude. Even more striking is the decline in the total catch of most of the marketable species. These data would support the hypothesis that the eastern Pacific, at least that portion east of 150° W longitude and outside of the EEZ of the West Coast, is not as productive as the central Pacific. However, when you look at the catch per set of swordfish and blue sharks, vessels fishing east of 150° W longitude have a much higher CPUE for these species. The CPUE of vessels fishing for swordfish shows an increase of almost 400% over boats fishing west of 150° W longitude. While this table does not quantify bycatch, it does suggest that the total bycatch in the eastern Pacific would probably be lower than the central Pacific simply because fewer fish are caught due to lower effort.

Table 5-15 Hawaiian based longline logbook data for catches East and West of 150° W longitude in number of fish landed and (catch per set)

Species	1999 West	1999 East	1998 West	1998 East	1997 West	1997 East
albacore	64,359 (5.320)	4,493 (3.580)	46,268 (3.947)	4,257 (3.654)	69,464 (6.102)	3,456 (3.905)
bigeye tuna	77,448 (6.402)	4,307 (8.342)	96,259 (8.212)	4,209 (3.613)	78,707 (6.914)	2,751 (3.108)
bluefin tuna	9 (0.001)	0 (0.000)	159 (0.014)	882 (0.757)	223 (0.023)	55 (0.062)
skipjack tuna	22,082 (1.828)	188 (0.150)	8,701 (0.742)	66 (0.057)	12,061 (1.060)	0 (0.000)
yellowfin tuna	16,779 (1.387)	256 (0.204)	21,340 (1.821)	470 (0.403)	28,957 (2.544)	131 (0.148)
blue shark	74,179 (6.132)	9,444 (7.525)	84,477 (7.207)	9,722 (8.345)	77,272 (6.788)	8,061 (9.108)
mako shark	1,534 (0.127)	271 (0.216)	1,284 (0.1100	258 (0.221)	1,119 (0.098)	231 (0.261)
thresher shark	3,707 (0.306)	43 (0.034)	3,836 (0.327)	15 (0.013)	2,321 (0.204)	70 (0.079)
other shark	4,136 (0.342)	15 (0.012)	3,439 (0.293)	58 (0.050)	2,327 (0.204)	5 (0.006)
dorado	40,788 (3.371)	6,308 (5.026)	21,898 (1.868)	447 (0.384)	48,588 (4.268)	1,233 (1.393)
black Marlin	571 (0.047)	13 (.010)	947 (0.081)	8 (0.007)	1,129 (0.099)	1 (.001)
blue marlin	4,864 (0.402)	70 (0.056)	5,301 (0.452)	48 (0.041)	8,239 (0.724)	20 (0.023)
striped marlin	14,034 (1.160)	392 (0.312)	14,119 (1.204)	214 (0.049)	12,611 (1.108)	1 (0.001)
sailfish	613 (0.051)	5 (0.004)	619 (0.053)	1 (0.001)	588 (0.052)	11 (0.012)
shortbill spearfish	15,736 (1.301)	186 (0.148)	9,871 (0.842)	57 (0.049)	7,308 (0.642)	1 (0.001)
swordfish	32,168 (2.659)	12,177 (9.703)	35,471 (3.026)	12,818 (11.003)	34,287 (3.012)	11,738 (13.263)
oilfish	93 (0.008)	788 (.628)	2,532 (0.216)	157 (0.135)	1705 (0.150)	42 (0.047)
opah	11,798 (0.975)	634 (0.505)	8,927 (0.762)	263 (0.226)	8,240 (0.724)	65 (0.073)
pomfret	2,421 (0.200)	266 (.212)	14,687 (1.253)	78 (0.067)	10,433 (0.917)	1 (0.001)
wahoo	10,140 (0.838)	138 (0.110)	8,172 (0.697)	98 (0.084)	8,275 (0.727)	134 (0.151)
SETS	12,098	1,255	11,722	1,165	11,383	885
HOOKS (Thousands)	18,396	1,167	16,668	970	15,203	685

The IATTC placed observers on two longline vessels departing and returning to California ports during 1994. The two boats made 13 sets and fished 10,013 hooks (Table 5-16a). The trips occurred during June and September. Swordfish and dorado were the principal market species taken. Blue sharks were the principal bycatch species. One leatherback turtle was discarded alive while one bobbie(*sic*)/gannet was discarded dead. No other trips were observed.

Table 5-16a. IATTC observer program data for 1994 (13 sets and 10,015 hooks)

Management Unit Species	Caught	Kept	Alive	Returned Dead	Tagged
albacore	6	5	1	0	0
dorado	133	130	2	1	0
thresher shark	1	0	1	0	0
blue shark	52	0	9	43	0
mako shark	6	4	0	2	0
swordfish	46	40	1	3	2
Monitored Species					
blue marlin	6	2	2	0	2
escolar	5	0	0	0	0
opah	6	6	0	0	0

During late 2001 and early 2002, NMFS was able to place observers on vessels departing from the West Coast and fishing outside the EEZ (Table 5-16b). These vessels generally fished out to 1,000 nm from the West Coast. The reported bycatch was similar to sets observed by the IATTC with blue sharks the principal bycatch species. However, among fish discarded dead, the longnose lancetfish dominated. A total of 42 sets were observed. One loggerhead turtle was returned alive and one black-footed albatrose was returned dead.

Table 5-16b Observed catch in the U.S. West Coast pelagic longline fishery, October 2001 - February 2002, NMFS, Southwest Region, Fishery Observer Management

	Total		Returned			Catch
Species	Caught	Kept	Alive	Dead	Unknown	per Set
Swordfish	409	352	15	39	3	9.738
Striped Marlin	1		1			0.024
Albacore	31	30		1		0.738
Bigeye Tuna	4	4				0.095
Bluefin Tuna	8	8				0.190
Blue Shark	395		370	14	11	9.405
Bigeye Thresher Shark	1	1				0.024
Shortfin Mako Shark	25	1	17	7		0.595
Unidentified Shark	1		1			0.024
Common Mola	16		15		1	0.381
Dorado	1	1				0.024
Escolar	56	48	2	5	1	1.333
Longnose Lancetfish	29			28	1	0.691
Oilfish	30		17	11	2	0.714
Opah	3	3				0.071
Pacific Pomfret	10	8		2		0.238
Pelagic Stingray	8		4	4		0.190
Remora	2	0	1	1		0.048
Unidentified Fish	5	4		1		0.119

The above table summarizes the total catch and final disposition, by species, of all fish observed caught in the U.S. West Coast Pelagic Longline fishery from October 2001 through February 2002. Data were collected at sea by contract observers, and represents a total of 42 sets.

5.3.4 Harpoon Fishery

The deliberate fishing nature of harpoon gear is such that bycatch is expected to be low. Neither the California Department of Fish and Game nor NMFS have an observer program for this fishery. CDFG does collect logbook data from harpoon vessels but they only record effort and number of swordfish (Coan *et al.*, 1998). Based on reports from harpoon fishers, there are some economic discards associated with shark or sea lion damage to harpooned fish. The overall total is not known but again, based on comments by fishers, it is probably less than one fish per vessel during the season.

Total effort in this fishery is very low with only 38 vessels registered in FY 2001/2002. The last year for which the landings of harpoon vessel taking swordfish could be identified was 1999. During that year 80 mt were landed, compared to the drift gillnet fleet which landed 573 mt.

5.3.5 Tropical Tuna Purse Seine Fishery (> 400 short tons)

All of the purse seiners with carrying capacity greater than 400 short tons fishing under this HMS plan in the eastern Pacific Ocean (EPO) are regulated by NMFS under the authority of the Tuna Conventions Act of 1950, in carrying out the recommendations of the Inter-American Tropical Tuna Commission (IATTC). The Commission is open to governments whose nationals fish for tropical tunas and tuna-like species in the EPO (see Chapter 1, section 1.5.2). As part of the most recent (1998) Agreement on the International Dolphin Conservation Program (AIDCP), IATTC continues to maintain 100% observers coverage on board Class-6 purse seiners (> 400 short tons capacity). In addition to documenting dolphin mortality, observers also collect data on bycatch and discards. The IATTC defines bycatch as fish other than commercially-important tunas, which are discarded dead at sea while "discards" are defined as commercially-important tunas which are discarded dead at sea. This is done to fulfill one of the objectives under AIDCP, specifically "avoiding, reducing and minimizing bycatch and discards of juvenile tunas and non-target species." The Commission is concerned about documenting and reducing bycatch and discards because of the recent shift in effort towards setting on floating objects and their associated elevated bycatch levels. Tables 5-17 through 5-21 shows the results of observed sets from 1997 through 2001.

The most striking conclusion that can be derived from the table is that the vast majority of bycatch and discards comes from sets on floating objects. Of the individual species identified in the table only bonito, swordfish and sailfish were taken with greater frequency when not fishing on floating objects.

IATTC has also initiated a full retention program in 2001to better document bycatch and as an incentive for vessels to avoid bycatch because of the economic penalty associated with having to land fish of little value. At the IATTC Working Group on Bycatch meeting in June 2002, there was a report that incomplete logbook reporting and dumping of fish in spite of the resolution, were jeopardizing the program since economic incentives to avoid bycatch (full retention) were not working. However, the program will be continued with efforts to improve compliance and effectiveness in 2003 and 2004.

The IATTC passed a Resolution on Bycatch reaffirming continuation of the full retention program, urged participating parties to ensure their fishers comply with the full retention requirement, strive for ways to reduce juvenile tuna catch, determine ways by which the bycatch of billfish and sharks could be reduced, and include observer coverage on small purse seiners. They also included a statement on sea turtles which called for better data collection and greater attention to releasing sea turtles alive.

Table 5-17 Estimated 1997 discards and bycatch from observed trips (all nations) in the purse seine fishery in the EPO - tuna discards in short tons, bycatch species by individuals landed (source, IATTC 2000b Annual Report, tables 11a-11c)

	Set Type			
Species	Dolphin	Floating Object	Unassociated	Total
yellowfin tuna	620	4,594	417	5,631
skipjack	127	30,718	1,022	31,867
bigeye tuna	0	5,620	8	5,627
black skipjack	84	2,109	389	2,582
bullet mackerel	25	2,756	626	3,407
other tuna	-	-	3	3
bonito	-	4	-	4
swordfish	14	16	21	51
blue marlin	88	926	173	1,188
black marlin	45	726	74	845
striped marlin	73	120	151	345
short billed spearfish	7	12	0	19
sailfish	325	112	438	875
unidentified marlin	6	54	8	68
unidentified billfish	2	10	4	16
dorado	64	470,768	6,178	477,010
wahoo	3,125	474,399	774	478,298
rainbow runner	1	54,969	2,044	57,014
yellowtail	9,136	118,636	4,275	132,046
other large teleost fish	68	28,467	14,684	43,219
trigger fish	321	725,714	752	726,788
other small teleost fish	16,217	1,216,287	65,011	1,297,515
sharks and rays	3,813	61,828	10,965	76,607
unidentified fish	0	5,725	1,381	7,106
Observed Sets	6,339	5,614	2,881	14,834

Table 5-18 Estimated 1998 discards and bycatch from observed trips (all nations) in the purse seine fishery in the EPO - tuna discards in short tons, bycatch species by individuals landed (source, IATTC 2000b Annual Report, tables 11a-11c)

	Set Type			
Species	Dolphin	Floating Object	Unassociated	Total
yellowfin tuna	709	3,203	806	4,718
skipjack	34	21,091	1,731	22,856
bigeye tuna	0	2,839	14	2,853
black skipjack	91	1,593	1273	1,857
bullet mackerel	32	1,033	168	1,233
other tuna	-	-	-	-
bonito	0	2	3	4
swordfish	11	3	11	25
blue marlin	76	1,094	73	1,243
black marlin	61	698	81	840
striped marlin	99	102	55	256
short billed spearfish	1	12	1	14
sailfish	1,011	14	461	1,486
unidentified marlin	13	54	9	76
unidentified billfish	336	19	4	359
dorado	225	346,286	4,774	351,267
wahoo	418	211,143	316	211,877
rainbow runner	18	130,935	136	131,089
yellowtail	8	116,555	5,038	121,601
other large teleost fish	44	75,095	27,796	102,601
trigger fish	2,352	2,011,658	5.562	2,019,662
other small teleost fish	16,239	655,865	73,994	746,098
sharks and rays	7,129	58,615	5,488	71,232
unidentified fish	87	2,950	50	3,087
Observed Sets	10,645	5,481	4,631	20,757

Table 5-19 Estimated 1999 discards and bycatch from observed trips (all nations) in the purse seine fishery in the EPO - tuna discards in short tons, bycatch species by individuals landed (source, IATTC 2000a Annual Report, tables 11a-11c)

	Set Type			
Species	Dolphin	Floating Object	Unassociated	Total
yellowfin tuna	471	5,363	794	6,628
skipjack	125	23,321	3,367	26,813
bigeye tuna	0	5,158	8	5,166
black skipjack	2	3,049	361	3,412
bullet mackerel	29	2,594	473	3,096
other tuna	0	0	542	542
bonito	0	0	0	0
swordfish	21	5	19	44
blue marlin	82	1,578	144	1,804
black marlin	73	936	149	1,158
striped marlin	67	280	75	422
short billed spearfish	4	13	6	23
sailfish	713	89	583	1,385
unidentified marlin	13	114	20	148
unidentified billfish	21	5	4	30
dorado	210	658,250	1,803	660,263
wahoo	35	304,433	268	304,736
rainbow runner	3	136,234	202	136,439
yellowtail	0	45,149	29,692	74,841
other large teleost fish	20	10,983	5,330	16,333
trigger fish	292	1,468,734	9,540	1,478,567
other small teleost fish	5,944	549,074	9,654	564,672
sharks and rays	3,634	46,842	7,301	57,777
unidentified fish	22	4,842	1,466	6,331
Observed Sets	6,536	4,513	4,633	15,682

Table 5-20 Estimated 2000 discards and bycatch from observed trips (all nations) in the purse seine fishery in the EPO - tuna discards in short tons, bycatch species by individuals landed (source, IATTC 2000a Annual Report, tables 11a-11c)

	Set Type			
Species	Dolphin	Floating Object	Unassociated	Total
yellowfin tuna	427	5,570	799	6,796
skipjack	16	20,052	5,780	26,298
bigeye tuna	0	5,571	52	5,624
black skipjack	156	1,659	55	1,870
bullet mackerel	21	1,280	185	1,486
other tuna	-	-	-	-
bonito	-	-	-	-
swordfish	19	3	22	45
blue marlin	81	903	207	1,191
black marlin	87	459	180	726
striped marlin	54	88	86	229
short billed spearfish	13	10	6	30
sailfish	786	124	904	1,813
unidentified marlin	17	23	9	50
unidentified billfish	1	4	4	9
dorado	673	558,170	18,583	577,426
wahoo	122	179,894	501	180,517
Rainbow runner	63	78,280	2,197	80,540
yellowtail	10	14,527	11,236	25,772
other large teleost fish	24	6,019	3,637	9,680
trigger fish	32,140	405,913	699	438,752
other small teleost fish	20,558	440,903	26,757	488,218
sharks and rays	2,085	28,912	8,093	39,091
unidentified fish	2	551	143	695
Observed Sets	6,087	3,701	3,926	13,714

Table 5-21 Estimated 2001 discards and bycatch from observed trips (all nations) in the purse seine fishery in the EPO - tuna discards in short tons, bycatch species by individuals landed (source, IATTC preliminary tables 11a-11c)

	Set Type			
Species	Dolphin	Floating Object	Unassociated	Total
yellowfin tuna				Not available
skipjack				Not available
bigeye tuna				Not available
black skipjack				Not available
bullet mackerel				Not available
other tuna				Not available
bonito				Not available
swordfish				Not available
blue marlin				Not available
black marlin				Not available
striped marlin				Not available
short billed spearfish				Not available
sailfish				Not available
unidentified marlin				Not available
unidentified billfish				Not available
dorado	571	705,019	10,988	716,578
wahoo	52	456,980	969	458,001
rainbow runner	4	81,838	170	82,012
yellowtail	45	29,444	54	29,543
other large teleost fish	12	19,187	8,743	27,942
trigger fish	0	326,506	3,077	329,583
other small teleost fish	580	187,416	25,123	213,119
sharks and rays	6,075	25,488	3,561	35,123
unidentified fish	8	429	0	437
Observed Sets	5,403	4,789	1,997	12,189

5.3.6 Coastal Purse Seine Fishery (< 400 short tons)

Purse seiners with carrying capacity less than or equal to 400 short tons fishing under this HMS plan in the eastern Pacific Ocean (EPO) are also regulated by NMFS under the authority of the Tuna Conventions Act of 1950, in carrying out the recommendations of the Inter-American Tropical Tuna Commission (IATTC). Most U.S. vessels in this fleet segment are also involved in the Council regulated fishery for coastal pelagics, they seldom venture far from port, are not required to carry observers and bycatch information is currently not available. During the season, generally May through October, they will fish for bluefin tuna. During warm water periods they may also take yellowfin, bigeye and skipjack tuna. Very rarely, usually in the year following a major El Nino event they will land significant amounts of albacore. Generally they fish off southern California or outside the EEZ of Mexico. Occasionally, they will fish for bluefin tuna off central California. The IATTC hopes to expand observer coverage to monitor this fleet and will consider the matter at their 2003 annual meeting.

When fishing for bluefin tuna, the fish are usually free-swimming (not associated with floating objects). Based on observer data from the tropical tuna purse seine fishery, these seiners probably encounter little bycatch during these sets. If they are setting fish working a baitball, other species of tuna along with some sharks might be taken and this could be considered bycatch if discarded. However, anecdotal evidence indicates these vessels will land all tunas taken in a set since they have some economic value and only discard blue sharks while retaining the marketable mako and thresher sharks. Some vessels do set floating objects (usually kelp paddies) and probably do have some bycatch based on the observations aboard the larger vessels. However, without observers the extent of the assumed bycatch is unknown. Anecdotal information from partyboat skippers and private boat recreational anglers indicate that yellowtail and dorado are often found in conjunction with yellowfin and skipjack tuna found in association with kelp paddys. They would probably be taken in a set on a kelp paddy. Under California law, the yellowtail would have to be discarded since it is illegal to land them when taken with purse seine gear. No prohibition exists for dorado so they could be landed as an incidental catch. In summary, bycatch in this fishery is not known.

5.3.7 Party/Charter Boat Fishery

The Marine Recreational Fisheries Statistics Survey (MRFSS), sponsored by NMFS and administered by the Pacific States Marine Fisheries Commission on the West Coast, provides the only data base which encompasses most HMS taken in the party/charter recreational fishery. Within California, mandatory logbooks provided by the state allow skippers to report fish thrown back so it is possible to estimate bycatch using logbooks. However, the data have never been tabulated to determine bycatch. Washington has an ocean boat sampling program and a voluntary logbook program which collects catch and bycatch data. The Washington data are added to the MRFSS data base as part of an agreement for recreational sampling in the state. Oregon collects vessel catch data during the summer (July and August) and has added it to the MRFSS since 1997. Since the MRFSS collects data on HMS anglers, and is a depository for state data which is collected when the MRFSS is not sampling, it was used to look at angler catch and bycatch. While it provides reliable estimates of take and discards for species that are commonly taken and, because the directed take of most HMS species is a relatively rare event, the catch and discard estimates can have a high degree of variability. The only HMS fishery for Washington, Oregon and northern California is the albacore fishery. In southern California, private boat recreational anglers fish for most HMS species while party/charter vessels, because of their nature, tend to concentrate on tunas and dorado with a limited amount of directed shark fishing. Because of targeting on these species there is almost no bycatch of billfish or sharks, blue sharks being the exception. Table 5-22 lists individual HMS species and treats thresher sharks as a group, although none were reported taken or released.

The MRFSS has been criticized for over estimating catches because of inaccurate estimates of effort from the random telephone survey of the general public. To overcome this, NMFS has initiated a program to call party/charter boats directly to determine the number of passengers and frequency of trips. The new survey has produced significantly lower effort estimates and brought them in line with CDFG logbook effort when it is adjusted for under reporting. Another factor which can affect bycatch estimates from MRFSS is the reliance on anglers to determine how many fish were thrown back. In essence, you create a bias similar to logbook bias where the person doing the reporting may not report accurately. This is partially mitigated by the fact that samplers are aboard the vessels and intentional under reporting is probably not a problem since the sampler has a sense of what the bycatch rate is, and the anglers are aware of this when they are interviewed to supply catch information. The major strengths of the MRFSS are it's time series (1980 to present) and the ability to provide estimates of bycatch within 2-3 months of the collection date.

Data from the MRFSS also faces a severe limitation in that it does not routinely estimate effort or catch of southern California anglers fishing in the EEZ of Mexico. In some years, 90% of the HMS catch in the party/charter fishery may be taken off Mexico. This can result in a large reported catch from California's party/charter fleet but only a small catch reported by the MRFSS. When examining catch from the two data bases, care must be taken to exclude the Mexican portion of the party/charter vessel catch when comparing the results.

Table 5-22 Estimated total number of fish landed and released (with percent standard error) by the West Coast party/charter fleet based on data from the Marine Recreational Fisheries Statistics Survey 1993-2001

Species	Number Landed	Number Released	Percent Released
albacore	305,000 (7%)	0	-
bigeye tuna	0	0	-
bluefin tuna	0	0	-
skipjack	35,000 (15%)	9,000 (25%)	20
yellowfin tuna	132,000 (12%)	0	-
dorado	34,000 (22%)	0	-
blue shark	1,000 (40%)	26,000 (18%)	96
mako shark	0	0	-
thresher shark	0	0	-
striped marlin	0	0	-
swordfish	0	0	-

Under the two categories listed in Table 5-22 (also Table 5-23 below) for disposition of fish, number landed includes all fish retained by the angler and also those thrown back dead. The number of fish released includes only live releases. The data are available to determine the number thrown back dead but are not readily accessible. Among the tuna taken by party/charter vessels only skipjack has a significant bycatch. This occurs because they are often taken while fishing for more desirable tuna species, or, in fact, a few anglers may be catching them with the intent of releasing the fish. The high bycatch of blue sharks usually occurs while fishing for tunas or dorado. Since the fish are not desirable for these anglers, they are usually released alive. Occasionally, there is a party/charter boat "shark" trip targeting the three species listed in Table 5-22 but blue sharks usually are the only species encountered and they are almost always released alive since anglers are not interested in keeping this species.

5.3.8 Private Recreational Boat Fishery

The MRFSS provides the only coastwide estimate of bycatch for private recreational boat anglers. Washington samples private ocean boat anglers to collect catch and bycatch data. The Washington data are added to the MRFSS data base as part of an agreement for recreational sampling in the state. Oregon also collects ocean boat angler catch and bycatch data during the summer (July and August) and has added it to the MRFSS since 1997. Since the MRFSS collects data on HMS anglers, and is a depository for state data which is collected when the MRFSS is not sampling, it was used to look at angler catch and bycatch. There is little private boat fishing for HMS in Washington or Oregon. Unfortunately, because the directed take of most HMS species is a relatively rare event, this can lead to catch estimates with a high degree of variance. This is further compounded by the fact that large private vessels, boats most capable of pursuing HMS, are usually not available to be sampled because they are in private slips, off-limits to most samplers. Table 5-23 lists individual HMS species and treats thresher sharks as a group because of identification problems. However, given that most sport fishing for thresher shark take place inshore, common threshers probably make up the majority of the catch. Most of the private boat catch data comes from interviews at launch ramps and public marinas. Anglers fishing from private marinas or docks are not sampled because of trespass issues. The lack of access to private facilities probably biases the sample towards anglers on smaller boats, vessels which because of their size (< 28 ft), may not fish as intensively for HMS as larger vessels that are usually found berthed at private docks.

Table 5-23 Estimated total number of fish landed and released (with percent standard error) by the private boat fleet based on data from the Marine Recreational Fisheries Statistics Survey 1993-2001

Species	Number Landed	Number Released	Percent Released
albacore	470,000 (8%)	16,000 (33%)	3
bigeye tuna	0	0	-
bluefin tuna	3,000 (39%)	0	-
skipjack	77,000 (18%)	82,000 (19%)	52
yellowfin tuna	88,000 (15%)	1,000 (100%)	1
dorado	103,000 (26%)	3,000 (49%)	3
blue shark	12,000 (22%)	203,000 (9%)	94
mako shark	37,000 (11%)	30,000 (15%)	45
thresher shark	15,000 (17%)	13,000 (21%)	46
striped marlin	1,000 (47%)	2,000 (49%)	67
swordfish	0	0	-

Bycatch in the private boat fishery is varied. It is difficult to discuss "bycatch" because many fishers value the experience of fishing and may not be targeting a particular pelagic species. Recreational "marlin" or "tuna" trips may yield dorado, tunas or sharks. However, given that the definition of bycatch "means fish which are harvested in a fishery, but which are not sold or kept for personal use", private recreational anglers do have a significant amount of bycatch of some HMS species. Among the tunas, only skipjack appears to have a large bycatch. This occurs because they are often taken while fishing for more desirable tuna species, or, in fact, anglers may be catching them with the intent of releasing the fish. Dorado have a low bycatch because they are highly desirable food fish. Those that are released are generally small fish (< 3 pounds). Sharks as a group have the highest bycatch rate. Over 94% of all blue sharks taken by private boat are released. While there is some directed fishing for blue sharks, most are taken while anglers are pursuing mako or thresher sharks. The bycatch of mako and thresher sharks in this fishery is high because most of the sharks anglers catch are juveniles. Because of their small size, and angler awareness of the value in releasing these fish to grow to adults, most are returned alive. Interestingly, very large sharks are also released because of their perceived breeding potential and peer pressure not to kill large females because of that potential.

While the MRFSS does provide an estimate of striped marlin landed and released, its value is questionable because of the extremely rare nature of taking a marlin. Data from the MRFSS shows that 67% of the marlin caught during the past 7 years were released alive. This figure is probably low and does not reflect the true percent of fish released. A more accurate data base to judge the percent of fish released is available from various fishing clubs and weigh stations. The Balboa Angling Club (Newport Beach), San Diego Marlin Club and weight station in Avalon Harbor, Santa Catalina Island report most of the marlin taken/released in southern California. Data taken from the Balboa Angling Club and San Diego Marlin yearbooks show that anglers release between 67% and 90% of all fish reported to the clubs. There is a growing trend over the years towards releasing more striped marlin.

5.4 Bycatch Mortality

5.4.1 Introduction

The reduction of bycatch mortality is an important component of National Standard 9. Physical injuries may not be apparent to the fisher who is quickly releasing a fish because there may be injuries associated with the stress of being hooked or caught in a net. Little is known about bycatch mortality for the species in this FMP but some data do exist from other fisheries. Information on bycatch mortality of these fish will continue to be collected, and in the future, will account for bycatch mortality in stock assessments. An analysis of efforts which might reduce bycatch and bycatch mortality is contained in Chapter 5, section 5.6.

5.4.2 Mortality by Fishery

5.4.2.1 Drift Gillnet Fishery

It is difficult to consider reducing post release mortality in the pelagic drift gillnet fishery due to the nature of the gear. Most finfish are dead when the net is hauled, although the data in Tables 5-1 thought 5-12 would indicate that some blue sharks and almost all common molas can be released alive. However, the long-term survival of these individuals is not known.

5.4.2.2 Surface Hook & Line Fishery (troll and live bait)

No data are available on the mortality of fish released alive in this fishery although tagging studies suggest that where the fish is hooked (upper versus lower jaw) does affect survivability to the extent that fish hooked in the lower jaw show 50% higher survival based on tag recovery rates.

5.4.2.3 Pelagic Longline Fishery

NMFS collects information regarding the bycatch mortality of dead finfish in the pelagic longline fishery Preliminary data from a study by Berkeley and Edwards (1997), suggests that hook damage and entanglement with the gangion may be important factors causing mortality in longline caught bycatch. The study indicated that it may be possible to modify hook type and gangion material to reduce billfish mortality in longline fisheries. To follow up on this study, NMFS is supporting a study to consider the use of circle hooks in the pelagic longline fishery, and NMFS has considered reducing the soak time in this fishery. Very often, gear modifications are not easily enforced, and therefore NMFS encourages pelagic longline fishers to take voluntary steps to increase survival of released finfish.

The survival rate of billfish on pelagic longline gear in the Atlantic Ocean is validated by results from a study by Berkeley and Edwards (1997), stating that 20 to 75 % of billfish were alive 12 hours after being hooked . After accounting for live releases, the effective billfish fishing mortality (i.e., discarded dead) was 0.4 % of the total pelagic longline catch (blue marlin - 0.12 %; white marlin - 0.15 %; sailfish - 0.08 %; and spearfish - 0.03 %). Total bycatch mortality impact of Atlantic pelagic longline gear cannot be determined since the release mortality is unknown for the hooked billfish fish that are released alive. Billfish, however, tend to have higher survival rates on a pelagic longline (Berkeley and Edwards, 1997) compared to other HMS species such as swordfish and tunas. No data are available to estimate mortality in the eastern Pacific longline fishery.

5.4.2.4 Harpoon Fishery

As stated in Chapter 5, 5.3.4 , the deliberate fishing nature of harpoon gear is such that bycatch is expected to be low. Since bycatch approaches zero in this fishery, it follows that bycatch mortality is near zero.

5.4.2.5 Tropical Tuna Purse Seine Fishery (> 400 short tons)

There are no data on bycatch mortality in the purse seine fishery, although there is growing concern for the need to know the mortality rate as the floating object fishery continues to take greater numbers of fish as bycatch (IATTC 2000b). A quote from the 1998 IATTC Annual Report (page 90) sums up the available knowledge:

> "The information available on the biology of the species listed in Table 41 is insufficient to determine the effects of their capture by the purse-seine fishery. If any of them are seriously affected, it is most likely to be one or more species of sharks or ray, as their fecundities are low, and removing substantial amounts of these are likely to reduce their recruitment in subsequent years."

Table 41 mentioned in the quote was used to develop Tables 5-17 through 5-21 in Chapter 5, section 5.3.5 on the purse seine fishery for boats greater than 400 tons.

5.4.2.6 Coastal Purse Seine Fishery (< 400 tons)

No data are available on bycatch mortality in the coastal purse seine fishery. However, it is reasonable to estimate that mortality rates are lower than with large purse seine sets as fish can be handled and discarded more rapidly in small purse seine sets and they would more likely survive.

5.4.2.7 Party/Charter Fishery

No studies exist on bycatch mortality of skipjack tuna and blue shark, the only species reported as bycatch from the party/charter fishery (Table 5-22). There are some data from the Atlantic Ocean on bluefin tuna. Results from one of those studies indicate that immediate fishing mortalities in recreational hook and line-caught juvenile bluefin tuna can be substantial (29.2 %) due to injuries or predation (Belle, 1997). This is likely to be a conservative estimate because scientific personnel in the study were professionally trained and had extensive experience in fish handling techniques designed to reduce mortality. Mortality often occurs ten minutes or longer after the fish is released under normal circumstances. Injuries may not be readily apparent to the angler and seemingly minor capture injuries may be related to substantial internal injuries. Forty % of sampled tuna that died during that study did not have injuries that would be apparent to the angler in the boat. Skomal and Chase (1996) provide evidence that the extreme stress of rod- and- reel angling did not cause immediate post-release mortality in larger bluefin tuna (50 to 150 kg). However, they do document metabolic and pH disturbances in bluefin tuna sampled off of Hatteras, NC. The physiological consequences of angling stress are poorly understood for several species of large pelagic fishes (Skomal and Chase, 1996). While these studies were for bluefin tuna in the Atlantic, they do provide insight into the potential bycatch mortality of tunas. Skipjack tuna may or may not exhibit similar mortality rates.

Quantitative estimates of post-release mortality rates of blue sharks in the party/charter fishery are not currently available, although this mortality is generally believed to be low since sharks are seldom removed from the water when the hook is removed or the leader cut..

5.4.2.8 Private Recreational Boat Fishery

Private boat anglers have high release rates for skipjack tuna, blue shark, mako shark, thresher shark and striped marlin (Table 5-23). The same caveats on bycatch mortality apply to this fishery as apply to the party/charter fishery. Because of the lack of local data, the Council must use studies from other areas. The only exception to this is striped marlin. Tagging studies with acoustical tags on more than 15 fish revealed all the fish were alive after vessel tracks of 5 to 48 hours (Holts and Bedford, 1990). The authors felt that most fish were traumatized (wildly swimming about) by tagging but returned to normal behavior (swimming slowly near the surface) within two hours of tagging.

5.4.3 Code of Angling Ethics

NMFS developed a Code of Angling Ethics as part of implementing Executive Order 12962 - Recreational Fisheries. NMFS implemented a national plan to support, develop, and implement programs that were designed to enhance public awareness and understanding of marine conservation issues relevant to the well-being of marine recreational fishing. This code is consistent with National Standard 9, minimize bycatch and bycatch mortality, and is therefore reproduced below. These guidelines are discretionary, not mandatory, and are intended to inform the angling public of NMFS's views regarding what constitutes ethical angling behavior. Part of the code covers catch and release fishing and is directed towards minimizing bycatch mortality.

Code of Angling Ethics

- Promotes, through education and practice, ethical behavior in the use of aquatic resources.
- Values and respects the aquatic environment and all living things in it.
- Avoids spilling, and never dumps any pollutants, such as gasoline and oil, into the aquatic environment.
- Disposes of all trash, including worn-out lines, leaders, and hooks, in appropriate containers, and helps to keep fishing sites litter-free.
- Takes all precautionary measures necessary to prevent the spread of exotic plants and animals, including live baitfish, into non-native habitats.
- Learns and obeys angling and boating regulations, and treats other anglers, boaters, and property owners with courtesy and respect.
- Respects property rights, and never trespasses on private lands or waters.
- Keeps no more fish than needed for consumption, and never wastefully discards fish that are retained.
- Practices conservation by carefully handling and releasing alive all fish that are unwanted or prohibited by regulation, as well as other animals that may become hooked or entangled accidentally.
- Uses tackle and techniques which minimize harm to fish when engaging in "catch and release" angling.

5.5 Standardized Reporting of Bycatch

Section 303(a)(11) of the Magnuson-Stevens Act,16 U.S.C. 1853(a)(11), requires that a fishery management plan establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery. This section will describe the standardized methodology proposed under this FMP.

As discussed in the previous sections, each HMS fishery sector has different gear and operating characteristics and different bycatch levels and rates. For example, longline fishing results in more bycatch of more species than harpoon fishing, and drift gillnet fishing likely has more bycatch of more species than recreational fishing. Similarly, longline and drift gillnet fishing gear and techniques are different from harpoon and recreational gear and techniques. Further, the vessels involved have different characteristics and capabilities. Finally, the fisheries are of different sizes and geographic spread. It is important that these factors be taken in to account when determining the appropriate level of use of different data collection and reporting requirements for each fishery sector to assess bycatch in the different sectors. There is no single set of data collection techniques that will work equally well to establish reliable estimates of bycatch.

There are several potential mechanisms for obtaining total catch and catch disposition data and deriving estimates of bycatch in the HMS fisheries. Daily fishing logbooks have long been used in several fisheries and can be used to record details of fishing location and time of fishing, amount of gear deployed, catch by species, and retained catch by species. Current logbook requirements are as follows:

1. Drift Gillnet - State logbooks for California and Oregon
2. Surface Hook and Line - NMFS logbook for high seas fishery
3. Pelagic Longline - NMFS logbook for high seas fishery
4. Harpoon - State logbook for California
5. Tropical Tuna Purse Seine - IATTC logbook when fishing for HMS or high seas logbook
6. Small Vessel Purse Seine - IATTC logbook when fishing for HMS or high seas logbook
7. Party/Charter Boats - State logbooks for California

Currently used logbook forms are shown in Appendix D. The advantage of logbooks is that a great deal of information can be collected for analysis and use at little cost to the government. The disadvantages are that there is little incentive for the fisher to report completely and accurately, the fisher may not be able to identify all incidental catch by species (especially for some sharks or juvenile tuna), and the fisher may not accurately report all requested information such as discards or protected species interactions. Experience under the central and Western Pacific Pelagics FMP indicates that logbook reports are not reliable when taken alone for assessing bycatch in the longline fishery and, even when observers are on board the vessel, there are occasional differences between observer records and logbook entries.

Landings receipts have been required by West Coast states for many years. The receipts generally record and report amount of fish by species in the landing, the gear used, the price paid per pound for the fish sold, and in some cases the area fished. Advantages of landings receipts are that they are tax documents (and thus may result in severe penalties if falsified), that fishers and buyers are all familiar with them and appear to be comfortable with the receipt process, and that they appear to provide a generally reliable count of landings. Disadvantages are that non-landed fish (bycatch) are not recorded or reported, that gear type may be inaccurately reported, that area of fishing is generally not going to be accurate for trips that covered more than one statistical area, and that species composition of mixed species landings may not be accurately determined. When used in conjunction with logbooks, however, it may be possible to derive estimates of total bycatch by vessels of the same type and using the same gear if the logbook records are accurate.

Another mechanism to refine estimates of catch and bycatch is the use of shore side or shore based samplers and interviewers to inspect the catch or landings and ask questions of the fishers to obtain details about the trip and catches. Records collected by shoreline sampling and interviews will ensure more accurate species identification of landed species. When viewed in conjunction with observers' records as well as landings and/or logbook records of similar vessels and gear types that carried observers, shore based sampling and interviews also can be used to confirm logbook records of catch and discards by similar vessels that were not observed. If there were substantial differences between observers' records and logbook records for vessels sampled at port, it would suggest either that there was misreporting or that the unobserved vessel experienced unusual conditions. Port samplers also can question the captain or crew to determine if there were unusual events or conditions on the trip or if there were substantial discards and, if so, of what species. This could be especially useful when interviewing a captain or crew while reviewing a logbook for completeness and accuracy of entries.

At-sea observers are likely the most reliable method to determine total catch and disposition of catch for several HMS fishery sectors. Observers can not only accurately report catch, effort and operational conditions (weather, sea state, time, location); they can be relied on for more complete and accurate species identification data and can take and record biological data and samples that could not reasonably be expected of vessel operators or crew. There is a long history or observer use on HMS fisheries off the West Coast, including the purse seine fishery (now conducted by the IATTC), the drift gillnet fishery (California state observers in the past and NMFS observers presently), and occasional observers on West Coast longline and albacore troll vessels. The disadvantages of observer programs are the cost ($350 or more per observer day), possible disruption of normal vessel operations (especially for small vessels), the logistical difficulty of placing observers on long trips, and safety (some small vessels find it difficult to meet Coast Guard health and safety requirements).

Taken together, it is clear that no single data collection mechanism will generally be sufficient alone for every fishery sector, and that the appropriate approach is to combine different elements of a monitoring program to assess bycatch tailored to the vessels and operating characteristics of each HMS fishery sector. Therefore, under this FMP, there are standard data collection and reporting components as follows to ensure that estimates of total catch and bycatch for each sector will be reliable, with the mix of components varying to suit the fishery sector.

5.5.1 At-Sea Observers

It is acknowledged that some level of observer placements will be necessary to ensure reliable bycatch assessments in most if not all sectors. Logbooks alone are not likely to result in complete and accurate information on total catches and discards (alive or dead). Landings receipts only document fish actually brought to shore or transshipped. Interviews can fill some gaps. However, at least some at-sea observer coverage is necessary in most cases to obtain accurate records on total catches and discards from a sample large enough to provide reliable extrapolations of total catches and discards. What will vary is the level of observer coverage needed by fishery sector. NMFS would be required to place observers on a sample of fishing vessels in each sector to document total and retained catch, bycatch, and disposition of bycatch (released alive, released injured, released dead) by species, and protected species interaction data. If practicable, consistent with the need to collect bycatch and protected species interaction data, the observer also would collect other fishery dependent data (e.g., size, sex ratio, biological samples). The sample level in each sector will depend on the characteristics of the fishery, the likelihood of bycatch, the magnitude of bycatch and potential associated mortality, and the extent to which other monitoring elements are likely to result in reliable estimates of bycatch and bycatch mortality. The sampling designs would be developed by the National Marine Fisheries Service, in consultation with the Council, the states, and industry, but the sampling program must be at a level sufficient (in combination with other monitoring efforts) to provide reliable estimates of bycatch in each sector.

5.5.1.1 Harpoon

The harpoon fishery for swordfish is expected to have virtually no bycatch. The operator knows exactly at what fish/species the harpoon is directed and presumably would not throw a harpoon at an animal that is not intended to be captured for later sale or personal consumption. There could be an instance in which a fish is harpooned and subsequently damaged by marine mammal or shark predation, such that the harpooned animal is unsuitable for sale or consumption. In this fishery sector, while an observer placement might be useful to confirm information about operational aspects of the sector, there is little reason to expect that any bycatch (as defined by the Act) would be documented even at a 100% coverage level.

5.5.1.2 Drift Gillnet

Bycatch in the drift gillnet fishery for swordfish and sharks can be estimated based on NMFS observer program that has been in effect since 1990 and has documented catch and disposition of the catch at a level of 20% or more the past 5 years (see Tables 5-1 thru 5-12 for annual summaries of observer records 1991-2002). Observer coverage for this fishery should continue to obtain reliable information reflecting changes in regulations for this fishery and to determine if regulatory changes have resulted in changes in time, area, or manner of fishing such that bycatch rates or composition may have changed.

5.5.1.3 Longline

Based on experience in the central and western Pacific, it is certain that there would be significant bycatch in the longline fishery, but there is a limited basis for estimating what the levels and species composition would be for fishing out of the West Coast. There has been very little observer coverage of longline fishing out of West Coast ports, although some vessels that landed in California in recent years began their trips in Hawaii with observers on board. Those vessels were not subject to any of the regulations that would be implemented under this FMP and therefore their fishing could represent results from an unregulated fishery. However, there are good reasons (e.g., differences in oceanic temperatures, temperature fronts, and currents between areas fished by western Pacific vessels and areas fished by West Coast vessels) to hypothesize that catch and catch rates by species in waters closer to the West Coast (i.e., east of the 150° W. meridian) would differ from rates farther west (See Table 5-15). Observer data are needed to determine the bycatch and protected species interaction rates for West Coast vessels' fishing areas and to provide a basis for determining if the conservation and management measures under this FMP are having the intended effects. Therefore, it is important that the West Coast longline fishery be covered at an adequate sampling level soon after the FMP is implemented. NMFS currently has a study underway to determine sampling design and level of observer coverage necessary to adequately sample longline bycatch.

5.5.1.4 Purse Seine

The tropical tuna purse seine fishery has bycatch that varies depending on the fishing strategy being used (see Chapter 5, section 5.3.5). A pilot program for reducing bycatch in this fishery is currently in place. The IATTC and its member nations have had a 100 % coverage level for Category V and VI purse seine vessels (i.e., 363 mt or larger carrying capacity) for many years, and it is expected that this will continue in the future. This FMP does not propose any changes in that program.

There has been very little observer coverage of smaller purse seiners (< 363 mt carrying capacity). It is likely but not certain that the bycatch by large purse seiners generally fishing in waters south of the U.S. West Coast differs from the bycatch experienced by smaller vessels fishing in the EEZ. The smaller vessels are opportunistic in targeting tuna when they are available nearer to or in U.S. waters in selected periods of the year. While it is likely that this will happen (if at all) in late summer and fall, it is not predictable whether the catch will be principally yellowfin, skipjack or bluefin tuna. It also is not known if the smaller vessels fish principally on free-swimming schools of tuna or set on floating objects, though the former appears more likely. In any event, it is clear that observers will be required for this sector. The United States is cooperating with the IATTC in exploring ways in which the IATTC and its members can get coverage of these small vessels, but no action has yet been taken. It is important that the small purse seine vessel fishery be covered at an adequate sampling level when this FMP is approved. NMFS currently has a study underway to determine sampling design and level of observer coverage necessary to adequately sample small purse seine bycatch.

5.5.1.5 Surface Hook and Line

Some members of the albacore fleet have maintained logbooks on a voluntary basis for years, and there have been occasional placements of observers on a voluntary basis as well. While it is known and acknowledged by the fleet that there is occasional bycatch, the extent of bycatch is not well documented, and additional observer placements are needed. NMFS should differentiate between vessels that fish mainly in coastal waters and vessels that make much longer trips across the north Pacific as both bycatch rates and species composition are likely to vary by area. NMFS currently has a study underway to determine sampling design and level of observer coverage necessary to adequately sample surface hook and line bycatch.

5.5.1.6 Party/Charter (CPFV) Fleet

As a general rule, there is little bycatch in this sector other than sharks (especially juveniles) that are released alive (see Table 5-22). The party/charter fleet has occasionally been observed by state personnel, as well as being regularly covered under the MRFSS program. NMFS should evaluate the level of observer coverage on HMS trips and should work with the NMFS contractor to ensure that observers are regularly collecting bycatch/discard data on such trips. This will be especially important to provide a basis for evaluating the effects and effectiveness of the "catch and release" program proposed under this FMP. Part of NMFS current study to determine sampling design and level of observer coverage necessary to adequately sample bycatch is focused on the party/charter fleet. It is noted that bycatch would likely decline substantially if there is approval and adoption of the "catch and release" program proposed in this FMP.

5.5.1.7 Private Recreational Fleet

It is expected that there would be little bycatch other than fish in excess of personal consumption capacity or sharks that are of little or no personal value. While Table 5-23 indicates fairly substantial discards, especially of sharks and skipjack tuna; it is unknown what the condition of these fish is upon release or the likelihood of survival after release. However, it is believed that the condition on release is generally supportive of a conclusion that mortality is low. Determining the bycatch and disposition of fish by private boat recreational anglers with certainty would be extremely difficult. At sea observations are generally impractical to schedule because of the size of the vessels, the diversity of departure sites and unpredictable times of departure. On the other hand, HMS fishers tend to be better equipped and on larger vessels than many other coastal recreational fishers, and at least in southern California, there are a number of organized clubs and associations oriented principally at HMS. NMFS should work with these recreational fishing clubs and associations to develop a systematic program that could include at-sea observations as well as targeted interviews and focus groups to determine the extent of bycatch and bycatch mortality. NMFS should also explore the potential for the MRFSS to provide an ongoing opportunity to sample private boat anglers for HMS. Part of NMFS current study to determine sampling design and level of observer coverage necessary to adequately sample bycatch is focused on the private recreational fleet. It is noted that bycatch would likely decline substantially if there is approval and adoption of the "catch and release" program proposed in this FMP.

As more information and experience are gained, it would likely be necessary and appropriate to adjust observer coverage among different sectors reflecting any significant changes in fishery regulations because such changes can cause changes in fishing practices or times and areas of operation, and in turn affect bycatch rates.

5.5.2 Logbooks

Under this FMP, each commercial fishery sector and the CPFV sector would be required to maintain and submit to the Regional Administrator logbooks that document daily fishing effort, gear used, catch (by species), disposition of catch (retained, released alive, released injured, released dead), and other information about the fishing activity and results. While they may not be reliable alone for estimating bycatch, logbooks can provide a sound foundation for estimating total fishing effort of the fleet (a component in estimating total catch and bycatch) and comparing reported and observed levels of bycatch by sector. Logbook records can be checked against observers' reports to determine if there are any consistent biases in logbooks that need to be corrected, either through improved logbook forms or through data system and expansion algorithms, after which logbooks might provide a more sound basis for estimating total catch and bycatch. In the future, logbooks used to monitor HMS fisheries will need to be more inclusive as to the disposition of fish thrown back. Currently, some logbooks only list fish landed and those returned to the sea; the condition of the returned fish is not noted. Listing the condition (alive, dead, injured) of fish on all logbooks is essential to fulfilling the requirement of Magnuson-Stevens for determining bycatch mortality. Beyond the disposition issue, logbooks currently in use appear to provide adequate data on catch and location, two of the major data elements of the logbook programs. A vessel monitoring system(VMS) can be used to supplement and check against reported locations for covered vessels (see section 5.5.5 below).

5.5.3 Shoreside Observers

Port biologists from the states and possibly NMFS should be assigned to monitor landings and observe the amount and composition of commercial landings and their condition by vessel, port area, species, and time. These staff can also conduct recreational port interviews and obtain measurements from fish landed and biological samples. Shoreside sampling records could be checked against logbooks and landings receipts to provide an indication of the accuracy and completeness of those records. Discrepancies can indicate a need to adjust logbooks, observer coverage, or other monitoring activities to obtain more complete or accurate records and derive more reliable bycatch estimates. It is expected that NMFS will continue the MRFSS program on the West Coast; this is vital to ensuring good data on recreational catches and may be the principal method for determining recreational sector catches and possibly bycatch.

5.5.4 Dockside Inspections

NMFS enforcement or other NMFS officials would make spot checks of vessels as they make landings. Actual landings could be compared to logbook reports for consistency in terms of amount of landing by species. Vessel operators or crew could be interviewed to determine whether there were particular conditions that resulted in unusual incidence of bycatch or protected species interactions or particular areas with high bycatch or protected species interactions that might not be fully reflected in logbooks.

5.5.5 Vessel Monitoring Systems (VMS)

Automated vessel monitoring systems can supplement observer and reporting requirements and in some cases provide a sound basis for estimating bycatch in selected fisheries. For example, VMS information could be used to confirm reported area of catch information from logbooks and support a comparison of reported bycatch information from observed and unobserved vessels fishing in similar areas and times. If there are substantial differences, it would suggest a need to expand the observer program as well as to engage in outreach with fishers to ensure that they understand that these differences exist and that, if correct data are not being reported, this can ultimately result in inappropriate management decisions due to inadequate or incomplete data to their disadvantage. VMS would initially be required in the West Coast longline fishery as a tool to enforce the EEZ closure.

5.5.6 Other Activities

In addition, as noted, each state requires that every landing of fish for commercial sale be recorded on a landing receipt indicating species, gear, area of fishing, price paid, and other data elements. These are official tax documents, and misreporting or misrepresentation can result in significant civil and even criminal penalties. Therefore, landing receipts can provide a supplementary source of information for checking against logbooks and other records of catch. Although they will not be very useful for assessing bycatch as such, they may be indicative of fishing effort and/or strategies that likely resulted in catches and bycatches that were not fully revealed by logbook records and of a need for changes in observer coverage. As deemed appropriate, NMFS would work with other agencies to review the full range of information on the fisheries and their performance to determine whether the overall approach needed to be changed for one or more sectors. It is expected that, as experience is gained in monitoring the fisheries, there will be a better basis for shifting the relative reliance on the different monitoring components to improve the estimates of bycatch.

In summary, the FMP proposes that the standardized elements of the methodology to assess bycatch and bycatch mortality in the HMS fisheries are at-sea observers, logbooks, landings receipts and shoreline observations. VMS will initially be used in the longline fishery and may be used in other sectors in the future. The reliability of specific levels of observer coverage has to be determined through sampling design by NMFS, in consultation with the Council and industry for specific fishery sectors. Under the FMP, NMFS will be required to place observers as necessary, in coordination with other measures, to obtain reliable estimates of bycatch and bycatch mortality in the HMS fisheries.

5.6 Bycatch Reduction in HMS Fisheries

Section 303(a)(11) of the Magnuson-Stevens Fishery Conservation and Management Act requires a fishery management plan to "establish a standardized reporting methodology to assess the amounts and types of bycatch occurring in the fishery, and include conservation and management measures, that to the extent practicable and in the following priority–

(A) minimize bycatch; and
(B) minimize the mortality of bycatch which cannot be avoided.

Section 303(a)(12) requires the plan to "assess the type and amount of fish caught and released alive during recreational fishing under catch and release fishery management programs and the mortality of such fish, and include conservation and management measures that, to the extent practicable, minimize mortality and insure extended survival of such fish." Chapter 5, section 5.5 has already covered standardized reporting methodologies. The remainder of this section will examine methods which can be used to either reduce bycatch or the mortality associated with bycatch.

5.6.1 Commercial Fisheries

5.6.1.1 Potential Methods Considered to Reduce Bycatch and Bycatch Mortality

1. Gear Modifications: Bycatch and bycatch mortality can be reduced in some instances by modifications in the fishing gear or the way the gear is fished. For example, mesh size in nets might be modified to avoid bycatch of certain size fish or suspenders could be used to fish nets at certain depths as in the shark/swordfish drift gillnet fishery, thus avoiding fish near the surface.

2. Time/Area Closures: Time area/closures could be used to prohibit fishing in certain geographical areas and/or certain times of the year to avoid bycatch problems. The spring closures off the Channel Islands for the shark/swordfish drift gillnet fishery are an example of this type of bycatch reduction method.

3. Full Retention of Catch: Full retention of the catch would reduce bycatch to zero by definition; all fish would have to be landed. This is the approach IATTC has implemented to document and reduce bycatch of small tunas. It does not, however, reduce fishing mortality.

4. Performance Standards: This method would reward fishers for decreasing their bycatch and/or bycatch mortality. Under a program using performance standards, goals could be set to reduce bycatch, (as an example 10% of the current bycatch of a particular species) and fishers who meet the goal would be rewarded with some incentive (an example might be additional time on the water). The same could apply for a reduction in bycatch mortality. Under such a program, incentives could be offered for both reducing bycatch and bycatch mortality.

5. Education: Under this option, fishers would attend educational seminars to learn how to reduce bycatch or bycatch mortality. Currently this method is in use in the shark/swordfish drift gillnet fishery. This could include fish handling and release guidelines in recreational fisheries.

6. Effort Reduction: Restricting effort in the fishery by its very nature serves to reduce overall bycatch by capping the amount of effort that can take place in a fishery. Assuming bycatch rates and mortality remain constant, a 50% reduction in fleet effort would result in a 50% reduction in bycatch and mortality. This could include limited entry.

7. Limit Time of Gear in Water: Restricting the time that gear might be in the water could be used to prevent bycatch of many species. In the shark/swordfish drift gillnet fishery, nets can only be set 2 hours before sunset and must be out of the water two hours after sunrise. This is done to reduce the take of striped marlin which would have to be discarded as bycatch because they cannot be landed commercially.

8. **Prohibit Setting on Floating Objects:** Under this option purse seiners would be prohibited from setting on floating objects such as kelp paddies, floating logs, clumps of marine debris, etc.

5.6.1.2 Fishery Discussion of Bycatch Reduction Measures

For a summary of bycatch reduction measures by fishery and how they should be applied to a specific fishery, see Table 5-24.

Drift Gillnet:

1. Gear modification measures are already in place as part of NMFS Take Reduction Team recommendations to reduce the take of marine mammals. Mesh sizes greater than 14 inches, 36 foot suspenders to sink the net, and pingers to drive off the animals have shown good results in reducing the take of marine mammals. The gear modifications have also reduced the bycatch (discarded dead) of striped marlin, skipjack tuna, blue shark and common mola. However, they have increased the bycatch (discarded dead) of albacore, Whether this is statistically significant is unknown. Further modifications to reduce the bycatch of fish might increase the take of marine mammals, making this option one to be considered carefully. This is a potentially practicable option but care must be taken not to increase the bycatch of marine mammals. The FMP recommends research and gear development to determine the practicability of additional gear modifications to reduce bycatch. However, it does not appear that gear modifications for reducing bycatch mortality is practicable at this time.

2. Time/area closures already exist for this fishery at the state level and are proposed in the FMP. The closures are to protect juvenile and adult sharks, thus reducing the bycatch of these species by reducing economic discards. Time/area closures also exist to protect sea turtles, and since they reduce effort, tend to reduce the overall bycatch of other fish (sea turtles are classified as fish under the Magnuson-Stevens Act). This is a practicable option and should be continued.

3. Full retention of catch currently is not applied to this fishery by the States of California or Oregon. In light of the response the IATTC is receiving to their full retention program, without very careful laws governing the landing of all fish, this option does not appear to be practicable. Blue sharks may prove to be an exception in the future as markets are developing in Mexico and could offer a possible commercial outlet.

4. Performance standards in the shark/swordfish drift gillnet fishery would require extensive study before they could be applied. The objectives would need to be identified, rewards for achieving the goal would need to be identified, rules would have to be implemented by the Council, observers would need to be employed to evaluate the success of the program as logbooks would not provide reliable data. Because of this, at this time, performance standards are not a practicable option to reduce bycatch or bycatch mortality.

5. NMFS currently has an educational program for skippers of drift gillnet vessels. While the focus is on avoiding interactions with marine mammals and sea turtles, some discussion of avoiding blue sharks does take place. Future workshops could be expanded to include more information on avoiding bycatch of fish (assuming known ways exist) and on decreasing bycatch mortality. This option appears to be a practicable way to reduce bycatch and bycatch mortality.

6. Effort reduction through limited entry and permit reduction already exist at the state level for this fishery. California and Oregon limit the number of permits. California also has a program to reduce permits through attrition. With these two measures, effort will be reduced and there should be an associated reduction in bycatch and mortality. This option appears to be a practicable way to reduce bycatch and bycatch mortality.

7. Limiting soak time is currently employed in California to avoid the bycatch of striped marlin. This measure is proposed in the FMP and should continue the current practice with its assumed bycatch reduction benefits. This is a practicable option which should be continued.

8. Prohibiting sets on floating objects - This measure only applies to the coastal purse seine fishery.

PROPOSED ACTION

Include the current bycatch and bycatch mortality reduction measures (gear modifications, time/area closures, education, effort reduction and limited soak time) in the FMP.

Surface-Hook-and Line:

1. Gear modifications may be a possibility, especially in the design of a hook which travels with the point facing down. However, gear evolution has dictated the hook pointing up because it produces higher catch rates; one pointing down would probably produce lower catch rates. NMFS studies conducted in conjunction with tagging albacore have shown lower hooking mortality on fish hooked in the lower jaw (Norm Bartoo, NMFS La Jolla, pers. comm.). NMFS should consider undertaking a hook design study if it is determined that bycatch and bycatch mortality are at unacceptable levels (observers will be needed to determine this). Without better data, this does not appear to be a practicable option.

2. Time/area closures offer the possibility to reduce interactions with juvenile fish, which, because of their small size are discarded for economic reasons. However, since juvenile fish range over wide areas of the ocean at differing times of the year, this alternative probably is not practicable since the times and boundaries would constantly be changing.

3. Full retention of catch would avoid the bycatch issue completely. However, it would increase the cost to fishers by forcing them to land small fish in favor of larger, more profitable fish. In deliveries where small fish (less than 4 kg) constitute greater than 5% of the catch, canneries pay significantly less for the fish. This can lead to discarding of fish at sea for economic reasons. There would also be a problem of enforceability because, without an observer program, most fishers would discard small fish in favor of larger ones. The bycatch of small albacore in the north Pacific constitutes less than one-half of one percent (60 mt) of total catch (12,000 mt) and does not constitute a resource issue. Because of these issues, this option does not appear to be practicable.

4. Performance standards in this fishery would require extensive study before they could be applied. The objectives would need to be identified, rewards for achieving the goal would need to be identified, rules would have to be implemented by the Council, and observers would need to be employed to evaluate the success of the program as logbooks would not provide reliable data. Because of this, at this time, performance standards are not a practicable option to reduce bycatch or bycatch mortality.

5. An educational program on how to avoid areas of small fish, what to do when you find small fish and how to successfully release them would help to reduce bycatch and associated mortality. NMFS would need to institute a study to determine if this is feasible. Fishers currently voluntarily avoid areas of small fish because of the economic loss associated with fishing for something you are going to throw back or commands a low price. Until NMFS completes a study of the problem this option is not a practicable way to reduce bycatch and mortality.

6. Effort reduction through limited entry and permit reduction could be used to reduce the total amount of effort in the fishery. Whether this would reduce total bycatch is unknown since the remaining vessels might simply increase their effort to make-up for the reduction in fleet size. One positive thing that might happen is the reduction in bycatch and bycatch mortality that might occur as less skilled fishers are eliminated from the fishery through limited entry or permit reduction regulations. This assumes that older, more experienced fishers would qualify for limited entry while newer, less experienced fishers would not. Without better data, it would be difficult to implement and it is not practicable.

7. Limiting soak time - This measure does not apply to this fishery.

8. Prohibiting sets on floating objects - This measure only applies to the coastal purse seine fishery.

PROPOSED ACTION

There are no proposed actions to reduce bycatch or bycatch mortality in the surface hook-and-line fishery.

Pelagic Longline:

1. Gear modifications may be a possibility, although what has been done in the Hawaiian longline fishery to limit the take of birds and sea turtles (shooters to get baits down fast to avoid birds and minimal depth of set to avoid sea turtles) will apply to only longline vessels operating from the West Coast which fish west of 150° W longitude. West coast longline vessels fishing east of 150° W longitude will not be restricted to a minimal depth requirement. Because of this, NMFS would have to undertake a study to determined if fish bycatch and bycatch mortality could further be reduced by additional gear modifications. At this time this option is not practicable.

2. Time/area closures already exist in the Hawaiian fishery and are proposed for vessels fishing west of 150° W longitude. The closures are to protect sea turtles and sea birds. Since they reduce effort, they tend to reduce the overall bycatch of fish. New closures may be warranted east of 150° W longitude under this FMP, but the extent of those closures is yet to be determined. Incorporating the Hawaiian restrictions west of 150° W longitude is a practicable option.

3. Full retention of catch would avoid the bycatch issue completely. However, it would increase the cost to fishers by forcing them to land small fish rather than larger, more profitable fish. There would also be a

problem of enforceability because, without an observer, most fishers would discard small fish in favor of larger ones. This option does not appear to be practicable.

4. Performance standards in this fishery would require extensive study before they could be applied. The objectives would need to be identified, rewards for achieving the goal would need to be identified, rules would have to be implemented by the Council, and observers would need to be employed to evaluate the success of the program as logbooks would not provide reliable data. Because of this, at this time, performance standards are not a practicable option to reduce bycatch or mortality.

5. An educational program on how to avoid bycatch species, what to do when you find them, and how to successfully release them could help to reduce bycatch and associated mortality. NMFS could institute a program similar to the one for the shark/swordfish drift gillnet fishery. In this way, the option appears as a practicable way to reduce bycatch and mortality.

6. Effort reduction through limited entry and permit reduction could be used to reduce the total amount of effort in the fishery. Whether this would reduce total bycatch is unknown since the remaining vessels might simply increase their effort to make up for the lost effort. One positive thing that might happen is the reduction in bycatch and mortality that might occur as less skilled fishers are eliminated from the fishery through limited entry or permit reduction regulations. This assumes that older, more experienced fishers would qualify for limited entry while newer, less experienced fishers would not. Without better data, it would be difficult to implement and it is not practicable.

7. Limiting soak time is a possibility in the longline fishery but NMFS would need to do a study to determine if there was any benefit due to fish bycatch reduction or decrease in mortality. Forcing vessels to pick up their longlines sooner than is the current practice without data to support this action is not practicable.

8. Prohibiting sets on floating objects - This measure only applies to the coastal purse seine fishery.

PROPOSED ACTION

Include the current Western Pacific Council bycatch and bycatch mortality reduction measures (gear modifications, time/area closures and education) for West Coast vessels fishing west of 150° W longitude in the FMP. This action would restrict fishing west of 150° W longitude, thus preventing an increase in bycatch and bycatch mortality from the area.

Harpoon:

The harpoon fishery is excluded from this discussion because there is no expectation of bycatch in the fishery as harpoons are directed only at swordfish and do not incidentally take any other species. Some economic discards do occur whenever swordfish are damaged by sealions or sharks.

PROPOSED ACTION

There are no proposed actions to reduce bycatch or bycatch mortality in the harpoon fishery at this time.

Tropical Tuna Purse Seine:

The tropical tuna purse seine fishery is excluded from this discussion for the following reasons. The U.S. purse seine tuna fishery is currently required to comply with regulations implementing an IATTC recommendation that addresses bycatch concerns. Under those regulations (50 CFR 300.29), a purse seine vessel operator must retain on board all tuna brought on board from a set, except any fish that are not suitable for human consumption; must promptly release all non-tuna in a manner intended to promote survival; and must use special handling and release procedures for any sea turtles caught in a purse seine set. IATTC and member nations' observers are collecting data on the effects and effectiveness of this pilot program that will last through 2002. The IATTC has a Bycatch Working Group that reviewed the initial results of the program in June 2002. The intent of the program is to provide an incentive to either reduce or abort sets that capture large amounts of juvenile tuna (and thus reduce yield per recruit in the fishery as well as possibly reduce future spawning potential) or to ensure that discards of juvenile tuna are fully accounted for in the determination of fishing mortality and stock assessments. Unfortunately, most vessels fish under foreign flags and initial reports indicate the program is not working because of poor compliance with logbook requirements to document catch and the loop-hole which allows fish to be dumped if not fit for human consumption. U.S. vessels fishing under IATTC authority are 100% observed so bycatch data are available for the U. S. fleet.

The Council is not aware of any other practicable measures that could reduce bycatch or minimize unavoidable bycatch mortality in this fishery. The Council will be apprised of the results of the IATTC pilot program and may consider adopting it (or similar measures) under the authority of the FMP in the future.

PROPOSED ACTION

There are no proposed actions to reduce bycatch or bycatch mortality in the tropical tuna purse seine fishery at this time.

Coastal Purse Seine:

1. Gear modifications to reduce bycatch appear impractical in this fishery. The current practice of using mackerel or tuna nets allows for no modification. First, it would need to be determined if there was a bycatch problem in the fishery since currently nothing is known. NMFS would have to undertake such a study to determine if bycatch and bycatch mortality could be reduced by gear modifications. At this time the option doesn't appear to be a practicable option until NMFS could undertake such a study.

2. Time/area closures would be impractical until a bycatch study is initiated to determine if a problem exists in the coastal purse seine fishery. Until that happens, this option is not practicable.

3. Full retention of catch would avoid the bycatch issue completely. However, it would increase the cost to fishers by forcing them to land small fish instead of larger, more profitable fish. There would also be a problem of enforceability because, without an observer, most fishers would discard small fish in favor of larger ones. The retention of yellowtail, white seabass and barracuda would be a violation of California state law, thus placing this option in conflict with state law. Because of these issues, this option does not appear to be practicable.

4. Performance standards in this fishery would require extensive study before they could be applied. The objectives would need to be identified, rewards for achieving the goal would need to be identified, rules would have to be implemented by the Council, observers would need to be employed to evaluate the success of the program as logbooks would not provide reliable data. Because of this, at this time, performance standards are not a practicable option to reduce bycatch or mortality.

5. An educational program on how to avoid bycatch species, what to do when you find them and how to successfully release them would help to reduce bycatch and associated mortality. NMFS could institute a program similar to the one for the shark/swordfish drift gillnet fishery. In this way, the option appears as a practicable way to reduce bycatch and mortality.

6. Effort reduction through limited entry and permit reduction could be used to reduce the total amount of effort in the fishery. Whether this would reduce total bycatch is unknown since the remaining vessels might simply increase their effort to make-up for the lost effort. One positive thing that might happen is the reduction in bycatch and mortality that might occur as less skilled fishers are eliminated from the fishery through limited entry or permit reduction regulations. This assumes that older, more experienced fishers would qualify for limited entry while newer, less experienced fishers would not. There is already de facto limited entry since, south of 39° N lattitude, most California vessels already possess a Coastal Pelagic Species (CPS) limited entry permit. California vessels without a CPS limited entry permit cannot operate economically on HMS alone, therefore the de facto limited entry. The few vessels that do not possess the CPS permit are vessels which fish under IATTC regulations and it is unlikely more will enter this fishery. This is not a practicable option.

7. Limiting soak time - This measure does not apply to this fishery.

8. Prohibiting sets on floating objects - Based on IATTC data, setting on free swimming schools of tuna does not produce significant bycatch of fish. NMFS would need to do a study on the fishery, collecting data with observers, before this measure could be implemented, assuming bycatch or mortality was a problem. Without further study, this is not a practicable option.

PROPOSED ACTION

There are no proposed actions to reduce bycatch or bycatch mortality at this time.

5.6.2 Recreational Fisheries

5.6.2.1 Potential Methods Considered to Reduce Bycatch and Bycatch Mortality

1. Use of De-hooking Devices for Sharks: Under this option, shark fishers or any angler with a reasonable expectation of catching a shark that is to be discarded would be required to have a de-hooking device on the vessel and use it as necessary. Further, the angler would have to know how to use the device.

2. Use of Circle Hooks: This style of hook has been proven to significantly reduce hooking mortality on fish that are to be released. On the West Coast, anglers that are mooching for salmon (drifting with dead bait) are required to use circle hooks because of the proven reduction in mortality. Applying the same principle to HMS anglers would assure that the lowest possible mortality would occur if a fish were thrown back.

3. Full Retention of Catch: All anglers would be required to land all HMS. Full retention of the catch would reduce bycatch to zero by definition; all fish would have to be landed. This is done in many invertebrate fisheries, where the first number of animals harvested must be retained to avoid waste. However, in this instance, it is done to avoid bycatch.

4. Formal Voluntary Catch and release Program for All Species: This type of formal program where anglers voluntarily release their catch would provide for a meaningful angling experience while reducing bycatch by definition. The program would hinge on developing a successful educational component which would inform anglers on how to avoid the catch of non-target HMS and how to minimize mortality of any released fish.

5. Formal Mandatory Catch and release for Striped Marlin Only: This would authorize a formal catch and release program for recreational anglers in which no striped marlin could be retained. Fish brought dead to the vessel must be released.

5.6.2.2 Fishery Discussion of Bycatch Reduction Measures

Bycatch by recreational anglers on party/charter boats and private vessels is significant for only a few species. Skipjack tuna and blue shark make up the vast majority of the bycatch. Both resources are healthy, and the magnitude of bycatch is documented by the MRFSS. To the extent that the Magnuson-Stevens Act calls for the reduction of bycatch when practicable, the fleets are currently complying with the law. Some options listed below could serve to reduce bycatch mortality by increasing the survivability of released fish. The major concern of the fleets is the definition of bycatch under the National Standard Guidelines which makes mandatory the release of all fish released alive under a formal catch and release program. The Magnuson-Stevens Act only states that "Such term (*bycatch*) does not include fish released alive under a recreational catch and release fishery management program." This more liberal interpretation would cover the existing practice of voluntary catch and release of HMS along the West Coast.

Party/Charter Boats:

1. Use of de-hooking devices for sharks would serve to reduce mortality on sharks by allowing anglers to successfully retrieve their hooks without significantly traumatizing the animals. The devices provide a leverage point which allows for a successful release without undo risk to either the angler or shark. Several devices are on the commercial market at this time. However, no studies have occurred to document their use or effectiveness. Because no data are available to evaluate the effectiveness of these devices, this option is not practicable as a way to reduce bycatch mortality.

2. Use of circle hooks could decrease mortality on bycatch species by decreasing hooking trauma since almost all fish are hooked in the corner of the mouth, an area where little damage occurs and fish can easily be released. However, currently the only study on Pacific species relates to salmon. While the study did show hooking mortality was reduced, it was specific to these fish. Work in the Atlantic on tuna does offer some insight into tuna survival. However, pending the outcome of a hooking study for HMS on the West Coast, this option is not a practicable way to reduce bycatch mortality.

3. Full retention of catch is one method that could be used to reduce bycatch. Under this option, all anglers would be required to keep and land all HMS. It would meet the requirements of Magnuson-Stevens Act by eliminating bycatch among party/charter boat anglers. However, it would create a problem of waste as anglers dump the undesirable part of their catch after returning to port. Because of the potential for dumping, this option is not practicable.

4. A formal voluntary catch-and release program for all species would hinge on developing a successful educational component which would inform anglers on how to avoid non-directed bycatch (HMS taken when fishing for other species and not retained) and how to minimize mortality of any HMS bycatch. National Standard Guideline 50 CFR 600.350(c) calls for the release of all fish taken under a formal catch-and -release program. Since these are guidelines, a formal voluntary program with an educational component to reduce bycatch where practical and bycatch mortality if that is not possible, would appear to mitigate for the intent of the guideline, reduction of bycatch by forcing the release of all fish whether dead or alive. With this caveat, this option is practicable.

5. Formal voluntary catch and release for striped marlin only would be similar to a program currently in use in the Atlantic Plan for Tuna and Billfishes. It is in compliance with National Standard Guideline 50 CFR 600.350(c) which calls for the release of all fish taken under a formal catch and release program. For party/charter boats with their extremely low catch rate (< 10 fish per year) of striped marlin, enforceability would be an issue. Further, discarding a fish which comes up dead would be wasteful when there is no biological reason not to keep the fish since the resource is healthy and the current take is below MSY. This option is practicable because of the low catch rate and effort to avoid waste of fish.

PROPOSED ACTION

Implement a voluntary catch and release program for all species.

Private Vessels:

1. Use of de-hooking devices for sharks would serve to reduce mortality on sharks by allowing anglers to successfully retrieve their hooks without significantly traumatizing the animals. The devices provide a leverage point which allows for a successful release without undo risk to either the angler or shark. Several devices are on the commercial market at this time. However, no studies have occurred to document their use or effectiveness. Because no data are available to evaluate the effectiveness of these devices, this option is not practicable as a way to reduce bycatch mortality.

2. Use of circle hooks could decrease mortality on bycatch species by decreasing hooking trauma since almost all fish are hooked in the corner of the mouth, an area where little damage occurs and fish can easily be released. However, currently the only study on Pacific species relates to salmon. While the study did show hooking mortality was reduced, it was specific to these fish. Work in the Atlantic on tuna does offer some insight into tuna survival. However, pending the outcome of a hooking study for HMS on the West Coast, this option is not a practicable way to reduce bycatch mortality.

3. Full retention of catch is one method that could be used to reduce bycatch. Under this option, all anglers would be required to keep and land all HMS. It would meet the requirements of the Magnuson-Stevens Act by eliminating bycatch among party/charter boat anglers. However, it would create another problem, what would anglers do with undesirable species such as blue shark? Undoubtedly, it would result in significant waste as anglers dump the undesirable part of their catch after returning to port. Further, since private vessels operate differently than party/charter boats where peer pressure significantly increases compliance with the law, the lack of peer pressure on private vessels would undoubtably lead to undesirable fish being thrown back. Because of the potential for dumping and fish being thrown back because of lack of enforcement, this option is not practicable.

4. A formal voluntary catch-and release program for all species would hinge on developing a successful educational component which would inform anglers on how to avoid non-directed bycatch (HMS taken when fishing for other species and not retained) and how to minimize mortality of any bycatch. National Standard Guideline 50 CFR 600.350(c) calls for the release of all fish taken under a formal catch-and -release program. Since these are guidelines, a formal voluntary program with an educational component to reduce bycatch where practical and bycatch mortality if that is not possible, would appear to mitigate for the intent of the guideline, reduction of bycatch by forcing the release of all fish whether dead or alive. With this caveat, this option is practicable.

5. Formal catch and release for striped marlin only would be similar to a program currently in use in the Atlantic Plan for Tuna and Billfishes. It is in compliance with National Standard Guideline 50 CFR 600.350(c) which calls for the release of all fish taken under a formal catch-and -release program. For the private boat fishery where the vast majority of fish are released, it would not be a hardship. However, since some marlin die while being caught, it would create some bycatch although that bycatch would be less than the current "bycatch" associated with California's voluntary program where the vast majority of fish are released alive. The

discarding of fish would be wasteful when there is no biological reason not to keep the fish since the resource is healthy and the current take is below MSY. However, since this complies with the letter of the law, it is a practicable option.

PROPOSED ACTION

Implement a voluntary catch and release program for all species.

Table 5-24. Summary of potential bycatch reduction measures by gear type and whether the option is practicable at this time

Gear Type	Proposed Action							
COMMERCIAL	Gear Modifications	Time/Area Closures	Full Retention of Catch	Performance Standards	Education	Effort Reduction	Limit Soak Time	Cannot Set Floating Object
Drift Gillnet	Yes[1]	Yes[1]	No	No	Yes[1]	Yes[1]	Yes[1]	Does Not Apply
Surface Hook-and-Line	No	No	No	No	No	No	Does Not Apply	Does Not Apply
Pelagic Longline	Yes[2]	Yes[2]	No	No	Yes[2]	No	No	Does Not Apply
Harpoon	NO MEASURES NECESSARY - NO BYCATCH BECAUSE OF THE NATURE OF THE FISHERY							
Large Tuna Purse Seines	NO MEASURES NECESSARY - REGULATED BY INTERNATIONAL TREATY THROUGH INTER-AMERICAN TROPICAL TUNA COMMISSION							
Coastal Purse Seines	No	No	No	No	No	No	Does Not Apply	No
Gear Type	Proposed Action							
RECREATIONAL	Use of Dehooking Devices For Sharks	Use of Circle Hooks	Full Retention of Catch	Formal Voluntary Catch and release Program for all Species	Formal Voluntary Catch and release Program for Marlin			
Party/Charter Boats	No	No	No	Yes	Yes			
Private Vessels	No	No	No	Yes	Yes			

1 Already in effect as part of the state restrictions on the DGN fishery

2 Already in effect for Western Pacific Council vessels fishing under their HMS FMP

5.7 Voluntary Catch and Release Recreational Fishery

5.7.1 Background

Amendment 1 to the Atlantic Billfish Fishery Management Plan established a recreational catch-and-release fishery management program. The following factors supported the establishment of a catch-and-release program in the Atlantic recreational billfish fishery: (1) the exclusive recreational nature of the Atlantic billfish fishery, (2) the already existing high rate of release of live fish in the recreational fishery,(3) the high rate (likely in excess of 90 %) of survival of recreationally caught and released fish and(4) the high economic benefit of each fish caught. Furthermore, the plan authors believed that establishing a catch-and-release fishery in this situation would further foster the already existing catch-and-release ethic of recreational billfish fishers, thereby increasing release of billfish caught in the fishery.

The drafters noted a 1997 ICCAT recommendation to promote the voluntary release of Atlantic blue and white marlin. In addition, they looked at National Standard Guideline 50 CFR 600.350(c) which states"[a] catch and release fishery management program is one in which the retention of a particular species is prohibited." They pointed out this definition is a guideline and is only an example of management measures which may be used to establish a recreational catch-and-release program. In their conclusion establishing the Atlantic catch-and-release billfish program the drafters stated "The establishment of a catch-and-release fishery management program for recreational Atlantic billfish fishery is a final action because it meets the objectives of the FMP amendment as well as National Standard 9 and the 1997 ICCAT recommendation." The recreational fishery which releases fish in southern California meets the same criteria used to establish the catch-and release program in the Atlantic. While tuna and sharks are a shared resource with commercial fishers, the dorado fishery is almost exclusively a recreational fishery and striped marlin is currently reserved for recreational anglers by law in California.

Several of the species taken in the recreational fishery already have a high rate of live releases, and many of those species have a high rate of survival. This produces high economic benefit for each fish caught. Since there is wide-spread support for a voluntary catch-and-release program which allows the angler the option to land a fish, the FMP proposes such a program. In this manner, bycatch and bycatch mortality would be reduced.

5.7.2 Catch and Release Alternatives

Alternative 1: (No Action): Status quo. No bycatch and/or catch and release programs would be implemented under this FMP. Under this option all highly migratory fish released would be considered bycatch

Alternative 2: (Proposed Action): The FMP would establish a framework procedure for bycatch reduction, and adopts a formal voluntary "catch and release" program for HMS recreational fisheries to promote the handling and release of fish in a manner that minimizes the risk of incidental mortality, and encourages the release of small fish. Released fish under this program would no longer be classified as bycatch.

Under Alternative 2, NMFS and the states jointly would develop and implement an educational program to inform anglers on how to avoid bycatch of HMS, or if that was not practicable, ways to release fish which minimize bycatch mortality. The details of the program would be announced by NMFS shortly after implementation of the FMP. NMFS already has moved in this direction under Executive Order 12962 - Recreational Fisheries. Under the order, NMFS has established a national plan to support, develop, and implement programs that are designed to enhance public awareness and understanding of marine conservation issues relevant to the well-being of marine recreational fishing. NMFS could build on their current conservation efforts by including information on how to avoid bycatch when fishing for HMS or for other fish where HMS might be incidentally taken. In addition, information on how to successfully release HMS so as to minimize mortality would be part of the program. The program would be voluntary since the angler would retain the alternative to keep the fish.

The main focus of the program will be NMFS employees dealing with recreational fisheries issues, primarily through the Pacific Recreational Fisheries Coordinator of the Office of Constituent Services, Recreational Fisheries Division. Notice of the policy regarding catch and release and development of materials for dissemination to anglers and angler clubs will be completed when an opportunity permits. There will be opportunities to provide such information through the following:

- Recreational symposia
- Southwest Fisheries Science Center's Billfish Newsletter
- Fish tagging programs
- Fishing tournaments

Currently, the magnitude of bycatch in recreational fisheries is very low. In the party/charter vessel fishery, only blue sharks and skipjack tuna are discarded (Table 5-22). For the private recreational fishery, striped marlin, skipjack, and blue, mako and thresher sharks comprise most of the bycatch (Table 5-23). NMFS and the states could develop two plans for bycatch and bycatch mortality reduction. One would be aimed at party/charter skippers and the other at private recreational anglers. For party/charter skippers the emphasis would be on avoiding the unintended take of skipjack and blue sharks, or if they are taken incidentally or as a result of catch and release, how to successfully release the fish with the lowest possible mortality. The private recreational angler program would do the same for striped marlin, skipjack, and blue, mako and thresher sharks. Once educational programs were developed, NMFS and the states would need to inform the public of their existence and the necessity to participate. Party/charter vessels skippers could attend mandatory workshops to learn about bycatch reduction measures. Private recreational anglers would be more difficult to reach but public information programs carried out through press releases, articles in popular sport fishing publications and seminars at local angling clubs would reach most HMS anglers. Under a voluntary catch and release program, NMFS would take on added educational responsibilities which would have additional costs. These costs are unknown at this time.

Establishing a formal voluntary catch and release program would increase angler awareness of the necessity to avoid needless bycatch, and if bycatch did occur, propose release methods which minimize bycatch mortality. The benefit to the HMS resources would be significant since anglers would know how to avoid bycatch and how to reduce bycatch mortality. By establishing a voluntary program versus a mandatory catch and release, waste of fish could be avoided as the angler would be able to retain injured fish subject to state bag limits.

Alternative 3: Would establish a bycatch reduction program; does not authorizes a formal voluntary catch and release program for recreational fisheries. Under this option all highly migratory fish released would be considered bycatch.

Alternative 4: Establishes a formal voluntary catch and release program for striped marlin. Under this option all other highly migratory fish released would be considered bycatch.

5.7.3 Analysis of Catch and Release Alternatives

Alternative 1 would continue the current practice in West Coast states of no formal measures to reduce bycatch nor any formal measure to reduce bycatch mortality. Since this is in conflict with the Magnuson-Stevens Act, adoption of this option is not practicable under this FMP.

Alternative 2 would establish a voluntary recreational catch and release program for all HMS in order to reduce the probability of present and future overfishing, maximize access to and reduce overall mortality on resources which are available to West Coast anglers in relatively short time frames and small geographic areas, and to conform to bycatch reduction requirements mandated in the Magnuson-Stevens Act. This voluntary catch and release program would be implemented in recognition of the recreational nature of many West Coast HMS species where current trends are moving towards increasing release rates on recreationally caught fish. The program would be adopted after consideration of the high survival rates for released HMS and the high economic benefits associated with distributing these resources among the greatest number of participants.

The benefits from this program will be maximized by increasing outreach efforts to West Coast anglers through cooperative efforts with organizations like the United Anglers of Southern California, The Billfish Foundation, angling clubs and individual anglers to provide information on the use of fishing gear, practices and techniques which will increase the survival rates of released fish. The use of de-hooking devices, circle hooks, proper handling techniques, and other angling practices can increase survivability of released fish. Further studies on release survival within the areas affected by this program should be used to incorporate all sources of mortality into stock assessments (Goodyear 2002, Nelson 2002).

The utilization of voluntary catch and release fishing practices by anglers targeting striped marlin, tunas and sharks from the highly populated coast of southern California has increased dramatically over the last decade (B. Hoose, Tuna Club, Avalon, CA, pers. comm. and K. Poe, Balboa Angling Club, Newport Beach, CA, pers.

comm.). This practice has been shown to have efficacy as a management tool in situations where population growth has increased both the total number of potential anglers and the number of angling trips (Nelson 2002).

Mortality on HMS species is reduced by this practice. Studies attempting to document survival in hook-and-line caught marlin and sailfish across a broad spectrum of fishing methods have yielded results ranging from 0% to 50% not accounting for overestimation due to tag shedding (Goodyear 2002) with likely mean mortality from such practices around 10% to 15% (Hinman 2001). Similarly both physiological and traditional and archival tagging studies have shown low mortalities associated with the release of tuna species (Block et al 2001, Brill, et al. 2003; Skomal et al. 2003). Encouraging the release of fish reduces mortality on the stock and reduces the probability of localized or regional stock depletions. Consistent use of this form of fishing can provide insurance against future overfishing.

Most HMS species occur seasonally in the waters off southern California and are often available in pulses. Temporal increases in local availability attract increased angling participation. Keeping large quantities of HMS during each trip limits participation to those first reaching the concentrations of fish and applies the greatest potential mortality per unit effort. Catch and release fishing allows access to the resource to be available to a greater number of people while maintaining higher levels of local abundance. This form of resource sharing increases the economic benefits obtainable from each unit of resource.

While the National Standard Guidelines suggest that a catch and release program should be established for species where retention is prohibited (CFR 600.350(c), they also advise that the consideration of the practicability of bycatch reduction measures must take into account consistency with other national standards and the maximization of net benefits to the nation (CFR 600.350(d). A catch and release program has been put into place for Atlantic Billfishes where, as is the case in this FMP, release is not mandatory. Furthermore, requiring the release of all Pacific HMS species is not warranted by existing scientific information on stock status and would likely cause significant reductions in participation in recreational HMS fisheries with loss of economic benefits. On the other hand, categorizing voluntarily released fish as bycatch would tend to force the retention of more fish and increase fishing mortality while reducing the availability of these resources to a larger number of anglers. This result would be inconsistent with National Standard 1 and its direction to prevent overfishing while optimizing yield. Establishing a voluntary recreational catch and release program for the HMS covered in this FMP serves, on the whole, to balance optimal harvest with a precautionary approach to reduce potential mortality on these stocks.

Alternative 3 would authorize no formal catch and release program. Under this alternative the catch of recreational anglers would need to be monitored to determine bycatch and bycatch mortality. NMFS would then have to determine if the resource was being impacted as a result of recreational bycatch, and if there was an impact, develop methods to reduce bycatch, or reduce bycatch mortality if actual bycatch could not be reduced. Given the status of the stocks of fish taken in the recreational fisheries and the small portion recreational anglers contribute to overall mortality, NMFS would probably find bycatch and bycatch mortality were not of concern in the recreational fishery. Initiating no formal catch and release would put an additional unnecessary burden on NMFS ,so this option is not practicable.

Alternative 4 calls for a formal catch and release program for striped marlin only. All fish would have to be released per National Standard Guideline 50 CFR 600.350(c) which states "[a] catch and release fishery management program is one in which the retention of a particular species is prohibited." It would also place the remaining HMS in a category equivalent to alternative 3. While placing striped marlin in this category would approximate the current practice of recreational anglers in southern California, it would waste fish which are now utilized since dead fish could not be retained. Further, the discard of dead fish would not be as well documented as it is under the current practice where anglers report the disposition of fish to NMFS and local angling clubs. Bycatch would be eliminated by definition. Not having a formal catch and release for other HMS would create the same problems encountered in alternative 3. While this option is practicable for the striped marlin fishery, it only focuses on one species and is therefore less desirable than option 2.

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Chapter 6
INTERACTIONS WITH PROTECTED SPECIES

6.0 INTERACTIONS OF HMS FISHING GEARS WITH PROTECTED SPECIES

6.1 Introduction

This section examines the interaction between protected species and HMS fisheries under consideration in this FMP. As a point of clarification, interactions are different than bycatch. Interactions take place between fishing gears and marine mammals, turtles and birds while bycatch consists of discards of fish. Following a brief review of the three acts (Marine Mammal Protection Act, Endangered Species Act and Migratory Bird Treaty Act) affecting protected species, the interactions between HMS gears and each species will be examined. Additionally, the interaction of seabirds and longline fisheries are considered under the auspices of the United States "National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries" (NPOA-Seabirds). While sea turtles are defined as fish in the Magnuson-Stevens Act, and thus technically are bycatch, they are discussed in this section because of their protected status (NMFS, 1998) under the ESA.

6.1.1 Interactions and the Marine Mammal Protection Act

The Marine Mammal Protection Act of 1972 as amended (MMPA) is one of the principal federal statutes that guides marine mammal species protection and conservation policy. In the 1994 amendments, section 118 established the goal that the incidental mortality or serious injury of marine mammals occurring during the course of commercial fishing operations be reduced to insignificant levels approaching a zero mortality rate goal (ZMRG) and serious injury rate within 7 years of enactment (i.e., April 30, 2001). In addition, the amendments established a three-part strategy to govern interactions between marine mammals and commercial fishing operations. These include the preparation of marine mammal stock assessment reports, a registration and marine mammal mortality monitoring program for certain commercial fisheries (Category I and II), and the preparation and implementation of take reduction plans (TRP).

6.1.1.1 Species of Interest Under the MMPA

The following marine mammal species occur off the West Coast that are or could be of concern with respect to potential interactions with HMS fisheries. A synopsis of stock assessment information for marine mammals is presented in Appendix E.

Cetaceans	
North Pacific right whale	*Eubalaena glacialis*
Sei whale	*Balaenoptera borealis*
Blue whale	*Balaenoptera musculus*
Fin whale	*Balaenoptera physalus*
Humpback whale	*Megaptera navaeangliae*
Sperm whale	*Physeter macrocephalus*
Bryde's whale	*Baleanoptera edeni*
Sei whale	*Baleanoptera borealis*
Minke whale	*Baleanoptera acutorostrata*
Killer whale	*Orcinus orca*
Short-finned pilot whale	*Globicephala macrorhyncus*
Baird's beaked whale	*Berardius bairdii*
Cuvier's beaked whale	*Ziphius cavirostris*
Pygmy sperm whale	*Kogia breviceps*
Harbor porpoise	*Phocoena phocoena*
Dall's porpoise	*Phoconoides dalli*
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*
Risso's dolphin	*Grampus griseus*
Bottlenose dolphin	*Tursiops truncatus*
Striped dolphin	*Stenella coeruleoalba*
Short-beaked common dolphin	*Delphinus delphis*
Long-beaked common dolphin	*Delophinus capensis*
Northern right-whale dolphin	*Lissodelphis borealis*
Pinnipeds	
Steller (=northern) sea lion	*Eumetopias jubatus*
California sea lion	*Zalophus californianus californianus*
Guadalupe fur seal	*Arctocephalus townsendi*
Northern elephant seal	*Mirounga angustirostris*
Harbor seal	*Phoca vitulina richardsi*
Northern fur seal	*Callorhinus ursinus*

The NMFS Southwest Fisheries Science Center recently published "U.S. Pacific Marine Mammal Stock Assessments: 2001" (Carretta et al. 2001, NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-317, December 2001). This presents the most current information on the status of the stocks listed above with the exception of Steller sea lion. The report also presents estimates of takes in fisheries. Of these species, only Guadalupe fur seal is considered a depleted and "strategic" stock; it also is listed as threatened under the ESA. The population trends for these species off the West Coast are generally increasing. Mortality due to interactions with fishing gear by vessels off the West Coast is estimated to be well within the Potential Biological Removal (PBR) levels and considered insignificant under the MMPA.

6.1.1.2 Management Under the MMPA

Under MMPA requirements, NMFS produces an annual List of Fisheries that classifies domestic commercial fisheries, by gear type, relative to their rates of incidental mortality or serious injury of marine mammals. The List of Fisheries includes three classifications; following is a description of potential injury and affected West Coast fisheries under consideration:

1. Category I fisheries are those with frequent serious injury or mortality to marine mammals (drift gillnet);
2. Category II fisheries are those with occasional serious injury or mortality (includes pelagic longline and purse seines <400 short tons, or 363 mt, carrying capacity); and
3. Category III fisheries are those with remote likelihood of serious injury or mortality to marine mammals (harpoon and surface troll).

Large tuna purse seiners (>400 short tons) fishing in the eastern tropical Pacific Ocean (EPO) are excluded from being categorized under section 118 because they are fishing under another section of the MMPA. Commercial passenger fishing vessel (charter boat) fisheries are subject to section 118 and are listed as a Category III fishery. Recreational vessels are not categorized since they are not considered commercial vessels.

Fishermen participating in Category I or II fisheries are required to register under the MMPA and to accommodate an observer aboard their vessels if requested. Vessel owners or operators, or fishermen, in Category I, II, or III fisheries must report all incidental mortalities and serious injuries of marine mammals during the course of commercial fishing operations to NMFS Headquarters. There are currently no regulations requiring recreational fishermen to report takes, nor are they authorized to have incidental takes (i.e., they are illegal).

Section 118(f), which was included in the 1994 amendments of the MMPA, established the take reduction team (TRT) process which allows development of take reduction plans for Category I and II fisheries if the determination is made that the fishery has a high level of mortality and serious injury across a number of strategic marine mammal stocks. The MMPA defines a strategic stock as a (1) marine mammal species that is listed as endangered or threatened under the ESA; (2) marine mammal stock for which the human-caused mortality exceeds the PBR level; or (3) marine mammal stock which is declining and likely to become listed as a threatened species under the ESA. The PBR level is the maximum number of animals, not including natural mortalities, that may be annually removed from a marine mammal stock while allowing that stock to reach or maintain its optimal population level.

Take reduction teams are made up of individuals who represent the span of interests affected by the strategies to reduce takes, including commercial and recreational fishing industries, fishery management councils, interstate commissions, academic and scientific organizations, state officials, environmental groups, Native Alaskans or other Native American interests, if appropriate, and NMFS representatives. The immediate goal of a take reduction plan is to reduce, within six months of its implementation, the incidental take of affected marine mammal stocks to below their potential biological removal (PBR) levels. The long-term goal of a take reduction plan is to reduce, within five years of its implementation, the incidental take of marine mammals to insignificant levels approaching a zero mortality rate goal (yet to be defined) and serious injury rates. The TRT develops a take reduction plan which is forwarded to the Secretary of Commerce with recommendations for implementation. The TRT relevant to these HMS fisheries is the Pacific Offshore Cetacean Take Reduction Team (POCTRT).

6.1.1.3 Marine Mammal Protection in the Drift Gillnet Fishery

The POCTRT was formed in February 1996 to address the incidental mortality and serious injury of strategic marine mammal stock takes by the CA/OR drift gillnet fishery. In August 1996, the POCTRT recommended to NMFS four primary strategies to reduce marine mammal takes . They were:

1. Require the top of the submerged net to be a minimum of 36 ft below the surface;
2. Conduct experiments on the use of pingers to reduce marine mammal entanglements;
3. Recommend the states issue no new drift gillnet permits; and
4. Require permit holders to attend mandatory skipper education workshops.

After the 1996-97 fishing season, the pinger experiment appeared to be successful with a 78% reduction in the level of cetacean entanglements. The use of pingers was mandated, as well as the requirement relating to minimum net depth and mandatory skipper workshops when final regulations implementing the Take Reduction Plan were promulgated in October 1997.

At their annual meeting in 2000, the POCTRT discussed the 1999-2000 season. Based on observer data during the season, the entanglement of cetaceans, especially common dolphins, had increased for the first time since pinger use became mandatory. The increase in take was particularly notable in the months of December 1999 and January 2000. This trend appeared to replicate a similar increase in January 1999 when takes were also elevated to pre-pinger levels. Although takes of strategic marine mammal stocks addressed by the Pacific Offshore Cetacean Take Reduction Plan were below PBR, and takes were below 10% of PBR for all but four species, the POCTRT was concerned about the increase in overall cetacean take.

Since the POCTRT was unable to ascertain whether the problem was a result of a decline in pinger effectiveness, or the possibility that the pingers utilized were not fully functioning, or of some other factor, the POCTRT recommended a package of measures for the next fishing season with the goal of addressing some of the potential causes for the possible increasing trend that had been identified and obtaining additional data to assist in its analysis of appropriate recommendations. The measures included the ones then in place (numbers 1-4 below) and two additional ones. The recommendations included:

1. Continued mandatory deployment of 36 ft net buoy line extenders;
2. Continued use of pingers;
3. Continuation of the voluntary program to reduce the number of permits;
4. Continuation of mandatory skipper education workshops;
5. Better data gathering and analysis capabilities; and
6. Increased enforcement and compliance.

At their annual meeting in 2001, the POCTRT discussed the 2000-2001 season. Based on observer data during the season, the entanglement of cetaceans was down from the prior season but still not at the low levels of the 1998-1999 season, causing some concern about the inconsistency of takes by season. There were no observed takes of strategic stocks during the season. Although takes of marine mammal species addressed by the Pacific Offshore Cetacean Take Reduction Plan continue below PBR, and takes are below 10% of PBR for all but four species (sperm whale, fin whale, northern right-whale dolphin, and short-finned pilot whale), the POCTRT was still concerned about the takes of those animals above 10% of PBR.

The linkage between the MMPA and ESA is an important factor in management of the drift gillnet fishery. If a fishery incidentally takes marine mammal species that are listed under the ESA during the course of commercial fishing activity, a permit under 101(a)(5)(E) of the MMPA must be obtained to authorize the lawful incidental taking of those species under the MMPA. A permit may be issued during a period of up to 3 consecutive years if:

1. The incidental mortality and serious injury from commercial fisheries will have a negligible impact on such species or stock;
2. A recovery plan has been developed or is being developed for such species or stock pursuant to the ESA;
3. A monitoring program is established under section 118(d) of the MMPA;

4. Vessels are registered in accordance section 118(c) of the MMPA; and
5. A take reduction plan has been developed or is being developed for such species or stock under section 118(f) of the MMPA.

NMFS has defined negligible impact as an impact resulting from the specified activity that cannot be reasonably likely to adversely affect the species or stock through effects on annual rates of recruitment or survival (50 CFR 226.103). In 1990, the Marine Mammal Commission (MMC) submitted guidelines to NMFS to govern the incidental taking of marine mammals in the course of commercial fishing operations. In those guidelines, the MMC recommended NMFS determine negligible impact if the mortality and serious injury incidental to commercial fishing operations would cause no more than a 10% increase in the time to recovery. Participants at NMFS' 1994 workshop to prepare initial draft guidelines for calculating PBR and for writing the draft stock assessment reports agreed, and determined that authorized levels of human-related mortality should increase recovery time of endangered stocks by no more than 10%. Therefore, a default recovery factor of 0.1 was chosen to use in the PBR equation for endangered stocks of marine mammals (Barlow et al., 1995). Using a PBR containing a recovery factor of 0.1 would allow a large portion of the stock's annual net production to be used for recovery rather than being authorized for removal due to incidental mortality. This would allow a large fraction of the net production of the population to contribute to population increase and eventual recovery, and thus have a relatively insignificant negative impact upon the population (Wade 1998). Therefore, when incidental mortality and serious injury was below the stock's PBR, such mortality and serious injury would have no more than a negligible impact on the stock.

On August 31, 1995 (60 FR 45399), NMFS issued permits for fisheries meeting the conditions under section 101(a)(5)(E) of the MMPA. At that time, NMFS did not issue a permit to the California/Oregon drift gillnet fishery for the CA/OR/WA and Mexico humpback whale stock or the CA/OR/WA sperm whale stock because NMFS was unable to determine that the estimated mortality and serious injury incidental to commercial fishing operations was negligible. In addition, in 1995, NMFS did not consider issuing a permit for the incidental mortality and serious injury of the CA/OR/WA fin whale stock because there had been no reported incidental takes at that time, and NMFS had no reason to anticipate any such takes. However, NMFS did determine that the mortality and serious injury incidental to commercial fishing operations were negligible for the eastern Steller sea lion stock and issued a permit for that stock.

Subsequently, on June 6, 2000 (65 FR 35904), NMFS proposed the issuance of a permit, for a period of 3 years, to authorize the incidental, but not intentional, taking of four stocks of threatened or endangered marine mammals by the CA/OR drift gillnet fishery under section 101(a)(5)(E) of the MMPA. On October 24, 2000, NMFS issued a permit to allow the incidental, but not intentional, taking of four stocks of endangered or threatened marine mammals to the CA/OR drift gillnet fishery: (1) fin whale, CA/OR/WA stock; (2) humpback whale, CA/OR/WA and Mexico stock; (3) Steller sea lion, eastern stock; and (4) sperm whale, CA/OR/WA stock. These permits may be suspended or revoked if the level of take is likely to result in an impact that is more than negligible. The permit was published in the Federal Register on October 30, 2000 (65 FR 64670).

Although not charged with reducing the take of sea turtles, at their annual meeting in 2001, the POCTRT discussed alternatives which might reduce the take of leatherback sea turtles in the DGN fishery. They proposed that NMFS consider the following alternative to the Biological Opinion of October 2000:

1. Closure of the region from 36° 15' N latitude to 45° 00' N latitude from August 15 through November 15;
2. Minimum extender length of 60 ft in the northern area;
3. Skipper workshops to educate skippers on how to reduce take, revive animals and use special tools to cut animals out of the net;
4. Increased observer coverage;
5. Closure of the fishery if more than one turtle was taken in the first two years or two were taken in three years; and
6. Re-evaluation of the plan when consultation is re-initiated.

The POCTRT also recommended a package of measures for the next DGN fishing season which included:

1. Continued mandatory deployment of 36 ft net buoy line extenders;
2. Continued use of pingers;
3. Continuation of the voluntary program to reduce the number of permits;
4. Continuation of mandatory skipper education workshops; and
5. Better data gathering and analysis capabilities.

The available observer data confirm that the regulations issued to implement the TRP have generally been quite effective in reducing marine mammal takes as intended.

6.1.1.4 Other Marine Mammal Management Concerns

Recreational and commercial fishers and others have frequently complained that the growth of marine mammal populations (and especially the California sea lion population) has caused several problems. First, marine mammals may frequently take fish catch off fishers' hooks or take large bites out of the caught fish. This either means that the fish will have no commercial value or will have to be discarded by the recreational fisher. There are no provisions in the MMPA and associated regulations to allow fishers to take serious measures to protect their catch. Further, marine mammals sometimes break into bait holding tanks. Second, fishers allege that growing marine mammal populations are exerting excessive mortality on fish populations and excessive pressure on other coastal resources. To the fishers, it is unrealistic to provide total protection to marine mammals when human populations and development have changed the environment so dramatically since the MMPA was enacted. Third, marine mammals may inflict mortality on species listed under the ESA (e.g., sea lions capturing salmon and steelhead in the locks connecting Puget Sound and Lake Union in Washington).

Of these interaction issues, only the first is relevant to this FMP. Marine mammal interactions with specific HMS fisheries are discussed in more detail in section 6.2.

6.1.1.5 Measures to Avoid or Mitigate Takes Under the FMP

This FMP endorses and supports the management measures adopted under the MMPA to avoid and mitigate marine mammal takes in the drift gillnet fishery under the Take Reduction Plan prepared by the POCTRT. Nothing in this FMP or the proposed framework procedures is intended to supersede or limit the adoption of future regulations by the Secretary of Commerce under the MMPA provisions pertaining to the procedures and timelines for marine mammal take reduction plans and take reduction teams. The Council will have opportunity to participate on the POCTRT and to review and comment on any such proposals through regular notice and comment procedures for such rule-making. The Council also may offer management recommendations for consideration by the Secretary and the POCTRT. Some marine mammal interactions in other HMS fisheries (e.g., recreational fisheries interactions with sea lions) are not amenable to resolution under this FMP. Other marine mammal interactions (dolphins taken in large vessel purse seine fishing) are covered by existing international agreement and will not be affected by this FMP.

Observers will be required to be placed on many HMS fishing vessels under this FMP, and their reports will indicate whether there are additional concerns that should be addressed in the future. If so, action can be taken under the framework procedures.

6.1.2 Interactions and the ESA

The Endangered Species Act of 1973 as amended (16 U.S.C. 1531 *et seq.*) provides for the conservation and recovery of endangered and threatened species of fish, wildlife, and plants. The listing of a species is based on the biological health of that species throughout its range or in a specific portion of its range in some instances. The status determination is either threatened or endangered. Threatened species are those likely to become endangered in the foreseeable future [16 U.S.C. § 1532(20)] if no action is taken to stop the decline of the species. Endangered species are those in danger of becoming extinct throughout all or a significant portion of their range [16 U.S.C. § 1532(20)]. Species can be listed as endangered without first being listed as threatened. The Secretary of Commerce, acting through NMFS, is authorized to list marine and anadromous fish species, marine mammals (except for walrus and sea otter), marine reptiles (such as sea turtles) and marine plants. The Secretary of the Interior, acting through the USFWS, is authorized to list walrus and sea otter, seabirds, terrestrial plants and wildlife, and freshwater fish and plant species.

In addition to listing species under the ESA, the service agency (NMFS or UFWS) generally must designate critical habitat for listed species concurrently with the listing decision to the "maximum extent prudent and determinable" [16 U.S.C. § 1533(a)(3)]. The ESA defines critical habitat as those specific areas that are essential to the conservation of a listed species and that may be in need of special consideration. Federal agencies are prohibited from undertaking actions that destroy or adversely modify designated critical habitat. Some species, primarily the cetaceans, which were listed in 1969 under the Endangered Species Conservation Act and carried forward as endangered under the ESA, have not received critical habitat designations.

6.1.2.1 Species Listed

The following species that occur in the areas in which West Coast HMS fisheries are or could be active or in areas near or adjacent to HMS fishing areas are listed as threatened or endangered under the ESA (CH indicates that critical habitat has been designated as well).

Amphibians and Reptiles		
Loggerhead sea turtle	*Caretta caretta*	T
Green sea turtle	*Chelonia mydas*	T
Leatherback sea turtle	*Dermochelys coriacea*	CH, E
Olive (=Pacific) ridley sea turtle	*Lepidochelys olivacea*	T
Fish		
Chum salmon (Hood Canal summer, Columbia River)	*Oncorhynchus keta*	T
Coho salmon (Central California)	*Oncorhynchus kisutch*	T
Coho salmon (S. Oregon/N. Calif. Coast)	*Oncorhynchus kisutch*	T
Steelhead (Upper Columbia River, Southern California)	*Oncorhynchus mykiss* ssp.	E
Steelhead (Snake River Basin)	*Oncorhynchus mykiss* ssp.	T
Steelhead (Upper Willamette River)	*Oncorhynchus mykiss* ssp.	T
Steelhead (Columbia River)	*Oncorhynchus mykiss* ssp.	T
Steelhead (South-Central California, Central Valley, Northern California)	*Oncorhynchus mykiss* ssp .	T
Sockeye salmon (Snake River)	*Oncorhynchus nerka*	CH, E
Sockeye salmon (Ozette Lake)	*Oncorhynchus nerka*	T
Chinook salmon (Lower Columbia River)	*Oncorhynchus tshawytscha*	T
Chinook salmon (Upper Willamette River)	*Oncorhynchus tshawytscha*	T
Chinook salmon (Snake River Spring/Summer/Fall runs)	*Oncorhynchus tshawytscha*	CH, T
Chinook salmon (Sacramento River Winter, Upper Columbia Spring)	*Oncorhynchus tshawytscha*	E
Chinook salmon (Central Valley Spring, California Coastal)	*Oncorhynchus tshawytscha*	T
Tidewater goby	*Eucyclogobius newberryi*	E

Marine Mammals

Blue whale	*Balaenoptera musculus*	E
Fin whale	*Balaenoptera physalus*	E
Humpback whale	*Megaptera novaeangliae*	E
North Pacific right whale	*Eubalaena glacialis*	E
Sei whale	*Balaenoptera borealis*	E
Sperm whale	*Physeter macrocephalus*	E
Steller sea lion	*Eumetopias jubatus*	CH, T
Guadalupe fur seal	*Arctocephalus townsendi*	T
Southern sea otter	*Enhydra lutris nereis*	T
<u>Birds</u>		
Short-tailed albatross	*Phoebaotria albatrus*	E
Bald eagle	*Haliaeetus leucocephalus*	T
Brown pelican	*Pelecanus occidentalis*	E
California least tern	*Sterna antillarum browni*	E
Western snowy plover	*Charadrius alexandrinus*	T
Marbled murrelet	*Brachyramphus marmoratus*	CH, T
California clapper rail	*Rallus longirostris obsoletus*	E
<u>Invertebrates</u>		
White abalone	*Haliotis sorenseni*	E

<u>6.1.2.2 ESA Consultation Process</u>

Federal agencies have an affirmative mandate to use their legal authorities to conserve and restore listed species. One effect of this mandate is that federal actions, activities or authorizations (hereafter referred to as federal actions) must be in compliance with the provisions of the ESA. Section 7 of the ESA provides a mechanism for consultation by the federal action agency with the appropriate expert agency (NMFS or USFWS) as actions are being considered. Informal consultations, resulting in letters of concurrence, are conducted for federal actions that have no adverse affects on the listed species. Formal consultations, resulting in biological opinions, are conducted for federal actions that may have an adverse effect on the listed species. Through the consultation and preparation of the consequent biological opinion, a determination is made as to whether the proposed action poses "jeopardy" or "no jeopardy" of extinction to the listed species. If the determination is that the action proposed (or ongoing) will cause jeopardy, reasonable and prudent alternatives may be identified which, if implemented, would modify the action to no longer pose the jeopardy of extinction to the listed species. These reasonable and prudent alternatives (RPA) must be incorporated into the federal action if it is to proceed. A biological opinion with the conclusion of no jeopardy may contain a series of management measures (conservation recommendations) intended to further reduce the negative impacts to the listed species. These management alternatives are advisory to the action agency [50 CFR. 402.24(j)]. If a likelihood exists of any taking occurring during promulgation of the action, an incidental take statement may be appended to a biological opinion to provide for the amount of take that is expected to occur from normal promulgation of the action. An incidental take statement is not the equivalent of a permit to take. Incidental take statements may include reasonable and prudent measures, non-discretionary requirements of the action agency that are intended to minimize the effects of the incidental take. Terms and conditions for implementing the reasonable and prudent measures may also be included in the incidental take statement.

In the case of marine fisheries, NMFS Southwest Region's Sustainable Fisheries Division consults with the Region's Protected Resources Division to determine if the fishery, as it would be carried out under the fishery management plan, would likely jeopardize the continued existence of any listed species and, if so, what reasonable and prudent alternatives would be appropriate to prevent jeopardy or otherwise promote the recovery of the species in question. Under the consultative process, the Regional Administrator has recently been delegated authority to issue the biological opinion. In the case of seabirds and marine mammals under the purview of the USFWS, the Southwest Region will formally consult with the USFWS when the FMP is under review for potential approval and implementation.

Even before the initiation of a section 7 consultation, the information and analyses in this FMP have been developed in coordination with the NMFS protected resources program staff and USFWS offices to ensure evaluation of the likelihood that the fisheries under this FMP would jeopardize any listed species. Chapter 9 discusses in detail the expected impacts of the proposed action and alternatives on these species and any identified critical habitat for listed species. Information from prior biological opinions has been drawn on substantially in these evaluations. Appendix E presents detailed information on the status of listed species and their designated critical habitat.

6.1.2.3 Historic NMFS Consultations - Drift Gillnet Fishery Biological Opinion

In 1997, NMFS issued a Biological Opinion on the implementation of the Pacific Offshore Cetacean Take Reduction Plan for the CA/OR drift gillnet fishery for swordfish and sharks, and found that the implementation of the take reduction plan would not jeopardize the continued existence of any endangered or threatened species associated with the fishery. However, in 1998, the CA/OR drift gillnet fishery exceeded the incidental take statement (exemption from the section 9 prohibition of the ESA) for loggerhead sea turtles, causing NMFS to request re-initiation of consultation in December 1999. In October 2000, NMFS determined that the continued implementation of the Pacific Offshore Cetacean Take Reduction Plan for the CA/OR drift gillnet fishery was not likely to adversely affect species listed under the ESA.

Subsequently, NMFS issued a biological opinion on October 23, 2000, on the issuance of a permit under section 101(a)(5)(E) of the MMPA to the CA/OR drift gillnet fishery for the taking of listed species under the ESA. In this biological opinion, NMFS evaluated the effects of the fishery as it would be practiced under the proposed action (i.e., consistent with a §101(a)(5)(E) marine mammal permit) on all threatened and endangered species, including sea turtles and marine mammals. NMFS concluded that issuance of the permit was likely to jeopardize the continued existence of both loggerhead and leatherback sea turtle populations by appreciably reducing the likelihood of both the survival and recovery of these species. It is important to note that loggerhead sea turtles are jeopardized only when the fishery operates during El Niño events, as loggerhead sea turtles have only been observed caught during these events. In order to avoid jeopardy, NMFS developed a RPA that consists of two management measures designed to avoid the likelihood of jeopardizing leatherback turtles and one management measure designed to avoid the likelihood of jeopardizing loggerhead turtles. There are no records of interactions with north Pacific right whales, and therefore there was no need to consider measures to prevent takes or adverse effects.

Specifically, the biological opinion determined that either NMFS or the States of California and Oregon must close an area to drift gillnets from Point Conception, California (34° 27' N latitude), north to 45° N latitude, and west to 129° W longitude, from August 15 to October 31 for a period of three years (2001-2003), to protect leatherback turtles. Also by August 1, 2001, NMFS or the States of California and Oregon must close an area to drift gillnets south of Point Conception, and west to 120° W longitude, from August 15 to August 31 and again from January 1 through January 31, during a forecasted or occurring El Niño event, to protect loggerhead turtles.

Additional requirements of the Biological Opinion included:

a. CA/OR drift gillnet vessel operators and observers shall be educated on sea turtle biology and on methods that will reduce injury or mortality during fishing operations;
b. Live capture sea turtles shall be released uninjured from the net in a manner that minimizes the likelihood of further gear entanglement or entrapment;
c. NMFS shall continue to collect data on capture, injury and mortality of sea turtles in addition to life history information;
d. Comatose and lethargic sea turtles shall be retained on board, handled, resuscitated (if feasible), and released according to the procedures outlined by NMFS; and

e. Sea turtle mortalities shall be disposed of at sea unless an observer requests retention of the carcass for sea turtle research.

Subsequent to the Biological Opinion of October 2000, NMFS completed an "Environmental Assessment for the Interim final Rule to implement the reasonable and prudent alternative in the biological opinion related to the California/Oregon drift gillnet fishery." This analysis examined a new DGN fishery option, proposed by the POCTRT and modified by NMFS, which would allow part of the fishery to remain open off central California (NMFS, 2001). In this modified option, the open season was extended from August 15 to run through November 15. The area of the new closure would start at Point Sur (36° 18.5' N latitude) and continue southwest to 34° 27' N latitude, 123° 35' W longitude, then turn west to 34° 27' N latitude, 129° W longitude. The western limit would then run north to 45° N latitude, 129° W longitude and finally move east along the 45° N parallel until it intercepts the Oregon coast. NMFS made the determination based on lack of observed takes of leatherback sea turtles in the past and new information on their movement which shows they move southwest in a corridor that is outside the area where fishing will take place. The interim rules were published in the Federal Register on August 24, 2001 (50 CFR Parts 223 and 224). Under the terms and conditions of the Incidental Take Statement, the drift gillnet fishery is anticipated to experience the estimated and observed entanglements and/or mortalities under the §101(a)(5)(E) permit as presented in Table 6-1.

Since this last biological opinion, there has been only one observation of a sea turtle take - a loggerhead turtle taken and released alive during the 2001-2002 season.

Table 6-1: Estimates of expected entanglement and mortality of listed species in DGN fishery under regulations of 8/24/01.

Species	Estimated Entanglement	Estimated Mortality	Total Expected Observations[1]
Fin whale	6 in 3 years	6 in 3 years	1
Humpback whale	6 in 3 years	0	1
Sperm whale	6 in 3 years	4 in 3 years	1
Steller sea lion	5 in 3 years	5 in 3 years	1
Green turtle	6 in 3 years	2 in 3 years	1
Leatherback turtle	9 in 3 years	6 in 3 years	1
Loggerhead turtle	5 per El Niño year	2 per El Niño year	1 per El Niño year
Olive ridley turtle	6 in 3 years	2 in 3 years	1

[1]Total expected observations of an entanglement or mortality over the three year permit period.

6.1.2.4 Historic Consultations - Other West Coast HMS Fisheries

The large purse seine fishery for tuna covered under the IATTC Convention was the subject of a consultation following implementation of the International Dolphin Conservation Program Act (IDCPA). The only listed species taken in that fishery are sea turtles (see 6.2.5.2). A consultation for the IDCPA indicated that management of the fisheries under that program would not jeopardize the continued existence of any species.

No other West Coast HMS fisheries have been subject to ESA Section 7 consultations to date. Further, the consultations have focused on sea turtles and short-tailed albatross and not other listed species. The conservation and management measures proposed in this FMP will be subject to consultations before their implementation with respect to all listed species.

It should be noted that management of the longline fishery for tuna and swordfish based in Hawaii has been the subject of several NMFS consultations addressing concerns due to the takes of listed sea turtles and potential interactions with short-tailed albatross (STAL), while other western Pacific HMS fisheries were addressed in the March 29, 2001 opinion covering all western Pacific pelagic fisheries. The latest of the longline fishery consultations (November 2002) concluded that the fishery would not pose jeopardy to any species of sea turtles as a result of conservation actions to prohibit swordfish sets and close a portion of the central Pacific near the equator. In addition, an opinion from the USFWS has addressed concerns about potential impacts of the longline fishery on the listed short-tailed albatross. While the USFWS opinion concluded that the longline fishery would not pose jeopardy for that species, several reasonable and prudent measures were identified to reduce the likelihood of sea bird takes. Together, these opinions have significantly reduced fishing opportunities for the vessels in that fishery and have resulted in increasingly stringent controls on the fishery, including prohibition of the strategy that targets swordfish (rather than tuna) and time and area closures to minimize interactions with sea turtles, as well as requirements for the use of seabird avoidance gear and techniques. This FMP proposes that the same sea turtle protective measures be applied to West Coast-based longline vessels operating west of 150° W longitude to ensure that the controls are applied consistently to all U.S. longline fishing vessels in those waters. On the other hand, the prohibition of swordfish targeting by longline vessels east of 150 ° W longitude would not be applied as there is insufficient evidence that longline fishing in these waters would pose problems with respect to sea turtle takes.

No Section 7 consultation has been conducted relative to the potential impacts of the West Coast longline fishery on sea turtles because there have in the past been no federal actions to regulate that fishery. Permits have been issued under the High Seas Fishing Compliance Act to vessels that longline on the high seas, but those are not conditional permits and are not tied to specific fisheries or gear. Because there is no discretion associated with issuance of these permits, it has been concluded that Section 7 consultation requirements do not apply to that action. Similarly, NMFS has not initiated consultations with the USFWS with respect to potential impacts of longline fishing on short-tailed albatross. Again, there has been no federal action to trigger a consultation under Section 7 of the ESA.

6.1.3 Interactions with Seabirds

Several HMS fisheries have reported or observed interactions with seabirds, some of which are listed under the Migratory Bird Treaty Act (MBTA) and/or the ESA. The MBTA, enacted in 1918, implemented the 1916 convention between the U.S. and Great Britain (for Canada) for the protection of migratory birds. Later amendments implemented treaties between the U. S and Mexico, Japan and the Soviet Union. Specific provisions of the act include federal prohibitions, unless permitted by regulation, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, caused to be shipped, deliver for transportation, transport, cause to be transported, carry, cause to be carried by any means whatever, any migratory bird, included in the terms of the Convention . . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird." (16 U.S.C. 703). The ESA has been described above.

While the area of jurisdiction of the MBTA is currently under review in the U.S., the U.S. has adopted its National Plan of Action-Seabirds (NPOA-S). Although not a law, the NPOA-S constitutes national policy relating to interaction of seabirds with longline fisheries (see below).

6.1.3.1 Species of Concern

Three species of albatross are known to occur within the region: the black-footed albatross (BFAL, *Phoebastria nigripes*), the Laysan albatross (LAAL, *P. immutabilis*) and the STAL (*P. albatrus*). STAL are listed as endangered. According to Cousins and Cooper (2000) and various researchers they cite, the BFAL 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 eastem in its at-sea distribution than the LAAL. The estimated number of BFAL worldwide is approximately 290,000, of which 58,000 pairs (116,000 birds) bred in 2001/2002 (USFWS data, 2002). The conservation status for BFAL under the World Conservation Union (IUCN) criteria for threatened species is 'Vulnerable,' because of an observed 20% or more population decrease over three generations (~45 years). While the LAAL is less common in our region, it is the most abundant albatross Pacific-wide (est.2,200,000 individuals, USFWS data, 2002), being most abundant in the central and westem Pacific (Cousins and Cooper 2000). Numbers of breeding LAAL have decllined over the last five years in the two largest colonies of this species (USFWS data 2002). IUCN status for the LAAL is "Lower Risk-Least Concern." Both the BFAL and LAAL nest principally in the Hawaiian Islands, mate for life, and lay only one egg in a single season. The BFAL occurs off the West Coast primarily from spring through fall but can be found year round; breeding birds begin retuming 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 LAAL also occurs uncommonly off the West Coast year round, primarily in summer during the non-breeding season.

The STAL 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 retum 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% have been made in the last two decades (1983-2000) with 88% occurring from August through 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 1,700 individuals on Toroshima and 200-250 individuals from Minami-Kojima, not including the results of 2002 breeding (K. Rivera, NMFS, Alaska Region, Pers. comm. 2002). In summer (i.e., the non-breeding 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 (USFW 2000). Its current distribution may also be complicated by identification problems. For the untrained observer, even though the STAL is the largest albatross and has an extremely large pink bill, during its various plumage stages it can be confused with BFAL and LAAL (Mitchell and Tristram 1997). The STAL is currently listed as "Endangered" throughout its range under the ESA, now including U.S. waters (FR: July 31,2000 Vol. 65(14) p. 46643-46654). The BFAL and LAAL are not listed under the ESA but they and some other seabirds are protected under the MBTA where it applies.

The brown pelican remains endangered in Califomia, Texas, and Louisiana, as well as outside the U.S. It has been removed from the endangered species list on the U.S. Atlantic and Florida Gulf coasts. The bald eagle occurs along the coast and is listed as threatened. The California least tern and Califomia clapper rail are listed as endangered.

6.1.3.2 Incidental Takes of Seabirds in West Coast HMS Fisheries

The level of incidental catch of seabirds is reasonably well documented for one U.S. West Coast HMS fishery (the drift gillnet fishery) but unknown or poorly understood for other fisheries (e.g., coastal purse seine, troll, Califomia-based high-seas longline). The drift gillnet fishery has had about a 20 percent observer coverage level the past 10 years, and in the past decade, 16 northern fulmar and 4 "unidentified" seabirds have been recorded by observers. Recently, NMFS has received funding for observers to monitor the California-based high seas longline fishery that fishes beyond the EEZ (~40 active vessels in 2000, D. Petersen, pers. comm. NMFS SWR Observer Program). Data collection began in 2001 and expanded in late 2002, but the utility of the results prior to 2003 will not be known until it is clear what portion of fishing effort has been covered and possibly not until after at least a year of coverage. Bird interactions in the HMS recreational fisheries have never been documented, but from anecdotal accounts, most appear to involve pelicans and cormorants that become hooked while chasing hooked bait. These birds reportedly are de-hooked and released alive. The brown pelican remains endangered in California as well as outside the U.S. There are unpublished observer records of two seabird interactions in with the troll albacore fishery. There are no records of takes of any seabirds in purse seine or harpoon fisheries off the West Coast. Comprehensive seabird monitoring and refinement of mitigation measures are therefore recommended for HMS fisheries to ensure complete and accurate information on seabird interactions and the effectiveness of measures to reduce seabird takes. Of primary concern is the potential for seabird interactions with longline fisheries, to which albatrosses, especially younger and more inexperienced birds, are vulnerable (Cousins and Cooper 2000).

6.1.3.3 Interactions and the NPOA-Seabirds

The NPOA-S was prepared to guide U.S. implementation of the International Plan of Action for conservation of seabirds taken in longline fisheries (including bottom and pelagic longline use). The NPOA-S provides an action plan to reduce the incidental catch of seabirds in U.S. longline fisheries, provides national-level policy guidance on reducing the incidental catch of seabirds in U.S. longline fisheries, and requires that NMFS, in cooperation with FWS, assess all U.S. longline fisheries to determine whether a seabird incidental catch problem exists. This NPOA-S further requires NMFS, in cooperation with FWS, to work through the regional fishery management council process in partnership with longline fishery representatives to develop and implement seabird incidental catch mitigation measures in those fisheries that have a seabird incidental catch problem. Such measures should attempt to reduce the incidental catch of seabirds to the maximum extent practicable.

The longline fishery authorized under the HMS FMP has been assessed for the incidental catch of seabirds, and actions are proposed to prevent and reduce the incidental catch of seabirds to the maximum extent practicable. NMFS would be required to increase observer coverage on West Coast longline vessels to obtain more complete and reliable data on the extent of interactions. NMFS has been cooperating with the FWS in Hawaii and will do so on the West Coast as well. The FMP initially proposes that the seabird avoidance requirements applicable to Hawaii-based longline vessels also be applied to West Coast-based longline vessels to minimize the risk of adverse effects on seabirds (and especially STAL) while more information is obtained through the observer program.

6.2 Protected Species Interactions and HMS Fisheries

6.2.1 Drift Gillnet Fishery

6.2.1.1 Marine Mammal Interactions

The drift gillnet fishery for swordfish and sharks has existed off the West Coast since 1977 (Hanan *et al.*, 1993). Beginning in 1980, CDFG started collecting logbooks, a practice which continues to the present. The logs are released to NMFS for analysis. Since 1980, with the exception of a few years, either the CDFG or NMFS has fielded an observer program to record catch, bycatch, and interactions with protected species.

Based on the recommendation of the Pacific Scientific Review Group (a group of non-federal scientists that provide NMFS with advice regarding marine mammal research and population estimates, status and trends), NMFS has determined that with the implementation of the Pacific Offshore Cetacean Take Reduction Plan in 1997, the most representative data to use for estimating marine mammal mortality and serious injury is NMFS observer data since the implementation of the plan (1997 through 2000). The basis for this decision is that cetacean mortality and serious injury have significantly decreased since the plan was implemented in 1997. Therefore, estimated marine mammal mortality and serious injury during the past three years will be used in the discussion.

Table 6-2 shows the estimated mortality of cetaceans and pinnipeds in the California drift gillnet fishery based on observer data. Takes of most species remain below 10% of PBR for the past three years, the period when fishing has been subjected to the requirements of the Pacific Offshore Cetacean Take Reduction Plan. Although the estimated mortality and serious injury of the sperm whale and fin whale are above 10% of PBR, NMFS has determined that the human caused mortality and serious injury from commercial fisheries are negligible and do not pose jeopardy to the species.

The estimated mortality of small cetaceans based on gillnet observer data is found in Table 6-3. Takes of most species remain at or below 4% of PBR for the past three years, the period when fishing has been restricted by recommendations of the POCTRT. Catches of short-finned pilot whales and northern right-whale dolphins are higher at 16% and 35% of PBR, respectively.

Table 6-2 Estimated California Gillnet Cetacean and Pinniped Mortality Summary 1990 Through 2000 Based on NMFS Observed Data

SPECIES	90	91	92	93	94	95	96	97	98	99	00	Avg. 97-00	2000 PBR	% 2000 PBR
WHALES														
Blue whale	0	0	0	0	0	0	0	0	0	0	0	0.0	1.7	0
Fin whale	0	0	0	0	0	0	0	0	0	5	0	1.3	2.1	60
Gray whale	0	0	0	0	0	0	0	0	5	5	0	2.5	490	1
Humpback whale	0	0	0	0	0	0	0	0	0	0	0	0.0	1.7	0
Minke whale	0	0	0	0	0	0	12	0	0	0	0	0.0	4	0
Sei whale	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0
Sperm whale	0	0	7	15	0	0	1	0	5	0	0	1.3	2.0	63
Unid. Whale	0	0	0	7	0	0	0	0	0	0	0	0.0	--	0
Total whales	0	0	7	22	0	0	13	0	10	10	0	5.1		
PINNIPEDS														
Calif. sea lion	46	41	66	82	28	26	36	210	114	30	54	99.8	6591	2
Guadalupe fur seal	0	0	0	0	0	0	0	0	0	0	0	0	104	0
Harbor seal	23	0	0	0	0	0	0	0	0	0	0	0	1678	0
No. Elephant seal	115	132	110	105	123	90	37	45	20	10	26	25.3	2142	1
Steller's sea lion	0	0	7	0	6	0	0	0	0	0	0	0	1368	0
Unid. Sea lion	46	0	0	0	0	0	0	0	0	0	0	0	--	0
Total Pinnipeds	230	173	183	187	157	116	73	246	134	40	80	125		
% observed sets	4.4	9.8	13.6	13.4	17.9	15.6	13.	22.8	17.6	21.0	25.0			

Table 6-3 Estimated California Gillnet Small Cetacean Mortality Summary 1990 Through 2000 Based on NMFS Observed Data

SPECIES	90	91	92	93	94	95	96	97	98	99	00	Avg 97-00	2000 PBR	% 2000 PBR
Baird's beaked whale	0	0	0	0	0	0	0	0	0	0	0	0.0	2	0
Bottlenose dolphin	0	0	22	0	0	0	0	0	0	0	0	0.0	8.5	0
Common dolphin, unid.	92	71	37	30	6	0	0	5	0	2	0	2.3	--	--
Common dolphin, long beak	0	0	15	0	6	39	12	25	0	8	9	10.5	250	4
Common dolphin, short beak	92	376	287	179	140	231	319	101	45	191	75	103	3188	3
Cuvier's beaked whale	0	0	44	22	34	32	0	0	0	0	0	0.0	43	0
Dall porpoise	23	20	7	87	11	6	24	20	0	0	0	5.0	737	1
Killer whale	0	0	0	0	0	8	0	0	0	0	0	0.0	2.1	0
Mesoplodont beaked whale	23	0	29	0	17	0	0	0	0	0	0	0.0	27	0
No. right whale dolphin	0	71	15	52	39	58	27	29	0	17	47	23	97	24
Pacific-white sided dolphin	69	51	22	15	17	6	25	12	0	0	5	4.3	157	3
Risso' dolphin	0	51	37	52	6	39	0	11	0	0	7	4.5	105	4
Short-finned pilot whale	23	0	7	60	0	0	0	6	0	0	0	1.5	5.7	26
Striped dolphin	0	0	0	0	6	0	0	0	0	0	0	0.0	180	0
Pygmy sperm whale	0	0	7	7	0	0	0	0	0	0	0	0.0	28	0
Unid. Beaked whale	0	0	15	0	6	0	0	0	0	0	0	0.0	--	--
Unid. Cetacean	0	10	7	0	0	0	0	0	0	0	0	0.0	--	--
Unid. dolphin	0	0	7	0	0	0	0	0	0	0	0	0.0	--	--
Total small cetaceans	322	650	558	484	288	417	407	209	45	218	143			
% observed sets	4.4	9.8	13.6	13.4	17.9	15.6	13.0	22.8	17.6	21.0	25			

6.2.1.2 Endangered and Threatened Species Interactions

In the 2000 Biological Opinion cited earlier, NMFS addressed the incidental take of marine mammals and sea turtles (Table 6-4) listed under the ESA in the drift gillnet fishery. NMFS found that the take of leatherback and loggerhead turtles incidental to commercial fishing operations by the CA/OR drift gillnet fishery was likely to jeopardize the continued existence of these stocks and developed a reasonable and prudent alternative to mitigate this effect. With the development of the RPA, NMFS issued an incidental take statement that anticipates the level of take under the RPA. This level of take is exempt from the Section 9 ESA take prohibition and NMFS believes will avoid the likelihood of jeopardizing the continued existence of the leatherback and loggerhead sea turtle populations. To this end, NMFS authorized a take of nine leatherbacks in three years and a mortality of six over a three year period. The incidental take statement for loggerheads is not expected to exceed five takes with two mortalities during any given year that there is an El Niño event. For olive ridley and green turtles, NMFS does not anticipate there to be more than six takes, or more than two mortalities, in three years.

Table 6-4 Estimated California Total Drift Gillnet Sea Turtle Mortality Summary 1990 Through 2000 Based on NMFS Observed Data

SPECIES	90	91	92	93	94	95	96	97	98	99	00
Loggerhead turtle	0	0	7	0	0	0	0	6	5	0	0
Leatherback turtle	23	0	15	15	0	26	24	7	0	0	0
Green turtle	0	0	0	0	0	0	0	0	0	5	0
Unid. turtle	0	0	0	7	0	0	0	0	0	0	0
% observed sets	4.4	9.8	13.6	13.4	17.9	15.6	13.0	22.8	17.6	21.0	25

There have been no observed salmon species or cutthroat trout captured by the CA/OR drift gillnet fishery based on NMFS data collected from July 1990 through January 2001.

There have been no recorded or reported interactions between the drift gillnet fishery and southern sea otters.

Information on the incidental mortality and serious injury of marine mammal stocks that are listed under the ESA was presented in the above section under marine mammal interactions.

6.2.1.3 Seabird Interactions

Observer data from the drift gillnet fishery showed few interactions with seabirds. The California-Oregon drift gillnet fishery for swordfish and shark has had ~20% observer coverage since 1990, and since then, 16 northern fulmar and 4 'unidentified seabird' takes have been recorded by observers (NMFS Observer data). From 1990 through 2000, the estimated mortality was 42. There was an estimated mortality of 23 unidentified seabirds in 1990, 6 unidentified seabirds in 1994, and 13 northern fulmars in 2000. From 1995 to 1999, there was no seabird mortality. There are no records or observations of nor any evidence to suggest there would be any interactions between drift gillnet gear and short-tailed albatross, bald eagles, California least tern, western snowy plover, marbled murrelet, or California clapper rail.

6.2.2 Surface Hook & Line Fishery (troll and live bait)

6.2.2.1 Marine Mammal Interactions

The surface hook-and-line fishery targets albacore primarily in the eastern and central Pacific ocean. Little data are available on marine mammal interactions in the fishery. What is available comes from either logbooks or an extremely limited observer program run by NMFS (27 trips in 8 years). Since observers were not required to collect interaction data, and the observer program was not conducted in a systematic fashion, a complete analysis of interactions is not possible. Logbooks show no interactions with marine mammals, and the observer data have yet to be analyzed (Norm Bartoo, NMFS-La Jolla, personnel communications).

There are no observer data or logbook data for live-bait boats fishing for albacore off the West Coast, so the extent, if any, of marine mammal interactions is unknown. Most fishing occurs many miles from shore, so the likelihood of interactions with pinnipeds is low.

6.2.2.2 Endangered Species Interactions

The drift gillnet 2000 Biological Opinion states that anecdotal information indicates there are rare occurrences of sea turtle take in the U.S. albacore fishery (NMFS, 2000). However, it is not possible to determine if any turtles were killed or seriously injured based on available data.

Because of the nature of the live-bait fishery, there should be no interactions with turtles when fishing. There is the possibility, however remote, of capturing a sea turtle alive while catching bait. If a sea turtle were taken while catching bait, it could be easily released.

The extent of salmon interactions is unknown because the fishery is not observed in a scientifically designed observer program. However, albacore troll fishing technique and strategy differ from those used in trolling for salmon. While troll albacore vessels often carry both gears, and operators may shift strategy from albacore to salmon, or from salmon to albacore, depending on the availability of the different species in the area being fished, the likelihood of taking a listed salmon when targeting albacore is very low.

In 1997, one humpback whale was snagged by a central California troller (though this injury was not considered serious).

6.2.2.3 Seabird Interactions

This HMS fishery is not regularly observed. Incidental takes of 'albatrosses, unid.' are known to occur in the albacore troll fishery but appear to be infrequent (Cousins and Cooper 2000 citing Bartoo). The extent of seabird interactions is unknown because observer placements on vessels in the fishery have been very rare and observers were not directed to record interactions. There are no records or observations of nor any evidence to suggest there would be any interactions between troll gear and short-tailed albatross, bald eagles, California least tern, western snowy plover, marbled murrelet, or California clapper rail.

6.2.3 Pelagic Longline Fishery

6.2.3.1 Marine Mammal Interactions

Vessels fishing in the far offshore longline fishery (outside the EEZ) were required to submit logs to the States of California and Oregon until 2000. Beginning in 2000, NMFS high-seas logbooks were required. Between August 1995 through December 1999, data were collected from 33 different vessels that fished a total of 2,090 days and set 7,071,745 hooks. Some of the vessels began and ended their fishing trips in California. However, some of the vessels began their trips in Hawaii and ended in California. The data are preliminary and have not been edited. Only two interactions with marine mammals were noted; one monk seal and one unidentified sea lion were reported released.

6.2.3.2 Endangered Species Interactions

In the past year, substantial information has been obtained and analyzed concerning the rates and levels of sea turtle interactions in the waters fished by West Coast-based longline vessels. This includes data extracted from the data base of observations made by observers placed on vessels in Hawaii that fished in the eastern Pacific (i.e., east of 150° W longitude) and data collected by observers placed on vessels in California and that fished east of 150° W longitude. These data, which were presented to the Council by NMFS in March and June 2003, are discussed in detail in Section 9.2.5.2.2 and associated tables. They demonstrate that there is little difference in interaction rates with leatherback and loggerhead sea turtles west and east of 150° W longitude, though there does appear to be a decrease in interaction rates with loggerhead turtles as fishing occurs closer to the West Coast. It is estimated by NMFS that, if fishing effort remains at the 1.55 million hook level estimated for 2002, and all fishing occurred east of 150° W longitude, the longline fishery would take approximately 174 loggerhead and 53 leatherback turtles per year. It is possible that annual loggerhead takes would be lower if fishing were restricted to waters closer to the West Coast, but it appears that leatherback takes would be the same, assuming that effort relocated to waters in which swordfish targeting was permitted and remained at the 1.55 million hook level. The Council is aware that there may be a need for additional conservation and management measures to protect sea turtles but needs further guidance from NMFS before being able to consider and recommend such measures. It is noted that NMFS will conduct a Section 7 consultation under the ESA which may propose reasonable and prudent alternatives to ensure that the fishery does not jeopardize the continued existence of any sea turtle populations. If provided with such information, the Council will act accordingly.

There have been no reports of takes of short-tailed albatross but seabird conservation measures are recommended for consistency with the NPOA.

There have been no reports of interactions with any other listed seabirds by the longline fishery nor is there reason to expect that there would be any such interactions as the fishery would only be pursued beyond the EEZ and out of the range of the other listed seabirds.

There are no reported takes of salmonid species by these vessels.

There have been no reported takes of listed marine mammals by these vessels.

6.2.3.3 Seabird Interactions

Albatross interactions are moderately frequent based on the California observer data referenced above. On 13 observed trips, a total of 62 albatross were recorded as being taken; 58 were black-footed albatross and 4 were Laysan albatross. No short-tailed albatross were observed.

As noted above and discussed in Section 6.3.2 below, this FMP proposes a variety of measures to minimize the risk of adverse impacts on seabirds such as albatross.

There are no records or observations of, nor any evidence to suggest there would be any interactions between longline gear and short-tailed albatross, bald eagles, California least tern, western snowy plover, marbled murrelet, or California clapper rail.

6.2.4 Harpoon Fishery

6.2.4.1 Marine Mammal Interactions

Because of the deliberate nature of the harpoon fishery, there are few interactions with marine mammals. As stated in Section 5.3.4, there may be minimal interactions with sea lions if they are depredating harpooned fish before retrieval.

6.2.4.2 Endangered Species Interactions

There are no records or observations of interactions with any endangered species.

6.2.4.3 Seabird Interactions

There are no records or observations of nor any evidence to suggest there would be any interactions between harpoon gear and short-tailed albatross, bald eagles, California least tern, western snowy plover, marbled murrelet, or California clapper rail.

6.2.5 Large Vessel Tuna Purse Seine Fishery (>400 short tons)

6.2.5.1 Marine Mammal Interactions

Large vessels fishing for tuna in the EPO under jurisdiction of the Inter-American Tropical Pacific Tuna Commission (IATTC) are governed by the International Dolphin Conservation Program (NMFS, 1999). The overall dolphin mortality limit set for the fleet for 1998 was 6,500 animals. Observer data from 1998 showed total dolphin mortality caused by the fishery to be 1,877 animals (IATTC, 2000). No other marine mammal interactions were noted by observers.

6.2.5.2 Endangered Species Interactions

Observer data from IATTC for the period 1994 through 1996 showed that 2,015 olive ridley turtles were encountered in purse seine sets, of which 75% were encountered in sets on floating objects, 12% on free-swimming schools of tuna, and 13% in dolphin sets (IATTC, 2000). Similar data for green turtles shows that 943 were encountered in purse seine sets, of which 47% were in sets on floating objects, 50% in free-swimming schools of tuna, and 3% in dolphin sets. Lesser numbers of loggerhead (86), hawksbill (32) and leatherbacks (10) were also encountered; nearly all of these were released in good condition.

The recent Biological Opinion on drift gillnets examined the estimated mortality of sea turtles captured in the EPO large vessel purse seine fishery for the period 1993 through 1997 (NMFS, 2000) . The yearly average mortality for the period was: olive ridley (143), green/black (21), loggerhead (5), and leatherback (0).

6.2.5.3 Seabird Interactions

There are no records or observer data documenting large purse seine vessels' interactions with any species of seabird in the EPO. Brown pelicans and other species may dive into fish concentrated within or in the vicinity of purse seines in pursuit of bait fish, but there are no documented entanglements leading to injury or death. There are no records or observations of nor any evidence to suggest there would be any interactions between large scale purse seine gear and short-tailed albatross, bald eagles, California least tern, western snowy plover, marbled murrelet, or California clapper rail.

6.2.6 Coastal Purse Seine Fishery (<400 short tons)

6.2.6.1 Marine Mammal Interactions

No observer data or other records are available indicating interactions with marine mammals in the small-vessel purse seine tuna fishery. There are records indicating occasional interactions with small purse seine vessels when fishing for coastal pelagic species such as Pacific mackerel and sardine. However, neither the IATTC nor NMFS places observers on these vessels when fishing for tuna, though NMFS hopes to begin doing so in 2003 or early 2004.

6.2.6.2 Endangered Species Interactions

Since the IATTC does not observe vessels with carrying capacity of less than 400 tons, no observer data are available about interactions with turtles in the fishery. Because there were documented interactions with turtles in the purse seine fishery for larger vessels, the same is probably true for small vessels. The interactions are probably with turtles found more in temperate waters (loggerheads, hawksbill, and leatherbacks) than those found in tropical waters (olive ridley and green). In its Biological Opinion for the IDCPA, NMFS stated the capture of a turtle by the small vessel fleet would be a rare event.

There are no records indicating the occurrence or risk of taking of any listed salmon by small coastal purse seine vessels fishing for tuna.

6.2.6.3 Seabird Interactions

Neither IATTC nor NMFS has placed observers on small purse seine vessels with carrying capacity of less than 400 tons; therefore, there are no observer data available about interactions with seabirds in the small tuna purse seine fishery. However, there is no reason to expect interactions at a different rate than those by large purse seine vessels. Since large purse seine vessels > 400 short tons (with IATTC observer coverage) have no documented bird interactions, the same is probably true for smaller vessels, although documentation is needed. There have been occasional interactions with seabirds when small purse seine vessels set on coastal pelagic species such as Pacific mackerel and sardine.

There are no records or observations of nor any evidence to suggest there would be any interactions between small scale purse seine gear and short-tailed albatross, bald eagles, California least tern, western snowy plover, marbled murrelet, or California clapper rail.

6.2.7 Party/Charter Boat Fishery

6.2.7.1 Marine Mammal Interactions

The party/charter boat fleet fishing offshore (> 25 miles from land) for HMS has few interactions with marine mammals. The majority occur when they have stopped to fish and are actively chumming. At this time, California sea lions may be attracted to the vessel and actively eat the chum or attempt to eat fish that have been hooked by anglers. No independent observer data are available for this fishery. CDFG does collect logbook data on number of fish lost to sea lions but the data have never been analyzed.

Party/charter vessels working off southern California occasionally fish in the vicinity of dolphins or large whales. Tuna are often found in association with these animals. The interactions are limited to moving/fishing alongside the animals, behind the animals or stopping the vessel in front of the animals and attempting to chum the school of fish away from animals and toward the boat.

6.2.7.2 Endangered Species Interactions

There are no known interactions between party/charter vessels and turtles. Most party/charter vessels fishing off the West Coast operate in areas where turtles are seldom encountered, though some travel extensive distances in pursuit of tuna and other HMS.

6.2.7.3 Seabird Interactions

Party/Charter vessels fishing with live bait may interact with brown pelicans, cormorants, seagulls, shearwaters and petrels. These interactions take place when the vessels are actively chumming to attract tuna or other HMS species to the boat. Some birds may be hooked, but crew members quickly release the animals. Due to the lack of observer data, neither the number of interactions nor the survival rate is known.

There are no records or observations of nor any evidence to suggest there would be any interactions between charter boat fishing gear and short-tailed albatross, bald eagles, California least tern, western snowy plover, marbled murrelet, or California clapper rail.

6.2.8 Private Recreational Boat Fishery

6.2.8.1 Marine Mammal Interactions

Presumably the same interactions that take place on party/charter boats take place on private vessels, but to a lesser extent since private vessels do not have the live bait carrying capacity of party/charter boats.

6.2.8.2 Endangered Species Interactions

There is no reason to expect different types of interactions with listed species on private boats than on party/charter boats, but they would likely occur even less frequently because many if not most private vessels do not have the live bait carrying capacity of party/charter boats.

6.2.8.3 Seabird Interactions

Presumably the same interactions that take place on party/charter boats take place on private vessels, but likely to a lesser extent as noted above because private vessels do not have the live bait carrying capacity of party/charter boats. Bird interactions in the HMS recreational fisheries have never been documented, but from anecdotal accounts, most appear to involve pelicans, gulls, and cormorants that become hooked while chasing baited hooks. Most are reportedly de-hooked and released alive. There are no records or observations of nor any evidence to suggest there would be any interactions between private boat recreational fishing gear and short-tailed albatross, bald eagles, California least tern, western snowy plover, marbled murrelet, or California clapper rail.

6.3 Initial Measures to Address Protected Species Concerns

This FMP proposes that the following initial measures be implemented to ensure that the fisheries as operating under the FMP will not have adverse impacts on any protected species.

6.3.1 Drift Gillnet Fishery

Section 8.5.1 provides specific information about the initial conservation and management measures that would be continued under Magnuson-Stevens Act authority under this FMP. A summary follows:

Take Reduction Team (POCTRT) measures to protect marine mammals would be continued:

- Acoustic deterrent devices (pingers) are required on drift gillnets to deter entanglement of marine mammals.
- All drift gillnets must be fished at minimum depth below the surface of 6 fm (10.9 m).
- Skipper workshops are required.
- Vessels must provide accommodations for observers when assigned.

The Federal Turtle Conservation Closed Areas under the drift gillnet fishery management regulations would be maintained:

- Drift gillnet fishing may not be conducted:
  - In the portion of the EEZ bounded by a line south from Point Sur (36° 18.5' N latitude) to 34° 27' N latitude along the 123° 35' W meridian; then west to 129° W longitude; then north to 45° N latitude;

then east to the point where the 45° N parallel meets land from August 15 to November 15 through year 2003 (see map, Chapter 9, Figure 9-1);

- In the portion of the EEZ south of Point Conception, California (34° 27' N latitude) and west to 120° W longitude from August 15 to August 31 and again from January 1 through January 31 during a forecasted or occurring El Niño, as announced by NMFS[1].

Mainland area and Channel Islands (California) closures would also be maintained in which drift gillnets cannot be used. These are listed in Section 8.5.1.

In addition, NMFS would be required to maintain observer coverage of this sector at statistically reliable levels.

6.3.2 Longline Fishing

Longline fishing inside the EEZ would be prohibited. Beyond the EEZ, all conservation and management measures that apply to Hawaii-based longline vessels to control sea turtle and seabird interactions and to monitor the fishery would also apply to West Coast-based longline vessels west of 150° W longitude. These are as follows:

1. Line clippers, dip nets, and bolt cutters meeting NMFS' specifications must be carried aboard each vessel for releasing turtles (specifications vary by vessel size);
2. A vessel may not use longline gear to fish for or target swordfish (*Xiphias gladius*) north of the equator (0° latitude); landing or possession of more than 10 swordfish per trip is prohibited.
3. The length of each float line possessed and used to suspend the main longline beneath a float must be longer than 20 m (65.6 ft or 10.9 fm).
4. From April 1 through May 31, a vessel may not use longline gear in waters bounded by 0° latitude and 15° N latitude, and 145° W longitude and 180° W longitude;
5. No light stick (any light emitting device for attaching underwater to the longline gear) may be possessed on board a vessel;
6. When a longline is deployed, no fewer than 15 branch lines may be set between any two floats (10 branch lines if using basket gear);
7. Longline gear must be deployed such that the deepest point of the main longline between any two floats, i.e., the deepest point in each sag of the main line, is at a depth greater than 100 m (328.1 ft or 54.6 fm) below the sea surface;
8. While fishing for management unit species north of 23°N lat, a vessel must:

- 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;
- Use completely thawed bait to fish for Pacific pelagic management unit species;
- Use only bait that is dyed blue of an intensity level specified by a color quality control card issued by NMFS;
- Retain sufficient quantities of offal for the purpose of discharging the offal strategically in an appropriate manner;
- Remove all hooks from offal prior to discharging the offal;
- Discharge fish, fish parts (i.e., offal), 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;
- Use a line-setting machine or line-shooter to set the main longline (unless using basket gear);
- Attach a weight of at least 45 g to each branch line within 1 m of the hook; and

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[1]As of June 2003, a rule to modify the El Niño closure is being finalized. It proposes instead to prohibit fishing during the months of June, July, and August, which NMFS has concluded offers more protection for loggerheads while having less impact on the fishery than a closure in January and August.

- 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.

9. Other required measures include the proper release and handling of turtles and seabirds, the requirement for vessel operators to attend a protected species workshop each year, and the requirement for Vessel Monitoring Systems (VMS). VMS is required to facilitate enforcement of the area-specific regulations proposed.

Measures 1, 4, 8, and 9 would apply in all waters; measures 2, 3, 5, 6 and 7 in the list above would apply only to fishing west of 150° W longitude. hus, longline fishing directed at the capture of swordfish would be permitted on the high seas west of the EEZ and east of 150° W longitude.

6.3.3 Coastal Purse Seine

The FMP would allow purse seine fishing in all portions of the EEZ. With few data to suggest any potential harmful bycatch or gear conflicts, this action would provide additional opportunity for purse seiners to fish for bluefin tuna in those years when they travel in fishable schools off Oregon and Washington, and could raise a potential for purse seining for albacore in the northwest portion of the EEZ.

Purse seine fishers targeting HMS from any state could fish anywhere in the EEZ, although there has been little interest in such fishing off Oregon and Washington.

6.3.4 Recreational Fishing

The FMP would require all commercial and recreational party/charter (CPFV) recreational fishing vessels to maintain and submit to NMFS logbook records of catch and effort statistics for all waters fished. The FMP also authorizes adjustment of reporting requirements under a framework process.

6.3.5 Other Fisheries

No immediate conservation and management measures are proposed for other fisheries. However, all HMS fishing vessel operators would be required to maintain and submit logbooks of fishing effort and catch and disposition of catch as well as interactions with protected species. All vessels also would be subject to the potential for carrying observers to document protected species interactions. The framework provisions of the FMP would be used to address new protected species concerns as they are identified. Both through the SAFE Report and through special reports from interested parties (which could include the USFWS or environmental organizations), the Council would be advised of the new concerns; would direct the plan team or others to investigate and recommend action; would determine if action is needed and, if it is viewed as a matter of substantial concern, would direct the completion of necessary documents to analyze the issues and evaluate alternatives; and would submit recommendations for corrective action to NMFS for consideration. If there were agreement, the regulatory actions would be implemented by NMFS.

See Chapter 8 for more detailed discussion of alternatives and Chapter 9 for analysis of the impacts of these proposed measures and alternatives.

6.4 Literature Cited

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Chapter 7
CURRENT MANAGEMENT

7.0 CURRENT MANAGEMENT

This chapter summarizes current state and federal fishery regulations and monitoring programs for West Coast HMS fisheries.

7.1 Summary of State Regulations

The following is a summary of the current state HMS fishery regulations for Washington, Oregon, and California. A more detailed comparison of state regulations is contained in Appendix B.

7.1.1 Recreational Fishery

Licenses

Currently, a recreational fishing license is not required to fish for albacore tuna off Washington; however, a recreational fishing license is required in Oregon and California. In addition, California requires an "ocean fishing enhancement stamp" south of Point Arguello. Changes in licenses require state legislative action.

Seasons

Fishing is open year-round coastwide with minor exceptions in specific areas off Oregon (i.e., Pyramid Rock, Three Arch Rocks, Whale Cove) and off California. California has several marine reserves and preserves, some of which prohibit fishing; as such, these areas may be closed to bluefin tuna and thresher shark harvest. Changes to season structure require action by each state's respective Fish and Wildlife Commission.

Daily Bag Limit

Washington does not have a daily bag limit for HMS species; Oregon has a daily bag limit of 25 fish in aggregate. California has a 20 finfish bag limit with no more than 10 fish of any one species. In addition, the following sub-limits apply in California within the 20 fish aggregate limit:

- marlin - 1
- swordfish - 2
- blue shark - 2
- shortfin mako shark - 2
- sixgill shark - 1
- sevengill shark - 1
- thresher shark - 2

There are no limits on albacore, bluefin and skipjack tuna in California. Changes to daily bag limits require action by each state's respective Fish and Wildlife Commission.

Possession Limit

There is no possession limit in Washington (since there is no daily bag limit). The possession limit in Oregon is two daily bag limits and the possession limit in California is up to three daily bag limits, depending on the duration of the trip and filing of a multi-day declaration. Changes to possession limits require action by each state's respective Fish and Wildlife Commission.

Minimum Size Limit

There are no minimum size limits for HMS fisheries coastwide. Changes to minimum size limits require the action of each state's respective Fish and Wildlife Commission.

Fishing Gear

HMS recreational fishing gear is comparable coastwide, with troll and hook-and-line gears used in each state. "Mousetrap gear" is specifically prohibited in California. Changes to legal fishing gears require the action of each state's respective Fish and Wildlife Commission.

Prohibited Species

The taking of white sharks and basking sharks is prohibited in California. Prohibiting species requires action by each state's respective Fish and Wildlife Commission.

Logbook Program for Charter Boats

California has a mandatory logbook requirement for charter boats, and Washington recently initiated a voluntary logbook program.

7.1.2 Commercial Fishery

Licenses

Currently, in Washington a salmon troll fishing license or a non-salmon delivery permit is required to deliver HMS into Washington. A Washington fishing license is not required to fish for albacore tuna.

In Oregon, a commercial fishing license is required to fish for or land HMS into Oregon (Oregon also has an albacore tuna landing license which may be used in lieu of a commercial fishing license when landing only albacore tuna).

In Califomia, a commercial fishing license is required to fish for or land HMS into Califomia. In addition, the following permits are also required in California:

- Permit to land Califomia-caught fish at points outside Califomia
- Permit for sharks or swordfish using drift gillnets (limited entry license) and a gillnet/ trammel net permit
- Permit to fish for swordfish (harpoon)

Changes in licenses require state legislative action.

Seasons

HMS fishing seasons are open year-round in all three states with a few exceptions in Califomia: California does not allow commercial fishing for marlin; and the drift gillnet season is from May-August 14 offshore (outside 75 miles) and August 15-January 31 inshore (to within 3 miles, where designated). Changes to season structure requires the action of each state's respective fish and wildlife commission or legislature.

Fishing Gear

All three states allow the use of troll gear, or hook-and-line gear. Washington and California prohibit the use of drift longlines.

In Washington, the use of gillnets in Pacific Ocean waters is prohibited; sharks may be caught with otter trawl, beam trawl, set lines, bottomfish pots, commercial jig, and troll lines. It is unlawful to use bottomfish trawl gear in state waters (0-3 miles).

In Oregon, legal gears are handline, pole and line, longline, seines, and spears. It is unlawful to use gillnets for thresher shark.

In Califomia, legal gears are gill nets, drift gill nets, and trammel nets, purse seine, and harpoon; set lines are legal in Districts 6, 7, 10, 17, 18, and 19; set lines cannot be used for shortfin mako, thresher, swordfish, or marlin.

Species-Specific Regulations Including Prohibited Species

Oregon prohibits the use of gillnets to take thresher shark; however, incidental catches of thresher shark taken in the swordfish gillnet fishery is permitted.

Califomia prohibits the taking of white shark and basking shark in its commercial fisheries; bluefin tuna weighing less than 7 ½ pounds cannot be canned; the sale of marlin is prohibited; and incidental catches of swordfish or marlin by gillnet or trammel net must be delivered to CDFG.

Wastage and Shark Finning

It is unlawful to waste or destroy food fish in all three states. Califomia specifically prohibits the landing or possession of "any shark fin or shark tail or portion thereof that has been removed from the carcass," except for thresher shark.

Washington indirectly prohibits shark finning by WAC 220-20-010 which states that it is "unlawful to take, fish for, possess or transport for any purpose food fish, shellfish or parts thereof, in or from any waters or land over which the state of Washington has jurisdiction, or from the waters of the Pacific Ocean...."

Oregon indirectly prohibits shark finning by OAR 635-006-0210 which states that fishing receiving tickets need to include the pounds of each species received; pounds are to be determined by taking the actual round weights of the fish unless a conversion from dressed weight has been established in the OARs.

7.1.3 Far Offshore Fishery

All three states have regulations for far offshore fisheries which are similar. Washington's far offshore regulations pertain to bottomfish only, which includes sharks. Oregon's far offshore regulations also pertain to bottomfish and have a specific exception for albacore and swordfish. California's far offshore regulations pertain to all fish, but the State is in the process of revising legislation to provide an exemption for the albacore troll fishery.

7.1.4 Experimental, Emerging, or Developmental Fisheries

Currently, all three states have regulations pertaining to experimental, emerging, or developmental fisheries.

In Washington, an experimental fishery cannot be conducted on a species managed under a federal FMP; however, trial commercial fisheries can be conducted on federally managed species, but the number of participants cannot be limited.

In Oregon, a developmental fishery can be conducted on a species managed under a federal FMP and the number of participants can be limited.

In California, an emerging fishery cannot be conducted for a fishery with a federal FMP in which the catch is limited within a designated time period.

Changes to experimental fishery regulations require action by each state's respective Fish and Wildlife Commission.

7.2 Summary of Federal Legislation/Regulations

7.2.1 High Seas Fishing Compliance Act (HSFCA)

This statute requires that any U.S. vessel fishing on the high seas:

- obtain a permit (valid for five years) from the NMFS; and
- maintain and submit gear-specific logbooks detailing catch and effort on the high seas using forms provided under the program, unless the vessel is already reporting on its fishing under other regulations (e.g., regulations implementing a FMP).

7.2.2 Marine Mammal Protection Act (MMPA)

For a more complete description of the requirements of the MMPA and the interactions of HMS fisheries with marine mammals, refer to Chapter 6 of this FMP.

Pacific Coastal Fisheries

The MMPA generally provides protection for marine mammals that (among other things) may interact with fisheries. Vessel operators must obtain certificates of inclusion that authorize "takes" of marine mammals during their fishing operations. In response to interactions with the drift gillnet fishery, a Pacific Offshore Cetacean Take Reduction Plan has been developed and implemented through federal regulations that require the following of U.S. drift gillnet vessels operating in waters seaward of the coast of California or Oregon, including adjacent high seas waters:

- extenders of at least six fm be used on all sets (lower the net in the water at least six fm);
- pingers (acoustic deterrent devices) be used on all vessels during every set, with specific performance standards for the pingers and with specific configuration requirements on the net; and
- skippers (after notification by NMFS) attend an educational workshop held by NMFS before commencing fishing each season (defined as May 1 through January 31 of the following year).

In addition, NMFS has implemented an observer program for the drift gillnet fishery since 1990.

Eastern Pacific Purse Seine Fisheries

The MMPA also requires that operators of purse seine vessels greater than 400 short tons (363 mt) carrying capacity operating in the IATTC area must:

- obtain a General Permit that authorizes the take of marine mammals in the area, even if they do not intentionally set on marine mammals;
- carry an observer on all trips; and
- comply with a number of gear and procedural requirements if setting on dolphin to catch tuna or if marine mammals are accidentally taken in a set that was not made on dolphin.

Operators of vessels smaller than 400 short tons carrying capacity must report any incidental takes of marine mammals in their fishing operations.

7.2.3 Pacific Tuna Fisheries (50 CFR Part 300 Subpart C)

The regulations in this subpart implement the Tuna Conventions Act of 1950 (as well as the Atlantic Tunas Convention Act of 1975). The regulations provide a mechanism to carry out the recommendations of the Inter-American Tropical Tuna Commission (IATTC) for the conservation and management of highly migratory fish resources in the Eastern Tropical Pacific Ocean so far as they affect vessels and persons subject to the jurisdiction of the United States. In 1999, NMFS promulgated new regulations establishing the procedure for carrying out these recommendations in the U.S.

The only continuing requirement for U.S. vessel operators under these regulations is the requirement to maintain logbooks of catch and effort covering their fishing in the Commission Yellowfin Tuna Regulatory area, which is generally described as 40° N latitude to 150° W longitude to 40° S latitude. The rules provide that the vessel operator has met the NMFS regulatory requirements if he/she maintains the IATTC logbook and submits the logbook to the IATTC. The IATTC also has an arrangement with the CDFG whereby the IATTC can determine vessels that landed tuna in California (which means the tuna presumably was taken in the eastern Pacific) and then contact the vessel operator/owner to ensure that logbook records are made available to IATTC.

Each year the IATTC may make management recommendations (e.g., a quota on yellowfin tuna), with associated measures (e.g., area closures or gear restrictions) to carry out those recommendations. After approval of the IATTC recommendation by the U.S. Department of State (DOS), the NMFS Southwest Region (in consultation with DOS) determines the best way to implement the recommendations. Generally, the Regional Administrator may implement the measures by direct notice to the U.S. fleet, with a follow-up notice in the Federal Register as soon as practicable thereafter. If there is a substantially new measure (e.g., a fleet capacity limit), a notice-and-comment rule-making may be required. To date, quotas have been set for yellowfin tuna (for many years) and bigeye tuna (since 1998), and implementing measures have included landing restrictions, area closures, and closure of the fishery on floating objects. In March 2001, NMFS published proposed rules to reduce bycatch in the purse seine fishery and to establish a regional vessel register.

7.2.4 South Pacific Tuna Fisheries (50 CFR 300 Subpart D))

The regulations in this Subpart implement the South Pacific Tuna Act of 1988 and the South Pacific Tuna Treaty and apply to persons and vessels subject to the jurisdiction of the United States. The regulations require licenses, reporting, and vessel/gear identification. Vessels must comply with all of the applicable national laws.

7.2.5 Magnuson-Stevens Fishery Conservation and Management Act

Under the MSFCMA, regulations affecting U.S. HMS fisheries in the Pacific area are implemented pursuant to FMPs developed by regional fishery management councils. If adopted and implemented, this FMP and its implementing regulations will affect U.S. West Coast-based fisheries for HMS.

In December 2000, the MSFCMA was amended to prohibit "finning" of sharks. Under this legislation, "shark-finning" means the taking of a shark, removing the fin or fins (whether or not including the tail), and returning the remainder of the shark to the sea. Regulations implementing the legislation are found at 50 CFR 600 Subpart M. It is a rebuttable presumption that shark fins found on board, or landed by, a fishing vessel were taken, held, or landed in violation of the regulations if the total weight of the shark fins on board, or landed, exceeds 5 percent of the total dressed weight of shark carcasses on board or offloaded from the fishing vessel.

Section 305(a) of the MSFCMA requires the Secretary of Commerce to publish a list of authorized fisheries under the authority of each council and all fishing gear used in such fisheries in the EEZ. A fish may be retained only if it is taken within a listed fishery, is taken with a gear authorized for that fishery, and is taken in conformance with all other applicable regulations. The current list was effective December 1, 1999. After that date, an individual fisherman may notify the appropriate council of the intent to use a gear or participate in a fishery not already on the list. Ninety days after such notification, the individual may use the gear or participate in that fishery unless regulatory action is taken to prohibit the use of the gear or participate in the fishery. The list includes the following HMS gears/fisheries:

Thresher shark and swordfish drift gillnet fishery/ gillnet
Shark and bonito longline and setline fishery/ longline
Pacific albacore and other tuna hook-and-line fishery/ hook and line
Pacific swordfish harpoon fishery/ harpoon
Pacific yellowfin, skipjack tuna purse seine fishery/ purse seine
Recreational fishery/ spear, trap, handline, pot, hook and line, rod and reel, hand harvest
Commercial fishery/ trawl, gillnet, hook and line, longline, handline, rod and reel, bandit gear, cast net, spear

There is a Western Pacific Regional Fishery Management Council FMP for Pelagic Fisheries of the Western Pacific Region, with regulations at 50 CFR Part 660 (see section 1.5.5 for a summary of the FMP). The longline fisheries in the western Pacific are subject to permit and logbook reporting requirements, and there are only minor differences between this logbook and the one required under the HSFCA. In addition, the Hawaii-based longline fishery is subject to a variety of other management measures, including limited entry permits, observer coverage, vessel monitoring system equipment, area closures that vary in size by season, a maximum vessel size limit (101 feet length overall), and the use of techniques to minimize seabird interactions with longline gear. Recent U.S. District Court decisions have resulted in large area closures and the use of line clippers and special handling procedures to minimize harm to sea turtles caught on longline hooks or entangled in longline gear.

7.2.6 Endangered Species Act

Refer to Chapter 6 of this FMP for information on the ESA as it affects HMS fisheries.

7.3 International Management

Currently there are no federal regulations implementing the U.S./Canada Albacore Treaty, although the potential exists for regulations in the future.

7.4 Tribal Management

The four treaty Indian tribes (Makah, Quileute, Hoh, and Quinault) that NMFS recognizes as having usual and accustomed fishing grounds in the EEZ do not currently have any tribal regulations regulating treaty fishing for HMS by tribal members.

7.5 Monitoring and Data Collection Programs

The States of California, Oregon, and Washington and the National Marine Fisheries Service, as well as other agencies and organizations, currently have monitoring and/or data collection programs in place for HMS fisheries.

7.5.1 Federal Programs

7.5.1.1 High Seas Fishing Compliance Act (HSFCA)

Under the HSFCA, NMFS has implemented regulations requiring U.S. vessels operating on the high seas to maintain and submit records of catch and effort on their high seas fishing. The reporting requirement would be met if a vessel is reporting in compliance with regulations under another federal statute (e.g., Magnuson-Stevens Act). Thus, longline vessels operating outside the EEZ, but based on the west coast, must maintain and file the new federal logbook, and West Coast trollers must maintain and file a troll logbook. NMFS provides the required forms or logbooks. It should be noted that fishers are not required to report catch and effort within the EEZ under this requirement, although NMFS has asked that all activity be recorded and reported.

7.5.1.2 Marine Mammal Protection Act (MMPA) Reporting Requirements

Under the MMPA, any U.S. vessel must report any interactions with marine mammals. Of the HMS fishing sectors, the drift gillnet fleet is the most likely to be faced with this requirement. It should be noted that the NMFS Southwest Region has maintained an observer program that has covered about 20% of all drift gillnet effort for several years. This greatly supplements the data available from fisher's reports and landing receipts.

7.5.1.3 Monitoring the Canned Tuna Industry

The NMFS Southwest Region has maintained an extensive data collection program for the U.S. canned tuna industry for several years. Data are available on total U.S. consumption of canned tuna products; U.S. production by product type and source; and the sources of raw product by species. Imports of canned tuna are closely monitored as a result of a tariff program under which tariffs rise when imports reach specified levels.

7.5.1.4 Reporting Under Pacific Tuna Arrangements

Under regulations implementing the Tuna Conventions Act (which is the implementing statute for the IATTC Convention), U.S. purse seine and baitboat vessels fishing for tuna in the eastern Pacific are required to maintain and make available to the U.S. logbooks of catch and effort. This requirement is met if the vessel maintains and submits to IATTC a logbook that the IATTC provides. IATTC receives similar data from all member nations (and some non-members) whose vessels fish for tuna in the IATTC area of competency. The IATTC also has a port monitoring program to collect samples and data at ports, and has an observer program to ensure accurate records of interactions with dolphins and mortality of dolphins from such interactions. These observers also collected catch data. In turn, the IATTC conducts annual assessments of the status of principal tuna stocks as well as research into fishery impacts on tuna and on bycatch species. The U.S. has limited access to these data, but can request access and/or special analyses in some cases.

7.5.2 State Programs

The states have various logbook, port sampling, and data recording programs in place for the different HMS fisheries.

7.5.3 Current Programs by Fishery

The following sections list the current programs, by fishery, that the Pacific Council could utilize in monitoring HMS fisheries.

7.5.3.1 General

In addition to the data collected by programs mentioned above, the following data are available for all HMS fisheries:

Federal

- U.S. Coast Guard vessel registration/documentation data
- NMFS high seas compliance logbooks (mandatory; includes catch and effort data)
- Cannery receipts (includes catch and transhipment data)

State

- Vessel registration/license data
- Fish receiving tickets (includes landing data)

Other

- Fuel price information from marine docks

7.5.3.2 Surface Hook-and-Line

Federal

- NMFS coastwide logbooks (voluntary; includes catch and effort data)
- NMFS coastwide shoreside port sampling efforts (includes interviews, catch and effort data, and length frequency data)
- NMFS ride-along observer data for high seas and coastal areas (includes occasional length data by location)
- Cannery receipts (includes catch and transhipment data, but not by individual vessel)

Other

- IATTC baitboat logbooks (mandatory; includes catch and effort data)
- Transhipment costs from American Fishermen's Research Foundation

7.5.3.3 Purse Seine - Large

Federal

- Cannery receipts (includes catch and transhipment data by individual vessel)

Other

- IATTC logbooks (mandatory; includes catch and effort data)
- IATTC observer program (100% coverage; includes catch and effort data)
- IATTC sampling program (includes catch data)
- South Pacific Forum Fishery Agency logbooks and dockside sampling efforts (includes catch by area and time and species and size compositions)

7.5.3.4 Purse Seine - Coastal

State

- Some dockside sampling (California; includes catch data)

Other

- IATTC logbooks (mandatory; includes catch and effort data)

7.5.3.5 Drift Gillnet

Federal

- NMFS observer program (20% coverage; includes catch and effort data and length frequencies)

State

- Logbooks (mandatory in California and Oregon; includes catch and effort data)

7.5.3.6 Harpoon

State

- Logbooks (mandatory in California; includes catch and effort data)

7.5.3.7 Longline - High Seas

Federal

- Observers (on a limited and voluntary basis)

7.5.3.8 Charter Vessels

Federal

- NMFS Marine Recreational Fishery Statistical Survey (MRFSS) data

The MRFSS has collected a time series of catch and effort data by area, time and mode of fishing since 1981. While not specifically focusing on HMS fisheries, the MRFSS program includes charter vessel trips on which HMS were caught. MRFSS samplers generally ride on the vessels, collecting data as the boat returns to port. Occasionally, they will interview anglers as they depart the vessel. The time series is believed to be reasonably reliable with respect to trends over time while estimates of species composition and catch in any single year are less reliable.

State

- Logbooks (mandatory in California; voluntary for albacore in Washington; includes catch and effort data)
- Dockside sampling (Washington)

7.5.3.9 Private Recreational Fishing Vessels

Federal

- NMFS Marine Recreational Fishery Statistical Survey (MRFSS) data

The MRFSS has collected a time series of catch and effort data by area, time and mode of fishing since 1981. While not specifically focusing on HMS fisheries, the MRFSS program includes estimates of catch and effort for private recreational fishing vessel trips on which HMS were caught. However, it is acknowledged that estimates of catch on such trips are subject to wider confidence limits due to the difficulty of obtaining information from vessels in private marinas to which access is limited. The vessels that pursue HMS are generally larger and range farther than small vessels seeking coastal species, and these vessels more often are berthed in private marinas. To the extent that these marinas cannot be sampled, there may be underestimates of catch and effort by these vessels targeting HMS. MRFSS samplers have not been placed on these vessels and shoreside interviews have been limited.

State

- Dockside sampling (Washington)

Chapter 8
PROPOSED ACTIONS AND ALTERNATIVES

8.0 PROPOSED ACTIONS AND ALTERNATIVES

This chapter describes proposed and alternative actions that are being considered by the Council for management of the HMS fisheries. Chapter 9 provides a detailed analysis and evaluation of environmental consequences of the proposed and alternative actions if adopted.

At the broadest decision level, the **No Action** alternative is to not adopt and implement the HMS FMP and the initial regulatory measures. Under this alternative, the States of Washington, Oregon and California would continue to manage their respective licensed fishers. NMFS would continue to promulgate federal regulations to minimize interactions with protected species under separate processes (ESA, MMPA) and separate regulations to implement IATTC recommendations under the Tuna Conventions Act. Essentially, under this alternative, the Council would have no responsibility in management of the HMS fisheries. None of the advantages of an FMP cited in Chapter 1 section 1.5, "Purpose and Need for FMP," would be realized under this alternative. A more complete description of the expected future conditions under the No Action/No FMP alternative may be found in Chapter 9 section 9.1 (Baseline Conditions). In most cases, the No Action alternative is at a narrower decision level and refers to not implementing a *specific* measure within the FMP. The difference from the broader No Action alternative will be apparent.

The proposed FMP is a framework plan that includes some fixed elements (described in section 8.3) and the process for implementing or changing regulations without amending the plan (flexible measures). This is needed because ongoing management of highly migratory species and the need to address new issues that arise make it impossible to foresee and address all regulatory issues in the initial plan. Framework adjustments can be implemented more quickly than plan amendments, allowing for more timely management response. Changes to any of the fixed measures in the plan require a plan amendment.

This chapter describes the fixed (section 8.3) and initial management measures (sections 8.4, 8.5) proposed for implementation with approval of the FMP. If adopted by the Council and approved and implemented by NMFS, these measures would become federal regulations affecting fisheries for highly migratory species. They may be modified in the future, or new regulations may be implemented, using the framework adjustment procedures in the plan. The initial management measures are intended to be the minimum necessary to manage these fisheries at the outset.

State regulations not superseded by the initial federal regulations will continue to remain in effect until such time as the Council determines they should be supplanted by federal regulations. The Council has reviewed these state regulations and determined that they are consistent with the FMP. Some of the state regulations are now inconsistent from state to state, but these inconsistencies do not pose management problems that require immediate federal action.

The proposed FMP is intended to prevent overfishing while achieving the optimum yield from the fisheries pursued by the gear types included in the management unit. Chapter 1, section 1.4 provides background information about the history of the FMP, and section 1.5 describes the purpose and need for an FMP and the reasons why the Council concluded that an FMP is warranted.

8.1 Management Philosophy and Approach

Highly migratory species are wide-ranging, likely to be fished by multi-national fleets beyond U.S. waters, have productivity potentials ranging from very low to very high, and can seldom be directly surveyed for abundance. Their management usually requires international cooperation, for which there must be active U.S. participation at international forums. The management should be precautionary and multidimensional in approach.

Precautionary management should be the guiding theme in managing HMS species. It is called for by National Standard 1 of the Magnuson-Stevens Act, FAO's Code of Conduct for Responsible Fisheries, the United Nations' "UNIA" or "Highly Migratory Species and Straddling Stocks" Agreement, and regional agreements, such as MHLC. Precautionary management is proactive, i.e., it seeks to minimize the likelihood of attaining the overfished condition by accounting for uncertainties and by establishing preventive procedures. Other aspects of this concept are discussed in Chapter 3, section 3.2. Precautionary management of HMS species should include:

1. Consideration of the biological limitations of species. Due to different and unique life histories, HMS species have differing vulnerabilities to exploitation that require differing management. For example, most tunas are wide-ranging and productive while many sharks, with delayed sexual maturity and low fecundity, are not. Precautionary quotas may be more appropriate for vulnerable species, as maintenance of healthy levels of their reproductive potential is more the concern than is maximization of yields.

2. Control of the growth rate of fisheries. Rapidly expanding fisheries are likely to overshoot management goals, both biological and economic. Uncontrolled growth can produce excess fishing capacity that is difficult to withdraw. The lower the productivity of a species, the greater the need for this control.

Multidimensional management, within the context of the above two precautionary concepts, refers to methods that are complementary and which are often applied in combination in actual management. There are at least four methods:

1. Management by Catch and Effort Limits. The limits for this traditional approach should be determined with express consideration of species' life histories and productivity potentials and applied within the context of control rules (Chapter 3, section 3.2.1). These limitations should also extend to controlling the rate of fishery expansions (#2 above).

2. Management by protecting reproductive potential. Season and/or area closures should be considered for times and places occupied by significant portions of populations that are reproducing females, especially for low-productivity species.

3. Management by Limiting Access. To prevent rapid increase in fishing effort, excess fishing capacity, and boom-bust exploitation, and to promote stable and long-term fishing investment and thereby incentives for resource conservation, limited entry systems should be considered.

4. Management by Limiting Bycatch. Under the Magnuson-Stevens Act, bycatch must be minimized and avoided to the extent practicable. Increased utilization to reduce bycatch discards can be promoted, but with the productivity potentials of the species involved considered. Incentives should be provided to promote gears with low bycatch.

Whatever the method or approach, specific management actions in this plan are to be in accordance with a control rule (Chapter 3, sections 3.2.1 - 3.2.3), which focuses on biomass relative to that for MSY (the B/B_{MSY} ratio) and on biomass relative to MSST (the B/B_{MSST} ratio - for the overfished condition). Thus in managing to maintain MSY, specific corrective action is not mandatory unless biomass giving B_{MSST}, or the overfished ratio, is reached. If MSY is exceeded, managers must bear in mind that MSY and other reference points refer to the equilibrium or long- term average stock condition, and that any year's catch can be above or below the target level depending on variations in stock availability or stock size as affected by recruitment. It is for this reason that the overfished state is specified as biomass reduced to B_{MSST} (not B_{MSY}), and not simply catch being greater than MSY. Moreover, when MSY is a proxy estimate, managers need to recognize its interim nature. There will be uncertainty in all cases, so quotas or harvest guidelines must be developed with care.

8.2 Unilateral Management, Harvest Guidelines and Quotas, and Overfishing

Unilateral Management

For most management unit species in this FMP, U.S. harvest by West Coast-based vessels represents only a small fraction of total fishing mortality out of the overall range of the species, and any unilateral action, such as a reduction in the U.S. West Coast harvest or effort, would not likely have a significant biological effect on the stock. However, as discussed in the section on overfishing (see "overfishing" below), U.S. law requires unilateral action when a stock is determined to be overfished. Furthermore, unilateral management of U.S. vessels may also be appropriate under some circumstances apart from overfishing. This is particularly true for vulnerable stocks, defined, in part, as stocks that will require more than ten years to recover from depletion (see Chapter 3, section 3.2.3). Circumstances where unilateral management may be appropriate, not necessarily because a stock is overfished, include, but are not limited to, the following situations:

1. Where a stock is regionally distributed, and a significant portion of the regional distribution is subject to harvest by U.S. West Coast fisheries;

2. Where the ESA, the MMPA, or the MBTA mandate that a species be protected in both United States' and international waters; or
3. Where unilateral action is needed to address domestic issues such as local depletion, protection for essential fish habitat in United States' waters, bycatch reduction, catch allocations, or conflicts among user groups.

Precautionary harvest guidelines and quotas

A quota is a specified numerical harvest objective, the attainment (or expected attainment) of which causes closure of the fishery for that species or species group. A harvest guideline is a specified numerical harvest objective that is not a quota. Attainment of a harvest guideline does not require closure of a fishery.

None of the management unit species that are taken by U.S. West Coast harvesters are overfished, and no U.S. harvest quotas are recommended at this time. A U.S. harvest guideline (to replace the current PSMFC guideline) is initially recommended for the common thresher shark, since thresher shark is regionally distributed, its population occupies a significant portion of the EEZ every year, and it is harvested by West Coast-based U.S. fishing vessels. A harvest guideline is also recommended for the shortfin mako shark because of the stock's vulnerability, and the possible importance of the U.S. West Coast EEZ as nursery habitat. The recommended harvest guidelines for these sharks are given in Chapter 3 and Table 3-5.

Overfishing

Section 304(e) of the Magnuson-Stevens Act, 16 U.S.C. § 1854(e), governs the rebuilding of overfished stocks. At any time, if the Secretary of Commerce (Secretary) determines that a fishery is overfished, the Secretary must immediately notify the Council and request that actions be taken to end overfishing and rebuild the affected stock(s). For those fisheries managed under an FMP or an international agreement, the status is determined using the criteria for overfishing specified in the FMP or the agreement. Once an HMS stock is determined to be overfished, the Council must prepare, within one year, an FMP amendment or proposed regulations to end overfishing and rebuild the affected stock (see Chapter 3, section 3.2.4).

Because of the widespread distribution of HMS stocks outside the U.S. EEZ, it is recognized that unilateral action by the U.S. will likely provide little or no biological benefit to the stock(s), and that concerted international efforts will be required in order to achieve rebuilding. Therefore, if NMFS notifies the Council that a stock managed under an international agreement is overfished or is approaching a condition of being overfished, the Council may, in connection with preparing a rebuilding plan pursuant to the Magnuson-Stevens Act at 16 U.S.C. §1854(e) and 50 C.F.R. 600.310(e), provide analysis and documentation to NMFS and the Department of State supporting its recommendation for action under the international agreement to end or prevent overfishing. It is expected that the Department of State and U.S. delegation, in coordination with NMFS, will consider the Council's recommendation in developing U.S. positions for presentation to the international body, and will keep the Council informed of actions by the international body to end or prevent overfishing. These actions will be taken into account by the Council in completing its rebuilding plan, and in developing its recommendation to NMFS as to what additional U.S. regulations, if any, may be necessary to end or prevent overfishing. The Council's rebuilding plan will reflect traditional participation in the fishery, relative to other nations, by fishers of the United States, consistent with Section 304(e)(4)(C) of the Magnuson-Stevens Act, 16 U.S.C. §1854(e)(4)(C).

8.3 Fixed Elements of the Fishery Management Plan

Fixed elements are the long-standing elements of a fishery management program that direct how it is applied and for what purpose. FMP amendments are required when fixed elements of the FMP are changed, as well as for major or controversial actions outside the scope of the original FMP.

Examples of fixed element actions that would require an FMP amendment include:

- changes to management objectives;

- changes to the species in the management unit (actively managed species);
- changes to the control rules (definition of overfishing);
- amendments to any procedures required by the FMP;
- implementation of limited entry programs. This FMP does not propose a federal limited entry program for any HMS fishery at this time. The Council adopted a control date of March 9, 2000 for commercial and party/charter fisheries for HMS, in anticipation that a limited access program may be needed in the near future. Meanwhile, existing state limited entry programs for HMS fisheries will remain in effect when the FMP is implemented; and
- allowing a longline fishery in the EEZ (other than through approved activities under an EFP).

<u>8.3.1 Species in the Management Unit</u>

Numerous species are caught in HMS fisheries. Those to be actively managed are the Management Unit Species (MUS), for which the alternatives are as listed below (see Chapter 3, section 3.1.1 for more detail on these alternatives). Other species, caught incidentally to targeted species, will be monitored (Chapter 3, section 3.1.2).

Alternatives Considered

Alternative 1 (No Action): No species are listed as MUS. This is not a viable alternative, because this FMP is predicated on the need to actively manage certain species.

Alternative 2 (Proposed Action): The following species in the management unit are proposed: albacore, yellowfin, skipjack, bigeye, north Pacific bluefin tunas; swordfish; striped marlin; common thresher, bigeye thresher, pelagic thresher, shortfin mako and blue sharks; and dorado (dolphinfish). <u>Rationale</u>: The FMP should manage all HMS that are at least moderately important or of special conservation concern in West Coast fisheries.

These are the main species of concern to commercial and sport fishers as well as to conservationists; they are discussed in detail in Chapter 3, section 3.1.1. This FMP is developed considering these species.

Alternative 3: Same as Alternative 2 but dorado (dolphinfish) not included. The dorado's importance off the West Coast is relatively small and recent, and it is not commercially targeted.

Alternative 4: Same as Alternative 2 but dorado (dolphinfish), pelagic thresher shark, and bigeye thresher shark not included. These species are deleted for their present and near future lack of analytically-based MSY estimates.

Alternative 5: Same as Alternative 2 but sixgill shark *added*. The sixgill, while not commercially important, has high market value, and is a species of low productivity.

Alternative 6: Same as Alternative 2 but all sharks *deleted*.

Management of shark species caught incidentally in MUS fisheries could bring strict restrictions to those fisheries, because the productivities of sharks are usually low relative to that of targeted species.

<u>8.3.2 Control Rule</u>

The concepts of control rules and status determination criteria for management are described in detail in Chapter 3, section 3.2.1, and the Default Alternative Rule proposed to be adopted for this FMP, is discussed in section 3.2.3. Control rules for managing MUS are required under the Magnuson-Stevens Act.

Alternatives Considered

Alternative 1 (No Action): No control rule is adopted. This is not a viable alternative under the Magnuson-Stevens Act.

Alternative 2 (Proposed Action): Adopts the default MSY (or MSY proxy) control rule, but additionally uses an OY (instead of MSY) target for vulnerable species, as defined and discussed in Chapter 3, section 3.2.3. Rationale: The default MSY control rule was chosen because it is the standard recommended in technical guidance for implementing National Standard 1 of the Magnuson-Stevens Act, and it is consistent with the WPRFMC's rule for pelagic fisheries. The vulnerable species OY is applied to sharks because of their low productivity, and to bluefin tuna and striped marlin because of uncertainties concerning total catches and stock structures.

To be precautionary, the OY for vulnerable species is set for now at 0.75MSY (from the relationship shown in Figure 3-1). Any harvest guideline for vulnerable species is set equal to that OY.

The status of the MUS in this FMP is discussed in terms of this default control rule (Chapter 3).

8.3.3 Management Goals and Objectives

The preceding approaches for managing the management unit species of this plan are to be implemented by specific proposed management actions and alternatives that are described in this chapter. The general goals and objectives of this FMP are listed below to provide context for these various actions and alternatives. They are not listed in order of priority:

1. Promote and actively contribute to international efforts for the long-term conservation and sustainable use of highly migratory species fisheries that are utilized by West Coast-based fishers, while recognizing these fishery resources contribute to the food supply, economy, and health of the nation.

2. Provide a long-term, stable supply of high-quality, locally caught fish to the public.

3. Minimize economic waste and adverse impacts on fishing communities to the extent practicable when adopting conservation and management measures.

4. Provide viable and diverse commercial fisheries and recreational fishing opportunity for highly migratory species based in ports in the area of the Pacific Council's jurisdiction, and give due consideration for traditional participants in the fisheries.

5. Implement harvest strategies which achieve optimum yield for long-term sustainable harvest levels.

6. Provide foundation to support the State Department in cooperative international management of highly migratory species fisheries.

7. Promote inter-regional collaboration in management of fisheries for species which occur in the Pacific Council's managed area and other Councils' areas.

8. Minimize inconsistencies among federal and state regulations for highly migratory species fisheries.

9. Minimize bycatch and avoid discard and implement measures to adequately account for total bycatch and discard mortalities.

10. Prevent overfishing and rebuild overfished stocks, working with international organizations as necessary.

11. Acquire biological information and develop a long-term research program.

12. Promote effective monitoring and enforcement.

13. Minimize gear conflicts.

14. Maintain, restore, or enhance the current quantity and productive capacity of habitats to increase fishery productivity for the benefit of the resource and commercial and recreational fisheries for highly migratory species.

15. Establish procedures to facilitate rapid implementation of future management actions, as necessary.

16. Promote outreach and education efforts to inform the general public about how West Coast HMS fisheries are managed and the importance of these fisheries to fishers, local fishing communities, and consumers.

17. Manage the fisheries to prevent adverse effects on any protected species covered by MMPA and MBTA and promote the recovery of any species listed under the ESA to the extent practicable.

18. Allocate harvest fairly and equitably among commercial, recreational and charter fisheries for HMS, if allocation becomes necessary.

8.3.4 Framework Procedures

Many fishery management plans under the Magnuson-Stevens Act use framework procedures by which flexible management, within the scope and criteria established by the FMP and implementing regulations, can be implemented without amending the FMP. Framework actions can usually be implemented more quickly than FMP amendments, allowing for more timely management response.

Such flexible management measures may be imposed, adjusted, or removed at any time during the year, or according to an established management cycle. Management measures may be imposed for resource conservation, or social or economic reasons consistent with FMP procedures, goals and objectives.

Analyses of biological, ecological, social, and economic impacts will be considered when a particular change is proposed. As a result, the time required to take action will vary depending on the type of action, its impacts on the fisheries, resources, and environment, and the review of these impacts by interested parties. Satisfaction of legal requirements under other applicable laws (e.g., Administrative Procedure Act, National Environmental Policy Act, Regulatory Flexibility Act, Executive Order 12866, etc.) for actions taken under framework procedures generally requires analysis and public comment before the measures may be implemented by the Secretary of Commerce.

Types of Framework Actions.

Under most framework procedures, management measures may be established, adjusted or removed using the following categories of actions:

- "Automatic" actions such as quota closures, which are nondiscretionary and must have already been analyzed in advance. Automatic actions may be made effective immediately in a single *Federal Register* notice, if there are adequate grounds for appropriate waivers of prior opportunity for public notice and comment, and the cooling-off period, as provided in the Administrative Procedure Act.

- "Notice" actions requiring at least one Council meeting and one *Federal Register* notice. These are management actions other than "automatic" actions that are either nondiscretionary or within the scope of a previous analysis. An example of a "notice" action might be a change in the incidental catch allowance per trip for non-HMS gears. Notice actions may be made effective immediately in a single *Federal Register* notice, if there are adequate grounds for appropriate waivers of prior opportunity for public notice and comment, and the cooling-off period, as provided in the Administrative Procedure Act.

- "Abbreviated Rulemaking" actions normally requiring at least two Council meetings and one *Federal Register* notice. Abbreviated rulemaking would be used only when time is insufficient to use the full rulemaking process. Abbreviated rulemaking actions may be made effective immediately in a single *Federal Register* notice, if there are adequate grounds for appropriate waivers of prior opportunity for public notice and comment, and the cooling-off period, as provided in the Administrative Procedure Act.

- "Full Rulemaking" (regulatory amendments or adjustments to change management rules) requiring at least two Council meetings and two *Federal Register* notices consisting of proposed and final rules. These include any proposed management measures not falling within the other categories, including measures that are highly controversial or that directly allocate a resource.

These procedures would not affect the authority of the Secretary of Commerce to take emergency regulatory action under Section 305(c) or (d) of the Magnuson-Stevens Act.

Framework Process for Rulemaking Actions.

New measures or changes to measures may be implemented for one or more fisheries for HMS in the Pacific Council area through the framework procedures. The objective is efficiency in management.

Reasons for adopting these framework measures may include, but are not limited to, the following:

- to implement U.S. obligations under an international agreement;
- to achieve optimum yield and prevent overfishing;
- to respond to a determination that overfishing is occurring;
- to minimize adverse impacts of fishing on EFH;
- to minimize bycatch and bycatch mortality;
- to reduce adverse effects of fisheries on protected resources and promote the recovery of any species listed under ESA.
- to promote vessel safety;
- to reduce conflict and provide for orderly fisheries;
- to allocate among domestic HMS fisheries;
- to address social or economic issues;
- to facilitate management of the fisheries;
- to meet goals and objectives of the FMP;
- to respond to changes in management of HMS in other areas of the Pacific.

The following types of measures are authorized to be established, adjusted, or removed using this framework process, without amending the FMP:

- time/area restrictions;
- reporting requirements;
- permits or licenses (for commercial harvesters or vessels, for recreational harvesters or vessels, and for processors) and endorsements for individual fisheries;
- quotas or harvest guidelines;
- fish length limits;
- recreational daily catch (bag) limits;
- trip limits;
- gear restrictions;
- changes to definition of legal gear;
- allocations among U.S. West Coast fisheries;
- at-sea observers;
- vessel monitoring systems (VMS);
- adjustments to descriptions of EFH and designation of habitat areas of particular concern;
- measures to minimize bycatch or minimize mortality of bycatch;
- measures to minimize interactions with protected species, including, but not limited to, implementation of federal biological opinions and court rulings.

General Procedure. Following an established management cycle which includes production of an annual Stock Assessment and Fishery Evaluation (SAFE) report, the HMS Management Team, HMS Advisory Subpanel, or other Council advisory body, or a member of the public, may identify a problem and request regulatory action. If the Council agrees that regulations may be necessary, it will direct the HMS Management Team and/or staff to prepare a draft document which includes a description of the problem, alternative management actions and analysis of the impacts of the alternatives. The document will be in the form of an environmental impact statement or environmental assessment/regulatory impact review/regulatory flexibility analysis which meets the analytical requirements of NEPA, Executive Order 12866, the Regulatory Flexibility Act, the Magnuson-Stevens Act and other applicable law.

Upon completion, the draft document will be made available to the interested public and will be addressed by the Council at a subsequent meeting. The issue will be placed on the subsequent meeting agenda, which will be distributed to the media and interested public and published in the *Federal Register*. The Council will seek to identify all interested persons and organizations and solicit their involvement in discussion and resolution of this problem through the Council process. If the action involves a fishery that extends beyond the EEZ, the Council shall invite comments from the Western Pacific and North Pacific Fishery Management Councils on the action that may affect those councils' fisheries. After receipt of comment from its advisory entities and the public, the Council will decide whether or not to adopt the draft document for public comment.

If the Council decides to proceed with the issue, it will revise the draft document as necessary and make it available for public comment. The issue will be placed on the agenda for a subsequent meeting, which will be distributed to the media and interested public and published in the *Federal Register*. At this meeting, after receipt of comment from its advisory entities and the public, the Council will adopt a measure or package of measures for submission to NMFS for approval. A final document including the Council action and rationale will be prepared and submitted to NMFS. The document will specifically indicate whether there will be any impacts on HMS fishery interests in areas of concern of other fishery management councils. If another council has commented on the proposed action, a copy of those comments will be included in the submission.

Point-of-Concern Framework Procedure. The point-of-concern procedure is an additional tool for the Council's use in exercising resource stewardship. The process is intended to foster continuous and vigilant review of Pacific HMS stocks and fisheries. Point-of-concern criteria are intended to assist the Council in determining when a focused review of a particular species is warranted and if management measures are required. The Council has the authority to act solely on a point-of-concern. The point-of-concern framework is intended to be complementary to the work by the HMS Management Team to monitor the fisheries throughout the year. A point-of-concern must be raised to the Chair of the Council in writing, including rationale, background and supporting data.

A point-of-concern occurs when one or more of the following is found or expected:

- Catch is projected to exceed, within two years, the current harvest guidelines or quotas based on current exploitation rates;
- Developments in a foreign fishery or actions required under an international management framework affect the likelihood of overfishing HMS domestically;
- Estimated bycatch of a species or species group increases significantly above previous estimates, or there is information that abundance of a bycatch species has declined significantly;
- New information is discovered on the biological characteristics of one or more species, or on the characteristics of a stock, indicating that current management measures are inadequate;
- An error in data or stock assessment is detected that significantly changes the estimates of impacts of current management;
- MSY control rule parameters or approach require modification;

- Projected catches for a non-management unit HMS species increase substantially such that applying the default control rule to that species would show catches exceeding the Allowable Biological Catch. This could require moving a species into the management unit;

- Changes in ecological relationships, such as significant shifts in predator-prey interactions or declines in forage species, indicate that an HMS population may be in decline.

If a point-of-concern is raised to Chair of the Council, the Council shall decide if the HMS Management Team (HMSMT) should proceed to address the concern, and/or if any additional actions are warranted by the Council at that time.

If so directed by the Council, the HMSMT will prepare a report including recommendations, rationale, and analysis for appropriate management measures to resolve the point-of-concern. After receiving the HMSMT report, the Council will hear public testimony and, if appropriate, recommend management measures to the NMFS Regional Administrator accompanied by supporting rationale and analysis of impacts. The Council analysis will include a description of (a) resource conservation or ecological issues consistent with FMP objectives; (b) likely impacts on other management measures, other fisheries, and bycatch; and c) socioeconomic impacts to commercial and recreational segments of the HMS fishery. The recommendation will also explain the urgency of the measure(s), if any.

The NMFS Regional Administrator will review the Council's recommendation and supporting information and will follow the appropriate implementation process. If the NMFS Regional Administrator does not concur with the Council's recommendation, the Council will be notified in writing of the reasons for the rejection.

Alternatives Considered:

Alternative 1 (No Action): There would be no framework procedures; all changes would be made via amendment process.

Alternative 2 (Proposed Action): Adopts the framework procedures to be used during the management cycle for changing conservation and management measures, with the point-of-concern framework procedure additionally specified. Rationale: Effective precautionary management must be timely as well as proactive (here via framework and point-of-concern procedures, respectively).

These procedures would be followed in response to new problems in the fisheries or information about the fisheries and/or stocks; they do not affect the ability of the Council to consider and propose action to address a conservation concern at any time, nor affect the ability of the Secretary to take emergency action if deemed necessary and appropriate.

Alternative 3: Adopts the framework procedures as in Alternative 2, but *without* the point-of-concern framework procedure.

The same framework procedures as in Alternative 2 would be used during the management cycle for changing conservation and management measures, except there would be no point-of-concern criteria for raising conservation concerns to the Council.

8.3.5 Management Cycle

The management cycle is a pre-determined regular schedule for council management actions with respect to HMS fisheries. Cycle differences affect the time available for fishery assessments, the timeliness of available data and of management response, and the degree to which fishers can participate in the management process.

Future developments in the fisheries do not ordinarily bring need for change in the management cycle schedule, and the management cycle is thus a fixed element of the FMP. However, should there be need to change the management schedule, e.g., because of marked changes in fishery practices, the Council can do so by vote and without a plan amendment, provided the Council gives six-month notice.

Alternatives Considered

Alternative 1 (No Action): No cycle established.

The HMSMT would still prepare an annual SAFE document that would be presented to the Council, e.g., in March or September. There is no fixed schedule for addressing management issues. The Council would adopt or amend management measures whenever a problem is identified requiring management action. Measures stay in effect until changed.

The open cycle of this alternative minimizes unnecessary reporting of unchanged status of stocks, but tardy management responses to unforseen fishery changes are also likely.

Alternative 2 (Proposed Action): Establishes a *biennial* management cycle with regulatory/statistical year *April 1 to March 31*. The schedule would be as follows:

Year 1	June	Provide update to the Council on status of the HMS fisheries; preliminary SAFE report. If necessary, Council directs HMSMT to prepare draft regulatory analysis to implement harvest levels and/or management measures.
	September	Annual SAFE document presented to Council. If necessary, Council directs HMSMT to prepare a draft regulatory analysis to implement new harvest levels and/or management measures. Council adopts for public review proposed actions addressing concerns from current and previous SAFE reports.
	November	Council adopts final action and submits to NMFS for approval.
Year 2	April	Measures become effective, and stay in effect for at least two years.

<u>Rationale</u>: Allows at least minimally sufficient time for data analysis, provides for timely response to fishery problems, and allows most fishers adequate access to the management process, as scheduled.

The cycle is repeated biennially, with new actions considered in September and becoming effective in April every other year. The Council would schedule HMS for the June, September, and November Council meetings.

Under this biennial cycle (or any cycle), the HMS management team would still conduct ongoing reviews of the fisheries and status of stocks and prepare an annual SAFE document for the Council. The Council would still have to prepare a stock rebuilding plan within one year of notification by the Secretary of Commerce that a stock has been declared overfished, as called for under the Magnuson-Stevens Act (Sec. 8.2).

Alternative 3: Establishes a *biennial* management cycle with regulatory and statistical fishing year *January 1 to December 31*; measures stay in effect until changed. The schedule would be as follows:

Year 1	March	SAFE document presented to Council. If necessary, Council directs HMSMT to prepare a draft regulatory analysis to implement harvest levels and/or management measures.
	June	Council adopts proposed actions for public review.

	September	Council adopts final action and submits to NMFS for approval.
Year 2	January	Measures become effective, and stay in effect for at least two years.

The cycle is repeated biennially, with new actions considered in June and becoming effective in January every other year.

This alternative's cycle has the analysis and response time advantages of the Alternative 2 cycle, except that fishers would have poor access to the management process, because the cycle is matched to the calendar rather than the fishing year.

Alternative 4: Establishes a *biennial* management cycle with regulatory and statistical fishing year *October 1 to September 30*; measures stay in effect until changed. The schedule would be as follows:

Year 1	September	Annual SAFE document presented to Council. If necessary, Council directs HMSMT to prepare a draft regulatory analysis to implement harvest levels and/or management measures.
	November	Council adopts proposed actions for public review.
Year 2	March	Council adopts final action and submits to NMFS for approval.
	October	Measures become effective, and stay in effect for at least two years.

The cycle is repeated biennially, with new actions considered in November and becoming effective in October every other year. This alternative's cycle has the analysis and response time advantages of the Alternative 2 cycle, and provides for fishers access to the management process at least as good. However, the schedule precludes the use of recently summarized data.

Alternative 5: Establishes an *annual* management cycle, with regulatory and statistical fishing year *April 1 to March 31*; measures stay in effect until changed.

This cycle is repeated annually. Management response time could be rapid, but there could often be insufficient time for careful analysis of data.

Alternative 6: Establishes a *multi-year* management cycle.

This alternative is similar to the biennial cycles, except actions would be considered every three or more years. Measures would stay in effect for at least three years unless fishery changes call for more timely action. Management response could often be tardy.

8.4 Initial General Provisions of the FMP

This section describes the general elements of the FMP that affect the fisheries directly. Many of these elements address fundamental requirements of the Magnuson-Stevens Act and other applicable law. They can be modified through framework procedures if the Council so chooses.

8.4.1 Legal Gear and Gear Restrictions

Background

Various state restrictions on gear exist in Washington, Oregon, and California. A listing of current state regulations in Washington, Oregon, and California is in Appendix B.

For commercial fisheries, all three states allow the use of troll gear or hook-and-line gear.

In Washington, gillnet, harpoon, pelagic longline and purse seine gear are not listed as authorized gear. Sharks may be caught with otter trawl, beam trawl, set lines, bottomfish pots, commercial jig, and troll lines. (Note: sharks are classified by Washington as bottomfish and as such these are legal gears for sharks.) It is unlawful to use bottomfish trawl gear in state waters (0-3 miles).

In Oregon, most HMS are classified as ocean food fish. Legal gears for ocean food fish include handline, pole and line, longline, seines, spears, trawls, and pots. Drift gillnets may be used to harvest swordfish under a developmental fishery permit. It is unlawful to use gillnets to target thresher shark. Oregon has provisions for developmental longline fisheries for swordfish and blue shark outside 25 miles.

In California, legal gears are gillnets, drift gillnets, and trammel nets, purse seine and harpoon; set lines are legal in open ocean waters, but may not be used for shortfin mako, thresher, swordfish, or marlin. Pelagic longline gear is prohibited by California, but longliners may fish outside the EEZ and land in California.

HMS recreational gear is comparable coastwide, with troll and hook-and-line gears used in each state. "Mousetrap gear" is specifically prohibited in California. (Mousetrap gear means a free floating set of gear thrown from a vessel, composed of a length of line with a float on one end and one or more hooks or lures on the opposite end.)

The Federal List of Fisheries is a list of authorized fisheries under the authority of each regional fishery management council and all fishing gear used in each fishery in the EEZ. The following non-FMP fisheries (and gear) related to HMS are included in the List of Fisheries under the authority of the PFMC:

- Thresher shark and swordfish drift gillnet fishery (gillnet);
- Shark and Bonito longline and set line fishery (longline);
- Pacific albacore and other tuna hook-and-line fishery (hook and line);
- Pacific swordfish harpoon fishery (harpoon);
- Pacific yellowfin, skipjack tuna, purse seine fishery (purse seine);
- Recreational fishery (spear, trap, handline, pot, hook and line, rod and reel, hand harvest).
- Commercial fishery (trawl, gillnet, hook and line, longline, handline, rod and reel, bandit gear, cast net, spear)

The List of Fisheries will need to be modified after implementation of this FMP to be consistent with the definition of legal HMS gear in the FMP.

Alternatives Considered

Alternative 1 (No Action): No legal gears are specified.

This is not a viable alternative because all decisions on gear would be deferred to the states, and management under the FMP would be inconsistent and difficult with respect to gear type.

Alternative 2 (Proposed Action and Sub-Alternatives): Authorizes commercial legal HMS gear as harpoon, surface hook and line, drift gillnet (14 inch stretched mesh or greater), purse seine, and pelagic longline. Two options were initially presented for definition of drift gillnet mesh size (see below). For recreational gear authorizes rod and reel, spear, and hook and line. Rationale: The FMP needs uniform definitions of gear so that management can be consistent and unambiguous, coast-wide.

Gear specifications are as follows:

Legal Gears and Definitions. The following gears would be authorized for the commercial and recreational harvest of HMS in the EEZ by all vessels, and beyond the EEZ by vessels landing in West Coast ports. Specific management measures regulating the use of legal gear types will be developed if necessary, using the framework procedures of this FMP. The proposed initial specific measures for the respective fisheries are set forth in section 8.5. Gear that is not defined as legal gear is prohibited.

Commercial Gear

Harpoon: fishing gear consisting of a pointed dart or iron attached to the end of a line several hundred feet in length, the other end of which is attached to a flotation device. Harpoon gear is attached to a pole or stick that is propelled only by hand, and not by mechanical means.

Surface Hook and Line: one or more hooks attached to one or more lines (includes troll, rod and reel, handline, albacore jig, live bait, and bait boat; excludes pelagic longline and mousetrap gear [defined above]).

Drift Gillnet: a panel of netting, suspended vertically in the water by floats along the top and weights along the bottom, which is not stationary nor anchored to the bottom.

There are two sub-alternatives for restricting drift gillnet mesh size:

Sub-Alternative 2a (Proposed Action): Specifies that HMS drift gillnets must be *minimum stretched mesh size of 14 inches.* Rationale: Minimizes potential problems from additional bycatch, protected species interactions, and competition with other fishery sectors by disallowing a relatively new fishery (small-mesh gillnet) that targets HMS; precautionary in limiting additional new fishing on HMS.

This alternative is consistent with the historic use of drift gillnet used to target swordfish and sharks. It would mean that small mesh drift gillnet gear cannot be used to target HMS.

Sub-Alternative 2b: Specifies *no minimum stretched mesh size* for authorized HMS drift gillnet gear; includes small mesh drift gillnet gear, which could target HMS.

This alternative has no restriction on drift gillnet mesh size, and encompasses both the drift gillnet fishery targeting swordfish and sharks and the small mesh gillnet fishing targeting bluefin and/or albacore tuna. The latter use is relatively new and poorly documented.

Purse Seine: a floated and weighted encircling net that is closed by means of a purse line threaded through rings attached to the bottom of the net (includes encircling net, purse seine, ring net, drum purse seine, lampera net).

Pelagic Longline: a main line that is suspended horizontally in the water column, which is not stationary nor anchored, and from which dropper lines with hooks (gangions) are attached.

Recreational Gear

Rod and Reel (pole and line): a hand-held (including rod holder) fishing rod with a manually or electrically operated reel attached.

Spear: a sharp, pointed, or barbed instrument on a shaft. Spears can be operated manually or shot from a gun or sling.

Hook and Line: one or more hooks attached to one or more lines (excludes mousetrap gear).

Alternative 3: As in Alternative 2, except that *pelagic longline gear would not be legal gear* for vessels landing in U.S. West Coast ports.

This would prohibit all landings in West Coast ports of HMS taken with pelagic longline gear (eliminates existing high seas longline fishery; eliminates developmental longline permit fishery in Oregon).

Adjustments to Definition of Legal Gear and Gear Restrictions

The FMP authorizes the modification of the definition of legal fishing gear. New commercial or recreational gears may be authorized or existing legal gears may be prohibited using the framework adjustment procedures. Implementation or modification of commercial or recreational gear restrictions is authorized. Gear restrictions may specify the amount, dimensions, configuration or deployment of commercial and recreational fishing gear, for example minimum mesh size or the number of hooks. Any changes in gear regulations should be scheduled to minimize costs to the fisheries, insofar as this is consistent with achieving the goals of the change.

8.4.2 Incidental Catch Allowance

Incidental catch refers to harvest of HMS which are unavoidably caught while fishing for other species or fishing with gear that is not legal for the harvest of HMS. This FMP authorizes the harvest and landing of incidental catches by gears not listed as legal HMS gears in the FMP up to a maximum number or percentage of the total weight, per landing. The incidental limit may be adjusted, or separate limits may be established for different non-HMS fisheries, in accordance with framework procedures described in this chapter. The objectives of allowing incidental catches are to:

- Minimize discards in fisheries using gear that is not legal for harvesting HMS, while increasing fishing income by allowing retention and sale of limited amounts of HMS.
- Discourage targeting on HMS by non-HMS fisheries; also reduces any associated take of marine mammals, sea turtles, and seabirds.

Alternatives Considered

Alternative 1 (No Action): Represents the status quo. Landing of HMS could be made using any gear authorized by individual states' regulatory requirements.

Alternative 2 (Proposed Action): Allows incidental commercial landings of HMS, within limits, for non-HMS gear such as bottom longline, trawl, pot gear, small mesh drift gillnet, set/trammel gillnets, and others. Small mesh gillnetters and set net gillnetters would not be permitted to land swordfish (as currently required under California law), but would be permitted to land other HMS, with the restriction of 10 fish per landing of each non-swordfish highly migratory species. For the bottom longline (set line) fishery, landings would be restricted to 3 HMS sharks in total or 20% of total landings by weight of HMS sharks, whichever is greater by weight. For trawl, pot gear, and other non-HMS gear, a maximum of 1% of total weight per landing for all HMS shark species combined would be allowed (i.e., blue shark; shortfin mako shark; and bigeye, pelagic, and common thresher sharks) or two (2) HMS sharks, whichever is greater. Rationale: Discourages targeting of HMS with non-HMS gears by limiting the allowed landings; reduces wastage of HMS by still allowing traditional levels of incidental catch by those gears.

These allowances are based on the frequency distribution of HMS in landings by non-HMS gears, and are intended to be practical with respect to the levels of HMS expected to be taken by non-HMS gears while not targeting HMS. A description of these rates in landings is given in Chapter 9, section 9.2.4.2.

Alternative 3: Allows no landings of HMS caught with gear that are not specified as HMS gear under the FMP. All landings of HMS taken with non-HMS gears would be prohibited.

8.4.3 Essential Fish Habitat (EFH)

Background

Chapter 4 identifies and describes EFH for management unit species. Improved descriptions of EFH may be possible with more basic research on life history, habitat use, behavior and distribution of life stages.

Research also is needed to identify Habitat Areas of Particular Concern (HAPC). This FMP authorizes changes to the identification and description of EFH, and of HAPC, as new information is collected.

The FMP also authorizes the adoption of management measures to minimize adverse effects on EFH from fishing when there is evidence for such effects. Presently, however, there is no clear evidence of adverse impacts from any fisheries' practices or gear on HMS EFH. Management measures to prevent, mitigate, or minimize adverse effects from fishing activities include, but are not limited to:

Fishing gear restrictions: Seasonal and areal restrictions on the use of specified gear; gear modifications to allow escapement of particular species or particular life stages (e.g., juveniles); prohibitions on the use of explosives and chemicals; prohibitions on anchoring or setting gear in sensitive localities; and prohibitions on fishing activities that cause significant physical damage in EFH.

Time/area closures: Closing areas to all fishing or specific gear types during spawning, migration, foraging, and nursery activities; and designating zones for use as marine protected areas to limit adverse effects of fishing practices on certain vulnerable or rare areas/species/life history stages.

Harvest limits: Limits on the take of species that provide structural habitat for other species assemblages or communities, and limits on the take of prey species.

Alternatives Considered

Alternative 1 (No Action): EFH would not be designated and described by this FMP.

This is not a viable alternative. The Magnuson-Stevens Act requires that FMPs describe and identify EFH, minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat.

Alternative 2 (Proposed Action): Adopts species and stage-specific Essential Fish Habitat designations for individual Management Unit Species as described in Chapter 4, section 4.6 and Appendix A. Rationale: Designating EFH according to the best understanding of species' requirements enables informed assessments of the impacts of habitat alterations or disturbances.

Alternative 3: Adopts a broad designation of EFH to apply to all management unit species collectively, i.e., all surface waters of the ocean in the EEZ down to 1000 m depth (the lower bound of the mesopelagic zone).

This is similar to the EFH as designated in the WPRFMC's FMP for Pelagic Fisheries.

Alternative 4: Adopts designations of EFH for individual Management Unit Species as surface waters of the ocean in the EEZ down to 1000 fm depth (the lower depth of the mesopelagic zone), *but restricts EFH areas to documented capture locations only.*

8.4.4 Bycatch (Including Catch-and-Release Programs)

The Magnuson-Stevens Act requires that bycatch in fisheries be assessed, and that the bycatch and bycatch mortality be reduced to the extent practicable. Specifically National Standard 9 states that an FMP shall establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority: 1) minimize bycatch; and 2) minimize the mortality of bycatch which cannot be avoided.

Bycatch has been identified as a concern in HMS drift gillnet and longline fisheries and large-vessel purse seine fisheries (see Ch 5). Anecdotal accounts indicate bycatch in the small-vessel HMS purse seine and albacore troll fishery is relatively low, but these fisheries have not had formal observer programs. The harpoon fishery is thought to have little if any bycatch due to the selective nature of the gear.

Establishing a Standardized Bycatch Reporting Methodology

The Council examined existing bycatch reporting methodology, and found that current logbook requirements for the various fisheries (states, NMFS and IATTC), together with periodic recreational fishing surveys and port sampling, have provided an important source of information on catch and bycatch for all HMS fisheries (Chapter 5, section 5.5). Nonetheless, certain additional measures were considered to provide improved standardization of logbook reporting and better ground-truthing of the logbook data through pilot observer programs for some of the presently unobserved fisheries. The FMP proposes to mandate observer programs initially for the longline, surface hook-and-line, small purse seine, and CPFV fisheries, with NMFS to develop and review the observer sampling plans. This action and related actions are discussed separately in Chapter 9 under Fishery Observers section 9.2.4.5. Also, in Reporting Requirements section 9.2.5.6, the FMP proposes that all commercial and recreational party or charter/CPFV fishing vessels maintain and submit to NMFS logbook records of catch and effort statistics, including bycatch. These measures, together with existing reporting requirements, should provide for a comprehensive standardized bycatch reporting system.

Minimizing Bycatch and Bycatch Mortality

In addition to the alternatives listed below, actions that will have the effect of reducing bycatch and bycatch mortality are discussed in Chapter 5 and under the various fishery-specific actions in sections 8.5.1 and 9.2.5.1 (drift gillnet fishery), 8.5.2 and 9.2.5.2 (pelagic longline fishery) of Chapters 8 and 9, respectively.

The following are additional alternatives not mentioned above that address the issue of bycatch:

Alternative 1 (No Action): Status quo. No bycatch and/or catch-and-release programs would be implemented under this FMP.

This is not a viable alternative. Measures to minimize bycatch and bycatch mortality are required by the Magnuson-Stevens Act.

Alternative 2 (Proposed Action): Provides for a fishery-by-fishery review of measures to reduce bycatch and bycatch mortality (see Chapter 5); establishes a framework for implementing bycatch reduction; adopts measures to minimize bycatch in pelagic longline and drift gillnet fisheries (section 8.5); and adopts a formal voluntary "catch-and-release" program for HMS recreational fisheries. <u>Rationale</u>: Meets the goals of the Magnuson-Stevens Act and of this FMP and the requirements for estimating bycatch and for establishing measures to reduce bycatch and bycatch mortality in HMS fisheries.

Background for Proposed Action:

The framework procedure is to allow efficient implementation of bycatch reporting and reduction measures as needed and as is practical. Potential measures/methods include but are not limited to:

- logbooks
- observers
- time/area closures
- gear restrictions or modifications, or use of alternative gear
- educational programs
- performance standards
- real-time data collection programs (e.g., VMS, electronic logbooks)

The voluntary "catch-and-release" program is to promote reduction of bycatch mortality and waste by encouraging the live release of unwanted fish. Its rationale and origination for recreational fisheries is explained in Chapter 5, section 5.7. The establishment of the catch-and-release program removes live releases in the recreational fisheries from the "bycatch" category as defined in the Magnuson-Stevens Act at 16 U.S.C. § 1802(2) and also promotes the handling and release of fish in a manner that minimizes the risk of incidental mortality, encourages the live release of small fish, and discourages waste.

Alternative 3: As in Alternative 2 but does not authorize a catch-and-release program for recreational fisheries.

All HMS caught and released by anglers would be considered bycatch.

Alternative 4: As in Alternative 2 but establishes a formal voluntary catch-and-release program for striped marlin only.

Striped marlin is a species of special status for many recreational fishers.

8.4.5 Fishery Observer Authority

Observer programs are important for obtaining accurate information on total catch, catch disposition and protected species interactions, and also for detailed biological data and samples that managers cannot expect fishers to collect. Catch disposition information importantly includes data on bycatch, for which observers are indispensable in most cases (section 8.4.4). Observers' observations can also be very useful to better understand how different gears are actually deployed and how practical and effective regulations actually are. Most FMPs provide observer placement authority for NMFS in the interest of obtaining more accurate and complete information about their fisheries. The Council and NMFS recognize, however, that observers may not be suitable for all vessels, that smaller vessels may not have accommodations for observers, and vessels that take extended trips are much more costly to observe. Therefore, it is incumbent on NMFS to develop an observer sampling plan that, in addition to the scientific objectives, also recognizes the different types of vessels and vessel capabilities in the various fisheries.

An observer program must include a sample design and cost analysis (including impacts on the vessels being sampled) for Council review and comment prior to implementing the program. The sampling design will include sampling rate, which is a function of the required sample size for determining take rates or amounts with a given precision. When a take amount is the result of infrequent events, as in certain protected species interactions, very large sampling of a fleet is needed for its precise estimation, and cost will be the determining factor for sample size.

Alternatives Considered

Alternative 1 (No Action): The FMP would not contain authority to establish observer programs for HMS fisheries.

If any observer programs are to be implemented, they would be done under other statutory authority or mandated through a subsequent management action by the Council. Decisions as to whether to continue existing observer programs or initiate new ones would be left to NMFS for the indefinite future.

Alternative 2 (Proposed Action): Authorizes NMFS to require that vessels carry observers when directed to do so by the NMFS Regional Administrator, and mandates observer programs initially for the longline, surface hook-and-line, small purse seine, and commercial passenger fishing vessel (CPFV) fisheries, with NMFS to complete initial observer sampling plans within six months of FMP implementation. NMFS is also to develop initial observer sampling programs for the private recreational fisheries at a later date. Rationale: Focuses initially on the fisheries inadequately or not monitored under federal authority (MMPA, ESA) in meeting the FMP goal of documenting and reviewing bycatch mortality and protected species interactions in the HMS fisheries.

The large- and small-mesh DGN fisheries already have MMPA-mandated observer programs, and the longline fishery has recently come under ESA mandate for observers. These programs will be reviewed by the HMS management team for adequacy in meeting the goals of this FMP (important if the sampling rates in the protected species programs are reduced).

Alternative 3: Authorizes NMFS to require that vessels carry observers when directed to do so by the NMFS Regional Administrator, but does not mandate any new observer programs.

This would recognize that observer coverage will likely be required to ensure reliable determinations of bycatch and bycatch mortality, but would leave the discretion to the NMFS Regional Administrator to develop sampling plans based on NMFS determinations of need and priorities and to place observers subject to availability of funds and/or resources.

8.4.6 Protected Species

Various federal laws provide protection for special resources, including those for protected species under ESA, MMPA, and MBTA. Interactions of HMS fishing gears with protected species are described in Chapter 6, section 6.3. This FMP authorizes the adoption of measures to minimize interactions of HMS gears with protected species and to implement recommendations contained in Biological Opinions (ESA), Take Reduction Plans (MMPA), Seabird Management Plans, or other relevant documents pertaining to HMS fisheries. The FMP also authorizes programs to collect information on interactions in any or all HMS fisheries.

Fishery-specific measures affecting protected species are included in the initial implementing alternatives for drift gillnet and longline fisheries (sections 8.5.1, 8.5.2). The effects and effectiveness of the proposed measures are evaluated in Chapter 9, section 9.2.5.1-3. Protected species interactions with the other gear types are not major issues (Chapter 6), and no alternatives were considered for those gears.

Alternatives Considered

Alternative 1 (No Action): Adopts no measures to specifically minimize interactions with protected species under the FMP. Protected species measures would continue to be promulgated by NMFS under separate processes (e.g., ESA, MMPA, etc.).

Alternative 2 (Proposed Action): Adopts a framework authorization for protected species conservation measures and implements initial conservation and management measures for drift gillnet and pelagic longline fisheries as described in section 8.5, Chapter 6 section 6.3, and Chapter 9 sections 9.2.5.1-2. Rationale: The FMP requires general provision for its proposed protected species measures and also for future measures to reduce the takes of protected species and to minimize the risk of adverse impacts from those takes. The framework provisions of the FMP would be used to address new protected species concerns as they are identified.

Both through the SAFE Report and through special reports from interested parties (which could include the USFWS or environmental organizations), the Council would be advised of new protected species concerns; would direct the plan team or others to investigate and recommend action; would determine if action is needed and, if it is viewed as a matter of substantial concern, would direct the completion of necessary documents to analyze the issues and evaluate alternatives; and would submit recommendations for corrective action to NMFS for consideration. If such an action were recommended by the Council and approved by NMFS, the action would be implemented by NMFS.

In fisheries where protected species takes are already being addressed, as by the Pacific Offshore Cetacean Take Reduction Team (POCTRT) for the drift gillnet fishery, any recommendations and supporting analyses, as by POCTRT, would be provided by NMFS to the Council for consideration. The Council would make recommendations as it deems appropriate to NMFS, which will make final decisions on whether to proceed with rulemaking under the MMPA or Magnuson-Stevens Act, as appropriate.

8.4.7 Prohibited Species

As indicated in Chapter 3 (section 3.1.3), certain species are proposed to be designated as "prohibited species" under the FMP, meaning that they cannot be retained, or can be retained only under specified conditions, by persons fishing for management unit species. Three species of shark, as well as Pacific halibut and Pacific salmon, are recommended for this designation. The designation of prohibited species could be changed using framework procedures.

Alternatives Considered

Alternative 1 (No Action): Prohibitions on retention of certain species would not be incorporated into this FMP.

Alternative 2 (Proposed Action): Prohibits retention of great white, basking and megamouth sharks (except for sale or donation of incidentally-caught specimens to recognized scientific and educational organizations). Also prohibits retention of Pacific halibut and salmon (except when caught with authorized gears during authorized seasons). Also adopts a framework authorization for changes in prohibited species designations. Rationale: Neither the populations of these rare or low productivity sharks nor the strict management of halibut and salmon should be compromised by HMS fisheries. The prohibited species status of halibut and salmon is also consistent with U.S. policy and other FMPs.

The great white shark's low productivity, its accessibility in certain localized areas, and its appeal to trophy hunters make it especially vulnerable to depletion. The species has been protected in the State of California since 1995; it may not be taken except for scientific and educational purposes under State permit. The sale (or donation) of incidentally-caught specimens, live or dead, to recognized scientific and educational organizations for research or display purposes would be allowed.

Megamouth sharks are extremely rare, though 4 have been taken in the drift gillnet fishery in recent years. Protection is recommended because of extreme rarity and uniqueness. Sale (donation) of incidentally caught specimens to recognized scientific and educational organizations for research or display purposes would be allowed.

Basking sharks occur in greatest numbers in the eastern Pacific in autumn and winter months. The fins are valuable in east Asian markets. This species is recommended for protection because it is thought to be among the least productive of shark species and thus highly vulnerable to depletion. The north Pacific stock is listed as endangered by the World Conservation Union (IUCN Red List of Threatened Species). The sale (donation) of incidentally-caught specimens, live or dead, to recognized scientific and educational organizations for research or display purposes would be allowed.

Pacific halibut and Pacific salmon, while not HMS, are important as incidental catch in some HMS fisheries and so are recommended to be prohibited to ensure they are not targeted by HMS fishers, unless with authorized gear during authorized seasons. The fisheries that target halibut and salmon are already overcapitalized. Further, some runs of salmon are listed as threatened or endangered.

8.4.8 Quotas or Harvest Guidelines

Background

A *quota* is a specified numerical harvest objective for a stock, the attainment (or expected attainment) of which causes the complete closure of the fishery or fisheries for that species. A *harvest guideline* is a numerical harvest level that is a general objective and is not a quota. Attainment of a harvest guideline does not require a management response, but it does prompt review of the fishery. This will include a Management Team meeting to evaluate the status of the stock and to make recommendations.

Factors involved in choosing between a quota or harvest guideline include:
- the status of the stock and the need to prevent overfishing or rebuild overfished stocks;
- effects on bycatch;
- impacts on fisheries;
- achievement of the FMP goals and objectives

- ability to monitor catches during the season;
- U.S. obligations under an international agreement.

Harvest guidelines can help prevent overfishing or localized depletion of vulnerable species, or can be used in implementing management decisions by international HMS management bodies. Allocation of guideline amounts among fisheries may be necessary (see following section).

As explained in Chapter 3, the proposed harvest guidelines for common thresher and shortfin mako sharks are based on a "local MSY" concept. The thresher shark harvest guideline is lower than the recommended harvest limit set in the tri-state fishery management plan for thresher shark. These two sharks are the only species with harvest guidelines thus far proposed.

Alternatives considered

Alternative 1 (No Action): Establishes no harvest guidelines or quotas for any HMS.

Alternative 2 (Proposed Action): Establishes harvest guidelines for selected shark species and authorizes establishment or modification of quotas or harvest guidelines under the framework provisions. Initial harvest guidelines are proposed for common thresher and shortfin mako sharks, set equal to an OY estimate specified as 0.75MSY. The MSY used is the local MSY (LMSY), as the stock-wide maximum sustainable harvests are not known.

The initial harvest guidelines are OY=0.75xLMSY, as follows:

common thresher	340 mt (round weight)
shortfin mako	150 mt (round weight).

Rationale: As vulnerable species in this FMP and with total catches and extent of stocks poorly known, management of these sharks under precautionary harvest guidelines is appropriate.

These harvest guidelines pertain only to the portion of the stocks that are vulnerable to capture by West Coast vessels as they now fish. They are particularly conservative as LMSY necessarily underestimates stock-wide MSY. The guidelines are catch benchmarks that warn of possible approach to the local sustainable maximum.

The HMS Management Team, at its annual meeting in May or June, will review the catches from the previous statistical year (April 1-March 31) and compare those catches with the established harvest guidelines; evaluate the status of the stocks; and develop recommendations for management measures, as appropriate. These management measures will be presented to the Council as part of the SAFE document at its June and/or September meetings to be reviewed and approved for public review. Final action on management measures would be scheduled for the Council's November meeting.

Alternative 3: Establishes quotas or harvest guidelines for additional species.

Presently, no additional species are proposed as needing Council imposed quotas or harvest guidelines.

8.4.9 Allocation

This FMP authorizes allocation of HMS quotas or harvest guidelines among U.S. West Coast-based HMS fisheries if necessary using the full rulemaking framework process. In addition to other requirements of the FMP, the Council will consider the following factors when adopting allocations of HMS among domestic fisheries:

- present participation in and dependence on the fishery, including alternative fisheries;
- historical fishing practices in, and historical dependence on, the fishery;

- economics of the fishery;
- agreements or negotiated settlements involving the affected participants;
- potential biological impacts on any species affected by the allocation;
- consistency with the Magnuson-Stevens Act National Standards;
- consistency with the goals and objectives of the FMP.

Alternatives Considered

Alternative 1 (No Action): The FMP would not establish quota or harvest guideline allocations to different fisheries or fishery sectors.

Alternative 2 (Proposed Action): The FMP would not establish initial quota allocations to different fisheries or fishery sectors, with the exception of a 'No Sale' of Striped Marlin Proposed Action described in section 8.5.4. This action allocates striped marlin for sport use only. Future allocations could be made using framework procedures. Rationale: There is no pressing need to establish allocations since no quotas are presently proposed. No compelling argument was raised for repealing the long-standing (California; since 1937) no-sale status of striped marlin and for establishing it as a commercial species on the West Coast.

Alternative 3: The FMP would make initial specific allocations among fisheries or fishing sectors, in addition to the striped marlin allocation.

8.4.10 Treaty Indian Fishing

Alternatives Considered

Alternative 1 (No Action): Neither the FMP nor the initial implementing regulations would contain explicit measures or procedures for accommodating treaty Indian fishing rights.

Alternative 2 (Proposed Action): Authorizes adoption of measures and procedures to accommodate treaty fishing rights in the initial implementing regulations for the FMP. Also authorize revisions to the initial regulations through regulatory amendments, without the need to amend the FMP. The initial implementing regulations would contain the measures and procedures specified below. Rationale: This action is a practical procedure for accommodating treaty fishing rights, without need of plan amendments for revisions.

Alternative 3: Includes specific provisions in the FMP describing the measures and procedures for accommodating treaty fishing rights. Any revision to the measures or the procedures would require an FMP amendment.

Initial Measures and Procedures

Under either Alternative 2 or Alternative 3, the initial measures and procedures for accommodating treaty fishing rights would be as follows:

(a) Pacific Coast treaty Indian tribes have treaty rights to harvest HMS in their usual and accustomed (u&a) fishing areas in U.S. waters.

(b) Pacific Coast treaty Indian tribes means the Hoh, Makah, and Quileute Indian Tribes and the Quinault Indian Nation.

(c) The NMFS recognizes the areas set forth below as marine u&a fishing grounds of the four Washington coastal tribes. The Makah u&a grounds were adjudicated in U.S. v. Washington, 626 F.Supp. 1405, 1466 (W.D. Wash. 1985), affirmed 730 F.2d 1314 (9^{th} Cir. 1984). The u&a grounds of the Quileute, Hoh, and Quinault tribes have been recognized administratively by NMFS. See, e.g., 64 Fed. Reg. 24087-24088 (May 5, 1999) (u&a grounds for groundfish); 50 C.F.R. 300.64(i) (u&a

grounds for halibut). The u&a grounds recognized by NMFS may be revised as ordered by a federal court.

(d) Procedures. The rights referred to in paragraph (a) will be implemented by the Secretary of Commerce, after consideration of the tribal request, the recommendation of the Council, and the comments of the public. The rights will be implemented either through an allocation of fish that will be managed by the tribes, or through regulations that will apply specifically to the tribal fisheries. An allocation or a regulation specific to the tribes shall be initiated by a written request from a Pacific Coast treaty Indian tribe to the NMFS Northwest Regional Administrator, at least 120 days prior to the time the allocation is desired to be effective, and will be subject to public review through the Council process. The Secretary recognizes the sovereign status and co-manager role of Indian tribes over shared Federal and tribal fishery resources. Accordingly, the Secretary will develop tribal allocations and regulations in consultation with the affected tribe(s) and, insofar as possible, with tribal consensus.

(e) Identification. A valid treaty Indian identification card issued pursuant to 25 CFR Part 249, Subpart A, is prima facie evidence that the holder is a member of the Pacific Coast treaty Indian tribe named on the card.

(f) Fishing (on a tribal allocation or under a federal regulation applicable to tribal fisheries) by a member of a Pacific Coast treaty Indian tribe within that tribe's usual and accustomed fishing area is not subject to provisions of the HMS regulations applicable to non-treaty fisheries.

(g) Any member of a Pacific Coast treaty Indian tribe must comply with any applicable federal and tribal laws and regulations, when participating in a tribal HMS fishery implemented under paragraph (d) above.

(h) Fishing by a member of a Pacific Coast treaty Indian tribe outside that tribe's usual and accustomed fishing area, or for a species of HMS not covered by a treaty allocation or applicable federal regulation, is subject to the HMS regulations applicable to non-treaty fisheries.

8.4.11 Procedures for Reviewing State Regulations

Any state may propose that the Council review a particular state regulation for the purpose of determining its consistency with the FMP and the need for complementary federal regulations. Although this procedure is directed at the review of new regulations, existing regulations affecting the harvest of highly migratory species managed by the FMP may also be reviewed under this process. The state making the proposal will include a summary of the regulation in question and concise arguments in support of consistency.

Upon receipt of a state's proposal, the Council may make an initial determination whether or not to proceed with the review. If the Council determines that the proposal has insufficient merit or little likelihood of being found consistent, it may terminate the process immediately and inform the petitioning state in writing of the reasons for its rejection.

If the Council determines sufficient merit exists to proceed with a determination, it will review the state's documentation or prepare an analysis considering, if relevant, the following factors:

- How the proposal furthers, or is not otherwise consistent with, the objectives of the FMP, the Magnuson-Stevens Act, and other applicable law
- Likely effect on or interaction with any other regulations in force for the fisheries in the area concerned
- Expected impacts on the species or species group taken in the fishery sector being affected by the regulation
- Economic impacts of the regulation, including changes in catch, effort, revenue, fishing costs, participation, and income to different sectors being regulated as well as to sectors that might be indirectly affected.

- Any impacts in terms of achievement of harvest guidelines or harvest quotas, maintaining year-round fisheries, maintaining stability in fisheries, prices to consumers, improved product quality, discards, joint venture operations, gear conflicts, enforcement, data collection, or other factors.

The Council will inform the public of the proposal and supporting analysis and invite public comments before and at the next scheduled Council meeting. At its next scheduled meeting, the Council will consider public testimony, public comment, advisory reports, and any further state comments or reports, and determine whether or not the state regulation is consistent with the FMP and whether or not to recommend implementation of complementary federal regulations or to endorse state regulations as consistent with the FMP without additional federal regulations.

If the Council recommends the implementation of complementary federal regulations, it will forward its recommendation with the proposed rule and rationale to the NMFS Regional Administrator for review and approval. The NMFS Regional Administrator will publish the proposed regulation in the *Federal Register* for public comment, after which, if approved, he/she will publish final regulations as soon as practicable. If the Regional Administrator disapproves the proposed regulations, he/she will inform the Council in writing of the reasons for disapproval.

8.4.12 Exempted Fishing

Background

Existing Federal Procedures. Exempted fishing is defined to be fishing practices that are new to a fishery and not otherwise allowed under an FMP. The NMFS Regional Administrator, using Federal EFP (Exempted Fishing Permit) procedures, may authorize the targeted or incidental harvest of HMS for experimental or exploratory fishing that would otherwise be prohibited. Applicants must submit their application package at least 60 days before the desired effective date of the EFP, provide a statement of purpose and goals of the EFP activity, the species (target and incidental) expected to be harvested, arrangements for disposition of all regulated species and any anticipated impacts on marine mammals or endangered species, and provide the times and places fishing will take place and the type, size and amount of gear to be used. There are no specific requirements. The Administrator may restrict the number of experimental permits by total catch, time, area, bycatch, incidental catch or protected species takes. The NMFS Regional Administrator may require any level of industry-funded observer coverage for these experimental permits.

Exempted fisheries are expected to be of limited size and duration and must be authorized by an EFP issued for the participating vessel in accordance with the criteria and procedures specified in 50 CFR §600.745. The duration of EFPs will ordinarily not exceed one year. Permits will not be renewed automatically. An application must be submitted to the Regional Administrator for each year. A fee sufficient to cover administrative expenses may be charged for EFPs. An applicant for an EFP need not be the owner or operator of the vessel(s) for which the EFP is requested as long as the proposed activity is compatible with limited entry and other management measures in the FMP.

The Regional Administrator or Director may attach terms and conditions to the EFP consistent with the purpose of the exempted fishing, including, but not limited to:

(a) The maximum amount of each regulated species that can be harvested and landed during the term of the EFP, including trip limitations, where appropriate.

(b) The number, size(s), name(s), and identification number(s) of the vessel(s) authorized to conduct fishing activities under the EFP.

(c) The time(s) and place(s) where exempted fishing may be conducted.

(d) The type, size, and amount of gear that may be used by each vessel operated under the EFP.

(e) The condition that observers, a vessel monitoring system, or other electronic equipment be carried on board vessels operated under an EFP, and any necessary conditions, such as pre-deployment notification requirements.

(f) Reasonable data reporting requirements.

(g) Other conditions as may be necessary to assure compliance with the purposes of the EFP, consistent with the objectives of the FMP and other applicable law.

(h) Provisions for public release of data obtained under the EFP that are consistent with NOAA confidentiality of statistics procedures at set out in subpart E. An applicant may be required to waive the right to confidentiality of information gathered while conducting exempted fishing as a condition of an EFP.

<u>Proposed Additional FMP Requirements for an Exempted Fishing Permit</u>. This FMP places additional requirements for authorizing an EFP for targeting HMS species. An EFP proposal will be required to follow a specific Council protocol and be reviewed by the Council prior to application to NMFS. The intent of the protocol is to ensure the Council has adequate information on all aspects of the proposed fishery and has adequate time to consider, review and formulate recommendations. This protocol will be available from the Council. It will require additional detailed information and analysis beyond those specifically required for an NMFS EFP. The protocol will specify timing for submissions and timing for Council review.

This FMP authorizes mandatory data reporting and mandatory on-board observers for vessels with exempted fishing permits (Chapter 9, section 9.2.4.6). Installation of vessel monitoring units (VMS) aboard vessels with exempted fishing permits may be also required.

Alternatives Considered

Alternative 1 (No Action): The FMP would not specify any general or specific EFP processes for any HMS fishery. NMFS regulations at 50 CFR §600.745 would be available to issue EFPs pursuant to the procedures and criteria in that section.

Alternative 2 (Proposed Action): The FMP would require that applicants submit for Council review and approval an initial EFP plan prior to formal application to NMFS, following a specific Council supplied EFP protocol, which is to be developed by the HMS Management Team. The specific protocol will be available from the Council as a Council Operating Procedure. The protocol will include, but not be limited to, the following elements:

schedule and procedure for submitting EFP applications;
format for applications;
qualification criteria for applicants;
Council internal review procedures;
relevant laws and regulations that must be followed.

<u>Rationale</u>: To serve its constituents, the Council needs a formal process through which it can review and make recommendations on the EFP applications to NMFS.

The Council will review, comment, and make recommendations on the plan and may require changes or request additional information. The final EFP plan and Council recommendations will then be provided by the applicant to NMFS for action. An example of a fishery-specific proposal is shown in Chapter 9 section 9.2.5.2.1 under "Example of Exempted Longline Fishery Permit with Experimental Design." NMFS review and any subsequent issuance of an EFP would then proceed according to regulations specified in Code of Federal Regulations (50 CFR §600.745) pursuant to the procedures and criteria in that section.

8.4.13 Temporary Adjustments due to Weather

The Council will consider and may provide, after consultation with the U.S. Coast Guard and persons utilizing the fishery, temporary adjustments for access to the fishery by vessels otherwise prevented from harvesting because of weather or other ocean conditions affecting the safety of the vessels, except that the adjustment shall not adversely affect conservation efforts in other fisheries or discriminate among participants in the affected fishery. No adjustments due to weather are proposed at this time as the Council has no information from fishery participants or others to indicate that particular accommodations are needed to provide reasonable opportunity to harvest HMS. There are no quotas or allocations that could not be harvested due to poor weather.

8.4.14 Safety of Life at Sea

National Standard 10 (NS-10) requires that conservation and management measures shall, to the extent practicable, promote the safety of human life at sea. The substantive requirements of NS-10 are fulfilled by Council, NMFS, USCG, and fishing industry consultation on the nature and extent of any adverse effects that proposed management measures may have on safety of human life at sea. The purpose of consultation is to identify and mitigate, to the extent practicable, any adverse effects. 50 C.F.R. §600.355, which implements NS-10, provides lists of safety considerations and mitigation measures that could be considered. To fulfill NS-10, the Council will utilize existing Council and Council subgroup meeting procedures, and the framework provisions of the FMP. Except for automatic actions such as quota closures, the framework provisions require public comment and Council action before management actions are implemented. Safety and weather issues can be considered during the Council process. The USCG has a Council representative who regularly comments on proposed management measures. In addition, the USCG participates on the Council's Enforcement Consultants Committee, which is another forum for considering safety and weather issues. The HMS Management Team and Advisory Subpanel also hold public meetings where safety and weather concerns can be raised and addressed. Mitigation measures may be incorporated into pre-season and in-season actions under the framework procedures.

A NMFS regulation at 50 CFR 600.745 applies to any fishing vessel required to carry an observer as part of a mandatory observer program or carrying an observer as part of a voluntary observer program under the Magnuson-Stevens Act, MMPA (16 U.S.C. 1361 et seq.), the South Pacific Tuna Act of 1988 (16 U.S.C. 973 et seq.), or any other U.S. law. Observers may not depart on a fishing trip aboard a vessel that does not comply with United States Coast Guard safety requirements or that does not display a current commercial fishing vessel safety examination decal. All vessels required to carry an observer must meet Coast Guard safety requirements and display a current safety decal (issued within the previous two years). Vessels not meeting these requirements are deemed unsafe for purposes of carrying an observer and must correct deficiencies before departing port. The vessel owner or operator must also allow an observer to visually inspect any safety or accommodation requirement if requested. Observers are required to complete a pre-trip safety check of the emergency equipment and are encouraged to review emergency instructions with the operator before the vessel departs port.

8.5 Initial Conservation and Management Measures of the FMP

This section describes the initial specific management measures (i.e., alternatives) proposed by the Council to be implemented when the plan is adopted. The adopted measures may be modified in the future, or new regulations may be implemented, using framework adjustment procedures in the FMP. These measures would stay in effect until revised or removed by specific action.

The proposed measures or alternatives are described below specifically for the drift gillnet, longline, and purse seine fisheries only, because of the measures that would affect how those particular fisheries are conducted. On the other hand, the measures proposed for hook-and-line, harpoon, and recreational fisheries are largely administrative in nature, having to do with permits and logbooks that do not directly affect fishing operations. Management of recreational fishing, moreover, is essentially deferred to the states in this FMP, reflecting the mainly localized nature of sportfishing issues and values that are best addressed at that level. Although this

FMP does have a proposed catch-and-release measure for the recreational fishery that could affect fishing practices, that program would be voluntary.

8.5.1 Drift Gillnet Fishery Management Measures

Background

The drift gillnet fishery for swordfish and shark (14" minimum mesh size) is managed under numerous complex and detailed federal and state regulations to protect the populations fished as well as the protected species incidentally taken. These regulations are described in Appendixes B and C, the latter being the California code for fishing swordfish and shark with minimum stretched mesh of 14 inches required. Briefly, the regulations (for ≥14" stretched mesh only) drift gillnets are as follows:

Federal Regulations

Take Reduction Team (POCTRT) measures to protect marine mammals:

- Acoustic deterrent devices (pingers) are required on drift gillnets to deter entanglement of marine mammals.
- All drift gillnets must be fished at minimum depth below the surface of 6 fm (10.9 m).
- Skipper workshops may be required.
- Vessels must provide accommodations for observers when assigned.

Federal Turtle Conservation Closed Areas:

- Drift gillnet fishing may not be conducted:.
  - In the portion of the EEZ bounded by the coordinates 36° 18.5' N latitude (Point Sur), to 34°27' N latitude, 123°35' W longitude (off CA); then to 129°W longitude; then north to 45° N latitude (off OR); then east to the point where 45° N latitude meets land (OR), through year 2003 from August 15 to November 15 (see map, Chapter 9 Figure 9-1);
  - In the portion of the EEZ south of Point Conception, California (34°27' N latitude) and west to 120° W longitude from August 15 to August 31 and again from January 1 through January 31 during a forecasted or occurring El Niño, as announced by NMFS[1].

State Restrictions (applicable to vessels operating from the state's ports)

Participation restrictions:

- The California and Oregon limited entry programs for the swordfish/shark drift gillnet fisheries.

Gear restrictions (California):

- The maximum cumulative length of a shark or swordfish gill net(s) on the net reel of a vessel, on the dock of the vessel, and/or in the water at any time shall not exceed 6,000 ft in float line length, except that up to 250 fm of spare net (in separate panels not to exceed 100 fm) may be on board the vessel stowed in lockers, wells, or other storage.
- The use of quick disconnect devices to attach net panels is prohibited.
- Drift gillnets must be at least 14 inch stretch mesh.
- The unattached portion of a net must be marked by a pole with a radar reflector.

Mainland area restrictions/closures:

- Drift gillnets cannot be used:
  - In the EEZ off California from February 1 to April 30.
  - In the portion of the EEZ off California within 75 nm of the coastline from May 1 to August 14.

[1] As of June 2003, a rule to modify the El Niño closure is being finalized. It proposes instead to prohibit fishing during the months of June, July, and August, which NMFS has concluded offers more protection for loggerheads while having less impact on the fishery than a closure in January and August.

- In the portion of the EEZ off California within 25 nm of the coastline from Dec. 15 through Jan. 31.
- In the portion of the EEZ bounded by a direct line connecting Dana Point; Church Rock on Catalina Island; and Point La Jolla, San Diego County; and the inner boundary of the EEZ from August 15 through September 30 each year.
- In the portion of the EEZ within 12 nm from the nearest point on the mainland shore north to the Oregon border from a line extending due west from Point Arguello.
- East of a line running from Point Reyes to Noonday Rock to the westernmost point of southeast Farallon Island to Pillar Point.
- In the portion of the EEZ within 75 nm of the Oregon shoreline from May 1 through August 14, and within 1000 fm the remainder of the year.
- Off Washington (Washington does not authorize this HMS gear).

Channel Islands (California) closures:

- Drift gillnets cannot be used:
  - In the portion of the EEZ within six nm westerly, northerly, and easterly of the shoreline of San Miguel Island between a line extending six nm west magnetically from Point Bennett and a line extending six nm east magnetically from Cardwell Point and within six nm westerly, northerly, and easterly of the shoreline of Santa Rosa Island between a line extending six nm west magnetically from Sandy Point and a line extending six nm east magnetically from Skunk Point, from May 1 through July 31 each year.
  - In the portion of the EEZ within 10 nm westerly, southerly, and easterly of the shoreline of San Miguel Island between a line extending 10 nm west magnetically from Point Bennett and a line extending 10 nm east magnetically from Cardwell Point and within 10 nm westerly, southerly, and easterly of the shoreline of Santa Rosa Island between a line extending 10 nm west magnetically from Sandy Point and a line extending 10 nm east magnetically from Skunk Point from May 1 through July 31 each year.
  - In the portion of the EEZ within a radius of 10 nm of the west end of San Nicolas Island from May 1 through July 31 each year.
  - In the portion of the EEZ within six of the coastline on the northerly and easterly side of San Clemente Island, lying between a line extending six nm west magnetically from the extreme northerly end of San Clemente Island to a line extending six nm east magnetically from Pyramid Head from August 15 through September 30 each year.

The federal Turtle Conservation Closed Areas are based on recommendation from the Pacific Offshore Cetacean Take Reduction Team (POCTRT or TRT), which was modified by NMFS after considering fishery observer data and recent satellite telemetry tracking data obtained from two leatherback sea turtles that were tagged in Monterey Bay in September 2000; and on existing state restrictions that regulate drift gillnet gear and regulate drift gillnet use in certain times or places. In an effort to minimize the economic impact of the time and area closures, the above "modified" TRT recommendation was developed to provide access to the productive fishing grounds north of Point Conception, which is consistent with the intent of the TRT proposal, while still providing at least an equal, if not greater, level of protection for leatherback and loggerhead sea turtles. In addition, the modified TRT recommendation does not include the lowering of the net to at least 60 feet as recommended by the TRT because observer data (1990-2000) do not suggest that the lengthening of extenders to 60 ft would result in a definite decrease in leatherback interactions. The original *trigger* language identified by the TRT to extend the area closure in a southerly direction to Point Conception if a leatherback was observed was also removed because NMFS did not consider this extra precaution to be necessary based on the distribution of the turtles. Although the TRT recommended 36°15' N latitude as the southern boundary of the closed area, Point Sur was set as the southern boundary because it is a more recognizable landmark and only three miles north of 36° 15' N latitude. The diagonal line from Point Sur to 34° 27' N latitude, 123° 35' W longitude was developed by plotting the satellite tracking data of two leatherback turtles, keeping the southernmost turtle trajectory north of the diagonal line. The reason for this precaution is to protect a potential migratory corridor of leatherbacks departing Monterey Bay for western Pacific nesting beaches. NMFS hopes to learn more about this migratory corridor through additional satellite tag attachments on turtles leaving Monterey Bay, in order to minimize the impact of commercial fisheries on leatherbacks.

Alternatives Considered

The following drift gillnet (DGN) alternatives refer to driftnets with mesh size ≥14 inches stretched mesh. A separate alternative for allowing or not drift gillnets with smaller mesh size is described in section 8.4.1.

Alternative 1 (No Action): Continues the swordfish/shark drift gillnet fishery regulations under current authorities.

Under this alternative, regulatory authority would continue under existing state and federal authorities. There would be no new federal regulations for this fishery implemented under the FMP. Federal regulations under MMPA and ESA authority would remain in effect, as would all state regulations. This would include the states' definitions of legal gear and their respective time/area restrictions. Drift gillnet is not a legal gear for Washington residents or anyone who is licensed by that state; Oregon vessels cannot fish within 75 nm May 1 through Aug 14 and inside 1000 fm the remainder of the year; and California has many closures for its vessels. These are listed under *Background* above. The states' requirements regarding gear configuration also would continue to apply as would state limited entry programs.

The FMP would explicitly state that federal regulations under the MMPA and ESA are to remain in place and that future federal regulations would be issued under those authorities; and that state regulations are to remain in place and future state regulations would be issued under state authority. The FMP would be explicit that the states' closures and other restrictions are consistent with the goals and objectives of the FMP, but without commitment that future changes in states' regulations would be found consistent.

Alternative 2 (Proposed Action): Endorses or adopts in the FMP all federal conservation and management measures in place under the MMPA and ESA; adopts all state regulations for swordfish/shark drift gillnet fishing under Magnuson-Stevens authority except limited entry programs (which will remain under states' authority); modifies an OR closure inside 1000 fm (or way point equivalent) to be in effect year round; closes EEZ waters off WA to all drift gillnet fishers; and continues the current turtle protection closure north of Point Sur, CA to 45° N latitude (August 15 to November 15), and south of Pt. Conception to 120° W longitude during a forecasted or occurring El Niño event (August and January). **Note:** NMFS had issued a proposed and interim final rule to implement this January and August 15-31 El Niño closure stemming from the October 2000 Biological Opinion, but a modified rule is now being finalized, which would change the closure months to June, July and August. NMFS has concluded that this modified closure offers more protection for loggerheads during El Niño periods, while having less impact on the fishery than the former closure in January and August. An analysis for this alternate closure will be included in the final rule. This final rule will likely be published by the time NMFS issues the proposed regulations to implement this FMP and therefore the FMP regulations should reflect this modified closure. It would prohibit fishing with drift gillnets in the CA/OR thresher shark/swordfish drift gillnet fishery in U.S. waters off southern California east of 120° W longitude, for the months of June, July, and August, when El Niño conditions are forecasted or present off southern California. Rationale: Existing federal and state regulations, including current states' drift gillnet time-area closures and gear restrictions (except for an Oregon spring-summer closure) were deemed appropriate for adopting intact. However, the Council concluded it was premature to federalize the states' limited entry programs, with its increase in federal costs and administrative burdens. Closures off Washington and Oregon are intended to protect the common thresher shark, sea turtles and marine mammals.

This alternative modifies the current state regulations to prohibit, year round, drift gillnet fishing for swordfish and sharks in EEZ waters off OR east of a line approximating the 1000 fm curve (deleting the May-August prohibition within 75 nm) and prohibits HMS DGN fishing in all EEZ waters off WA. The state of Washington currently does not allow the use of drift gillnet gear and Oregon does not allow drift gillnets to target thresher shark, although DGN vessels have fished off both states and landed their catch in California.

Alternative 3: Endorses or adopts only existing federal (MMPA, ESA) drift gillnet regulations into FMP.

Future changes in these fishery regulations would be handled under the Council framework process. The FMP would explicitly state that the states' closures and other restrictions are consistent with the goals and objectives of the FMP, but without commitment that future changes in states' regulations would be found consistent.

Alternative 4: Endorses or adopts in the FMP all federal conservation and management measures in place under the MMPA and ESA, and adopts state regulations under MSFCMA authority, *but also includes and federalizes the states' limited entry programs.*

This alternative is the federalized version of the status quo (Alternative 1). Regulations would apply to all drift gillnet fishers.

Alternative 5: As in Alternative 8, *but substitutes the time/area closures of the Biological Opinion (BO) on issuance of the 101(a) (5) (E) permit under the MMPA for the current turtle conservation closed areas now in place (see section 8.5.1).*

The time/area closures of the BO would be substituted for the present federal Turtle Conservation Closed Areas described above under *Background.* It would close an area to drift gillnets from Point Conception, California (34° 27' N latitude) north to 45° N latitude, and west to 129° W longitude from August 15 to October 31, and close an area to drift gillnets south of Point Conception, California (34° 27' N latitude) and west to 120° W longitude from August 15 to August 31 and again from January 1 through January 31 during a forecasted or occurring El Niño event. The 101(a)(5)(E) permit requiring the above time/area closures specified in the BO is effective for a period of three years only. After the permit expires, the Council would consider the circumstances (such as whether the permit is extended or amended) and might develop a regulatory amendment to revise or abolish the closures, if appropriate.

Alternative 6: As in Alternative 8, *but additionally drift gillnets could not be used to take swordfish and sharks in any exclusive economic zone (EEZ) waters less than 1000 fm off Oregon and Washington to protect large adult thresher sharks and where there are bycatch and protected species concerns.*

Currently, Oregon drift gillnetters can only fish beyond 75 nm from May1-Aug14, and outside the 1000 fm curve the rest of the year. The state of WA currently does not allow the use of drift gillnet gear and OR does not allow drift gillnets to target thresher shark, although in the past, DGN vessels have fished off both states and landed their catch in California.

Alternative 7: As in Alternative 8, *but additionally, for shark protection and to address bycatch and protected species concerns, drift gillnets could not be used to take swordfish and sharks in any exclusive economic zone (EEZ) waters north of 45° N latitude year round*, including times when the northern turtle closure is not in effect (Nov 16 to Aug 14).

Currently, Oregon drift gillnetters can only fish beyond 75 nm from May1-Aug14, and outside the 1000 fm curve the rest of the year. The state of WA currently does not allow the use of drift gillnet gear and OR does not allow drift gillnets to target thresher shark, although DGN vessels have fished off both states and landed their catch in California.

Alternative 8: Like Alternative 2, continues limited entry under states' authority, adopts or endorses federal and state regulations, *but does not modify any existing Oregon area closures.*

Drift gillnetting would be prohibited inside 75 nm off Oregon from May 1 to August 14 and inside the 1000 fm curve the rest of the year, and EEZ waters off Washington would be closed year round to all, including Oregon- and California-based DGN fishers.

8.5.2 Pelagic Longline Fishery Management Measures

Alternatives considered

The pelagic longline alternatives differ according to their application inside or outside the EEZ.

Inside the EEZ:

Alternative 1 (No Action): Current state measures would remain in place under states' authorities and there would be no new federal regulations governing longline use in the EEZ.

Alternative 2 (Proposed Action): Establishes a general prohibition on the use of pelagic longline gear in the EEZ (see also Legal Gear Alternative 3 section 8.4.1 and Chapter 9 section 9.2.4.1, with reference to prohibition of longline gear inside the EEZ). Rationale: Avoids/prevents potential bycatch, protected species, and fishery competition problems by continuing the de facto longline prohibition throughout the EEZ.

Proposals for research or exempted fishing permit (EFP) use of longline gear under this prohibition would be evaluated when the proposals are submitted, the latter according to EFP guidelines developed by the HMS management team (see section 8.4.12, Exempted Fishing, Alternative 2).

Alternative 3: Prohibits longlining within the West Coast EEZ by indefinite moratorium, with the potential for re-evaluation by the Council following completion of a bycatch reduction research program with pre-established strict protocols. Must prove negligible impact on protected and bycatch species.

The intent is to: 1) explicitly prohibit use of pelagic longlines within the EEZ until a determination is made that longline gear should be allowed; 2) establish a bycatch reduction research program with clearly defined goals and objectives that will guide the exempted fishing permit (EFP) evaluation process. The research priorities and evaluation criteria should be developed through a transparent process involving all interested stakeholders (NMFS, Plan Team, SSC, conservation community, and recreational and commercial fishers) and include publication in the Federal Register. Following completion of the research program protocol, NMFS would only permit requests meeting all protocol criteria.

This alternative maximizes bycatch protection for fish and protected species in the EEZ by preventing increase of takes with a longline moratorium that would be lifted only if the research program demonstrates that the longline gear or methods to be used would have *negligible impact* on those species.

Alternative 4: Authorizes a limited entry pelagic longline fishery for tunas and swordfish within the EEZ, with effort and area restrictions, to evaluate longline gear as an alternative to drift gillnet gear to reduce bycatch or bycatch mortality and protected species interactions (limited entry to be addressed in a separate plan amendment).

This alternative would:

- Limit initial longline fishing effort to a maximum of 10 drift gillnet permitted vessels (10 vessels to be determined through plan amendment/limited entry process), and restrict the use of drift gillnet by those vessels (can use either longline or drift gillnet, but not both, during a one-year period);
- Prohibit fishing with longline north of Pt. Conception within 25 miles of shore and, south of Pt. Conception, east of a line from Pt. Conception to the western tip of San Miguel Is., to the northwest tip of San Nicholas Is., to the intersection of longitude 118°00'00" W with the southern boundary of the U.S. EEZ (Chapter 9 Fig. 9-2);
- Institute monitoring and reporting requirements to document longline effort, harvest, bycatch, and bycatch mortality levels;

- Evaluate the performance of the longline fishery as part of the SAFE process, and adjust longline effort up or down, or enact other restrictions or regulations as appropriate, through framework rule-making procedures.

This alternative proposes a controlled fishery trial to determine if longline fishing is a feasible gear-switch alternative to drift gillnet fishing, in terms of overall bycatch reduction and the economic practicality of such fishing.

Alternative 5: Prohibits longlining within the West Coast U.S. EEZ with the potential for re-evaluation by the Council following completion of a tuna-swordfish-bycatch research experiment carried out under a qualified EFP to determine if longline gear can be fished in ways that produce bycatch and protected species interaction levels that are significantly less than by drift gillnets (α=0.05).

This alternative prevents additional bycatch in the U.S. EEZ from longline fishing while seeking, through a scientific gear/methods/bycatch mitigation study, methods that are sufficiently safe to allow shifting a limited amount of effort from drift gillnet to longline fishing. The gear experiments are to be conducted in the context of fishing tunas and swordfish. An example of such a study is given in the analysis of this alternative in Chapter 9, section 9.2.5.2.1.

Outside the EEZ:

Alternative 1 (No Action): No action (status quo).

States' regulations would apply to longline fishing and landings and federal regulations may be developed under other authorities. Vessels would have to obtain HSFCA permits and file HSFCA logbooks, as is now the case.

Alternative 2 (Proposed Action): Under this alternative, all of the restrictions applied to Hawaii-based longline vessels would also apply to West Coast-based longline vessels when fishing west of 150° W longitude. However, West Coast-based longline vessels fishing east of 150° W longitude would only be subject to *selected* restrictions. This would allow West Coast-based vessels to target swordfish east of that line (except for a partial closure in April and May - see control No. 4 under Alternative 3 below). Restrictions adopted are for controlling sea turtle and seabird interactions and for monitoring the fishery. It is recognized that a Section 7 consultation under the ESA will be conducted and may result in recommendations for additional measures to protect sea turtles in the future. The Council will then evaluate the benefits and costs of alternate ways to achieve the protection needed pursuant to the ESA. Rationale: A viable West Coast fishery for swordfish could continue net national and regional benefits, if such fishing can be non-harmful to protected and other non-targeted species.

The Western Pacific-based longline measures that would initially apply to vessels fishing east of 150° W longitude would be Nos. 1, 4, 8 and 9 listed under Alternative 3 below, including measures for avoidance, release and handling of turtles and seabirds, as well as the requirements for attending protected species workshops and for vessel monitoring systems. The measures that would not apply to these vessels would be Nos. 2, 3, 5, 6 and 7, which pertain to gear and techniques associated with the targeting of swordfish.

Alternative 3: Applies to West Coast-based longline vessels all conservation and management measures applied to Hawaii-based longline vessels to control sea turtle and seabird interactions and to monitor the fishery. Future measures are to be developed by PFMC in cooperation with other regions/councils.

Under this alternative, longline vessels operating on the high seas outside the EEZ would be subject to the same controls that apply to Hawaii-based longline fishing vessels holding longline permits. These are as follows:

1. Line clippers, dip nets, and bolt cutters meeting NMFS' specifications must be carried aboard each vessel for releasing turtles (specifications vary by vessel size);
2. A vessel may not use longline gear to fish for or target swordfish (*Xiphias gladius)* north of the equator (0° latitude); landing or possession of more than 10 swordfish per trip is prohibited.
3. The length of each float line possessed and used to suspend the main longline beneath a float must be longer than 20 m (65.6 ft or 10.9 fm).
4. From April 1 through May 31, a vessel may not use longline gear in waters bounded by 0° latitude and 15° N latitude, and 145° W longitude and 180° W longitude;
5. No light stick (any light emitting device for attaching underwater to the longline gear) may be possessed on board a vessel;
6. When a longline is deployed, no fewer than 15 branch lines may be set between any two floats (10 branch lines if using basket gear);
7. Longline gear must be deployed such that the deepest point of the main longline between any two floats, i.e., the deepest point in each sag of the main line, is at a depth greater than 100 m (328.1 ft or 54.6 fm) below the sea surface;
8. While fishing for management unit species north of 23° N latitude, a vessel must:
   - 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;
   - Use completely thawed bait to fish for Pacific pelagic management unit species;
   - Use only bait that is dyed blue of an intensity level specified by a color quality control card issued by NMFS;
   - Retain sufficient quantities of offal for the purpose of discharging the offal strategically in an appropriate manner;
   - Remove all hooks from offal prior to discharging the offal;
   - Discharge fish, fish parts (i.e., offal), 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;
   - Use a line-setting machine or line-shooter to set the main longline (unless using basket gear);
   - Attach a weight of at least 45 g to each branch line within 1 m of the hook; and
   - 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.
9. Other measures[2] for the proper release and handling of turtles and seabirds, the requirement for vessel operators to attend a protected species workshop each year, and the requirement for Vessel Monitoring Systems (VMS). VMS is required because the proposed action involves area-specific regulations.

<u>8.5.3 Purse Seine Fishery Management Measures</u>

These measures pertain to the small purse seine vessels (< 364 mt carrying capacity) fishing HMS.

Alternatives considered

Alternative 1 (No Action): Adopts no new federal regulations.

State area closures would remain in effect under states' authorities. The FMP would state explicitly that the states' closures are consistent with the goals and objectives of the FMP, but there would be no commitment for future determinations finding future changes in states' regulations to be consistent with the FMP.

Alternative 2 (Proposed Action): Opens the entire EEZ to purse seine fishing. <u>Rationale</u>: With few data to suggest any potential harmful bycatch or gear conflicts, this action would provide additional opportunity for

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[2] Full description of all applicable measures are in 50 CFR Part 660: *Federal Register* 12/10/01 vol. 66 No. 237, p. 63630-32 (turtles) and 5/14/02 vol. 67 No. 93, p. 34408-13 (seabirds).

purse seiners to fish for bluefin tuna in those years when they travel in fishable schools off Oregon and Washington, and could raise a potential for purse seining for albacore in the northwest portion of the EEZ.

Purse seine fishers targeting HMS from any state could fish anywhere in the EEZ, although there has been little interest in such fishing off Oregon and Washington.

Alternative 3: Closes the area within the EEZ north of 45° N latitude to purse seine fishing to address bycatch and protected species concerns, and possible adverse impacts on other fisheries.

Purse seines are presently not authorized by Washington, mainly because of concern for salmon and shark bycatch and for potential interactions with protected species; thus this alternative extends that protection south of the OR-WA border to 45° N latitude, with compliance to be required of all West Coast fishers. Some species of salmon are listed as threatened or endangered. Since purse seine fishing for HMS has only rarely been practiced in these waters in the past, this precautionary action would effectively maintain the status quo.

Alternative 4: Closes the EEZ off Washington to purse seine fishing, but allows it off Oregon and California.

All (not just WA) fishers would be prohibited from purse seine fishing off Washington.

8.5.4 Prohibit Sale of Certain Species (No-sale Marlin Provision)

Alternatives considered

Alternative 1 (No Action): The sale of striped marlin would not be prohibited by federal regulation in this FMP, but would continue to be prohibited by the state of California.

Alternative 2 (Proposed Action): Prohibits the sale of striped marlin by vessels under PFMC jurisdiction. Rationale: Greater regional and national net benefits are obtained from continuing coast-wide under federal authority the long standing, traditional policy (California) of reserving this species for sport use only.

Striped marlin is considered to have far greater value as a recreational rather than commercial target species, and is only available seasonally. Prohibiting its sale removes the incentive for its taking by commercial fishers.

8.5.5 Permits

Permits are a standard tool used in virtually all fishery management plans to support management by:

- enhancing or facilitating collection of biological, economic or social data.
- facilitating enforcement of laws and regulations.
- identifying those who would be affected by actions to prevent or reduce excess capacity in the fishery.
- providing information to meet international obligations.

A special kind of permit is for limited entry into a fishery. However, no limited entry systems are proposed at this time. Implementation of a limited entry program would require a plan amendment. The Council adopted a control date of March 9, 2000 for commercial and charter fisheries for HMS, in anticipation that a limited access program may be needed in the future.

Alternatives Considered

Commercial Permits

Alternative 1 (No Action): Requires no new federal permits. Federal permits under other laws (e.g., HSFCA) would remain in place, as would state permit requirements.

Alternative 2 (Proposed Action): Requires a federal permit for HMS vessels with a specific endorsement for each gear type (harpoon, drift gillnet, surface hook and line, purse seine, and pelagic longline). The permit is to be issued to a vessel owner for each specific fishing vessel used in commercial HMS fishing. Rationale: This action is a practical procedure for tracking and controlling, by permits, commercial HMS fishing activities and the effects of regulations on those activities.

Regulations implementing the FMP would establish the permitting system and set the terms and conditions for issuing a permit. Initially, there will be no qualification criteria, such as minimum amount of landings, to obtain specific gear endorsements. Any commercial fisher may obtain the required gear endorsements. The permits and endorsements are subject to sanctions, including revocation, as provided by Section 308 (g) of the Magnuson-Stevens Act. Permit requirements could be changed in the future under the framework procedures (section 8.3.4). This alternative would not eliminate existing state permit or licensing requirements, nor would federal permits under the High Seas Fishing Compliance Act be eliminated.

Alternative 3: Requires a federal permit for all vessels engaged in commercial HMS fisheries within and outside the EEZ. One permit would cover all HMS fisheries for a given vessel.

Alternative 4: Requires a federal permit for all vessels engaged in *selected* commercial fisheries. Initial candidates for permits would be vessels engaged in drift gillnet and longline fisheries.

Recreational Permits

Alternative 1 (No Action): Requires no new federal permits for recreational vessels, private or party/charter.

Alternative 2 (Proposed Action): Requires a federal permit for all commercial passenger recreational fishing vessels (CPFV) that fish for HMS, but an existing state permit or license for recreational vessels could meet this requirement. The Council would, however, request states to incorporate in their existing CPFV permit systems an allowance for an HMS species endorsement on the permits so that statistics could be gathered on that segment of the HMS fishery. Rationale: This action is a practical procedure for tracking and controlling, by permits, recreational HMS fishing activities and the effects of regulations on those activities.

Alternative 3: Requires a separate federal permit for all commercial recreational fishing vessels (CPFVs) that fish for HMS; *a state permit could not be used to fulfil this requirement,* as in Alternative 2.

Alternative 4: Requires a federal permit for *all* recreational fishing vessels (private, party and charter/CPFV) that fish for HMS within and outside the EEZ.

8.5.6 Reporting Requirements

Background

The Magnuson-Stevens Act requires that FMPs specify the pertinent data which shall be submitted to the Secretary with respect to commercial, recreational, and charter fishing in the fishery, including, but not limited to, information regarding the type and quantity of fishing gear used, catch by species in numbers of fish or weight thereof, areas in which fishing was engaged in, time of fishing, number of hauls, and the estimated processing capacity of, and the actual processing capacity utilized by, United States fish processors (Sec. 303(a)(5)).

Catch, effort, and catch disposition data are critical for monitoring the fisheries, assessing the status of the stocks and fisheries, and evaluating the effectiveness of management. Data necessary for management of HMS have not been regularly or fully collected by state, federal and international agencies under existing provisions. HMS reporting requirements for basic catch-effort and bycatch are inconsistent among the states and the federal government and do not cover all HMS fisheries operations or do not collect all data needed for stock and fishery monitoring. The NMFS requires logbooks under the High Seas Fishing Compliance Act for all vessels fishing outside the U.S. EEZ (purse seine, surface hook-and-line, longline) and the formats of the logs are tailored to the fishery-specific needs. But the logbook requirements do not extend to fisheries in the EEZ. Logbooks are required for specific fisheries by non-federal authorities: the IATTC (purse seine, baitboat), California (drift gillnet, harpoon, charter/party), Oregon (developmental gillnet, developmental longline). No other HMS reporting requirements exist in Washington or Oregon (although voluntary logbooks for various HMS fisheries are accepted).

Current estimates indicate catch, effort and bycatch data are not captured for approximately 72% of the surface hook-and-line vessels fishing in the U.S. EEZ and an unknown percentage of the charter/party vessels operating from Oregon and Washington ports. In 2000, 28% of the estimated 710 surface hook-and-line vessels fishing in the EEZ submitted logbooks. Currently 77% of the charter/party vessels coast-wide submit logbooks. The remainder of the HMS fisheries report catch and effort and bycatch data in one format or another to some collecting authority with approximately 100% reporting rate. Not all currently collected data are available to PFMC on a timely basis or in a detailed format making contemporary monitoring of some HMS stocks and fisheries difficult or problematic. Bycatch/incidental catch reporting is not consistent among fisheries and will need revision upon adoption of this FMP. PacFIN does not capture catch and effort data (allowing CPUE to be estimated), which is fundamental for stock assessment and monitoring and needed for preparation of SAFE documents.

All three states have far offshore fishery regulations that require fishers to declare when they plan to fish on the high seas. These fishers are then allowed to fish outside the EEZ, but cannot fish inside the EEZ during the same trip. All three states have exceptions for albacore troll vessels. The FMP does not propose federal regulations addressing declarations, because the state requirements are adequate.

Alternatives considered

Alternative 1 (No Action): There would be no new federal requirements for reporting, including federal provisions for filling out Far Offshore Fishing Declarations.

Existing federal reporting requirements (e.g., HSFCA reports for fishing on the high seas) and state reporting requirements would apply.

Alternative 2 (Proposed Action): Requires all commercial and recreational party or charter/CPFV fishing vessels to maintain and submit logbooks to NMFS. State or existing federal logbooks could meet this requirement as long as essential data elements are present, and data are available to NMFS subject to a data exchange agreement. Authorizes adjustment of reporting requirements under a framework process. Rationale: This action is a practical procedure for obtaining commercial (including CPFV) catch and effort data for a standardized NMFS data base on West Coast fisheries.

The operator of any commercial fishing vessel and any charter vessel fishing for HMS would be required to maintain on board an accurate and complete record of catch, effort and other data on logbook forms provided by NMFS or a state agency. The original logbook form for each day of the fishing trip must be submitted to either the Southwest Regional Administrator of NMFS or the appropriate state management agency. Existing state or federal logbook forms may be used. These include logbooks required by: 1) the Tuna Conventions Act, the FMP for Pelagic Fisheries of the Western Pacific Region, the High Seas Fishing Compliance Act, and any logbook required by California, Oregon or Washington. These logbook forms can be found in Appendix D. Information required to be submitted on logbooks may be revised in the future. Existing state reporting requirements, including those for landing receipts, would remain in effect.

Alternative 3: Limits new federal reporting requirements to those commercial vessels that are not already required to report under existing federal laws.

For example, troll albacore vessels fishing on the high seas would continue to use HSFCA logbooks while troll albacore vessels fishing in the EEZ would be required to use a logbook provided by NMFS, pursuant to the FMP reporting requirements.

8.5.7 Comparison of Initial Management Alternatives by Fishery

In this section the alternative actions or options for the initial management measures described above are compared for their effects or impacts in each fishery. The comparisons are made with respect to stock health, fishery health, community health, EFH and ecosystem health, bycatch impact, protected species impact, management costs, and cumulative impacts. The last is the effect of the particular alternative in conjunction with effects from other actions or circumstances, including other fisheries, on the environment, which includes the West Coast ecosystem and the stocks of interest found there. Besides by fishery, a comparison is also given for the most basic alternative, that of adopting this FMP or not. These comparisons are given below in matrix form (Table 8-1).

Table 8-1(a-i). Comparison of alternative actions

Table 8-1a. FMP vs. No FMP

Indicator:	Alternative 1 - No Action: Management remains under current state and federal authorities (baseline).	Alternative 2 - Proposed Action: Adopts FMP with proposed alternatives.
Stock Health	E. Pacific tunas and billfishes would continue to be reviewed/managed by international bodies. West Coast fisheries take only small fractions of the tropical stocks, but more of temperate species; the latter could be at least locally depleted before a management body(s) responds.	MUS benefit from systematic review per overfishing criteria. With the resulting more prompt management response, species of concern, especially their regional stocks/substocks, are less likely to be overfished.
Fishery Health	HMS fisheries growth is likely to remain static, or will possibly decline, as in the drift gillnet fishery increasingly regulated with time/area closures.	Depending on the measures addressed and adopted, the FMP could lead to more efficient and less risky fishing practices that emphasize sustained resource benefits.
Community Health	Effects of any fishery decline is not expected to be notable where port cities are large as in southern CA; exceptions may be where the fishery has an important ethnic component, as in longline.	Similar, but FMP's stress on bycatch reduction could lead to fishing with less incidental catch and waste, and fisheries more healthy and accepted in communities.
EFH & Ecosystem Health	No known EFH/ecosystem effects, but fisheries targeting top predators (swordfish, marlin, sharks) could bring imbalances and changes in the importance relationships of species in the system.	Depletion of top predators (especially species of low productivity) and possible changes to the biological community are much less likely.
Bycatch Impact	Bycatch in unobserved fisheries could long remain poorly known, with no comprehensive approach for documentation, and for reduction where it is high.	FMP has general to specific directions to reduce bycatch in each fishery; proposed actions would provide much needed documentation on actual levels of bycatch and relative risks from different fishing types.
Protected Species Impact	Protected species interactions in certain fisheries could remain poorly known; could critically delay needed mitigation actions for listed species.	Provides mechanism for placing concerns for listed species at high priority in regional management.
Management Costs	Costs to remain the same; NMFS and the states would continue to incur management costs of these fisheries under non-Council authorities.	New expenses incurred for permit and logbook systems, annual SAFE assessments, Council administration and reviews, observer programs, and gear studies, depending upon the measures adopted. Costs to states would likely be reduced.
Cumulative Impacts	Present exploitation, domestic and international, has not produced noticeable effects on regional ecosystem productivity; nor are any MUS thought to be now depleted.	Proposed actions combined are expected to better safeguard the ability of HMS to both sustainably support fisheries and maintain their relative importance in food chains.

Table 8-1b. Drift Gillnet (DGN) Fishery

Indicator:	Altern. 1 - No Action: Management remains under current state and federal authorities (baseline).	Altern. 2 - Proposed Action: Modifies an OR closure inside 1000 fm to be year round; adopts or endorses all other existing state and federal rules including closure of EEZ north or OR/WA border; continues limited entry under states' authority.	Altern. 3: Incorporates only MMPA, ESA and related federal rules for protected species	Altern. 4: Incorporates all existing state and federal rules, including states' limited entry programs.	Altern. 5: As for Altern. 8, *but substitutes the time/area closures of the ESA Biological Opinion (BO) for the Turtle Conservation Closed Areas now in place.*	Altern. 6: As for Altern. 8, *but closes all areas inshore of 1000 fm off OR and WA* (extends existing closure inside 1000 fm off OR to WA waters as well).	Altern 7: As for Altern. 8, *but closes all EEZ areas north of 45°N latitude.*	Altern. 8: Incorporates all existing state and federal rules except states' limited entry programs (which would remain under states' authority).
Stock Health	Local swordfish/shark mortality should decrease if fishery continues decline under current rules; but if federal closed area for turtle conservation redirects fishery to the SCB, fishing mortality on some sharks could increase significantly.	Little effect on swordfish because fishery is mainly south of WA and outside 1000 fm; protection of adult thresher sharks should increase (fishers of all states must abide by closures off OR/WA), unless there is increased take in opened area between 75 nm and 1000 fm in May-Aug off OR.	Stock health as for Altern. 1 (baseline) and likely to continue being less emphasized relative to protected species.	Effects little different from Altern. 2, but with adult sharks better protected because prohibition on fishing inside 75 nm in May-Aug off OR will be retained and for all fishers.	Larger turtle conservation closed area of B.O. should reduce swordfish mortality; but a re-direction of fishing effort into the SCB is also more likely, increasing the mortality on sharks there.	Effects little different from Altern. 4, but with less protection of adult threshers off WA.	Effects little different from Altern. 4, but with greater protection of adult sharks.	Effects little different from Altern. 4.
Fishery Health	Fishery is static or declining under constraints of federal rules for protected species.	Little or no improvement to fishery health expected, especially as management rules applied equitably to fishers from all states will constrain fishing strategies.	Effects little different from Altern. 1.	Added constraints on fishing strategies due to fishing rules being applied equitably to fishers from all states.	Fishery would be more curtailed as turtle conservation area of B.O. is not modified for greater swordfish access (as is the present closed area).	Overall, little change, but will eliminate some inshore fishing off WA by CA/OR fishers.	Overall, little change, but will eliminate some inshore fishing off WA by CA/OR fishers.	Little difference from Altern. 4.
Community Health	Economic effects of declining fishery could be important in small ports, but would be largely absorbed in the large port cities of southern CA.	Some small port communities serving shark fishers could be impacted by federal closure off WA.	Little difference from Altern. 1 since state fishing rules remain in place.	Some small port cities could suffer from curtailed fishing strategies under federal management.	Resulting reduced availability of swordfish could hurt small businesses of the fresh fish trade.	Some small boat operators, unable to fish outside the closed inshore areas, would suffer losses.	Small port communities serving fishery operations north of 45°N could be disproportionately affected by the closure.	Little difference from Altern. 4
EFH and Ecosystem Health	No effects anticipated, and measures to protect target and associated spp. remain unchanged.	Combining HMS fisheries, EFH, and protected spp. management under the same regulatory body fosters more coordinated and careful ecosystem monitoring.	Little difference from Altern. 1 since state fishing rules remain in place.	Better system protection under equitable federal rules.	No expected EFH effects; top/apex predators are possibly better protected by B.O.'s larger turtle conservation area.	No expected EFH or ecosystem effects, but shark/protected spp. receive federal inshore protection off WA.	No expected EFH or ecosystem effects; but additionally, thresher shark and protected/associated spp. receive *all-EEZ* protection in northern OR and WA waters.	Little difference from Altern. 4.

Indicator:	Altern. 1 - No Action: Management remains under current state and federal authorities (baseline).	Altern. 2 - Proposed Action: Modifies an OR closure inside 1000 fm to be year round; adopts or endorses all other existing state and federal rules including closure of EEZ north or OR/WA border; continues limited entry under states' authority.	Altern. 3: Incorporates only MMPA, ESA and related federal rules for protected species	Altern. 4: Incorporates all existing state and federal rules, including states' limited entry programs.	Altern. 5: As for Altern. 8, *but substitutes the time/area closures of the ESA Biological Opinion (BO) for the Turtle Conservation Closed Areas now in place.*	Altern. 6: As for Altern. 8, *but closes all areas inshore of 1000 fm off OR and WA* (extends existing closure inside 1000 fm off OR to WA waters as well).	Altern 7: As for Altern. 8, *but closes all EEZ areas north of 45°N latitude.*	Altern. 8: Incorporates all existing state and federal rules except states' limited entry programs (which would remain under states' authority).
Bycatch Impact	Bycatch species composition and amounts could change if new turtle protection rules result in significant relocated fishing effort.	Little resulting difference expected, but FMP's stress on bycatch reduction should lead to more responsible fishing. Some reduction of bycatch off OR/WA expected.	Little difference from Altern. 1 (baseline) since state fishing rules remain in place.	Some minor changes in bycatch is expected from changes in fishing under equitable federal rules.	May significantly affect species composition of bycatch as the B.O.'s larger closed area is more likely to shift fishing effort into the SCB.	Relatively minor effect as additional WA closure inside 1000 fm represents minor fishing effort affected, although it will decrease bycatch there.	Relatively minor effect as OR/WA EEZ area north of 45°N currently has little gillnet effort; still, the closed area will decrease bycatch there.	Little difference from Altern. 4.
Protected Species Impact	Gradual reduction of takes is expected to continue under federal rules for protected species.	Federal closures off OR and WA will contribute to the reduction of protected species takes, although there is relatively little fishing there.	Little difference from Altern. 1 since state fishing rules remain in place.	Little difference is expected from Altern. 1	Same trend but higher likelihood of avoiding leatherback turtles, marine mammals, and seabirds.	Relatively small effect as OR/WA inshore closure affects few boats, but it does continue the protection of sea turtles and mammals that has resulted from current state closures.	Relatively little effect as closed area north of 45°N is mainly where fishery does not now operate; but it does give protected spp. additional protection over a very large area of the EEZ.	Little difference from Altern. 4.
Management Costs	Observer and mitigation costs could increase if focus on rare species takes increases.	Administrative costs would increase to federalize/enforce the state rules. States will maintain costs associated with limited entry.	Administrative costs are least since only existing federal rules are placed in the FMP.	Additional costs to federalize/enforce states' rules, including limited entry systems.	Additional enforcement costs would be less for the simpler closed area polygon of the B.O.	Although there is relatively little fishing in the closed inshore areas, enforcement of the 1000 fm limit could be costly where fishing is along that contour.	There is relatively little fishing in this closed northern area, and enforcement would simply be relative to the 45°N line.	As for Altern. 4, but without costs to federalize states' limited entry systems.
Cumulative Impact	Continuing the status quo, along with the predicted decline of the fishery, will mitigate against regional changes in species balances from all fishing sources. But fishing on sharks and more-tropical species could increase, e.g., if turtle protection closures force fishers into the SCB.	Like for Altern. 1 since this option is near status quo, but with possibility of changed shark populations from altered shark protection off OR/WA.	As for Altern. 1 since this option is essentially status quo.	Like for Altern. 1 since this option is near status quo, but with protection rules applied equitably to all fishers.	Like for Altern. 1 but shifts in fishing effort south into the SCB, and increased shark catches, is more likely.	Like for Altern. 1, but with greater, equitable protection for protected spp. and reproductively-valuable adult thresher sharks, especially during warm-water years when the fishery expands northward.	Like for Altern. 1 but with even greater equitable protection provided in all northern EEZ waters.	Like for Altern. 1 since this option is near status quo, but with protection rules applied equitably to all fishers.

Table 8-1c. Small Mesh vs. Large Mesh Drift Gillnets (DGNs)

Indicator:	Subalternative 2a - Proposed Action: **DGN with minimum stretched mesh size of 14 inches *(<14" mesh prohibited).***	Subalternative 2b: **DGN with no minimum stretched mesh size *(<14" mesh not prohibited)***
Stock Health	No change to stocks is expected from prohibiting small mesh DGNs from fishing HMS because that effort is currently irregular and opportunistic (small mesh fishery normally targets coastal species).	Allowing small mesh DGN fishing on HMS should not appreciably affect stocks, as that fishing is irregular and largely opportunistic. But any future expansion of small mesh fishing on HMS could significantly increase mortality on temperate tunas in the EEZ.
Fishery Health	Prohibiting small mesh fishing on HMS denies additional fishing opportunities to DGN fishers, which could be important at local level.	Allows additional fishing opportunities, especially for the small mesh DGN fishery that generally targets coastal species.
Community Health	Unless small mesh fishing on HMS becomes important, economic dislocations are unlikely from prohibiting < 14" gear.	Allows for additional economic input to local communities from the small mesh fishing targeting HMS; but gains could be dissipated by suspicions of sport fishers.
EFH and Ecosystem Health	No known EFH effects from fishing with large mesh gear only; ecosystem changes from large mesh fishing have not been evident.	No known EFH effects; significant ecosystem effects from small mesh targeting of HMS schools are not anticipated, as the fishing would come under same/similar rules as for large-mesh fishing.
Bycatch Impact	Total bycatch in the DGN HMS fishery will be reduced due to less fishing effort; but there could be a slight increase in the bycatch of sharks from forcad discarding (the bycatch of common threshers is expected to increase by 5% due to the incidental 10 fish limit for non-HMS gear).	Bycatch in both the large and small mesh drift gillnet fishery would remain the same, although there may be some reduction in the small mesh fishery for HMS as it comes under same/similar rules as for the large mesh fishery.
Protected Species Impact	Total protected species interactions should decrease; bycatch/protected spp. monitoring of large mesh fishery to continue at ~20% coverage.	Protected spp. interactions in the small mesh fishery is being studied. Interactions are likely to decrease as the small mesh fishery for HMS comes under same/similar rules as for the large mesh fishery.
Management Costs	Some additional costs to enforce against small mesh targeting of HMS.	More additional costs to document/monitor the small mesh fishing on HMS.
Cumulative Impacts	Negative cumulative impacts on the environment are unlikely because the large mesh fishery itself will probably decline, although shark catches could increase if fishing effort increases in the SCB due to northern area closures to protect sea turtles.	Small mesh DGN fishers targeting HMS schools constitutes a new fishery for tunas that has not been monitored or managed as an HMS fishery. A significant expansion, even under the same regulations as for the large mesh fishery, could affect local distribution/availability of HMS and associated species in the inner EEZ.

Table 8-1d. Pelagic Longline (LL) Fishery - *Inside* the EEZ

Indicator:	Altern. 1 - No Action: Management remains under current state and federal authorities (baseline).	Alternative 2 - Proposed Action: Longline gear prohibited in EEZ.	Altern. 3: Indefinite moratorium on longline fishing until EFP experiment demonstrates negligible impact on bycatch/ protected spp. (OWC Proposal).	Alternative 4: Limited entry trial fishery with effort and area restrictions; as possible replacement for drift gillnet fishery that has high protected spp. impact (Industry Proposal).	Alternative 5: Longline fishing prohibited at least until EFP experiment demonstrates bycatch/protected spp. impact significantly less than in DGN fishery (Plan Team Proposal).
Stock Health	LL fishing in EEZ essentially not permitted; OR developmental fishery inactive and available permits few; thus no effects on stock from this gear.	Stocks protected by general prohibition, but without any specific EFP protocol as in Alternatives 3 and 5.	Indefinite moratorium and stringent experimental performance standards give strong protection to stocks/ populations.	During fishery trial, stocks/populations are protected inshore by closed areas and offshore by strict monitoring and adjustments, and few allowed vessels (initially 10).	Stocks/populations are protected by LL prohibition and by trigger limits for termination of the EFP gear experiments.
Fishery Health	Essentially no LL fishing in EEZ; but possible for a limited expansion of the OR developmental fishery.	No LL fisheries allowed in EEZ; no exempted fishery protocols specified.	If a bycatch-safe method is found, it could be important for fisheries development; but negligible impact is difficult to demonstrate.	Demonstration of reduced bycatch and non-harmful fishing could allow a small LL fishery that results in reduced DGN fishing effort and a reduced impact on marine mammals, and would produce a new supply of fresh fish.	If EFP gear experiments are successful in developing bycatch-reducing methods, gear switching, if allowed, could reduce DGN fishing effort and reduce the impact on marine mammals; the LL fishery could be a new supply of fresh fish.
Community Health	Essentially no LL fishing in EEZ, so fish/fishing related economies rely on other fishery sectors.	Like status quo (Altern. 1), but expressly EEZ wide, and with no stipulations allowing change.	Small likelihood that LL fishery can be allowed, so status quo is anticipated.	Temporary economic boost to commercial fishing-related businesses during fishing trial; possible longer-lasting benefits to community if longlining is eventually allowed, but would be strongly opposed by sportfishing industry.	If gear experiments are successful and shown to be non-harmful, and limited DGN-LL gear switching is allowed, the commercial industry could be re-vitalized. But rivalry between commercial and sport fishers for the resources will likely remain.
EFH and Ecosystem Health	Essentially no LL fishing; thus no EFH and ecosystem effects from this gear.	Like status quo (Altern. 1), but expressly EEZ wide.	Status quo (Altern. 1) for system is likely to remain.	Minimal additional impact on environment is expected even if fishery is eventually allowed, because few vessels will be permitted, and especially if care is taken to prevent loss of gear, especially lightsticks.	Minimal additional impact on environment is expected even if DGN-LL gear switching is eventually allowed, because fishing would be strictly controlled for non-harm, including reduced overall bycatch.
Bycatch Impact	Essentially no LL fishing; thus no bycatch from this gear.	Like status quo (Altern. 1), but expressly EEZ wide.	No change in bycatch is highly likely.	Trial fishery is not likely to significantly impact bycatch species, because of its limited scope and the strict controls for keeping incidental species mortality below that of DGN gear. Blue shark bycatch could be an issue, as would any catches of striped marlin unless demonstrated to be very low.	Experiment is not likely to have an impact on bycatch because of its limited scope and pre-established trigger levels. Council could later allow gear switching, but only if there is overall reduction of bycatch and protected spp. take.
Protected Species Impact	Essentially no LL fishing; thus no protected spp. takes from this gear.	Like status quo (Altern. 1), but expressly EEZ wide.	No change in protected species interactions is highly likely.	Mortality of protected spp., especially turtles and albatrosses, are a concern, but would be closely monitored; fishery would not be allowed to continue if impacts are harmful.	Experiment is not likely to have an impact on protected spp. because of its limited scope and pre-established trigger levels. Council could later allow gear switching, but only if there is overall reduction of protected spp. take.
Management Costs	Essentially no LL fishery and no costs.	Like status quo (Altern. 1).	No change in management costs is highly likely.	Costs of initial trial fishery largely borne by industry; NMFS would incur some additional costs for monitoring the fishing.	Costs to seek methods leading to non-harmful fishing would be largely borne by the public (i.e., government).
Cumulative Impact	Essentially, any effect on stocks or ecosystem would derive from other fisheries.	Like status quo (Altern. 1).	No effect on species community is highly likely, except from external sources.	Harm to stocks/ecosystem is unlikely because of the controls on, and the objectives of, this trial fishing, which includes impacts on vulnerable species. But unforseen effects are possible if the fishery is allowed to expand.	Harm to stocks/ecosystem is unlikely because of the controls on, and the objectives of, this experiment, which includes impacts on vulnerable species. But unforseen effects are possible if the experiment leads to establishment of LL fishing that expands.

Table 8-1e. Pelagic Longline (LL) Fishery - *Outside* the EEZ

Indicator:	Altern. 1 - No Action: **Management remains under current state and federal authorities (baseline).**	Altern. 2 - Proposed Action: **Applies Western Pacific Council's protected species rules for LL fishing west of 150°W; applies West Coast appropriate protected species rules east of 150°W (allows swordfish fishing insofar as not harmful to protected species).**	Altern. 3: **Applies Western Pacific Council's protected species rules for LL fishing in all waters outside the West Coast EEZ.**
Stock Health	Widely-distributed stocks of targeted swordfish and tunas are little affected by the West Coast fishery's take that is a relatively small fraction of the total catches.	Mortality on E. Pacific stocks/populations are expected to change little, but depending on how fishing is allowed east of 150°W re protected species and possibly of domestic harvest controls.	Regional swordfish and tuna populations should benefit as Hawaii-fishery rules will strongly curtail, if not eliminate, the West Coast fishery.
Fishery Health	Fishery is expected to decline in the next few years as it comes under protected species regulations.	Viable West Coast fishery is possible if protected species can be avoided at non-harmful levels while fishing east of 150°W.	Stringent Hawaii-fishery rules applied outside the EEZ will strongly curtail or close the West Coast fishery.
Community Health	Economic effect of expected fishery decline should be mitigated by the large size of the port cities, but could also to be magnified by the fishery's distinct ethnic component.	Support and related businesses will derive economic benefits to the degree the eastern fishery can significantly avoid protected species.	Support and related businesses, especially ethnic component, will decline or terminate with fishery.
EFH and Ecosystem Health	Continued use of swordfish gear and methods may cause harm to turtles and albatrosses, and reduction of apex predators is potentially destabilizing to the system. But current level of West Coast fishing is unlikely to cause a detectable effect.	Rules for east of 150°W would allow a fishery only under strict restraints, so ecosystem effects are unlikely.	Even a strongly curtailed fishery is unlikely to affect the ecosystem in detectable ways.
Bycatch Impact	Blue shark is likely to remain the top bycatch species, but West Coast fleet is unlikely capable of generating harmful take levels.	Any protected spp. rules to be developed for the fishery east of 150°W would also have to adjust for any increases in bycatch.	Bycatch should be reduced, or eliminated if fishery ceases.
Protected Species Impact	Not presently regulated for protected species takes, but regulations are expected in near future. Observers became mandatory after 8/02.	Protected spp., especially sea turtles and seabirds, would have more/less protection to degree the rules developed for east of 150°W are more/less protective than the HI rules.	Sea turtles and seabirds, especially, would benefit from the Hawaii rules that are designed to reduce their bycatch and bycatch mortality.
Management Costs	Increased management and enforcement costs for inevitable protected spp. rules should be partly mitigated by decline of the fleet.	Studies to find the proper mitigation rules for east of 150°W will be costly, as would the monitoring and enforcement costs if the fishery stays viable.	Strong curtailment of the fleet could cancel the increase in costs for monitoring and enforcement.
Cumulative Impact	Biomasses of large top predators, targeted or incidentally caught, are unlikely to be reduced sufficiently by West Coast fisheries to change species balances in region.	Regardless of how viable the fishery becomes with West Coast appropriate rules, ecosystem effects are unlikely from reductions of pelagic populations already and naturally thinly distributed.	Stringent protection of sea turtles and seabirds, and the probable curtailment of the fishery itself (even though minor in the E. Pacific) should proportionately reduce human impact on the ecosystem.

Table 8-1f. Purse Seine (PS) Fishery in EEZ

Indicator:	Altern. 1 - No Action: Management remains under current state and federal authorities (baseline).	Altern. 2 - Proposed Action: Opens entire EEZ to purse seine fishing.	Altern. 3: Prohibits purse seine fishing in EEZ north of 45°N.	Altern. 4: Prohibits purse seine fishing in EEZ only off WA.
Stock Health	Most tunas would be little affected by purse seine fishing in EEZ as stocks are Pacific-wide. But possible for local bluefin catch to become a significant fraction of stock mortality.	Possible significant mortality on bluefin tuna, especially if schools can be followed north of California in warm-water years, or if large adults can be targeted.	Little change from Altern. 1 (No Action), since there is relatively little fishing north of 45°N.	Little change from No Action since there is relatively little fishing north of 45°N, and WA already does not authorize purse seine fishing for HMS.
Fishery Health	Purse seine vessels remain dependent on coastal species, fishing tunas opportunistically when they appear.	Fishers from all states would have opportunity to purse seine, especially for bluefin tuna in warm-water years.	Little effect except during warm-water years when fishers could otherwise have followed schools north of 45°N.	Except during warm-water years, little change since little fishing north of 45°N and WA already does not authorize purse seine fishing for HMS.
Community Health	Without canneries, fishery related businesses are expected to decline; reversal depends on expansion of fresh fish market.	Widened fishing opportunities could boost industry and markets, including in OR and WA; but there could also be conflict with salmon and sardine fishers in inshore waters.	Little change expected since market capacity already limits profits, including from better catches during warm water years.	Little change since little fishing north of 45°N, and WA already does not authorize purse seine fishing for HMS.
EFH and Ecosystem Health	No known EFH or ecosystem effects, but there could be interactions with predators that might feed on captured HMS (e.g., on captured bluefin schools being hauled *in net* to Mexican "fattening" pens).	Possibility of new species being affected by gear if fishery increases significantly off OR/WA, especially if HMS schools interact with schools of other species there.	Little change expected since there is relatively little fishing north of 45°N.	Little change since little fishing north of 45°N, and WA already does not authorize purse seine fishing for HMS.
Bycatch Impact	Bycatch poorly known; could be important in kelp paddy and night fishing.	Possibility of a new suite of bycatch species, especially if the fishery develops in the different regime north of the Columbia River plume.	Little reduction in bycatch since there is relatively little fishing north of 45°N; however, reduction could be important in warm-water years when HMS move northward.	As per proposed Altern 3, especially as WA already does not authorize purse seine fishing for HMS.
Protected Species Impact	Protected species impact is poorly known, especially when fishing on large tuna schools.	Possibility of new protected species interactions if fishery develops off OR/WA.	Little reduction in protected species interactions since there is relatively little fishing north or 45°N; but reduction may be significant in warm water years.	As per proposed Altern. 3, especially as WA already does not authorize purse seine fishing for HMS.
Management Costs	Status quo costs for monitoring and management.	Largest potential for additional costs because fishery could expand and bring new bycatch/protected species problems.	Additional costs over Altern. 1 for investigating bycatch, protected species, developing new reporting forms, enforcement, etc.	Less additional costs because simpler to impose changes in parallel with existing state regulations.
Cumulative Impact	Species balances affecting ecosystem production are unlikely to change as long as catches from targeting HMS remain near present levels; the stocks themselves are more likely to be affected by the fishing in international waters.	Some tunas could be subjected to significant additional mortality if their schools regularly migrate northward in the EEZ and can be targeted.	As for Altern. 1, but with less fishing impact on system.	As for Altern. 1, but reduction of fishing impact less than for Altern 3.

Table 8-1g. Surface Hook and Line Fishery (alternatives here are not formal options, but result from adoption or not of FMP)

Indicator:	Altern. 1 - No Action: **Management remains under current state and federal authorities (baseline).**	Altern. 2 - Preferred Action: **Management under FMP but adding no initial measures other than for permits and logbooks.**
Stock Health	Albacore is monitored by int'l management body(s) and is presently healthy, but could be significantly affected by West Coast, high seas fishery.	Stock is presently healthy but if it approaches being, or becomes, overfished, FMP backed by SFA is vehicle for pressing for international action (and could reduce domestic fleet's harvest).
Fishery Health	Presently healthy; problem of Canadian fishing in U.S. waters is being addressed by treaty bill.	Fishery expected to remain healthy, with the FMP an efficient vehicle for implementing future management, including effort limitations to protect U.S./U.S.-fisher interests; domestic harvest could be reduced.
Community Health	Depends on health of both albacore and salmon stocks, as their natural productivities are often out of phase, and fishers switch fisheries.	As for Altern. 1, but FMP also mandates that any fishery management shall have due regard for the effects on communities.
EFH and Ecosystem Health	No known EFH or ecosystem effects from fishing.	As for Altern. 1.
Bycatch Impact	Rates are thought to be small, although bycatch is not well documented.	As for Altern. 1, but FMP provides for bycatch documentation by scientific study.
Protected Species Impact	Rates are thought to be small, although interactions are not documented - the fishery does operate in N.Pacific transition waters where seabirds and turtles importantly feed.	As for Altern. 1, but FMP provides for its documentation by scientific study.
Management Costs	Present costs are for collecting fisheries data and for international reviews of the fishery.	Additional costs for new permit and logbook systems; also probably temporary-only costs for documenting the expected low bycatch and protected species take.
Cumulative Impact	Possible for fishery buildups during climatology-driven productive periods to exacerbate stock declines during periods of natural downturn.	Regular reviews of the fishery under the FMP should facilitate adjusting West Coast fishing for natural changes in stock productivity and availability.

Table 8-1h. Harpoon Fishery (alternatives here are not formal options, but result from adoption or not of FMP)

Indicator:	Altern. 1 - No Action: **Management remains under current state and federal authorities (baseline).**	Altern. 2 - Proposed Action: **FMP adds no initial measures other than for permits and logbooks.**
Stock Health	Small harpoon fishery does not affect health of swordfish stock.	No effect on stock health, but local changes are better monitored.
Fishery Health	Exciting and low cost method of fishing keeps fishery viable at a low level, despite relative inefficiency.	No effect on fishery health.
Community Health	Small fishery is important supplier of high grade product to fresh fish market - and colorful presence for visitor industry.	No effect on community health..
EFH and Ecosystem Health	No known EFH or ecosystem effects from this fishery..	No effect on EFH/ecosystem health.
Bycatch Impact	All indications are of virtually no bycatch, but little is known about struck/escaped or struck/not-retrieved fish.	Bycatch and non retrieval rates will be studied under FMP.
Protected Species Impact	All indications are of no impact.	No effect.
Management Costs	Little costs other than for collecting fishery data.	Initial and temporary costs to document the expected low bycatch and non retrieval rates.
Cumulative Impact	None expected because this small fishery has very low impact on the swordfish stock, and the E. Pacific stock is considered healthy.	No difference from Altern. 1.

Table 8-1i. **Recreational Fishery** (alternatives here are combined from the bycatch, permit, and reporting alternatives described in sections 8.4.4, 8.5.5, and 8.5.6, respectively, and numbered differently.

Indicator:	Altern. 1 - No Action: **Management remains under current state and federal authorities (baseline).**	Altern. 2 - Proposed Action: **Federal HMS permits and logbooks required only for party/charter vessels (CPFV) fishing HMS, *with valid state permits allowed as substitute for federal permit;* voluntary catch-and-release (C/R) program for all HMS established.**	Altern. 3: **As for Proposed Action, *but not allowing state permits as a substitute.***	Altern. 4: **Alternatives 2 (Proposed) or 3, but extending the federal permit requirement to *all* recreational vessels fishing HMS (CPFV *and* private vessels).**	Altern. 5: **Alternatives 2 (Proposed), 3, or 4, *but with the voluntary catch-and-release program for striped marlin only.***
Stock Health	Except for localized sharks, sport fishing is unlikely to affect health of HMS stocks at present catch and effort levels.	Little effect on stocks, but uniform logbooks allow better tracking of sport harvest of HMS. Voluntary C/R program encourages live releases to benefit stocks, but could increase mortality on larger, reproductively more-valuable adults of some species.	As for Proposed Action but the uniform federal permit would likely expedite tracking of CPFV fleet and thus the impact on stocks.	As for Proposed Action, but with expanded capability to track participation of *entire* HMS recfish fleet (private boats are an important fishery segment), for better assessment of impact of sportfishing on local populations.	As for proposed Action, but any added survival benefits from C/R releases is concentrated on striped marlin.
Fishery Health	Little change to fishery; current recreational fishing trends are stable or slightly declining. Gaps would remain in assessing magnitude of HMS recfish catch and effort.	Permit/logbook system should lead to better measure of fishery and trends; releasing of caught fish is not expected to diminish, but voluntary C/R program may enhance angler interest and participation.	As for Proposed Action, but more efficient to track status of fishery with the uniform federal permit.	As for Proposed Action, with added capability to track the status of all segments of the HMS rec fishery. But would be an added burden to private boat anglers.	As for Proposed Action with little effect from restricting C/R to striped marlin, since program is voluntary, and benefitting this species is already of prime importance to anglers.
Community Health	Little change expected to community health under this status quo; sport fishing industry would continue to provide marine recreational opportunities to community.	Better measure of HMS fishery should benefit anglers and community support industries that must assess fishery's scope. Voluntary C/R may enhance the positive image of sportfishing, and hence community involvement in, and support of, the industry.	As for Proposed Action, with no effect expected from the required federal CPFV permit.	As for Proposed Action, but federal permit revenues from the very large private fleet could be a significant removal of monies from some communities.	As for Proposed Action, with no significant economic effects expected from the C/R restricted to striped marlin.
EFH and Ecosystem Health	Sport fishing at present levels is not known to effect EFH and ecosystem health.	No direct EFH/ecosystem effects, but some local species demographies and balances could be affected if there is a significant, C/R-induced increase of mortality on the largest, fastest growing fish.	As for Proposed Action, with no effects from the required federal CPFV permit.	As for Proposed Action, with no effects expected from requiring federal permits for the private fleet.	As for Proposed Action, with no effects expected from the restricted C/R, unless there is a disproportionate removal of the largest, fastest growing marlin.
Bycatch Impact	Bycatch and waste may remain a problem when schooling HMS are caught abundantly on sport trips. Better estimates of extent of bycatch is still needed.	Bycatch could be better estimated, and C/R would reduce bycatch. But there could be increased wastage if released fish subsequently die.	As for Proposed Action, with no effects from the required federal CPFV permit.	As for Proposed Action, but better estimates of HMS participation/effort may lead to more accurate estimates of sport fishery bycatch.	As for Proposed Action, but C/R would reduce bycatch of striped marlin only.
Protected Species Impact	Interactions with sea lion and coastal seabirds are expected to continue, but remain poorly documented. But direct mortalities are thought to be low.	Standardized logbook system would improve the ability to estimate trends and extent of protected species interactions.	As for Proposed Action, with no effect from requiring a federal CPFV permit.	As for Proposed Action, but better estimates of HMS participation/effort may lead to more accurate estimates of sport fishery effects on protected spp.	As for Proposed Action, with no effect expected from the restricted C/R.
Management Costs	Status quo; administrative and enforcement costs remain the same.	Initial costs incurred, mainly to develop the federal logbook system for the CPFV fleet.	As for Proposed Action but with additional costs to develop the permit program for the CPFV fleet.	Expected to be costly to implement/ enforce the permit system for all private vessels.	No direct effect on costs since C/R, restricted or not, remains voluntary.
Cumulative Impact	Except on localized populations, sport fishing is unlikely to have a compounding effect on species balances or on HMS stocks – biggest effects come from the environment and fisheries external to West Coast fishing.	Little or no effect, although the voluntary C/R program has the potential to increase mortality selectively on fast-growing fish (since anglers prize large fish). But total sport mortality is currently low relative to commercial fishing mortality on HMS.	As for Proposed Action, with no effect expected from requiring a federal CPFV permit.	As for Proposed Action, but the ability to gather statistics on the entire HMS fleet would enable managers to better assess cumulative impacts of sport fishing.	As for Proposed Action, but with possible effects from C/R mortality restricted to striped marlin.

8.6 Research and Data Needed for Management

There is substantial uncertainty on the status of stocks and estimates of MSY for many HMS species. Basic biological and life history data are unknown for some species, and understanding of distribution, abundance, and reproductive behaviors of most is poor. There is insufficient understanding of stock structures relative to the extent of fisheries, on the interchange between stocks, and on survival and fecundity schedules for investigating exploitation effects and species' resiliency to exploitation. Total catch data may be inaccurate for some species, because of unreported catch by international fisheries, or unreported bycatch. There is lack of fishery independent indexes of abundance.

More complete catch information and data on interactions with protected and prohibited species are needed for most fisheries. Data collection and reporting requirements are inconsistent between state and federal regulations. There is inadequate understanding of the fisheries on some HMS stocks that are shared with Mexico (e.g., species composition of shark catches in Mexican fisheries), and inadequate data exchange with Mexico.

Little is known of the long-term survivorship of hooked fishes after release, to assess the effectiveness of recreational tag-and-release methods on big game fishes (pelagic sharks, tunas and billfishes) and of methods to reduce bycatch mortality in longline fishing. Controlled studies of the survivability of hooked and released pelagic sharks and billfishes are needed to determine the physiological responses to different fishing gears, and the effects of time on the line, handling, methods of release, and other factors. More work is also needed to investigate the hooking survivorship of protected species, such as turtles and seabirds, that are caught incidentally in HMS fisheries.

There is very little specific information on the migratory corridors and habitat dependencies of these large mobile fishes, how they are distributed by season and age throughout the Pacific and within the West Coast EEZ, and how oceanographic changes in habitat affect production, recruitment and migration. Research is needed to better define EFHs and to identify specific habitat areas of particular concern (HAPC), such as pupping grounds, key migratory routes, feeding areas, and where adults aggregate for reproduction. A special need is to determine the pupping areas of thresher and mako sharks, which are presumed to be within the southern portion of the U.S. West Coast EEZ, judging from the occurrence of post-partum and young pups in the area (e.g., NMFS Driftnet Observer data).

For sharks, the size/age groups contributing most to population growth and maintenance need to be determined by demographic studies to better determine how best to apply management measures, such as season and area closures, and 'slot' size limits. Additionally, the U.S. Congress identified the following data needs for sharks in the Shark Finning Prohibition Act (PL 106-557) (see also the U.S. National Plan of Action for Sharks):

- The collection of data to support stock assessment of shark populations subject to incidental or directed harvesting by commercial vessels, giving priority to species according to vulnerability of the species to fishing gear and fishing mortality, and its population status.
- Research to identify fishing gear and practices that prevent or minimize incidental catch of sharks in commercial and recreational fishing.
- Research on fishing methods that will ensure maximum likelihood of survival of captured sharks after release.
- Research on methods for releasing sharks from fishing gear that minimize risk of injury to fishing vessel operators and crews.
- Research on methods to maximize the utilization of, and funding to develop the market for, sharks not taken in violation of a fishing management plan approved under the Magnuson-Stevens Act.
- Research on the nature and extent of the harvest of sharks and shark fins by foreign fleets and the international trade in shark fins and other shark products.

8.6.1 Information Needs by Species

The following information needs have been identified. They are to obtain better fundamental information, like on reproductive and feeding habits, and distribution and abundance. There is a need to determine:

Albacore Tuna

a. Whether there are multiple sub-stocks with differently-migrating juveniles or juveniles from different spawning localities with different migration routes and timetables.
b. How deep-dwelling adults migrate and are distributed in the north Pacific by season and age, including in the West Coast EEZ.
c. How ENSO and decadal oceanographic changes affect stock production and the east-west migrations of juveniles.
d. Whether certain prey species are key for survival and reproductive success.

Bigeye Tuna

a. How deep-dwelling adults migrate and are distributed by season and age in the Pacific.
b. Significance of floating object and other-species associations in bigeye life history.
c. How ENSO/decadal oceanographic changes affect stock production and recruitment success.
d. Whether certain prey species are key for survival and reproductive success.

Skipjack Tuna

a. The significance of floating object and other-species associations in skipjack life history.
b. How ENSO/decadal oceanographic changes affect production and recruitment.
c. How the very large skipjack catch in the western Pacific is affecting the pelagic community.
d. Whether certain prey species are key for survival and reproductive success.

Bluefin Tuna

a. How adult bluefin migrate and are distributed by season and age in the North Pacific, including in the West Coast EEZ.
b. How stock abundance can most reliably be measured.
c. How ENSO/decadal oceanographic changes affect production, recruitment, and east-west migrations.
d. Whether certain prey species are key for survival and reproductive success.

Yellowfin Tuna

a. How yellowfin migrate and are distributed by season and age in the Pacific.
b. How ENSO/decadal oceanographic changes affect yellowfin production and recruitment.
c. The significance of floating object and other-species associations in yellowfin life history.
d. Whether certain prey species are key for survival and reproductive success.

Common Thresher Shark

a. The stock structure and boundaries of this species; the relationship to populations to the south and west.
b. The extent of pupping and nursery grounds off northern Mexico, and their relationship to those of southern California.
c. The pattern of seasonal migrations for feeding and reproduction, and where and when life stages may be vulnerable.
d. Aging and growth rate, including validation.

Pelagic Thresher Shark

a. How this species is distributed by season and age in the eastern Pacific, especially off Mexico.
b. Reproductive biology and cycle off Mexico and California.
c. How growth rates in the eastern Pacific compare with rates estimated in the western Pacific.
d. How this species' ecology compares with that of the other thresher species.

Bigeye Thresher Shark

a. Ways to reduce the take of this species, especially by longline fishing in deep water.
b. Importance of EEZ habitat to adult males and juvenile females and proportion of the stock utilizing this habitat (using archival tags).
c. Maturity and reproductive schedule in the eastern Pacific, including validation of extremely slow growth.
d. The ecology of this species compared with the other, more surface-dwelling, threshers.

Shortfin Mako Shark

a. Distribution, abundance, size, and catch distribution of shortfin mako to the south and west of the U.S. EEZ; relative importance of the nursery areas off southern California.
b. Pupping areas off southern California and northern Mexico, and whether any are critical for stock health.
c. Importance of the high-seas habitat and the dispersal and migratory patterns of adults.
d. Age and growth of this species (current growth estimates differ widely).

Blue Shark

a. Survival rate of discarded longline-caught blue sharks.
b. Total regional catches by sex and size (unknown because of high discard rate).
c. Movements of maturing fish from the EEZ to the high seas, comparing size composition of catches inside the EEZ and beyond.

Swordfish

a. How swordfish can be caught with greatly reduced take of protected species.
b. How swordfish are distributed by season and age in the outer EEZ and beyond, and whether there could be better fishing strategies.
c. Age and growth of west-coast-caught swordfish.

Striped Marlin

a. Nature and degree of exchange or isolation of the U.S./Mexico population with populations to the south and west (stock structure).
b. How the seasonal migration into southern California waters differs by size, age, and sex (archival tagging).
c. Age and growth of fish sampled from the eastern Pacific.

Dorado

a. Stock structure of eastern Pacific population.
b. The catches in the eastern Pacific, including from artisanal fisheries.
c. The importance of floating objects to this species according to age, sex, and reproductive state, comparing associated and non-associated fish (archival tagging).

8.6.2 Information Needs by Fishery

There is a need to determine, in priority order of need (not of fisheries):

Drift Gillnet

a. Size composition of bycatch species.
b. Adequacy of catch sampling by observers–are enough samples being collected given variability?
c. Dressed weights of individually landed fish (weight of entire catch is presently entered on fish tickets)

Surface Hook and Line (troll)

a. Total catch information (including incidental and bycatch) by vessel.
b. The extent of protected species interactions in this fishery (thought to be low).
c. Mortality of fish released in this fishery.

Pelagic Longline

a. The size and species composition of the primary catch.
b. Extent and composition of bycatch and of protected species interactions and resulting impacts on populations; distribution, abundance and movements of protected species.
c. How protected species takes can be reduced and survivability increased with new techniques and gear modifications. Effectiveness of the conservation measures adopted from the Hawaii-based longline fishery in the area fished by the West Coast longline fleet.
d. Economic factors (for RIR and RFA analysis).

Harpoon

a. Accurate catch composition taken exclusively by harpoon (California landings data, drift gillnet catches, are sometimes mixed with the Harpoon/Spear category when fishers hold multiple gear permits).
b. Length and weight data for individual swordfish (including estimates for fish struck but escaped).
c. Economic factors (for RIR and RFA analysis).

Coastal Purse Seine

a. Extent and composition of bycatch and protected species interactions, and the mortality rates.
b. Size, sex, and maturity composition of bluefin in catch.
c. Economic factors (for RIR and RFA analysis).

Recreational - Party/Charter Vessels

a. Complete catch composition and logbook information on a coast-wide basis (CA/OR/WA).
b. Protected species interactions, including depredation by sea lions and survival of hooked birds, and evaluation of the adequacy/accuracy of logbook entries.
c. Bycatch on a coast-wide basis and evaluation of adequacy/accuracy of information from logbooks and the MRFSS.
d. Economic factors (for RIR and RFA analysis).

Recreational - Shore and Private Vessels

a. Ways to adequately sample private vessels utilizing marinas.
b. Ways to determine the bycatch and protected species interactions by such private vessels.
c. Ways to sample the recreational catch for length and weight of fish caught to be able to convert catches reported in numbers to catches by weight.
d. Economic factors (for RIR and RFA analysis).

8.6.3 General Information Needs

EFH

a. Very little is known about the habitat of different life stages of most highly migratory species that are not targeted.
b. Little is known about the environmental effects of mid-water trawling and of the processing of discards.
c. Need to identify pupping grounds of common thresher sharks and shortfin mako sharks. Areas where pregnant females congregate may be sensitive to perturbation, and the aggregated females and pups there may be vulnerable to fishing.

PacFIN Data Issues

There are significant errors in gear codes of existing PacFIN data, and there is a need for finer resolution of California, Oregon, and Washington gear codes associated with HMS landings. Specific recommendations are:

Problem: Landings reported under incorrect gear codes.

Solution: Minimize inaccurate reporting on HMS fish tickets by eliminating defunct gear codes and by discouraging the use of dealers' knowledge of vessels to designate gear type. These concerns should be addressed through the states' fish ticket systems, and may require newly designed, or redesigned, fish tickets that more precisely identify HMS gears. California tickets to which this might apply include: (1) northern, central and southern hook and line; (2) central and southern gillnet and harpoon; and, (3) pelagic species.

Problem: Drift gillnet landings reported under both specific and lumped gear categories.

Solution: Recommend CDFG provide "corrected" drift gillnet fishery landings (using a filtering process) to PacFIN that include drift gillnet catches previously lumped under the general "entangling net" (60) and "other gear" (0) categories. Currently, PacFIN data for the drift gillnet fishery reflect only those landings that were assigned to gear code 65 (drift gillnet), and do not consider drift gillnet landings that were assigned to gear code 0 (unknown gear) or, more importantly, to gear code 60 (the general gillnet category, "entangling net").

Problem: Historical drift gillnet landings data contain errors stemming from inconsistent reporting of data processing practices.

Solution: To the extent possible, generate a "correct" record of historical drift gillnet landings.

Problem: Longline landings are lumped so impossible to separate out pelagic longline data.

Solution: Request that California delineate a drift/pelagic longline gear on HMS fish tickets, using a PacFIN gear code (GRID) created for drift/pelagic longline gear. Lately there has been increased interest in West Coast HMS species by pelagic longline vessels. A distinct pelagic longline gear code would accommodate landings by these vessels.

To the extent possible, generate a "correct" record of historical, pelagic longline landings.

Problem: Inability to differentiate CA coastal purse seine landings from distant water purse seine landings.

Solution: Request that the states and PacFIN distinguish between HMS purse seine landings by distant water tuna vessels (U.S. tropical tuna purse seine fleet) and HMS purse seine landings by California coastal vessels. The distinction is important for socioeconomic impact analyses, Regulatory Flexibility Analysis and potential quota allocations between fleets. To the extent possible, generate a "correct" record of historical purse seine landings of tropical tunas, bluefin and albacore, by purse seine gear type.

Problem: Inability to separate salmon from albacore effort/landings for OR and WA.

Solution: Develop distinct salmon and albacore troll gear codes for Oregon and Washington fish tickets. To the extent possible, generate a "correct" record of historical albacore and salmon landings, by species troll type.

8.7 Domestic Annual Harvest (DAH), Total Allowable Level of Foreign Fishing (TALFF), and Domestic Annual Processing (DAP)

The Magnuson-Stevens Act at 16 U.S.C. § 1853(a)(4) requires that each fishery management plan assess and specify 1) the capacity and extent to which U.S. fishing vessels, on an annual basis, will harvest the OY from the fishery (DAH); 2) the portion of the OY which, on an annual basis, will not be harvested by U.S. fishing vessels and can be made available for foreign fishing (TALFF); and 3) the capacity and extent to which U.S. fish processors, on an annual basis, will process that portion of the OY that will be harvested by U.S. fishing vessels (DAP). Regulations implementing the Magnuson-Stevens Act at 50 C.F.R. § 600.516 further define the total allowable level of foreign fishing, as – with respect to any fishery subject to exclusive U.S. fishery management authority (i.e., the portion of the fishery that occurs within the U.S. EEZ) – that portion of the OY of such fishery that will not be caught by U.S. vessels.

All species in the management unit of this FMP are highly migratory and range far beyond the EEZ. As presently defined, the OY for each species is based on MSY for the entire stock, both within and beyond the U.S. EEZ. However, the U.S. domestic fleet harvests only a small portion of the OY, and only a small portion of the U.S. harvest is taken in the EEZ. The rest of the U.S. harvest is taken beyond the EEZ.

Presently, no highly migratory species in excess of U.S. harvest capacity are available for foreign fishing (TALFF) in the EEZ. The DAH of HMS from 1995 through 1999 has averaged 24,349 mt (Chapter 2, Table 2-1). During this period, an average of 1,074 vessels landed HMS on the West Coast (Chapter 2, Table 2-64). The amount of fishing gear actually deployed on an annual basis to take management unit species depends on availability of the resource. In all instances, the harvesting capacity of the U.S. fleet along the West Coast exceeds the amount of the resource available in the EEZ.

Similarly, no HMS are available for foreign processing. In Chapter 2 section 2.4, the FMP documents the characteristics of 20 HMS communities, including the number of processors/buyers in each area. U.S. processors process fish caught within and outside the EEZ by U.S. vessels, and import additional HMS to meet market demand. Therefore, the capacity and extent of domestic annual processing (DAP) exceeds the amount of HMS harvested by U.S. vessels in the EEZ.

A review of the capacity and extent of domestic annual harvest and processing will be included in the annual SAFE document.

8.8 Alternatives Eliminated

Several management alternatives that were considered for this FMP were subsequently eliminated. The following matrix (Table 8-2) lists those alternatives, and the reasons for their elimination.

Table 8-2. Alternatives eliminated

Fishery or Issue	Alternative Eliminated	Reason for Elimination
Drift Gillnet	None	
Longline	1. Allow pelagic longlining outside the EEZ only under an exempted fishing permit (EFP).	Would require a prohibition on longlining outside the EEZ. Other less severe measures provide options to protect turtles and seabirds in this fishery.
	2. Establish a limited entry program for longlining outside the EEZ.	Council's policy at this time is to defer considering limited entry (see "Limited Entry" Issue below). However, the Council will be providing recommendations for limited entry to the CA-based fishery.
	3. Allow a limited cable longline fishery in the EEZ for sharks.	The Council chose not to consider opening a directed fishery for sharks, especially one targeting juveniles, in this case, of short-fin mako. A high bycatch of blue shark is also expected.
	4. Allow pelagic longlining outside the EEZ, but restrict swordfish targeting to east of 140°W long.	Presentation of various closure alternatives was considered premature pending determination of whether swordfish targeting by the West Coast fleet causes jeopardy to any listed species, and a more thorough examination and analysis of reasonable and prudent alternatives.
Hook-and Line (surface)	Limited Entry	Council's policy at this time is to defer considering limited entry. See "Limited Entry" Issue below.
Purse Seine (small)	Require live release of pelagic sharks.	Postponed for future consideration. Data on catch and bycatch in this fishery is being collected.
Harpoon	None	
Recreational	1. Federalize existing state regulations.	Management of recreational fisheries, which seldom can significantly affect HMS stocks, is best managed by states, where regulations that reflect the diverse sportfishing conditions and local issues and values are best administered.
	2. Establish a framework for setting bag limits which can differ by states or be uniform coast-wide.	Management of recreational fisheries is best managed by states, where regulations (here, bag limits) that reflect the diverse sportfishing conditions and local issues and values are best administered.
Shark Conservation	1. Require release of sharks taken in any round haul fishery.	Postponed for future consideration. See Purse Seine (small) above.
	2. Impose daily bag limits and minimum size limits for recreational shark fisheries consistent with current California rules.	No compelling reasons were presented on any need to adopt the California limits coast-wide.
	3. Prohibit any new commercial fisheries targeting sharks until research determines that such fisheries are sustainable and not harmful.	Although this prohibition would cap development of shark fisheries and be precautionary for these generally low-productivity fishes, it could indirectly constrain development of other fisheries with significant incidental catches of sharks. Not considered necessary at this time.
	4. Replace states' regulations on shark finning with the 3/2002 federal rule's restrictions on fin landing.	States prefer maintaining their existing rules, which comply with and are stricter than the new federal rule prohibiting shark finning or possessing or landing fins without corresponding carcasses. CA now prohibits landing of fins cut from carcasses, except for thresher sharks, and OR and WA prohibit transport of detached fins.
	5. Develop commercial or recreational harvest quotas for vulnerable species (sharks) based on historical landings.	Historical landings by themselves are insufficient to develop stock and local population quotas because the sharks are not directly targeted and generally are poorly accessed (except occasionally, the common thresher), although such quotas would be conservative and precautionary. This FMP does, however, recommend harvest guidelines for common thresher and shortfin mako sharks (sec. 8.4.8) based on historical landings as well as life history information, but not quotas (the status of stocks remain unknown).
	6. Include white shark as a management unit species.	The white shark is proposed to be a prohibited, not actively managed species under this FMP.
Bycatch Reduction	1. Develop a formal, comprehensive bycatch reduction plan.	The FMP proposes, instead, Bycatch Alternative 2 (sec. 8.4.4) that would establish a framework authorization for bycatch reduction, a voluntary catch and release program for the recreational fishery, and various fishery-specific measures.
	2. Establish performance standards to reduce and minimize bycatch.	Considered premature at this time as performance standards first require identification of the fishery-specific objectives and the rewards for their obtainment. Such a program would require observers to document performance and results.
	3. Require full retention of catch in HMS fisheries.	Full retention, to discourage fishing where bycatch is high, requires observers for enforcement and the onboard space to store the catch, both impractical on many vessels. Moreover, it could result in dumping at landfills, a worse waste than discarding at sea. Species with good release-survival rates, like ocean sunfish and blue shark, would have to be retained and would likely be wasted.
	4. Reduce or limit the number of boats in the drift gillnet and other fisheries.	The drift gillnet fishery is already by limited entry with permits not being renewed, and the Council's policy at this time is to defer consideration of limited entry for other HMS fisheries. A need for effort reduction in these other West Coast fisheries has not been shown.
	5. Limit soak time in drift gillnet and longline fisheries.	The drift gillnet fishery already is by night fishing only, and the longline fishery soak time may be constrained by the work/rest cycle. Other possible periodicities involving soak time need to be studied in terms of the fishing crew's operating cycle and how it affects fishing efficiency and safety.
	6. Prohibit coastal purse seiners from setting on floating objects.	Considered premature until the importance of this mode of fishing is determined, and the cost/benefit of such a prohibition is estimated.
	7. Require circle hooks and de-hooking devices in the recreational fishery.	While these gear have been shown to reduce mortality of caught fish, their effectiveness varies by fish species and capture mode, and there are no standards for type. They are best used volnntarily, since enforcement would be difficult.
Limited Entry	Establish limited entry programs for drift gillnet, longline, and troll fisheries.	The Pacific Council has deferred consideration of limited entry at this time, an issue that is both socioeconomic and resource-protecting. Limited entry is already established in the drift gillnet fishery (CA, OR), a developmental longline fishery in the EEZ (OR), and in the small purse seine fishery (de facto via coastal permits; CA). Adopting limited entry would benefit the troll and CA high seas longline fisheries by capping effort and helping reduce protected species takes (longline fishery). The Council established a control date (3/9/00) for future use in limited entry and will consider limited entry options at a later date (Nov. 2003).

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Chapter 9
ENVIRONMENTAL CONSEQUENCES OF PROPOSED ACTIONS AND ALTERNATIVES

9.0 ENVIRONMENTAL CONSEQUENCES OF PREFERRED ACTIONS AND ALTERNATIVES

This chapter describes the expected conditions in the fisheries without an FMP in place, and evaluates the impacts of the proposed actions and alternative actions described in Chapter 8. This information was used to compare the benefits and costs of the alternatives and form the basis for the ultimate decisions on which alternatives to adopt.

9.1 Baseline Conditions Under the "No Action" Alternative

To establish a basis for evaluating the effects of the proposed action and alternatives and comparing the alternatives against each other, it was necessary to estimate what the conditions in the fisheries and the stocks are likely to be in the future if there was no FMP in effect. This is basically the future expected conditions under the "Status Quo" or "No Action" alternative. It recognizes that fisheries are dynamic and changes are likely in the future even if the FMP is not implemented. Future conditions are not likely to be identical to current or recent past conditions. The estimation of future conditions is a judgment about whether trends of the past are likely to continue into the future or whether future actions will result in changes in conditions in the absence of the FMP. The following discussion reflects the combined judgment of the preparers of the FMP and advisors. For more detailed discussions about the fisheries and the stocks, see Chapters 2 and 3, respectively.

9.1.1 Projected Status of Fisheries under the No Action Alternative

Drift Gillnet

This fishery has gone through significant changes in the past 20 years (e.g., see Holts and Sosa-Nishizaki 1998). The fishery began off southern California in 1978, primarily for pelagic sharks, but since then, major changes have occurred in almost every aspect of the fishery — vessel numbers, gear, fishing techniques, regulations, fishing areas, seasons and targeted species. Thresher shark landings have declined to an average of ~220 mt (round weight equivalent, or rw) since the peak of the shark driftnet fishery in 1981-1982 when an average of ~721 mt rw per yr was landed valued at $1.1 to $1.3 million. The decline has been largely due to a re-targeting of effort toward swordfish and regulatory measures that have effectively eliminated thresher shark fishing in the spring months. In 1983, swordfish landings (242 mt) began to exceed thresher shark landings, and thereafter, shark has been a secondary target. In 1999, approximately 573 mt of swordfish were landed, valued at $2.7 million (see Tables 2-44 and 2-45). The number of active participants has shown similar trends with a decline in the past 20 years.

There is no reason to expect any significant increase in the fishery in the next few years, while there is reason to think the fishery will decline further. The time/area restrictions established by NMFS to protect sea turtles pursuant to the recent biological opinion dealing with this fishery will likely continue in the absence of the FMP and will place serious constraints on the fishery. Similarly, the time/area restrictions and gear requirements of the states are likely to continue under states' authorities. It is possible that the restrictions placed on the Hawaii longline fleet will result in substantial decreases in the availability of fresh U.S.-caught swordfish to West Coast markets, but given the amount of fresh and frozen swordfish available from other Pacific sources, this is not likely to result in increases in ex-vessel prices to drift gillnet vessels that could offset decreased catch and landings of swordfish and sharks under the biological opinion. In the absence of this FMP, the fishery will continue to be controlled by the regulations issued pursuant to the biological opinion and those from the Pacific Offshore Cetacean Take Reduction Plan (POCTRP). Therefore, it is expected that landings in the future will likely be less than the 1999 levels of landings (about 1,000 mt) and landed value ($3.47 million). The number of active vessels is expected to be fewer than the 80-90 vessels active in 1999, and direct employment would be expected to be fewer than the 250 estimated to be employed in 1999. The fishery will continue to be centered in southern California, with clusters of vessels in Ventura/Oxnard, Los Angeles/Terminal Island, and San Diego.

While the initial focus has been on drift gillnet use to target swordfish and sharks with at least 14-inch stretched mesh nets, there are some vessels (estimated variously at 3-10 vessels) that use small mesh drift gillnets to target bluefin and albacore when they are available. NMFS and state agencies are currently determining the extent to which management measures under existing authorities would be applied to these vessels. In the absence of this FMP, it is presumed that their activities can and will continue, but that monitoring will expand, including observer coverage, to ensure that catch, effort and protected species interactions are fully recorded and reported. If so, possibly 10-20 vessels will be engaged in this fishery part time with total landings of 500-1,000 mt per year. NMFS has begun placing observers on these vessels.

Purse Seine

The purse seine fishery used to account for almost all HMS landings into West Coast ports but the level of participation and landings have declined dramatically since 1981 (see Tables 2-64 and 2-31). In 1981, a total of 137 purse seine vessels reported landing some HMS into West Coast ports; by 1999, only 16 purse seine vessels reported tuna landings into a West Coast port. In 1981, 101 vessels with HMS landings could be characterized as having purse seine as their principal gear; by 1999, only 5 vessels were in this category. In 1981, almost 130,000 mt of tuna with an estimated ex-vessel landed value of $278 million were landed by purse seine vessels; that dropped to less than 5,000 mt valued at $3.9 million ex-vessel in 1999.

There are two components to this fishery sector: large vessels (larger than 400 short tons (st) carrying capacity) and small vessels (equal to or less than 400 st carrying capacity). The fleet of large vessels based on the West Coast and fishing in the eastern Pacific has been greatly reduced over the past 20+ years. Many of the vessels active in the 1970s have been sold to companies or owners in other countries (e.g., Ecuador) or have been retired or lost altogether (sinkings, fire). One group of large vessels relocated to the western Pacific, but that fleet also has seen substantial reduction over the past 20 years. As a result, there are only 4-6 large vessels based on the West Coast that still fish regularly in the eastern Pacific. Most of their landings are delivered to foreign ports or shipped to canneries/processing facilities outside the mainland United States.

The small vessel fleet that catches tuna is a multi-fishery fleet. It actually is generally reliant on coastal pelagic species (CPS, such as Pacific sardine, Pacific mackerel, market squid, anchovy) and shifts to tuna when they are seasonally available or accessible to the fleet in U.S. waters or perhaps on the high seas. In 1999, 21 vessels whose principal species are CPS, reported landings of HMS, and most of these were undoubtedly purse seine vessels. The number of small purse seiners landing tuna into West Coast ports also has been declining over the years; in 1981, fewer than 10 small purse seine vessels were recorded as having made HMS landings into West Coast ports. However, there are 65 small purse seiners with limited entry permits under the CPS FMP, and most if not all are capable of catching and delivering tuna. The average crew on a small purse seine vessel has seven members.

The landings and landed value of HMS catches in this fishery (both components) have been trending downward for many years. Even if this fleet could increase effort targeting on bluefin, it would not likely make up for the decline in tropical tuna catches. The recent closure of the last cannery that processed whole fish in California also suggests that the trend will continue as the market for large volumes of whole tuna will be very limited. Some vessel operators may be able to develop special handling techniques for purse seine-caught fish to provide a higher quality fish for fresh and frozen markets rather than canned tuna markets. But it is not known if the market can absorb large quantities of fresh tuna at prices that would make these handling techniques profitable. A few vessels may be able to make arrangements to have their catch shipped to Mexico or landed there for processing, and other catches may be shipped to American Samoa canneries. However, shipping costs may be high and might make fishing less profitable or even unprofitable.

A few vessels also may be able to arrange to catch bluefin for transfer to Mexican vessels for "grow out" facilities that have been established off Baja California. This has been done to a certain extent in recent years. However, the ability of this market to handle large quantities is unknown. Thus significant growth in the U.S. purse seine fishery is not expected, and declines seem more likely, but again, changes are difficult to predict with so many variables. Tropical tunas are not significantly abundant in the EEZ or available to current commercial fishing gear off the West Coast. U.S. vessels would continue to be shut out of Mexico waters where fishing is more productive. States' area closures and other fishery restrictions will likely remain in place without the FMP. Therefore, the expected baseline for this fishery is 10-15 part-time, small purse seine vessels with total landings of 1,000 mt or less valued at $1.5 million or less per year in the absence of this FMP. Total employment in this fishery would remain below 50 persons. The fishery would still be centered in southern California. There would be no growth in processing or support industries associated with the purse seine fishery.

Albacore Surface Hook and Line and Baitboat

The northern albacore fishery has rebounded strongly from the lows of the 1986-1991 period, although total participation and landings are still down from the peaks prior to the 1980s. In 1981, 1,828 vessels recorded albacore landings with "surface hook-and-line" gear; this dropped to a low of 170 vessels in 1991, but then rose to 1,196 vessels in 1997 and an average of more than 800 vessels per year in the 1995-1999 period (Table 2-64). The average vessel has a crew of 1-2 persons, so employment has been about 1,200 persons per year in that period. Similarly, landings (see Table 2-12) have cycled from high to low to high in the past 20 years. In 1981, the surface troll fishery landed 13,421 mt of albacore; this dropped to 1,638 mt in 1991, and then rose to 14,075 mt in 1996, and the average has been almost 11,000 mt in the 1995-99 period. The value of the landings has shown the same cycle, reaching $45 million in 1981, dropping to $3.25 million in 1991, and rising again to over $28 million in 1996 and an average of about $19 million per year 1995-1999. In real terms, the value of landings has dropped in part because the real price paid per ton has dropped over the years. In 1981, the ex-vessel value was more than $3,000 per mt; in 1999, the ex-vessel value was just under $2,000 per mt. The U.S. fleet's per cent share of surface-caught albacore is higher than its share for any other tuna in the Pacific, but it is believed that Japanese fleets overall have a greater impact on the stock. U.S. vessels have occasionally fished in Canadian waters in the past, but most fishing in the past decade has been either in the U.S. EEZ or on the high seas.

The resurgence of the albacore fishery is due to a rebound in the stock from depressed conditions in the late 1980s and early 1990s and its increased availability to West Coast vessels. This has attracted vessels back into the albacore fishery. It is possible that some vessels shifted from depressed salmon fisheries into albacore as the fishery rebounded in the early 1990s; many operators have always been interested in both salmon and albacore (and sometimes other species such as Dungeness crab), shifting their strategy in the different seasons.

It is not known how long the increased availability of albacore to the West Coast fleet the past five years will continue. Albacore (like most tunas) have variable recruitment dependent in part on environmental conditions, and their migratory patterns may bring them closer to shore in some years than in others. Further, the industry's occasional difficulty marketing its catch when canneries have large supplies and thus offer low prices, is buffered by more of the catch entering the fresh and frozen product market. Overall, it does not appear likely that the West Coast albacore fishery will change substantially in the next few years in the absence of this FMP. The fishery is expected to remain fairly stable with a fleet of 800-1,000 vessels making landings of about 10,000 mt valued at about $20 million per year. Employment would remain at about 1,600-2,000 persons.

Pelagic Longline

At the present time, all active longline fishing by West Coast-based vessels takes place on the high seas outside of the EEZ. States have stringent controls on longline fishing such that there is no longline fishing occurring in the EEZ, except that Oregon allows longlining outside 25 miles for swordfish and blue shark under the state's developmental fisheries program permit system. Blue shark permits are limited to 10 and swordfish permits are limited to 20, although there are no active permittees at the present time. Since 1995, the number of Oregon blue shark permits issued in a year has ranged from none to six, and the number of swordfish permits issued has ranged from one to nine. Increased participation in this fishery is not expected. Even if participation were to increase, the maximum allowable number of vessels fishing would be small. The high seas longline fishery based on the West Coast is a recent addition to West Coast HMS fisheries, and few of the vessels active in the fishery have been full year participants most years. Even before the Hawaii longline fishery was being tightly regulated to protect sea turtles, several Hawaii-based longline vessels made some trips into and out of West Coast ports. The first significant appearance of longliners was in 1994, when 26 vessels taking HMS using longline as their principal gear reported landings (see Table 2-66). That number dropped to 15 vessels in 1996, but then rose to 32 vessels in 1999. With the tight restrictions now in place for Hawaii-based vessels, a number of vessels have given up their western Pacific longline limited entry permits and have been fishing more regularly out of California. The amount of landings by these vessels had risen to 1,541 mt of swordfish and small amounts of other species by 1999 (Table 2-71), valued at more than $5.8 million (Table 2-72). Most of these vessels are based in southern California. Average crew size is estimated to be 5-7 crew per vessel, or about 200 persons overall in 1999.

Due to concerns about impacts of Hawaii-based longline fishing on endangered and threatened sea turtles, NMFS completed a Section 7 consultation with a biological opinion that has led to very restrictive regulations that are applicable to longline vessels that are registered for use under a western Pacific longline limited entry permit (see Chapter 8). These regulations have had substantial impact on that fleet, and some of the vessels have since shifted to the West Coast. The preferred alternative under this FMP attempts to correct this regulatory inconsistency by applying many restrictions also to vessels based on the West Coast. It differs in allowing continued targeting of swordfish east of 150° W longitude (although not west of that line). If the FMP were not adopted, however, it is assumed that NMFS would use its authority under the Magnuson-Stevens Act or ESA to promulgate restrictions independent of the FMP, possibly adopting the western Pacific full ban on swordfishing north of the equator. Thus, the future without the FMP with respect to the longline fishery based on the West Coast is expected to be different from recent conditions: swordfish sets may be prohibited; gear restrictions (no light sticks, minimum depth of sets, line clippers to release sea turtles) would apply; and seabird avoidance methods would be required. Longline fishing targeting tuna on the high seas out of West Coast ports might then be an alternative, but fishing would probably be only seasonal. Although some profitable fishing might occur in the periods when tuna are available within a reasonable distance from the outer edge of the EEZ off the West Coast, it is assumed that this would not support full time longline fishing, judging from existing seasonal catch patterns in the EPO. Drift gillnet participants currently fishing in the EEZ would like the opportunity to use longline to target bluefin and other HMS within the EEZ as an alternative to drift net use, and to reduce existing marine mammal interactions. In the absence of the FMP, moreover, it is assumed that the states' controls on longline fishing would continue, effectively prohibiting its use inside the EEZ. If these assumptions hold true, in the absence of the FMP, there may soon be little or no longline fishing by vessels based on the West Coast, thus landings revenues may drop to near zero. While there could still be some fishing, it would certainly be far less than the 1,500 mt valued at $5.8 million landed in 1999. Employment would drop to zero or near zero as well.

Harpoon

The harpoon fishery used to account for the bulk of swordfish landings into California but was supplanted by the drift gillnet fishery in the 1980s. The harpoon fleet declined from 103 vessels in 1981 to 18 vessels in 1999, virtually all of which are in southern California (Table 2-76). Average employment is 2-3 persons per vessel. This fleet also utilizes spotter planes and pilots to locate fish. Since 1984, the California Fish and Game Commission has allowed unlimited airplane use to assist harpoon permittees in locating fish, but the total annual plane effort is not known. The annual landings of swordfish have declined in the past 20 years from 289 mt in 1981 to 83 mt in 1999 (Table 2-71), and the real ex-vessel value of the landings dropped from about $1.8 million in 1981 to $600,000 in 1999. The real price per pound of swordfish, however, has risen for this fishery in that period, reflecting the premium price paid for harpoon swordfish landings.

The controls on drift gillnet fishing and longline fishing expected without the FMP could result in slightly improved prospects for the harpoon fishery. If there are lower swordfish catches in the drift gillnet and longline fisheries, then more swordfish might be available to harpoon vessels. Also, a decline in swordfish in the markets from those other gears could result in some improvement in price for harpooned swordfish, although as noted above, swordfish is an internationally traded species and other sources appear likely to fill any void left by decreased drift gillnet or longline landings of swordfish. However, this harpoon fishery is highly dependent on suitable environmental conditions to be able to locate and harpoon swordfish on the surface and there is little reason to expect significant changes that will enhance this spotting capability and the efficiency of the fishing gear. The harpoon fishery is expected to remain about as it has been the past few years, with about 15-20 vessels making annual landings around 75 mt valued at $500,000-$600,000. Employment would remain at about 50 persons per year.

Recreational Fisheries

All of the HMS are prized to some extent by recreational fisheries. In general, as incomes and leisure time have increased in the United States, more time and money have been expended on recreational activities. However, the trend in marine recreational fishing on the West Coast has generally been downward. This appears to be confirmed in the NMFS Marine Recreational Fisheries Statistics Survey, California commercial passenger fishing vessel (CPFV) customer counts, and marine angling license sales in California. On the other hand, recent limits on marine recreational fishing opportunities for groundfish may be promoting an increase in marine angling for HMS. No data are available indicating the extent to which CPFV trips oriented to HMS have increased or decreased in recent years, but the resurgence of albacore may be resulting in increased trips targeting this stock along the West Coast. Private vessels' targeting HMS may also be increasing due to the availability of albacore and other HMS. Further, HMS fishing is somewhat more specialized, such that there are probably higher expenditures per trip targeting HMS than for trips targeting groundfish or nearshore species. Thus, there could be increased expenditures and associated impacts even if the number of marine angling trips overall is decreasing. There are no studies to indicate whether HMS angling will increase or decrease, or what the expenditures and associated impacts would be, in the absence of the FMP.

9.1.2 Future Projected Status of Stocks Under No Action Alternative

Tropical Tunas (yellowfin, bigeye, skipjack)

There is little basis to project significant changes in the status of tropical tuna stocks in the next few years. These stocks are principally harvested in international fisheries in the eastern Pacific under conservation recommendations made by IATTC and implemented by member nations. The IATTC has set yellowfin quotas for several years based on the estimated status of the stock and is committed to limiting harvests to levels consistent with producing the maximum sustainable yield from the stock. If fishery and research data indicate that harvests must be reduced in response to changes in stock conditions (e.g., low recruitment), the IATTC presumably will agree to such a reduction. Low catches of juvenile yellowfin tuna in the floating objects fishery suggest that there has been poor recruitment in the past two years. This stock probably is oceanwide with portions being fished beyond the eastern Pacific, so conditions in the eastern Pacific may not be indicative of the condition of the stock throughout its range. It is possible the species is being fished beyond the MSY level, but the species does not appear to be overfished in terms of the control rules proposed in this FMP. With respect to bigeye tuna, the IATTC has been monitoring catch of juvenile bigeye to try to determine if catch limits are necessary to protect or maintain the stock. In 1999, the IATTC even established a quota for bigeye with the intention of ensuring that there would not be excessive fishing of juveniles. In fact, purse seine sets on floating objects were prohibited late in 1999 to keep catches within the quota. Skipjack has been less well studied than yellowfin and bigeye and with this species, too, there are major unknowns concerning its life history, although this species appears to be highly productive. The catch in 2001 has been significantly lower than in 1999 and 2000 in the eastern Pacific; this may reflect changes in the stock or changes in the fishery in the eastern Pacific. There are no indicators of overfishing of this stock at this time. No quota has been set for skipjack. However, in the interest of reducing bycatch from the capture and discard of juvenile yellowfin and bigeye tuna, the IATTC agreed on a pilot project for 2001 (subsequently extended through 2002) to require purse seine vessels to retain all tuna brought on board the vessel after a set. The intent is to provide an incentive to not set on schools that have a high proportion of small fish or to perhaps abort sets in which small fish are found to make up a high proportion of the catch. If effective, this would contribute to reduced catches of juveniles and probably reduced catches of skipjack tuna, which are predominately caught in sets on floating objects along with juvenile yellowfin and bigeye tuna. The U.S. fleet of small purse seiners accounts for a small portion of the total catch of these stocks and is not substantially reliant on them at this time. The larger purse seiners are more dependent on the tropical tuna stocks but have the alternative of relocating to other grounds if eastern Pacific stocks were to decline or if economic conditions were more favorable in other areas.

With or without this FMP, the tropical tuna stocks will respond to environmental factors and overall fishing impacts in the same manner. No significant change in the stocks is foreseen.

Albacore Tuna

The stock of albacore ranges across the north Pacific from Japan to the U.S. West Coast. It has rebounded from low levels in the late 1980s and early 1990s and appears to be healthy. The U.S. accounts for a higher share of total catch of north Pacific albacore than for other tunas but is still only one of the major fishing nations in this fishery. There is no international agreement to limit fishing on this stock but it is not clear that total fishing mortality at this time is affecting recruitment and stock size. Albacore researchers anticipate no major changes in the stock, other than due to long term environmental factors, as described in Chapter 3 section 3.3.1. Through the North Pacific Albacore Working Group, a group of international scientists (including U.S., Canadian, Taiwanese, and Japanese scientists) is monitoring the fisheries and the stock, and this should provide a basis for determining future need for management controls, although the group has no procedures for agreement or for management. At this time, it is expected that the stock will remain at or near current levels in the next few years and will support the U.S. fishery as described above with or without the FMP.

North Pacific Bluefin Tuna

This stock ranges across the Pacific from Japan to the eastern Pacific but is mainly concentrated in and spawns in the western Pacific. It is quite valuable as a food fish, and U.S. West Coast average annual landings in recent years (1997-99) have been 1,462 mt valued at $2.3 million (Tables 2-1 and 2-2). There is no international management organization responsible for setting harvest controls for this stock, though its status is reviewed by the IATTC. The U.S. fisheries off the West Coast account for about 10-12 percent of total fishing mortality in some years, but this may change as management controls continue to restrict the drift gillnet and longline fisheries. Whether purse seine fishery catches decline or increase in the future will depend on economic conditions, the extent to which fresh and frozen product markets are available given that processing facilities in California have closed, and the availability of shipping services to transfer catches to foreign processors. Pen rearing operations off Mexico may provide an economic incentive to increase targeting on this stock when it is available. Some catches of bluefin tuna caught in U.S. waters are towed live to pens in Mexico for grow-out, and presumably some fish may be also landed there. Fish are generally shipped from Mexico to Asian markets via Los Angeles. It is not known if other fisheries that harvest this stock are increasing or decreasing especially in the western Pacific. There is no reason to predict a substantial change in the status of the stock in the next few years from fishing in the eastern Pacific, assuming present levels of effort.

Pacific Swordfish

This stock appears to be in good condition and there are no current signs pointing toward a significant change in its condition over the next few years. Absent the FMP, the anticipated reductions in drift gillnet and longline fishing even without the FMP are not expected to affect the condition of the stock overall since the regional harvest accounts for only 12% of the North Pacific take. The stock is thought to have a wide distribution and fished by many gears and fleets. With the strong demand for swordfish in the United States, it is possible that overall fishing pressure by international fleets less constrained than U.S. fleets by regulatory protections, will increase. There is no international management arrangement setting limits on the fisheries for this stock, although the Interim Scientific Committee for Tuna and Tuna-like Species of the North Pacific Ocean is studying and assessing the stock.

Common Thresher Shark

While the common thresher is widely distributed in the Pacific, it is principally taken in shore within 40 to 100 km of the coast (see pictures and graphics after executive summary). As indicated in Chapter 3, they are vulnerable to localized reductions from fishing due to low rates of population increase. There is no international management and there is no binding quota, though an interstate management plan was agreed to by Washington, Oregon and California in 1990. If this FMP were not adopted, there could be increased risk of localized overfishing or depletion of common thresher off the West Coast as there might not be systematic monitoring and assessment of the stock, and it is likely that the only harvest guideline would be the 578 mt level in the tri-state fishery management plan. Based on available evidence and the results of a thresher shark stock assessment conducted for this FMP, this harvest level may not be sustainable.

Shortfin Mako Shark

The shortfin mako is an oceanic shark widespread throughout the tropical and temperate Pacific. As with thresher sharks, the rate of natural increase is low and, if the localized population were depleted, rebuilding of the population would be slow. There is no international management and there is no harvest limit for this stock. If this FMP were not adopted, there could be increased risk of localized overfishing or depletion of shortfin mako off the West Coast as there might not be systematic monitoring or assessment of stock status.

Blue Shark

This is probably the most commonly caught shark off the West Coast and Pacific-wide. Reproductive rates for this stock are somewhat higher than for thresher and shortfin mako, but are still lower than for the other HMS species. There is no international management and there is no harvest limit for this stock. However, the risk of localized overfishing or depletion of the stock is thought to be low due to this species' vast range and continual immigration from adjacent areas of the Pacific, and given the assumption of no substantial increases in fleet size. The blue shark stock is under intensive fishing pressure ocean wide but there has been no indication of overfishing, according to a recent stock assessment (Kleiber et al. 2001). If this FMP were not adopted, there would still likely be little effect on or risk to blue sharks, since the regional catch is estimated to be 1% of the north Pacific take of this species, and assuming stable or decreasing effort in West Coast HMS drift gillnet and longline fisheries, which account for most of our regional take. Thus there is no reason to conclude that the absence of the FMP would have significant effect on the future status of the stock, except that a lack of a federal management focus may lead to inaction or delayed response to declines in local/regional abundance due to fisheries or natural causes.

Pelagic and Bigeye Thresher Shark

Little is known about these stocks which occur less frequently in the EEZ than common thresher. As with common thresher sharks, the rate of natural increase is low and, if the localized population were depleted, rebuilding of the population would be slow. There is no international management and there is no harvest limit for this stock. If this FMP were not adopted, however, there is still low risk of localized overfishing or depletion of either of these species due to their relatively limited occurrence in the EEZ and the limited extent to which U.S. fisheries take these species. Nonetheless, the species will be monitored actively under the FMP. Without the FMP, there would be little monitoring of the catches or regular assessment of stock status.

Striped Marlin

This species is taken throughout the Pacific by commercial and recreational gears. The stock appears to be healthy throughout its range, though there may be local areas where abundance has decreased from heavy fishing pressure. However, as much international longline fishing has shifted to deeper sets and away from tropical waters, the incidental pressure on striped marlin may have decreased. There is no international management and there is no harvest limit for the species. In the absence of the FMP, states' prohibitions on sale of striped marlin would continue. The incidental take of striped marlin in the drift gillnet and longline fisheries, which are minimal, would continue to be constrained by measures that are expected to have the effect of reducing overall fishing pressure on all HMS stocks. However, while this could affect local abundance and availability to recreational fisheries, it is unlikely to affect the overall status of the EPO stock, although more stock structure work is needed to explore the possibility of more localized regional stocks. Assuming a single EPO stock, there is no reason to conclude that the absence of the FMP would have significant effect on the future status of the stock, except that a lack of a federal management focus may lead to inaction or delayed response to declines in local/regional abundance due to fisheries or natural causes.

Dorado (Dolphinfish)

This highly productive species is a seasonal migrant into the EEZ and is exploited in the eastern Pacific as well as in other Pacific areas. There is no international management and there is no harvest limit for the species. In the absence of the FMP, the incidental take of dorado in the drift gillnet and longline fisheries would continue to be constrained by measures that are expected to reduce overall fishing pressure on all HMS stocks. However, while this could affect local abundance and availability to recreational fisheries, it would not likely affect the overall status of the stock. The species appears to be healthy and well able to sustain present levels of fishing pressure.

9.1.3 Projected Conditions Relative to Other Socio-Economic Factors Under No Action Alternative

U.S. Markets for HMS

U.S. consumers constitute a huge market for HMS products, the bulk of which is consumed as canned tuna but which also includes fresh and frozen tuna, swordfish and sharks.

As West Coast landings of tuna species for canning have declined in the past 20 years, imports of canned products from Asia and shipments of canned products from processing facilities in American Samoa and Puerto Rico have accounted for most of the canned tuna products consumed in the U.S. Imports are expected to remain the principal source of canned tropical tuna to U.S. markets, whether or not the FMP is implemented.

U.S. harvesters of north Pacific albacore account for a somewhat higher share of the total amount of canned albacore consumed in the United States; however, imports still account for more than half the consumption. Much of this comes from landings of albacore into U.S. canning facilities in American Samoa and Puerto Rico. This is expected to continue with or without the FMP. U.S. vessels targeting albacore will likely continue to seek product forms and fish handling techniques that will expand the accessibility of fresh and frozen albacore to consumers and lessen the reliance on canners as the principal outlet for their catches. Some West Coast seafood processors will continue to seek local albacore for their product lines, both from U.S. and Canadian vessels. This will occur with or without the FMP.

Northern bluefin tuna are seasonally available to West Coast consumers and for export to Asian markets. Little is known about the extent to which fresh or frozen bluefin from local catches is consumed locally, is exported, or is shipped to canneries for processing. Some bluefin caught by U.S. vessels is towed (alive) to pens off Mexico where they are fed to a larger size and shipped to Asian markets (through Los Angeles). These shipments are tracked. However, without the FMP, large information gaps would continue and the size and importance of this product in U.S. markets would continue to be unknown. NMFS is required to track the shipments of bluefin generally (under ICCAT management in the Atlantic), and it is likely that there would be greater difficulty monitoring the local fisheries and tracking bluefin shipments without the FMP.

Imports account for a large portion of the fresh and frozen swordfish consumed in the United States. However, U.S. vessels based in California and operating out of Hawaii also have accounted for large amounts of swordfish available in West Coast markets. It is expected that, with and without this FMP, there will continue to be restrictions imposed on West Coast and Hawaii longline vessels and West Coast drift gillnet vessels that will have the effect of reducing or eliminating the amount of swordfish being landed into the West Coast and available to U.S. markets. There could be a somewhat lesser decline in the short term if the FMP were not implemented because NMFS would then be delayed (by 6-12 months) in implementing management measures for the longline fishery under other statutory authorities. However, these limitations would likely be implemented at some time in the next year. On the other hand, in the absence of the FMP, if NMFS were to find through research or exempted fishing permits that there were changes in gear that would provide opportunity to target swordfish without risking harm to sea turtles, there would not be framework procedures to allow rapid implementation of new measures, so the absence of the FMP could result in a longer delay in resuming the flow of U.S.-caught swordfish to U.S. markets and consumers.

The market for shark is fully filled by U.S. producers delivering to the fresh fish market. With or without the FMP, this market is expected to remain somewhat of a niche market in that the proportion of people who seek or consume shark is relatively low in the population. Without the FMP, however, there could be a higher potential for localized overfishing of sharks, such that the availability of sharks to even this small market would decrease or that shark would only be available at a higher price.

Support Industries

Suppliers of fishing equipment, fuel and other supplies to HMS fleets would be expected to experience continued declines in overall sales to those fleets in the absence of the FMP as the fisheries are expected either to remain as they have been or to decline. While troll albacore and harpoon fishing may remain constant or even expand somewhat, drift gillnet, longline and purse seine fishing is expected to at best remain constant and more likely decline with or without the FMP. There are very limited data on the role that fisheries play in regional and local economies and the extent to which firms engaged in supplying fishing enterprises provide significant income or employment opportunities regionally or locally. However, it appears that HMS fisheries make up only a small portion of overall fisheries-related business in most ports and communities and especially in southern California, where the bulk of the vessels involved (except for the albacore fleet) are located. This will continue with or without the FMP. In turn, employment and personal income would remain at or decline from recent levels.

Suppliers of fishing equipment, fuel, bait and other supplies to HMS anglers could be expected to enjoy increasing business sales and activity in line with general increases in angling as incomes grow. However, as noted earlier, there has been a decreasing trend in overall marine angling, and it is not known if this trend is universal or limited to certain types of fishing. If HMS angling has been constant or increasing, then this is presumably a substitution from other angling activity. It is also noted that HMS angling is somewhat more specialized than other marine angling, and that the expenses or expenditures from HMS angling are generally higher per trip than for other marine angling. Thus a gain in HMS angling will generate more business sales for suppliers than other marine angling. Data do not permit a quantitative analysis of trends in this regard. It appears reasonable to hypothesize, however, that sales to HMS anglers will remain at the same levels with or without the FMP. Presently there is no basis for assuming otherwise.

9.1.4 Projected Management and Research Capabilities Under No Action Alternative

Management Responsiveness

In the absence of the FMP, there would not be a formal, structured mechanism for monitoring all the West Coast HMS fisheries and, in collaboration with scientists and interested public, adjusting management to solve new problems or incorporate new information. There would continue to be regulations under other federal and state authorities, including laws implementing international fishery agreements, and these would provide a basis for monitoring some fishery sectors (e.g., tropical tuna and albacore) and specific issues (e.g., takes of protected species in the fisheries). However, there would not be a formal SAFE document and framework procedures system to ensure periodic compilation and analysis of fishery and biological information with which to determine if new conservation and management measures would be appropriate and to implement those measures in a timely manner. While international fishery monitoring provides the basis for considering overall stock condition and the possible need for international action to conserve HMS stocks, it does not provide a basis for addressing problems singular to U.S. fisheries off the West Coast, especially with respect to protected species interactions. IATTC has focused on tropical tunas, and with the decline of the purse seine fishery, these species have generally declined in importance to U.S. fishers on the West Coast. Further, IATTC recommendations are of limited geographic scope as the Convention Area extends only to 40° N. latitude IATTC has not focused its management on swordfish, albacore, and sharks, which are of more concern to West Coast fishers. IATTC recommendations to date have had very limited effects on most HMS fishers, although it is noted that the recent establishment of the vessel register for HMS fishing fleets of member countries is a logical precursor to the listing of permitted vessels that would be established under the permit system proposed in this FMP. The IATTC bycatch reduction program is consistent with the Magnuson-Stevens Act goal of reducing bycatch and bycatch mortality, but only extends to purse seine fishing. Further, while IATTC stock assessments represent the best scientific information available on the assessed stocks, there is no orientation in the IATTC quarterly or annual reports to management issues other than limiting total catch and/or effort to achieve MSY from the stocks. There is no ability to focus on gear conflicts or protected species interactions that are of great concern to the Pacific Council. There are no international agreements extending to other species or waters beyond the IATTC Convention Area at this time. Finally, while the U.S. Department of State is expected to re-establish its General Advisory Committee to assist in review of IATTC management and development of U.S. positions in IATTC, this would likely not provide the same mix of users as the Pacific Council HMS Advisory Subpanel or address issues especially relevant to the West Coast fisheries.

Reliance on other federal laws and regulatory processes might be less structured and scheduled than expected under the FMP. The drift gillnet fishery controls presumably would be reviewed periodically by the Cetacean Take Reduction Team, but this would be done outside the context of the complex of HMS fishing sectors and perhaps with less diversity of viewpoints and information. Purse seine fishery controls other than those achieved through the IATTC recommendations would be limited, possibly led by state actions without the public Pacific Council process. There would be no management of troll albacore fishery controls except as mandated by the U.S.-Canada Albacore Treaty. The longline fishery would be managed solely by state' actions or as mandated by ESA concerns. State management of harpoon, CPFV, and recreational fisheries would continue. The benefits of organized public input through the Pacific Council process would not be available, although states have certain provisions for public processes in their own rulemaking and decision systems.

Overall, management would likely be less responsive to new HMS management problems and issues without the FMP. The ability to identify and respond quickly to social and economic problems or conditions specific to the West Coast and even subregional areas would probably also be lower. Individual states might be able to respond separately to problems in their individual fleets or areas but in some cases (especially California) the legislature retains a great deal of regulatory authority, and this may result in significant delays in action, although the venue of the Pacific States Fisheries Commission would probably continue to help coordinate and expedite certain actions.

State Management Programs

In the absence of the FMP, states would continue to manage their fisheries under the mandate of state laws. No significant management changes are foreseen in the absence of the FMP. Permit and reporting requirements would be the same so that the universe of HMS fisheries would remain incompletely documented, data collection would not be sufficiently targeted, data inconsistencies and errors would likely not be resolved and data gaps would not be filled. Striped marlin would continue to be a "no sale" species in California. States' time and area limits would remain in force. Inconsistencies in states' regulations would not be reconciled.

Research and Data Collection

In the absence of the FMP, there would not be a clear Magnuson-Stevens Act mandate to collect data on the fisheries and stocks and to conduct research to improve the understanding of the stocks and the impacts and effectiveness of management of the fisheries under the FMP. There would be less likelihood that new information would be collected and analyzed to address West Coast social or economic problems in the fisheries. NMFS receives little funding directly related to Pacific HMS stocks associated with West Coast fisheries. Research and data collection would likely be less coordinated and less focused on the problems or needs identified in the FMP and in subsequent SAFE reports. There would be a lower probability that stock conservation problems would be identified in a timely manner, especially for such vulnerable species as the common thresher shark. IATTC and the ISC would continue to focus research and stock assessment efforts on tropical tunas and temperate water species in the north Pacific, respectively, but as indicated above, IATTC and other international entities are concerned with stocks overall, and especially with tropical tunas, and would not be addressing individual nations' problems or concerns. There would be less pressure to review state and federal data collection programs to ensure maximum compatibility in the data bases. There would likely still be one or more observer programs run by NMFS under authority of other regulations, but this might be at lower than desired levels if there were no FMP to provide a stronger rationale for the programs. The potential for augmenting states' research and data collection by federal assistance would be limited.

Monitoring and Enforcement

In the absence of the FMP, NMFS would continue to enforce regulations issued under authorities other than the Magnuson-Stevens Act (e.g., measures under the ESA and MMPA or under the Tuna Conventions Act), and states would continue to enforce their laws and regulations. But NMFS' cooperative enforcement agreements with states would not be applied to HMS fisheries.

Essential Fish Habitat and Habitat Conservation

In the absence of the FMP, there would no habitat categorized as EFH for HMS. NMFS and states presumably would continue to review programs and projects of other agencies under such laws as the Fish and Wildlife Coordination Act and make recommendations to protect habitat, including HMS habitat, but EFH consultations would not be required and the focus that is provided by the EFH designation would not be available. Given what is known of the distribution of habitat for some species/stages, and the limited understanding of activities by federal agencies that could adversely affect EFH for HMS, it is difficult to estimate the relative risks to the species without the FMP. Nonetheless, there would presumably be a greater risk that adverse impacts would not be addressed due to EFH areas not being designated. This may be especially important for such vulnerable species as thresher and shortfin mako shark.

Information and Advice to Regional Fishery Management Organizations

In the absence of the FMP, there would still be an opportunity to use the Council to assist in development of U.S. positions and in carrying on negotiations on behalf of U.S. interests in regional fishery management organizations. There doubtless would also be continued participation of industry representatives in international management and research efforts. However, the Council would not have a plan team or an advisory subpanel to assist in developing Council positions and recommendations for advice to the Department of State and NMFS. Similarly, the ability to use the Pacific Council and its public processes to implement or assist in implementing recommendations that the United States agrees to in regional fishery management organizations would be limited. The Pacific Council process is open and transparent, with all important user and interest groups represented. This process is structured to ensure that all interests have an opportunity to make inputs to management decisions, and use of the process to implement the decisions to which the United States has agreed may be vital for timely action and compliance by achieving "buy in" of the affected interests.

9.2 Environmental Consequences of Proposed Actions and Alternatives

9.2.1 Analytical Approach

Given the large number of alternatives considered in the different categories of potential actions, it was impossible to evaluate the impacts of all potential combinations. Instead, the evaluations focus mostly on the preferred or proposed alternatives selected by the Council in the two major categories of actions (fixed/administrative/operational actions and initial regulatory actions). Essentially, all administrative or fixed elements are considered in one block, and the initial management measures for all and for specific fisheries (i.e., drift gillnet, longline and purse seine fisheries) are considered in another. In this manner, the analysis differentiates between those actions that are relevant to all fisheries and those that are relevant only to specific fisheries.

9.2.2 Actions and Alternatives Relating to Fixed Elements

To recap (see sections 8.3 and 8.4 for a more complete discussion), proposed and alternative actions relating to fixed and general provisions are listed below with accompanying analyses for alternatives. Discussion of environmental consequences of Proposed Actions are provided in the next section (section 9.2.3).

9.2.2.1 Species in the Management Unit

FIXED PROVISIONS:

- Management Unit Species
- Framework Procedures
- Management Cycle
- Control Rules

Alternative 1: (No Action): No species are listed as MUS.

Alternative 2: (Proposed Action): The following species in the management unit are proposed: albacore, yellowfin, skipjack, bigeye, and north Pacific bluefin tunas; swordfish; striped marlin; common thresher, bigeye thresher, pelagic thresher, shortfin mako, and blue sharks; and dorado (dolphinfish).

Alternative 3: Same as Alternative 2, but dorado (dolphinfish) not included.

Alternative 4: Same as Alternative 2, but dorado (dolphinfish), pelagic thresher shark, and bigeye thresher shark not included.

Alternative 5: Same as Alternative 2, but sixgill shark *added.*

Alternative 6: Same as Alternative 2, but all sharks *deleted.*

Analysis of Management Unit Species Alternatives: Chapter 3 (3.1.1) provides full background on the process and criteria by which the Council agreed on the proposed specification of species in the management unit and that discussion will not be repeated here. The inclusion of more species would raise the cost and difficulty of the Council to keep track of the fisheries and determine the need for management actions. NMFS is not in a position to provide stock assessment and research support for those other species, which are generally rare and inconsequential in the fisheries. The Council fully expects, however, that the reporting requirements will ensure all species caught in the fisheries will be monitored and that the SAFE report and points of concern mechanism will enable the Council to determine whether catches of other species have changed sufficiently to warrant reconsideration of the species for the management unit. Adding species to the management unit would not affect their fisheries significantly unless control is needed to prevent overfishing.

Reducing the species in the management unit would result in a somewhat lower level of monitoring burden for the Council and NMFS. It would allow a tighter focus on a smaller number of species, recognizing that not all species are of equal importance to the fisheries (or to the ecosystem). Since the reporting requirements would still cover all fishes caught, species could still be proposed as an addition to the management unit through the SAFE Report and Point of Concern process.

It is expected that these alternatives would not result in substantial savings to the Council or NMFS over time. The management measures proposed should be the same with or without additional species in the management unit, because the major concerns of fishery conservation and management are still the need to (1) monitor the fisheries to determine what is occurring in the fisheries and whether new management measures are appropriate and necessary; (2) have a structure and process to deal with future problems, whether domestic or international, that affect West Coast HMS fisheries. Moreover, the principal concern driving fishery specific conservation and management measures is the need to ensure adequate protection of species of special significance. In neither case would the designation of fewer or more species in the management unit likely change the measures proposed in the FMP.

9.2.2.2 Control Rules

Control Rule Alternative 1: (No Action): No control rule is adopted.

Control Rule Alternative 2: (Proposed Action): Adopts the default MSY (or MSY proxy) control rule, but additionally uses an OY (instead of MSY) target for vulnerable species, as defined and discussed in Chapter 3, Section 3.2.3.

To be precautionary, sharks, because of low productivity, and bluefin tuna and striped marlin because of uncertain total catches and stock structures, are treated as vulnerable species. For the present, the OY for vulnerable species is 0.75MSY (from the relationship shown in Chapter 3, Figure 3-1). Any harvest guideline for these species is set equal to that OY.

The status of the MUS in this FMP is discussed in terms of this default control rule.

Analysis: The "No Action" alternative is not a viable option because the National Standard Guidelines for implementing National Standard 1 (Optimum Yield) of the Magnuson-Stevens Act specifically call for use of control rules in managing the species of an FMP.

The Proposed Action establishes such a rule, by adopting the default MSY control rule, and using an OY target for vulnerable species. This default MSY control rule is a generalized, and therefore versatile, control rule, because it is defined with the Maximum Fishing Mortality Threshold and the Minimum Stock Size Threshold as ratios relative to MSY (Figure 3-1). This is very useful because it allows management to proceed according to specific criteria with only relative estimates of stock biomass or exploitation status. Thus all the MUS of this FMP, diverse with respect to productivity, scientific understanding, and stock status, can be managed under one rule to meet the requirements of the Magnuson-Stevens Act. This control rule is the most straight-forward of the possible rules discussed by Restrepo et al. (1998) and is the one they recommend. The reduction in fishing mortality it calls for to rebuild depleted populations is intermediate with respect to the degree of depletion that can be remedied at acceptable rates of recovery.

Using a more specific control rule, e.g., one that accounts for a species' actual rebound capability at various levels of stock depletion, is not warranted. The biological understanding for the level of detail required is lacking for all the MUS of this plan. Forcing management decisions according to detailed criteria when uncertainty prevails is simply not useful.

The proposed alternative's default MSY control rule is the same rule used in the WPRFMC's FMP for Pelagic Fisheries, with the addition of a precautionary treatment for vulnerable species. Sharks are deemed vulnerable because of their low productivity, and bluefin tuna and striped marlin because of uncertainties concerning total stock-wide catches and their respective stock structures.

9.2.2.3 Framework Procedures

Alternative 1: No Action: There would be no framework procedures; all changes would be made via the amendment process.

Alternative 2: (Proposed Action): Adopts framework procedures to be used during the management cycle for changing conservation and management measures, with the point-of-concern framework procedure additionally specified.

These procedures would be followed in response to new problems in the fisheries or information about the fisheries and/or stocks; they do not affect the ability of the Council to consider and propose action to address conservation issues at any time, nor affect the ability of the Secretary to take emergency action if deemed necessary and appropriate. These procedures are described in more detail in Chapter 8 section 8.3.4

Alternative 3: Adopts the framework procedures as in 2, but *without* the point-of-concern framework procedure (see Chapter 8 section 8.3.4)

Analysis: Under the No-Action alternative, no framework procedures would be incorporated into the FMP. Under this alternative, all future changes in management would be made by FMP amendments. This could pose difficulty in implementing timely changes to management measures, especially if the changes are not controversial or difficult. The framework process is intended to facilitate rapid action while allowing full input by constituents and the public. Relying solely on FMP amendments would likely increase the cost and time for action in most cases.

Alternative 2 would allow the Council and NMFS to make changes to many types of management measures using the framework adjustment process, without going through the FMP amendment process. FMP amendments would only be required if fixed elements of the FMP needed to be revised. Fixed elements include the management objectives, species in the management unit, control rules, and procedures. Implementation of a limited access program also would require an FMP amendment. Most types of management measures could be implemented through rulemaking or even more quickly through automatic or notice actions (see section 8.3.4). Changes to the regulations can be accomplished more quickly and at less cost than FMP amendments, although the time required to develop and implement regulatory amendments increases with increasing complexity and controversy of the issue. Inclusion of the point-of-concern framework procedure provides a continuous review of HMS stocks and fisheries and allows any concerned individual to raise a point-of-concern to the Council based on specific criteria in the FMP. This enhances the probability that conservation and management problems will be identified and addressed in a timely fashion.

Alternative 3 would adopt the framework procedures but without the point-of-concern mechanism. There would still be an annual Stock Assessment and Fishery Evaluation (SAFE) report prepared, and the Council would still use framework procedures to consider and propose regulatory action to respond to new problems or new information about the fisheries and/or stocks. The elimination of the point-of-concern component would mean that the Council would not specifically identify a set of factors that would trigger review of the circumstances or conditions changing those factors to determine if new action is warranted. There could be greater potential to miss important changes in the fisheries that would warrant changes in management. If that occurred, there could be lost values from the fisheries in the future. The cost to the Council is expected to be similar to the preferred alternative.

9.2.2.4 Management Cycle

Alternative 1: (No Action): No cycle established. Annual SAFE document presented to Council, but no fixed schedule for addressing management issues.

Alternative 2: (Proposed Action): Establishes a *biennial* management cycle with regulatory and statistical fishing year April 1 through March 31. The cycle may be adjusted by Council vote, provided the Council gives six-month notice.

Alternative 3: Establishes a biennial management cycle with regulatory and statistical fishing year January 1 through December 31; measures would stay in effect until changed.

Alternative 4: Establishes a biennial management cycle with regulatory and statistical fishing year October 1 through September 30; measures would stay in effect until changed.

Alternative 5: Establishes an annual management cycle with regulatory and statistical fishing year April 1 through March 31; measures would stay in effect until changed.

Alternative 6: Establishes a multi-year management cycle. Similar to biennial cycle, except actions would be considered every 3-4 years; measures would stay in effect for at least three years unless changed due to unexpected problems.

Methods of Analysis: In developing the alternatives, consideration was given to the following factors: Fishing periods of various HMS fisheries; time needed to collect and enter data; adequate public notice time for proposed and final rules; age of data (new vs. old); availability of fishers to participate in the process; and Council staff and HMSMT preparation time needed.

***Analysis of Mgt Cycle Alternative 1: (No Action)*:** There would be no fixed schedule for addressing management issues. While there would be an annual SAFE report, there would be no certainty that measures, such as harvest guidelines, would be formally evaluated and discussed by the Council on a regular schedule. This could make it difficult for the HMSMT, advisors, and public to plan ahead and focus their research or data analyses and present recommendations in a systematic manner. However, there could be less cost to the Council as it is possible that there would be very few instances in which management changes would be necessary. In general, problems would be addressed as they arose, although in an ad hoc process. But given the Council's full workload with management of other fisheries (e.g., groundfish, salmon, coastal pelagic species), it may be desirable that HMS issues have a scheduled placeholder for discussion and consideration.

***Analysis of Mgt Cycle Alternative 2: (Proposed Action)*:** Establishes a biennial management cycle in which measures would be considered every two years, with an annual SAFE report presented to the Council. This would allow the HMSMT adequate time to review fisheries data (including international data) before making recommendations to the Council, and would allow the Council to respond to new information in a timely manner. It would also allow the Council to revise the cycle using the framework process. Having the fishing and statistical periods scheduled for April 1 through March 31 would encompass all of the West Coast HMS fisheries' seasons, so measures for a particular fishery would not routinely change mid-season. Presenting the SAFE document in September and having the Council take final action in November (of every other year) would allow for participation by most HMS fishers in the public process. The cost to the Council would be less than the annual cycle, and likely less than the no action alternative as well.

***Analysis of Mgt Cycle Alternative 3*:** This also establishes a biennial management cycle, with an annual SAFE report presented to the Council; however, the fishing and statistical periods would be scheduled on a calendar year basis–from January 1 through December 31. In order to accomplish this administratively, the SAFE document would be presented to the Council in March with Proposed Action considered in June and final action scheduled for September. First of all, it would be difficult to develop a SAFE report by March that contained data on international HMS fisheries as those data are typically not available until June (for the previous calendar year). Second, having the Council take action in June and September would not provide for meaningful public participation as the summer months constitute the peak of the HMS fishing seasons.

Analysis of Mgt Cycle Alternative 4: This also establishes a biennial management cycle, with an annual SAFE report presented to the Council; however, the fishing and statistical periods would be scheduled from October 1 through September 30. In order to accomplish this administratively, the SAFE document would be presented to the Council in September with Proposed Action considered in November and final action scheduled for March of the following year. The SAFE report presented in September would contain data that was at least 12 months old; by the time the Council took action in March, the data would be 18-19 months old. Therefore, this schedule would not allow the Council to address concerns, based on new data, in a timely manner. However, having the Council take action over the November-March timeframe would provide for participation by most HMS fishers in the public process.

Analysis of Mgt Cycle Alternative 5: This would establish an annual management cycle which would fit well with an annual SAFE report, but could result in greater pressure to take action based on limited (incomplete) data. The cost to the Council would be higher as it would likely be necessary to include HMS matters on at least two Council agendas each year, and Council staff and HMSMT workloads would be increased. Most of the anticipated HMS issues which will need to be addressed in the future will require some coordination with other international entities; as such, it is not likely that routine measures will need to be modified annually.

Analysis of Mgt Cycle Alternative 6: This would establish a multi-year management cycle which would allow more time to analyze the effects of prior management actions, but could be less responsive to new information and could result in missing the important changes in stocks or fisheries. The cost to the Council would likely be somewhat lower than with the biennial cycle, unless it resulted in more proposals for action outside the management cycle by persons convinced of the need for more prompt action than what is provided for. This could make it more difficult for the HMSMT, advisors, and constituents to schedule their work.

9.2.3 Environmental Consequences of Actions Relating to Fixed Elements of the Plan

Several of the Proposed Actions listed above are administrative in nature. They relate to the types of decisions that are made and how they are made under the FMP. For the most part, these elements do not regulate the fisheries or impose constraints on how they operate and do not affect the amount of fishing, the catch in the fisheries, the status of stocks or economic values from the fisheries (except for the control rule). The costs to the Pacific Council and NMFS will vary depending on the decisions made on administrative elements. The Proposed Actions are intended to establish an administrative framework for monitoring the fisheries, evaluating the effects and effectiveness of management, considering new information or conditions to determine the need for additional actions, and establishing a process for adoption and implementation of such additional actions without FMP amendments when possible. It is expected that this approach (which is used in other Council fishery management plans) will provide a structure (plan team, advisors, and other entities) and a process (SAFE report and framework procedures) by which the Council can achieve efficient and timely decision-making with full public input but without formal FMP amendments to the extent possible. The proposed framework procedures with the "points of concern" will include the annual SAFE report to provide a basis for the Council to consider and propose regulatory action to respond to new problems in the fisheries or information about the fisheries and/or stocks. A "points of concern" mechanism is included to provide some specific benchmarks that would trigger review of the cause for changes in certain conditions and evaluation of potential actions to address any problems identified through analysis of the causes for the changes in those conditions. This is intended to provide a degree of focus for the Council's review of the fisheries and some assurance that the Council will not miss important changes in the fisheries that would warrant changes in management.

The proposed two-year management cycle (management/statistical year beginning either April or October) is a balance between the need to monitor or manage a fishery on a timely basis and to have a management period long enough for stability in the fisheries and for adequate analysis of impacts and effectiveness. The framework process, regardless, provides a basis for making adjustments as needed, notwithstanding the intended two-year management cycle. The management cycle also provides certainty that such measures as harvest guidelines would be formally evaluated and discussed by the Council on a regular schedule. It should also facilitate planning by the plan team, the focusing of research or data analyses, and for all concerned to develop and present recommendations in a systematic manner. The cost to the Council would likely be lower than with the annual cycle unless it resulted in more proposals for action outside the management cycle by persons convinced that actions are needed more promptly. This could make it more difficult for the plan team, advisors and constituents to plan their work.

In all, the estimated cost to the Council under the proposed combination of FMP administration elements is about $100,000 per year. This covers staff costs; travel for staff, advisors, scientific committee, and plan team; and copying and distribution of meeting materials.

9.2.4 Actions Relating to General Provisions

9.2.4.1 Legal Gear and Gear Restrictions

GENERAL PROVISIONS
- Definition of Legal Gear
- Incidental Catch Allowance
- Essential Fish Habitat
- Bycatch and Catch & Release Program
- Protected Species
- Observers
- Prohibited Species
- Quotas/Harvest Guidelines
- Treaty Indian Fishing
- Exempted Fishing Permits
- Allocation
- Reporting Requirements

Note: These alternatives are presented in detail in Chapter 8 section 8.4.1.

Legal Gear Alternative 1: (No Action): No legal gears would be specified. All decisions on gear would have to be deferred to the states.

Legal Gear Alternative 2: (Proposed Action and Sub-Alternatives): Authorizes commercial legal HMS gear as harpoon, surface hook and line, drift gillnet (14 inch stretched mesh or greater), purse seine, and pelagic longline (two options were initially presented for definition of drift gillnet mesh size, see below). For recreational gear authorizes rod and reel, spear, hook and line.

Sub-Alternative 2a (Proposed Action): Specifies that HMS drift gillnets must be minimum stretched mesh size of 14 inches.

Sub-Alternative 2b: Specifies *no minimum stretched mesh size* for authorized HMS drift gillnet gear; includes small-mesh drift gillnet gear, which could target HMS.

Legal Gear Alternative 3: As in Legal Gear Alternative 2, except *pelagic longline gear* would not be a legal gear for vessels landing in U.S. West Coast ports (eliminates existing high seas longline fishery, eliminates developmental longline permit fishery in Oregon).

Analysis of Legal Gear Alternative 1: (No Action) - Under the No Action alternative, no legal gears would be specified in the FMP. This is not a viable alternative under the FMP, since it would defer all gear decisions to the states, which vary in some instances in their definitions of legal gear. The FMP needs uniform definitions of legal gear so that management can be consistent, and the concept of HMS legal gear unambiguous coastwide. The status quo causes difficulties for West Coast fishers when they attempt to move from state to state. One gear may be legal in one or two states but not in the other one or two. The DGN and longline fisheries are examples of this; California and Oregon authorize the gears but they are prohibited in Washington. The intent of HMS FMP is to provide consistency in regulation and the no action alternative does not meet this requirement. The no action alternative would also eliminate the Council's ability to prevent the introduction of new fishing gear into the fishery without specific prior authorization by the Council.

***Analysis of Legal Gear Alternative 2: (including DGN Mesh Size Options Analyses) (Proposed)*:**

The FMP establishes definitions of legal gear and also describes two alternatives for drift gillnet gear depending on whether to include a specification of a minimum mesh size. Sub-alternative 2a, which specifies that HMS driftnets must be 14 inches stretched mesh or greater, was chosen as preferred by the Council.

The DGN sub-alternatives concerning mesh size and definition of legal drift gillnet gear have differential impacts on catch and effort. If the definition specifies that only drift gillnets with stretch mesh size of 14 inches or more are legal, then small mesh gear could not be used to target HMS like albacore and bluefin tuna. The small mesh sector is not well documented but data that are available from CDFG logbooks show the fishery consisted of four vessels in 2001and two vessels in 2000. Fishers claim there may be as many as many as 8-10 vessels that occasionally use small-mesh drift gillnets when albacore and bluefin tuna are available. PacFIN data indicates there could be as many as 20 vessels which might have fished small-mesh drift gillnets based on landing receipts for drift gillnet vessels landing albacore and bluefin tuna, but not swordfish. Under California law it is illegal to take swordfish with stretched mesh less than 14 inches so an absence of swordfish landings by vessels using drift gillnet gear was used to screen potential small-mesh fishing operations. The total catch and total revenue from this fishery sector are not known but the four documented vessels did land 25 mt of albacore and 5.0 mt of bluefin tuna in 2001. The value of the fish was $100,000 ex-vessel. With a minimum 14 inch stretched mesh requirement, these smaller mesh vessels could no longer target HMS, but could possibly be allowed to fish under an EFP. With the more general definition (no mesh size restriction) these vessels would be required to obtain permits with an endorsement for small mesh drift gillnet gear, maintain and submit logbooks, carry observers when directed, and comply with all the other constraints imposed on drift gillnet fishing (time/area closures, gear restrictions) as the larger mesh vessels. Since the true level of catch and effort in the small mesh fishery is unknown, it is difficult to predict what would happen, but it is likely that catch and effort in this sector would decrease somewhat as a result of the increased regulatory burden.

Legal Gear SubAlternative 2a (Proposed) (Minimum stretched mesh size 14 inches stretched mesh or greater)

Under this alternative, there would be a prohibition on the use of drift gillnets with a stretched mesh size of less than 14 inches for U.S. West Coast-based vessels. Vessels fishing small mesh (less than 14 inches stretched mesh) would be restricted to landing HMS only as an incidental catch. There would be restrictions placed on the amount (numbers or weight of landings per trip) of fish a small mesh gillnet vessel could land when fishing for other species (Chapter 9.2.4.2) under a permit issued by the state. The economic impact on the four vessels that were documented as using small mesh drift gillnets would amount to between 20% and 48% of gross receipts. They landed between 1.0 and 15.0 mt of albacore and 0.0 to 3.0 mt of bluefin tuna during the 2001 season. The vessels might make up for the lost revenue through other small mesh gillnet fisheries or simply return to using large mesh nets (≥14 inches sm) as all four vessel also possess shark/swordfish (large mesh DGN) permits. Vessels currently fishing large mesh nets would suffer no economic loss under this option as they would not need to modify their gear or current fishing practices. Community impacts would be difficult to determine because landings of these vessels could be replaced by other gear types or other landings by the effected vessels. The opportunity for albacore surface hook-and-line vessels to deploy small mesh DGN gear to target albacore while on overnight trips would be preempted under this alternative. Loss of this opportunity would prevent realization of potential efficiency gains from landing more albacore per unit of time on the water. This option would prevent the expansion of the existing small mesh drift gillnet fishery for white seabass, California barracuda and yellowtail into the tuna fishery off the West Coast, thereby preventing additional mortality on tuna stocks. It would also preclude any additional bycatch of fish which new vessels would bring to the fishery. The impact on protected species is unknown for small mesh drift gillnet vessels fishing offshore, since NMFS large-mesh DGN observer program has not observed these vessels in the past. This could change as NMFS has initiated a observer program to collect data on bycatch and the take of protected species from small mesh gillnet boats during the 2002 season, both in inshore and offshore areas. For small mesh DGN vessels fishing inshore, there could be increased interactions with seabirds and marine mammals. The state of California recently closed the set net fishery off the central coast to protect seabirds and marine mammals from small mesh gillnets. Assuming the NMFS small mesh observer program collects sufficient data, the impacts may be known by 2003. Unresolved questions about the fishery could be addressed through experimental fishing using an exempted fishing permit, as this is a new, untested fishery for HMS. Management costs would not increase significantly because existing programs are already collecting logbooks, providing observers and law enforcement.

EFH would not be affected since there would be essentially no change to the existing status of legal HMS gear presently operating off all three states. No additional burden would be placed on existing data collection and monitoring programs. This option would not affect consistency with the Western Pacific Council's FMP since they do not have a DGN fishery. This option would prevent user conflicts between albacore trollers and small mesh drift gillnet vessels since small mesh vessels would be excluded. Safety at sea is not expected to be affected since this option only allows existing large mesh DGN vessels to continue fishing.

This option addresses HMS management objectives to minimize bycatch by prohibiting a gear with unknown bycatch potential and also the objective of minimizing gear conflicts. No international obligations would be affected by this option.

Analysis of impacts of limiting smaller mesh fisheries to incidental HMS catches is provided in section 9.2.4.2

Legal Gear SubAlternative 2b (No minimum stretched mesh size):

Under this alternative the current shark/swordfish drift gillnet fishery using 14 inch stretched mesh would be authorized as well as the use of stretched mesh smaller than 14 inches. This would add a potential new fishery, ie., the small mesh drift gillnet fishery for HMS. During 2001, there were four documented vessels in the fishery, but industry representatives have expressed an interest in expanding the fishery. Potentially, the size of the fleet (California and Oregon currently have 120+ large mesh DGN permits) could expand by 75+ vessels based on number of registered small mesh gillnet vessels in California. The economic impact of an expanded small mesh drift gillnet fishery would probably be positive. If most of the 100+ potential vessels were already active in the small mesh DGN fishery for non-HMS, there would likely be an increase in HMS landings with minimum investment costs. Moreover, because these vessels would probably already be quite proficient in the use of small mesh DGN gear additional operating costs from targeting HMS would be relatively small. Both these factors would suggest cost savings and increased profitability for small mesh DGN vessels, which means an increase in producer surplus. An increase in landings of HMS with some of the cost savings realized by harvesters passed on to consumers would expand consumer surplus. This alternative would also enable albacore surface-hook-and-line vessels to expand their fishing opportunities on overnight albacore trips, should they choose to fish with small mesh drift gillnets at night. There would be gains in consumer surplus for these vessels from increased landings of HMS for the amount of time on the water. Greater landings at potentially lower costs would also benefit consumers of HMS. Likewise, the impact on local communities would probably be positive. Any increase in HMS landings, nothing else changed, will lead to more dockside economic activity. The impact on target species would be to increase mortality on the affected stocks. The impact on bycatch of fish is unknown as well as the impact on protected species. The NMFS small mesh gillnet observer program described in option 2a should provide data on both bycatch and the take of protected species after observations conducted in 2002. Recently California closed the set net fishery off central California to protect seabirds and marine mammals. While small mesh DGN fish further offshore, the potential for the take of seabirds and marine mammals does exist and would be documented under an observer program, which has recently been implemented by NOAA Fisheries.

This alternative would likely result in increased management costs in terms of enforcement and additional observers. EFH impacts are unknown but the NMFS observer program could provide data upon which to determine if there was an effect. Existing data collection and monitoring programs would need to be expanded to monitor and evaluate the small mesh fishery. There should not be any change in the quality of the data collected through existing programs. This option would not affect consistency with the Western Pacific Council's FMP since they do not have a DGN fishery. This option has the potential to increase user conflicts between albacore trollers and large mesh gillnet vessels while pursuing the same fish as the small mesh drift gillnet vessels. To what extent this would happen is unknown. Safety at sea could be affected if many small vessels which fish small mesh DGN were to start fishing offshore. These vessels are small by nature (< 40 ft), usually are older and do not carry as much safety equipment. Safety at sea for large mesh vessels could be negatively impacted by increased vessel traffic on the fishing grounds. This option does addresses one of the HMS management objective; to provide viable and diverse commercial fisheries, by allowing the use of small mesh drift gillnets. No international obligations would be affected by this option. If the Council adopts the non-restrictive mesh size definition, then small mesh vessels would be required to obtain permits with an endorsement for small mesh gear, maintain and submit logbooks, carry observers when directed, and comply with all the other constraints imposed on drift gillnet fishing (time/area closures, gear restrictions) pursued by the larger mesh vessels. Catch and effort would still likely increase in the small mesh fishing sector but probably not to the level expected if the restrictions were not in place.

Analysis of Legal Gear Alternative 3: Under Alternative 3, there would be a general prohibition on the use of pelagic longline gear by U.S. West Coast -based vessels. It would prohibit all landings in West Coast ports of HMS taken with pelagic longline gear and would effectively close the high seas longline fishery. Landings (which had reached $4.7million) would decline to zero, and income and employment in the fishery (up to 37 vessels and about 200 persons employed) would be zero. The vessels would either have to exit fishing, relocate to other areas, or shift to other fishing strategies. Businesses selling goods and services to longliners would lose those sales, and businesses buying the landings would lose that source of product. Imports of swordfish would likely fill the void. The risk of adverse impacts on sea turtles and sea birds from the fishery would be eliminated to the extent that the vessels were fully retired from longline fishing. Bycatch from this fishery would be eliminated. Observer program costs would decline. The prohibition would not only terminate the California-based fishery, but also end the developmental longline fishery authorized by Oregon in waters greater than 25 miles from shore within the EEZ. Many of these vessels are owned and operated by Vietnamese Americans, who would bear a disproportionate burden from the closure. These vessels land principally in the ports of San Diego, San Pedro and Ventura. The extent of any impacts of a prohibition of longline landings depends on what individual vessel owners/operators choose to do in response to such action. Alternatives include: 1) quit fishing, 2) switch to another fishery off the West Coast or elsewhere, 3) continue longlining and land in Hawaii or another non-West Coast port, or 4) re-flag their vessel and continue longlining. It is difficult to predict what they would do and therefore difficult to estimate impacts. It is noted that many of the vessels have or would be eligible for restoration of their western Pacific longline limited entry permits and could readily return to that area if it appeared more likely to support alternatives to controlled longline fishing outside the EEZ adjacent to the West Coast. Closing the high seas longline fishery is unlikely to significantly benefit the tunas, swordfish, and sharks (except possibly the thresher species), because of the small fraction of the total eastern Pacific Ocean (EPO) catch represented; but it would significantly weaken the U.S. longline presence in the Pacific, and a weakened presence in international fisheries could compromise U.S. access to high seas fisheries data and U.S. bargaining power on relevant fishery and conservation issues.

Prohibition of longlining within the EEZ would establish a new West Coast EEZ-wide policy with regard to pelagic longlining. It primarily addresses concerns expressed by the recreational fishing and environmental communities about potential user conflicts and possible interactions with protected species and recreationally targeted HMS species. Presently Oregon allows longlining outside 25 miles under the state's developmental fisheries program permit system. Blue shark permits are limited to 10 and swordfish permits are limited to 20, although there are no active permittees at the present time. Thus this alternative, while similar to the status quo, does eliminate the potential opportunity now available to west-coast based commercial fishers for fishing off Oregon and California and landing in Oregon, and any potential opportunity for consumers for a new source for fresh locally-caught HMS. This action would differ from the policies in other fishery management plans for HMS fisheries that allow pelagic longlining within the EEZ in other areas.

9.2.4.2 Incidental Catch Allowance:

Alternative 1: (No Action): Represents the status quo. Landings of HMS could be made using any gear authorized by individual states' regulatory requirements.

Alternative 2: (Proposed Action): Allows incidental commercial landings of HMS, within limits, for non-HMS such as bottom longlines, trawl, pot gear, and small mesh drift and set/trammel gillnets and others. Small mesh gillnetters and set gillnetters would not be permitted to land swordfish (as currently required under California law), but would be permitted to land other HMS, with the restriction of 10 fish per landing of each non-swordfish highly migratory species. For the bottom longline (set line) fishery, landings would be restricted to three HMS sharks in total or 20% of total landings by weight of HMS sharks, whichever is greater by weight. For trawl, pot gear and other non-HMS gear, a maximum of 1% of total weight per landing for all HMS shark species combined would be allowed (i.e., blue shark; shortfin mako shark; and bigeye, pelagic, and common thresher sharks), or two (2) HMS sharks, whichever is greater.

Alternative 3: Allows no landings of HMS caught with gears that are not specified as HMS gear under the FMP. All landings of HMS taken with non-HMS gears would be prohibited.

***Analyses of Incidental Catch Allowance Alternative 1: (No Action)*:** Alternative 1 would place no Council restriction on the incidental take of HMS. Each state would regulate landings, as is the current practice. In the absence of state regulations (currently none of the states regulate the incidental catch of HMS), this means that any gear authorized to take non-HMS could land unlimited quantities of HMS as an incidental catch. Currently, only small mesh drift and set gillnets, bottom longlines, trawl and pot gear land any significant quantities of HMS. This practice would continue and any new gear, or new use of an existing gear, would be allowed to land HMS incidentally. Except where states specifically prohibited HMS fishing, this would essentially allow unrestricted HMS fishing, since the incidental catch could be 100% of the fish landed, assuming the fisher was targeting non-HMS and caught only HMS, which were landed. Since this alternative allows for essentially unrestricted HMS drift gillnet fishing, it runs counter to the provision of the Magnuson-Stevens Act.

Analyses of Incidental Catch Allowance Alternative 2: (Proposed Action): Alternative 2 would allow for restricted landings of HMS by small mesh gillnets, bottom longlines, trawl and pot gear.

Small mesh drift gillnet fishery

Logbook data from CDFG for the period 1997 through 2001 show 40-57 vessels were actively engaged in the small mesh gillnet fishery (drift and set nets). They fished primarily for white seabass, California barracuda, and yellowtail. They also landed thresher, mako and blue sharks along with albacore, bluefin, yellowfin and skipjack tuna. Except for a few directed tuna trips, addressed in Chapter 2.2.6, thresher and mako sharks made-up the majority of the incidental catch. The biological impact of continued takes of common thresher and mako sharks as incidental catches in this fishery is significant and needs to be monitored closely. Common threshers are taken at the rate of 2.82 fish per day while mako sharks are taken at a rate of 1.55 sharks per day. From 1997 through 2001, small mesh gillnet vessels reported fishing an average of 352 days a year. For 2001, they fished 375 days. Using the 5 year average, these vessels landed 996 common threshers and 546 mako sharks per year. No data are available on average size since the fishery is not observed. However assuming an average round weight of 50 pounds for each species yields total landings of 22.6 mt for common threshers and 14.5 mt for mako sharks. Analyses of the logbook data show that during 95% of the trips, incidental landings of HMS never exceeded 10 fish of any species (except for mako sharks which was 93% of trips). On the few trips where 10 fish by species was exceeded (common thresher and mako sharks), it appears the landings were randomly distributed across all fishing areas and months of the year. Interestingly, once fishers found an area of high abundance, especially for thresher sharks, they returned until catches decreased significantly. The economic impact on small mesh drift gillnet fishers of this alternative would be to reduce their income from thresher and mako sharks by 5%. The overall impact on total income of these vessels is unknown. While this may affect a few disproportionally, since landings over 10 fish were concentrated in a few vessels, the potential for replacement income is available in the directed fishery for white seabass, California barracuda, and yellowtail. Economic impacts on local communities are expected to be negligible because of the small reduction in catch and the fact that the fleet is distributed throughout several communities along the California coast. This option is expected to discourage targeting of HMS with non-HMS gears since there would be a limit on what could be landed. Bycatch would be reduced by definition since fish which would have to be discarded could now be landed. However some bycatch would occur when the 10 fish per species limit is exceeded (estimated to be about 5% of days fished). Currently, impacts on protected species are unknown since the fishery is unobserved, however, NMFS observer program implemented in 2002 should provide data on the impacts to protected species. This alternative would likely result in increased management costs in terms of enforcement because it will be necessary to ensure the incidental take allowance is not exceeded. Impacts on EFH are unknown, but the new NMFS observer program should provide some data upon which to make an assessment, and together with existing data collection and monitoring programs should be sufficient to monitor and evaluate the fishery. There should not be any change in the quality of the data collected through existing programs. This option would not affect consistency with the Western Pacific Council's FMP; user conflicts, or safety at sea. This option addresses

HMS management objectives to minimize bycatch by allowing some incidental catch of HMS with non-legal gears. No international obligations would be affected.

Bottom longline fishery

Bottom longline gear is used in Oregon and Washington to catch halibut, sablefish and various groundfish species. HMS, such as blue shark and mako shark are also occasionally caught incidentally. From 1993 through 2000, 9,589 landings using bottom longline gear were made into Oregon to land 8,738 mt of fish. Fifty one tickets (0.5%) recorded 1.9 mt of HMS ranging from 6 to 540 pounds per landing, with an average of 82 pounds per landing. The percent of HMS of the total landing weight ranged from 0.4% to 100%, with an average of 16.5%. Logbook information is not available to analyze the numbers of fish caught. Of the 51 Oregon bottom longline tickets with HMS landings, eight tickets had more than 20% of the landings as HMS and four of the eight had HMS landings of 100%. The tickets with 100% HMS ranged from 18 to 72 pounds and most of the landings would probably be allowed under the three fish provision. The four landings with HMS over 20% but less than 100% would have had a total bycatch of approximately 0.3 mt of blue shark. The decrease in incidental landings of shark would reduce revenues to bottom longline fishers, however the effect is expected to be minimal. From 1993 to 2000, HMS landings were 0.02% of total bottom longline landings into Oregon. A reduction of less than 1 mt of HMS by bottom longline fishers is expected to have a minimal impact on communities. This option is expected to discourage targeting of HMS with non-HMS gears since the economic incentive to fish for these species is lessened by the incidental catch limits. Bycatch will be reduced by allowing some incidental catch of HMS, but some bycatch will occur. Of the 51 Oregon bottom longline tickets with HMS landings, approximately four landings would have had a total bycatch of approximately 0.3 mt of blue shark. Bycatch mortality with bottom longline gear is unknown. However, it is thought most blue shark are caught on bottom longline gear as the gear is being retrieved and if the shark are released immediately, mortality is expected to be low. The impacts on protected species are unknown. This alternative would likely result in increased management costs in terms of enforcement. The impacts on EFH are unknown. Existing data collection and monitoring programs should be sufficient to monitor and evaluate the fishery. There should not be any change in the quality of the data collected through existing programs. This option would not affect consistency with the Western Pacific Council's FMP. This option would not affect user conflicts. Safety at sea is not expected to be affected. This option addresses HMS management objectives to minimize bycatch by allowing some incidental catch of HMS with non-legal gears. No international obligations would be affected.

Trawl and pot fisheries and other non-HMS fisheries

Alternative 2 would allow incidental landings of HMS caught with trawl and pot gear, subject to landing limits. Trawl and pot gear are used off the West Coast to target groundfish and shrimp. In reviewing the landings data for 1993-2000, incidental catches of blue, thresher, and shortfin mako shark have been landed with these gears. The percent of the total landings by weight has ranged from 0.1-10.9%–the higher percentages were the result of smaller trawl landings accompanied by one thresher shark. Thus the proposed limit of a maximum of 1% by weight, or a total of two (2) HMS sharks, whichever is greater, would have accommodated all of the trawl and pot incidental landings that were made during this time period, and presumably for future landings if they follow the same landing pattern. The higher incidental landings were made in the groundfish midwater trawl fishery off Oregon, which primarily targets whiting. A vessel landing 150,000 lbs of whiting would be allowed up to 1,500 lbs of HMS sharks, which would accommodate incidental catches while discouraging directed HMS fisheries with trawl and pot gear. This alternative would not, however, allow incidental landings of other HMS species (tunas, billfish, and dorado) with trawl and/or pot gear, since for these types of gears, only shark incidental catches are allowed. These species have not been landed with these gears during the period reviewed; therefore, the impact of this prohibition is expected to be minimal. Should fishers using trawl and/or pot gear want to land incidentally caught HMS in the future, this can be accommodated through a modification using the framework procedures outlined in the FMP. Other non-HMS fisheries would accommodate a small incidental catch of sharks for gear as yet undefined. This would allow other non-HMS fisheries to incidentally take small amounts of sharks and not discard them as bycatch.

Analyses of Incidental Catch Allowance Alternative 3: Alternative 3 would create a situation where all HMS species would have to be discarded as bycatch since they could not be landed. This alternative would obviously increase the bycatch in the small mesh drift gillnet, bottom longline, trawl and pot gear fisheries since all the catch must be discarded. It would probably discourage the development of other fisheries where the incidental catch of HMS might be a significant portion of the catch. Since it would shift the disposition of fish from incidentally caught and landed to discarded, it would significantly increase bycatch. This is counter to the intent of Magnuson-Stevens to reduce bycatch, thus, making this a non-viable alternative.

9.2.4.3 Essential Fish Habitat

EFH Alternative 1: (No Action): EFH would not be designated and described by this FMP.

EFH Alternative 2: (Proposed Action): Adopts species and stage-specific Essential Fish Habitat designations for individual Management Unit Species as described in section 4.6 and in Appendix A.

EFH Alternative 3: Adopts a broad designation of EFH to apply to all management unit species collectively, i.e., all surface waters of the ocean in the EEZ down to 1000 m depth (the lower bound of the mesopelagic zone).

EFH Alternative 4: Adopts designations of EFH for individual Management Unit Species in the surface waters of the ocean in the EEZ down to 1000 m depth (the lower depth of the mesopelagic zone), but restricts EFH areas to documented capture locations only.

The alternatives and analyses associated with Essential Fish Habitat and Habitat Areas of Particular Concern (HAPCs) are provided in Essential Fish Habitat Chapter 4, section 4.3.

9.2.4.4 Bycatch (Including Recreational Catch-and-Release Programs)

The Magnuson-Stevens Act at 16 U.S.C. § 1853(a)(11) contains two separate requirements with respect to bycatch. First, the FMP must establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery. Second, the FMP must include conservation and management measures that, to the extent practicable and in the following priority, (A) minimize bycatch, and (B) minimize the mortality of bycatch which cannot be avoided.

Bycatch has been identified as a concern in HMS drift gillnet and longline fisheries and large-vessel purse seine fisheries (see Chapter 5). Anecdotal accounts indicate bycatch in the small-vessel HMS purse seine and albacore troll fishery is relatively low, but these fisheries have not had formal observer programs. The harpoon fishery is thought to have little if any bycatch due to the selective nature of the gear.

Establishing a Standardized Bycatch Reporting Methodology

The Council examined existing bycatch reporting methodology, and found that current logbook requirements for the various fisheries (states, NMFS and IATTC), together with periodic recreational fishing surveys and port sampling, have provided an important source of information on catch and bycatch for all HMS fisheries. Nonetheless, certain additional measures were considered to provide improved standardization of logbook reporting and better ground truthing of the logbook data through observer programs for some of the presently unobserved fisheries. The FMP proposes to mandate observer programs initially for the longline, surface hook-and-line, and small purse seine fisheries and CPFV fisheries, with NMFS to develop and review the observer sampling plans. In consultation with the Council, its advisory bodies, and the fishery participants, NMFS is also developing initial observer coverage plans for these fisheries that will be completed when the FMP is implemented. Results of the observer coverage plans for these fisheries may be adjusted as the newly collected data are assessed and more is learned about the levels of coverage necessary to obtain reliable data on bycatch in these fisheries. In addition, a pilot observer sampling plan for the private recreational and CPFV fisheries is being developed to present various options to the Council on levels of observer coverage or intermittent sampling that might be needed to improve information on species and quantity of bycatch and/or release mortality in recreational fisheries. These actions and related actions are discussed separately in the Fishery Observers section at 9.2.4.5. Also, in Reporting Requirements section 9.2.5.6, the FMP proposes that all commercial and recreational party or charter/CPVF fishing vessels maintain and submit to NMFS logbook records of catch and effort statistics, including bycatch. These measures, together with existing reporting requirements, are intended to provide a comprehensive standardized bycatch reporting system.

Minimizing Bycatch and Bycatch Mortality

In addition to the alternatives listed below, actions that will have the effect of reducing bycatch and bycatch mortality are discussed in Chapter 5 and under the various fishery-specific actions in sections 9.2.5.1(Drift gillnet fishery), 9.2.5.2 (Pelagic longline fishery), and 9.2.5.3 (Purse seine fishery).

The following are additional alternatives not mentioned above that address the issue of bycatch:

Bycatch Alternative 1: (No Action): Status quo. No bycatch and/or catch-and-release programs would be implemented under this FMP.

Bycatch Alternative 2: (Proposed Action): Provides for a fishery-by-fishery review of measures to reduce bycatch and bycatch mortality (see Chapter 5); establishes a framework for implementing bycatch reduction; adopts measures to minimize bycatch in pelagic longline and drift gillnet fisheries (Chapter 8 section 8.5); and adopts a formal voluntary "catch-and-release" program for HMS recreational fisheries.

The establishment of the catch-and-release program removes live releases in the recreational fisheries from the definition of "bycatch" in the Magnuson-Stevens Act at 16 U.S.C. § 1802(2), and also promotes the handling and release of fish in a manner that minimizes the risk of incidental mortality, encourages the live release of small fish, and discourages waste.

Bycatch Alternative 3: As in Alternative 2 but does not authorize a catch-and-release program for recreational fisheries.

Bycatch Alternative 4: As in Alternative 2, but establishes a formal voluntary catch-and-release program for striped marlin only.

The alternatives and analyses associated with these Bycatch and Catch-and-Release Programs are provided in Bycatch Chapter 5.

9.2.4.5 Fishery Observer Authority

The following alternatives address fishery observer program authority and observer programs and plans. See also Chapter 8 section 8.4.5.

Observer Alternative 1: (No Action): The FMP would not contain authority to establish observer programs for HMS fisheries. If any observer programs are to be implemented, they would be done under other statutory authority or mandated through a subsequent management action by the Council. Decisions as to whether to continue existing observer programs or initiate new ones would be left to NMFS for the indefinite future.

Observer Alternative 2: (Proposed Action): Authorizes NMFS to require that vessels carry observers when directed to do so by the NMFS Regional Administrator, and mandates observer programs initially for the longline, surface hook-and-line, small purse seine, and commercial passenger fishing vessel (CPFV) fisheries. Initial observer sampling plans are to be completed by NMFS within six months of FMP implementation. NMFS is also to develop initial observer sampling plans for the private recreational fisheries at a later date. Observer coverage plans for these fisheries may be adjusted as the initial data is assessed and more is learned about the levels of coverage necessary to obtain reliable data on bycatch in these fisheries.

The large- and small-mesh DGN fisheries already have MMPA-mandated observer programs implemented by NOAA Fisheries, and the longline fishery has recently come under ESA mandate for observers. This action assumes continuation of the existing drift gillnet and longline observer programs.

Observer Alternative 3: Authorizes NMFS to require that vessels carry observers when directed to do so by the NMFS Regional Administrator, but does not mandate any new observer programs. This would recognize that observer coverage will likely be required to ensure reliable determinations of bycatch and bycatch mortality, but would leave the discretion to the NMFS Regional Administrator to develop sampling plans based on NMFS determinations of need and priorities and to place observers subject to availability of funds and/or resources.

Analysis: Providing the NMFS Regional Administrator with observer placement authority would establish a vehicle for NMFS to ensure that, as necessary, observers can be placed on vessels to collect at-sea fishery data that might not be uniformly collected and reported by fishers or which would be more detailed (e.g., biological data and samples) than could be reasonably required of permit holders. It would leave the RA with the discretion to decide whether to place observers. Presumably, the RA would have a detailed sampling design developed in cooperation with the Council, its advisory bodies, and the fishery participants to ensure the needed level of coverage with the least possible burden on the industry for that coverage. Alternative 2 is preferred because it would require that NMFS place observers as necessary to ensure reliable estimates of bycatch and bycatch mortality, as well as providing data on protected species interactions. It is certain that there will be bycatch if fisheries occur as expected under this FMP. The surface-hook-and-line, pelagic longline, and small purse seine fisheries are particularly poor in bycatch data, therefore, observers would be mandated under the FMP for these fisheries that currently have poor data reporting on bycatch species. Information on bycatch in other fisheries is currently obtained from logbooks, port sampling and landings records, but can be improved. NMFS also intends to develop an analysis of various levels of sampling needed to assess bycatch and/or releases in the private recreational and CPFV fisheries. The RA would be required to develop sampling designs in consultation with the Council, its advisory bodies, and fishery participants.

The Proposed Action requires that observers be placed at a level sufficient, together with other monitoring requirements, to generate reliable determinations of bycatch and bycatch mortality and of interactions with protected species such as sea turtles and seabirds. It also initiates observer plans for HMS fisheries that presently do not have them. This alternative suggests priorities for observer placements based on information about the different fishery sectors, the vessels involved, and the nature and practices of the different sectors. This includes development of appropriate levels of sampling for the different sectors in consultation with the Council, industry and other interested parties. It also promotes or requires continuation of observer programs in place for the drift gillnet fishery and large scale purse seine fishery and new coverage of the longline and other non-covered fishery sectors. See Chapter 5 and Chapter 6 for more information about data collection needs, including observer programs, to address bycatch and protected species determination requirements.

Observer programs would likely result in a burden on industry with the scope of the burden depending on the number of observers placed and whether the vessels were responsible for some of the cost of the observer program or were likely to suffer disruption or inefficiency to make accommodations for the observer on the vessel. At this time, it is estimated that the burden to fishers would be about $15-20 per day of observer coverage. Observers are already placed on the drift gillnet fleet so there would likely be no change in costs for that fishery. Observers currently are placed on a limited and voluntary basis on the longline fleet but this would likely change with added cost to the vessels. No specific observer sampling design has yet been completed for a comprehensive HMS fishery observer program so no specific requirements and associated costs can yet be specified; however, NMFS currently estimates a cost of $300-650 per day for observer coverage. The cost of a comprehensive observer program could be as high as $1 million per year (Appendix F section 1.6).

Under the "No Action" alternative 1, the FMP would not contain authority to establish observer programs for HMS fisheries. If any observer programs were implemented, they would be done under other statutory authority. Observer placements could continue under existing MMPA or ESA authority in the drift gillnet fishery and possibly the longline fishery if NMFS were to independently implement regulations under those authorities, and those vessels would continue to be subject to some costs as is now the case. Other sectors (troll, harpoon, purse seine, charter) would not be subject to coverage under this alternative. There would be lower costs for the fishers in those sectors though the amount cannot be quantified without knowing what sampling coverage would be with and without observer authority. Current large-mesh DGN and longline observer program costs are about $600,000 per year.

9.2.4.6 Protected Species

Protected Species Alternative 1: (No Action): Adopts no measures to specifically minimize interactions with protected species under the FMP. Protected species measures would continue to be promulgated by NMFS under separate processes (ESA, MMPA, etc)

Protected Species Alternative 2: (Proposed Action): Adopts a framework authorization for protected species conservation measures (see Chapter 8 section 8.4.6) and implements initial conservation and management measures for the drift gillnet and pelagic longline fisheries as described in this Chapter, in Chapter 8 section 8.5, and in Chapter 6, section 6.3. These measures are intended to reduce the potential for takes of protected species and to minimize the risk of adverse impacts from these takes. The framework provisions of the FMP would be used to address new protected species concerns as they are identified.

Both through the SAFE report and through special reports from interested parties (which include the USFWS and environmental organizations), the Council would be advised of any new concerns; would direct the plan team or others to investigate and recommend action; would determine if action is needed and, if it is viewed as a matter of substantial concern, would direct the completion of necessary documents to analyze the issues and evaluate alternatives; and would submit recommendations for corrective action to NMFS for consideration. If such an action were recommended by the Council and approved by NMFS, the action would be implemented by NMFS. In fisheries where protected species takes are already being addressed, as by the POCTRT for the DGN fishery, any recommendations and supporting analyses, as by the POCTRT, would be provided by NMFS to the Council for consideration. The Council would make recommendations to NMFS, which will make final decisions on whether to proceed with rulemaking under the MMPA or Magnuson-Stevens Act, as appropriate.

The analyses associated with Protected Species alternatives are provided in this Chapter, under the drift gillnet and longline alternatives sections which deal with impacts of proposed fishery management measures on protected species.

9.2.4.7 Prohibited Species

Alternative 1: (No Action): Prohibitions on retention of certain species would not be incorporated into this FMP.

Alternative 2: (Proposed Action): Prohibits retention of great white, basking and megamouth sharks (except for the sale or donation of incidentally-caught specimens to recognized scientific and educational organizations). Also prohibits retention of Pacific halibut and salmon (except with authorized gear during authorized seasons). Also adopts a framework authorization for changes in prohibited species designations.

Analysis: The designation of the proposed prohibited species will have little if any economic or biological impacts, but may lessen the risk of added mortality on these species for curio, trophy or other market value. The amounts likely taken and discarded in HMS fisheries are not expected to be substantial, and their non-consumptive, existence value is thought to greatly exceed their market value.

The white and basking shark cannot be retained now, catching a megamouth shark is an exceedingly rare event, and salmon and halibut can only be retained to the extent the fishers are eligible to retain them under existing regulations. There should be no affect on the status of these stocks, because of the rarity of take, and there should be no added biological impacts as a result of the Proposed Action. The Proposed Action will not affect producer or consumer benefits, and recreational fishers will still derive non-market benefits from catching and releasing any of these species. Any potential reduction in commercial or recreational retention of great white, basking and megamouth sharks will extend the non-consumptive benefits associated with preservation of these species.

The "No Action" alternative 1 is to not designate any species as prohibited. This would allow all species caught to be retained and landed, except where States have existing prohibitions on their retention. This may increase the risk that especially rare and vulnerable species such as great white, basking and megamouth sharks would be retained and landed. There is not expected to be any substantial change in catches or landings of these species under this option, and therefore no economic impacts. While this would allow opportunities for scientific samples it would also allow targeting of such species, which may have more existence value, than commercial or even scientific value.

Allowance of retention of halibut and salmon out of season or with unauthorized gear would risk the potential for vessels to claim to be targeting HMS while actually targeting Pacific halibut or salmon. Those species are subject to intense fishery competition and allocations, and allowing unlimited retention could severely disrupt management of those fisheries. Any economic benefits accruing to HMS fishers from such practices would severely diminish the benefits that would accrue to legitimate Pacific halibut or salmon fishers, resulting in no change in overall net economic benefits.

9.2.4.8 Quotas or Harvest Guidelines

Alternative 1: (No Action): Establishes no harvest guidelines or quotas for any HMS.

Alternative 2: (Proposed Action): Establishes harvest guidelines for selected shark species and authorizes establishment or modification of quotas or harvest guidelines under the framework provisions. Initial harvest guidelines proposed are for common thresher shark and shortfin mako shark, and are set equal to an OY estimate specified as 0.75MSY. The MSY used is the local MSY (LMSY), as the stock-wide maximum sustainable harvests are not known. Initial harvest guidelines are: common thresher shark, 340 mt (round weight or rw), and shortfin mako shark, 150 mt rw.

Alternative 3: Establishes quotas or harvest guidelines for additional species.

Analysis: Under the "No Action" alternative 1, no harvest guidelines or quotas would be established for any species. The direct effect on the fisheries or the stocks, at least initially, would be the same as under the Proposed Action because the proposed harvest guidelines for common thresher and shortfin mako sharks are not binding harvest limits. Thus, under either the No Action or Proposed Action alternative, the harvest of these sharks (and all other HMS species) could be unlimited. However, without harvest guidelines for the sharks, there is a greater likelihood that large changes in the harvests of these species will not be viewed as a reason for considering conservation and management measures in the future. A harvest guideline provides a frame of reference or benchmark for assessing if management is being effective or having the desired effects. The plan team, advisors and Council can all benefit from comparing actual catches to harvest guidelines. If the catch exceeds a harvest guideline, it will trigger analysis to determine if this reflects increased abundance or availability of the fish, a change in fishing efficiency, or some other factor, such as overfishing. If proactive action is then taken, it could prevent future quotas that would be more disruptive and limiting than harvest guidelines. The establishment of harvest guidelines does, however, raise the need for accurate monitoring of the fisheries and tracking of all fishing mortality throughout the year, which would add to management costs.

In Alternative 2 (Proposed), initial harvest guidelines for common thresher and shortfin mako sharks are set to provide a baseline for evaluating the potential need for tighter fishery restrictions if the shark harvest expands. No quotas are proposed because there is no clear evidence that the stocks are overfished, and they would be very costly to establish, administer, and enforce. They also could require allocations which would be difficult to agree on when there is very little limit on international fisheries for the management unit species. The establishment of harvest guidelines equal to optimum yield (=0.75MSY) was chosen as a precautionary approach, considering the relatively low productivity of sharks, and indications that the recovery of the common thresher from overfishing in the 1980s is still proceeding at a relatively slow rate. Because the proposed harvest guidelines for common thresher and shortfin mako sharks are not binding harvest constraints, this action would not in itself limit landings and revenues.

Attainment of a harvest guideline would not require a management response, but does prompt a review of the fishery. At the HMS Management Team's annual meeting in May or June, the Management Team will review the catches from the previous statistical year (April 1-March 31) and compare those catches with the established harvest guidelines (or quotas, if in place); evaluate the status of the stocks; and develop recommendations for management measures, as appropriate. These management measures will be presented to the Council as part of the SAFE document at its June and/or September meetings to be reviewed and approved for public review. Final action on management measures would be scheduled for the Council's November meeting. There is not expected to be an economic impact of the Proposed Action when the FMP is implemented, since no change in fishing patterns are expected as a result of establishing initial harvest guidelines.

In Alternative 3, another option is to set quotas or harvest guidelines for additional species. Quotas could be viewed as a precautionary approach intended to ensure that there will not be excessive expansion of the fisheries. But this would not likely contribute in any measurable way to the protection of the stocks of any management unit species (except perhaps sharks) due to their wide distribution throughout the eastern or entire Pacific and to the fact that U.S. catches make up a small share of their total catches. Yet quotas could put U.S. vessels at a competitive disadvantage in the international fisheries. However, quotas could minimize the potential for a "boom or bust" cycle in which the U.S. fisheries rapidly expand only to face severe economic problems if the stocks were to decline substantially in the future. Administration of quotas would also be quite difficult and costly as there would almost have to be allocations for some species that are targeted by several fishery sectors at the same time. Without allocations, there could be catch patterns that many would view as unfair or economically inefficient. Finally, harvest guidelines would be less burdensome to administer than quotas because it would not be critical to have accurate data in-season to determine when to close fisheries. However, harvest guidelines, if set too low, might degrade their general usefulness.

9.2.4.9 Allocation

Alternative 1: (No Action): The FMP would not establish quota allocations of HMS to different fisheries or fishery sectors.

Alternative 2: (Proposed Action): The FMP would not establish initial quota allocations of HMS to different fisheries or fishery sectors, with the exception of a 'No Sale' of Striped Marlin Proposed Action described in Chapter 8 section 8.5.4 and Chapter 9 section 9.2.5.4. This action allocates marlin for sport use only. Future allocations could be made using framework procedures.

Alternative 3: The FMP would make initial allocations among fisheries or fishing sectors, in addition to the striped marlin allocation.

Analysis: At the present time there are only two quotas for harvested species caught by multiple sectors. The IATTC has established commercial quotas for yellowfin and bigeye tuna. Further specific allocations among fisheries or fishing sectors could in the future be necessary if there were quotas established for species which are harvested by several different gear types. Establishing allocations among fishery sectors (other than recreational-only retention of striped marlin) was considered premature at this time, considering the reported status of the stocks and the level of fishing effort.

The prohibition of the sale of striped marlin will have no economic or biological impacts. Striped marlin now cannot be sold in California so no revenue impacts will occur to commercial fishers. Since longline vessels are either not permitted or do not currently operate out of Washington and Oregon, commercial longliners from those states would not be impacted. Only 10 permitted drift gillnet vessels operate out of Oregon, but the catch of marlin is rare and only during extreme El Niño years. There will continue to be some bycatch (discard) of striped marlin taken incidentally in the California-Oregon drift gillnet and longline fisheries. Since those fisheries are observed, the take can be documented for use in stock assessments. Sport anglers in southern California will benefit from less competition for striped marlin because there will be no commercial incentive to increase the take of these fish. The overall value of a striped marlin landed in the sport fishery is estimated to far exceed that of the market value of one landed commercially.

Prohibiting the sale of striped marlin would create an inconsistency with the Western Pacific Council's management plan for pelagic fishes, but it reflects long standing policy along the U.S. West Coast. Under the WPRFMC Pelagics Plan, the sale of marlin is legal. Cultural differences play a major role in determining the use of marlin. In Hawaii, they are perceived as both a commercial and sport species (although sport anglers are allowed to sell their catch), while in California, the only West Coast state with a viable fishery, there is an 80+ year history of sport take only.

9.2.4.10 Treaty Indian Fishing Rights

There are three alternatives for consideration. All three are procedural in nature, and thus have no environmental consequences per se. The procedural consequences of each alternative are discussed below.

Alternative 1: (No Action): Neither the FMP nor the initial implementing regulations would contain explicit measures or procedures for accommodating treaty Indian fishing rights.

Analysis: Under the Magnuson-Stevens Act, all fishery management plans must be consistent with "other applicable law." 16 U.S.C. 1853(a)(1)(C). As a matter of law, treaty Indian fishing rights are "other applicable law," and must be accommodated whether or not they are expressly recognized in the FMP and/or implementing regulations. See, Parravano v. Babbitt, 70 F.3d 539, 544 (9th Cir. 1995), cert. denied, 116 S.Ct. 2546, 518 U.S. 1016, 135 L.Ed.2d 1066 (1996); Washington State Charterboat Ass'n v. Baldrige, 702 F.2d 820, 823 (9th Cir. 1983), cert. denied, 464 U.S. 1053, 104 S.Ct. 736, 79 L.Ed.2d 194 (1984). Since treaty Indian fishing rights must be accommodated whether they are mentioned in the FMP or not, Alternative 1, which fails to expressly provide for treaty rights, would leave fishery participants with no clear process or parameters for dealing with treaty fishing issues, and would result in needless confusion. It is preferable to make express provision for treaty fishing rights, both so that fishery participants are informed that they are a component of the fishery, and to provide clear rules for their implementation.

Alternative 2: (Proposed Action): Authorizes adoption of measures and procedures to accommodate treaty fishing rights in the initial implementing regulations for the FMP. Also authorizes amendments to the initial regulations through regulatory amendments, without the need to amend the FMP. The initial implementing regulations would contain the measures and procedures specified in Chapter 8 at section 8.4.10, "Treaty Indian Fishing."

Analysis: The Proposed Action authorizes adoption of the basic measures and procedures relevant to treaty Indian fishing rights in the initial implementing regulations. This alternative explicitly establishes both the fundamental parameters for treaty fishing, and the procedures by which tribal allocations can be made. It also provides flexibility to revise the implementing regulations through regulatory amendments, rather than using the more cumbersome process for an FMP amendment.

Alternative 3: Include specific provisions in the FMP describing the measures and procedures for accommodating treaty fishing rights. Any revision to the measures or the procedures would require an FMP amendment.

Analysis: Under Alternative 3, the FMP would contain detailed provisions on treaty fishing rights, which could only be changed by plan amendment. This alternative has two disadvantages relative to Alternative 2. First, the FMP document is less accessible to the public than the implementing regulations, which are published in the Federal Register and codified in the Code of Federal Regulations. Second, plan amendments require a more cumbersome process than regulatory amendments, and provide a less timely means of response if revisions to the treaty fishing provisions are needed (for example, to respond to new case law or to new developments in the fishery). For these reasons, Alternative 2 is preferred.

Initial measures and procedures: The initial measures and procedures that would be applicable to treaty Indian fishing under either Alternative 2 or Alternative 3 are set forth in full in Chapter 8 at section 8.4.10, " Treaty Indian Fishing."

Analysis: The initial provisions are derived from the coastal pelagic species fisheries regulations at 50 C.F.R. § 660.518, the West Coast groundfish regulations at 50 C.F.R. § 660.324, and regulations of the Department of the Interior (at 25 C.F.R. Part 249) on off-reservation treaty fishing. The initial provisions incorporate relevant case law on treaty Indian fishing rights and NMFS administrative practice (boundaries of tribal usual and accustomed fishing grounds). To the extent that these provisions have been litigated to final decisions in the courts, they have been upheld. The initial provisions are not, however, intended to be a comprehensive statement of existing or future rules applicable to treaty Indian fishing.

In the future, as new issues arise and are resolved through the courts and/or by agreement of the parties, the initial provisions under the FMP will need to be revised. Alternative 2 provides the most efficient method for addressing new issues.

9.2.4.11 Exempted Fishing Permits (EFP)

See also Chapter 8, section 8.4.12 for background and details on NMFS-issued Exempted Fishing Permits.

Alternative 1: (No Action): The FMP would not specify any general or specific EFP process for any HMS fishery. NMFS regulations at 50 CFR §600.745 would be available to issue EFPs pursuant to the procedures and criteria in that section.

Alternative 2 (Proposed Action): The FMP would require that applicants submit for Council review and approval an initial EFP plan prior to formal application to NMFS, following a specific Council-supplied EFP protocol, which is to be developed by the HMS Management Team. The specific protocol will be available from the Council as a Council Operating Procedure. The protocol will include, but not be limited to, the following elements:

- schedule and procedure for submitting EFP applications;
- format for applications;
- qualification criteria for applicants;
- Council internal review procedures;
- relevant laws and regulations that must be followed

The Council will review, comment, and make recommendations on the plan and may require changes or request additional information. The final EFP plan and Council recommendations will then be provided by the applicant to NMFS for action. An example of a fishery-specific proposal is shown in section 9.2.5.2.1 under "Example of Exempted Longline Fishery Permit with Experimental Design." NMFS review and any subsequent issuance of an EFP would then proceed according to regulations specified in Code of Federal Regulations (50 CFR §600.745) pursuant to the procedures and criteria in that section.

Analysis of EFP Alternative 1 (No Action): Not providing any general or specific EFP procedures in the FMP means that EFP applications would be submitted to NMFS first and the Council and NMFS would rely on the NMFS procedures. While these do not specifically require NMFS to consult with the Council and states, in practice NMFS has consulted with stakeholders in review of EFP applications and sought recommendations for NMFS action on those applications. Under this approach, the Council is in a reactive rather than proactive mode. There will be some undetermined cost to the Council to take time to process, discuss and make recommendations on any EFP applications submitted to it for review. The possibility of

NMFS requesting Council input in a relatively short time frame (> 60 days) exists, which may not mesh well with the meeting schedule of the Council.

Analysis of EFP Alternative 2 (Proposed Action): This new Proposed Action would require that the HMS Management Team develop a specific set of EFP guidelines for the Council to use in reviewing all EFP proposals. Specific guidelines (to be developed) will be provided to the Council to evaluate HMS EFP proposals. These guidelines would include a time line and procedures for submitting EFPs, a required format to follow, qualification criteria for applicants or sponsors, procedures to follow for internal review, and identification of pertinent state/federal laws with which EFP activity should comply. The Council could then formulate its advice and recommendations and provide them to the NMFS SW Regional Administrator, who will have the responsibility for accepting and approving all EFP applications. NMFS regulations at 50 CFR §600.745 would be available to issue EFPs pursuant to the procedures and criteria in that section. This alternative will likely add time to the EFP process and involve a minimum of one or more Council meetings. There is not likely to be a substantial difference in cost to the Council or prospective EFP applicant under this alternative.

Analysis of EFP Alternative 3 (Former Proposed Action): This action would require that an EFP Plan be submitted to the Council and acted upon prior being submitted to NMFS puts the Council in a proactive mode. Specific information will be provided to the Council which may then formulate its advice and recommendations and provide them to the NMFS Regional Administrator. NMFS regulations at 50 CFR §600.745 would be available to issue EFPs pursuant to the procedures and criteria in that section. This alternative will likely add time to the EFP process and involve a minimum of one or more Council meetings. There is not likely to be a substantial difference in cost to the Council or prospective EFP applicant under this alternative.

9.2.5 Actions Relating to Fishery-specific and Other Conservation and Management Measures

The following sections describe and analyze the expected impacts on the biological, ecological and socio-economic environment of the conservation and management measures for the drift gillnet, longline, purse seine, and recreational fisheries (see Chapter 8 sections 8.5.1, 8.5.4 through 8.5.6 for more discussion of the Proposed Actions and alternatives). See also a comparison of environmental effects of alternatives presented in matrix table form in Chapter 8 section 8.5.7.

9.2.5.1 Drift Gillnet Fishery: Actions, Alternatives and Analyses

The following presents alternatives pertinent to the large mesh drift gillnet fishery for swordfish and sharks, which is defined as a mesh size of 14 inches or greater. See also Legal gear sub-alternatives 2a and 2b in Legal Gear and Gear Restrictions section 9.2.4.1 and Chapter 8 section 8.4.1; also Incidental Catch Allowance section 9.2.4.2 for discussion of non-HMS small gill net fisheries. Most of the following alternatives include measures issued under the authority of the MMPA and the ESA to protect marine mammals and endangered turtles. These measures are in effect and will not be changed by this FMP, but the measures are included here to provide a clear understanding of the issues involved because data obtained may require changes in the future. Alternatives 2, 3, 4, 6, 7, and 8 all contain existing federal regulations. Alternative 5 contains an area closure that was contained in the Biological Opinion to authorize the incidental take of marine mammals listed under the ESA. This area closure was not adopted, but was modified to the existing closure.

Driftnet Alternative 1: (No Action): Continues swordfish/shark drift gillnet fishery regulations under current authorities. Under this alternative, regulatory authority would continue under existing state and federal authorities. There would be no new federal regulations for this fishery implemented under the FMP. Federal regulations under MMPA and ESA authority would remain in effect, as would all state regulations. This would include the states' definitions of legal gear and their respective time/area restrictions. Drift gillnet is not a legal gear for Washington residents or anyone who is licensed by that state; Oregon vessels cannot fish within 75 nm May 1 through August 14 and inside 1000 fathoms the remainder of the year; and California has many closures for its vessels. These are listed in Chapter 8 section 8.5.1. The states' requirements regarding gear configuration also would continue to apply as would state limited entry programs.

Driftnet Alternative 2: (Proposed Action 2): Endorses or adopts in the FMP all federal conservation and management measures in place under the MMPA and ESA; adopts all state regulations for swordfish/shark drift gillnet fishing under Magnuson-Stevens authority except limited entry programs (that will remain under states' authority); modifies an OR gear restriction inside 1000 fm (or way point equivalent) to be in effect year round; closes EEZ waters off WA to all DGN fishers; and continues the current turtle protection closure north of Point Sur, CA to 45° N (August 15 to November 15), and south of Point Conception to 120° W longitude during a forecasted or occurring El Niño event (August and January[1]).

This alternative modifies the current state regulations to prohibit, year-round, drift gillnet fishing for swordfish and sharks in EEZ waters off OR east of a line approximating the 1000-fm curve (deleting the May-August prohibition within 75 nm) and prohibits HMS DGN fishing in all EEZ waters off WA. The state of WA currently does not allow drift gillnet gear and OR does not allow drift gillnets to specifically target thresher shark. Both states have a landing restriction ratio of two swordfish to one thresher shark. DGN vessels have in the past been able to avoid OR and WA restrictions by fishing off both states and landing their catch in California.

Driftnet Alternative 3: Endorses or adopts only existing federal (MMPA, ESA) drift gillnet regulations into the FMP.

Drift Gillnet Alternative Measures Considered:

- Alternative 1: No Action: (Status Quo)
- Alternative 2: **(Proposed Action):** Continues limited entry under states' authority; modifies an Oregon closure inside 1000 fm (or way point equivalent) to be in effect year round; and adopts or endorses all other existing state and federal regs, including the current turtle conservation closure North of Pt. Sur.
- Alternative 3: Adopts only federal regs
- Alternative 4: Adopts all existing state and federal regs, and federalizes states' limited entry systems.
- Alternative 5: Adopts Turtle time/area closures per Biological Opinion, including larger area closure north of Point Conception.
- Alternative 6: Adds closure inshore 1000 fm (or waypoint equivalent) off OR <u>and</u> WA
- Alternative 7: Adds closure throughout EEZ north of 45° N latitude off OR and WA
- Alternative 8: As in 2, but no modified Oregon closure (existing closures federalized).

Driftnet Alternative 4: Endorses or adopts in the FMP all federal and conservation and management measures in place under the MMPA, ESA, and adopts state regulations under MSFMCA authority, but also includes and *federalizes the states' limited entry programs*. Like Alternative 8, does not modify any existing Oregon area closures. Currently, Oregon driftnetters can only fish beyond 75 nm from May 1-Aug 14, and outside the 1000 fm curve the rest of the year. The state of WA currently does not allow the use of drift gillnet gear and OR does not allow drift gillnets to specifically target thresher shark, although landings are allowed in the ratio of two swordfish to one thresher shark. DGN vessels have fished off both Oregon and Washington and landed their catch in California.

Driftnet Alternative 5: As in Alternative 8, but substitutes the time/area closures of the Biological Opinion on issuance of the 101(a) (5) (E) permit under the MMPA for the current turtle conservation closed areas now in place. (See Chapter 8 section 8.5.1).

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[1] As of June 2003, a rule to modify this El Niño closure is being finalized. It proposes instead to prohibit fishing during the months of June, July and August, which NMFS has concluded offers more protection for loggerheads while having less impact on the fishery than a closure in January and August.

Driftnet Alternative 6: As in alternative 8, but additionally, DGNs could not be used to take swordfish and sharks in any EEZ waters less than 1,000 fm off Oregon and Washington to protect large adult thresher sharks and where there are bycatch and protected species concerns.

Driftnet Alternative 7: As in Alternative 8, but additionally, for shark protection and to address bycatch and protected species concerns, drift gillnets could not be used to take swordfish and sharks in any exclusive economic zone (EEZ) waters north of 45° N latitude year round, including times when the northern turtle closure is not in effect (Nov 16 to Aug 14).

Driftnet Alternative 8: As in Alternative 2, continues limited entry under states' authority, adopts or endorses all federal and state regulations, but does not modify any existing Oregon area closures.

With this alternative, all driftnetters fishing off Oregon would be required to fish beyond 75 nm from shore during May 1 through August 14. The rest of the year, as in Alternative 2, the 1000 fm contour (or equivalent waypoint line) would serve as the inner boundary, except when and where the leatherback turtle closure is in effect (August 15 through November 15 south of 45° N latitude). Along much of the Oregon coast the 75 nm boundary is further offshore than the 1000 fm contour, except where these two boundaries may overlap north of 45° N latitude.

Analyses of Alternatives:

The following analyses apply to driftnets *with mesh sizes ≥ 14 inches stretched mesh* (analyses dealing with smaller mesh driftnets are provided in Legal Gear Chapter 8 section 8.2.4.1):

Analysis Driftnet Alternative 1 (No Action): See section 9.1.1. for discussion of expected conditions under the "No Action" alternative.

Analysis Driftnet Alternative 2 (Proposed Action): Adopts existing state and federal DGN regulations (except defers limited entry authority to the states), and additionally modifies an existing Oregon gear restriction, making drift gillnet fishing for swordfish and shark prohibited in waters less than 1000 fm *year round*, as defined in equivalent waypoints. Discontinues the current Oregon regulation that prohibits drift gillnetting within 75 nm from shore from May 1-August 14. It adopts and continues the federal Pacific Leatherback Conservation Area closure north of Pt Sur, CA (Fig 9-1), which was implemented on August 24, 2001 (66 FR 44549, August 24, 2001). This still allows vessels to fish the southern edge of the Davidson Seamount, which is a productive fishing area, and allows these vessels to land fish in either Moss Landing, Monterey, or Morro Bay, California. This alternative also adopts the Pacific loggerhead turtle closure south of Pt. Conception, which was implemented on January 23, 2003 (67 FR 78388, December 24, 2002).

Concerning closures off Washington and Oregon, the State of Washington currently does not allow the use of drift gillnet gear and Oregon does not allow drift gillnets to target thresher shark, although California DGN fishers have fished off both states and landed in California. Sets have been made off Washington in recent years, but these sets came from non-Washington-licensed fishers, who by law, had to return to either Oregon or California to land their fish. Washington does allow thresher shark landings, subject to a landing ratio (which is the same in Oregon) of one thresher shark for every two swordfish. However, in order to land thresher shark in Washington, they must have been taken south of the WA/OR border.

Oregon has had seasonal inshore closures for Oregon licensed drift gillnet fishers since 1995. Waters within 75 miles of the shoreline are closed from May 1 through August 14 and waters less than 1000 fm (approximately 125° 10' to 125° 30' W longitude) are closed the remainder of the year. The closure from May through mid August is intended to discourage targeting on thresher sharks which are found off Oregon earlier in the year than swordfish.

In 1986-1988 an experimental gillnet fishery targeting thresher sharks was conducted off Oregon and Washington (primarily north of 45° N latitude). During the three-year fishery, landings began in early to mid

July and peaked in late July or early August. The main fishing effort was concentrated 20-60 nm off Oregon and 50-80 nm off Washington. The fishery was discontinued because of bycatch concerns and incidental takes of sea turtles and marine mammals.

In this alternative, a line is proposed, which would be defined by a series of waypoints, rather than the 1000 fm curve or a mileage offshore as is currently used off Oregon, because a line would be easier to enforce. The waypoint line, which lies roughly between 125° 10' to 125° 30' W was chosen off Oregon because, although all sea turtles and marine mammals taken in the experimental thresher shark fishery were taken east of 125° W longitude, only 1% of the thresher sharks taken in the DGN fishery are taken east of 125° W longitude. As an example, extending the line to approximately 125° 30' W would reduce the take of thresher sharks in the DGN fishery by 84%.

Impacts of the recently imposed Pacific Leatherback Conservation Area closure (Modified TRT Alternative published as interim final rule Aug 24, 2001 (66 FR 44549)) and the final interim rule for loggerhead turtle protection (67 FR 78388) were analyzed, because the former closure became effective during the FMP development process and will continue in effect under the Proposed Action, and the latter will be effective by the time the FMP is implemented. The leatherback closure is expected to produce a reduction in driftnet fishing effort, as larger mixed-gear (i.e., driftnet and surface hook-and-line)vessels already trolling for albacore in northern waters will likely continue targeting albacore to some extent into October and November, rather than switching back to driftnet gear. For purposes of evaluating the impacts of the alternative, we assume that fishing effort that previously occurred in the closed area during this time period will have shifted south out of the new closed area, but will, for the most part, still remain north of Point Conception (34° 27' N latitude). Impacts on fish species were estimated by determining whether the alternative would increase or decrease the likelihood of capturing each species. Fish catch rates in the northern closed area were compared to those in the open area north of Point Conception from August 15 through November 15, for the years 1990 through 2000 (NMFS unpublished DGN observer data). NMFS has observed 1,825 sets in the proposed northern time/area closure, and 531 sets in the open area during this period. The interim rule 67 FR 78388 to protect loggerhead sea turtles would close an area to drift gillnets south of Point Conception, California (34° 27' N latitude) and west to 120° W longitude from August 15 to August 31 and again from January 1 through January 31 during a forecasted or occurring El Niño event. *Note:* A modified rule is now being finalized, which would change the closure months to June, July and August. NMFS has concluded that this modified closure offers more protection for loggerheads during El Niño periods, while having less impact on the fishery than the former closure in January and August. An analysis for this alternate closure will be included in the final rule, which will likely be published by the time NMFS issues the proposed regulations to implement this FMP. Therefore, the FMP regulations should reflect this modified closure, which would prohibit fishing with drift gillnets in the CA/OR thresher shark/swordfish drift gillnet fishery in U.S. waters off southern California in waters east of the 120 W long., for the months of June, July, and August, when El Niño conditions are forecasted or present off southern California.

Effects on Swordfish - Driftnet Alternative 2 (Proposed)

The observed swordfish catch in the leatherback closed area from August 15 through November 15 is 3.07 fish per set. The corresponding catch rate is 3.12 swordfish per set in the open area, slightly higher than in the closed area. Therefore, the Proposed Action is expected to have a minor effect on the possibility of catching swordfish. Changes in total catches and landings of swordfish will also depend on the geographic distribution and the amount of change in aggregate DGN fishing effort during the closed period.

Off Oregon, sets east of 125° 30' W longitude accounted for 40% of the swordfish logged (226 in number). The catch rate east of 125° 30' W longitude was similar to the catch rate west of 125° 30' W longitude (2.6 and 2.8 fish per set, respectively). Therefore, if all the effort were to move west of 125° 30' W longitude, the total catch of swordfish would be similar.

Effects on Marlin - Driftnet Alternative 2 (Proposed)

Striped marlin catch rates are similar in the northern leatherback closed area (0.008) and in the open area (0.004 fish per set). Blue marlin catch is 0.001 fish per set in the closed area (1 blue marlin in 1,474 sets), and zero fish per set in the northern open area. This is not expected to significantly change the catch of billfish by the drift gillnet fishery.

Effects on Blue Shark - Driftnet Alternative 2 (Proposed)

This action is expected to increase the likelihood of catching blue sharks in the drift gillnet fishery. Blue sharks have been caught at a rate of 4.64 fish per set in proposed leatherback closed area and 6.09 fish per set in the open area.

Effects on Thresher Shark - *Driftnet Alternative 2 (Proposed)*

Drift gillnet vessels catch common thresher shark at a higher rate in the California open area (1.03 fish per set) than in the leatherback northern closed area (0.38 fish per set). Redistribution of fishing effort southward is expected to increase common thresher shark catches by the fishery. Some vessels may elect to directly target common thresher shark during this time period, producing even higher catch rates and landings for this species. The catch of bigeye thresher shark is expected to decrease, as the catch rate in the open area (0.02 fish per set) is lower than that to the north (approximately 0.10 fish per set), although observed bigeye thresher shark catch has been lower than average in the past several years (9-15 sharks per year with approximately 20% observer coverage).

The common thresher shark was overfished in the 1980s and the stock is currently rebuilding (see Chapter 3 for stock assessment). Adopting this alternative would continue the rebuilding which has been aided by the current state closures. In the DGN fishery off Oregon, the catch rate of thresher shark was much higher east of 125° 30' W longitude (0.5 fish per set) than west of 125° 30' W longitude (0.1 fish per set). Sets east of 125° 30' W longitude accounted for 84% of the thresher shark logged off Oregon (84 in number). Therefore, if all the effort were to move west of 125° 30' W longitude, the total catch of thresher shark would be lower.

Discontinuing the 75 nm Oregon closure during May 1 through August 14 will allow drift gillnetting further inshore than previously in certain areas off central and southern Oregon at this time of year. While this would allow them to fish closer to the 1000 fm contour where adult thresher sharks have been taken in the past, the grounds inshore of 1000 fm further north off the Columbia River are considered more productive, and would now be protected from all drift gillnet fishing. Federalizing both Washington and Oregon closures and gear restrictions will prevent California-based fishers from fishing in OR/WA closed areas and landing in California. The Washington and Oregon landing ratio requirement of one thresher to two swordfish would continue under states' authority in those states. Finally, the recently enacted biological opinion to protect leatherback sea turtles closes all waters south of 45° N latitude (at approximately Cascade Head, OR) during the period August 15 through November 15, which will further contribute to a reduction in fishing effort on thresher sharks in these waters compared to effort in the recent past.

Effects on Shortfin Mako Shark - Driftnet Alternative 2 (Proposed)

Drift gillnet catch rates for shortfin mako shark are 0.42 fish per set in the leatherback turtle closed area and 0.43 fish per set in the open area. Compliance is not expected to significantly affect shortfin mako shark catches during the closed period.

A summary of the above information is included in Table 9-1.

Effects on Green Turtles - Driftnet Alternative 2 (Proposed)

NMFS has observed only one green turtle taken in the drift gillnet fishery. The animal was released dead. This entanglement is considered a rare event (one turtle in 6,025 observed sets). The animal was observed on November 3, 1999, at 34° 31' N latitude, 121° 45' W longitude. Assuming that the number of vessels that normally would be fishing north of Point Sur would fish south of Point Sur and north of Point Conception, there is a slightly greater chance that an interaction might occur. However, NMFS considers the likelihood of an interaction with a green turtle as remote based on historical observer data.

Effects on Leatherback Turtles - Driftnet Alternative 2 (Proposed)

The proposed time and area closure north of the diagonal line defined by Point Sur to 34° 27'N latitude, 123° 35' W longitude is expected to reduce the likelihood of leatherback interactions. This alternative provides additional protection to the potential leatherback turtle migratory corridor from Monterey Bay, California to western Pacific nesting beaches. The closed area is based on observer data that indicate there is not a large increase in leatherback turtle entanglement rates at Point Conception. The most substantial increase in entanglement rates occurs north of 36° 30' N latitude (NMFS unpublished data, J. Morgan, NMFS SWR, Long Beach, CA). Extending the time of the closure from October 31 to November 15 is expected to compensate for moving the boundary farther north because the leatherback entanglement rate north of 36°30'N latitude is significantly higher.

Observer data of the number of leatherback turtles entangled from July 1990 through January 2001 show that the Modified TRT Alternative provides the same level of protection for leatherback turtles as the alternative identified in the biological opinion. This conclusion is based on observer data that indicate the calculated entanglement rate from 32° N latitude through 33° 30' N latitude (Mexico border to Santa Catalina Island) is 0.0004 leatherbacks per set (one observed leatherback in 2,717 observed sets), and that the entanglement rate from 33° 30' N latitude to 35° N latitude (approximately Santa Catalina Island to Point Conception) is 0.003 leatherbacks per set (two observed leatherbacks in 647 observed sets). From 35° N latitude to 36° 30' N latitude (approximately Point Conception to Point Piños) the entanglement rate is 0.004 leatherbacks per set (four observed leatherbacks in 919 observed sets). The entanglement rate from 36° 30' N latitude (Point Piños) to 38° N latitude (Point Reyes) is 0.018 leatherback turtles per set (eight observed leatherbacks in 434 observed sets). Leatherback entanglement rates clearly increased with latitude. Therefore, allowing vessels to fish north of Point Conception in the area south of the diagonal line described above is not expected to significantly increase the likelihood of an interaction with a leatherback because the entanglement rate from approximately Santa Catalina Island to Point Conception is relatively low at 0.003 leatherbacks per set, and it is still 0.004 leatherbacks per set from there north to Point Pinos. The likelihood of an entanglement is almost the same whether vessels are fishing in the area north of Point Conception, south of the diagonal line, or fishing south of Point Conception, between Point Conception and Santa Catalina Island.

More importantly, compliance with the recent turtle closure provides additional protection (compared to the regulations in place prior to the ESA action) to leatherback turtles that may be departing Monterey Bay, California to migrate to their nesting beaches in the western Pacific. This conclusion is based on two leatherback turtles that were tagged by NMFS with satellite transmitters in Monterey Bay during September 2000. Shortly after these turtles were tagged, they moved away from the coast of California in a southwesterly direction. This alternative potentially provides additional protection to migrating leatherback turtles that are moving out of the area. This potential migratory corridor is based on only two leatherback turtles; however, NMFS intends to attach additional satellite tags to leatherbacks when they are found in the Monterey Bay area (July through September). With additional information, NMFS hopes to better define the migratory route that leatherbacks use to travel from the West Coast of North America to the western Pacific nesting beaches.

No incidental take of sea turtles off Oregon and Washington was indicated on the California or Oregon DGN logbook data. However, incidental takes of sea turtles recorded in the experimental thresher shark gillnet fishery in 1986-1988 give an indication of potential takes in the DGN fishery. Off Oregon, three leatherback turtles were taken, all east of 125° W longitude. Off Washington, 13 leatherback turtles were taken. Adopting this alternative would continue the protection of sea turtles that have resulted from the current state closures.

Effects on Loggerhead Turtles - Driftnet Alternative 2 (Proposed)

The time and area closures to protect leatherback turtles are not expected to affect the likelihood of an interaction with loggerhead turtles because there have been no loggerhead turtles observed taken by the drift gillnet fishery north of Point Conception. Vessels that normally fish north of Point Conception during this time of year are expected to continue to fish in the open area near Point Conception when the area closure is in effect; therefore, an increase in vessel activity south of Point Conception is not expected. For these reasons, the implementation of the northern closure of the Modified TRT Alternative is not expected to affect the number of loggerhead sea turtle interactions. Compliance with the closure south of Point Conception during a forecasted or occurring El Niño event should result in a reduction in the take of loggerhead turtles, as NMFS has determined the incidental take of these turtles by this fishery correlates to the area and season being fished during these oceanographic conditions (67 FR 78388, December 24, 2002). Recent re-examination of biological data used as a basis for the Biological Opinion and the Modified Take Reduction Alternative with regard to the loggerhead turtle time/area closure resulted in no change to the initial recommendation. See also analysis under *Effects on Loggerhead Turtles - Driftnet Alternative 5.*

Effects on Olive Ridley Turtles - Driftnet Alternative 2 (Proposed)

The only olive ridley sea turtle that NMFS has observed taken by the drift gillnet fishery occurred south of Point Conception on November 25, 1999. NMFS considers this a rare event (one olive ridley in 6,025 observed sets), and the entanglement occurred during a time in which the northern area time and area closure would not be in effect. The vessels that normally fish north of Point Conception are expected to continue to fish near Point Conception in the open area when the northern area is closed; therefore, an increase in fishing activity south of Point Conception is not expected.

Effects on Marine Mammals -Driftnet Alternative 2 (Proposed)

In general, the entanglement rate for cetaceans is higher in the areas north and south of the leatherback turtle closed area. From observer data from July 1990 through January 2001, the entanglement rate for cetaceans in the closed area between August 15 and November 15 was 0.083 animals per set (151 observed cetaceans/1,825 observed sets). Conversely, the entanglement rate south of the area during this time period for cetaceans is 0.192 animals per set (102 observed cetaceans/531 sets). Based on this information, there could be a higher cetacean entanglement rate during this time period if fishing effort shifted to the open area. However, since the implementation of the take reduction plan, the entanglement rates have decreased to 0.055 animals per set (25 animals/456 observed sets) in the closed area, and to 0.10 (27 animals/270 observed sets) in the open area.

The northern area leatherback closure incorporated in the Proposed Action is expected to have a beneficial effect on listed marine mammal species because some of the interactions between listed species occurred inside the time and area closure. Specifically, there have been eight observed sperm whale interactions since the inception of the observer program (July 1990 through January 2001). Four of those interactions occurred inside the time and area closure of the proposed alternative and none of them occurred within the open area. Therefore, there could be a 50% reduction in the number of sperm whale interactions with the implementation of the proposed alternative. Since the implementation of the take reduction plan, there has been only one observed sperm whale interaction. This entanglement occurred outside of the time and area closure. In addition, this interaction occurred in a set that was not in full compliance with the take reduction plan.

The northern leatherback closure is not expected to have an affect on the interaction rate of humpback whales because both humpback whales that were observed taken by the drift gillnet fishery occurred south of Point Conception. The northern closure is not expected to have an effect on the entanglement rate of fin whales for the same reason because there has been only one fin whale interaction and that occurred south of Point

Conception during the month of November. These determinations are based on the assumption that there will not be an increase in the number of vessels fishing south of Point Conception because the vessels that have historically fished north of Point Conception will fish in the open area. Therefore, the northern closure of the proposed alternative is not expected to increase or decrease the likelihood of interactions with humpback whales or fin whales.

NMFS has observed only two Steller sea lions taken in the drift net fishery. One of these animals was observed south of Point Conception during the month of June and the other occurred during the month of September in the closed area. Therefore, this northern area closure from August 15 through November 15 may decrease the likelihood of an interaction with a Steller sea lion, recognizing that the chances of an interaction are already low (less than one in 3,000 sets). There have been no Steller sea lions observed since the implementation of the take reduction plan.

NMFS has observed 28 northern right whale dolphins taken in 1,825 sets in the northern closed area from August 15 through November 15, for a take rate of 0.015 animals per set. The take rate is 0.034 animals per set (18 animals in 531 observed sets) in the open area north of Point Conception. The Proposed Action is expected to increase the likelihood of an interaction with northern right whale dolphins if fishing effort that was previously made in the closed area from August 15 through November 15 shifts to the open area north of Point Conception and south of Point Sur during the closure.

Short-finned pilot whale are taken at a rate of 0.004 animals per set (8 animals in 1,825 observed sets) in the northern leatherback closed area. There have been 3 short-finned pilot whales observed taken in 531 sets in the open area north of Point Conception (0.006 animals per set). This closure is expected to slightly increase the likelihood of an interaction with short-finned pilot whales if fishing effort that was previously made in the northern closed area shifts to the open area north of Point Conception and below Point Sur during the closure. However, since implementation of the TRT, there has not been a short-finned pilot whale observed taken by the fishery.

No incidental take of marine mammals was indicated on the California or Oregon DGN logbook data. However, incidental takes of marine mammals recorded in the experimental thresher shark gillnet fishery in 1986-1988 give an indication of potential takes in the DGN fishery. Off Oregon, 24 marine mammals (dolphins, porpoises, whales, seals, and sea lions) were taken, all east of 125° W longitude. Off Washington, 12 marine mammals (dolphins and porpoises) were taken. Adopting this option would continue the protection of marine mammals that have resulted from the current state closures.

Effects on Seabirds - Driftnet Alternative 2 (Proposed)

The northern leatherback closure may slightly increase the likelihood of northern fulmars being taken incidental to the drift gillnet fishery. However, in general, the drift gillnet fishery does not incidentally take seabirds. In 2000, NMFS observed northern fulmars pecking at the net webbing during net retrieval. From August 15 through November 15, there were 11 northern fulmars observed caught in the gear. Eight of these were released alive, two were released dead and one was released injured. NMFS has not observed this type of behavior during previous years. The entanglement rate for northern fulmars inside the open area is 0.021 northern fulmars per set, and the entanglement rate in the closed area is zero northern fulmars per set. If all the fishing effort that has occurred north of the line moves south, there is a likelihood that there will be a slight increase in the number of northern fulmars caught incidentally to the fishery.

In addition to the Northern Fulmars, there have been a couple of unidentified birds recorded by onboard observers. Two of these occurred in the closed area for an entanglement rate of 0.001 unidentified birds per set (one unidentified bird in 1,825 observed sets), and one occurred in the open area north of Point Conception, for an entanglement rate of 0.002 unidentified seabird per set (one unidentified bird in 531 observed sets). Based on this information, the likelihood of a seabird interaction might increase slightly if the fishing effort north of the diagonal line extending from Point Sur moved into this area off central California. Possible increased concentration of fishing effort in more southerly waters may increase encounter frequency with certain seabirds, such as Xantus' Murrlets *(Synthliboramphus hypoleucus)*, but the agility and small size of these seabirds, and the large mesh size of the gear, is not thought to present a risk. Additionally, the Endangered Brown Pelican generally occurs in waters inshore of DGN fishing areas. The Endangered Short-tailed Albatross (*Phoebustrius albatrus*) has been reported as occurring very rarely in the area, while the Black-footed (*P. nigripes*) and Laysan *(P. immutabilis)* albatrosses are more common (especially the former), but no albatross of any species has ever been recorded as taken by NMFS observers in the drift net fishery.

Other listed bird species that occur in the U.S. West Coast EEZ in the general area include the Threatened Marbled Murrelet (*Brachyramphus marmoratus marmoratus*), Endangered California Least Tern (*Sterna antillarium (=albifrons) browni*), Threatened Snowy Plover (*Charadrius alexandrinus nivosus*) and Endangered Brown Pelican (*Pelecanus occidentalis*). These species do not range offshore into the swordfish/shark drift gillnet fishing area, and thus are not considered at risk.

Socio-Economic Impact - Driftnet Alternative 2 (Proposed)

Based on landing receipt information, NMFS has estimated that if all the fishing effort that typically occurs north of the line extending from Point Sur (36° 18.5 N latitude) during the time period between August 15 through November 15 did not relocate, the closure under this alternative could cause a loss of $640,818 in ex-vessel gross revenues. This is a worst case scenario because many vessels are likely to fish in areas that are still open to drift gillnet fishing under this alternative. Table 9-2 provides estimates of the average ex-vessel gross revenues and pounds landed, by species, during the time and area closure using the past four years of California Department of Fish and Game landing receipt data from 1997-2000.

For purposes of analyzing the impacts of this alternative, it is also possible to analyze the change in gross revenues assuming that all of the fishing effort that historically occurred north of the line extending from Point Sur will shift south or east of the line, but still remain above Point Conception. In response to the closure, some larger vessels may choose to troll for albacore later into the season (September/October) if the catch rates of albacore remain profitable before shifting to drift gillnet gear.

Based on landing receipt data, swordfish accounts for 90% of the ex-vessel gross revenues during this time period; therefore, for purposes of determining the impacts of this alternative, swordfish is used as an indicator. The catch rate for swordfish for this time period north of a line extending from Point Sur is 3.068 fish per set compared to 3.117 swordfish per set south of the line. The swordfish catch rate south of this line is slightly higher than in the northern closed area; therefore, a reduction in the catch of swordfish during this time period is not expected with the implementation of the Proposed Action. Assuming the catch rate remains the same, NMFS estimates that the ex-vessel gross revenues for swordfish catch will not change under this alternative.

Substantial additional operating costs for vessels that historically fish north of the line extending from Point Sur are not expected because many of the vessels typically fish in this area south of the line during the season. However, there are a few boats that generally fish out of Oregon ports or northern California ports such as Crescent City, Fort Bragg, and Bodega Bay that may have to change their operating procedures and travel south earlier in the season. Some of the larger vessels that troll for albacore may also have to move down the coast earlier in the season. Typically, these vessels will finish their last albacore trip in Oregon and Washington and then begin targeting swordfish in the northern waters using drift gillnet, then begin moving down the coast in November. The vessels that home port in Santa Cruz, Moss Landing, Monterey, or Morro Bay typically operate near these ports during this time of year and will not be affected as much by the proposed closure under this alternative.

This alternative includes a closure of waters south of Point Conception and east of 120° W longitude during an El Niño event. In such years, vessels that fish south of Point Conception are not likely to then travel north to Morro Bay to land fish. This is because the prevailing northwesterly winds, large swells, and choppy conditions persisting at Point Conception discourage and inhibit vessels from routinely traveling north around the point. The likelihood of a vessel fishing west of 120° W longitude would depend on the size of the vessel and the weather conditions. Typically, during the month of January, strong low pressure systems move into the Southern California Bight from Alaska. These strong weather systems will discourage even larger vessels, such as longline vessels, from leaving port, especially if the fishing conditions offshore are marginal. U.S. vessels are not permitted to fish or land fish in Mexico.

Based on landing receipt information, NMFS has estimated that if all the fishing effort that typically occurs south of Point Conception during El Niño events between August 15 through August 31 and January 1 through January 31 did not relocate, the closure south of Point Conception could cause a loss of approximately $438,688 in ex-vessel gross revenue during an El Niño. There have been two El Niños in the last ten years, so the loss indicated would not occur every year. This is a worst case scenario since some of the vessels will decide to fish in areas that are still open to drift gillnet fishing under the RPA. Table 9-3 provides estimates of the average ex-vessel gross revenue and pounds landed, by species, for the time and area closure, using California Department of Fish and Game landing receipt data from 1997-2000.

For purposes of analyzing the impacts of the Proposed Action, the change in gross revenue was estimated by assuming that the vessels that typically fish north of Point Conception during August 15 through 31 will be able to fish outside of 120° W longitude. To the south and, therefore, would not be affected by this closure during the month of August. However, during the month of January, there is uncertainty in how many of these vessels would choose to fish outside because of the adverse offshore weather conditions that typically occur during that time of year offshore. NMFS expects these larger vessels that historically fish off San Diego during January will choose to not fish in January.

The smaller vessels that typically fish off San Diego during August 15 through August 31 during an El Niño at 9-mile and 20-mile banks are not likely to fish beyond 120° W longitude because of the distance from shore and the offshore weather conditions. However, some of the small vessels that home port in Santa Barbara or Los Angeles may choose to fish outside of the 120° W longitude (this longitude intersects California just north of Santa Barbara). The Los Angeles boats could move up the coast and work out of Santa Barbara for convenience and may choose to target thresher shark inside the Santa Barbara Channel. Therefore, the reduction in ex-vessel gross revenues may be lower than projected. In the month of January, however, these vessels are not as likely to fish in this area because historically swordfish catch tends to be greater in the warmer water off the coast of San Diego. Therefore, not much fishing effort is expected to occur south of Point Conception beyond 120° W longitude by these smaller vessels.

In addition to the reduction in swordfish revenue caused by the inability of vessels to fish inside 120° W longitude, there are additional operating costs for vessels that choose to fish on the outside, because of the increased distances.

The DGN swordfish fishery occurs off Oregon mostly from September through December. Waters off Washington have been closed since 1989 to Washington licensed fishers. The time/area closures off Oregon have affected Oregon fishers since 1995. Since a federal closure would apply to all harvesters, California fishers would also be affected by this option. However, the fishing effort inside the potential closed areas is a small portion of the DGN fishery. California and Oregon DGN logbook data from 1995-2000 shows a total of 89 of the 194 sets of gillnet gear off Oregon east of 125° 30' W longitude. An analysis of the drift gillnet logbook data indicates that there have been 47 drift gillnet sets north of the OR/WA border since 1990 (less than 0.001%), and there were six years without any sets occurring north of the OR/WA border since 1990. Therefore, impact to drift gillnet fishers is expected to be minimal, as an average of 15 sets of gear per year off Oregon and 1.4 sets off Washington inside the proposed closed area is small in comparison to 2,000-3,000 sets per year for the fishery as a whole.

Effects on National Net Economic Values - Driftnet Alternative 2 (Proposed)

Net national benefits would increase with an increase in existence value, producer surplus and consumer surplus. While the economic values of fish catches and landings will likely decline, non-consumptive benefits (existence value) will increase as a result of the closures due to a reduction in swordfish and possibly shark landings, as well as from potential reductions in marine mammal and sea turtle mortalities. But not all species would gain. There would likely be increases in the bycatch of other species, but comparing the gains in a reduced bycatch of blue shark with the increased catches of other species is not possible without comprehensive measures of willingness to pay by consumers. However, non-consumptive benefits could be transitory to the extent that swordfish, sharks, marine mammals and sea turtles move outside the closed areas and are taken elsewhere. Consumer surplus from reduced consumption of locally caught swordfish is unlikely to substantially change since there are readily available alternative supplies of imported swordfish and prices are expected to remain fundamentally stable as a consequence.

Impacts on Small Entities - Driftnet Alternative 2 (Proposed)

The closures may have a disproportionate impact on smaller vessels, those unable to fish outside the closed areas. Smaller vessels may shift from drift gillnet fishing to alternative fisheries such as surface hook-and-line albacore. Increased albacore effort could result in greater albacore landings and exvessel revenues. However, if an increase in landings depresses albacore exvessel price, the shift in effort could diminish profits at the vessel level assuming there is no offsetting decrease in costs. The closures could also result in a restructuring of the fleet, smaller vessels being replaced with larger vessels capable of operations further offshore. If so, there could be new investment in the fishery. However, new investment is not likely. The fishery is too depressed for new investment and is most likely to consist of larger vessels remaining in the fishery while looking for additional fishing opportunities and reduced fishing by the smaller vessels. The net change in harvesting capacity is difficult to predict.

Fishing/User Conflicts - Driftnet Alternative 2 (Proposed)

Any existing gear conflicts and other competitive and social interactions between the drift gillnet fishery and other commercial and recreational fishing activities in the areas designated for closure would be reduced. However, shifting fishing effort to other open areas or to alternative fisheries (e.g. surface hook-and-line albacore) could create or exacerbate interactions elsewhere. Increasing the number of drift gillnet vessels fishing south of the line extending from Point Sur is expected to potentially increase slightly the direct competition for setting gear on desirable oceanographic conditions (water temperature breaks) and possibly for the available swordfish stocks. This direct competition may cause a slight decrease in the observed catch rate since there would likely be more fishing vessels in the area. Under this alternative, allowing the vessels to fish north of Point Conception and south of the line should eliminate the concern expressed by various recreational fishery organizations about the potential increase in the number of commercial drift gillnet vessels operating in ocean waters south of Point Conception and the potential increase in striped marlin bycatch.

In the WA/OR area, user conflicts in the proposed closed area have not been documented. Any existing conflicts would be minimized in the closed areas.

Management Costs - Driftnet Alternative 2 (Proposed)

This alternative may result in some increases in management costs in terms of enforcement. However, there could be a possible cost saving from reduced observer trips resulting from a smaller or more inactive fleet. New enforcement technologies (e.g., VMS) could reduce management costs in the long run.

Concerning the WA/OR closures, this option is not expected to have any significant impacts on management costs or administration. There will be slight administrative costs in drafting federal regulations to implement these closures on a federal level.

Impact on Essential Fish Habitat - Driftnet Alternative 2 (Proposed)

The Washington closure would provide additional protection of adult thresher shark EFH habitat.

Safety of Life at Sea and Weather Conditions - Driftnet Alternative 2 (Proposed):

Safety of life at sea could be compromised if, as a result of the proposed area closures, vessels take greater risks. However, under this alternative, drift gillnet fishing vessels are less likely to fish in potentially more adverse weather conditions because there are more opportunities to fish productive areas off California than are contained in any of the alternatives.

Oregon/Washington closures are not expected to affect safety at sea.

Consistency with FMP Objectives - Driftnet Alternative 2 (Proposed)

This alternative is consistent with the HMS FMP management objectives. It addresses management objectives by carrying over existing season and area closures and thus preventing possible overfishing of shark stocks; maintaining the productive capacity of inshore habitat areas; and ensuring fisheries are in compliance with state and federal laws designed to protect protected species.

Consistency with International Conventions - Driftnet Alternative 2 (Proposed)

This alternative is consistent with existing international conventions.

Analysis Driftnet Alternative 3: This alternative would incorporate only existing federal regulations into the FMP under the Magnuson-Stevens Act authority, and federal regulations would be issued under that authority. Existing states' regulations would remain in effect under the states' authorities without change. The impacts of this alternative are virtually the same as Alternative 1 (Status Quo), as the fishery would be subject to essentially the same regulations.

Analysis Driftnet Alternative 4: This alternative is the same as Alternative 8, incorporating in the FMP all federal and conservation and management measures in place under the MMPA and ESA, as well as all state regulations, but additionally, it *federalizes the limited entry program*. Persons holding California drift gillnet permits would be permitted to obtain federal limited entry permits to participate in the drift gillnet fishery under the FMP regulations. This would have the effect of ensuring that there would be no additional entry to the fishery. If the states' limited entry program were federalized, there would be little if any environmental changes, but federal management costs would increase and states' costs decrease, as costs for administering and implementing the program would shift from state to federal authority. However, the Pacific Council has concluded that it is premature to propose any specific federal limited entry programs at this time, and this alternative was not addressed any further, but may be revisited in the future. This Alternative does not modify any existing Oregon area closures, so therefore all driftnetters fishing off Oregon would be under the requirement to fish beyond 75 nm from May 1-August 14, and outside the 1000 fm curve the rest of the year, and HMS DGN fishing would be prohibited in EEZ waters off WA. WA and OR state laws would continue to require a landing ratio of two swordfish to one thresher shark.

Analysis Driftnet Alternative 5: This alternative differs from Alternative 8, only in the definition and scope of sea turtle time and areas closures. It would implement the time/area closures originally recommended by the Biological Opinion on the issuance of the 101(a) (5) (E) permit under the MMPA to authorize the incidental take of marine mammals listed under the ESA. It would close an area to drift gillnets from Point Conception, California (34° 27' N latitude) north to 45° N latitude, and west to 129° W longitude from August 15 to October 31, and close an area to drift gillnets south of Point Conception, California (34° 27' N latitude) and west to 120° W longitude from August 15 to August 31 and again from January 1 through January 31 during a forecasted or occurring El Niño event. Continuing the closures beyond three years or changing the closures, would depend on a review of the incidental take permit issued under the authority of the Endangered Species Act.

Effects of this alternative were determined by assuming that all of the fishing effort made north of 34°27'N latitude during the closure would shift south of Point Conception during August 15 - October 31. Fish catch rates north of 34° 27' N latitude were compared to those south of this area during the months of August, September, and October, for the years 1990 through 2000 (NMFS, SWR, Long Beach, CA, J. Morgan, unpublished data). NMFS has observed 1,859 sets north of this latitude and 825 sets south of this latitude during these months.

The observed swordfish catch rate north of 34° 27' N latitude during August through October is 2.95 fish per set. South of 34° 27' N latitude, the catch rate is 0.99 fish per set. Therefore, fewer swordfish would be caught by the drift gillnet fishery during the closed months.

Striped marlin catch rates are higher in the south (0.14) than to the north (0.01 fish per set). Blue marlin catch is 0.02 fish per set in the south, and <0.01 fish per set in the north (one blue marlin in 1,859 sets). Therefore, closing the fishery north of Point Conception from August 15 through October 31would be expected to increase the catch of billfish, if it results in diverting and concentrating effort south of Point Conception where billfish concentrate. The full impact cannot be determined because it is not known how many fishers will move south, switch to other gears, or simply discontinue fishing.

Blue sharks are caught at a rate of 5.31 fish per set north of Point Conception and 2.7 fish per set south of Point Conception during the proposed closed months. Blue shark catch would likely decrease under this alternative.

Drift gillnet vessels catch common thresher shark at a higher rate in the south (0.9 fish per set) than in the north (0.51 fish per set). Redistribution of fishing effort to south of 34° 27' N latitude during August, September, and October is expected to increase common thresher shark catches by the fishery during those months. The catch of bigeye thresher shark may also increase, as the catch rate in the south (0.16 fish per set) is higher than that to the north (0.08 fish per set), although observed bigeye thresher shark catch has been lower than average in the past several years (9-15 sharks per year with approximately 20% observer coverage).

Drift gillnet catch rates for shortfin mako shark are 0.46 fish per set north of Point Conception and 1.97 fish per set south. Therefore, this alternative is expected to produce higher shortfin mako shark catches during the closed months as fishing effort is shifted to south of Point Conception.

A summary of the above information is included in Table 9-4.

While the above describes the effects expected from closing the northern portion under this alternative, it would also lead to a reduction of fishing effort days south of Point Conception during El Niño years. Vessels that usually begin fishing south of Point Conception on August 15 will have the alternative of fishing west of 120°W longitude or delaying fishing operations until after August 31. Some drift gillnet vessels, especially the San Diego and Los Angeles small boat fleets, are not capable of fishing in the sea conditions encountered west of 120° W longitude. Therefore, the owners of these vessels are expected to wait until after August 31, when fishing east of 120° W longitude can begin. Those vessel owners that are able to fish west of 120° W longitude may find it more economical to wait two more weeks and begin fishing east of 120° W longitude after August 31 rather than pay the additional fuel costs necessary to reach the fishing grounds west. Some effort may shift north of Point Conception during January, but the amount is expected to be minimal because weather conditions north of Point Conception preclude most drift gillnet fishing during this month.

Effects on Green Turtles - Driftnet Alternative 5

Only one green turtle has been observed in the drift gillnet fishery, which occurred in 1999. This animal was taken in the month of November and was released dead. The entanglement, which occurred south of Point Conception, is considered a rare event (one turtle in 6,025 observed sets). NMFS does not expect an increase in the number of vessels that typically fish in the area where the green turtle was taken because vessels are able to choose whether to fish north of Point Conception or south of Point Conception during the month of November. NMFS believes that the observed take of the green turtle was likely the result of a rare overlap between the drift gillnet fishery and the oceanographic conditions occurring during the time period of the entanglement.

The time and area closure south of Point Conception is not expected to increase the likelihood of an interaction with a green turtle because the closure does not include the month of November.

Effects on Leatherback Turtles - Driftnet Alternative 5

There have been significant encounters with leatherback turtles, and the time and area closure north of Point Conception was developed to minimize the likelihood of leatherback takes. Since NMFS began observing the fishery, there have been 23 observed entanglements, of which 91% have been taken north of Point Conception. Two turtles have been observed taken south of Point Conception, but the most substantial increase in entanglement rates occurs north of 36° 30' N latitude. Based on the observer data, leatherback entanglement rates clearly change as a function of latitude.

This entanglement rate increase north of 36° 30' N latitude appears to correspond to the number of leatherback turtles in the area. Leatherback turtles are known to aggregate in the Monterey Bay area with the highest density of sightings on the U.S. West Coast in August (Starbird, *et al.* 1993). In this area, north of Point Conception, a major upwelling begins in the spring, when the inverted bottom water is often 3° to 5° C colder than the sun-warmed surface water it replaces. By summertime, seawater temperatures are relatively cold compared to other areas in the same latitude, and coastal upwelling generates high productivity, attracting species such as the leatherback, which can tolerate and may favor the highly productive cool coastal waters. Leatherbacks caught in the drift gillnet fishery off central and northern California most probably originated from offshore 13-15° C isotherm waters pushed in-shore in the late summer (Stinson, 1984, *in* Eckert, 1993). All of the observed leatherback takes occurred from September to January, with approximately 60% of the captures occurring in October. The leatherbacks were found in waters with an average monthly sea surface temperature of between 10 to 17.5° C. The majority of the animals were found in areas of coastal upwelling and some were found on distinct temperature breaks. Only five of the turtles were measured, all between 132 to 160 cm, which are sub-adults and adults. The rest were most likely too large to be brought on board and measured; therefore, they were probably adults.

Samples from two of the 23 leatherbacks taken in the drift gillnet fishery were genetically analyzed and found to be representative of nesting turtles from western Pacific beaches (i.e. Malaysia, Indonesia, Solomon Islands). Similarly, all samples taken from stranded leatherbacks on the California coast have indicated origin from western Pacific nesting beaches (Dutton, et al., *in press*, and pers. commun. NMFS/SWFSC La Jolla, CA March, 2000). Moreover, two leatherbacks tagged off Monterey, California in early September 2000 may have been heading toward western Pacific nesting beaches.

This alternative would be expected to reduce the likelihood of the drift gillnet fishery causing a serious injury or mortality to leatherback turtles. This is based on data that indicate 78% of the leatherbacks observed taken in the past occurred in the area and during the time of the closure. Based on the information in the biological opinion, NMFS expects that the likelihood of the drift gillnet fishery taking a leatherback is significantly reduced to where the continued operation of the fishery will not jeopardize the continued existence of the species. This time and area closure is expected to provide protection to leatherbacks that aggregate in Monterey Bay during the summer and then depart in early fall to possibly migrate to western Pacific nesting beaches.

The time and area closure south of Point Conception during August 15 through 31 and January 1 through 31 during El Niño events is not expected to increase the likelihood of a leatherback interaction because there have been no observed leatherbacks taken during this time period south of Point Conception. The two turtles that have occurred south of Point Conception occurred in December 1999, during an unusual oceanographic upwelling event near Santa Catalina Island, and the other occurred in January, more than 200 nm miles from shore at 34° 18.9' N latitude, 121° 47' W longitude, which is almost 8 nm south of the closure line. Therefore, the implementation of the measure to close fishing operations south of Point Conception out to the 120° W longitude will not increase the likelihood of an interaction.

Effects on Loggerhead Turtles - Driftnet Alternative 5:

Loggerhead sea turtles have been taken by the drift gillnet fishery only south of Point Conception during El Niño events. Therefore, closing the ocean waters north of Point Conception (for leatherback turtle protection) is not likely to have an effect on loggerhead sea turtle interactions.

The measure to close the fishery south of Point Conception out to 120° W longitude was developed to avoid the likelihood of the drift gillnet fishery jeopardizing the continued existence of the loggerhead sea turtle populations. The drift gillnet fishery is not anticipated to take any loggerheads during non-El Niño years because loggerheads have not been observed taken in non-El Niño years (based on observer data from 1990-2000). The observed incidental take of loggerhead turtles by the drift gillnet fishery is infrequent, although they were the second most common sea turtle species caught since the fishery has been observed by NMFS. This may be due in part because loggerheads are rarely seen in the eastern Pacific north of Baja California, Mexico. Loggerhead occurrence in the drift gillnet fishery is probably associated with the northward extension of Transition Zone waters along the North American coast during El Niño events. The large aggregations of juveniles off Baja California have been observed foraging on dense concentrations of the pelagic red crab, *Pleuroncodes planipes* (Pitman, 1990).

Three unidentified turtles were observed taken in 1993 off southern California, all on the same trip, but in different sets. Only one of these sea turtles was measured, and was 43 cm in length, the average length of measured loggerheads captured incidentally in the fishery during 1990-2001. This turtle was most likely a loggerhead. In addition, all three turtles were caught in the same concentrated area that all loggerheads in the past 11 years have been caught by this fishery. They were also caught during an El Niño, which is the only time that loggerheads have been caught in this fishery since July 1990, when the fishery was first observed by NMFS. Assuming these three unidentified turtles were loggerhead turtles, there have been a total of 17 loggerhead turtles observed during the past 11 years. Four of these events took place during the month of July, three of which occurred when the fishery was allowed to fish inside 75 nm during this time period. Another turtle was observed taken during the month of June. However, because the fishery is now closed inside 75 nm until August 15 under state law, and there is minimal fishing effort during the months of June, July, and the first part of August, there are not expected to be many loggerhead turtles taken outside of the August and January closure. The closure south of Point Conception in August and January is expected to reduce the incidental mortality and serious injury to a level that will avoid the likelihood of jeopardizing the continued existence of the loggerhead sea turtle populations.

Effects on Olive Ridley Turtles - Driftnet Alternative 5

Olive ridley sea turtles are rarely caught in the drift gillnet fishery, although the olive ridley is widely regarded as the most abundant sea turtle in the world. The olive ridley prefers tropical and warm temperate waters. Of all sea turtle strandings in California from 1990-99, the olive ridley was the sea turtle most rarely found (J. Cordaro, NMFS, SWR, Long Beach, CA, pers. commun. May, 2000). The first olive ridley turtle observed taken by the drift gillnet fishery occurred in November 1999, south of Point Conception. The animal was released alive with no injuries. This entanglement is considered rare (one turtle in 6,025 observed sets), and the likelihood of such an event is not expected to increase with this alternative.

Compared to other sea turtles, olive ridleys are the second deepest divers, after leatherbacks, and have been found captured in bottom trawls 80 to 110 m deep (Plotkin, 1994 *in* Lutcavage and Lutz, 1997), and at 300 m deep, feeding on crabs (Landis, 1965 in NMFS and USFWS, 1998). Utilizing a wide range of foraging habitats, they are known to feed in deep water, pelagic habitats and in relatively shallow benthic waters, on a variety of crabs, jellyfish, tunicates, etc. They are also known to associate with flotsam, perhaps feeding on associated fish and invertebrates (Pitman, 1992 *in* NMFS and USFWS, 1998). With such a wide variety of foraging and behavioral habits, evaluating whether there is a specific cause for the interaction to occur is difficult. Therefore, the observed take of the olive ridley was likely the result of unusual oceanographic conditions and a rare co-occurrence with the fishery and will not be affected by the implementation of this alternative.

Restricting fishing south of Point Conception during August 15 through 31 and January 1 through 31 is not expected to affect the likelihood of an interaction with a olive ridley sea turtle. Since the time and area closure does not include the month of the observed olive ridley take, and the take did not occur during an El Niño event, a change in the take rate is not expected. With only one interaction in 6,025 sets, interaction is a rare event.

Effects on Marine Mammals - Driftnet Alternative 5

This alternative would be expected to result in a reduction in the number of marine mammal interactions. According to observer data (July 1990 through December 2000), the cetacean entanglement rates south of Point Conception have been lower than the entanglement rates north of Point Conception during those months that the northern area will be closed. The entanglement rate south of Point Conception during the months of the closure is 0.038 (30 sets with entanglements and 758 sets without an entanglement), and the cetacean entanglement rate north of Point Conception during the months of the closure is 0.083 (156 sets with entanglements and 1,708 sets without an entanglement). Since the implementation of the take reduction plan, the cetacean entanglement rate south of Point Conception during the months of the closure is 0.007 (two sets with entanglements and 284 sets without an entanglement), and the cetacean entanglement rate north of Point Conception during the months of the closure under this alternative is 0.032 (13 sets with entanglements and 395 sets without an entanglement). If all fishing effort shifted south of Point Conception, a reduction in marine mammal entanglements would be expected.

There may also be a reduction in drift gillnet fishing effort because vessels trolling for albacore may continue targeting albacore into the month of October until drift gillnets can be set to target swordfish in November. Some participants may choose not to fish until sets can be made north of Point Conception.

There have been eight observed sperm whale interactions since the inception of the observer program in July 1990 through January 31, 2001. During this time period, seven of the eight sperm whale entanglements occurred outside of the time closure (November and December). There has been only one sperm whale observed taken inside the closed time and area closure and that was during an El Niño event in 1993. Therefore, to closing the fishery north of Point Conception from August 15 through October 31 may slightly decrease the likelihood of an interaction with a sperm whale.

There have been only two humpback whales observed taken by the fishery and both of these interactions occurred outside of the time and area closure (south of Point Conception during the months of August and November). Both of these observed takes were released alive without injury. In 1999, NMFS observed the first fin whale interaction with the drift gillnet fishery in more than 6,000 sets. This also occurred south of Point Conception and during the month of November. Therefore, implementation of the closure north of Point Conception is not expected to increase or decrease the likelihood of interactions with humpback whales or fin whales.

NMFS has observed only two Steller sea lions entangled. One of these animals was observed south of Point Conception during the month of June and the other occurred during the month of September north of Point Conception in ocean waters included in the time and area closure. Therefore, implementation of the closure north of Point Conception from August 15 through October 31 may decrease the likelihood of an interaction with Steller sea lions, recognizing that the chances of an interaction are less than one in 3,000 sets.

NMFS has observed 39 northern right-whale dolphins taken in 1,859 sets north of Point Conception during the proposed closed period, for a catch rate of 0.021 animals per set. South of Point Conception, the catch rate is 0.0 animals per set (zero animals in 825 observed sets). This alternative would be expected to decrease the likelihood of an interaction with northern right-whale dolphins if fishing effort north of Point Conception shifts to south of Point Conception during the closure.

Short-finned pilot whales are taken at a rate of 0.006 animals per set (11 animals in 1,859 observed sets) north of Point Conception during the closed period. There has not been a short-finned pilot whale observed taken south of Point Conception during the closed period (zero animals in 825 sets). This alternative would be expected to decrease the likelihood of an interaction with short-finned pilot whales if fishing effort that was previously made north of Point Conception shifts to south of Point Conception during the closure.

As stated above in the north of Point Conception closure, observer data (July 1990 through December 2000), indicate that the cetacean entanglement rates south of Point Conception are lower than the entanglement rates north of Point Conception during those months that the northern area would be closed. During the months of the southern closure during El Niño events, the entanglement rate is approximately 0.029 cetaceans per set (eight sets with entanglements and 263 sets without an entanglement).

During the August closure, implementation of the southern closure is expected to cause a reduction in the number of marine mammals taken because there will be a reduction in the number of sets made by the fishery. The south of Point Conception closure in combination with the north of Point Conception closure will effectively eliminate fishing effort from August 15 to August 31, which is likely to cause a reduction in the number of cetacean entanglements. There have not been observed entanglements of the listed sperm whale, fin whale, or Steller sea lion south of Point Conception during the month of August or January; therefore, implementation of the closure south of Point Conception during an El Niño event is not expected to affect the take of these species. There may be a slight reduction in the likelihood of taking a humpback whale because there was one humpback whale observed taken and released alive south of Point Conception in August 1994.

There has been one northern right-whale dolphin observed entangled south of Point Conception during the closed period. If fishing effort historically made during this period is eliminated, NMFS expects the southern closure in August and January during El Niño years may slightly decrease the likelihood of entangling northern right-whale dolphins

No short-finned pilot whales have been observed taken south of Point Conception during the closed period, so the southern closure from August 15 through August 31, and January 1 through January 31 is expected to have no effect on the take of this species.

Other marine mammals are encountered by the drift gillnet fishery, but all interactions have been a small percentage of what is defined in the Marine Mammal Act as the potential biological removal level, which is based on the status of the individual populations.

Effects on Seabirds -Driftnet Alternative 5

The closure north of Point Conception would be expected to slightly reduce the likelihood of Northern Fulmars being taken incidental to the drift gillnet fishery. In 2000, NMFS observed for the first time Northern Fulmars entangled while pecking at the net webbing during net retrieval in waters north of Point Conception. From August 15 through October 31, there were four Northern Fulmars observed caught in the gear. One of these was released alive, two were released dead and one was released injured. NMFS has not observed this type of behavior during previous years. The entanglement rate for Northern Fulmars north of Point Conception during the time period of the closure (August 15 through October 31) is 0.002 Northern Fulmars per set (four Northern Fulmars in 1,859 observed sets). If all the fishing effort that has occurred north of Point Conception moves south to ocean waters south of Point Conception, the likelihood of an interaction with Northern Fulmars would be reduced.

In addition to the Northern Fulmars, there have been four unidentified birds recorded by onboard observers. Two of these occurred in the closed area north of Point Conception, giving an entanglement rate of 0.001 unidentified birds per set (2 unidentified bird in 1,859 observed sets), and none occurred south of 34°27'N latitude during this time period. Based on this information, an interaction with an unidentified seabird if the fishing effort is shifted to south of Point Conception is not expected. Possible increased concentration of fishing effort in more southerly waters may increase encounter frequency with certain seabirds, such as Xantus' Murrelets *(Synthliboramphus hypoleucus)*, but the agility and small size of these seabirds, and the large mesh size of the gear, is not thought to present a risk. Additionally, the Endangered Brown Pelican generally occurs in waters inshore of DGN fishing areas. The Endangered Short-tailed Albatross (*Phoebustrius albatrus*) has been reported as occurring very rarely in the area, while the Black-footed (*P. nigripes*) and Laysan *(P. immutabilis)* albatrosses are more common (especially the former), but no albatross of any species has ever been recorded as taken by NMFS observers in the drift net fishery.

Other listed bird species that occur in the U.S. West Coast EEZ in the general area include the Threatened Marbled Murrelet (*Brachyramphus marmoratus marmoratus*), Endangered California Least Tern (*Sterna antillarium (=albifrons) browni*), Threatened Snowy Plover (*Charadrius alexandrinus nivosus*) and Endangered Brown Pelican (*Pelecanus occidentalis*). These species do not range offshore into the swordfish/shark drift gillnet fishing area, and thus are not considered at risk.

The vessels that typically fish south of Point Conception in August are not expected to venture north of Point Conception because the vessels are not equipped to handle the heavy northwesterly gales that are encountered off Point Conception or the change of climatic and meteorological conditions. In January, vessels fish in southern California because there are no longer sufficient oceanic water temperature breaks north of Point Conception that provide suitable fishing conditions for catching swordfish, and the weather conditions are usually poor. NMFS does not expect vessels to fish north of Point Conception during the month of January. Therefore, the closure south of Point Conception is not expected to increase or decrease the likelihood of an interaction with seabirds.

Effects on Socio-Economic Impacts -Driftnet Alternative 5:

Based on landing receipt information, if all the fishing effort that typically occurs north of Point Conception between August 15 through October 31 did not relocate, the north of Point Conception closure could cause a loss of $712,000 annually in ex-vessel gross revenue. This is a worst case scenario because many of the vessels will decide to fish in areas that are still open to drift gillnet fishing. Table 9-5 provides estimates of the average ex-vessel gross revenue and pounds landed, by species, generated during the time and area closure (August 15 through October 31), using the past four years of landing receipt data from 1997-2000 (CDFG unpublished data).

For purposes of analyzing the range of impacts of the different alternatives, it is also possible to analyze the change in gross revenues by assuming that all of the fishing effort that historically occurred north of Point Conception will shift south of Point Conception. However, if the catch rates remained profitable, many of the vessels that typically troll for albacore could extend their albacore fishing season later into the year (September/October) to avoid having drift gillnet fishing south of Point Conception. Other vessels may choose not to fish during the closed months. If all vessels were to fish south of Point Conception, a reduction in overall fishing revenues would be expected because the catch rates for many of the target species are lower south of Point Conception.

Based on the landing receipt data, swordfish accounts for 90% of the ex-vessel gross revenues during this time period. For purposes of determining the impacts of this alternative, swordfish is used as an indicator. The catch rate for swordfish for this time period north of Point Conception is 2.945 fish per set compared to 0.999 south of Point Conception. Therefore, vessels that normally fish north of Point Conception during this time period would experience a reduction in the catch of swordfish. However, this estimate is based on the swordfish catch rates remaining constant even with an increase in the number of vessels fishing south of Point Conception. There is the possibility that the catch rate will decrease because of the increase in fishing effort in the Southern California Bight. Assuming that the catch rate south of Point Conception remains the same, the ex-vessel gross revenues for swordfish for the vessels that normally fish north of Point Conception will be approximately $215,000, which would be a 66% reduction in ex-vessel gross revenue for fishing vessels that historically fish north of Point Conception during this time period. If the fleet chose to target thresher shark in addition to swordfish south of Point Conception, the total gross revenue loss could be slightly less because the catch rate for thresher shark is higher south of Point Conception, although the price per pound is lower than for swordfish.

In addition to the reduction in swordfish gross revenue caused by the decrease in the swordfish catch rate south of Point Conception, there could be additional operating costs for vessels that historically fish north of Point Conception during this time period. Many of the vessel owners who fish north of Point Conception live in coastal communities near where they home port their vessel. These vessel operators may incur additional fuel costs to travel to and from their home port to the open ocean waters south of Point Conception. This cost would vary depending on the distance vessels would need to travel. In addition, there may be higher operating costs for these vessels when fishing south of Point Conception because there are more fair weather days to fish. Typically, weather conditions north of Point Conception may prevent vessels from leaving port for several days at a time. South of Point Conception, these vessels are more likely to be able to fish more days since there are more fair weather days. Conversely, because vessels have the potential to fish more days south of Point Conception, the lower catch rate and reduction in ex-vessel gross revenues may be offset by the increase in the number of fishing days compared to north of Point Conception.

Increasing the number of drift gillnet vessels fishing south of Point Conception would be likely to cause an increase in direct competition for areas of desirable oceanographic conditions (water temperature breaks) and for the fishery resources associated with these conditions. This could cause a decrease in the observed catch rate because there would likely be more fishing vessels in the area. NMFS and the State of California also have received letters and telephone calls from various recreational fishery organizations expressing concern about increasing the number of commercial drift gillnet vessels operating in ocean waters south of Point Conception because of the potential increase of striped marlin bycatch. Although the larger drift gillnet vessels that typically fish north of Point Conception are more likely to fish farther offshore and in areas that recreational vessels do not normally fish, the concern is that these vessels will intercept the striped marlin as they move inshore. There also could be concern about an increased harvest of shortfin mako shark, which supports a recreational fishery.

Another indirect effect of restricting fishing activity by drift gillnet vessels to south of Point Conception from August 15 through October 31 would be that the vessels that typically fish north of Point Conception may choose to fish in more adverse weather conditions because they may try to fish near the closed area at Point Conception. This area marks an abrupt change in climatic and meteorological conditions and is often subjected to heavy northwesterly gales and strong offshore gusts. Vessels fishing in this area must fish farther offshore in open water conditions in which there is not a port nearby to seek shelter if weather conditions should change quickly.

Looking only at restricting vessels from fishing inside 120° W longitude south of Point Conception during an El Niño event, the likelihood of a vessel fishing west of that longitude would depend on the size of the vessel and the weather conditions. Vessels are not likely to fish south of Point Conception and then travel north to Morro Bay to land fish. This situation is caused by the prevailing northwesterly winds, large swells, and choppy conditions persisting at Point Conception, which discourage and inhibit vessels from routinely traveling north around the point. In August, larger vessels could fish outside 120° W longitude south of Point Conception and then travel north to land fish at Morro Bay. But even these vessels would be discouraged from leaving port, especially if the fishing conditions offshore are marginal, and during January when weather deteriorates. U.S. vessels are not permitted to fish or land fish in Mexico.

Based on landing receipt information, NMFS has estimated that if all the fishing effort that typically occurs south of Point Conception during El Niño events between August 15 through August 31 and January 1 through January 31 did not relocate, the closure south of Point Conception could cause a loss of approximately $438,688 in ex-vessel gross revenue during an El Niño. There have been two El Niños in the last ten years, so the loss indicated would not occur every year. This is a worst case scenario since some of the vessels will decide to fish in areas that are still open to drift gillnet fishing. Table 9-6 provides estimates of the average ex-vessel gross revenue and pounds landed, by species, for the time and area closure, using California Department of Fish and Game landing receipt data from 1997-2000.

In addition to the reduction in swordfish revenue caused by vessels being prohibited from fishing inside 120° W longitude, there may be additional operating costs for vessels that choose to fish outside of the closed area during this time period because of the increased distance the vessels would need to travel.

Analysis Driftnet Alternative 6: Under this alternative, DGNs could not be used to take swordfish and sharks in any EEZ waters less than 1,000 fm from the Oregon-California border to the U.S.-Canadian border, year round (off <u>both</u> Oregon and Washington). The State of Washington currently does not allow the use of drift gillnet gear and Oregon does not allow drift gillnets to specifically target thresher shark. Oregon has had seasonal inshore closures for Oregon licensed drift gillnet fishers since 1995. Waters within 75 miles of the shoreline are closed from May 1 through August 14 and waters less than 1000 fm are closed year-round. The closure from May through mid August is intended to discourage targeting on thresher sharks which are found off Oregon earlier in the year than swordfish.

In 1986-1988 an experimental gillnet fishery targeting thresher sharks was conducted off Oregon and Washington (primarily north of 45° N latitude). During the three year fishery, landings began in early to mid July and peaked in late July or early August. The main fishing effort was concentrated 20-60 nm off Oregon and 50-80 nm off Washington. The fishery was discontinued because of bycatch concerns and incidental takes of sea turtles and marine mammals.

Economic Impacts -Driftnet Alternative 6

The DGN swordfish fishery occurs off Oregon and Washington mostly from September through December. Waters off Washington have been closed since 1989 to Washington licensed fishers. The time/area closures off Oregon have affected Oregon fishers since 1995. Since a federal closure would apply to all harvesters, California fishers would also be affected by this option. However, the fishing effort inside the potential closed areas has been a small portion of total effort for the DGN fishery. California and Oregon DGN logbook data from 1995-2001 shows that of the 1,141 sets of gillnet gear off Oregon and Washington, only 266 occurred in waters less than 1,000 fm. An average of 38 sets of gear per year off Oregon and Washington inside the proposed closed area is small in comparison to 2,000-3,000 sets per year for the fishery coastwide.

While the amounts are difficult to predict, any decrease in landings of swordfish and sharks due to lost fishing opportunities for West Coast DGN vessels under this alternative are expected to be negligible, and will only result in a slight reduction in revenues received by DGN permittees. If there is not at least a proportionate reduction in costs from decreased time spent fishing, or increased landings from shifting DGN fishing effort elsewhere (increased fishing effort on swordfish and thresher sharks outside the 1,000 fm contour, or in the Southern California Bight), then profits will also decrease. Conversely, profits could increase if a reduction in landings leads to an increase in exvessel prices for swordfish and sharks without a commensurate increase in costs. This situation will reduce consumer benefits (consumer surplus), but increase producer benefits (producer surplus). There is also a cost (lost opportunity) to DGN permittees if swordfish and sharks present in the closed areas move elsewhere and are harvested by foreign fishers. Consumer benefits may not be affected if foreign-caught swordfish and shark make up the potential shortfall in the domestic harvest. However, if imports are not of comparable quality to that of "locally-caught" fresh swordfish and shark, consumer benefits would be diminished. Likewise, producer surplus may not be realized if imports negate potential increases in exvessel price due to a shortfall in the domestic harvest.

Non-consumptive benefits (existence value) will increase as a result of the closure due to a reduction in swordfish and possibly shark landings, as well as from expected reductions in marine mammal and sea turtle mortalities. However, non-consumptive benefits could be transitory to the extent that swordfish, sharks, marine mammals and sea turtles move outside the closed areas and are taken elsewhere.

The closure may have a disproportionate impact on smaller vessels, those unable to fish outside the closed areas. Smaller vessels may shift from DGN fishing to alternative fisheries such as surface hook-and-line albacore introducing more competition in those fisheries. The closure could also result in a restructuring of the fleet, smaller vessels being replaced with larger vessels capable of operations further offshore. If so, there could be new investment in the fishery. The net change in harvesting capacity is difficult to predict.

Net national benefits would increase with an increase in existence value, producer surplus and consumer surplus.

Community Impacts - Driftnet Alternative 6

Reduced fishing opportunities off Oregon and Washington could lead to a slight decrease in economic activity, employment and incomes in California ports dependent on DGN landings, particularly those nearest the closed areas. This will be destabilizing to these communities. If smaller vessels are replaced with larger vessels that fish in different areas, there could be a shift in economic activity associated with the DGN fishery to California ports that are more convenient for the operations of larger vessels.

Impacts on Small Entities - Driftnet Alternative 6:

The Oregon closures may have a disproportionate impact on smaller vessels, those unable to fish outside the closed areas. Smaller vessels may shift from drift gillnet fishing to alternative fisheries such as surface hook-and-line albacore creating spillover effects in other fisheries. The closures could also result in a restructuring of the fleet, smaller vessels being replaced with larger vessels capable of operations further offshore. If so, there could be new investment in the fishery. The net change in harvesting capacity is difficult to predict.

Impact on Target or Incidental Fish Species - *Driftnet Alternative 6*

From logbook data, sets in waters less than 1,000 fm off Oregon and Washington accounted for 14% of the swordfish logged (418 in number). The catch rate for swordfish in waters less than 1,000 fm was lower than the catch rate in waters greater than 1,000 fm (1.5 and 2.8 fish per set, respectively). Therefore, if all the effort were to move to waters greater than 1,000 fm, the total catch of swordfish could be higher.

The common thresher shark was overfished in the 1980s and the stock is currently rebuilding (see Chapter 3 for stock assessment). Adopting this option would continue the rebuilding which has been aided by the current state closures. From logbook data for the DGN fishery off Oregon and Washington, the catch rate of thresher shark was much higher in waters less than 1,000 fm (4.1 fish per set) than in waters greater than 1,000 fm (1.1 fish per set). Sets in waters less than 1,000 fm accounted for 51% of the thresher shark logged off Oregon and Washington (1122 in number). Therefore, if all the effort were to move to waters greater than 1,000 fm, the total catch of thresher shark could be lower.

Protected Species Impacts -Driftnet Alternative 6

No incidental take of sea turtles or marine mammals was indicated on the California or Oregon DGN logbook data, which is the best available data set in these more northerly waters where effort is not as intense. However, incidental takes of sea turtles and marine mammals recorded in the experimental thresher shark gillnet fishery in 1986-1988 give an indication of potential takes in the DGN fishery. Off Oregon, three leatherback turtles and 24 marine mammals (dolphins, porpoises, whales, seals, and sea lions) were taken, all in waters less than 1,000 fm. Off Washington, 13 leatherback turtles, and 12 marine mammals (dolphins and porpoises) were taken, all but two turtles and one dolphin were taken in waters less than 1,000 fm. Adopting this option would continue the protection of sea turtles and marine mammals that have resulted from the current state closures.

Management Costs and Administration - Driftnet Alternative 6

This alternative would likely result in increased management costs in terms of enforcement; possible cost savings from reduced observer coverage. New enforcement technologies (e.g. VMS) could reduce management costs in the long run.

Impact on Essential Fish Habitat - Driftnet Alternative 6

EFH would not be affected.

Monitoring and Data Needs - Driftnet Alternative 6

Existing data collection and monitoring programs should be sufficient to monitor and evaluate the fishery. There should not be any change in the quality of the data collected through existing programs.

Consistency with the Western Pacific FMP - Driftnet Alternative 6

This option would not affect consistency with the Western Pacific FMP.

User Conflicts - Driftnet Alternative 6

User conflicts inside the proposed closed area have not been documented. Any existing conflicts would be minimized in the closed areas.

Safety at Sea Issues - Driftnet Alternative 6

Safety at sea is not expected to be affected.

Relation to Objectives of this HMS FMP - Driftnet Alternative 6

This option addresses HMS management objectives by carrying over existing season and area closures and thus preventing possible overfishing of shark stocks; maintaining the productive capacity of inshore habitat areas; and ensuring fisheries are in compliance with state and federal laws designed to protect protected species

Consistency with International Obligations - Driftnet Alternative 6

No international obligations would be affected.

Analysis Driftnet Alternative 7: This option would also continue existing time/area closures in the drift gill net fishery off California, Oregon and Washington, but prohibit all drift gillnet fishing in all EEZ waters north of 45° N latitude. Most effects would be very similar to those of Alternative 6, although this alternative differs in that it would not allow drift gillnet fishing both *inshore and offshore* north of 45° N latitude, where concentrations of large adult thresher sharks have been caught in the past. Large thresher sharks are important to the reproductive capacity of this species. There also are bycatch concerns with regard to salmon, some of which are endangered or threatened. Because waters off Washington have been closed to Washington driftnetters since 1989 and because Oregon has prohibited the targeting of thresher sharks by drift gillnets and has set a landing ratio, there are no expected changes in most management costs, socioeconomic conditions, community impacts, EFH impacts, data requirements, consistency with the Western Pacific HMS FMP, user conflicts, or safety at sea. An analysis of the drift gillnet logbook data indicates that there have been 47 drift gillnet sets north of 45° N latitude since 1990 (less than 0.001%), and there were six years without any sets occurring north of 45° N latitude since 1990. Therefore, impact to drift gillnet fishers is expected to be minimal. There is expected to be decreases in fishing mortality of adult thresher sharks (incidental catch), protected species interactions, and bycatch. There may be administrative costs in drafting federal regulations to implement these closures on a federal level. This option addresses HMS management objectives by carrying over existing season and area closures and thus preventing possible overfishing of shark stocks (Mgt Objective 10); minimizing user conflicts in inshore and offshore areas (Mgt Objective 13); maintaining the productive capacity of inshore habitat areas (Mgt Objective 14) and also ensuring fisheries are in compliance with state and federal laws designed to protect protected species (Mgt Objective 17).

Analysis Driftnet Alternative 8: Impacts of this alternative would be similar to those of the Proposed Alternative 2, although it is more restrictive because existing Oregon area closures would not be modified. As with Alternative 2, state restrictions on swordfish/shark drift gillnets off Washington and Oregon would now apply to all DGN fishers, including those based in California. But unlike Alternative 2, current Oregon closures, *including the spring-summer closure inside 75 nm*, would be federalized. Thus all drift netters would be required to fish beyond 75 nm from shore off Oregon during the May 1 through August 14, and beyond 1000 fm from August 15 through April 30, except when the turtle closure south of 45° N latitude is in effect August 15-November 15. Because the 75 nm distance is as much as 50 nm offshore of the 1000 fm curve in certain places off Oregon, this option represents a more restrictive option than the Proposed Alternative or maintaining the status quo. Thus it offers increased protection for adult thresher sharks off Oregon, especially those concentrated between 125° 30' W longitude and the 1000 fm curve south of 45° N latitude. Threshers have historically been taken in this area, although in less numbers than north of 45° N latitude, where most effort has been reported in the recent past, and also during the 1986-1988 experimental thresher shark drift gillnet fishery.

9.2.5.2 Pelagic Longline Fishery: Actions, Alternatives and Analyses

9.2.5.2.1 Longlining Within the EEZ

EEZ Longline Alternative 1: (No Action): Current state measures would remain in place under states' authorities and there would be no new federal regulations governing longline use in the EEZ.

EEZ Longline Alternative 2 (Proposed): Establishes a general prohibition on use of pelagic longline gear in the EEZ (see also Legal Gear Alternative 3, section 9.2.4.1, with reference to prohibition of longline gear inside the EEZ).

EEZ Longline Alternative 3: Prohibits longlining within the West Coast U.S. EEZ by indefinite moratorium with the potential for re-evaluation by the Council following completion of a bycatch reduction research program with pre-established strict protocols. Must prove negligible impact on protected and bycatch species.

EEZ Longline Alternative 4: Authorizes a limited entry pelagic longline fishery for tunas and swordfish within the EEZ, with effort and area restrictions, to evaluate longline gear as an alternative to drift gillnet gear to reduce bycatch, or bycatch mortality and protected species interactions (limited entry to be addressed in a separate plan amendment).

EEZ Longline Alternative 5: Prohibits longlining within the West Coast U.S. EEZ with the potential for re-evaluation by the Council following completion of a tuna-swordfish-bycatch research experiment carried out under a qualified EFP to determine if longline gear can be fished in ways that produce bycatch rates and protected species mortality levels that are significantly less than by drift gillnets *($\alpha = 0.05$)*.

Analysis of EEZ Longline Alternative 1: (No Action): This alternative would mean that there would be no federal regulations governing longline fishing in the EEZ. At this time, the states have stringent controls on longline fishing such that there is no longline fishing occurring in the EEZ, except that Oregon allows longlining outside 25 miles under the state's developmental fisheries program permit system. Blue shark permits are limited to 10 and swordfish permits are limited to 20, although there are no active permittees at the present time. Since 1995, the number of Oregon blue shark permits issued in a year has ranged from none to six, and the number of swordfish permits issued has ranged from one to nine. See "Baseline conditions" (section 9.1) for an assessment of the likely future for the longline fishery in the absence of an FMP.

Analysis of EEZ Longline Alternative 2 (Proposed): This would establish a general prohibition on use of pelagic longline gear inside the EEZ by U.S. West Coast-based vessels. For an analysis of this alternative, see parts of the Analysis of Legal Gear Alternative 3, section 9.2.4.1, which are summarized below. Pelagic longlining could not take place except under an NMFS and Council-authorized Exempted Fishing Permit

(EFP), and after submission and approval of an EFP plan to the Council, and following established EFP procedures (See Chapter 8 section 8.4.12).

There are not expected to be any impacts associated with this alternative since it essentially represents the status quo. It would eliminate the Oregon longline fishery, authorized outside 25 miles under the state's developmental fisheries program permit system. However, there are no active Oregon permittees at the present time. This alternative would also eliminate the potential opportunity now available to west-coast based commercial fishers for fishing off Oregon and California and landing in Oregon, which is currently not being exercised.

PELAGIC LONGLINING WITHIN THE EEZ)-- Measures Considered:

- Alternative 1: No action
- Alternative 2 (Proposed): Establishes a general prohibition on longlining in the EEZ.
- Alternative 3: Prohibits longlining within EEZ with potential for re-evaluation by Council following completion of bycatch reduction research program with pre-established strict protocols. Research to be carried out under qualified exempted fishing permit (EFP) only to those who meet protocol criteria. Must prove negligible impact on protected and bycatch species.
- Alternative 4: Authorizes limited pelagic longline fishery for tunas/swordfish (with effort and area restrictions) to evaluate longline gear as lower bycatch alternative for existing limited entry driftnet gear fishers.
- Alternative 5: Like 2, prohibits longlining with potential for re-evaluation by Council following completion of bycatch EFP experiment to see if gear can be fished safely. Must prove gear produces significantly less bycatch/protected species mortality than by driftnet. Aim is to investigate a bycatch-safe gear/effort replacement strategy for driftnet permittees only.

Analysis of EEZ Longline Alternative 3: This Ocean Wildlife Campaign proposal would impose an indefinite moratorium on pelagic longlining within the West Coast U.S. EEZ with the potential for re-evaluation by the Council following completion of a bycatch reduction research program carried out under a qualified exempted fishing permit. The fishing method must show negligible impacts on all bycatch species. The term 'negligible impact' is not specifically defined. The intent would be to: 1) explicitly prohibit the use of pelagic longlines within the West Coast US EEZ until a bycatch reduction research program is completed and a determination made as to whether or not longline gear should be allowed as a legal gear within the EEZ in the West Coast - based HMS FMP; and 2) to establish a bycatch reduction research program with clearly defined goals and objectives that will guide the exempted fishing permit (EFP) evaluation process. The research priorities and evaluation criteria should be developed through a transparent process involving all interested stakeholders (NMFS, Plan Team, SSC, conservation community, and recreational and commercial fishers) and include publication in the *Federal Register*. Following completion of the research program protocol, NMFS would only permit requests meeting all protocol criteria.

Specifically, the research program would test the effectiveness of various methods to reduce bycatch and bycatch mortality of fish and protected species through changes in gear design (i.e., bait type, gangion length and material, and hook type) and deployment practices (i.e., depths, areas, times of operation, and length of sets/soak times). The program would have a protocol with clearly defined bycatch reduction goals and a timetable for conducting the program and reporting results to the Council. The research program would also include, at a minimum, (a) 100% observer coverage, (b) the number or participating vessels (expected to be very small), (c) definitions of "target catch" and "bycatch" (e.g., juveniles of the target species, non-target species, prohibited, and protected species) upon which the selectivity of the longlines are to be evaluated, and (d) regular reporting of bycatch rates, so that the study can be terminated should bycatch rates during the research program be unacceptably high.

EEZ LONGLINE ALTERNATIVES: A COMPARISON

GENERAL COMPARISON OF ALL WITHIN-EEZ LONGLINE ALTERNATIVES:	Alt #2 (General Prohibition)	Alt #3	Alt #4	Alt #5	Alt #1 "No Action" Alternative
1. General Pelagic Longlining Would be Allowed Within the EEZ with Open Eligibility	(No option of this type was proposed)				
2. Area-Restricted Pelagic Longlining Would be Allowed in the EEZ as Gear-Switch Option for DGN Permittees			X		
3. Prohibits Longlining in EEZ	X	X		X	
4. NMFS-approved Scientific Research Longlining Still Possible	X	X	X	X	X
5. Fishing Under NMFS Exempted Fishing Permit (EFP) Still Possible	X	X	X	X	X
6. EFP Fishing Possible but with Council and NMFS -specified EFP Restrictions, Such as:	X	X	X	X	X
6a. —EFP Experiment Must First Prove "Negligible Impact" on Bycatch & Protected Spp. before Fishing; not Linked to Driftnet Replacement Fishery. Provides Maximum Protection for Bycatch, Protected, Incidental and Target Species.		X			
6b. —EFP Experiment Must Prove "Significantly Lower than DGN" Bycatch/Protected Spp. Levels (α= .05); Linked to a Potential Replacement Gear Fishery for Existing Driftnet Permittees.				X	
7. Requires Public Comment and Review	X	X	X	X	
8. FMP Amendment Process Required Before Implementing			X		
9. Longlining Prohibited in the EEZ, Except Provisions for Oregon Swordfish and Blue Shark Developmental LL Fishery Outside 25 Miles off Oregon (No Active Permittees at the Present Time).					X
SPECIFIC COMPARISON OF ALTERNATIVES 2 AND 4:					
PRIMARY DIFFERENCES:					
10. EFP Experiment Must Prove "Negligible Impact" on Bycatch Species (including Prohibited and Protected) before Re-evaluation of Longline Fishery by Council (Maximizes Species Protection)–No Link to a Replacement Drift Gillnet Fishery		X			
11. Prohibits Longlining in EEZ until EFP Experiment Meets Criteria, Then Restricts Future Fishing to DGN Permittees Only				X	
12. EFP Results Must Prove at the least a "Significantly Lower" Bycatch/Protected Species Mortality (PSM) than by Driftnet (Statistical Level α= .05) before Re-evaluation of Gear Replacement Fishery by Council				X	
SIMILARITIES:					
13. Offers Opportunity to Develop "Clean" Fishing Technology and Example to Other Larger-scale LL Fishing Nations		X		X	
14. Establishes Bycatch Research Experiment Linked to EFP; Establishes Fishery Eligibility After Experiment is Completed		X		X	
15. EFP Research Priorities Involve Constituents, Published in Federal Register with Review Process		X		X	
16. Predetermined Fishing Standards (Trigger Limits) Set Prior to EFP Experiment		X		X	
17. Proposes 100% Observer Coverage		X		X	
18. Initial Total Fishing Effort Limited to 10 Vessels or Less		X		X	
19. FMP Amendment Process Required at end of EFP Process to Implement any Further Council Action		X		X	

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The effectiveness of the methods tested would be evaluated by the Council, in consultation with relevant advisory bodies, NMFS, and public interest groups at the completion of the research program, and a determination made by the Council as to whether or not longline gear can be fished with negligible impacts on bycatch species (as defined in the protocol). If so, a determination would then be made as to specific restrictions on longline fishing needed to achieve the same goal throughout the fishery. The evaluation by the Council would be based upon the ability of the gear to meet stringent conservation/performance standards that would be clearly identified in the research protocol in advance of the research and evaluation process.

Expected results of action: The available information, based upon the use of longline gear in HMS fisheries elsewhere, indicates that longline gear in the Pacific region (West Coast U.S. EEZ) could likely result in high levels of bycatch, especially blue sharks and interactions with protected species. The indefinite moratorium would prevent increasing bycatch and bycatch mortality, while the research program (whether conducted by NMFS or under an EFP) would provide the necessary data on target and incidental catch, as well as potential techniques to mitigate bycatch. This information would provide the basis for future management.

Issues - EEZ Longline Alternative 3

1. Longlining in EEZ would be prohibited until there is experimental evidence that the gear used would have negligible impact upon bycatch and protected species. The high standard gives maximum protection to those species, and the moratorium, until lifted, obviates management costs.

2. The exceptionally high "negligible-impact" standard would likely discourage fisher participation and further incentive for innovation.

This alternative would not allow longlining in the EEZ until there is research evidence that such fishing would have negligible impact on bycatch and protected species. It focuses on preventing possible harm from longlining at the outset before any fishing begins, by requiring proof, through experiment, that the gear will have a negligible impact on any bycatch species taken. While potential impacts and benefits cannot be fully evaluated until the experimental design details are established, the following provides general comments on possible effects of this alternative.

Prohibition of longlining within the EEZ would establish a new West Coast EEZ-wide policy with regard to pelagic longlining. This alternative was proposed in response to concerns expressed by the recreational fishing and environmental communities about potential user conflicts and possible interactions with protected species and recreationally targeted HMS species. Presently Oregon allows longlining outside 25 miles under the state's developmental fisheries program permit system. Blue shark permits are limited to 10 and swordfish permits are limited to 20, although there are no active permittees at the present time. Thus this alternative, while similar to the status quo, does eliminate the potential opportunity now available to west-coast based commercial fishers for fishing off Oregon and California and landing in Oregon, and any potential opportunity for consumers for a new source for fresh locally-caught HMS. This action would differ from the policies in other fishery management plans for HMS fisheries that allow pelagic longlining within their EEZ.

Impact on Fish Bycatch and Protected Species - EEZ Longline Alternative 3

This alternative gives maximum protection to any species likely to be taken. The very small amount of effort that would be represented by such a pilot EFP experiment in itself would likely have no impact on populations of all species involved, thus it is unclear how such a study could produce enough sampling effort to determine presence or absence of 'negligible impact' on bycatch species populations, especially those with low encounter rates. The high standard and restrictions on fishing makes it unlikely fishers would be motivated to invest in these experiments, or to reduce bycatch rates even further from whatever minimum rates they are able to meet. Nonetheless, it is possible that certain fishers may be willing to attempt such experiments, and if so, any gear improvements they devise, would be valuable for furthering bycatch reduction in longline fisheries in general. The Council and other advisory bodies, agencies, and public interest groups would have to decide on the likelihood of negligible impact from the gear (not fishery) experiments, and from experience in other fisheries. Also, potential impacts, if any, on any future fishing that may meet requirements cannot be fully evaluated until program details are established.

Management Costs–Enforcement, Data Processing and Administration - EEZ Longline Alternative 3

As a preventive stance, this alternative does not affect management costs, but costs would be incurred for any subsequent Council review and analyses of data generated from any potential EFP research experiment. The design, conduct, and evaluation and documentation of the research fishing could be quite costly, depending on the amount of research needed to meet standards of accuracy and precision intended by this alternative. No specific research proposal pertaining to gear design has yet been offered to provide a basis for estimating this cost.

Impact on Target or Incidental Fish Species - EEZ Longline Alternative 3

This alternative is not expected to affect mortality rates on target or incidental species, since it is not a fishing experiment but rather a gear experiment and presumably will be conducted on a very small scale. Also, potential impacts cannot be fully evaluated until program details are established.

Economic Impacts - EEZ Longline Alternative 3

By imposing an indefinite moratorium on the use of longline gear in the EEZ, with high performance standards for its repeal, participation by the industry is not likely. Thus potential increases in economic benefits for small fishery-related businesses or to the consumer (for new and continuing supplies of fresh HMS fish) would also be unlikely. Actual implementation of the moratorium part of this alternative will not have any impact because it essentially represents the status quo, but any bycatch-reducing findings would have a positive effect. Discovering new and more effective bycatch-reducing methods could result in a more enhanced and marketable "bycatch-safe" product, as well as increased existence values stemming from the enhanced protection of bycatch and protected species. If there is no experiment leading to lifting of the moratorium, this alternative would close the developmental Oregon fishery. Any change in net national benefits would stem from changes in landings and fishing activity in that fishery, which would be minimal, and from the non-consumptive benefits associated with any reduction of bycatch and protected resource interactions. If there is an experimental fishery, any direct change in net national benefits would theoretically be associated with the net value of the knowledge gained (a collective good) which is not subject to market valuation. However, if the experiment shows that longline gear is acceptable and a viable commercial longline fishery should develop, then the value of the research would be indirectly linked to the net benefits from the developing fishery.

Community Impacts - EEZ Longline Alternative 3

Effects on local communities would probably change little, at least in the short term, since presently there is no longlining in the EEZ. There is not expected to be any significant reduction in economic activity (employment, income, business transactions in the fishery and support sectors) in West Coast ports associated with a moratorium that could close the Oregon developmental fishery. The experimental fishery could stimulate some additional economic activity if it engaged latent fishing capacity. However, in the longer term, the drift gillnet fishery could be phased out, and local economies could suffer without its replacement, such as by a longline fishery. Demand for local seafood would be met by imports.

Impact on Essential Fish Habitat - EEZ Longline Alternative 3

Impacts on EFH would not change, since pelagic longlining is currently not allowed in the EEZ, and the number of participating experimental vessels is expected to be very few, representing an equally small amount of fishing effort.

Monitoring and Data Needs - EEZ Longline Alternative 3

The only new data needs would be that for the gear experiments, however, needs cannot be fully evaluated until program details are established.

Consistency with the Western Pacific FMP - EEZ Longline Alternative 3

This alternative, which represents a moratorium on longlining within the West Coast EEZ, would be inconsistent with the western Pacific region Pelagics FMP, which allows pelagic longlining in the EEZ, with restrictions.

User Conflicts - *EEZ Longline Alternative 3*

Conflicts among different user groups should change little, as fishers are used to the status quo that essentially prohibits longlining in the EEZ, and which this alternative strengthens.

Safety as Sea Issues - EEZ Longline Alternative 3

Safety at sea issues would not be affected, unless research under this alternative recommends mitigation procedures for protected species that endanger fishers.

Relation to Objectives of this HMS FMP - EEZ Longline Alternative 3

This alternative would promote the FMP objectives of ensuring consistency with protected species legislation, but not that of promoting long term supplies of quality local fish for consumers and for diverse commercial fisheries.

Consistency with International Obligations - EEZ Longline Alternative 3

This alternative would support the precautionary approach to resource management, and limit fishing effort as called for in FAO's IPOA to reduce fishing capacity; it may, however, weaken U.S. influence in international longline issues if it weakens the U.S. industry.

Legal Considerations - EEZ Longline Alternative 3

There are no legal considerations to conduct this experimental fishery.

Analysis of EEZ Longline Alternative 4: This alternative would allow longlining as a gear choice alternative to drift gillnet fishing. It would authorize a limited entry pelagic longline fishery for tunas and swordfish within the EEZ, with effort and area restrictions, to evaluate longline gear as an alternative to drift gillnet gear to reduce bycatch, or bycatch mortality and protected species interactions, and determine if a longline fishery is an economically viable substitute for drift gillnet gear. If the Council chose this alternative, further details on the limited entry portion would be addressed in a plan amendment after implementing regulations for the FMP were adopted.

Specifications:

- Limit initial longline fishing effort to a maximum of 10 drift gillnet permitted vessels (10 vessels to be determined through Plan amendment/limited entry process), and restrict the use of drift gillnet by those vessels (can use either longline or drift gillnet, but not both, during a one-year period);
- Prohibit fishing with longline north of Pt. Conception within 25 miles of shore and, south of Pt. Conception, east of a line from Pt. Conception to the western tip of San Miguel Is., to the northwest tip of San Nicholas Is., to the intersection of 118° W longitude, with the southern boundary of the U.S. EEZ (Figure 9-2).

- Institute monitoring and reporting requirements to document longline effort, harvest, bycatch, and bycatch mortality levels;
- Evaluate the performance of the longline fishery as part of the SAFE process, and adjust longline effort up or down, or enact other restrictions or regulations as appropriate through framework rule-making procedures.

History and Background of Alternative Development - EEZ Longline Alternative 4:

Longlining is currently not allowed within the U.S. West Coast EEZ (except by special permit beyond 25 miles off Oregon), although it is conducted in areas just beyond the EEZ. High-seas longline fisheries for tunas and swordfish have been conducted in the eastern north Pacific by Japanese vessels since the 1950s, Korea and Taiwan vessels since the 1960s and Mexico vessels since at least 1961 (Holts and Sosa-Nishizaki 1998). While the U.S. longline fishery did not expand significantly until the late 1980s, when a large number of vessels began using monofilament gear while fishing out of Hawaii, there had been a small (but in decline) longline fishery out of Hawaii for several decades before that. The fishery expanded, and several Hawaii- and California-based vessels began fishing after 1991. (See Chapter 2 for historical background and information on these fisheries.)

This alternative refers to a specific proposal to longline for tunas (particularly bluefin and bigeye tunas) and swordfish, and other marketable pelagic fishes within the EEZ, with restrictions designed to keep total drift gillnet (CA/OR) fleet size unchanged. As of 2000, 126 valid drift gillnet permits remain. This proposal would eliminate an additional 10 permits from this pool of potential drift gillnet effort. The proposed fishery would be exploratory to determine the more regular locations of bluefin and other deep tunas, and investigate the feasibility of fishing for them in the outer EEZ by a method with an anticipated lower bycatch or bycatch mortality and marine mammal take than by drift gillnet. Only permitted CA/OR drift gillnet fishers would be considered for possible gear switch to longline, and *only one type of gear (whether longline or drift gillnet) is to be used over any given one-year period*. Also, to mitigate conflicts with sport fishers, especially over striped marlin, longlining would be prohibited in the major essential habitat areas of marlin and inshore areas important to sport fishers.

The gear-switching concept (drift gillnet to longline) partly stemmed from past discussions on how to reduce marine mammal take. In 1996, the Pacific Offshore Cetacean Take Reduction Team (POCTRT) identified conversion of swordfish drift gillnet gear to longline gear as a strategy to reduce the incidental take of marine mammals in the drift gillnet fishery. This strategy was not pursued in the Take Reduction Plan because the drift gillnet fishery was managed by California, not under a federal FMP, and because of certain logistical constraints, lack of demonstrated success, and concern that longline fishing might trade off one set of undesirable bycatch factors for another.

In May 2000 this issue was revisited by the POCTRT. The Team stated support for the exploration of more selective gears for use by the drift gillnet fishery that demonstrated a reduction of bycatch. On June 29, 2000, a proposal presented to the HMS Advisory Subpanel referenced the POCTRT's support for exploration of longline as an alternative to reduce bycatch in the drift gillnet fishery.

In an October 23, 2000, NOAA/NMFS memo,[2] NMFS considered whether converting drift gillnet vessels to longline gear would reduce the number of sea turtle entanglements. It reasoned that because state laws prohibited longline fishing within the EEZ, only larger vessels would be able to fish beyond it, which would have a significant impact on the fishery, effectively the same as closing it down for the many smaller vessels in the DGN fleet not capable of such long-range offshore fishing. Because this was thought to be inconsistent with the intended purpose of the action, which is to allow the lawful incidental take of listed marine mammals during the course of fishing operations, NMFS did not pursue this alternative further. It expected that vessels might switch to longline gear on their own if they thought it was economically viable, but pointed out that longline

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[2] For Administrative Record for the 101(a)(5)(E) permit-CA/OR drift gillnet fishery section 7 consultation.

gear was also known to incidentally capture sea turtles. As mentioned, there was also a lack of demonstrated success and concern over trading off one set of undesirable bycatch problems for another.

On July 17, 2000, a complete discussion of the gear-switch concept, as well as related issues, was presented to the HMS Plan Development Team in a proposal authored by fishers. Plan Development Team agenda item H-5 reads: "Evaluate longline gear as an alternative gear type to drift gillnet fishing to be used in the West Coast EEZ."

During the development of this FMP, there were a considerable number of comments received expressing opposition to longlining within the U.S. West Coast EEZ from the recreational fishing and environmental communities. Most letters alleged that longline, as an alternative for an alternative gear to drift gillnet, would damage shark, swordfish, seabass, seabird, and sea turtle stocks. The industry has pointed out that the original and primary intent of this alternative was to evaluate reduction in bycatch, or bycatch mortality between longline and drift gillnet gears, but this intent became clouded during the drafting of earlier versions of the FMP because it was intermingled with discussions about longline as a general gear type, and alternative proposals calling for research protocols.

Species Impacts, General - EEZ Longline Alternative 4:

Little is known of the dynamics of deepwater tuna resources and associated species in the area of the California Current in the more offshore portions of the EEZ where the fishery is proposed. There has been no history of deep-longlining for tunas in this oceanographic region. Waters within the U.S. West Coast EEZ, especially the outer waters of this zone, are cooler and less saline than more inshore waters, and also cooler and less saline than more oceanic waters beyond the EEZ. The broad California Current, which carries colder, fresher water equatorward along the coast, dominates the EEZ. It is broader in the north and narrower in the south, extending approximately to the outer EEZ boundary south 40° N latitude, although its position and intensity can shift seasonally and from year to year with shifts in the Subarctic or California Front. Shoreward it mixes with plumes of cold, more saline upwelled water in the north, or warm countercurrent and gyre water of the Southern California Bight in the south. Seaward, the Current is bounded by the more oceanic waters of the Transition Zone, the Subarctic Front at the Zone's southern boundary, and to the south and west, waters of the North Pacific Central Water Mass (Saur 1980; Lynn 1986; see also EFH Chapter 4 Figure 1). Off Southern California, the California Current serves as a cold water barrier between the warmer, more tropical waters of the Southern California Bight inshore of the Santa Rosa-Cortes Ridge, and the warmer oceanic waters to the west beyond the outer EEZ boundary (Hickey, 1998; Lynn and Simpson 1990; Lynn et al. 1982, Norton 1999). Thus species taken by longline operations beyond the EEZ boundary, or in former longline operations within the EEZ but further inshore (e.g., the blue shark-mako shark experimental fishery, 1988-91) may not be representative of catches and species interactions that may occur in the proposed fishery. Additionally, much of the data on pelagic longlining are based on the high seas fishery that primarily targets swordfish (fishing gear in more shallow depths and at night), or inshore longlining that has targeted sharks.

Nonetheless, certain approximations can be made based on what is known of various longline operations in areas adjacent to the proposed fishing area, how catches compare with operations further westward and to the south, and what is currently known about the distributions of target, incidental and protected species. Some inferences may also be drawn from fisheries in other cold, eastern boundary currents, such as swordfish longline fishery in the Humboldt Current off Chile (Widner and Serrano 1997). To better assess potential species composition and bycatch and protected species interactions, we examined various sources of information on central and eastern Pacific high seas longlining, and past experimental and research longlining operations within and outside of the EEZ. This included 1994-2000 data from the Hawaii-based and California-based high seas longline fishery, including observer and logbook information from vessels fishing east and west of 135° W longitude (Tables 9-7, 9-8, 9-9). The plan development team also ranked and compared target, incidental, bycatch and protected species for these longline vessels (1994 through 2000) with those taken by the drift gill net fishery during the period 1997-1999 (Table 9-10). This was done to compare the likely differences between what has been taken in the drift net fishery to what is likely to be taken with longline in the proposed fishing area, using the most comparable data available.

Impact on Target/Market Species - EEZ Longline Alternative 4

Catches of longline vessels fishing in areas adjacent to the West Coast EEZ indicate that swordfish, albacore, bigeye tuna, bluefin tuna, yellowfin tuna, opah, escolar, shortfin mako, thresher shark and dorado could be potential market species for this fishery (although dorado is probably less likely to be taken in the cooler offshore waters, and especially in deeper water). One longline fisher targeting swordfish also supplied information on five trips by his vessel while targeting primarily swordfish near the West Coast EEZ boundary (pers. comm., P. Dupuy, commercial fisher). His data showed the following overall catches by numerical percent–swordfish, 50.8%; bigeye tuna, 43%; yellowfin tuna, 2%; bluefin tuna 1.3%; mako shark 2.7%. Limited data are also available for the area just south of the CA/OR/WA EEZ off Mexico. One early exploratory swordfish longline trip that fished along the 1,000 fm curve off central Baja California yielded 33 swordfish, 1,500 blue sharks, 83 sharks of five species, a few dorado, and one striped marlin (Kato 1969, total number of hooks set = 4,208). Shark species that would possibly enter the catch in this area by this method would be shortfin mako, silky shark (*Carcharhinus falciformis*), Galapagos shark (*C. galapagensis)*, silvertip shark (*C.albimarginatus*), oceanic whitetip shark (*C. longimanus*), common thresher shark, pelagic thresher shark, and scalloped hammerhead (*Sphyrna lewini*) (S. Kato, Larkspur CA, 7/12/2001, pers. commun.).

While these longline catches adjacent to the EEZ give some indication of catch composition, species and relative proportions may change as methods are developed to more selectively fish for the deepwater tunas. Adult-sized bluefin tuna (> 50kg) do occur irregularly in surface waters near the islands and offshore banks off southern California, especially during fall and winter (Foreman and Ishizuka 1990) and may occur more regularly at depth in offshore waters. The driftnet fishery also lands small bluefin incidentally. Bigeye tuna have been regularly taken by Japanese longliners fishing near the outer boundary of the U.S. West Coast EEZ (Uosaki and Bayliff 1999) and by California- and Hawaii-based longliners fishing east of 135° W longitude. Escolar, *Lepidocybium flavobrunneum*, which was among the top eight species taken by observed high seas longline vessels fishing east of 135° W longitude (Table 9-10), has become increasingly in demand for the restaurant trade and is expected to provide additional value to incidental landings. This tuna-like species is a large mesopelagic predator that often migrates to the surface at night (Ambrose 1996b).

Inside the EEZ, limited longline catch information is available for the Southern California Bight, recognizing that these waters are generally much warmer and the physical oceanographic structure different from offshore in the California Current proper (Lynn and Simpson 1990). Data are available from a former experimental longline fishery for mako and blue sharks, which took place from 1988-1991. This fishery was discontinued because 1) it could not develop a viable market for blue shark, 2) concern over the predominance of juvenile mako sharks and incidental catches of sea turtles and marine mammals, and 3) potential for capture of striped marlin, even though none had been observed in the catch (O'Brien and Sunada 1994). It was also conducted with cable longline, which is thought to produce weak galvanic electric currents that attract sharks by altering the surrounding electric field (Hueter and Gilbert 1990). Monofilament line used in tuna longlining lacks this property. In this fishery, blue sharks made up 62% of the total catch, shortfin mako sharks 29%, and pelagic stingrays (*Dasyatis violacea*) 9%. The rest of the catch (less than 1% in aggregate) consisted of California sea lions, one green sea turtle (*Chelonia mydas*), giant seabass (*Stereolepis gigas*), common thresher shark, ocean sunfish, hammerhead shark (*Sphyrna* spp.), Pacific mackerel, and finescale triggerfish (*Balistes polylepis*) (Table 9-11). During one observed year (1988), 52% of the blue sharks released were judged in "good" condition and likely to survive; in another year (1989) observers estimated 88% of blues returned to the water were in "good" condition, the increase in survival attributed to use of de-hooking devices (O'Brien and Sunada 1994).

Limited catch information is available from scientific research cruises conducted by state and federal scientists. In September 1968, a swordfish research longline cruise was conducted near San Clemente, Santa Barbara, and Santa Catalina Islands within the Southern California Bight (USFWS 1968[3]). This represented a small effort (total hooks set=1,236), but yielded a catch of 2 swordfish, 2 mako sharks, and an extraordinary catch of 553 blue sharks (equal to a hook rate of 447/1,000 hooks). Catch composition and catch rates are also available for NMFS shark research vessel surveys, which have taken place intermittently between 1993 and 2000 within the Southern California Bight (Table 9-12). These research vessel surveys targeted mako shark in 1994-1997, thresher shark in 1998-1999, and both species in 2000. One of the goals was to develop a fishery-independent index of abundance for juvenile pelagic sharks (especially shortfin mako) that could be linked to the former 1988-1991 mako-blue shark longline fishery. Sampling stations around the offshore islands and banks were chosen based on known areas of former high mako shark catches. In 1998 and in 1999, sampling switched to inshore stations to target common thresher shark for telemetry and satellite tagging experiments. In 2000, sampling protocol was modified and broadened to survey relative abundance of both shortfin mako and common thresher. Over the seven year period, the catch has consisted of mostly blue shark (66%), shortfin mako (22%), pelagic stingray (9%), and common thresher shark (3%), with the remaining species making up less than 1% of the catch (Table 9-12). No turtles were reported entangled on any of these research cruises; however, a total of one Brown Pelican and two California sea lions have been entangled (released alive) on NMFS shark cruises between 1994 and 2000 (S. Smith and D. Ramon, NMFS/SWFSC, La Jolla, CA, pers. commun. 7/01).

Impact on most highly migratory tuna stocks by 10 vessels in this area is not expected to be significant in stock-wide terms. Nonetheless, fishing mortalities would increase for bluefin and other tunas depending upon the degree to which fishing is successful, and if the size of the initial fleet of ten expands. Currently, U.S. West Coast vessels, mainly purse seines, already land approximately 12% of the Pacific-wide northern bluefin catch (see Chapter 3, Table 3-5).

Of the tunas, least is known of Pacific northern bluefin tuna, and its spawning ground (in the western Pacific) is also much more localized than that of other tunas. The effect of Pacific-wide exploitation on this species is not clearly understood because vital rate estimates (e.g., mortality rates) are imprecise, and there are no catch rate series that clearly follow abundance. Also, It is still unclear how long bluefin tuna reside in the eastern Pacific before or after spawning in the western Pacific, or from where the very large adult bluefin that erratically appear in the West Coast EEZ originate (Bayliff 1994). Much needs to be learned about residency times and movements within the U.S. West Coast EEZ. According to recent NRIFSF archival tagging data (Itoh et al. 1999), the journey from the western to the eastern Pacific is known to take as little as 55 days, after which time tagged fish have been known to remain off the coasts of California and Baja California for up to 2 years before returning to the western Pacific. Thus bluefin have the potential of remaining within the EEZ for much longer than previously thought. And very large adults, which used to be far more common in our EEZ (e.g., Collins 1892; Bayliff 1994), represent valuable reproductive potential for the population, so any intense exploitation of these individuals might represent a significant loss to the stock. Also, dynamics of bigeye tuna within the U.S. West Coast EEZ and exchange between the central and western Pacific is not well known. So although the anticipated catch relative to other segments of the Pacific-wide fishery is expected to be minimal, based on present knowledge of this species in the region, it is difficult to determine the relative impact of this fishery.

Swordfish would also be taken, although regulations concerning the targeting of swordfish will also have to be reconciled with restrictions placed on U.S. fisheries in adjacent areas of the Pacific (e.g., Federal Register Vol. 66, no 113, June 12, 2001, p. 31561-31565). While overall swordfish mortality within the EEZ should decrease with replacement of gillnet with longline effort (because longlines are generally less efficient at taking swordfish), total swordfish mortality might increase if the fishing season is extended considerably beyond the effective drift gillnet season (Aug 15 - Jan 31). If good catches of swordfish can be made year-round, increased fishing time and effort might more than compensate for lowered fishing power of the gear. But year-

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[3] USFWS. 1968. Cruise Report, AVR Miss Behavior, MB-19, September 23-September 28, 1968, Bur. Comm. Fish., Fishery-Oceanogr. Ctr., La Jolla, CA (now NMFS/SWFSC, La Jolla, CA).

round fishing is unlikely since swordfish are generally only available within the EEZ September through December.

Impacts on shark species are expected to vary, depending on locations and times of year fished, and possibly fishing depth. Although catch rates of common thresher are expected to be comparatively less than by drift net, adult common thresher and shortfin mako sharks might still be at risk. Mature adults of the common thresher, now recovering from its previous reduction to below B_{MSY}, are most abundant in May or earlier (Hanan et al. 1993) off California, and July through mid-October off Oregon and Washington (Stick and Hrehra 1988). Switching to low catch areas further offshore, or modifying bait configuration or hook types might reduce takes of these sharks. But the potential for increased mortality on reproductively valuable adults above what currently exists, still remains, especially if fishing takes place in areas and seasons when and where adult thresher shark occur. Adopting existing drift gillnet area/season closures should help protect these adults. Impacts on the much less productive shortfin mako shark is difficult to predict at this time given the lack of information on the habitat of adults and sub adults in the outer EEZ. Present gillnet operations catch predominately juvenile mako on their nursery grounds, but offshore deep longlining may tap into reserves of reproductive adults, which are more valuable to the population in terms of long-term ability to sustain or even rebound from increased fishing mortality. Removals of adult females, which have survived the gauntlet of fishing and other sources of mortality, have more impact on shark stocks that mature late in life than removals of the more numerous immatures (many of which will die of natural causes during the extended juvenile phase typical of late-maturing sharks). Mako shark have comprised a major portion of incidental catch and bycatch in the swordfish longline fishery off Chile in the comparably cool Humboldt Current area (Widner and Serrano 1997). Also, deep longlining may result in increased catches of the deep-living bigeye thresher shark, a species commonly caught by longline fishers on the high seas (Kato et al. 1967) and one that is thought to have very low productivity (Smith et al. in press); however, potential take levels are impossible to predict given the available data. See *Impact on Fish Bycatch* below for discussion on blue shark.

Potential Impact on Marine Mammals - EEZ Longline Alternative 4:

Gear switching from drift net to longline will likely result in a significant reduction in cetacean and pinniped takes (especially mortalities from those takes) due to the nature of the gear and, to some extent, the offshore fishing location (e.g., where pinnipeds are less likely to venture). In the Atlantic swordfish fishery, observer and vessel logbook data indicate that driftnet gear results in a significantly higher rate of take of protected marine mammals relative to other gear such as pelagic longline (63 FR 55998, October 20, 1998). Nonetheless, certain cetaceans still have a take potential, even though mortality from such interactions is expected to be low, especially for large cetaceans. These cetaceans interact either through depredation (e.g., toothed whales) or by entanglement (e.g., baleen whales). Species include the sperm whale (*Physeter macrocephalus*), Short-finned pilot whale (*Globicephala macrorhynchus*), Northern right whale dolphin (*Lissodelphis borealis*), Risso's dolphin (*Grampus griseus*), false killer whale (*Pseudorca crassidens*), bottlenose dolphin (*Tursiops truncatus*) and humpback whale (*Megaptera novaeangliae*), which have been known to interact with central and eastern Pacific longline fisheries and occur in the West Coast EEZ (WPRFMC Pelagic Fisheries FMP; CDFG data on experimental shark fishery; NOAA 2000; Forney et al. 2000; P. Kleiber, NMFS, Honolulu Laboratory, Hawaii, pers. commun. 7/20/01). Sperm whales are known to be attracted to longline operations in Alaska and have been involved in documented longline entanglements (probably due to depredation attempts by the whales), although there have been no reported injuries or mortalities (NOAA 2000). Observers in the Hawaii longline fishery during the period 1994-1997 (approx. 4-5% coverage) reported takes of four Risso's dolphin, one bottlenose dolphin, one short-finned pilot whale and one false killer whale, of which all were injuries, except for one pilot whale mortality (P. Kleiber, NMFS, Honolulu Laboratory, Hawaii, unpub. data, 7/20/01, pers. commun.). Humpback whales (CA/OR/WA-Mexico stock) also occur within the EEZ, spending winter and spring off coastal Central America and the West Coast of Mexico, then migrating to the coast of California and north to southern British Columbia in summer and fall. One humpback of the central north Pacific stock was observed entangled and expected to die due to interaction with a Hawaii longliner in 1991 (due to the low level of observer coverage during that year, a mortality estimate was not calculated). Northern right whale dolphin (*Lissodelphis borealis*) and Risso's dolphin (*Grampus griseus*) may be potentially taken in the more offshore fishery as well. These are primarily temperate water species occurring primarily in shelf and slope waters offshore the three states, tending to occur off California in cold water months and shifting northward into Oregon and Washington waters as water temperature increase in spring and summer. The range of Risso's dolphin, however extends into the tropics. Fin whale (*Balaenoptera physalus*) interactions with longlines have not been documented and are not expected, but this species has been observed year-round off central and southern California, with peak numbers in summer and fall, and in summer off Oregon (NOAA 2000). Blue whale (*Balaenoptera musculus*) longline takes have not been documented in eastern North Pacific, and are not expected, although the species does occur in the proposed fishing area, and float lines from longlines can be expected to occasionally entangle whales (Perrin et al. 1994). There is also a possibility of entanglement of common dolphin (*Delphinus delphis*) and the offshore stock of bottlenose dolphin (*Tursiops truncatus*), which have a more offshore distribution in the California Current (Smith, et al. 1986). The short-finned pilot whale (CA/OR/WA stock) appears to be returning to the EEZ after a virtual disappearance after the 1982-83 El Niño, but its occurrence is still rare (Forney et al. 2000) and thus is highly unlikely to interact with the proposed fishery. False killer whales are also among the least likely to be encountered within the proposed fishing area because of their preference for more tropical waters. Certain USFWS listed marine mammals also occur in the U.S. West Coast EEZ, such as the threatened southern sea otter, threatened Guadalupe fur seal, and Endangered Stellar sea lion, but these largely occur inshore of the proposed fishing area.

Potential Impact on Sea Turtles - EEZ Longline Alternative 4

There is serious concern about the potential take of turtles, even though projected effort, at least initially, is intended to be low (10 vessels). In particular, there is concern over the potential take of leatherback sea turtles in the proposed area, even though takes with longline gear would be less likely to result in mortality compared with driftnet gear (P. Dutton, NMFS/SWFSC La Jolla, CA pers. commun. 7/18/01). Takes of this species have been reported by California-based longliners and observers on the high seas, and the average annual take rate estimated for the CA/OR drift net fishery for the period 1990-2000 is high at 13 (NOAA 2000). It is presumed that the same area and time closures that now apply to the drift gillnet fishery to protect leatherbacks would be enforced for any proposed longline fishery within the EEZ. NMFS would engage in a Section 7 consultation (formal or informal) on the potential effects of fishing with longline gear in the proposed action area to ensure that the activity is not likely to jeopardize the continued existence of leatherback turtles or any other endangered or threatened species. A fishery of this type would require management measures that would provide for data collection and monitoring to properly assess levels of turtle and other bycatch levels and assure compliance with regulations, using at least the same or likely greater level of observer coverage as now exists in the drift gillnet fishery (> ~20%).

Information on past longline turtle takes on the high seas is available from the Hawaii-based and California-based high seas fisheries, which may or may not be applicable to the West Coast EEZ. Data from the latter fishery, which fish closer to the mainland, may be more applicable, especially for vessels fishing east of 135° W longitude. In skipper logbooks, from August 1995 through 1999, California-based longline fishing vessels reported 35 hookings of leatherbacks (two injured, 33 released alive), 21 loggerhead (released alive), 19 olive ridley (released alive) and 12 green sea turtles (released alive) (M. Vojkovich, CDFG). There are limited observer data that suggest lower rates of take in the outer EEZ compared to the high seas longline fishery to the west or to the drift gillnet fishery. The observed leatherback hooking rate of six high-seas longline vessels fishing east of 135° W longitude (1994-1999) was half the rate these vessels experienced west of that longitude (Table 9-9] (fishing took place primarily off central California between 35° and 40° N latitude). This difference should be interpreted with caution because the low encounter rate of this species makes it difficult to assess the true impact based on such small sample sizes. In a recent Biological Opinion (NOAA 2000), the annual take rate for leatherback turtles estimated for the California-based high seas swordfish longline fishery has been estimated at 8 (mortality 1.3) (NOAA 2000, Table 17) compared to an annual take rate for the CA/OR drift gill net fishery (1990-2000) of 13 (maximum 27 in 1995) with a mortality rate of 8 (maximum 17 in 1995).

Leatherback turtles occur Pacific-wide from 71° N latitude to 42° S latitude in the Pacific, foraging widely in temperate waters, exploiting convergence zones and upwelling areas in the open ocean, along continental margins and archipelagic waters (NOAA 2000). In the EEZ they are most abundant from Point Conception to central Oregon in summer and fall. They appear to be associated with warmer, clear oceanic waters and may enter the EEZ following warm water intrusions during relaxation of upwelling events, especially in the fall. Based on drift gillnet observer data from July 1990 through January 2000, 78% of leatherback entanglements occurred between Point Conception north to 45° N latitude and west to 129° W longitude between 15 August through 31 October. In addition, the highest densities of sightings along the U.S. West Coast have been in and around Monterey Bay, with a peak in sightings in August, decreasing significantly in September and October (NOAA 2000, citing NMFS and USFWS 1998 and Starbird et al. 1993). Preliminary data indicate that leatherbacks that inhabit our EEZ waters originate from nesting groups located in the western Pacific south of the equator in Indonesia or in the eastern Pacific along the Americas (e.g., Mexico, Costa Rica), with the majority from the western Pacific (NOAA 2000; Peter Dutton, SWFSC/NMFS La Jolla, CA 7/01, pers. commun.).

Loggerhead, olive ridley and green sea turtles may be the least affected, considering prevailing water temperatures most of the year in the proposed fishing area and the distribution in tropical and warm temperate waters of these turtle species. Loggerheads reportedly move along the Transition Zone chlorophyll fronts in the central Pacific characterized by 17° C SST and 20° C SST isotherms. These convergent fronts are key habitats for the species that are thought to concentrate on buoyant food organisms such as jellyfish and pelagic invertebrates (Polovina et al. 2000). Recent work by Polovina (pers. commun. NMFS, Honolulu, HI 7/30/01) indicates that elimination of shallow swordfish sets substantially reduces incidental takes of loggerheads, because they are largely found in the top 100 m, while deep sets for tunas are set below 200 m. Additionally, the ocean area west of the Santa Rosa-Cortez Ridge off southern California and areas to the north are generally much cooler than the Southern California Bight (Lynn and Simpson 1990; Lynn et al. 1982, Norton 1999), and thus presumably less likely to contain the more tropical of the pelagic and epipelagic species of fishes and turtles. The risk to these turtles will increase, however, during warm-water El Niño regime years. Green sea turtles were sighted off southern California during the 1997-1998 El Niño event (D. Hyrenbach, Point Reyes Bird Observatory, Bolinas, CA, pers. commun, July 24, 2001).

Potential Impact on Seabirds - EEZ Longline Alternative 4:

Seabirds, particularly albatrosses, are another concern. Albatrosses, especially younger and more inexperienced birds, are highly vulnerable to longline fisheries (Cousins and Cooper 2000). Any incidental catch of albatrosses by an EEZ longline fishery would be an increase over the level of take now in the drift gillnet fishery (which is zero; the total observed take of seabirds for 1990-1999 was: 16 Northern Fulmar and 4 'unidentified seabird' takes, NMFS Observer data). Preventative measures, such as use of blue-dyed baits, weighting of longlines, using tori lines, and strategic timing of offal discharges and set times have been shown to be effective at mitigating seabird interactions, and these measures would need to be adopted in combination with adequate observer coverage. Whether current mitigation technology will be sufficient to reduce or eliminate any potential seabird mortalities is not clear because of lack of information on fishing times, areas, strategies, and albatross encounter rates in the proposed fishing area. Some data and biological information is available, however, with which to make certain inferences.

Three north Pacific albatross species occur within the West Coast EEZ: Black-footed (*Phoebastria nigripes*), Laysan (*P. immutabilis*), and Short-tailed (*P. albatrus*) albatrosses. All three are taken by longline fisheries operating within subtropical and subarctic waters of the north Pacific and Bering Sea (Gales 1997). Although the federally endangered Short-tailed Albatross occurs within our region, it remains a rare visitor (Roberson 2000). The most abundant albatross off the West Coast of Canada and the United States is the Black-footed Albatross, which ranges throughout the north Pacific between 20° and 58° N latitude (Sanger 1974, Tickell 2000). This species forages more actively during the daytime, and night time foraging activity is influenced by the phase of the moon (Hyrenbach and Dotson, in press). Preliminary observer data indicate a high take rate of albatross in a small number of high seas longline vessels fishing east of 135° W longitude, although the sample size is small (Table 9-9). The mean albatross bycatch rate for these vessels (which also fished west of 135° W longitude), was 0.17 albatross/1,000 hooks overall, with a rate of 0.25/1,000 hooks east of 135° W longitude and a rate of 0.10/1,000 hooks west of 135 ° W longitude. The difference, however, was not statistically significant because of the small sample size. Although the Black-footed Albatross is the most abundant albatross within our region, its population is smaller than that of the other regularly occurring but less common albatross in our region, the Laysan Albatross. In the primary breeding grounds in Hawaii, there are only about 59,622 nesting Black-footed pairs, versus 558,378 nesting pairs of Laysan Albatross (Gales 1997). Neither is listed as endangered but both are protected under the Migratory Bird Treaty Act (16 U.S.C. 703 et. seq.). Furthermore, the Black-footed is considered threatened under IUCN criteria (Cousins and Cooper 2000). It is estimated that between 1994 and 1999, an average of 1,175 Laysan Albatrosses and 1,388 Black-footed Albatrosses were killed in the Hawaii longline fishery each year (WPRFMC 2001). 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 data 2002). The number of Laysan Albatross individuals has been estimated at 2,200,000, but the number of breeding birds has declined over the last five years in the two largest colonies of this species (USFWS data 2002). A new colony of Laysan Albatross was recently discovered in 1987 at San Benedicto Island, Mexico, (370 km south of the tip of Baja California, Mexico) where an estimated 12 nesting pairs were counted in December 2000 (Pitman and Ballance 2002). The colony is small, but thought to be steadily increasing.

Albatross catches reported in skipper logbooks are also available for all California-based swordfish longline vessels that fished on the high seas during the period August 15, 1995, through December 31,1999, (M. Vojkovich, CDFG, Long Beach, CA 7/11/2000, pers. commun.). These longliners reported a catch of 100 "albatross spp." caught, of which 73% were dead, 22% were released alive, and 5% released injured. These birds were the leading protected species taken, with a catch rate of 0.014 birds per 1,000 hooks (Table 9-10). If proposed fishing is primarily conducted during the day for tunas, interactions with these birds will be higher than it would be for night time fishing for swordfish, although hooking rates for albatrosses are reportedly lowest for fishers that target tuna exclusively, compared to swordfish or a mix of tuna-swordfish (USFWS 2000).

The Black-footed Albatross is abundant in the California Current summer, fall and winter but can be found in the EEZ year round (Tickell 2000). It is particularly susceptible to longline fisheries operating within the EEZ because it 1) occurs within the EEZ during all seasons (Briggs et al. 1987; K. D. Hyrenbach, Point Reyes Bird Observatory and Duke Marine Lab., Beaufort, NC, pers. comm. 7/24/01 La Jolla, CA), 2) is intensely attracted to vessels off southern California (K. D. Hyrenbach 2001b), and 3) appears to rely on fishery discards intensively (Gould et al. 1997). It is also known to concentrate off central California on the warm and clear side of upwelling plumes, where at least some tunas (e.g., albacore) aggregate to forage (Laurs et al. 1977, 1984; Briggs et al. 1987). Results of surveys conducted by the California Cooperative Oceanic Fisheries Investigations (CalCOFI) cruises off southern California between 1987-1998 suggest that Black-foots are consistently more numerous in pelagic waters (depth > 2000 m or 1093 fm) than within-slope regions (depth < 2000 m), with a small peak in abundance in spring (March - April). In early seabird distributional studies, Grinnel and Miller (1944) found them to be especially common along the edge of the continental shelf. Briggs et al. (1987) also described Black-footed Albatross concentrations along the edge of the continental shelf off the California coast north of Point Conception, and Haney et al. (1995) provided evidence that Black-footed Albatrosses aggregate at sea mounts and offshore banks of California. On the other hand, Allen (1994) has reported that in spite of these coarse bathymetric and water mass preferences, multi-year studies of Black-footed Albatross distributions off California had failed to detect persistent habitat associations, suggesting that these birds exploit a broad range of oceanographic conditions.

Breeding birds begin returning to the Hawaiian Island chain after August, but even during the breeding season, when the birds are generally more concentrated near their breeding colonies, they still travel considerable distances during the chick-rearing period (March-July), including to within the West Coast EEZ (Fernandez et al. 2001, Hyrenbach 2001a). Recent satellite telemetry studies have revealed that breeding Black-footed Albatrosses (March-June) concentrate their foraging activities over the continental shelf of North America (central California north to Washington state) and along the Subtropical Frontal Zone (Fernandez et al. 2001, Hyrenbach 2001a). During the post-breeding dispersal, black-footed albatrosses forage along the southeastern portion of the broad Transition Zone, where the southern flowing California Current mixes with warmer and saltier subtropical waters to the south and west (Hyrenbach and Dotson 2000, 2001). According to Sanger (1974) and others, these birds appear to be drawn to upwelling zones within the U.S. West Coast EEZ, and the birds appear to move northward along the CA/OR/WA coast as the upwelling season progresses (i.e., being most abundant off Baja in April and May, off southern and central California in May and June, northern California in June and July, and off Oregon in August and June).

The Laysan Albatross occurs within the EEZ during winter-spring (inshore domain, depth <2,000 m or 1,093 fm) and spring-fall (offshore domain, depth > 2,000 m) (D. Hyrenbach, Point Reyes Bird Observatory and Duke Marine Lab., Beaufort, NC 7/24/01 pers. comm.). In recent years, Laysan albatross sightings have increased off southern California, particularly within the onshore domain. Sightings were considered common in spring and winter during 1995-1998, likely in response to the establishment and expansion of breeding colonies off Baja California, Mexico (Jehl and Everett 1985, Howell and Webb 1992, Gallo-Reynoso and Figueroa-Carranza 1996, Pitman and Ballance 2002).

The endangered Short-tailed Albatross has also been sighted rarely off the West Coasts of the United States and Mexico in recent history. It is nonetheless endangered, has historically occupied U.S. West Coast EEZ waters, and will likely return to its former range as its population recovers (and may have already begun to do so). In spite of recent favorable recruitment at the only extant colony in Tori Shima, Japan, the world population is estimated at less than 1,000 birds (Gales 1997). Of the 23 sightings of this species within the CA/OR/WA EEZ since 1947, 74% have been made in the last two decades (1983-2000) with 88% occurring from August through January (Roberson 2000). Six Short-tailed Albatrosses have been killed by the Alaska bottom longline fleet and it is possible that interactions could occur within the U.S. West Coast EEZ, as has been postulated for the Hawaii-based longline fishery, where reportedly two individuals visit the Northwestern Hawaiian Islands each year (WPRFMC 2001).

A possible indirect impact of longlining includes ingestion by albatrosses of lost/discarded light sticks and discarded plastic items. These have been linked with chick mortality in the Hawaiian breeding colonies (Cousins and Cooper 2000). See also section below on *Impact on EFH.*

In addition to the Endangered Short-tailed Albatross, other USFWS listed seabirds occur in the U.S. West Coast EEZ, including the Threatened Marbled Murrelet (*Brachyramphus marmoratus marmoratus*), Endangered California Least Tern (*Sterna antillarium (=albifrons) browni*), Threatened Snowy Plover (*Charadrius alexandrinus nivosus*) and Endangered Brown Pelican (*Pelecanus occidentalis*). The Xantus' Murrelet (*Synthliboramphus hypoleucus)* is also under consideration for threatened status. Of these, the Xantus Murrelet would be the only one that may range far enough offshore into the proposed fishing area, however, these small, agile, diving seabirds are not known to interact with longline gear (Brothers et al. 1999).

Impact on Fish Bycatch - EEZ Longline Alternative 4:

Blue shark will probably remain the principal bycatch species, and a catch rate of greater than 15-20 per 1,000 hooks is expected. As has been estimated in Chapter 5 section 5.3.1, approximately 121 mt/yr of blue shark are caught (most discarded dead) annually in the swordfish/shark DGN fishery. Bonfil (1994) has estimated the blue shark catch in the North Pacific international high seas longline fishery to be roughly 40,000 mt/yr, and Nakano and Seki (unpub. data, Pelagic Shark section Chapter 3.3.2) estimate > 50 mt. The entire regional take has been estimated at about 1% of the North Pacific-wide catch (Chapter 3 Table 3-5). Replacement effort using longline may likely catch similar numbers (depending on fishing practices), but more sharks can be released alive by longline than by driftnet (O'Brien and Sunada 1994). Survivability is generally thought to be higher with hooking versus net entanglement (e.g., O'Brien and Sunada 1994; Hanan et al 1993), presumably due to lesser damage to gill chambers and respiratory functioning, as net-entangled sharks tend to wrap themselves up in mesh panels. In general, for market species, longline-caught fish are generally in better condition when landed and bring a higher price than driftnet-caught fish (Hanan et al 1993). Thus with proper de-hooking procedures, mortality may be significantly reduced from that currently experienced in the drift gillnet fishery. The Pacific-wide stock of blue shark, even under the current level of fishing in the Pacific, appears to be underexploited according to a recent joint stock assessment by NMFS and the National Research Institute of Far Seas Fisheries (DOC 2001), and the limited-entry driftnet-to-longline replacement segment of the fishery is not expected to add appreciably to the current level of take, even if dead discard rates were the same as with DGN, which is not expected.

There is also potential for a relatively large albacore bycatch (e.g., Table 9-10). Distance from port, market price relative to other species, and limited hold space may influence potential longline fishers to discard albacore and other fish species (which they might otherwise land if fishing further inshore with drift gillnet). Information is insufficient to evaluate the possible impact of these factors at this time; we can only infer that discard rates may be comparable to those given in Tables 9-7 and 9-8. If the fishing comes to target deep-swimming tunas, this fish species complex and relative proportions may change. For example, longlines currently set to target swordfish tend to catch species of the epipelagic zone, whereas longlines set for deep swimming tunas such as bigeye, may catch more mesopelagic species such as bigeye thresher shark. Daytime fishing for tunas may reduce catches of diel vertical migrating fishes that spend the daytime at extreme depths. Fish species taken by drift gillnet that may be taken in significantly less numbers by longline gear would be skipjack tuna, bullet mackerel, mola mola, pelagic thresher and possibly common thresher shark. Fish species not taken by driftnet gear (or in very low numbers) that may experience increased mortality from longline gear include longnose lancetfish (*Alepsaurus ferox*, a large pelagic to bathypelagic predator, Ambrose 1996a) and pelagic stingray (*Dasyatis violacea*), a common component of longline fisheries worldwide. All are widely distributed species, so the impact of a ten-vessel limited entry fishery should be very minor compared to the Pacific-wide take. But insufficient information exists on the combined impact of Pacific-wide longline operations and stock structure and biology of these little-known species to assess the effects of this additional source of mortality.

There is great concern from the recreational fishing community over the potential bycatch and accompanying local depletion of striped marlin as a result of allowing a longline fishery of this type within the EEZ. Often cited is published evidence that directed Japanese longlining for billfish in Mexico off Baja California reduced the catch rate of striped marlin by anglers in Mexico (Squire and Au 1990). The recreational fishing community contends that since relatively few striped marlin are taken within the U.S. West Coast EEZ, any removals by commercial fleets will reduce the likelihood of capture by sport anglers. Anglers are also concerned by a historical decline in catches and average size of striped marlin in the recreational fishery in the Southern California Bight (see FMP Chapter 2, Figures 2-5, 2-6). It is not clear if these indicators are signs of stock decline or regional depletion, since striped marlin occurrence in the EEZ is largely driven by warm-water intrusions from the south, and the recreational CPUE indicates no trend (FMP Chapter 2, Figures 2-20; section 3.3.3). Most recently, there has also been a regime shift since 1998 from warm El Niño to cooler La Niña conditions, which tend to be less favorable for marlin locally. Analysis of the decrease in average angler-caught fish size over time suggests that the available stock has not yet been subjected to a mortality level above MSY (See Chapter 3 section 3.3.3.1, D. W. Au, SWFSC/NMFS, La Jolla, CA 8/1/01 pers. commun.). Nonetheless, declining catches together with steady CPUE suggest that fishing efficiency has increased or fishing effort has declined, and the latter scenario, though possible, seems unlikely. Interpretation of these data are hampered by lack of information on trends in angler effort, although annual membership rolls in at least one southern California marlin angling club suggest little if any downward trend in membership since 1980 (R. Nelson, Billfish Foundation, Ft. Lauderdale, FL,8/1/01, pers. commun.; Balboa Angling Club membership records).

Commercial exploitation of striped marlin on a Pacific-wide scale is thought to have decreased over the past 25 years due partially due to re-targeting for deep-water tunas and a reduction in the numbers of hooks set by Japanese longliners. According to Hinton and Bayliff (2002) the ratio of current stock biomass to that expected at an average MSY is estimated to be about 1.01, thus the stock of marlin in the EPO appears at or near the level expected to provide landings at an average MSY of about 4,500 mt. They report that landings and standardized fishing effort for striped marlin decreased in the EPO from 1990-91 through 1998, and preliminary estimates indicate that nominal fishing effort in the area has continued to decrease in the 1999-2001 periods, with an associated continuing increase in stock biomass. While Hinton and Bayliff (2002) recently judged the EPO stock to be in good condition, they stressed the need for more information on stock structure and stock dynamics to better interpret assessment data. They cite Graves and McDowell (1994) who presented genetic evidence of separate northern and southern stocks of striped marlin in the EPO;

therefore, there may be less 'seeding' of the regional northeastern Pacific stock from other areas of the Pacific than previously thought (although tagging data suggest that there at least some movement out of the EPO). As mentioned above, this species is taken in low numbers by the drift gillnet fishery, and would also likely be taken in low numbers by longline gear, as suggested by the preliminary observer and skipper logbook data for the area east of 135° W longitude (Tables 9-7, 9-8, 9-9, 9-10) and preference of this species for warm water. If those that are taken are released alive, reports of their survival are encouraging; some specimens can survive over 12 hours on hooks (Berkeley and Edwards 1988). Additionally, the proposed fishing would take place mostly in cooler waters, largely outside the essential habitat of striped marlin within the EEZ (i.e., generally west of the Santa Rosa-Cortes Ridge). Striped marlin tracked off southern California and Hawaii have been found to spend the majority of swimming time in the highest water temperature available in the upper mixed layer and never descend into water more than 8° C colder than the temperature of this mixed layer. Off California, this mixed upper layer in which tracked marlin spent most of the time was 20 to 21° C; that off Hawaii was generally between 25.1° and 27° C (Holts and Bedford 1990; Brill et al. 1993). More tracking and tagging data are needed to determine the utilization of striped marlin in the outer EEZ to conclusively determine their habitat use in this area, and especially if marlin traverse the cool water zone during migration to and from the warmer waters of the central Pacific and the southern California Bight, and whether they do so on a regular basis.

Longline Gear Efficiency Versus Driftnet Gear - EEZ Longline Alternative 4

Murphy (1960), in his paper on fishing gear efficiency, pointed out that baited longlines are less efficient than gillnets because they lose fishing power over time. Unless the net fills up with unwanted species or becomes badly tangled on each contact with a fish, gill nets tend not to lose efficiency in any way analogous to the loss of baited hooks from bait loss and from fish being caught during longline sets. Thus fish bycatch should decrease in comparison to the existing drift gillnet fishery, with the above exceptions noted. However, deepwater tuna longlining could also bring its own suite of incidental takes at levels that only trial can determine. As mentioned, striped marlin may be taken (although probably in very low numbers), and longlines do take turtles and albatrosses that have protected status. And while generally less efficient than other gears, longlines are comparatively more efficient at catching deep tunas. The extent of this efficiency within our EEZ cannot be determined at the present time, however.

Monitoring and Data Needs - EEZ Longline Alternative 4

Monitoring and reporting requirements would have to be at least commensurate with that of the current drift gillnet fishery, and would probably increase to provide adequate tracking of the fishery. Details of these requirements would be finalized after the consultation process is completed with NMFS and the U.S. Fish and Wildlife Service. It is anticipated that much more comprehensive information on target, bycatch and incidental catch (e.g., size information) would be needed to document and monitor the impact of the fishery. Because of the small size of the exploratory fleet (only 10 vessels), mandatory observer coverage would probably have to be increased above 20% to possibly 100% in order to reliably monitor possible interactions of the less frequently taken bycatch and protected species. For example, while 20% coverage may be adequate for monitoring turtle interactions in a fleet of 150 vessels, a considerably higher level will be needed for a fleet of only 10 vessels, if the interactions are equally rare. Also, 100% observer coverage would be required to monitor mitigation devices and practices. Additional dockside and possibly at-sea monitoring may be needed to enforce gear switching restrictions. Data and other information on the fishery would be summarized and reviewed each year in the annual HMS SAFE report.

Legal Considerations - EEZ Longline Alternative 4

Authorization of this fishery would supercede all existing state laws regarding longlining in the action area. California currently does not allow longlining, but it does allow longlined fish caught outside the EEZ to be landed. Vessels and fishers are required to be properly licensed, maintain and submit logbooks, and comply with pre-landing notification procedures. Longline gear is not legal off Washington, but Oregon has provisions for developmental longline fisheries for swordfish and for blue shark outside 25 miles. Because the drift-net

-longline conversion fishery would be 1) limited to CA/OR drift gillnet permit holders, and 2) initially be limited to 10 vessels, it qualifies as a limited entry fishery. It would thus require a plan amendment, including an analysis of such a fishery and criteria for entry, which must go through standard review and approval processes before adoption and implementation. Protocols for adjusting longline effort up or down, or for enacting other restrictions or regulations as determined in the management cycle review, would be established through framework procedures and enacted in a timely manner. Proposed fishing area south of Point Conception suggests that areas near the islands would be open to fishing, whereas current drift gillnet regulations prohibit fishing within 1-10 nm of the islands; this issue and other more precise area/season closure issues would need to be resolved.

Management Costs: Enforcement, Data Processing and Administration - EEZ Longline Alternative 4

If approved, there would be new, but presently unknown management and data acquisition costs, including costs for increase in observer coverage for this segment of the fishery above that of the existing drift gillnet fishery; costs to cover development, design and implementation of new observer sampling procedures and training; costs for skipper workshop and training to implement bycatch mitigation measures; costs to track and evaluate the new fishery; and costs involving increased enforcement/surveillance.

Economic Impacts - EEZ Longline Alternative 4

The gain in producer surplus from the fishery could be substantial to the industry and support industries, as fresh tuna is a most valuable commodity. There would also be a gain in consumer surplus to consumers of fresh fish. Fresh bluefin tuna is highly prized for grilling and for sashimi in the U.S. and internationally. There is also a growing demand for fresh bigeye in the 20-50 pound size range for grilling in upscale U.S. mainland restaurants (HDBEDT 2001) and a continuing demand for bigeye sashimi in Japan. U.S. consumers might gain little if the fish are primarily exported to the Japanese market, but currently there appears to be a healthy and quite adequate market and demand along the West Coast, particularly in the Los Angeles area, which represents one of the largest markets in the U.S. for fresh tuna. While the raw tuna product (for sashimi and sushi) has had a traditionally high market in Japan, this market is now rapidly growing in the U.S. Also in the U.S., tuna and swordfish, even in the frozen form, have brought a high retail value averaging between $7.00 and $9.00 per pound in the California market for the past three years. Other incidentally caught species, such as mako shark, opah and escolar would provide additional value to the catch. The longline fishing method, whereby trauma to the fish is minimized, results in a good product appearance, texture and flavor, with a corresponding increase in consumer appeal. With its strong Pacific Rim culinary influence, the West Coast has an especially high and growing demand for fresh tuna and other HMS fish. Local markets, restaurants, and supporting industries would also benefit from the accompanying gain in producer surplus.

The proposed fishery, especially if it expands beyond ten vessels and catches of recreational species increase significantly, may reduce the availability of HMS stocks in southern California to the recreational fishery. This might have an economic impact on the recreational HMS fishery, and possibly competing commercial fisheries for HMS. But the significance or degree of impact cannot be determined at this time, though is expected to be minimal if the number of active vessels remains no greater than ten. Increased fishing mortality on bluefin tuna resulting from longlining and purse seining combined may contribute to lower availability to other segments if these fishery segments are exploiting the same components of the stock, or if the longline vessels intercept the 'front line' of these stocks as they move into the EEZ. If this occurs, there would be a loss in consumer surplus to recreational anglers due to reduced catch rates and reduced trips and opportunities. Should local depletion of bluefin tuna or marlin occur, there would also be a loss in producer surplus to industries supporting recreational angling (tackle, fuel, boating, CPFV industry, etc) if the probability of capture and recreational trips and participation subsequently decrease. It is recognized, however, that the drift net fishery already catches recreational HMS incidentally, so any impact from this replacement fishery would be the result of mortality considerably above what is currently taken.

Community Impacts - EEZ Longline Alternative 4

Benefits to local communities (as well as to the states) in terms of increased economic activity - employment, income and spending in the harvesting, processing and distribution sectors - could be large if the fishery is successful in producing high value, fresh tunas. This may more than offset any loss in economic activity from a concurrent contraction in the drift gillnet fishery. Depending on the range of the proposed fishery, this economic activity could be more widespread along the West Coast. With a transition of current drift gillnet fishers into the proposed longline fishery, there is not expected to be any significant changes in the socio-cultural structure of HMS communities. This is because participation in this gear-switch option would be limited to existing permit holders and, of these, only the few larger vessels designed for fishing offshore areas. To the extent that the proposed longline fishery reduces availability of HMS to recreational fisheries (should this occur), there may be a decline in recreational fishing activity and a corresponding decline in economic activity within supporting industries. The impact on recreational fishing would also depend on the availability of substitute recreational fishing opportunities within the affected communities.

Impact on Essential Fish Habitat - EEZ Longline Alternative 4

The expected impact to EFH from the conduct of this replacement fishery is expected to be minimal, especially if extreme care is taken to prevent loss of longline fishing gear, including light sticks, being accidentally lost at sea and possibly entering the pelagic zone, if only temporarily. Should use of light sticks be permitted at the time this fishery is approved, these plastics have the potential of being lost and remaining in the pelagic environment for some time, presenting a potential hazard to certain species, although not likely altering the water quality itself. Buoyant light sticks have been used by Hawaii and high seas longliners for targeting swordfish. These sticks are attached to branch lines with elastic bands approximately two to three meters from the baited hook. Often the bands break and the light sticks are accidentally lost. Once lost, they float on the ocean surface currents and are mistaken as food by some marine species, especially albatrosses. Plastic fed to albatross chicks can cause them to suffer from dehydration and starvation, can inflict mechanical injury to the lining of the gut wall, or can block the entrance of food into the intestine (Kenyon and Kridler 1969; Sievert and Sileo 1993). In addition to the U.S. swordfish longline fleets, there are several other sources of these light sticks, such as the U.S. Navy, U.S. Coast Guard, and foreign fishing fleets. A battery-driven luminescent light stick which is negatively buoyant so it will sink if lost is being developed, and will be designed to be attached to branch lines with a durable snap to retain the light stick on the line, and to also decrease the time in which baited hooks stay at the surface and might be available to birds (WPRFMC 2001). Fishers are required to save light sticks for disposal on land as required under the International Convention for the Prevention of Pollution from Ships, or MARPOL (MARine POLlution), in 1973. Annex V of the Protocol deals with plastics and garbage disposal from ships and prohibits ocean dumping of all ship-generated plastics. The Coast Guard is in charge of enforcing MARPOL Annex V within the U.S. Exclusive Economic Zone, 200 miles off the U.S. shoreline. All vessels, regardless of nationality, are bound by these MARPOL restrictions within the territorial waters of the treaty countries.

In summary, essential fish habitat, as designated for management unit species in this FMP should not be affected unless significant longline gear remnants are lost/discarded at sea, which is not expected considering the small amount of fishing effort ten or less vessels represents.

Consistency with the Western Pacific FMP - EEZ Longline Alternative 4

At the outset, the fishery would generally have to be made consistent with the Western Pacific Pelagics FMP with respect to mitigation of protected species in vessel longline operations, keeping in mind that distributions and likelihood of interactions with certain species may be different in the action area because of its different oceanographic regime. As its bycatch and species interactions are determined, alterations in these practices may become necessary that may diverge from those of the Western Pacific Council and become more region-specific.

If this alternative is chosen, it would provide comparable tuna longlining opportunities in both the eastern Pacific and western Pacific regions. Presently, Hawaii-based fishers can longline for tunas within their EEZ under the Western Pacific Council's Pelagics FMP, whereas West Coast-based fishers are presently governed by state laws and cannot longline for tunas within the EEZ.

User Conflicts - EEZ Longline Alternative 4

The recreational fishing community and their representatives have objected to any development of a longline fishery, even a gear replacement proposal such as this one. The sport fishing community is a strong, active and highly vocal stakeholder in the HMS fisheries within the EEZ. They are concerned that any longline fishery, even though small-scale, would have significant impacts on recreational species through the targeting, incidental catch or bycatch of these species in such longline operations. They are also concerned about the potential impact of increased bluefin tuna purse seining off Mexico and the U.S. combined with new effort in the proposed longline fishery. Some of this concern stems from a general distrust of this type of gear because of real and perceived impacts of past and current longline operations off the Atlantic and Gulf Coasts, off Baja California, Mexico, in the central Pacific, and in the southern California Bight. A major concern is with striped marlin, as mentioned above, but also bluefin tuna, pelagic sharks (thresher and shortfin mako) and other species that have occurred in the observed catch of the former mako-blue shark cable longline fishery (i.e., black sea bass). These target, incidental and bycatch issues are addressed above.

The commercial industry contends that the recreational hook and line - commercial longline controversy is fundamentally an allocation and not a gear issue, and should be evaluated as such. They make the point that both sectors are essentially fishing the same basic unit of gear (hook and line), although the longliner deploys multiple units and may deploy them differently than the recreational angler. The industry points out that the drift gillnet fishery is in decline through increasing regulation to mitigate protected species interactions, and that this proposal offers a solution to switch to a cleaner fishery for a highly marketable product. They feel that in not being able to longline for tuna and swordfish within their own U.S. EEZ, they are at a competitive disadvantage with foreign fleets and with Hawaii-based tuna longliners who are allowed to fish for tuna both on the high seas and within their respective EEZs. The proposed fishing area was chosen to minimize user and gear conflicts, especially with recreational anglers, although there is still a possibility of gear interaction between longliners and drift gill netters, especially north of Point Conception in areas and times of year when the two gears may overlap. Yet this seems unlikely since the drift gillnet industry proposed this alternative, and its members have the capability of avoiding each other's operations. Gear conflicts with the harpoon fishery are unlikely because proposed fishing would take place offshore of the inshore harpooning grounds.

The environmental community is also concerned about permitting such a fishery with its potential for bycatch and protected species interactions and possible detrimental effects on certain targeted species (e.g., bluefin tuna and sharks). There are concerns about the lack of in-place vessel performance standards, effective mitigation procedures, adequate monitoring and enforcement, and especially the potential for expansion of the fishery.

Safety as Sea Issues - EEZ Longline Alternative 4

Safety at sea could be an issue if vessels switched to longlining in the winter-spring period and far offshore to avoid user conflicts. But in general, the method is considered less dangerous in offshore waters than gillnetting. Longline vessels tend to be more stable in rougher offshore waters than comparably sized drift gillnet vessels, which become top-heavy when heavy nets are piled high on deck between sets and during transit.

Relation to Objectives of this HMS FMP - EEZ Longline Alternative 4

This alternative is not in conflict with FMP objectives; it attempts to reduce overall bycatch and protected species takes by reducing driftnet effort, and to minimize the effects of conservation regulations on fishing communities by providing a fishing alternative for driftnet fishers, as per National Standard 8 of Magnuson-

Stevens Act. If successful, this fishery could provide a new source and a stable supply of high-quality, locally caught fresh tuna to the public (mgt goal #2) while providing a new commercial fishing opportunity for HMS in the region's ports (mgt goal #4), and minimizing bycatch and discard mortalities (mgt goal #9) and certain protected species interactions (mgt goal #17). Much hinges on the potential take of other species that are vulnerable, such as albatrosses and sea turtles. Any mortality of albatrosses would represent an increase (rather than a reduction) over what is currently taken in the present drift gillnet fishery, which is inconsistent with the intent of the U.S. National Plan of Action for Reducing the Incidental Mortality of Seabirds in Longline Fisheries. Short-tailed Albatross distribution, abundance and rate of increase in the U.S. West Coast EEZ need to be reassessed to determine whether the proposed fishery is likely to adversely affect this endangered species.

Consistency with International Obligations - EEZ Longline Alternative 4

If this alternative is adopted, it is expected that the Council would abide by quotas established by the Inter-American Tropical Tuna Commission and effectively apply recommendations of other international bodies to domestic HMS fisheries on the West Coast as appropriate. It is possible that, through this fishery, new insights might be provided on bluefin tuna dynamics and behavior of this species off the Pacific States, which might alter how this tuna is managed at the international level.

Analysis of EEZ Longline Alternative 5: Under this alternative, longlining within the West Coast U.S. EEZ (including the existing but inactive Oregon fishery) would be generally prohibited, but there would be a potential for re-evaluation by the Council following completion of a tuna-swordfish-bycatch experiment to determine if longline gear can be fished in ways that produce bycatch rates and protected species interaction levels significantly less (within a standard statistical level of detectability, or $\alpha = 0.05$), than by drift gillnets.

Example of Exempted Longline Fishing Permit with Experimental Design

Title: Exempted Longline Experimental Fishery and Research Experiment.

Objectives

1. To determine if longline gear can be fished in ways that would produce bycatch rates (fish and protected species) significantly less or lower than by drift gill netting, and to develop gear or practices most effective in minimizing these interactions to the greatest extent possible.

2. To determine if longline fishing for swordfish and tuna in the outer EEZ (or beyond) can be a sustainable and economically viable alternative to drift gillnetting (DGN) for West Coast DGN fishery permittees ***after*** establishing an acceptably low level of bycatch and protected species interactions and mortality.

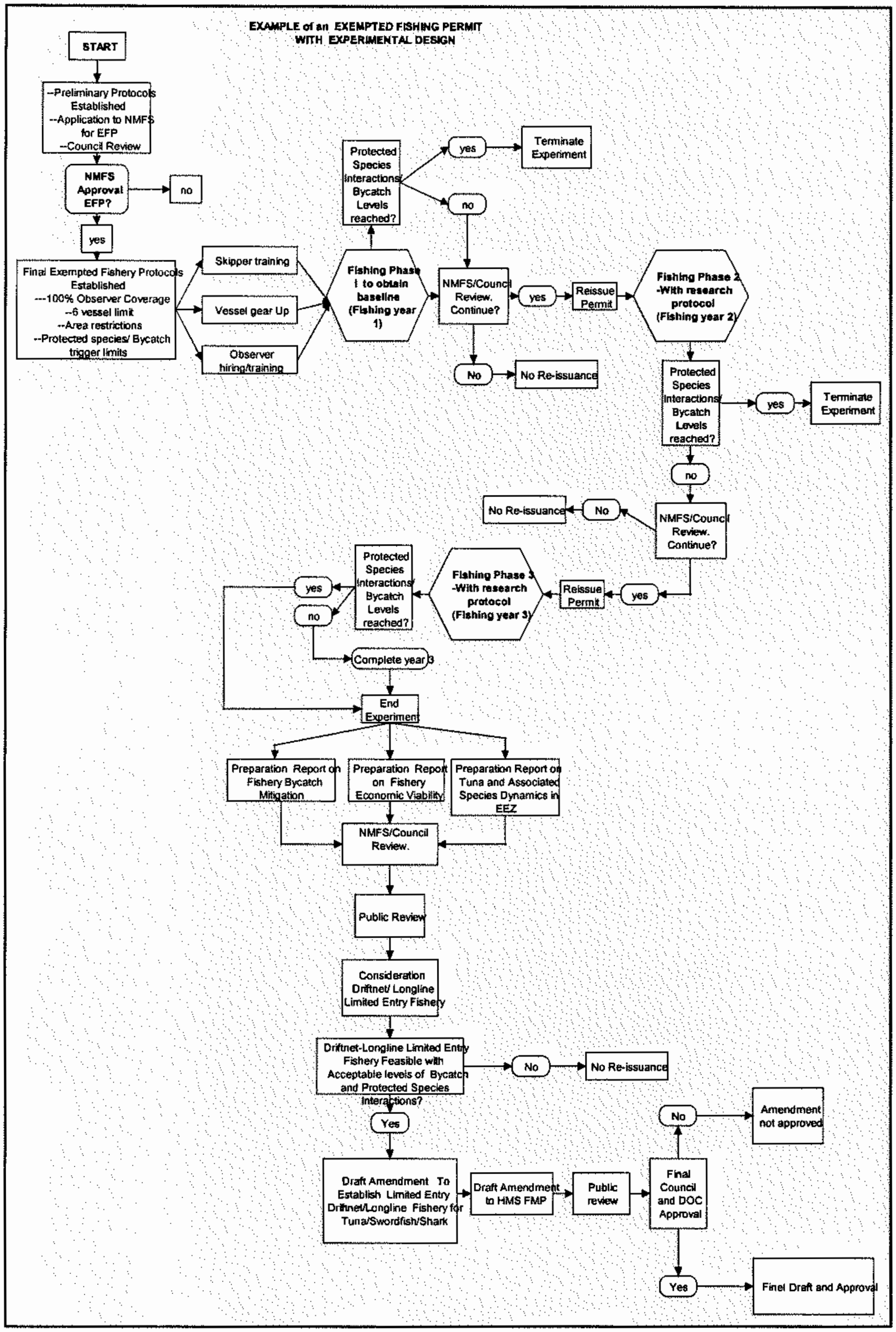
Method: Research experiment under exempted fishing permit (EFP) utilizing 4-6 commercial vessels, 100% observer coverage, area restrictions, and with time line and design as illustrated in the flow chart and described below.

Justification
1. A multi-year, well-documented scientific study is needed to determine definitively if a small, low-bycatch longline fishery for tunas and swordfish is feasible within the California Current, or whether a permanent prohibition of the gear is warranted.
2. Small-scale fisheries that can produce high quality, fresh fish with low bycatch should be promoted, preferably the lowest possible levels of bycatch and protected species interactions.
3. New bycatch-reducing methods may have application to other fisheries in the U.S. and International fisheries.
4. Migrations, movements and preferred habitat of adult bluefin tuna, bigeye tuna and swordfish in the outer EEZ are poorly understood; experiment should concurrently yield important information on their distribution in the West Coast EEZ, their essential habitat, and especially their species associations.

Phase 1 (1st year; simulated fishing with bycatch trigger limits): Determine general areas and seasons for commercial concentrations of tunas/swordfish. During this baseline fishing phase, observers will collect baseline data on bycatch rates (marine mammals, protected/prohibited /vulnerable species per boat-day) in the fishing areas. If bycatch and protected species interaction rates are less than an previously agreed upon trigger level, NMFS/Pacific Council can agree to Phase 2.

Phase 2 (2nd year; establish strata catch rates): Establish areal and season sampling strata based on the Phase 1 baseline information on tuna and bycatch species' distribution. In each stratum, vessels would test catch rates of tunas and bycatch species according to different mitigation procedures (e.g. by season, depth of hooks, time of setting, soak duration, hook, bait type, etc.). Each season, each vessel in each stratum would devote every 3rd to 5th set to a different mitigation procedure (while eliminating the obviously unworkable procedures). Fishing effort in each stratum would be proportional to tuna density, thus the fishers would be working in high tuna/swordfish catch areas. If results are promising, NMFS/Pacific Council can agree to Phase 3.

Phase 3 (3rd year; optimize a fishing strategy): Determine an optimum subset of strata that is practical with respect to catch rates and bycatch reduction to demonstrate the most optimal fishing strategy, as determined from Phase 2. Estimate the overall yield potential and bycatch reduction benefits (extrapolating, based upon the chosen strata and tuna/swordfish movements). If results are promising, NMFS/Pacific Council could consider allowing such a fishery with suitable controls.


EXAMPLE of an EXEMPTED FISHING PERMIT WITH EXPERIMENTAL DESIGN
START
--Preliminary Protocols Established --Application to NMFS for EFP --Council Review
NMFS Approval EFP?
no
yes
Final Exempted Fishery Protocols Established ---100% Observer Coverage --6 vessel limit --Area restrictions --Protected species/ Bycatch trigger limits
Skipper training
Vessel gear Up
Observer hiring/training
Fishing Phase I to obtain baseline (Fishing year 1)
Protected Species Interactions/ Bycatch Levels reached?
yes
Terminate Experiment
no
NMFS/Council Review. Continue?
yes
Reissue Permit
No
No Re-issuance
Fishing Phase 2 -With research protocol (Fishing year 2)
Protected Species Interactions/ Bycatch Levels reached?
yes
Terminate Experiment
no
NMFS/Council Review. Continue?
No
No Re-issuance
yes
Reissue Permit
Fishing Phase 3 -With research protocol (Fishing year 3)
Protected Species Interactions/ Bycatch Levels reached?
yes
no
Complete year 3
End Experiment
Preparation Report on Fishery Bycatch Mitigation
Preparation Report on Fishery Economic Viability
Preparation Report on Tuna and Associated Species Dynamics in EEZ
NMFS/Council Review.
Public Review
Consideration Driftnet/ Longline Limited Entry Fishery
Driftnet-Longline Limited Entry Fishery Feasible with Acceptable levels of Bycatch and Protected Species Interactions?
No
No Re-issuance
Yes
Draft Amendment To Establish Limited Entry Driftnet/Longline Fishery for Tuna/Swordfish/Shark
Draft Amendment to HMS FMP
Public review
Final Council and DOC Approval
No
Amendment not approved
Yes
Final Draft and Approval

This alternative does not pre-judge longline gear to be harmful but instead considers the possibility that longlining and protected species and bycatch responsibilities can be compatible, and that an evaluation under real fishing conditions is needed. The study, carried out under a qualified exempted fishing permit (EFP), by no more than 6 vessels, would also determine if bycatch-safe longline fishing for tunas/swordfish in the outer EEZ is feasible, and can be a sustainable and economically viable alternative to fishing with drift gillnets for West Coast drift gillnet fishery permittees. The EFP process (which would require an annual renewal) would allow an experiment to be conducted in and beyond the EEZ for a specified period of time and under specified conditions. The focus would be on how tunas and swordfish can be caught with the least impact on associated, non-target species. The biology, fishery potential, and effects of fishing, including effects on any protected or vulnerable species incidentally caught, are to be studied. Procedures for reducing the bycatch and mortalities to incidental and protected species will be an integral part of the study. This work would be conducted in the presumed habitat of bluefin and other deep tunas: north of Pt. Conception in waters greater than 25 miles off shore; south of Pt. Conception in waters west of the Santa Rosa - Cortez Ridge (the California Current oceanographic regime). Chartered longline vessels would be used, initially allowing those vessels to find and catch deep tunas for a data baseline, with the scientific sampling and gear experiments to be adapted to the fishing as it develops, as it can be modified, and as is practical. An example of one type of EFP experimental fishery-research experiment is provided on p. 74-75. Intent and protocols would be similar to those in Alternative 3, but would differ in that the experiment is 1) linked to a gear replacement option for the existing limited entry DGN fishery, and 2) does not have the bycatch/protected species reduction goal of "negligible impact," but rather has the goal of reducing bycatch rates to 'significantly less' than by driftnet in terms of removals/mortality (and to the greatest extent practicable, below those rates). Thus the minimum acceptable bycatch rate for continuing the experiment to its duration, would be bycatch/protected species take rates significantly less than drift gillnet rates. The level of significance would have to be established prior to issuance of the EFP and win approval by the Council/NMFS/relevant advisory bodies. It was thought that the criteria of "negligible impact," interpreted to mean impact at or near zero, was too stringent, in that even healthy populations respond to harvest removals (population reduction, size/age structure changes, etc). The experiment protocol would also establish "trigger" bycatch levels so the experiment could be terminated should observed bycatch rates be unacceptably high. Directed fishing for target species would be allowed at the beginning of the experiment, within specified temporal and spatial bounds, to more realistically determine associated bycatch rates in areas and depths most likely to be fished and to better estimate fishery impacts on bycatch/protected species. The acceptability of the bycatch rates demonstrated by the experiment on its completion, in view of authorizing any future gear replacement option for the limited entry DGN fishery, would be determined by the Council/NMFS/relevant advisory bodies, and through the federal regulatory and FMP amendment process, at the termination of the experiment. If found acceptable, participants in the drift gillnet fishery would be allowed the option of choosing to fish in any given year either with pelagic longline or driftnet gear within areas and at times and under restrictions specified by the Council.

Issues

- Longlining in EEZ would be prohibited until there is experimental evidence that the gear used would have impact not harmful to bycatch and protected species (as opposed to negligible impact). Reduction of bycatch to rates significantly less than what currently exists in the drift gillnet fishery is thought to be a more realistic improvement goal, and also more inducive for fishery and gear improvements.

- As an NMFS-Industry cooperative study, the public shares the costs of developing an experiment that may result in a replacement fishery able to produce sustainable amounts of seafood for consumers without harmful effects on bycatch and protected species interactions.

- Council and its advisory bodies can decide on the risks and advantages of the experimental gear and methods on the basis of gear experiments and fishery data obtained under conditions of real fishing for targeted species.

Impact on Target Species, Fish Bycatch and Protected Species - EEZ Longline Alternative 5:

This alternative, for determining if "clean" longline fishing for large pelagics in the EEZ is possible, focuses on reduction of overall bycatch and protected species take rates, with the intent of allowing a fishery if its take rates are not harmful to those species (as opposed to having negligible impact). Specifically, it provides for an EFP experiment (not a trial fishery) to determine if longlining for large pelagics is practical in terms of acceptably low bycatch rates. As in Alternative 3, there is some risk of bycatch and protected species interactions once the experimental fishing begins, so similar take-rate trigger criteria will be developed so that the experiment can be terminated quickly should unacceptable levels occur. Since a prime objective is to assist fisheries in reducing bycatch and protected species takes to acceptable levels, the experiments in bycatch reduction will be conducted within the context of actual commercial-style fishing for targeted species. This will (a) help in finding bycatch-reducing methods that are practical and relevant to actual fishing, and (b) provide to the Council and relevant advisory bodies/agencies realistic fishery data from which they can directly judge the costs, benefits, and possible harm from such fishing. By its nature, this alternative would encourage fishers to participate, cooperate, and innovate along with government and other scientists. It is meant to encourage the possibility of a sustainable, low bycatch fishery in the long term, which could be profitable regionally and serve as an example for longline fisheries elsewhere in the world.

This alternative recognizes that if longlining in the California Current can be conducted without substantial adverse impacts from bycatch, protected species interactions, or incidental catch of recreational species, a valuable additional source of high-quality fresh fish would become available with a net benefit to the Nation. New scientific insights based on data could lead to better knowledge of the species and improved international management of the targeted tunas. It further recognizes that conservation of resources exploited by international fleets on the high seas may well depend economically and politically on maintaining healthy domestic fisheries that are held to the standards of the Magnuson-Stevens Act and protected species legislation. Any beneficial modifications of fishing gear or techniques also could be made available to international organizations and other governments for adoption in other fleets and management programs.

EFP fishing would target principally deep-swimming tunas and swordfish while using methods to avoid non-target species and to maintain bycatch and protected species interactions below trigger levels. The targeted species, especially bluefin, are also targets of recreational anglers in more inshore waters. It is possible that higher densities of deepwater tunas may occur in the California Current than in the warmer oceanic waters beyond the EEZ, as indicated by logbook data from 276 longline trips out of California and 33 trips out of Hawaii (See Table 9-7, catch rate data, A. Coan, NMFS/SWFSC, La Jolla, CA, pers. commun.). These data indicate the temperate/subtropical bluefin and bigeye tunas are more available east, rather than west, of 135° W longitude. It is already known, too, that giant bluefin tuna sometimes occur at the inner edge of the California Current, near islands and banks of the Southern California Bight (Foreman and Ishizuka 1990). The data indicate that catches of juvenile shortfin mako and adult and juvenile common thresher sharks may decrease in the California Current, as they do with distance from shore in the drift gillnet fishery. But this may not be the case for the more oceanic blue shark. (See Alternative 4, Impact on Fish Bycatch).

Bycatch of striped marlin is a possibility, but capture of marlin would be minimized, since the experimental fishing would be primarily at depth in the cool waters of the California Current (see also discussion in the Fish Bycatch section of analysis of Alternative 4). Logbook data also indicate that tropical/subtropical striped marlin tend to be more abundant west of 135° W longitude, well outside the California Current. This is consistent with the fact that this marlin occurs seasonally in the SCB within tropical waters moving northward on the inshore coastal side of the Current.

There is, nevertheless, real potential for the taking of albatrosses and turtles in daytime longlining for tunas in the California Current, and the EFP experiment must carefully investigate this hazard and its mitigation. From their habit of scavenging and feeding at the surface, albatrosses are frequently caught on baited longline hooks as they are deployed. A small sample representing data from 6 observed longline trips originating from Hawaii and California, that fished both east and west of 135° W longitude (Table 9-9; 1994-2000 data, A. Coan, NMFS/SWFSC, La Jolla) had seabird catch rates higher east of 135° W longitude than in the central waters to the west (0.25 vs 0.10 albatross/1,000 hooks for 15 albatross), although because of the small sample size, the difference was not statistically significant. Black-footed Albatross are present year round off the West Coast, but more so during winter-spring. They are more abundant in the California Current outside the Southern California Bight, as subtropic-subarctic transition waters are important in their feeding (Hyrenbach 2001, Sanger 1974). On the other hand, the same data indicated slightly lower catch rates of leatherback and loggerhead turtles east of 135° W longitude (0.05 vs. 0.10 turtles/1,000 hooks for 11 turtles), so it is possible that measures to protect turtles from longline gear can be less stringent for the California Current than for the central Pacific (as in the WPRFMC Pelagics FMP).

Management Costs–Enforcement, Data Processing and Administration - EEZ Longline Alternative 5

As this alternative is a fishing gear-bycatch study to examine the feasibility for a gear replacement option for an existing fishery, there is no anticipated fishery management costs. However, administrative costs would be incurred for conducting experiments, reviewing ongoing progress, analyzing data, and preparing final reports. These costs could be substantially greater than for Alternative 4, especially because of charter costs.

Economic Impacts - EEZ Longline Alternative 5

This alternative could pave the way for the development of a longline fishery within the U.S. West Coast EEZ, targeting swordfish and tunas, which would increase net economic benefits. The resulting longline fishery would consist of vessels that hold current DGN permits and they would be allowed to fish one or the other gear, not both, subject to time/area/other restrictions established by the Council. DGN vessels are currently experiencing increased constraints on their traditional fishing operations, and a longline fishery within the EEZ would afford them an opportunity to engage in a fishery that would not already be oversubscribed. Under these circumstances, there would likely be a minimum of new investment in the fishery if existing DGN vessels can easily convert to longlining, which could realize a significant savings in investment costs. Each vessel eligible to fish in either the DGN or longline fishery would likely select the fishery that would yield the greatest net return. In aggregate this is expected to yield the greatest producer surplus over the range of HMS fishing opportunities available to these vessels. Benefits to consumer would likely increase from additional supplies of tuna and swordfish. Because the EEZ longline fishery would be predicated on experimental evidence that the gear would not have a detrimental impact in terms of bycatch and protected species interactions, recreational and non-consumptive benefits are not expected to be affected. Overall, there would seem to be an increase in net national benefits from a bycatch and protected species friendly longline fishery in the EEZ. (See also, the discussion of economic impacts for EEZ Longline Alternative 4)

Community Impacts - EEZ Longline Alternative 5

Localized fishery-associated communities would benefit if a viable and safe longline fishery develops in the EEZ. Increased landings of HMS expected with the development of a longline fishery following Alternative 4, would lead to an increase in shoreside economic activity. West Coast ports, particularly in southern California, would probably experience increased employment in the HMS processing, distribution and related sectors. Increased employment and employment income would filter through the local economy in the form of increased purchases from area businesses.

Impact on Essential Fish Habitat - EEZ Longline Alternative 5

There is little expected impact to EFH from the conduct of this longline/bycatch fishing experiment, other than the relatively remote chance of longline fishing gear being accidentally lost at sea and entering the pelagic zone, if only temporarily. Should use of light sticks be permitted in the experiment, these positively buoyant plastics have the potential of being lost and remaining in the pelagic environment for some time. These sticks present a potential hazard to albatrosses and possibly sea turtles, who might ingest them mistaking them for food. The sticks are not likely to alter the water quality itself. Additional information on light sticks is provided in the *Impact on Essential Fish Habitat* analysis of the EEZ longline Alternative 4, and would be applicable here.

Monitoring and Data Needs - EEZ Longline Alternative 5

This experiment would require a high level of data collection to monitor species taken and to conduct experiments. Presumably all vessels would carry observers or scientific technicians to gather data from the experiment.

Consistency with the Western Pacific FMP - EEZ Longline Alternative 5

WPFMP consistency would not be an issues until a longline-gillnet replacement fishery is actually considered for approval, and if so, effects would be similar to those discussed in analysis of the industry-proposed Alternative 4.

User Conflicts - EEZ Longline Alternative 5

Conflicts between commercial fishers and sport and conservationist groups could increase if this alternative is viewed as a precedent for opening and encouraging possible future expansion of longlining in the EEZ rather than an experimental study attempting to solve present and future bycatch problems in the West Coast drift gillnet and national and international high seas longline fisheries.

Safety at Sea Issues - EEZ Longline Alternative 5

Safety at sea could become a consideration if this study recommends mitigation procedures for protected species that endanger fishers.

Relation to Objectives of this HMS FMP - EEZ Longline Alternative 5

This alternative supports the FMP objectives of providing long term supplies of quality local fish, providing for diverse fisheries, acquiring scientific information, and complying with federal protected species legislation.

Consistency with International Obligations - EEZ Longline Alternative 5

This alternative is consistent with international management in that management and conservation must work within the context of existing fisheries.

9.2.5.2.2 Longlining Outside the EEZ on the High Seas:

High Seas Longline Alternative 1: (No Action):

High Seas Longline Alternative 2: (Proposed):

Under this alternative, all of the restrictions applied to Hawaii-based longline vessels would also apply to West Coast-based longline vessels when fishing west of 150° W longitude. However, West Coast-based longline vessels fishing east of 150° W longitude would only be subject to *selected* restrictions. This would allow West Coast-based vessels to target swordfish east of that line (except for a partial closure in April and May[4]). Restrictions adopted are for controlling sea turtle and seabird interactions and for monitoring the fishery. It is recognized that a Section 7 consultation under the ESA will be conducted and may result in recommendations for additional measures to protect sea turtles in the future. The Council will then evaluate the benefits and costs of alternative ways to achieve the protection needed pursuant to the ESA.

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[4] Longlining would not be allowed in the area bounded by 0° latitude and 15° N latitude and 145° W longitude and 180° W longitude from April 1 through May 31 (Hawaii high seas longline control No. 4, Chapter 8 section 8.5.2).

The Western Pacific-based longline measures that would initially apply to vessels fishing east of 150° W longitude would be nos. 1,4, 8 and 9 listed in Chapter 8 section 8.5.2, including measures for avoidance, release and handling of turtles and seabirds, as well as the requirements for attending protected species workshops and for vessel monitoring systems. The measures that would not apply to these vessels would be Nos. 2, 3, 5, 6 and 7, which pertain to gear and techniques associated with the targeting of swordfish.

High Seas Longline Alternative 3: Applies to West Coast-based longline vessels all conservation and management measures applied to Hawaii-based longline vessels to control sea turtle and seabird interactions and monitor the fishery. Future measures are to be developed by PFMC in cooperation with other regions/councils.

Analyses of Alternatives:

Analysis of High Seas Longline Alternative 1: (No Action): Under this alternative, the FMP would not propose regulations limiting longline fishing on the high seas by vessels based on the West Coast. Other than existing state regulations and HSFCA permit and reporting requirements now in place, fishing would continue without new regulations. It is recognized that NMFS could establish regulations under its own authorities to ensure protection of sea turtles and sea birds. See section 9.1 for a discussion of the likely future for this fishery under this alternative.

HIGH SEAS PELAGIC LONGLINING (BEYOND THE EEZ)--
Measures Considered:

- Alternative 1: No action
- Alternative 2 (Proposed): Adopts *selected* seabird and sea turtle measures currently required for the Hawaii-based longline fishery, allowing swordfish targeting to continue east of 150° W longitude, but not west of that line. Calls for area-specific analysis of protected spp. and bycatch risks.
- Alternative 3: Adopts *all* seabird and sea turtle protective measures currently required for the Hawaii-based longline fishery. Future measures to be developed by PFMC in cooperation with other regions/councils.

Analysis of High Seas Longline Alternative 2 (Proposed): This alternative would subject West Coast-based longline vessels to the same measures applicable to Hawaii-based longline fleet for protecting sea turtles and seabirds and for fishery monitoring (including a swordfish targeting ban) when fishing west of 150° W. longitude; but only selected measures (Nos. 1, 4, 8 and 9 listed in Chapter 8 section 8.5.2) would apply to vessels when fishing east of 150° W longitude. Measures not adopted for vessels fishing east of 150° W longitude, are Nos. 2, 3, 5, 6, and 7, which would prohibit certain gear configurations and techniques associated with targeting of swordfish (restrictions on fishing depth, possession of light sticks, and ban on swordfish fishing north of the equator). Thus vessels fishing east of 150° W longitude could target swordfish, while those fishing west of that line could only target tuna and other non-swordfish species. It is recognized that NMFS will conduct a Section 7 consultation under the ESA to determine if the fisheries as they would operate under the FMP would pose jeopardy for one or more species listed under the ESA and to develop reasonable and prudent alternatives in the event of a jeopardy finding. This could result in establishment of additional measures for the protection of turtles and seabirds in areas fished by the West Coast-based high seas longline fleet in the eastern Pacific (see also discussion under analysis of Alternative 3, which proposes to adopt *all* current WPRFMC longline measures).

The West Coast-based fishery, based on analyses of California skipper logbooks of California-based vessels fishing during 1994-2000, largely fished closer to the U.S. mainland, especially east of 140°-150° W longitude (Figure 9-3, Hawaii- and California-based longline logbook unpubl. data, A. Coan and D. Prescott, NMFS/SWFSC La Jolla, CA 8/01; Tables 9-13 and 9-14, J. Caretta, pers. com. SWFSC, NMFS, La Jolla, CA 4/03, unpub. data). The fishery has not received large enough observer coverage to fully evaluate protected species risks to date, but analysis and modeling of more recently accumulated observer data, fishery dynamics, and known turtle dynamics may allow such a determination to be made. Protective measures might be developed based on analysis of species risks in the main swordfishing areas of the West-Coast based fleet east of 150° W longitude. A recent analysis examining sea turtle take rates east and west of this line, using combined Hawaii and California vessel observer data was carried out during spring of 2003 by NMFS (Table 9-13, J. Caretta, pers. com. SWFSC, NMFS, La Jolla, CA 4/03, unpub. data). Results indicated that leatherback and loggerhead turtle hooking rates were not significantly different east and west of 150° W longitude. Nominal rates appeared lower east of the 140° W longitude, but the results were inconclusive. The biological impacts of the hooking rates on the turtle populations were not assessed.

Certain new mitigation and monitoring measures would apply to all California-based vessels regardless of fishing area, such as sea turtle handling and resuscitation measures as required by the Hawaii fleet, and annual attendance at protected species workshops. To protect albatrosses, thawed, blue-dyed bait and practicing strategic discard of offal would be required in all areas, as well as adequate observer coverage. VMS would be required to enforce area closures.

Restrictions on targeting swordfish, use of light sticks, and depth of sets would initially be imposed on all U.S. longline fishing vessels fishing west of 150° W longitude and landing in either WPRFMC or PFMC ports, but not those fishing east of this line. If NMFS concludes that this would pose jeopardy for one or more listed species, NMFS will identify reasonable and prudent alternatives which would avoid jeopardy. The Council would then consider how best to achieve the needed additional protection for the species in question. In addition, as more information on the fisheries is obtained and future recommendations are made, other separate measures could be developed and tailored to address interaction problems with ESA-listed species appropriately. The Council notes, however, that interaction rates and/or levels with sea turtles and seabirds east and west of 150° W longitude may differ due to different oceanographic conditions and features and associated species assemblages. Findings from consultations and fishery monitoring may result in future area-specific mitigation measures for the two fleets, while maintaining general regulatory consistency in areas where the fisheries overlap.

It is noted that at the time of this writing, no reliable or comprehensive analyses of impacts of observed take rates on protected species populations, and protected species distributions are available to the Council to determine what the appropriate controls east of 150° W longitude might be. Both fisheries exploit areas utilized by leatherback turtles, and both overlap portions of the 8,000 km long Transition Zone Chlorophyll front (TZCF), a known habitat of loggerhead sea turtles (Polovina et al. 2000). This habitat lies between 30° - 45° N latitude (the subarctic-subtropical transition zone) in the central Pacific west of 130° W longitude. There is a need to specifically examine the area bounded by 30° N - 35° N latitude and 125° W and 130° W longitude, where greater than 36,000 longline hooks have been set since 1994 (Hawaii- and California-based longline logbook unpubl. data, A. Coan and D. Prescott, NMFS/SWFSC La Jolla, CA, 9/01), because of recent evidence of a potential leatherback turtle migratory corridor there (NMFS 2001a; Dutton, Benson and Eckert 2003, unpub. data, NMFS/SWFSC La Jolla, CA). Certain time or area closures or gear modifications might be developed to avoid mortality to turtles during critical transit times through these areas after additional data have been obtained through the recommended observer coverage under this FMP.

Protected Species Impacts - High Seas Longline Alternative 2

Implementation of selected measures to protect turtles and seabirds should reduce protected species interactions and mortality, since West Coast longliners would no longer be unregulated with respect to protected species. The rule currently in effect is expected to be eventually superceded by a regulatory amendment to the Western Pacific Pelagics FMP.

Limited observer data indicate that turtle takes may be less frequent in the eastern north Pacific fishing area as compared with the central north Pacific, but that takes of albatross may be a potential problem. A small sample representing data from six observed longline trips originating from Hawaii and California that fished *both* east and west of 135° W longitude. (1994-2000 data, A. Coan, SWFSC, La Jolla, Tables 9-8, 9-9) has indicated that catch rates of endangered leatherback and loggerhead turtles are lower east compared to west of 135° W longitude (0.05 vs. 0.07-0.10 turtles/1,000 hooks for 11 turtles). Seabird catch rates were higher east of 135° W longitude (0.25 vs 0.10 albatross/1,000 hooks for 15 albatross). These differences, however, were not statistically significant, with such a small sample size (D.W. Au, 6/3/02 SWFSC/NMFS, La Jolla, CA pers. comm).

Additionally, preliminary examination of the distribution of protected species takes (including live releases), as recorded in vessel logbooks of both the Hawaii-based and U.S. West Coast-based longline fleets combined, indicate that both albatross and turtle interactions in the eastern North Pacific may be as high or higher in certain areas than in the central and western Pacific (Hawaii- and California-based longline logbook unpubl. data, A. Coan and D. Prescott, NMFS/SWFSC La Jolla, CA 9/01). Additional observer data are needed to confirm this, because of possible biases associated with logbook information, especially differences between the two fleets in the reporting of protected species interactions. These logbook data were examined only to determined broad east and central north Pacific differences in the distribution patterns of protected species, not to estimate levels of total take representative of either of these fisheries.

Because of the limited amount of observer data for the California fleet, data from Hawaii swordish longliners (1997-2001) that fished east of 150° W longitude were pooled with the California data (2001-03) to provide more statistical power for comparing interaction rates. These data were presented to the Council in March and June 2003 by NMFS, comparing overall take rates east and west of 150° W longitude. Results indicated that, when taking the large area east of 150° W longitude as a whole, loggerhead and leatherback turtle interactions are not statistically different from those west of that line (Tables 9-13, 9-14 and 9-15). No green and only two ridley turtles were observed taken east of 150° W longitude. Data were also summarized for the area closer to the West Coast (east of 140° W longitude), and compared to data from observed vessels fishing west of 140° W longitude out to 150° W longitude (Table 9-14, Table 9-15). No ridley turtles or Laysan Albatross were taken east of 140° W longitude. Significantly fewer loggerhead turtles were taken east of 140° W longitude, but this may partly be due to lowered fishing effort there. Because these two 'east' and 'west' areas did not have the same distribution of fishing effort by time (fishing quarter), no insights on turtle densities could be inferred. As observed in the earlier data, Black-footed Albatross rates were relatively high east of 150° W longitude (average ~0.23/1000 hooks for all quarters). They were also significantly higher east of 140° W longitude in the 4th quarter when LL fishing is nearer to the EEZ, and highest in the first quarter, especially east of 140° W longitude (as high as 0.38 per 1,000 hooks).

To get a preliminary estimate of projected fleetwide takes, both pooled (California and Hawaii-observed) and California-observed fleet interaction rates were used to obtain expanded or derived estimates of the number of sea turtle takes that might occur at various levels of fishing effort east of 150° W (Table 9-15). Based on NMFS' estimate that the California-based fleets set approximately 1.55 million hooks in 2002, approximately 174 loggerhead and 53 leatherback would be taken per year. If interaction rates from the CA-only data applied, 167 loggerhead and 20 leatherback turtles would be taken. Fewer takes are estimated if fishing is restricted to east of 140° W, especially if using the rates from the CA-only data (zero loggerhead takes) and the lesser 1 million level of hook effort.

NOAA Fisheries has adopted as current national policy, the following mortality rates to use for different types of sea turtle takes:

- Entanglement, no hooking, release without apparent injury - 0;
- External hooking, with or without entanglement – 0.27, and
- Internal hooking in the mouth or ingested – 0.42.

An initial review has suggested that most observed takes of loggerhead turtles involve some form of hooking, while leatherback takes are principally entanglements, with some involving hooking. Preliminary estimates, based on an average mortality rate of 0.27, are presented in Table 9-15. A final determination of projected mortalities is still pending examination of observer data in more detail to determine the types of takes that occurred.

Long term effects of implementing this alternative cannot be fully evaluated until determinations are made concerning the impact on protected species populations, and the resulting mitigation measures or area closures are proposed.

Management Costs: Enforcement, Data Processing and Administration - High Seas Longline Alternative 2

There would be a substantial increase in management (especially enforcement) and data acquisition costs to monitor closed areas and to provide adequate observer coverage. Coverage of 20 -100% may be needed initially to obtain reliable and statistically valid data, and also for adequate enforcement, especially if area-specific measures are required (unless alternate surveillance methods prove suitable). VMS costs were described below under *Monitoring and Data Needs*. Cost is relatively high for the VMS unit ($2,500-$3,000), installation ($750) and maintenance ($500/yr) and annual transmission costs ($750/yr).

Impact on Target and Incidental Fish Populations - High Seas Longline Alternative 2

The effect on HMS fish populations will likely not be significant because the fishery is a small portion of an international fishery, and any possible increase would not likely be enough to be measurable. Fish bycatch would decrease because of a possible reduction in swordfish target effort west of 150° W longitude, and its effect on the catch of co-occurring species. Impact of any future measures would have to be evaluated when details are established concerning any recommended area-specific closures or mitigation measures specific to the West Coast-based fishery.

Economic Impacts - High Seas Longline Alternative 2

This alternative could be costly to longliners (though less costly than a complete ban of swordfish targeting), depending upon the regulations adopted, thus reducing producer and consumer benefits. In 1999, the real ex-vessel revenue of swordfish landed by longline gear on the West Coast was $4,738,191, which was 80% of the fleet's ex-vessel revenue. The more shallow gear used to harvest swordfish is the fishing practice that impacts sea turtles, and thus gear modifications to protect turtles and seabirds would likely lower swordfish catches. Fishers may also have to incur some of the cost of monitoring equipment such as VMS, although many vessels already have this equipment installed and will only have to pay transmission fees (see above under *Management Costs* and also below under *Monitoring and Data Needs*). Net benefit to the Nation could possibly increase because of the high existence value of the protected marine turtles and birds. Hawaiian longliners would not be able to circumvent their protected species mitigation regulations by fishing out of West Coast ports, and West Coast businesses expecting revenues from serving those vessels may be disappointed. If subsequent analyses prove that swordfish longlining in the fishing grounds of the West Coast-based fleet results in less impact on turtles and other protected species (or that these interactions can be avoided), its successful development could lead to increased economic benefits to the fishery and the Nation. If subsequent analyses prove that swordfish longlining in the fishing grounds in the eastern north Pacific action area has potential for the same or greater impact on protected species, the fishery may not be able to operate unless ways to avoid jeopardy to protected species can be developed.

However, additional costs would be involved to gather data to determine regional-specific risks of the fishery and solutions to address those risks. This would raise the costs to NMFS or industry or both. There is likely to be substantial longline fishing out of West Coast ports under this alternative only if research or EFP fishing demonstrated ultimately that, with or without changes in gear or techniques, there would be no substantial protected species interactions, such that targeting swordfish would be permissible.

Impact on Essential Fish Habitat -High Seas Longline Alternative 2:

The primary effect on EFH may be the accidental loss of fishing gear, primarily swordfish light sticks. This issue is discussed in more detail in the *Impact on Essential Fish Habitat* analysis of the EEZ longline Alternative 4, section 9.2.5.2.1.

Monitoring and Data Needs - High Seas Longline Alternative 2

Data needs other than for enforcement and catch monitoring would not be directly affected. VMS would be an efficient, but expensive means of enforcement, but many vessels already have VMS equipment installed. High rates and extended duration of observer coverage would be necessary to monitoring takes of seabirds and infrequently occurring protected species and compliance with mitigation procedures. Observer coverage of 20-100% was recommended to adequately evaluate extremely rare encounter events with protected species, and at its meeting in June 2003, the Pacific Council supported the HMSPDT's recommendation for increased observer coverage for this fishery.

Data and analyses will be needed to compare the dynamics of the two fleets (Hawaii-based and California-based), their respective fishing grounds, and similarities and differences in risks to protected species by the two fleets, especially from the West Coast fleet perspective and for the area east of 150° W longitude.

Consistency with the Western Pacific FMP - High Seas Longline Alternative 2

This alternative addresses the current inconsistency concerning most mitigation procedures used aboard vessels for protected species; however, it would still allow targeting of swordfish east of 150° W longitude, and future protected species mitigation measures may differ. There may be regulatory inconsistencies based on areal or other differences in species complexes and encounter rates, which would warrant a different set of mitigation measures, but these would not be inconsistent with providing required protection to protected species.

User Conflicts - High Seas Longline Alternative 2

Implementation of this alternative may reduce potential conflicts between western Pacific and eastern Pacific longline fishers who now abide by different rules but who have the capability of fishing the same areas. Competition in West Coast ports would continue to increase as long as Hawaii longliners are able to relocate here to escape the more stringent western Pacific regulations that now ban targeting of swordfish north of the equator. Also, west-coast based fishers, who now target swordfish, may oppose being forced to comply with western Pacific species protection rules developed for another jurisdictional area.

Safety at Sea Issues - High Seas Longline Alternative 2

Safety at sea could be affected if mitigation procedures for protected species involve risk to fishers.

Relation to Objectives of this HMS FMP - High Seas Longline Alternative 2

FMP objectives for promoting inter-regional management and compliance with protected species laws would be met, and a solution providing for both high seas longlining and protected species would promote diverse commercial fisheries.

Consistency with International Obligations - High Seas Longline Alternative 2

There would be consistency with national and international obligations on protecting vulnerable or endangered species, including NPOA-Seabirds regarding seabird takes in longline fisheries. Observer data collection recently implemented will help to better assess the threat to protected species of continued swordfish targeting east of 150° W longitude. It would also help evaluate progress in reducing overall takes and mortality of these species in the West Coast-based pelagic longline fishery beyond the EEZ.

Analysis of High Seas Longline Alternative 3: This alternative proposes to adopt *all* seabird and sea turtle measures currently required for the Hawaii-based longline fishery. These measures include measures to establish consistent management of U.S. longline fishing on the high seas in the Pacific by incorporating conservation and management measures that longline fishing vessels holding western Pacific longline limited entry permits must comply with to protect sea turtles and sea birds.

Issues

- Mitigation procedures for protected species (primarily turtles and seabirds) used aboard vessels would be consistent with rules for the Hawaii longline fishery.

- May require VMS or other monitoring devices to enforce specific area closures under both Council jurisdictions on the high seas and increased mandatory observer coverage, possibly up to 100%.

- Will likely severely restrict the West Coast-based high seas longline fishery, since it relies heavily on targeting swordfish. This practice would become illegal north of the equator to comply with the same mitigation measures as the Hawaii (WPRFMC) fleet.

- Supply of fresh U.S. West Coast-caught swordfish/tuna reduced or eliminated.

As of this writing, certain seabird and sea turtle protective measures are required for the Hawaii-based pelagic longline fishery. On June 12, 2002, 67 FR 40232, NMFS promulgated a final rule (amending portions of 50 CFR Part 660, Subpart C-Western Pacific Pelagic Fisheries) that implements the reasonable and prudent alternative of the March 29, 2001 Biological Opinion issued by NMFS under the Endangered Species Act. This rule is intended to reduce interactions between endangered and threatened sea turtles and pelagic fishing gear and to mitigate the harmful effects of interactions that occur. The rule prohibits the targeting of swordfish north of the equator by Hawaii-based longline vessels and closes all fishing to longline vessels during April and May in waters south of the Hawaiian Islands (for 15° N latitude to the equator, and from 145° W longitude to 180° W longitude). It prohibits the landing or possessing of more than 10 swordfish per fishing trip by longline vessels fishing for other HMS north of the equator and allows re-registration of vessels to Hawaii longline limited access permits only during the month of October. It also requires all longline vessel operators to annually attend a protected species workshop, and requires utilizations of sea turtle handling and resuscitation measures. The final rule for seabird mitigation measures effective May 14, 2002, requires vessels operating north of 23° N latitude to employ a line-setting machine with weighted branch lines or use basket-style longline gear, and to use thawed blue-dyed bait and strategic offal discards during the setting and hauling of longlines. It also requires owners or operators of these vessels follow certain seabird handling techniques and annually complete an annual education workshop.

It is noted that these regulations may be extended or amended through action of the Western Pacific Fishery Management Council in the near future. The framework procedures of the FMP would provide a mechanism for rapid change in regulations under this FMP to resolve any new inconsistencies that would be problematic.

This alternative addresses the need to provide similar protection against adverse impacts of longline fishing on sea turtles and birds as is provided by the rules that operators of Western Pacific Regions longline limited entry permit vessels are subject to. It would be inconsistent to impose many constraints on one fleet but not another when they may fish the same north Pacific areas and encounter sea turtles and sea birds in the same manner and degree. Measures for the West Coast fleet must follow the principle that species that have been determined to be in need of protection are fully protected by all U.S. fishers regardless of management jurisdiction.

The initial adoption of these WPRFMC regulations does not imply that future development and adoption of regulatory measures will necessarily follow in 'lock step' with that of the WPRFMC. Future measures will be developed by the Pacific Council in collaboration with other NMFS regions, Pacific fishery management councils, and international management bodies.

Adoption of this alternative would eliminate targeting swordfish by prohibiting West Coast-based longline vessels from making sets that are made at times and with gear (e.g., light sticks) and at depths that generally are intended to catch swordfish. This would greatly reduce or terminate the California-based fishery and also end the developmental longline fishery authorized by Oregon in waters greater than 25 miles from shore within the EEZ. There are 37 high seas longline vessels operating from West Coast ports. Many of these vessels are owned and operated by Vietnamese Americans (see section on Economic Impacts). These vessels land principally in the ports of San Diego, San Pedro and Ventura. The extent of any impacts of a prohibition of longline swordfish landings depends on what individual vessel owners/operators choose to do in response to such action. Alternatives include: 1) quit fishing, 2) switch to another fishery off the West Coast or elsewhere, 3) continue longlining and land tuna and other non-swordfish pelagic fishes in either Hawaii or West Coast ports, or 4) re-flag their vessel and continue swordfish longlining. It is difficult to predict what they would do and therefore difficult to estimate impacts. It is noted that many of the vessels have or would be eligible for restoration of their western Pacific longline limited entry permits and could readily return to that area if it appeared more likely to support alternatives to controlled longline fishing outside the EEZ adjacent to the West Coast.

But adopting regulations/rules to protect turtles and albatrosses in longline fishing areas would prevent longline vessels based, or intending to base, on the West Coast from fishing free of the regulations with which other U.S. longline vessels must comply. West Coast longliners that fish in areas used by holders of western Pacific longline limited entry permits would be subject to the same species-protection standards, especially when fishing in areas designated as high risk to protected species. The California-based high seas longline fishery, based on analyses of California skipper logbooks of California-based vessels that fished during 1994-2000, largely fishes closer to the U.S. mainland, especially east of 140° W longitude (Hawaii- and California-based longline logbook unpubl. data, A. Coan and D. Prescott, NMFS/SWFSC La Jolla, CA 8/01; see Figure 9-2). More recent data have revealed this fleet has increasingly fished further west of 140° W longitude out to about 150° W longitude, following swordfish westward from the 4th to the 1st quarter of each year (J.V. Carretta unpubl. data 4/15/03, NMFS SWFSC La Jolla, CA) (Tables 9-13,14,15). The fishery has not received large enough observer coverage to fully evaluate protected species risks to date, but analysis of more recently accumulated observer data, fishery dynamics, and known turtle dynamics may allow a determination to be made in the future that prohibition of swordfish sets is not necessary. For the present time, however, this prohibition was proposed until that new information is available.

Protected Species Impacts - High Seas Longline Alternative 3

Implementation of measures to protect turtles and seabirds should significantly reduce protected species interactions and mortality, since West Coast high seas longliners would no longer be unregulated with respect to protected species. Therefore, the fishery may cease to exist if targeting swordfish is banned. Thus seabirds and marine turtles may be given complete protection from at least this small fleet. Even if some longliners re-target their high-seas longlining to tunas during the 4th and 1st quarters, preliminary observer data from the Hawaii fishery during 2001 indicate sea turtle interactions will be much less and seabird takes virtually insignificant with such fishing and with use of shipboard mitigation measures. Albatrosses, especially the black-footed, and the endangered leatherback and loggerhead turtles that are of great concern would be the main beneficiaries of eliminated or reduced high-seas longlining. But the magnitude of any benefits would depend on the amount of takes and effects on the populations, for which reliable estimates are not currently available. Adequate observer coverage is needed. Takes of marine mammals are already low in this fishery, so any decreases in interactions might not be significant.

Bycatch Impacts - High Seas Longline Alternative 3

Bycatch and bycatch mortality would be reduced to the extent that effort is reduced or eliminated, but as stated above vessels may choose to land elsewhere. Furthermore, this action would have no impact on foreign longline fisheries which do not operate under U.S. bycatch policy.

Management Costs: Enforcement, Data Processing and Administration - High Seas Longline Alternative 3

There would be a substantial increase in management (especially enforcement) and data acquisition costs to monitor closed areas and to provide adequate observer coverage, unless the ban on swordfishing causes vessels to drop out of the fishery or relocate elsewhere. In the latter case, management cost would be transferred elsewhere. Assuming the fleet remains intact, coverage of 100% may be needed initially to obtain reliable and statistically valid data, and also for adequate enforcement, especially if area-specific measures are required (unless alternate surveillance methods prove suitable). Certain management costs would depend on the level and type of activity and where the activity is located, and on any requirements imposed by ESA, HSFCA, or other applicable law. If vessels choose to continue longlining but land elsewhere, presumably there would still be a need to monitor and manage these fisheries, although the burden might shift to another entity such as the WPFMC or IATTC. NMFS logbook costs might not change.

Impact on Target and Incidental Fish Populations - High Seas Longline Alternative 3

The effect on HMS fish populations will likely not be significant because the fishery is a small portion of an international fishery, and any possible population increase due to this small reduction in fishing mortality would not likely be measurable. On the other hand, the mako and offshore species of thresher sharks that are taken less frequently, but whose stocks are more regional to the northeast Pacific or to the West Coast, may realize reductions in fishing mortality. Striped marlin mortality will be reduced, but probably minimally, since observer data indicate that California-based vessels catch relatively few marlin (D. Petersen, NMFS SWR Observer Program, Long Beach, CA pers. comm 6/17/02; Tables 9-8,9-9). Again, the degree of the survival benefit would depend upon the size of the longline fleet resulting from this alternative. Fish bycatch would decrease because of elimination of swordfish target effort, and its effect on the catch of co-occurring species. Impact of any future measures would have to be evaluated when details are established concerning any recommended area-specific closures or mitigation measures specific to the West Coast-based fishery.

Economic Impacts - High Seas Longline Alternative 3

This alternative could be costly to longliners, reducing producer and consumer benefits. Adoption will lead to a decline in profits (assuming that what these vessels are presently doing maximizes their profits) and a disproportionate impact on a minority group (Vietnamese American fishers). As in the Hawaiian-based swordfishery, the negative effects of this alternative on Vietnamese American owners of swordfish vessels would be immediate and substantial. Eliminating the targeting of swordfish would also impose a severe economic hardship on deckhands of Vietnamese descent. These crew members as a group may be among the least occupationally flexible populations. It is likely that there are few jobs available for them in the local community outside of minimum wage opportunities, and for many, it is possible that the income loss may be long-term. It would also lead to a disproportionate impact on three communities (San Diego, San Pedro and Ventura) and elimination of ex-vessel revenue (which in 1999 was $4.7 million, or 80% of the fleet's ex-vessel revenue) from this fishery, assuming no ability to shift to other strategies or fisheries. There would be a reduction in income and employment for suppliers of goods and services to longliners, and a reduction in consumption of goods and services by owners, operators and crews of longliners and their suppliers through direct, indirect and induced effects. As for disproportionate effects on small entities, all the entities affected are small businesses, therefore none would be affected disproportionately. There would be no impact on Oregon permittees since none are active, but the potential of such a fishery would no longer exist. Higher consumer prices may be expected with the amount of increase depending on what the vessels do, which reduces consumer surplus, and higher prices might reduce swordfish consumption. The supply of swordfish from harpoon and drift gillnet fisheries might increase, and imports of swordfish might increase. There may be changes in quality of swordfish on the market, depending on amount of frozen imports, or replacement by harpoon or driftnet landings. Harpoon, longline and gillnet fisheries land fresh swordfish, and product quality is highest in the harpoon fishery, followed by longline and gillnet. It is unlikely, however, that the low CPUE harpoon fishery could help significantly to meet the market demand. The alternative also puts U.S. longline fishers at a disadvantage in relation to foreign competitors.

In 1999, the real ex-vessel revenue of swordfish landed by longline gear on the West Coast was $4,738,191, which was 80% of the fleet's ex-vessel revenue. The more shallow gear used to harvest swordfish is the fishing practice that impacts sea turtles, and the gear and time/area restrictions to protect turtles and seabirds would likely lower swordfish catches. Net benefits to the Nation could possibly increase because of the high existence value of the protected marine turtles and birds. Longline vessels that had been registered for use with a western Pacific longline limited entry permit would not be able to circumvent the protected species mitigation regulations in the western Pacific by fishing out of West Coast ports, and West Coast businesses expecting revenues from serving those vessels may be disappointed.

Impact on Essential Fish Habitat - High Seas Longline Alternative 3

EFH has the potential of being positively effected, since a ban on swordfish longlining would reduce to zero the probability of light sticks accidentally entering the pelagic environment. Buoyant light sticks are used by high seas longliners for targeting swordfish, and would be banned by this action.

Monitoring and Data Needs - High Seas Longline Alternative 3

Data needs other than for enforcement and catch monitoring would not be directly affected but data availability would decrease. VMS would be an efficient means of monitoring vessel movements and activities, supporting both data collection and enforcement, but the cost is relatively high for the VMS unit ($2,500-$3,000), installation ($750), maintenance ($500/year), and annual transmission costs ($750/year). However, most of the vessels on the West Coast already have VMS units on board as a result of western Pacific requirements, so the additional cost of re-registering and turning on the units is fairly low and only transmission costs would be incurred in these cases. NMFS is equipped to cover the costs of any new units needed. High rates of observer coverage would be necessary to monitor takes of seabirds and infrequently occurring protected species and compliance with mitigation procedures. The current coverage rate in the western Pacific is about 20% of all trips. Observers also collect biological data and samples as well as discard or bycatch data in some cases, though that is not their principal purpose.

Consistency with the Western Pacific FMP - High Seas Longline Alternative 3

This alternative addresses the current inconsistency concerning mitigation procedures used aboard vessels for protected species; however, future protected species mitigation measures may differ. There may be regulatory inconsistencies based on areal or other differences in species complexes and encounter rates, which would warrant a different set of mitigation measures, but these would not be inconsistent with providing required protection to protected species. The framework procedures also provide a tool for ongoing coordination of efforts to promote management consistency over time.

User Conflicts - High Seas Longline Alternative 3

Implementation of this alternative would reduce potential conflicts between Western Pacific Region longline limited entry permit holders and eastern Pacific longline fishers who now abide by two separate sets of rules but who have the capability of fishing and often do fish the same areas. But West Coast based fishers, who now target swordfish but will no longer be able to do so, will likely oppose being forced to comply with western Pacific species protection rules developed for another jurisdictional area where they do not generally fish.

Safety at Sea Issues - High Seas Longline Alternative 3

Safety at sea could be affected if mitigation procedures for protected species involve risk to fishers. No such risks are currently apparent.

Relation to Objectives of this HMS FMP - High Seas Longline Alternative 3

FMP objectives for promoting inter-regional management and compliance with protected species laws would be met, and a solution providing for both high seas longlining and protected species would promote diverse commercial fisheries.

Consistency with International Obligations - High Seas Longline Alternative 3

There would be consistency with national and international obligations on protecting vulnerable or endangered species, including NPOA-Seabirds regarding seabird takes in longline fisheries.

However, purse seine gear offers the possibility to reduce incidental harvest. The incidental catch (or bycatch) in the sardine fishery gives some indication of this. This alternative could result in increased bycatch of salmon and other non-HMS species.

Analysis of Purse Seine Alternative 3: This closure was proposed by the State of Washington because of the state's concerns over possible salmon and shark bycatch and incidental catch by purse seiners, potential interactions with protected species and marine mammals, and adverse impacts on other fisheries, such as possible competition with the albacore troll fleet if a purse seine fishery develops for albacore. Few data are available on the potential extent of such interactions, however, the state wishes to be precautionary by proposing this closure. Such a closure would eliminate the opportunity that currently exists for non-Washingtonian fishers to use purse seines in the EEZ off Washington and would shift the management burden, and associated costs, from the state to the federal government. Purse seine fishers would still have the option to apply for an exempted fishing permit.

There has not been any recent purse seine fishing for HMS in the proposed closed waters and, even though purse seine gear is legal gear in Oregon, no one in the Northwest has expressed interest in using this gear to target HMS. In order to use purse seine gear, a vessel needs calm sea conditions which typically do not occur offshore in northern Pacific waters. If purse seiners targeted HMS in these waters, the most likely target species would be albacore or bluefin tuna. The latter species, while ranging north to Vancouver, is not thought to be common in this area, with only minor catches recorded historically and recently in Washington state waters. If purse seine fishers were to target albacore tuna, there could be potential gear conflicts with the albacore troll fleet, as they would be fishing in the same area, targeting the same species. The potential bycatch of purse seine gear targeting albacore tuna in offshore waters cannot be ascertained at this time. There is a current purse seine fishery for sardine in the area, but these data are not comparable because this fishery occurs inshore and uses a different type of seine gear.

The action would likely have little impact compared to the status quo. It would federalize regulations under the Magnuson-Stevens Act that already apply to Washington vessels under that state's laws but would add to those restrictions by closing some waters off Oregon as well. To the extent otherwise allowed under current states' regulations, purse seine fishing for HMS can continue. As noted in 9.1, it is expected that the coast-wide purse seine fishery will remain at or decline below recent levels, but this is dependent on a number of factors that are beyond the control of the Council. It is presumed that the proposed closure would have little impact because there has been virtually no purse seine fishing for HMS in the waters proposed to be closed except for a small amount of exploratory tuna purse seining in the 1960s. Absent data that demonstrates what the extent of bycatch and/or protected species interactions might be in waters offshore Washington, the State of Washington recommends that the Council take a precautionary approach regarding allowing any new, emerging HMS fisheries targeting HMS.

Analysis of Purse Seine Alternative 4: Closes the EEZ off Washington to HMS purse seining, but allows it off Oregon and California. The impacts of this alternative would be very similar to Alternative 3, which closes north of 45° N latitude (central Oregon), and to the "No Action" alternative. This would allow purse seine fishing off Oregon and California under the federal regulations, however currently there is virtually no purse seine fishing off Oregon. The closure off Washington is similar to the current state rule.

9.2.5.4 No-Sale Marlin Provision

Alternative 1: Marlin (No Action): The sale of marlin would not be prohibited by federal regulation in this FMP, but continue to be prohibited in the state of California.

Alternative 2: Marlin (Proposed Action): Prohibits the sale of striped marlin by vessels under PFMC jurisdiction. Striped marlin is considered to have far greater value as a recreational target species, and is only available seasonally. Prohibiting its sale removes the incentive for its taking by commercial fishers.

Analysis of Marlin Alternative 1 (No Action): The "No Action" alternative would leave in effect at the state level the prohibition in California on the sale of striped marlin. As a practical matter, the difference between this and the proposed action is probably not substantial; virtually all striped marlin caught in West Coast commercial HMS fisheries are caught off California or by vessels departing and returning to the state. It would be difficult for a fisher trying to sell striped marlin on the premise that federal regulations did not prohibit it. Little or no sale would be expected under this alternative. This approach could provide a potential legal obstacle to effective enforcement of the state's law.

Analysis of Marlin Alternative 2 (Proposed): The prohibition of the sale of striped marlin will have no economic or biological impacts. Striped marlin now cannot be sold in California so no revenue impacts will occur to commercial fishers. Since longline vessels are either not permitted or do not currently operate out of Washington and Oregon, commercial longliners from those states would not be impacted. Only 10 permitted drift gillnet vessels operate out of Oregon, but the catch of marlin is rare and only during extreme El Niño years. There will continue to be some bycatch (discard) of striped marlin taken incidentally in the California-Oregon drift gillnet and longline fisheries. Since those fisheries are observed, the take can be documented for use in stock assessments. Sport anglers in southern California will benefit from less competition for striped marlin because there will be no commercial incentive to increase the take of these fish. The overall value of a striped marlin landed in the sport fishery is estimated to far exceed that of the market value of one landed commercially.

Prohibiting the sale of striped marlin would create an inconsistency with the Western Pacific Council's management plan for pelagic fishes, but it reflects long standing policy on the U.S. West Coast. Under the WPRFMC plan, the sale of marlin is legal. Cultural differences play a major role in determining the use of marlin. In Hawaii, they are perceived as both a commercial and sport species (although sport anglers are allowed to sell their catch) while in California, the only West Coast state with a viable fishery, there is an 80 year history or more of sport take only.

Consideration was given to designating additional species as "no sale" species, but none appeared appropriate or had an established precedent or need. Other management unit species do not have the special reputation or standing in the recreational fishing community and are not subject to such targeted recreational fishing. Designating established market species as recreational-only would result in substantial costs to commercial fisheries, and contribute to a significant increase in bycatch and bycatch mortality. It is not known if designation of more species for no sale would result in increased recreational fishing pressure, fishing success, or economic values associated with recreational fishing.

9.2.5.5 Permits

Commercial Fishing:

Commercial Permit Alternative 1: (No Action): Require no new federal permits. Federal permits under other laws (e.g. HSFCA) would remain in place, as would state permit requirements

Commercial Permit Alternative 2: (Proposed Action): Requires a federal permit for HMS vessels with a specific endorsement for each gear type (harpoon, drift gillnet, surface hook and line, purse seine, and pelagic longline). The permit is to be issued to a vessel owner for each specific fishing vessel used in commercial HMS fishing.

Commercial Permit Alternative 3: Requires a federal permit for all vessels engaged in commercial HMS fisheries within and outside the EEZ. One permit would cover all HMS fisheries for a given vessel.

Commercial Permit Alternative 4: Requires a federal permit for all vessels engaged in *selected* commercial fisheries. Initial candidates for permits would be vessels engaged in drift gillnet and longline fisheries.

Recreational Fishing:

Recreational Permit Alternative 1: (No Action): Requires no new federal permits for recreational vessels, private or party/charter.

Recreational Permit Alternative 2 (Proposed): Requires a federal permit for all commercial passenger recreational fishing vessels (CPFV) that fish for HMS, but an existing state permit or license for recreational vessels could meet this requirement. The Council would, however, request states to incorporate in their existing CPFV permit systems an allowance for an HMS species endorsement on permits, so that statistics could be gathered on that segment of the HMS fishery.

Recreational Permit Alternative 3: Requires a separate federal permit for all commercial recreational fishing vessels (CPFVs) that fish for HMS; a state permit could not be used to fill this requirement, as in #2.

Recreational Permit Alternative 4: Requires a federal permit for *all* recreational fishing vessels (private, party and charter/CPFV) that fish for HMS within and outside the EEZ.

As with commercial fishing permits, this would provide a mechanism for identifying the scope of the recreational fishery and the participants, so that data collection and research could be more focused and effective.

Permit Analyses:

Analysis of Commercial Permit Alternative 1: This alternative would keep in place existing federal (HSFCA, MMPA) permits and state licenses and permits. These permits are not sufficient to determine the participants in the fisheries and do not provide a sound basis for sampling to collect good fishery-specific data. The Council would have limited new data to use in future management analyses. To some extent, the new NMFS regional HMS vessel register may fill this gap. However, in the absence of an ongoing permitting requirement, it would take repeated surveys to keep this register current. This would be costly to NMFS compared to other approaches. There would be no added cost to fishers under this alternative.

Analysis of Commercial Permit Alternative 2 (Proposed): The proposal to require a permit for all HMS commercial vessels accompanied by a gear endorsement was chosen to (1) enable efficient and effective notification of participants of changes in regulations, and (2) provide a complete data base to improve the collection of fishery information and preparation of analyses necessary for measuring the effects of proposed management actions. Requiring a permit for every commercial vessel used to fish for HMS with an endorsement for each commercial gear type would result in costs to fishers and NMFS. Industry costs arise from the time required to recover the necessary information and complete permit forms. Government costs arise from the work required to develop the permit process, time to review and process applications, and work to develop and run software to maintain a permits data base (see Appendix F). In this circumstance, however, there would be no qualifying criteria; therefore, issuing a permit is a simple administrative function. No time needs to be allocated to evaluate whether or not a vessel should be issued a permit.

The number of vessels involved will vary from year to year because the availability of HMS in the temperate waters off the West Coast is variable. For this exercise, an average of the number of vessels landing HMS from 1995 through 1999 is used. The estimated number of vessels by gear is as follows:

Surface hook-and-line:	887
Drift gillnet:	121
Pelagic longline:	47
Purse seine:	27
Harpoon:	32
	1,114

Permits are currently required for vessels fishing on the high seas under the authority of the High Seas Fishing Compliance Act, and registration is required of vessels fishing for tuna under the authority of the Tuna Conventions Act of 1950. Longline vessels fishing under the authority of the Fishery Management Plan for the Pelagic Fisheries of the Western Pacific Region must also have a permit. Many participants in the HMS fisheries have these permits or will obtain them; therefore, issuing HMS permits to all individuals on the NMFS list of vessels identified as using gear to harvest HMS would reduce potential costs to applicants. Vessel owners who have not received a permit to harvest HMS by a certain date would have to apply for a permit. All vessels would need an HMS permit to participate in the fishery by a reasonable date following publication of a final rule implementing the FMP. This would avoid duplication of effort and minimize the burden on applicants, many of whom will not need to fill out and submit an application. A review of NMFS data base indicates that there are an estimated 1,114 vessels likely to harvest HMS. Although only 10 to 20% of the vessels would be anticipated to need to apply for a permit under the procedures described above, all holders of permits would have to renew their permits periodically, anticipated to be every 5 years. Currently, permits issued under the High Seas Fishing Compliance Act must be renewed every 5 years. To estimate the cost to fishers, the number of vessel owners who would have to apply for a permit can be estimated by annualizing the total number of vessels over a chosen period of time. For example, 1,114 vessels renewing permits every five years would result in 223 vessels (1,114/5). Appendix F contains an estimate of permit costs for commercial and recreational vessels. About 81.7% of these costs can be attributed to commercial vessels; therefore, the cost of permits would be $13,476.00. The cost of an individual permit would be about $60.00. These costs could be recovered from fishers; however, the permit requirement under this FMP, although necessary, is somewhat duplicative in that a vessel may need two or three permits to harvest HMS species in the Pacific.

Analysis of Commercial Permit Alternative 3: Requiring a single permit, whether paid by the recipient or by the government, poses nearly the same cost as the proposed action because: (1) the work required to develop the software to maintain a data base is the same, regardless of the number of vessels involved; and (2) the information required by all alternatives is basic vessel and owner information. That is, there would be no qualifying criteria; permit issuance would be essentially a simple administrative function. No time needs to be allocated to evaluate whether or not a vessel should be issued a permit. Although many vessels may already have one or more permits and may be readily identified in existing data bases, the actual cost to issue the permits would be approximately the same for all vessels. The utility of the permits for tracking the fleet would be far lower without gear-specific endorsements, because only an after-the-fact review of landings data and logbooks would be available for determining principal gears and target species for each permittee. One of the principal functions of the permit and endorsement approach is to allow this determination to be made before fishing begins. By having the identification of vessels by endorsement, for example, NMFS and others will be in a better position to monitor actual performance in each fishery sector and to target observer placements by gear type. This would be much more difficult under the "no endorsement" alternative.

Analysis of Commercial Permit Alternative 4: This approach addresses each fishery separately with regard to participation. The effects of this approach are the same as depicted in Alternative 3; however, the administrative costs would be greater, because the requirement for a permit for each fishery would be a separate administrative and regulatory action. Information will be needed for all HMS fisheries to conduct needed analysis; therefore, alternative 4 is not an efficient approach.

Analysis of Recreational Permit Alternative 1 (No Action): This alternative would keep in place existing state licenses and permits, which do not currently have any type of HMS endorsement. Information gaps concerning the extent of the recreational HMS fishery (private and party/charter (CPFV) fleets) would continue to exist, although state costs involved in incorporating an allowance for some kind of HMS endorsement in their existing CPFV permit systems (as proposed in Alternative 2) would be avoided.

Analysis of Recreational Permit Alternative 2 (Proposed): Commercial recreational fishing vessels would be required to have an HMS permit, but this requirement could be met by state licenses or permits. To be effective, however, the states would have to agree to incorporate in their existing permit system an allowance for some type of HMS endorsement so that statistics could be gathered on effort or participation in HMS fishing. This could provide the full universe of CPFV vessels and would reduce duplication or facilitate the permitting program by using existing state licensing procedures. For example, it might be reasonable to use state fishing license sales outlets as a mechanism for issuance of HMS fishing vessel permits or annual vessel registration renewals. This would reduce the federal administrative burden and might reduce the total cost of the permit system. The states would have to find some way to distinguish HMS recreational fishing from other recreational fishing (which is done in the case of salmon) and may not be a major problem in this case. The purpose here would be to define the field of HMS participation, however, if there are no restrictions or qualifications for such a permit, anyone could apply, including vessels that may not actually participate in the fishery in any given year. Thus resulting statistics may not be completely accurate.

Analyses of Recreational Fishing Permit Alternatives 3 and 4: Alternative 4 would require that every owner of a vessel used to recreationally fish for HMS obtain a permit for that vessel. During development of this FMP, the lack of data to permit complete description of and analysis of alternatives relevant to recreational fishing was often discussed, and the major shortfall in completing proper analyses is the lack of a good data base. A permit for all recreational vessels harvesting HMS would provide the statistical universe needed for monitoring the fisheries; however, there are difficulties with this approach. One is the duplication of the permits required by the states for non-revenue producing fisheries, except for the CPFV fleet. There has been much opposition in the past to requiring a federal permit for recreational fishing. A second problem is distinguishing between HMS recreational fishers and other recreational fishers. A third problem is the large number of vessels and the costs necessary to establish a data base. A federal permit program for recreational vessels is likely to cost $50.00 or more per permit in administrative costs because getting the word to all recreational vessels on the West Coast would require a considerable public notification effort. This is the current cost of a permit issued under the High Seas Fishing Compliance Act. Distinguishing other recreational fishing from HMS recreational fishing would be necessary. HMS anglers would be subject to greater permit burdens than anglers pursuing other species. The estimated number of private boats in southern California fishing large pelagic fish is 4,000 to 6,000. The number of CPFV vessels on the West Coast is 300.

Recreational Permit Alternative 3 would limit the federal HMS permit requirement to commercial passenger fishing vessels (CPFVs), but would not allow existing state permits to suffice as in Alternative 2. Nonetheless, this would greatly reduce the overall administrative burden required of Alternative 4, because enforcing a recreational permit across the whole range of HMS fishers would not be necessary. However, the complete universe of HMS harvesters would not be defined for NMFS and the Council to best assess effects and effectiveness of HMS management. The ability to perform research and economic analysis of the recreational fisheries would be reduced and/or would become more expensive because different sampling designs would be needed to identify recreational fishers within a survey or study program rather than have them identified through the permit requirement. This would to a degree duplicate state systems that require charter vessels to be licensed, but the majority of vessels have been identified through state programs. Nevertheless, a permit would have to be renewed periodically. Approximately 250 of the 300 charter vessels harvest HMS. This number varies widely from year to year because HMS are highly variable in availability from year to year. Appendix F contains an estimate of permit costs for commercial and recreational vessels. About 18.3% of these costs can be attributed CPFV vessels ($3,018.00). Annualizing the costs over five years sets the cost of a permit at about $60.00 (250 vessels/5 years = 50 vessels). This is the estimated cost of a strictly federal permit.

Paperwork Burden of Commercial and Recreational Federal Permits: The proposed alternative requires a permit for all commercial fishing vessels harvesting HMS with an endorsement for a specific gear. There also is a proposed alternative to require a permit for recreational charter vessels. Cooperative efforts with the states to issue permits may reduce costs to the federal government, but increase costs to state agencies. Federal regulations will require a permit; therefore, there is a burden placed on participants to meet a reporting requirement. There are approximately 1,114 commercial vessels (see above) and an estimated 250 recreational charter vessels that catch and retain HMS annually off Oregon, Washington and California (S. Crooke, CDFG, Los Alamitos, CA; M. Robinson, WDFW, Montesano, WA; J. McCrae, ODFW, Newport OR, pers. commun). Initially, for purposes of estimating the work required for this task, an assumption was first made that from 10% (136) to 20% (273) of the vessels would not be on a NMFS list of vessels and would have to apply for a permit. Nevertheless, vessel owners will have to renew their permits every five years (permit system to be established by NMFS' Southwest Region); therefore, the burden estimate is based on 1,364 vessels annualized over the five year period (273).

Following is an estimate in hours required by applicants to fill out an application form. The information to be provided can be obtained from memory, with the possible exception of the official registration number.

Permit application hours: 273 applicant vessels x .25hrs/application = 68.25 hrs.

9.2.5.6 Reporting Requirements

Reporting Alternative 1: No Action. There would be no new federal requirements for reporting, including federal provisions for filling out Far Offshore Fishery Declarations.

The Council expects pending legislation in California to soon result in the exemption of surface hook and line (troll albacore) vessels from the current "offshore declaration" requirement whereby vessels must make a landing before shifting from high seas fishing to within-EEZ fishing. Commercial surface hook and line vessels would then be permitted to fish within and outside the U.S. EEZ on the same trip and not have to file this report; all other gear types permitted to fish in the EEZ would continue to be required to file California far offshore declarations if they fished outside the EEZ on that trip.

Reporting Alternative 2: (Proposed Action): Requires all commercial and recreational party or charter/CPFV fishing vessels to maintain and submit logbooks to NMFS. State or existing federal logbooks could meet this requirement as long as essential data elements are present, and data are available to NMFS subject to a data exchange agreement. Authorizes adjustment of reporting requirements under a framework process.

Reporting Alternative 3: Limits new federal reporting requirements to those commercial vessels that are not already required to report under existing federal laws.

For example, albacore troll vessels on the high seas would continue to use HSFCA logbooks while troll vessels within the EEZ would be required to use a logbook provided by NMFS pursuant to the FMP reporting requirements.

Analysis of Reporting Alternative 1 (No Action): Would impose no new federal reporting requirements. Under this alternative, existing reporting requirements would remain in effect and fishers would maintain and file those reports under the appropriate federal or state law. The federal reporting burden estimated above would not be incurred and this would ensure no duplication of reporting requirements. However, it would also result in continuing information gaps. Existing requirements were not designed with the intent of fully monitoring the fisheries and providing a basis for determining the effects and effectiveness of management with consistent and compatible data. The ability of the Council to identify and appropriately respond to changes in fishery conditions or new problems would be greatly reduced under this alternative. In addition, any impact analyses to evaluate the effects of new management actions would likely be based on incomplete data and subject to challenge. There could be more pressure to expand state data reporting requirements under this alternative.

No new Far Offshore Fishery Declaration provisions would be federalized, but problems with this requirement may soon be resolved by pending state action. If pending California legislation is approved, provisions for the Far Offshore Fishery Declaration requirement would be amended so that albacore surface hook and line/troll vessels could engage in fishing in and outside the EEZ on the same trip, subject to whatever time/area closures may be in effect for that gear. The inconvenience or inefficiency associated with having to make a landing before shifting from high seas fishing to within-EEZ fishing would be avoided. Enforcement difficulties could ensue but these could be ameliorated by reporting and/or observer requirements.

Analysis of Reporting Alternative 2 (Proposed Action):

Each commercial fishing vessel harvesting HMS must maintain a logbook and submit a record of harvest covering each fishing trip. Each commercial passenger recreational fishing vessel must also maintain a logbook and submit a record of harvest. Currently, logbooks are required under the authority of the Tuna Conventions Act of 1950, the High Seas Fishing Compliance Act, and the regulations implementing the Fishery Management Plan for the Pelagic Fishery of the Western Pacific Region for longline vessels with permits issued under that fishery management plan. Drift gillnet vessels, harpoon vessels, and recreational charter vessels are required by the California Department of Fish and Game to submit logbooks. The FMP proposes to use existing logbooks and not require any new logbooks, except in the case of the States of Oregon and Washington. These states do not require a logbook for charter vessels; therefore, a federal logbook will be necessary. Reporting will increase. For instance, longline vessels that normally fish out of Hawaii that have separated the limited entry permit from the vessel to fish out of West Coast ports are no longer required to submit a logbook to NMFS under the authority of the western Pacific FMP. When the FMP is implemented for the West Coast, a logbook will be required from those vessels. Logbooks are issued to troll vessels targeting albacore tuna, but vessels that do not fish on the high seas are not required to submit a logbook. When the FMP is implemented, a logbook will be required. Vessels chartered for recreational fishing will also be required to submit a logbook. The following estimates the burden of the HMS logbook program:

Purse seine vessels

The number of vessels targeting tuna varies from year to year. For the purpose of this exercise, 27 vessels are assumed to fish. Logbooks are required by federal regulations at 50 CFR 300.22 implementing the Tuna Conventions Act of 1950 and are distributed by the Inter-American Tropical Tuna Commission. Commission employees collect information from the logbooks, and this will continue; however, logsheets from each trip will have to be submitted to the Regional Administrator under this FMP. This will entail a minimal processing cost to the vessel owners and to the federal government. Under OMB number 0648-0148, 5 full-time and 20 part-time vessels are used in the calculation of the reporting burden. Using the numbers in the FMP for the average number of vessels participating in the fishery increases the part-time number to 27 vessels; therefore, an additional burden for seven vessels is provided.

27 vessels x 3days/trip x 4 trips/year x .10 hrs/report = 32.4 hrs.

Note: This estimate recalculates the burden estimate for part-time vessels under OMB number 0648-0148. This is a reduction of 27.6 hrs. (Previously 60 hrs.)

Hook-and-line vessels

Albacore logbooks are distributed every year for vessel operators to complete voluntarily. About 400 are returned, and the estimate of burden under OMB number 0648-0223 is based on 400 vessels. Under the authority of the FMP, all vessels would be required to fill out a logbook. Based on the number of vessels above (887), the number of respondents will increase by 487. The following estimate results:

887 vessels x 1hr/response = 887 hours.

Note: This estimate is an increase of 487 hours over the 400 hours provided under OMB number 0648-0223.

Drift gillnet vessels

All drift gillnet vessels are required to submit a logbook under the State of California regulations. While federal regulations implementing the FMP will require a logbook, the state logbook will suffice and the State of

California will continue logbook management. Processing logbooks and providing effort data to NMFS is handled through a contract to the California Department of Fish and Game. Nevertheless, the logbook will be required under federal regulations.

121 vessels x 7days/trip x 5 trips/year x .10hrs/logsheet = 423.50 hrs

Longline vessels

Longline vessels fishing under the authority of the western Pacific regulations governing HMS are required to maintain a logbook. Approximately 10 vessels fish out of West Coast ports that have not held a Hawaii permit. These vessels will be required to maintain and submit a logbook as well. Although many longline vessels in Hawaii have in the past separated their limited entry permit from the vessel to fish in the eastern Pacific and land on the West Coast, these vessels continue to maintain a logbook. Under this FMP, those logbooks would have to be submitted to the Regional Administrator. This will result in a coordinated logbook program for longline vessels in the eastern and western Pacific.

10 vessels x 7trips/vessel x 0.5hrs/log = 35 hrs.

Note: This estimate is an increase of 35 hours above the 1,106.87 hours under OMB number 0648-0214.

Harpoon vessels

Harpoon vessels make daily trips. This exercise assumes that each vessel makes seven trips. Logbooks are required by the California Department of Fish and Game, and the requirement will continue to be handled by the agency. Nevertheless, logbooks are required by federal regulations.

31 vessels x 7trips/vessel x 1day/trip x .10 hrs/logsheet = 21.7 hrs.

Recreational charter vessels

Recreational charter vessels will be required to submit logbooks for each trip. Each vessel is assumed to make an average of seven trips/yr, seasonally targeting HMS. These figures include 220 California vessels, 15 Oregon vessels, and 15 Washington vessels.

250 vessels x .50 hrs/logbook x 7 logbooks = 875 hrs.

OTHER REPORTING BURDENS

Vessel Monitoring System: Longline vessels fishing under the Western Pacific Pelagics FMP must have VMS, which has been installed at the expense of NMFS. Most vessels fishing from West Coast ports have VMS because most vessels fishing from West Coast ports have relocated from Hawaii, but there may be as many as 10 vessels that do not have VMS. Based on these figures, the estimated burden is:

VMS installation: 10 vessels x 4hrs/vessel = 40 hours
VMS maintenance: 10 vessels 2hrs/vessel = 20 hours

VMS monitoring 10 vessels x .0067 hrs/day (24 seconds/report) x 365 days/yr = 24.45 hours

Note: This is an increase of 84.45 hours above the 569 hours estimated under OMB number 0648-0214 for VMS

Installation and maintenance does not require time from the respondent, because the vessel owner does not have to perform any tasks; however, the vessel must be made available for installation of the VMS unit, and the vessel must also be available when the unit is in need of maintenance.

Vessel Markings: federal regulations will require that all permitted vessels be identified by displaying each vessel's official number on the port and starboard sides of the deckhouse or hull, and on an appropriate weather deck so as to be visible from enforcement vessels and aircraft. The official number would be affixed to each vessel in block Arabic numerals at least 14 inches in height. This is a common marking procedure for U.S. fishing vessels. Approximately 15 minutes is required to paint each number on a vessel at the three locations. The total number of hours required would be:

1,364 vessels x .75hr/vessel = 1,023 hrs.

COSTS TO RESPONDENTS:

Mailing Costs:

$0.37/stamp x 273 permit applications = $101.01

$0.03/envelope x273 permit applications = $8.19

136,400 logsheets (used 10 days x 10 trips for 1,364 vessels). Five logsheets equals one ounce; therefore, a 10 day trip would cost $.57 to mail ($.37 ounce + $.23 each additional ounce.) Ten trips for each vessel equals 13,654 x $.57 = $7,782.78

13,640 trips x $.20/manila envelope = $2,728.00

VMS

There are no costs to respondents with regard to VMS.

Vessel markings

The cost of the paint to affix each vessel's official number in the appropriate locations. The cost of the paint is estimated to be $9.00 (one pint, industrial grade). The total cost for all respondents would be $12,276.00 (1,364 X $9.00). The annualized cost over the five-year PRA approval period would be $ 2,455.20.00.

Category	OMB PRA Number	Increase in burden hours
Permits	New	68.25
Purse seine logbook	0648-0418	- 27.60 (reduction)
Hook-and-line logbook	0648-0223	487.00
Drift gillnet logbook	New	423.00
Longline logbook	0648-0214	35.00
Harpoon logbook	New	21.70
Recreational logbook	New	875.00
Vessel monitoring	0648-0214	84.45
Vessel markings	new	1,023.00

Analysis of Reporting Alternative 3: Under this alternative, new federal reporting requirements would only be set for commercial vessels that are not required to report under existing federal law; state reporting requirements would not be affected. The added federal reporting burden would be limited. Longline and albacore troll vessels fishing on the high seas are required to maintain and submit HSFCA logbooks of catch and effort. Purse seine vessels are required to maintain (but not to submit to NMFS) logbooks of catch and effort for fishing in the IATTC management area. These requirements capture data needed for longline and high seas purse seine and troll fisheries. However, no federal requirement exists for fishing within the EEZ except that vessels are to report interactions with marine mammals. Thus, this alternative would add somewhat to federal requirements and promote common and consistent reporting requirements to ensure full coverage for all commercial fisheries. However, it would leave in place the HSFCA longline logbook format rather than allowing NMFS to set a logbook format for West Coast vessels to ensure data consistency and compatibility to support data analyses and fishery evaluations. For example, the HSFCA longline logbook differs from the Western Pacific longline logbook, and the latter is preferred. Also, this alternative would not clearly require purse seine vessels to file logbooks with NMFS for their fishing beyond the EEZ. There would likely be some continuing data gaps and inconsistencies in data formats making analysis of the data more difficult than under the proposed action.

9.3 Comparison of Alternative Management Strategies

The section below provides a comparison of the various alternatives to the proposed management strategies under this FMP, in relation to the effects on conservation of stocks and prevention of overfishing, costs, efficiency and effectiveness, and public acceptance. See also comparative table matrix in Chapter 8 section 8.5.7, which provides a comparison of effects of initial management measures.

9.3.1 Conservation of Stocks and Prevention of Overfishing

The combination of specifications and measures that comprise the proposed FMP is more likely to contribute effectively to promoting conservation of the stocks and prevention of overfishing than the alternative of No FMP or Framework FMP (with no specific conservation and management measures when the FMP is approved). First, the FMP establishes a definition of overfishing that can provide a basis for scientific analysis to support U.S. efforts in international HMS management arrangements to take action to prevent overfishing and rebuild overfished stocks. Second, the FMP would establish a process to deal with localized stock problems, which may be especially important for sharks for which harvest guidelines would be set. Third, the open and public process of the Council under the FMP is more likely to result in development of management measures that will enjoy the support of fishers and other constituents. Fourth, the FMP is more likely to result in a flow of improved information about the stocks and the fisheries such that problems can be identified and solutions can be developed in a timely manner.

9.3.2 Costs

The proposed FMP is more costly to the fishing industry than the No FMP or Framework FMP alternatives. This is principally due to the costs of the permit and reporting requirements discussed above. In terms of impacts on catch and revenue in most fisheries, there are no greater costs under the proposed action because it essentially retains the current fishery restrictions for drift gillnet, harpoon, troll albacore and purse seine fisheries and does not impose new management measures. New measures would be imposed on the high seas longline fishery, but these would likely be imposed independently by NMFS if the FMP were not adopted. The principal difference is that action would be taken more rapidly under the FMP when management problems arose than if NMFS had to act separately.

The proposed FMP is more costly to the federal government than the No FMP or Framework FMP alternatives. NMFS will have to administer both the permit system and the data base system for the FMP. However, the No FMP and Framework FMP also could be more costly than the FMP to the federal government in that additional rulemaking by NMFS might be necessary under MMPA or ESA authority if the FMP did not contain immediate regulations to govern high seas longline fishing. Enforcement costs to NMFS and the Coast Guard will be somewhat higher under the proposed action than under the alternatives.

The cost to the Council is greater under the proposed FMP than under the alternatives. The Council will have to maintain the HMS plan team and advisory subpanel and their meeting costs, and build into its planning schedule meetings and staff resource commitments for consideration of annual SAFE reports and recommendations. Staff will have to be provided to assist and coordinate with the subsidiary bodies and compile briefing documents or other materials to assist the Council in its deliberations on HMS issues. Additional costs will be incurred for copying and distributing materials to the Council family.

The cost to the states under the proposed FMP are the same as or lower than without the FMP. To some degree, federal regulations under the FMP will supersede state regulations or add the force of federal authority to the enforcement and administration of state laws and regulations.

Documentation of FMP costs can be found in Appendix F.

9.3.3 Efficiency and Effectiveness

The proposed FMP is expected to be more efficient and effective in monitoring and management of the fisheries than the No FMP alternative. It should result in a more open and public decision-making process through the Council than if actions were independently undertaken by NMFS and the states under other authorities. Fishers should find it easier to participate and understand the regulations if they are all issued under a single process rather than multiple processes and if the federal regulations can ultimately be found in a single part of the *Federal Register*. By providing a systematic approach to monitoring the fisheries and assessing the need for management changes, the FMP should promote timely and effective responses to new conditions or information. The combined enforcement capabilities of NMFS, the Coast Guard, and the states should contribute to more effective administration of the regulations.

9.3.4 Public Acceptance

The proposed FMP is more likely to be accepted by the public than the No FMP or Framework FMP alternatives. It is a proactive approach reflecting broad participation and analysis of all reasonable alternatives in the decision making process. Decisions are made in open and public meetings and all have access to the same information in providing inputs to the decision process.

9.4 Summary of Cumulative Effects

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

Cumulative impacts of each alternative are presented in a matrix comparing the various alternatives in Chapter 8 section 8.5.7. This section provides an overall summary of these potential cumulative impacts. Also addressed in this section are events that have environmental consequences, but which are independent of any action.

9.4.1 Fluctuations in the Ocean Environment

Large scale environmental fluctuations are characteristic of all oceanic ecosystems and have significant effect on the distribution, movement, and habitat of all tuna and related species. Significant sources of inter-annual physical and biological variation are *El Niño* and *La Niña* events in the Pacific – with apparent secondary impact on the Atlantic and other world oceans. Regime shifts (e.g., in the North Pacific) have also been identified as having impacts on both the physical and biological systems, with concurrent impact on the distribution of oceanic species. There is no evidence to suggest that populations of eastern Pacific HMS are immune to these shifts. In fact, emerging evidence suggests that these environmental and climatological perturbations may have greater influence on the relative abundance of HMS (and especially tuna) and related species than any of the alternatives reviewed in this EIS.

While changes in the ocean environment affect HMS, implementation of the FMP is expected to have a beneficial cumulative effect. The condition of the stocks and the various fisheries will be monitored continuously, and necessary actions will be taken to promote conservation and management.

9.4.2 Food Webs and Ecosystems

The role of HMS in the structure of oceanic ecosystems and the potential ecological effects of their removal is an area of particular concern. For example, in some instances, sharks have been identified as "keystone predators". These are creatures that, if removed from an ecosystem in significant numbers, may cause existing trophic relationships to be upset, affecting other species' stock abundance or viability. The removal of some species of large pelagic and coastal sharks by fisheries has been identified as an area of particular concern (Kitchell et al. 1999), while others suggest that a reduction in shark harvests may have a negative impact on certain protected species populations, e.g., sea turtles (IATTC, 1999 as cited in NMFS 2000).

The development of fishery activities on the prey of HMS and related species may have significant implications for HMS. For instance, the now outlawed north Pacific high seas drift net fishery harvested between 300,000 and 340,000 mt of neon flying squid at its peak (Huppert and Mittleman 1993). These squid are a key prey species of the north Pacific ecosystem in which blue sharks thrive and it is unclear what effect these harvest levels had on fish populations. Future development of currently minimally harvested squid or small pelagic species fisheries could have significant impact on HMS populations.

None of the proposed actions in this FMP, separately or cumulatively, is expected to have a detectible impact on the food web within or beyond the management area.

9.4.3 Current and Future Regulatory Regimes

There are a variety of evolving national and international legal instruments in force for the conservation and management of HMS. To a great extent these regulatory regimes are representative of species-directed fishery management policies which, more recently, are being questioned as effective at preventing undesirable changes in the marine ecosystem structure and function. General principles for oceanic ecosystem management tend to be theoretical at this juncture. The extent to which they can be implemented is unclear. Regardless, members of the IATTC are engaged in renegotiating the convention that established the IATTC, and many of the same nations are involved in implementation of a new international conservation arrangement for HMS in the central and western Pacific. These arrangements will be intended to conserve the targeted species (mainly tuna) and related species but if they fail, there could be adverse impacts on U.S. West Coast fisheries that are beyond the ability of the Council to correct or mitigate. The Council is aware of the potential for unilateral fishery management programs by member nations that could supplement or be affected by IATTC or western Pacific organizations' management recommendations. At this point, there are no apparent conflicts between international management and the measures proposed in this EIS.

Meanwhile, within the United States, requirements of "other applicable law" such as the ESA will likely have equally significant impacts on the fisheries and in turn on the stocks pursued in those fisheries. Court imposed actions and remedies are having significant impacts on current fishery conservation and management regimes. A recent case (CMC vs NMFS) was the driving force for significant modifications to the Western Pacific Pelagics FMP. One of these impacts include essentially the cessation of longline fishing targeting swordfish. While this action has been focused on marine turtle bycatch mitigation in the central Pacific, it is acknowledged that this action has a bearing on management of the U.S. longline fishery in the eastern Pacific. The measures proposed in this EIS are intended to ensure the same degree of protection of important sensitive species that is being provided in other areas and fisheries.

The States of Washington, Oregon and California have managed HMS fisheries in the past, continue to do so at the present time, and it is expected that they will play a role in management of these fisheries in the future. Current state regulations are summarized in Chapter 7 and listed in detail in Appendix B. It is anticipated that most of these regulations will continue to remain in effect and will be consistent with the goals and objectives of the FMP. Those state regulations that conflict with the FMP will be superceded. In some cases, the FMP defers to the states' management programs, for example in the setting of recreational bag limits, licensing, and reporting provisions. California has the most extensive set of HMS regulations on the West Coast because of the diversity of HMS fisheries based there. One of the most notable California rules which the FMP will not include initially is the limited entry program for the drift gillnet fishery. The Council has determined that a federal program is not necessary at this time, since the state program is expected to continue to be effective at limiting entry into this fishery.

The Western Pacific and North Pacific Fishery Management Councils have management responsibility for U.S. HMS fisheries in other areas of the Pacific. Actions by these councils can impact HMS stocks and fisheries on the West Coast. There is a need to ensure coordination among the councils to achieve comprehensive management of HMS. Procedures for coordination with the WPFMC and NPFMC are described in Chapter 8, section 8.3.4.2. This process ensures that WPFMC and NPFMC are informed of and provided opportunity to comment on Pacific Council management actions affecting fisheries in their respective management areas, and promote consistent management of HMS fisheries.

Impacts of Other (non-HMS) Domestic Fisheries on HMS Stocks and Fisheries

The Council and the West Coast states manage numerous fisheries in the West Coast region. Management policies for other fisheries could impact HMS fisheries, and some of these fisheries harvest HMS incidentally.

Impacts of Management Policies for Other Fisheries: The West Coast groundfish fishery is managed by the Council and NMFS pursuant to the Fishery Management Plan for the California, Oregon and Washington Groundfish Fishery, as amended. The Council has adopted increasingly more restrictive management measures in an effort to rebuild depleted stocks. Since 1996, nine West Coast groundfish stocks have been declared overfished: bocaccio, yelloweye, canary, darkblotched and widow rockfish, cowcod, lingcod, Pacific ocean perch, and Pacific whiting. Rebuilding of rockfish stocks may take many years because of their long life span and low productivity. These stocks inhabit large areas of the continental shelf off the West Coast, and they are caught incidentally in non-groundfish fisheries. Beginning in 2003, the Council is considering the most restrictive measures ever adopted for the fishery, including large depth-related area closures of both commercial and recreational fisheries. The action will impact the prosecution of some non-groundfish fisheries in order to restrict the incidental harvest of overfished stocks. However, HMS commercial and recreational fisheries do not impact these stocks and are exempt from the closures. There are no expected direct impacts on HMS fisheries from these actions.

The restrictive management measures for groundfish also could impact HMS fisheries by encouraging transfer of effort into HMS fisheries. Whether or not effort transfer will occur as a result of these restrictions and the magnitude of the transfer are speculative. A fishery-by-fishery discussion follows.

> Surface Hook and Line: Access to this fishery is not limited, there are no restrictive management measures in effect now or proposed in the FMP, and start-up costs are relatively low. These conditions make this fishery a prime candidate for effort transfer. The number of vessels has varied considerably both within season and between seasons, depending on albacore availability, distance from shore and market conditions. For the period 1989 to 1999, vessel numbers ranged from a low of 200 in 1991 to a high of 1,182 in 1997.
>
> There are differing industry perspectives on this issue. One point of view is that vessels displaced from the groundfish fishery by the 2003 measures could increase effort in the albacore surface hook-and-line fishery by as much as 20%, which could have a negative effect on prices and markets, because the current markets are already filled. The other view is that there will likely be few or no

new entrants in the albacore fishery from the groundfish fishery, since groundfish vessels that are suitable for the albacore troll fishery most likely already are participating.

Drift Gillnet: This is a limited access fishery by state regulation, which will remain in effect under the FMP, and new vessels from other fisheries cannot enter this fishery. The FMP projects that the number of active vessels is expected to decline in the future (sections 9.1.1and 9.2.5.1).

Harpoon: This is a small open-access fishery with only about 15-20 vessels, concentrated in southern California. This fishery is highly dependent on suitable environmental conditions to be able to locate and harpoon swordfish on the surface, and participation is not expected to change (section 9.1.1).

Longline: The proposed actions in the FMP include closure of the EEZ to longlining and more restrictive measures outside the EEZ. The latter action may have an effect of reducing the California-based high seas longline effort (section 9.2.5.2.2), but a transfer of effort from the groundfish fishery is unlikely.

Purse Seine: The small vessel seine fleet on the West Coast generally is reliant on coastal pelagic species and shifts to tuna when they are seasonally available. The coastal pelagic species fishery is under limited entry pursuant to the Council's FMP, although vessels could enter the seine fishery to target on tunas. The landings of HMS in this fishery have been declining for many years, and the recent closure of the last cannery that processed whole fish in California suggests that this trend will continue (section 9.1.1). Large effort shifts into the purse seine fishery for HMS are not anticipated.

Recreational: The trend in marine recreational fishing on the West Coast has generally been downward, however recent limits on fishing opportunities for groundfish may be promoting an increase in marine angling for HMS (section 9.1.1). No data are available to substantiate whether trips oriented to HMS have increased or decreased, and it is not possible to predict the effect of the 2003 groundfish measures on HMS angling effort.

Impacts of Incidental Catches of HMS in Other Fisheries: According to PacFIN, HMS are landed by a diverse array of commercial gear types that are not proposed as legal HMS gear in the FMP. Data on HMS caught and discarded at sea (bycatch) by other fisheries are not available. These non-HMS gears include set gillnets and other entangling nets, miscellaneous net gears, groundfish and shrimp trawls, shellfish and fish traps, longlines and other line gear, and spear. However, there is a recognized problem with PacFIN HMS landings data, because of errors in recording the actual gear used on the fish tickets. PacFIN data for 1990 through 1999 include a total of 1,160 mt of HMS landed by other gears for the 10-year period, or an average of 116 mt per year. By comparison, total landings by all gears in 1999 were 17,583 mt. The landings attributed to set gillnets for the 10-year period are 902 mt, or about 78% of the total. Common thresher shark and swordfish were the principal HMS in the landings attributed to set gillnets. Since swordfish cannot be landed legally with gillnets less than 14-inch mesh, it is assumed that some portion of the landings attributed to set gillnets is actually landings from the drift gillnet fishery because of errors in gear coding. Another data source reports that in 1998 set gillnets landed 18% of the total common thresher shark landings of 187 mt dw; drift gillnets landed 78%, and other gears accounted for 4% (Hill and others, CALCOFI Rep.1999).

With the possible exception of set gillnet landings of common thresher shark, the landings of HMS by non-HMS gears are minor in comparison to the total landings of HMS and have little impact on the stocks. Historical catches by all gears coastwide have been included in HMS stock assessments and in the calculation of MSY estimates.

The FMP identifies a number of concerns with the PacFIN database which will have to be resolved when the FMP is implemented in order to properly account for landings by gear. The FMP also proposes to address incidental landings by other gears. Under the proposed action, the landings of incidental HMS in these fisheries would be limited to discourage targeting while minimizing bycatch (section 9.2.4.2).

9.4.4 Foreign Fisheries and Effective International Management

A summary of foreign fisheries for HMS can be found in Chapter 2, section 2.5. There are numerous foreign fisheries that operate throughout the Pacific Ocean using pelagic longline, pole-and-line, purse seine, gillnet, and troll gears. By comparison, U.S. West Coast-based fisheries generally harvest a small fraction of the total international harvest of most HMS. For example, for the eastern and North Pacific stocks, the West Coast regional catch fraction of bigeye tuna is probably less than 0.01, and is about 0.01 for striped marlin, yellowfin tuna, and blue shark; 0.03 for skipjack; 0.04 for dorado; 0.10 for bluefin; 0.12 for swordfish; and 0.16 for North Pacific albacore (Chapter 3 Table 3-5, from various sources). The West Coast fractions of catch for the three thresher sharks are more difficult to determine, since reported landings outside the U.S. tend to lump the thresher species. But considering their ranges, West Coast catches of pelagic and bigeye thresher are probably less than 0.01 of the North Pacific catch. The fraction of common thresher is probably considerably higher because of its more localized distribution and coastal migratory habits.

Success in conservation of HMS, bycatch species, and protected species depends largely on how well international fisheries are managed by international management regimes. To date, precautionary international management controls have been limited to yellowfin and bigeye tunas and dolphins in the eastern Pacific under the auspices of the IATTC. While there are expectations and efforts to expand management activities to more species and areas in the Pacific, there is no guarantee at this time that formal management mechanisms will be instituted or effective. In the absence of effective international management, the abundance of stocks harvested by U.S. fisheries could be negatively impacted and unilateral U.S. actions to conserve and manage HMS stocks might be insufficient.

While there is a risk that there could be overexploitation of one or more stocks due to ineffective international management, there are reasons to be optimistic. First, there is considerable and growing interest in the scientific assessment of the stocks involved. The IATTC, which has exercised responsible control over eastern Pacific yellowfin fisheries for many years, has a capable and well-regarded scientific staff, and the science processes are being opened to additional peer scrutiny. While not all stocks under this proposed FMP are currently being monitored by the IATTC, the IATTC work program provides a solid foundation for stock assessments that can be relied on for determinations of status relative to the control rules proposed in the FMP.

The Interim Scientific Committee for Tuna and Tuna-like Species of the North Pacific was formed initially by the United States and Japan, but most major north Pacific fishing entities are now represented. The focus of this scientific group is on such species as bigeye tuna, albacore tuna, and swordfish that migrate across eastern and central Pacific regions. Even if these species ultimately are shown to consist of two or more stocks (i.e., and eastern Pacific and central/western Pacific stock), the sharing of catch, effort, and biological information and collaboration on stock identification and assessments will provide a sound basis for determinations of biologically appropriate catch levels and evaluations of the impacts of fishing on the stocks. Again, the scientific basis for management controls should improve considerably over time. In addition, there is a "North Pacific Albacore Working Group" that consists of the nations with the major fleets harvesting the north Pacific albacore stock(s). These members are considerably increasing both the status of knowledge about the stocks and the fisheries and the ability to determine biologically appropriate harvest levels for use in the future if international management is deemed necessary.

With respect to management, the IATTC has demonstrated the ability and willingness to establish fishery controls dealing with yellowfin and bigeye tuna and bycatch reduction or mitigation. This history suggests that, if necessary and appropriate, the IATTC can approach management controls for other international fisheries in the eastern Pacific Ocean.

9.5 Irretrievable Commitments of Resources

None of the actions proposed in this FEIS constitute irretrievable commitments of resources. The FMP is intended to be flexible to allow rapid responses to new information or new problems and conditions. The FMP is intended to prevent overfishing and to achieve the optimum yield from the fisheries with the least burden necessary on the fishery participants. The measures are intended to prevent irreparable adverse impacts on protected resources. If problems are identified, the Council will attempt to rectify them in a timely and efficient manner.

9.6 Possible Conflicts with Other Resource Plans

This FMP was developed with active participation by the state fishery management agencies of California, Oregon and Washington. The Council fully considered existing and potential regulations of the states and the need for coordinated action to resolve inconsistencies in states' regulations dealing with HMS fisheries. The FMP acknowledges the utility of many of those state regulations but also proposes actions to ensure that the effects intended by states' controls can be achieved or maintained through incorporation into federal regulations under the authority of the Magnuson-Stevens Act through regulations implementing the FMP. There are no known substantive conflicts with any existing state regulatory or resource management laws or regulations.

The FMP does not pose any conflicts with existing international HMS fishery management measures adopted by regional fishery management organizations. The FMP will provide a mechanism for organizing inputs to U.S. negotiators or representatives at international fishery management organizations and can provide a mechanism for U.S. implementation of some or all recommendations of such international organizations.

There are no conflicts with any land use plans of any state or local governments.

The FMP provides authority for steps to accommodate treaty Indian HMS fisheries if they develop.

9.7 Summary of Impacts on Listed Species and Critical Habitat

The purpose of this section is to summarize the estimated impacts of the HMS fisheries, as they would operate under the proposed actions in the FMP on ESA-listed species in the management area or adjacent waters and any designated critical habitat for such species. This is to provide a basis for NMFS and the USFWS to conduct Section 7 consultations and issue biological opinions relative to the FMP. These impacts are also discussed in referenced information in Chapter 9, section 9.2.5, Analysis of Actions Relating to Fishery-specific and Other Conservation Measures, and in Essential Fish Habitat Chapter 4 section 4.5.2.2.

Sea Turtles

Chapter 9, section 9.2.5, provides substantial detailed analysis of the estimated impacts of the proposed action and alternatives on sea turtles, and the principal conclusions are as follows:

1. Conservation and management measures proposed to control drift gillnet fisheries are identical to those now in place under federal regulations issued under the authority of the Marine Mammal Protection Act and the ESA. In addition, the proposed action is to close additional waters to drift gillnet fishing off Oregon and Washington. Therefore, the proposed action relative to this fishing gear will have impacts judged by NMFS not to pose jeopardy for any species of sea turtle. Further, the FMP proposes that NMFS maintain its observer program for this fishery, ensuring continuation of monitoring so corrective action can be taken in the future if necessary.

2. Under the FMP, longline fishing within the EEZ would be prohibited. Even though there is an opportunity for re-evaluation of such a fishery following an EFP bycatch experiment, pelagic longline gear would not be permitted within the U.S. West Coast EEZ following implementation of this FMP. Additionally, longline fishing outside the EEZ would be limited by similar measures currently applicable to the Western Pacific longline limited entry program to protect sea turtles. The biological opinion resulting in those measures included an estimate of the impacts of longline fishing by vessels not covered by the Western Pacific longline limited entry program and did not consider them to be sufficient to recommend immediate action to control those vessels.

As a practical matter, most of the longline vessels operating out of West Coast ports at this time formerly were (and may still be) eligible to operate out of Hawaii as the vessel owners had (or have) Western Pacific longline limited entry permits. Thus, the impacts of fishing by these vessels were considered in the context of the Section 7 consultation for the Western Pacific fleet and associated regulations governing fishing by those vessels. The proposed action, therefore, should provide the necessary protection for sea turtles consistent with the requirements of the ESA and relevant biological opinions. Further, the FMP proposes that NMFS establish an observer program for this fleet to ensure monitoring of its activities and corrective action if necessary in the future. If encounter rates prove higher than in the central and Western Pacific area, this issue will be revisited.

3. No new measures to control purse seine fishing are proposed except the FMP does mandate observer coverage of the small vessel fleet and does open the entire EEZ to purse seining. It is known that large purse seine vessels catch turtles in association with tuna, and the IATTC observer program covers 100% of all large vessel trips, and this would continue. Pursuant to an IATTC recommendation, NMFS has promulgated regulations requiring immediate release of sea turtles tangled in purse seine gear and special handling and release techniques for sea turtles brought on board and injured or comatose. Those measures were subject to informal consultations under Section 7 of the ESA and were found not to pose jeopardy for any species of sea turtles. This FMP would not affect those regulations.

4. No new management measures are proposed for troll albacore and harpoon fisheries or the charter recreational fishery, although some observer coverage is mandated by the FMP. These fisheries are not known to have any contact with sea turtles, and their operation should in no way affect sea turtles. The FMP mandates some observer coverage of these fisheries to ensure monitoring of the fisheries and determination of the potential for takes and attendant conservation problems. The FMP framework procedure will support prompt action if any problems are identified.

5. No new management measures are proposed for the private boat recreational fishery. This fishery is not known to have any contact with sea turtles, and fishing by these vessels should in no way affect sea turtles.

Sea Birds

Chapter 9, section 9.2.5., provides analysis of the potential impacts of the proposed and alternative management measures on Short-tailed Albatross. This section summarizes those analyses and extends consideration to other listed seabirds.

1. Management measures now in effect for the drift gillnet fishery virtually preclude takes of Short-tailed Albatross and most other seabirds. Requiring nets to be set deep effectively removes them from the diving range of albatross and Brown Pelicans. Other seabirds listed by the USFWS (see 6.1) do not occur in the area of the fishery and should not be affected. Xantus' Murrelet, under consideration for listing, may occur in the action area, but its small size and agility make it a highly unlikely candidate for possible entanglement. Therefore, the fishery as it would operate under this FMP should have no effect on any seabirds listed under the ESA.

2. Under the FMP, longline fishing within the EEZ would be prohibited. Therefore, there would be no potential for longline fishing to affect any seabirds in these waters. Longline fishing beyond the EEZ would be permitted, but would be subject to similar seabird avoidance gear and techniques that apply to the western Pacific area longline limited entry fleet pursuant to a biological opinion relating the short-tailed albatross. Further, the FMP mandates observer coverage of this fishery to ensure monitoring of any seabird interactions so that corrective action can be taken if future observations demonstrate a need. Thus, the FMP provides the same degree of protection to seabirds as mandated in a previous biological opinion for the same species subject to potential takes by this gear in adjacent waters. No other species listed by the USFWS occurs beyond the EEZ. If observed seabird encounter rates prove higher than in the central and western Pacific area, this issue will need to be revisited.

3. No new management measures are proposed for the purse seine, harpoon, or troll albacore fisheries. These fisheries are not known to have regular or predictable interactions with seabirds, though brown pelicans are known to dive on fish within and adjacent to purse seines when they are set around a school of fish. However, entanglements in netting in tuna sets are believed to be rare. The FMP mandates some observer coverage to ensure monitoring of the fisheries and determination of the potential for takes and attendant conservation problems. The FMP framework procedure will support prompt action if any problems are identified.

4. Charter and private boat recreational fishing would not be subject to new management controls under this FMP. It is known that Brown Pelicans are occasionally hooked by recreational fishers, but in most such instances, the bird either breaks free from the hook, breaks the fishing line, or is brought close to the vessel for a safe release. There is no evidence indicating that such interactions result in large numbers of serious injuries or death of Brown Pelicans. No other seabirds (California Least Tern, Marbled Murrelet, Bald Eagle, or California Clapper Rail) listed by the USFWS are known to occur in the EEZ areas fished by recreational fishers pursuing HMS and therefore no such species would be affected by fisheries as they would operate under this FMP.

Other Fish

1. There are no documented records of takes of listed salmon in any HMS fisheries, but anecdotal reports indicate that salmon (listed or otherwise) may be taken incidentally (though rarely) by all HMS gear except harpoon. The FMP would extend/expand area closures for drift gillnet and purse seine fisheries and would maintain the *de facto* prohibition of longline fishing for HMS in the EEZ. Thus, there would be little or no potential for these fisheries to take salmon in the future. The combined action of this FMP, including the designation of salmon as a prohibited species, in addition to existing states and federal regulations, are thought to provide adequate protection for endangered salmon.

2. The FMP would not propose new conservation and management measures for the troll albacore fishery. When fishing for albacore, few, if any salmon are taken. However, many albacore troll vessels also fish for salmon when that season is open and salmon are available. As such, their activities are considered in the Section 7 consultation conducted for the salmon fisheries each year. Thus, fishing under this FMP would not add to any impacts on listed salmonids beyond those considered in those consultations.

3. The fisheries to be managed under the FMP occur in offshore waters of the EEZ; thus, the fisheries as they would be conducted under the FMP would not affect any listed coastal or estuarine species such as the tidewater goby.

Marine Mammals

With existing mitigation measures in place, there is no evidence that the HMS fisheries currently have had more than a rare interaction with any listed cetaceans or pinnipeds. Purse seine vessels occasionally set around whales in the past, but this is now prohibited. Right whale entanglements with longline gear have occurred frequently enough in the Atlantic to cause regulatory action to protect that species, but this is not a documented problem off the West Coast or in the central Pacific. The fisheries that might be most likely to have interactions are the drift gillnet, longline and purse seine fisheries, and recent biological opinions have concluded no jeopardy with respect to these fisheries' interactions with cetaceans and pinnipeds. The FMP essentially maintains existing protections (and to some extent expands them by expanding drift gillnet and prohibiting longline fishing in the EEZ) and therefore is believed to safeguard against adverse effects on listed species. Again, observer programs are mandated to ensure that any problems can be identified and corrective action can be taken as needed.

The fisheries managed under this FMP occur in the EEZ and thus are not likely to have any interactions with sea otters, which occur mainly within nearshore waters.

Impacts on Critical Habitat

The fisheries targeting HMS generally fish pelagic or near-surface waters; many with mobile gear. There are no known long-term habitat disturbances from such gear (see Chapter 4 for discussion of Essential Fish Habitat issues and concerns). As such, the fisheries as they would operate under this FMP would not likely adversely affect any critical habitat designated for any species listed under the ESA.

9.8 Energy Use Impacts and Implications

Nothing in this FMP has direct energy use or conservation impacts. The FMP proposes fishery conservation and management measures that could affect the efficiency of some fishing vessels in that they might use more fuel than without the FMP. However, the requirements imposed are believed to be the least burdensome consistent with achievement of the conservation of living marine resources under the FMP.

9.9 Natural or Depletable Resource Requirements

The FMP does not directly pose any natural or depletable resource requirements. However, the conservation and management measures for the fisheries, and the overall management system, are intended to prevent overfishing of fish stocks, to protect and promote the recovery of species with special status (such as sea turtles and sea birds), and to achieve optimum yield from the fisheries being managed. As noted above, some fisheries will be somewhat less efficient under the FMP than without it, but the burden is the least possible to meet the conservation objectives of the FMP.

9.10 Urban Resources and Quality

The FMP will not directly affect the quality of life, aesthetics, or structures in any urban areas. The FMP may have some adverse impact on income and employment in communities in which HMS are landed or in which persons who fish for HMS live. The FMP acknowledges that these effects may occur, but they are unavoidable to meet the conservation objectives and requirements of the FMP and applicable law.

9.11 Mitigating Measures

The actions proposed are considered to represent the optimum mix of fishery controls intended to achieve maximum benefits from the fisheries subject to the constraints imposed by the availability and vulnerability of the various species, the interests of the various fisheries and the need to protect and promote the recovery of species listed under the ESA. It is acknowledged that the conservation and management measures proposed for the drift gillnet and longline fisheries will limit their operational flexibility and may adversely affect income and employment in the fisheries and related businesses. With respect to drift gillnet fishing, however, net impacts compared to the status quo are slight because the proposed action essentially retains the management measures currently in place with some added federal controls to ensure that state controls cannot be avoided by interstate fisheries. With respect to the longline fishery, the net impacts are larger. The proposed action retains the current management measures within the EEZ (with the addition of closing the non-active experimental longline fishery allowed by Oregon) and establishes controls on distant water longline fishing that places West Coast vessels under similar controls with vessels that have Western Pacific Council area longline limited entry permits. This is likely to result in substantially lower catches, landings, income and employment in the longline fishery. However, if the FMP were not adopted, NMFS would be expected to use its authority under the Magnuson-Stevens Act, MMPA or ESA to achieve substantially the same controls. These impacts are unavoidable if the requirements to protect sea turtles and sea birds are to be met.

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9.2.5.3 Purse Seine Fishery: Actions, Alternatives and Analyses

Purse Seine Fishery Alternative 1: Adopts no new federal regulations. State closures would remain in effect under states' authorities.

Purse Seine Alternative 2 (Proposed): Opens the entire EEZ to purse seine fishing. Purse seiners from any state could fish anywhere in the EEZ.

Purse Seine Alternative 3: Closes the area within the EEZ north of 45° N latitude to purse seine fishing to address bycatch and protected species concerns, and possible adverse impacts on other fisheries.

Purse Seine Alternative 4: Closes the EEZ off Washington to purse seine fishing, but allows it off Oregon and California.

Purse Seine Proposed Action and Alternatives:

- Alternative 1: No Action
- Alternative 2: (Proposed Action): Opens entire EEZ to purse seine fishing.
- Alternative 3: Closes area north of 45° N to protect salmon and thresher shark, and to avoid gear conflicts and protected species interactions.
- Alternative 4: Allows purse seining for HMS in the EEZ off Oregon and California, but not off Washington.

Analysis of Purse Seine Alternative 1: (No Action): With the No FMP alternative, there could be an alternative fishing opportunity for Washington and Oregon fishers, particularly for those participating in the sardine fishery. While Washington does not allow the use of purse seine in its waters except for the sardine fishery, Oregon or California vessels could fish in the EEZ off Washington and land in Oregon or California, and Washington vessels under this alternative could possibly fish in the EEZ off Washington and land in another state. However, assuming significant start-up costs versus the expected returns, this may not be economically feasible. Net national benefits (NNB) would increase if a fishery off Washington were economically feasible, but NNB could decrease if earnings of salmon trollers were disproportionately offset. Unless purse seine vessels already fishing northern bluefin tuna/albacore to the south are attracted by this potential, harvesting capacity would need to increase. There is unlikely to be any significant in shift in the northern bluefin tuna/albacore purse seine fishery activity from traditional areas. Gear and territorial conflicts could arise between tuna purse seine, albacore hook-and-line and the trial sardine purse seine fisheries off Washington if they should simultaneously fish on large mixed aggregations of bluefin tuna, albacore tuna and sardine. This alternative also could result in increased bycatch of salmon and other non-HMS species.

Analysis of Purse Seine Alternative 2 (Proposed): Under this alternative, the purse seine fishery for HMS could operate throughout the EEZ. This would provide more opportunity to fish for bluefin tuna in those years when they travel in fishable schools as far north as Oregon and Washington, and could raise the potential for purse seining for albacore. Because northern bluefin tuna do not generally occur in significant numbers that far north except during periods of elevated water temperature, this would likely only result in an increase in purse seine fishing activity for northern bluefin tuna during El Niño-like conditions. However, assuming significant start-up costs versus the expected returns, this may not be economically feasible. NNB would increase if a fishery off Washington were economically feasible, but NNB could decrease if earnings of salmon trollers were disproportionately offset. Unless purse seine vessels already fishing northern bluefin tuna to the south are attracted by this potential, harvesting capacity would need to increase. There is unlikely to be any significant shift in the northern bluefin tuna purse seine fishery activity from traditional areas. Gear and territorial conflicts could arise between tuna purse seine, albacore hook-and-line and the trial sardine purse seine fisheries off Washington if they should simultaneously fish on large mixed aggregations of bluefin tuna, albacore tuna and sardine. Although it is difficult to know, there could be a significant incidental catch of sharks and albacore in a purse seine fishery targeting northern bluefin tuna off Washington and Oregon.

Table 9-1 DGN estimated harvest in number of fish resulting from the proposed area closure, as discussed in DGN Alternative 2 Analysis.

Species	Without closure, fishing unchanged (number of fish)	With Closure, Fishing moves south (number of fish)
Swordfish	7,260	7,351
Common thresher	1,240	2,427
Shortfin mako	995	1,013
Bigeye thresher	193	47
Blue marlin	2	0
Striped marlin	17	9
Blue shark	11,702	14,348

Table 9-2. DGN ex-vessel gross revenue and pounds based on fishing area recorded on landing receipts[1] for the time period between August 15 and November 15, 1997-2000, in ocean waters north of the line extending from Point Sur (36° 18.5' N latitude) to the point 34° 27' N latitude, 123° 35' W longitude.

	Blue	Louvar	Mako	Opah	Swordfish	Thresher
Pounds (1997-2000)[2]	81.50	4,745.60	55,453.70	68,159.20	884,184.40	140,303.50
Annual Average (lbs)	20.38	1,186.40	13,863.43	17,039.80	221,046.10	35,075.88
Average Price	$ 2.00	$ 2.90	$ 0.98	$ 0.38	$ 2.63	$ 1.02
Value (1997-2000)	$163.00	$13,773.36	$54,131.76	$26,033.49	$2,326,156.40	$143,015.59
Annual Average	$ 40.75	$ 3,443.34	$13,532.94	$ 6,508.37	$ 581,539.10	$ 35,753.90
Total Gross revenues	$ 2,563,273.60					
Annual Revenues (Avg)	$ 640,818.40					

[1] California Department of Fish and Game unpublished data.
[2] Pounds are dressed weight.

Table 9-3. DGN ex-vessel gross revenues based on fishing area recorded on landing receipts for the period between August 15 through August 31, and January 1 through January 31, 1997-2000, in ocean waters south of Point Conception east of 120° W longitude[1].

	Blue	Louvar	Mako	Opah	Swordfish	Thresher
Pounds (1997-2000) [2]	-	6,214.50	66,102.39	193,708.80	379,174.50	142,936.50
Annual Average (lbs)	-	1,553.63	16,525.60	48,427.20	94,793.63	35,734.13
Average Price	$ -	$ 4.08	$ 1.07	$ 0.42	$ 3.64	$ 1.37
Value (1997-2000)	$ -	$ 25,324.09	$70,857.02	$80,981.94	$1,381,074.43	$196,437.96
Annual Average	$ -	$ 6,331.02	$17,714.25	$20,245.48	$ 345,268.61	$ 49,109.49
Total Gross revenues	$1,754,675.44					
Annual Revenues (Avg)	$ 438,668.86					

[1] California Department of Fish and Game unpublished data.
[2] Pounds are dressed weight.

Table 9-4. DGN estimated harvest in number of fish resulting from closing the area north of Point Conception to 45° N latitude, as discussed in DGN Alternative 5 analysis.

Species	Without closure, fishing unchanged (Number of fish)	With closure, fishing moves south (Number of fish
Swordfish	6,301	2,657
Common thresher	1,691	2,416
Shortfin mako	2,480	5,287
Bigeye thresher	281	429
Blue marlin	35	54
Striped marlin	134	376
Blue shark	12,099	7,247

Table 9-5. DGN ex-vessel gross revenue based on fishing area recorded on landing receipts for the period between August 15 through October 31, 1997-2000, in ocean waters north of Point Conception[1]

	Blue	Louvar	Mako	Opah	Swordfish	Thresher
Pounds (1997-2000)[2]	81.50	6,477.10	64,049.00	83,536.20	906,682.30	133,658.50
Annual Average (lbs)	20.38	1,619.28	16,012.25	20,884.05	226,670.58	33,414.63
Average Price	$ 2.00	$ 3.18	$ 1.06	$ 0.41	$ 2.84	$ 1.13
Value (1997-2000)	$ 163.00	$20,577.75	$ 67,868.18	$34,466.90	$2,574,167.73	$150,824.44
Annual Average	$ 40.75	$ 5,144.44	$ 16,967.04	$ 8,616.73	$ 643,541.93	$ 37,706.11
Total Gross revenues	$2,848,068.00					
Annual Revenues (Avg)	$ 712,017.00					

[1] California Department of Fish and Game unpublished data.
[2] Pounds are dressed weight.

Table 9-6. DGN ex-vessel gross revenues based on fishing area recorded on landing receipts for the period between August 15 through August 31, and January 1 through January 31, 1997-2000, in ocean waters south of Point Conception east of 120° W longitude[1].

	Blue	Louvar	Mako	Opah	Swordfish	Thresher
Pounds (1997-2000) [2]	-	6,214.50	66,102.39	193,708.80	379,174.50	142,936.50
Annual Average (lbs)	-	1,553.63	16,525.60	48,427.20	94,793.63	35,734.13
Average Price	$ -	$ 4.08	$ 1.07	$ 0.42	$ 3.64	$ 1.37
Value (1997-2000)	$ -	$ 25,324.09	$70,857.02	$80,981.94	$1,381,074.43	$196,437.96
Annual Average	$ -	$ 6,331.02	$17,714.25	$20,245.48	$ 345,268.61	$ 49,109.49
Total Gross revenues	$1,754,675.44					
Annual Revenues (Avg)	$ 438,668.86					

[1] California Department of Fish and Game unpublished data.
[2] Pounds are dressed weight.

Table 9-7. Fish catches, discards and catch per thousand hooks (CPUE) reported for all high seas **logbook** data where a trip fished east of 135°W longitude, 1994-2000. Position is based on begin set position. Catch and discards are in number of fish. Data represent 33 Hawaii trips and 276 California Trips. Data are not treated for bias.

Area	Species	Catch	CPE	Discards	Total	Area	Species	Catch	CPE	Discards	Total
East of 135°		2,520,255	Hooks:			West of 135°		830,170	Hooks		
	Blue Marlin	0	0.005	12	12		Blue Marlin	56	0.078	9	65
	Striped Marlin	12	0.024	49	61		Striped Marlin	121	0.181	29	150
	Black Marlin	2	0.008	17	19		Black Marlin	3	0.007	3	6
	Sailfish	0	0.002	5	5		Sailfish	1	0.007	5	6
	Spearfish	44	0.023	14	58		Spearfish	107	0.143	12	119
	Swordfish	32,867	13.780	1,862	34,729		Swordfish	7,908	10.027	416	8,324
	Blue Shark	406	10.614	26,344	26,750		Blue Shark	169	7.709	6,231	6,400
	Mako Shark	421	0.393	569	990		Mako Shark	65	0.210	109	174
	Thresher Shark	50	0.116	243	293		Thresher Shark	2	0.037	29	31
	Other Shark	12	0.341	848	880		Other Shark	1	0.231	191	192
	Mahimahi	5,693	2.824	1,423	7,116		Dorado	1,814	2.780	494	2,308
	Moonfish	240	0.123	69	309		Moonfish	72	0.099	10	82
	Wahoo	42	0.021	12	54		Wahoo	114	0.143	5	119
	Other Pelagic	31	0.112	252	283		Other Pelagic	17	0.136	96	113
	Albacore	4,809	3.713	4,548	9,357		Albacore	1,659	3.910	1,587	3,246
	Bigeye Tuna	10,163	4.229	495	10,658		Bigeye Tuna	1,849	2.339	93	1,942
	Yellowfin Tuna	490	0.242	120	610		Yellowfin Tuna	254	0.432	105	359
	Other Tuna	18	0.010	6	24		N. Bluefin Tuna	53	0.064	0	53
	N. Bluefin Tuna	2,131	0.861	40	2,171		Oilfish	31	0.219	151	182
	Oilfish	321	0.270	360	681		Pomfret	38	0.049	3	41
	Pomfret	32	0.016	8	40		Skipjack Tuna	45	0.069	12	57
	Skipjack Tuna	7	0.012	24	31						
Protected species:						Protected species:					
	Sea Lion/Seal		0.0004	1	1		Sea Lion/Seal		0.0012	1	1
	Green Turtle		0.0040	10	10		Green Turtle		0.0012	1	1
	Leatherback Turtle		0.0123	31	31		Leatherback Turtle		0.0108	9	9
	Olive Ridley Turtle		0.0067	17	17		Olive Ridley Turtle		0.0084	7	7
	Loggerhead Turtle		0.0052	13	13		Loggerhead Turtle		0.0181	15	15
	Other Turtle		0.0008	2	2		Other Turtle		0.0060	5	5
	Albatross		0.0222	56	56		Albatross		0.0458	38	38

Table 9-8. Summary of **observer** data (fish catches) for high-seas longline vessels that fished 1994 through 2000 both east and west of 135° W longitude. CPUE is catch per 1,000 hooks, CPS is catch per set where catch is in number of fish. Data represent 6 trips, 100 sets and 86,045 hooks (West=42,198; East=43,847). Data are not treated for bias.

Species	WEST OF 135W				EAST OF 135W				ALL AREAS			
	Catch	Discards	CPUE	CPS	Catch	Discards	CPUE	CPS	Catch	Discards	CPUE	CPS
Albacore	337	206	7.986	6.878	513	422	11.700	10.059	850	630	9.879	8.500
Bigeye Thresher Shark	0	0	0.000	0.000	5	2	0.114	0.098	5	2	0.058	0.050
Bigeye Tuna	35	1	0.829	0.714	129	15	2.942	2.529	164	16	1.906	1.640
Blue Shark	702	702	16.636	14.327	861	861	19.636	16.882	1583	1583	18.165	15.630
Bluefin Tuna	8	1	0.190	0.163	15	1	0.342	0.294	23	2	0.267	0.230
Cartilaginous Fishes	3	3	0.071	0.061	1	1	0.023	0.020	4	4	0.046	0.040
Cookie Cutter Shark	1	1	0.024	0.020	1	1	0.023	0.020	2	2	0.023	0.020
Crestfish	0	0	0.000	0.000	1	1	0.023	0.020	1	1	0.012	0.010
Escolar	15	12	0.355	0.306	20	14	0.456	0.392	35	26	0.407	0.350
Fish, Unidentified	4	4	0.095	0.082	9	9	0.205	0.176	13	13	0.151	0.130
Indo-Pacific Blue Marline	0	0	0.000	0.000	1	1	0.023	0.020	1	1	0.012	0.010
Longfin Mako	1	0	0.024	0.020	0	0	0.000	0.000	1	0	0.012	0.010
Louvar	0	0	0.000	0.000	1	0	0.023	0.020	1	0	0.012	0.010
Dorado	22	3	0.521	0.449	17	1	0.388	0.333	39	4	0.453	0.390
Northern Lancetfish	11	11	0.261	0.224	28	28	0.639	0.549	39	39	0.453	0.390
Ocean Sunfish (Common Mola)	15	15	0.355	0.306	8	7	0.182	0.157	23	22	0.267	0.230
Oilfish	3	2	0.071	0.061	9	9	0.205	0.176	12	11	0.139	0.120
Opah (Moonfish)	1	0	0.024	0.020	7	4	0.160	0.137	8	4	0.093	0.080
Pacific Pomfret	2	0	0.047	0.041	2	0	0.046	0.039	4	0	0.046	0.040
Pelagics Stingray	26	26	0.616	0.531	11	11	0.251	0.216	37	37	0.430	0.370
Rainbow Runner	1	0	0.024	0.020	0	0	0.000	0.000	1	0	0.012	0.010
Remora	10	10	0.237	0.204	10	10	0.228	0.196	20	20	0.232	0.200
Shortbill Spearfish	1	0	0.024	0.020	1	1	0.023	0.020	2	1	0.023	0.020
Shortfin Mako (Mackerel Shark)	14	11	0.332	0.286	17	16	0.388	0.333	31	27	0.360	0.310
Sickle (Bigscale) Pomfret	2	1	0.047	0.041	0	0	0.000	0.000	2	1	0.023	0.020
Skipjack Tuna	2	1	0.047	0.041	1	0	0.023	0.020	3	1	0.035	0.030
Snake Mackerel	6	6	0.142	0.122	2	2	0.048	0.039	6	8	0.093	0.060
Striped Marlin	2	0	0.047	0.041	2	2	0.046	0.039	4	2	0.046	0.040
Swordfish, Broadbill	524	44	12.418	10.694	770	46	17.561	15.098	1294	90	15.039	12.940
Tuna and Mackerels	0	0	0.000	0.000	3	3	0.068	0.059	3	3	0.035	0.030
Wahoo	1	0	0.024	0.020	0	0	0.000	0.000	1	0	0.012	0.010
Yellowfin Tuna	3	1	0.071	0.061	5	3	0.114	0.098	8	4	0.093	0.080

Table 9.9. Summary of selected observer data (protected species) for high-seas longline vessels that fished 1994 through 2000 both east and west of 135° W longitude. Data not treated for bias.

Trips	Sets	Hooks	Catch				CPUE (number/1000 hooks)			
			Albatross	Leatherback	Loggerhead	Striped Marlin	Albatross	Leatherback	Loggerhead	Striped Marlin
Entire area: 6	100	86,045	15	6	5	4	0.174	0.070	0.058	0.046
East of 135° W: 6	51	43,847	11	2	2	2	0.251	0.046	0.046	0.046
West of 135° W: 5	49	42,198	4	4	3	2	0.095	0.095	0.095	0.047

Table 9-10. Comparative Species Ranking. Taken in the High Seas Longline Fishery and the CA/OR Drift Gill Net Fishery in the EEZ (1997-1999), based on longline observer, longline logbook, and drift net observer data*, Including catches of vessels that fished east of 135° W longitude. Protected species ranked separately. (Data are preliminary, unedited, not treated for bias and require more detailed analysis before extrapolation.)

High Seas LL Observed Catch Rates (East 135W) N= 43,847 hooks, 1994-2000	**High Seas LL Logbook Reported Catch Rates (East 135W) CA/HI -based vessels** N=2,520,255 Hooks, 1994-2000	**High Seas LL Logbook Reported Catch Rates ALL AREAS- California-Based vessels** N= 7,071,745 hooks-Aug 1995-Dec 1999	**DGN Observed Catch/Interactions (~20% observer Coverage1997,1998, 1999)**
Fishes:	**Fishes:**	**Fishes:**	**Fishes**
CPUE > 0.30/1000 hooks	*CPUE > 0.30/1000 hooks*	*CPUE > 0.30/1000 hooks*	*Numbers >1000:*
1 Blue Shark	1 Broadbill Swordfish	1 Broadbill swordfish	1 Mola mola
2 Broadbill Swordfish	2 Blue Shark	2 Blue shark	2 Blue shark
3 Albacore	3 Bigeye tuna	3 Albacore tuna	3 Albacore
4 Bigeye tuna	4 Albacore	4 Bigeye tuna	4 Swordfish
5 Northern Lancetfish	5 Dorado (mahimahi)	5 Dorado (mahimahi)	5 Skipjack tuna
6 Escolar	6 Northern Bluefin Tuna		6 Bullet mackerel
7 Shortfin mako shark	7 Shortfin mako shark		7 Bluefin tuna
7 Dorado (Mahimahi)	8 Other Shark	*CPUE<= 0.30 and >.05/1000 hooks*	8 Mako shark
8 Bluefin tuna		6 Bluefin tuna	9 Opah
		7 Mako shark	10 Common thresher shark
CPUE <= 0.30 and > .05/1000 hooks	*CPUE<= 0.30 and >.05/1000 hooks*	8 Yellowfin tuna	
9 Pelagic stingray	9 Oilfish	9 Other fishes, undet.	*Numbers<200:*
10 Remora	10 Yellowfin tuna		11 Louvar
11 Oilfish	11 Moonfish		12 Yellowfin tuna
11 Fish, Unid.			13 Bigeye thresher
12 Mola Mola	*CPUE < .05/1000 hooks*	*CPUE < .05/1000 hooks*	
13 Opah (Moonfish)	12 Thresher shark, undet.	10 Thresher shark, undet.	*Numbers <100:*
14 Bigeye thresher shark	13 Other pelagic fishes	11 Opah	14 Striped marlin
14 yellowfin tuna	14 Striped marlin	12 Oilfish	15 Pelagic thresher shark
15 Tunas and mackerels, undet.	15 Wahoo	13 Other shark, undet.	16 Blue marlin
	15 Spearfish	14 Wahoo	17 Bigeye tuna
CPUE < .05/1000 hooks:	16 Pacific pomfret	15 Striped marlin	18 Dorado (Mahimahi)
16 Pacific pomfret	17 Skipjack tuna	16 Sailfish	
16 snake mackerel	18 Black Marlin	17 Blue marlin	**Protected species (includes releases):****
16 Striped marlin	18 Other tuna	18 Spearfish	*5.0 to 25 per yr*
17 Cartilaginous fishes, undet.			1 Common dolphin (short-beaked and long)
17 Cookie cutter shark	**Protected species (includes releases):**	**Protected species (includes releases):**	2 California Sea Lion
17 Crestfish	1 Albatross (CPUE = 0.022)	1 Albatross, unspecified (CPUE=0.014)	3 Elephant seal
17 Blue marlin	2 Leatherback turtle (CPUE= 0.012)	2 Leatherback turtle (CPUE=0.005)	*1.0 to 3.0 per year*
17 Louvar	3 Olive Ridley turtle (CPUE= 0.007)	3 Loggerhead turtle (CPUE=0.003)	4 Northern Right Whale Dolphin
17 Shortbill Spearfish	4 Loggerhead turtle (CPUE= 0.005)	4 Olive ridley turtle (CPUE=0.003)	5 Leatherback Sea Turtle
17 Skipjack tuna	5 Green turtle (CPUE= 0.004)	5 Green turtle (CPUE=0.002)	6 Dall's Porpoise
	6 Other turtle (CPUE< 0.001)	6 Turtle, other (CPUE=0.001)	6 Loggerhead Sea Turtle
Protected species (includes	6 Seal (CPUE<0.001)	7 Bird, other (CPUE=0.001)	*0.3 to 1.0 per year:*
1 Black-footed albatross CPUE=.25		8 Monk seal (CPUE=<0.001)	7 Risso's Dolphin
2 Leatherback Turtle CPUE=.05		8 Sea lion (CPUE= <0.001)	7 Pacific White-sided dolphin
2 Loggerhead Turtle CPUE=.05			8 Grey Whale
			Less that 0.3 per yr:
			9 Short-finned Pilot Whale
			9 Fin Whale
			9 Minke Whale
			9 Humpback whale
			9 Sperm Whale
			9 Olive Ridley Turtle

* Data Obtained from NMFS longline observer, longline logbook, and drift gill net observer data; M. Vojkovich, Calif. Dep. Fish and Game (7/11/00); and from Cameron, G. and K.M. Forney. (1999; 2000) cetacean mortality papers presented to the International Whaling Comm.

** See also NOAA (2000) for expanded take rates 1990-2000.

Table 9-11. **Observer** catch data from Southern California experimental cable drift longline fishery for mako and blue shark, 1988 and 1989*. Includes releases. CPUE=catch or take/1000 hooks. Data based on O'Brien and Sunada (1994), and pers. commun., J. O'Brien, CDFG, 7/30/01.

	Number 1988	Number 1989	Total	CPUE
Fishes:				
Blue shark	1,900	1,320	3,220	82.14
Shortfin mako shark	883	610	1,493	38.08
Pelagic sting ray	265	194	459	11.71
Mola mola	1	2	3	0.07
Hammerhead shark	2	0	2	0.05
Pacific mackerel	2	0	2	0.05
Finescale triggerfish	1	0	1	0.03
Giant seabass	1	0	1	0.03
Common thresher shark	1	0	1	0.03
Protected species:				
California sea lion	3	2	5	0.13
Green sea turtle	2	0	2	0.05

Observer coverage approx 19%; no program in 1990-91. Total No. observed hooks set in 1988-89 = 39200

Table 9-12. NMFS/SWFSC Longline Shark Survey Catch Tally Summaries: Southern California Bight 1994-2000 *

Year	N. Hooks	SFMako	CThreshShrk	BlShark	PelRay	SoupShrk	SpDogfish	DskyShrk	Unid.Shrk	BatRay	Yllowtail	Pmack	BSndBass	Mola	WSeaBass	Opah	Dorado	Unkn
1994	3,637	146	1	119	117							7						
1995	5,633	162	1	263	28													
1996	6,212	206	0	695	73									1				
1997	5,529	108	0	195	45				1					1			3	1
1998	1,872	40	27	12	8			1					1					
1999	606	40	28	17	8		1		1									
2000	7,596	51	34	1,003	26	2				1	1	2	13	1	2	1		1
Totals	31,085	753	91	2,304	305	2	1	1	2	1	1	9	14	3	2	1	3	2
CPUE		24.20	2.33	74.12	9.81	0.06	0.03	0.03	0.06	0.03	0.03	0.29	0.45	0.10	0.06	0.03	0.10	0.06

* Sampling protocol and target species not uniform over time (see text). Source: D. Prescott, NMFS, Southwest Fisheries Science Center, La Jolla, CA 7/16/2001
CPUE = Catch per 1,000 hooks

Table 9-13. Turtle takes (numbers) and rates (in parentheses; per 1,000 hooks) west and east of 150° W longitude, based on combined fishery observer data from the Hawaii-based (1997-01) and California-based (2001-03) fleets. Asterisk * indicates statistical significant W-E difference in rates, with $p_\alpha \leq 0.05$), Fisher exact test.

Species	West of 150° W, All Quarters	East of 150° W, All Quarters
Leatherback Turtle	32 (0.021)	15 (0.034)
Loggerhead Turtle	129 (0.085)	50 (0.112)
Olive Ridley Turtle	38 (0.025)	2 (0.004)*
Green Turtle	13 (0.009)	0

Table 9-14. Turtle and albatross takes (numbers) and rates (parentheses; per 1,000 hooks) west and east of 140° W longitude (west to 150° W only), based on combined fishery observer data from the Hawaii-based (1997-01) and California-based (2001-03) fleets. Data are for all quarters combined and for quarters 4 and 1 separately, when most of fishing occurs. Asterisk * indicates statistical significant W-E difference in rates, with $p_\alpha \leq 0.05$, Fisher exact test.

	All Quarters		Quarter 4		Quarter 1	
Species	West of 140° W	East of 140° W	West of 140° W	East of 140° W	West of 140° W	East of 140° W
Leatherback Turtle	9 (0.034)	6 (0.033)	8 (0.078)	6 (0.046)	0	0
Loggerhead Turtle	48 (0.182)	8 (0.044)*	8 (0.078)	3 (0.023)	34 (0.242)	2 (0.151)
Olive Ridley Turtle	2 (0.008)	0	1 (0.010)	0	0	0
Green Turtle	0	0	0	0	0	0
BF Albatross	61 (0.231)	41 (0.227)	11 (0.107)	27 (0.206)*	40 (0.285)	5 (0.378)
Laysan Albatross	39 (0.148)	0	3 (0.029)	0	36 (0.256)	0

Table 9-15. Derived takes and initial estimates of mortality of loggerhead and leatherback turtles at three possible levels of longline fishing effort, and two westward limits to fishing, based on hooking rates from combined CA+HI (1997-2003)[1] and CA only (2001-2003)[2] observer data.

Estimated Take Rates			Estimated Number of Takes (Est. Mortalities[3]) by Projected Number of Hooks Fished[4]	
Species of Turtle	Area Fished	Take Rate (Per 1000 hooks)	1,550,000 hooks	1,000,000 hooks
Loggerhead	east of 150° W	CA+HI: 0.112 CA only: 0.108	174 (47) 167 (45)	112 (30) 108 (29)
	east of 140° W	CA+HI: 0.044 CA only: 0.000	68 (18) 0 (0)	44 (12) 0 (0)
Leatherback	east of 150° W	CA+HI: 0.034 CA only: 0.013	53 (14) 20 (5)	34 (9) 13 (4)
	east of 140° W	CA+HI: 0.033 CA only: 0.029	51 (14) 45 (12)	33 (9) 29 (8)

[1] Rates as in Tables 9-13, 9-14. From J.V. Carretta, unpubl., 4/15/03, An analysis of sea turtle take rates in the high-seas longline fishery in the eastern Pacific. NMFS, Southwest Fisheries Science Center, La Jolla CA.

[2] From L. Enriquez, NMFS, Southwest Region Office, Long Beach CA, 7/2/03; based on 11 CA-based vessels.

[3] Preliminary. Mortality rate used is 0.27, the NMFS national policy rate for any external hooking. Supplemental NMFS Report to PFMC Exhibit F.2.b, June 2003.

[4] Estimated total CA fleet hook effort in 2002. The 1.55 million hooks is the assumption that fleet effort stays the same.

Pacific Leatherback Conservation Area
Drift Gillnet Closed Area
August 15 Through November 15

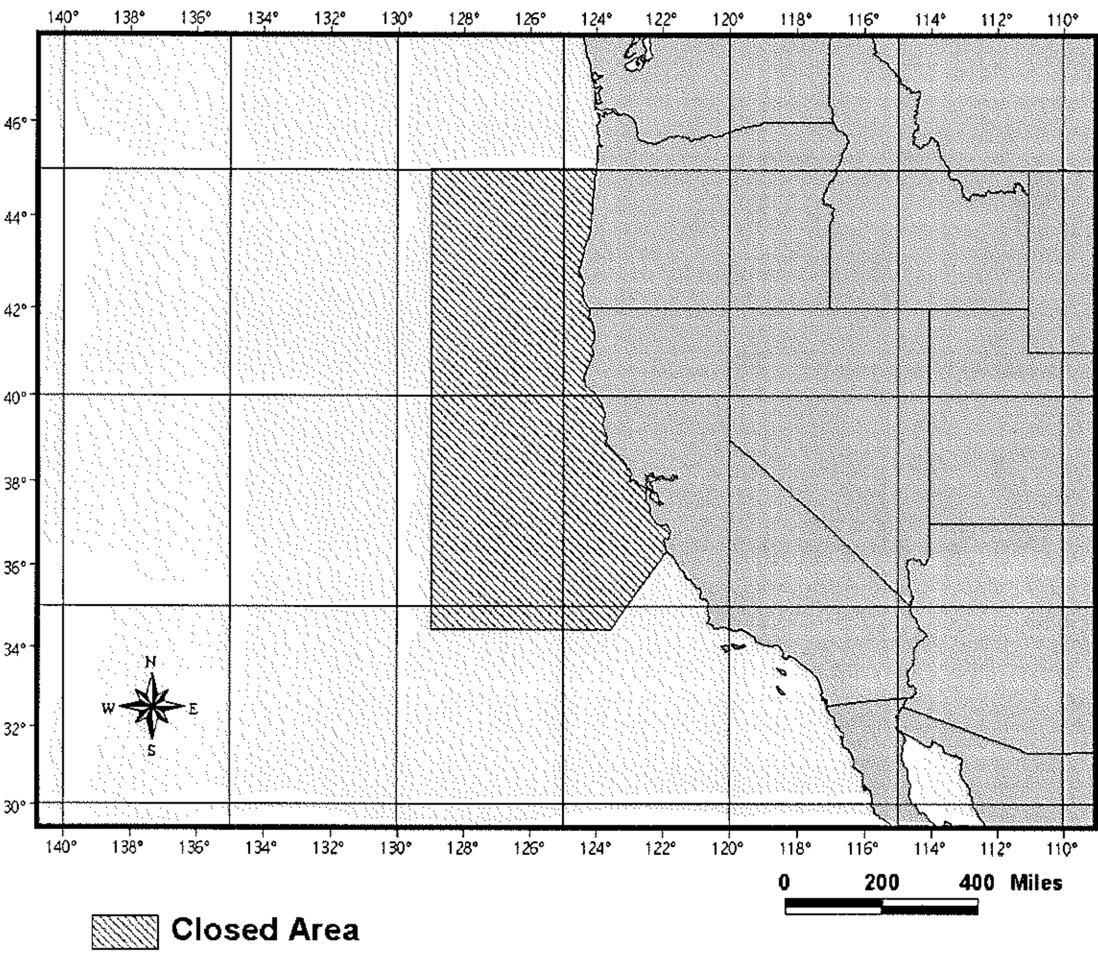

Figure 9-1

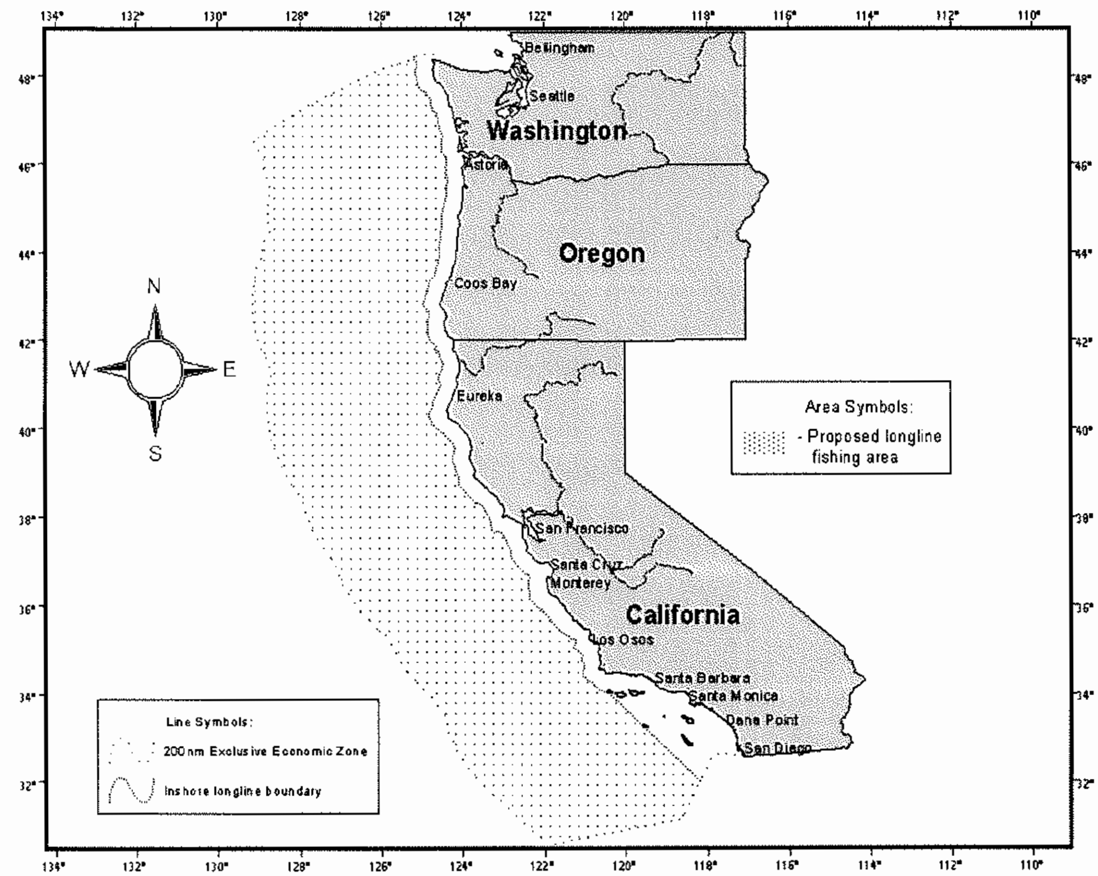

Figure 9-2. Industry-proposed longline fishing area (EEZ Longline Alt.# 4)

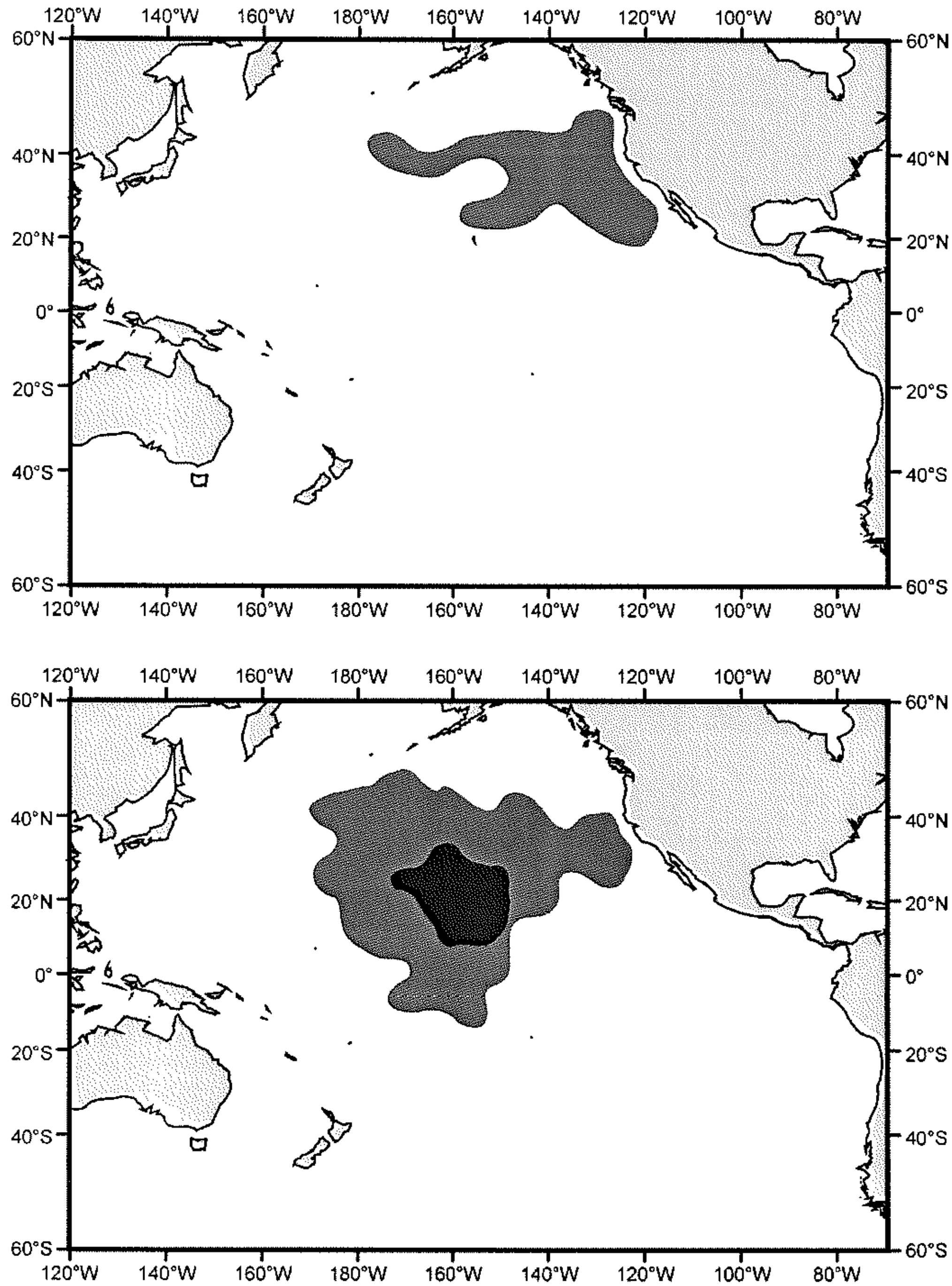

Figure 9-3: Distribution of California-based high seas longline effort (above) and Hawaii-based high seas longline effort (below), 1994-2000. (A. Coan, SWFSC/NMFS, La Jolla).

Chapter 10
RELATIONSHIP TO OTHER LAWS AND DIRECTIVES

10.0 RELATIONSHIP TO OTHER LAWS AND DIRECTIVES

The MSFCMA requires that an FMP meet the requirements of the Act and other applicable law. Following are the types of determinations NMFS will have to make when the FMP is submitted to NMFS for approval or disapproval to ensure that the FMP complies with the various laws and directives. Compliance will be evaluated during public review and the following amended accordingly.

10.1 National Environmental Policy Act

This FMP has been prepared in the structure of an Environmental Impact Statement (EIS). In this regard, it analyzes a wide variety of alternatives to avoid or minimize adverse impacts while enhancing the quality of the human environment. A notice of availability of the FMP and the draft EIS was published in the *Federal Register* on January 18, 2002 (67 FR 2651). Comments received on the draft and responses to the comments are included in this document as Appendix G.

10.2 Executive Order 12866 (Regulatory Impact Review)

The proposed action is expected to be determined to be not significant for purposes of Executive Order 12866. Based on analyses of the selected action and the alternatives, the EIS indicates that this action is not likely to result in a rule that may have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local, or tribal governments or communities; create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this Executive Order.

10.3 Regulatory Flexibility Act (RFA)

The FMP is accompanied by a Regulatory Impact Review/Initial Regulatory Flexibility Analysis (Appendix H) that describes the impact the FMP will have on small entities. No determination of significance under the RFA has yet been made. After public review of the FMP and the proposed rule, a determination of significance under the RFA will be made and, if necessary, a Final Regulatory Flexibility Analysis will be prepared.

10.4 Paperwork Reduction Act

This FMP contains collection-of-information requirements for six separate fisheries subject to review and approval by OMB under the Paperwork Reduction Act (PRA). These requirements will be submitted to OMB for approval. The public reporting burden for these requirements is estimated to be 15 minutes for a permit application, 6 minutes for filling out a log each day, and 45 minutes to affix the official number of a vessel to its bow and weather deck. In addition, for longline vessels, the reporting burden is estimated to be 4 hours for installation of a vessel monitoring system, 2 hours for maintenance of the system, and 24 seconds for electronic reporting via the satellite based vessel monitoring system. These estimates include the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

Public comment will be sought regarding whether these proposed collections of information are necessary for the proper performance of the functions of the agency, including whether the information shall have practical utility, the accuracy of the burden estimate, ways to enhance the quality, utility, and clarity of the information to be collected, and ways to minimize the burden of the collection of information, including through the use of automated information technology. The proposed rule will request that comments on these or any other aspects of the collection of information should be sent to NMFS, Southwest Region and to OMB at the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503 (Attn: NOAA Desk Officer).

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirement of the PRA, unless that collection of information displays a currently valid OMB control number.

10.5 Marine Mammal Protection Act (MMPA)

Under the requirements of the Marine Mammal Protection Act, each commercial fishery is categorized based on the level of incidental mortality and serious injury of marine mammals that occur in the fishery. The individual category determines whether participants in that fishery are subject to certain provisions of the MMPA such as registration, observer coverage, and take reduction plan requirements. There are three categories, and vessels in category I or II are required to be registered under section 118 of the MMPA. The California drift gillnet fishery for swordfish and thresher shark is a category I fishery, and NMFS has placed mandatory observers on these vessels since July 1990.

The Eastern Tropical Pacific (ETP) tuna purse seine fishery is governed by the International Dolphin Conservation Program Act (IDCPA), which amends provisions in the MMPA and the Dolphin Protection Consumer Information Act, governing marine mammal mortality in the U.S. ETP tuna purse seine fishery and the importation of yellowfin tuna and yellowfin tuna products from other nations. This fishery operates under an international observer program.

At this time, fishing activities conducted under the FMP are not expected to have an adverse impact on marine mammals.

10.6 Endangered Species Act

Chapter 6 provides a detailed description of protected species concerns in the HMS fisheries, and Chapter 9 evaluates the potential impacts on and implications for listed species under the proposed action and alternatives for management of the drift gillnet and pelagic longline fisheries under the FMP.

A biological opinion on the California/Oregon drift gillnet fishery was issued on October 23, 2000. The opinion concludes that issuing permits to this fishery is not likely to jeopardize the listed marine mammals affected by the fishery or the green and olive ridley sea turtles. However, the fishery is likely to jeopardize leatherback and loggerhead sea turtles, and a reasonable and prudent alternative was proposed that includes time/area closures for both species. A final interim rule has been published in the *Federal Register* on August 24, 2001 (66 FR 44549) implementing a closed area for leatherback turtles. A final interim rule implementing a closed area for loggerhead turtles was published on December 24, 2002 (67 FR 78388).

A biological opinion on the potential impacts of the purse seine fishery on listed species in the eastern Pacific was issued on December 8, 1999. The opinion concluded that the fishery as it was expected to operate under the International Dolphin Conservation Program Act would not adversely affect any listed species or any designated critical habitat for the species. Nothing in the proposed action will substantially affect the operation of the purse seine fishery and the proposed action is believed to not affect the conclusions of the biological alternative. Therefore, the proposed action with respect to purse seine fishing is believed to be consistent with the ESA.

The biological opinion addressing the impacts of the drift gillnet fishery on listed species ultimately resulted in adoption of regulations by NMFS that were slightly different from the reasonable and prudent alternatives (RPA) of the biological opinion (see Chapter 9 for a discussion of the alternatives). However, those regulations were deemed to provide at least the same level of protection as the RPA. The proposed action in this FMP is to adopt the same controls, thus the Council expects that the proposed action will result in a conclusion that no further action is necessary in this regard. The Council will consider any recommendations by NMFS for additional measures to ensure adequate protection of sea turtles.

Biological opinions addressing the impacts of the longline fishery of the western Pacific on listed species have not addressed the longline fishery based on the West Coast. Chapter 9 provides an assessment of the impacts of alternative longline fishery controls on listed species. It is believed that the proposed action will provide substantially the same degree of protection to listed sea turtles and seabirds as is provided by the longline fishery control measures applicable to western Pacific longline vessels. During the public review phase, NMFS will review the analyses to determine whether there is potential adverse effects on listed species and will advise the Council of any concerns with appropriate management recommendations. The final Council action will be guided in large part by the comments of NMFS and USFWS addressing ESA concerns and any recommendations for Council action.

The Council and NMFS also will cooperate with the USFWS in reviewing the potential impacts of the HMS fisheries, including the pelagic longline fishery, as they would operate under the proposed action and alternatives, on listed seabirds.

10.7 Coastal Zone Management Act

NMFS determined that the draft Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species was consistent to the maximum extent practicable with the approved coastal zone management programs of California, Oregon, and Washington. On January 24, 2002, this determination was submitted for review by the responsible state agencies under section 307 of the Coastal Zone Management Act. California concurred with this determination. Because no response was received from the States of Oregon and Washington, state concurrence on consistency is inferred.

10.8 Executive Order 13132 (Federalism)

E.O. 13132 directs agencies to minimize preemption of state laws, and if such preemption exists and is significant, an assessment must be prepared certifying compliance with E.O. 13132. At this time, the federal rules that would be necessary to implement this FMP are not expected to contain policies with federalism implications sufficient to warrant preparation of a federalism assessment under E.O. 13132.

10.9 Executive Order on Protection of Migratory Birds (E.O. 13186)

E.O. 13186, which was issued on January 10, 2001, requires, among other things, that a memorandum of understanding (MOU) be developed and implemented within two years between the Fish and Wildlife Service and each federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations. A draft memorandum of understanding between NMFS and the Fish and Wildlife Service has been prepared and is under review. This FMP supports the conservation intent of E.O. 13186 by integrating bird conservation principles, measures, and practices into the management of HMS fisheries and avoids or minimizes adverse impacts on migratory bird resources to the extent practicable. This is achieved by reviewing measures implemented for longline vessels in the western Pacific to reduce the impact of fishing on black-footed and Laysan albatross and adopting those measures for longline vessels on the West Coast so that all longline fishermen comply with the same rules when encountering seabirds in the area where fishing operations are occurring.

10.10 Executive Order 12962 (Recreational Fisheries)

Executive Order 12962 requires federal agencies, to the extent permitted by law and where practicable, and in cooperation with states and tribes, improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities. This FMP fosters conservation and proposes a catch-and-release program for recreational fisheries; therefore, it is in compliance with E.O. 12962.

10.11 U.S. National Plan of Action for Conservation and Management of Sharks

The *U.S. National Plan of Action for the Conservation and Management of Sharks* (NPOA-Sharks) has been developed by NMFS to fulfill the national responsibility as described in the International Plan of Action for the Conservation and Management of Sharks (IPOA) adopted by the FAO Conference in November 1999. The IPOA builds upon the FAO Code of Conduct for Responsible Fisheries, encompasses all elasmobranch fisheries (commercial and recreational), and calls on all member nations to implement, voluntarily, the international plan through the development of a national plan of action. The objectives of the international and national plans are to ensure the conservation and management of sharks and their long-term sustainable use. Member nations, including the U.S., have agreed to develop, implement, and monitor a national plan of action if their vessels conduct directed fisheries for sharks or if their vessels regularly catch sharks in non-directed fisheries.

The final draft of the NPOA–Sharks was published in February 2001. The national plan of action requires the fishery management councils to determine if catches of elasmobranchs in fisheries under their jurisdiction are sustainable, and if appropriate, enact management measures through the FMP process to ensure their sustainability. The Management Philosophy and Approach as outlined in this FMP have been designed to address these requirements; therefore, this FMP complies with this national plan of action.

10.12 National Plan of Action for Reducing the Incidental Mortality of Seabirds in Longline Fishing

The incidental take of seabirds is an international concern in longline fisheries, including longline fisheries for tuna, swordfish, and billfish. It is addressed in the *U.S. Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries* (NPOA-Seabirds), which was jointly developed by NMFS, USFWS and the Department of State (DOS) and published by NMFS in February 2001. The Plan was carried out in large part by the Interagency Seabird Working Group consisting of representatives from those three agencies.

The purpose of the plan is to provide an action plan that reduces incidental catch of seabirds in the U.S. longline fisheries, to provide national-level policy guidance on reducing impacts on seabirds, and to require that NMFS, in cooperation with USFWS, conduct an assessment of all U.S. longline fisheries to determine whether a seabird bycatch problem exists. The plan further requires NMFS, cooperating with USFWS, to work through the regional fishery management council process in partnership with longline fishery representatives to develop and implement seabird mitigation measures in those fisheries that have a seabird problem. Such measures should attempt to reduce impacts on seabirds to the maximum extent practicable.

This FMP complies with this national plan of action by implementing the measures previously described in section 10.9.

10.13 Executive Order 12898 (Environmental Justice)

E.O. 12898 requires each federal agency to make achieving environmental justice part of its mission in minority and low-income populations by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations to the greatest extent practicable and permitted by law.

Most of the management measures proposed by the FMP, such as the requirement for permits, the submission of logbooks, framework procedures, and optimum yield designations, impose small or no compliance costs on individuals. There are clearly no disproportionately high costs imposed on minority or low-income groups by these measures. There are two fisheries in which significant regulations are imposed by the FMP, the drift gillnet fishery and the longline fishery. The drift gillnet regulations have been adopted from federal rules issued under the authority of the Marine Mammal Act and Endangered Species Act, and from rules issued by the State of California. These regulations work in concert to reduce the take of marine mammals and endangered species. All individuals operating these vessels have been identified, and there are no disproportionately high costs imposed on minority or low-income groups in this harvesting sector. There are two groups that make up the longline fishery. One group consists of about ten vessels fishing out of California ports. The other group consists of twenty to thirty vessels that have periodically relocated from Hawaii. The Hawaii vessels have relocated because regulations applying to vessels fishing out of Hawaii have been implemented to protect threatened and endangered sea turtles and birds. The primary reason for these vessels to relocate is the loss of revenue from swordfish in the western Pacific resulting from fishing restrictions. The Environmental Impact Statement for the Pelagic Fisheries of the Western Pacific Region states that a survey of 130 Hawaii-based longline vessel owners and captains found that 65 percent of respondents identified themselves as non-Caucasian, and that non-Caucasian vessel owners and captains tend to hire crews that are non-Caucasian. The majority of the owners and operators of vessels relocating from Hawaii are believed to be Vietnamese; therefore, imposing the same regulations on these vessels in the eastern Pacific as those in the western Pacific would have a disproportionately high and adverse effect on a minority population; however, the proposed action with regard to longline fishing in the eastern Pacific is to allow fishing for swordfish. This action will significantly ameliorate the impact on those fishermen in Hawaii that transfer fishing operations to the Pacific Coast. Nevertheless, vessels fishing from Pacific Coast ports that fish west of 150° W longitude would not be able to target swordfish. There are no environmental or health impacts from the regulations, but the forced change in fishing strategy for vessels fishing in the western Pacific is expected to have an economic effect, even though this environmental justice issue has been previously addressed. The degree of the effect is not known at this time. To date, no vessels have ceased fishing operations, and whether lost income can be made up by focusing fishing efforts on tuna rather than swordfish has not been determined. Research efforts are underway to determine if there is an effective way to fish longline gear for swordfish while protecting threatened and endangered species; however, other than research efforts, there are no ameliorating actions taken to reduce the impact in the western Pacific because all longline gear must be fished in a manner that minimizes the impact on these species throughout the Pacific.

10.14 Literature Cited

National Marine Fisheries Service. February, 2001. Final United States Plan of Action for the Conservation and Management of Sharks. U.S. Dep. Commer., NOAA, NMFS, Silver Spring, MD 20910, 90 p. *http://www.nmfs.noaa.gov/sfa/Final%20NPOA.February.2001.pdf.*

National Marine Fisheries Service. February, 2001. Final United States Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries. U.S. Dep. Commer., NOAA, NMFS, Silver Spring, MD 20910. *http://www.nmfs.noaa.gov/sfa/international/Final_NPOA_seabirds.PDF.*

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