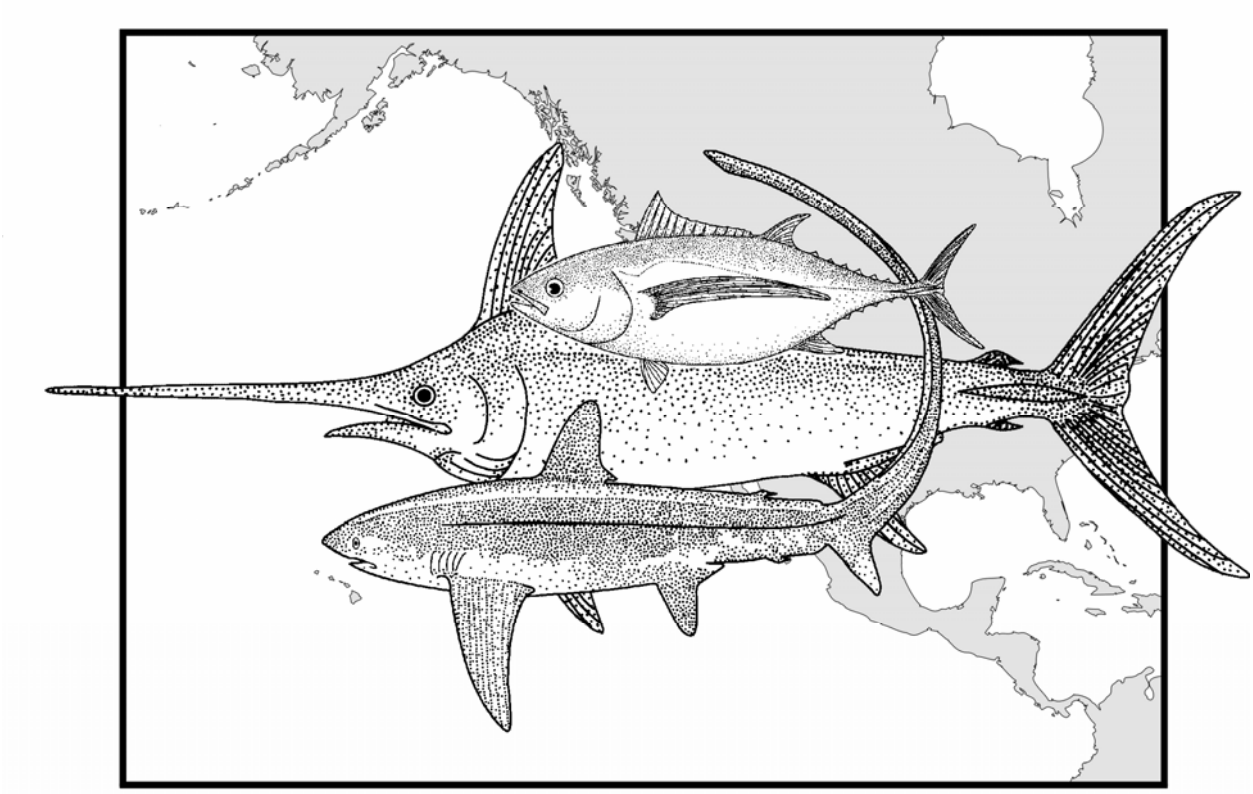
STATUS OF THE U.S. WEST COAST FISHERIES FOR HIGHLY MIGRATORY SPECIES THROUGH 2006



STOCK ASSESSMENT AND FISHERY EVALUATION

SEPTEMBER 2007

PACIFIC FISHERY MANAGEMENT COUNCIL
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Table of Contents

List of Tables

List of Figures

Acronyms Used In Highly Migratory Species Management

ABC	allowable biological catch
ADAPT	an age-disaggregated virtual population stock assessment model
AIDCP	Agreement on the International Dolphin Conservation Program
AMSY	average maximum sustainable yield
A-SCALA	age-structure catch-at-length analysis
ASPIC	a non-equilibrium surplus production stock assessment model
ATCA	Atlantic Tunas Convention Act
B	biomass
$\tilde{B}$	equilibrium biomass
B_0	initial (unfished) biomass
B_x	biomass under condition x, where x may be year or some type of reference point (e.g. MSY, Recent, FLAG, etc.)
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
CRFS	California Recreational Fisheries Survey
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
EFP	exempted fishing permit
EIS	environmental impact statement
EPO	eastern Pacific Ocean
EPOTFA	Eastern Pacific Ocean Tuna Fishing Agreement

ESA	Endangered Species Act
ESU	evolutionarily significant unit
ETP	eastern tropical Pacific
F	fishing mortality rate
$F_{x\%}$	fishing mortality rate producing x% of the maximum spawning potential in the absence of fishing
$F_{0.1}$	F_{MSY} proxy reference point defined by a line having a slope 0.1 times that of the yield per recruit curve near the origin
F_x	fishing mortality rate under condition x, where x may be year or some type of reference point (e.g. MSY, Recent, 2003, etc.)
F_{Max}	fishing mortality rate producing the maximum yield per recruit
FAD	fish aggregating device
FAO	Food and Agriculture Organization of the United Nations
FEAM	Fishery Economic Assessment Model
FFA	(South Pacific) Forum Fishery Agency
FL	fork length
FMP	fishery management plan
FR	Federal Register
FY	fiscal year
GIS	geographic information system
GLM	general linear model
h	steepness of the stock-recruitment relationship
HAPC	habitat area of particular concern
HMS	highly migratory species
HMS FMP	Highly Migratory Species Fishery Management Plan
HMSAS	Highly Migratory Species Advisory Subpanel
HMSMT	Highly Migratory Species Management Team
HSFCA	High Seas Fishing Compliance Act
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
IDCPA	International Dolphin Conservation Program Act
IPOA	International Plan of Action
ISC	International Scientific Committee for Tuna and Tuna-like Species in the North Pacific
ITQ	individual transferable quota
ITS	incidental take statement
IUCN	International Union for the Conservation of Nature and Natural Resources or the World Conservation Union
IUU	Illegal, Unreported, and Unregulated fisheries
JFL	jaw-to-fork length
JVP	joint venture processing
LMSY	local MSY
LOF	List of Fisheries
LOS	Law of the Sea

M	natural mortality
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
MSA	Magnuson-Stevens Act, Magnuson-Stevens Fishery Conservation and Management Act
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSST	minimum stock size threshold
MSY	maximum sustainable yield
MT	metric ton
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
NPALBW	North Pacific Albacore Workshop
NPDES	national pollutant discharge elimination system
NPFMC	North Pacific Fishery Management Council
NPO	North Pacific Ocean
NPOA	National Plan of Action
NPTZ	North Pacific transition zone
NRIFSF	National Research Institute of Far Seas Fisheries
NS	National Standards (of the Magnuson-Stevens Act)
NWI	National Wetlands Inventory
NWPO	northwest Pacific Ocean
ODFW	Oregon Department of Fish and Wildlife
OMB	Office of Management and Budget
ORBS	Ocean Boat Recreational Survey
OY	optimum yield
PacFIN	Pacific Fisheries Information Network
PBF	Pacific bluefin tuna
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
RFA	Regulatory Flexibility Act
RFMO	regional fishery management organization
RIR	Regulatory Impact Review
RPA	reasonable and prudent alternative
SAC	Sportfishing Association of California
SAFE	stock assessment and fishery evaluation
SAR	stock assessment report (for marine mammal stocks)
SBR	spawning biomass ratio (ratio of spawning biomass to that of the unfished stock)
SBR_{AMSY}	spawning biomass ratio supporting the average maximum sustainable yield
SCB	Southern California Bight
SCTB	Standing Committee on Tuna and Billfish
SDC	status determination criteria
SEB	Shore and Estuary Boat sampling program
SEPO	southeast Pacific Ocean
SFA	Sustainable Fisheries Act of 1996 (amendment to the Magnuson-Stevens Act)
SHBS	statistical habitat based standardization
SIC	Standard Industrial Classification
SPC	Secretariat of the Pacific Community
SPTT	South Pacific Tuna Treaty
SSB	spawning stock biomass
SSB_0	initial (unfished) spawning stock biomass
SSB_x	spawning stock biomass under condition x, where x may be year or some type of reference point (e.g. MSY, Recent, 2004, etc.)
SSC	Scientific and Statistical Committee
SST	sea surface temperature
SWFSC	Southwest Fisheries Science Center (NMFS)
SWR	Southwest Regional Office (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
VPA	virtual population analysis
VMS	vessel monitoring system
WCBA	Westport Charter Boat Association
WCPFC	Western and Central Pacific Fisheries Commission

WCPO	western and central Pacific Ocean
WDFW	Washington Department of Fish and Wildlife
WPFMC	Western Pacific Fishery Management Council
YPR	yield per recruit
ZMRG	zero mortality rate goal

1.0 INTRODUCTION

1.1 Goals and Objectives of the Fishery Management Plan

The Fishery Management Plan For U.S. West Coast Fisheries For Highly Migratory Species (HMS FMP) was developed by the Pacific Fishery Management Council (Council) in response to the need to coordinate state Federal, and international management of the stocks listed in Table 1–1.[1] The National Marine Fisheries Service (NMFS), on behalf of the Secretary of Commerce, partially approved the HMS FMP on February 4, 2004, with the exception of the reporting and recordkeeping provisions which became effective on February 10, 2005. The majority of HSM FMP implementing regulations became effective on April 7, 2004. The FMP identifies the following goals and objectives for HMS management:

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 the Marine

[1] Throughout this document "West Coast" is used to denote the geographic region comprising the coastal areas of Washington, Oregon, and California.

Mammal Protection Act (MMPA) and Migratory Bird Treaty Act (MBTA) and promote the recovery of any species listed under the Endangered Species Act (ESA) to the extent practicable.

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

On June 7, 2007, NMFS approved Amendment 1 to the HMS FMP. The FMP was amended to incorporate recommended international measures to end overfishing of the Pacific stock of bigeye tuna (*Thunnus obesus*) in response to formal notification from NMFS that overfishing was occurring on this stock. Amendment 1 also served as a means to substantially reorganize the original combined FMP and Final Environmental Impact Statement, published in August 2003. Much of the descriptive material in the combined document was moved to a series of appendices, substantially shortening the body of the FMP. An electronic copy of the current FMP is available on the Council's Web site at http://www.pcouncil.org/hms/hmsfmp.html.

Table 1–1. HMS FMP management unit species.

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

1.2 Purpose of the SAFE Report

Federal regulations (40 CFR 600.315(e)) pursuant to National Standard 2 in the Magnuson-Stevens Act, *Conservation and management measures shall be based upon the best scientific information available*, require preparation of a stock assessment and fishery evaluation (SAFE) report for each FMP. The HMS FMP summarizes the requirements for a SAFE report as follows:

> 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.

1.3 The Management Cycle

The HMS FMP also establishes an annual cycle for the delivery of the SAFE report to the Council, intended to coincide with the management cycle: a draft report is provided in June for initial decision-making on the need for new harvest specifications and management measures. The final report is delivered in September to provide the recommendations and information necessary to develop and implement any harvest specifications and management measures. Any such measures become effective at the start of the next fishing year, April 1 of the following year, and stay in effect for at least two years.

Council meetings in 2006 initiated the first biennial management cycle under the HMS FMP with consideration of measures to be implemented during the April 1, 2007, to March 31, 2009, biennium. Two changes were proposed by the Council. First, the Council recommended exempting charter passenger fishing vessels (CPFVs) from the requirement at 50 CFR 660.704 requiring subject vessels to display their official number. The second set of changes incorporates recreational bag limits for albacore and bluefin tuna into Federal regulations. For albacore tuna the Council recommended a daily bag limit of 10 fish in Federal waters south of Point Conception (34° 27’ N. latitude) to the U.S.-Mexico border and a daily bag limit of 25 fish in Federal waters north of Point Conception to the California-Oregon border. This differential bag limit is intended to accommodate differences in fishing opportunity in the two regions. In addition, the 25 fish bag limit north of Point Conception is consistent with the current albacore tuna bag limit established by the State of Oregon for recreational fisheries in its waters. For bluefin tuna the Council identified a 10-fish daily bag limit for Federal waters off of California.

1.4 Highly Migratory Species Management Team

This SAFE report was prepared by the members of the Highly Migratory Species Management Team (HMSMT). The HMSMT members at the time this report was published (September 2007), and their primary responsibilities in preparing the report, are listed below.

Mr. Lyle Enriquez (Chapter 3, observer requirements)
Fishery Biologist, NMFS Southwest Region

Mr. Craig Heberer, Team Chair (chapter 3, description of FMP management measures and regulations, international regulatory issues)
Fisheries Biologist, NMFS Southwest Region

Dr. Suzanne Kohin (chapter 5, chapter 6, research updates, chapter 8)
Research Fishery Biologist, NMFS Southwest Fisheries Science Center

Ms. Leeanne M. Laughlin (chapter 2, description of California fisheries)

Associate Marine Biologist, California Department of Fish and Game

Mr. Corey Niles (chapter 2 description of Washington fisheries, chapter 6)
Marine Resources Policy Coordinator, Washington Department of Fish and Wildlife (pending appointment)

Ms. Cyreis Schmitt (chapter 2 description of Oregon fisheries)
Oregon Department of Fish and Wildlife representative

Dr. Stephen Stohs (chapter 4)
Industry Economist, NMFS Southwest Fisheries Science Center

In addition to HMSMT members, the following people contributed to this SAFE report:

Dr. Kit Dahl (chapter 1, compilation of the report)
Staff Officer, Pacific Fishery Management Council

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Computer Specialist, NMFS Southwest Fisheries Science Center

Ms. Mandy Lewis (chapter 2, description of California fisheries)
Marine Biologist, California Department of Fish and Game

Ms. Elizabeth Petras (chapter 3, protected species regulations, chapter 6 research updates)
Liaison Officer, NMFS Southwest Region Office of Protected Resources

2.0 DESCRIPTION OF THE FISHERIES

2.1 Description of West Coast Commercial Fisheries

2.1.1 California

2.1.1.1 Surface Hook-and-Line Fishery for Albacore

Albacore is an economically valuable fishery in California and has been a target of commercial fishermen for more than 100 years. Troll and live bait are the principal commercial gears, although some albacore is caught using purse seine, longline, and drift gillnet gear as well. Since 1980, the number of surface hook-and-line vessels landing albacore in California ports has ranged annually from a high of 1,312 in 1981 to a low of 78 in 2006. The fishing season varies from year to year, depending on oceanographic conditions, which strongly influence the occurrence of fish within range of the California-based fleet, and economics; however, a typical season runs July through October, with landings peaking in the fall. A general resident or non-resident commercial fishing license and a current California Department of Fish and Game (CDFG) vessel registration are required to catch and land albacore in the state of California. Additionally, the HMS FMP requires a Federal permit with a surface hook-and-line gear endorsement for all U.S. commercial and recreational charter fishing vessels that fish for HMS within the West Coast exclusive economic zone (EEZ, 3–200 nautical miles) and to U.S. vessels that pursue HMS on the high seas (seaward of the EEZ) and land their catch in California, Oregon, and Washington.

In 2006, 78 commercial surface hook-and-line vessels landed 187 mt of albacore compared to 97 vessels that landed 462 mt in 2005 (Table 2–1). The volume and number of landings varied throughout ports in California with Eureka receiving a majority of the catch (Table 2–1). Nominal landings occurred January through July, increasing August through November with a peak in October (Table 2–2). The ex-vessel revenue was $0.5 million in 2006, dropping by more than half compared to $1.1 million in 2005.

Table 2–1. Annual commercial landings (round mt) and number of deliveries for albacore landed in California's major port complexes by the surface hook-and-line fleet, 2005–06.

	2005 Landings		2006 Landings	
Port Complex[1]	(mt)[2]	number	(mt)[1]	number
Eureka	222	88	89	144
Fort Bragg	13	43	6	31
Bodega Bay	8	5	11	21
San Francisco	11	33	10	34
Monterey	52	47	25	36
Morro Bay	6	23	8	29
Santa Barbara	6	7	*	*
Los Angeles	139	14	33	3
San Diego	5	46	5	6
Total	462	306	187	304

Source: California's Commercial Fisheries Information System (CFIS), market receipt data, extracted July 2, 2007.
Additional processing information:
[1]- Port Complex: composed of two or more ports within one of the nine geographic statistical reporting areas.
[2]-Landings in pounds are converted to round weight mt by dividing the landed weights by 2,000 for short ton (ton), and then multiplying the conversion factor of 0.9072 for mt.
* -Withheld for data confidentiality reasons.

In 2001, the last operational cannery in the Port of Los Angeles closed its doors, ending a West Coast tuna-canning dynasty. Changing global market conditions and a dynamic raw material/finished goods supply environment forced the plants to close. Without domestic-based cannery operations, a majority of the albacore are landed frozen and exported to overseas markets for processing. There were no exports of albacore from California in 2006.

Table 2–2. Monthly commercial landings (round mt) and ex-vessel revenue for albacore landed in California ports by the surface hook-and-line fleet, 2005–06.

	2005		2006	
Month	Landings (mt)[1]	Ex-vessel ($)[2]	Landings (mt)[1]	Ex-vessel ($)[2]
January	*	*	0	0
February	< 1	118	2	8,349
March	*	*	1	3,010
April	*	*	3	9,045
May	0	0	4	18,752
June	1	3,710	1	2,321
July	4	18,043	39	81,523
August	76	163,609	10	24,654
September	87	200,250	56	142,157
October	228	554,774	80	192,871
November	64	129,904	6	18,014
December	*	*	3	16,776
Total	460	1,070,408	204	517,472

Source: California's Commercial Fisheries Information System (CFIS), market receipt data, extracted July 2, 2007.
Additional processing information:
[1]-Landings in pounds are converted to round weight mt by dividing the landed weights by 2,000 for ton, and then multiplying the conversion factor of 0.9072 for mt.
[2]-Ex-vessel revenues are nominal (not adjusted for inflation).
* -Withheld for data confidentiality reasons.

Landings for 2006 are reminiscent of the late 1980s and early 1990s totals when they were also below the 1,000 mt bench mark (Table 4–34). The recent decline does not necessarily reflect a decline in the albacore population but a shift in fishing effort by California-based vessels into waters off Oregon and Washington where albacore have been more available due to oceanographic conditions. Additionally, industry representatives have indicated that in recent years lower operating cost and better landing facilities outside of California have resulted in a decrease in California landings.

2.1.1.2 Coastal Purse Seine Fishery for Yellowfin, Skipjack, and Bluefin Tunas

In the U.S. EEZ portion of the eastern Pacific Ocean (EPO) more than 90 percent of the yellowfin, skipjack, and bluefin tuna catch is made by small coastal purse seine vessels operating in the Southern California Bight (SCB) from May to October. These vessels primarily target small pelagic species, especially Pacific mackerel, Pacific sardine, and market squid. However, they will target the tropical yellowfin and skipjack tunas when intrusions of warm water from the south bring fish within range of the coastal fleet. Similarly, vessel operators will switch to the higher-valued temperate water bluefin tuna when they enter the coastal waters of the SCB. Since 1981, the number of purse seine vessels that have landed tuna in California has ranged from a high of 228 in 1986 to a low of one in 2003. In general, the decline in vessels can be attributed to the relocation of large cannery operations overseas to offset declining revenues, due to the cost of domestic production compared to foreign production. Currently

there are no canneries operating in California. A general resident or non-resident commercial fishing license and a current CDFG vessel registration are required to catch and land tuna caught in purse seine gear. Additionally, the HMS FMP requires a logbook and Federal permit with a purse seine gear endorsement for all U.S. vessels that fish for HMS within the West Coast EEZ and to U.S. vessels that pursue HMS on the high seas (seaward of the EEZ) and land their catch in California, Oregon, and Washington.

Yellowfin Tuna: Less than three boats landed yellowfin tuna in 2006, compared to seven purse seine vessels landing 283 mt of yellowfin in 2005, with an ex-vessel revenue of $304,037 (Table 2–3). Landings and revenue for yellowfin tuna in 2006 could not be reported because of Federal data confidentiality rules that do not allow reporting information unless aggregated for three or more vessels. However, the annual landing trend has been one of decline since 1976, when more than 125,000 mt of fish were landed in California ports.

In 2005, California landings of yellowfin tuna in April through June originated from waters outside the EEZ of Mexico. Exports of fresh yellowfin from California went to fresh fish markets in Canada; and frozen products also went to Mexico and South Korea for processing in 2006.

Table 2–3. Monthly commercial landings (round mt), number of deliveries, and ex-vessel revenue for yellowfin tuna landed at sites within the Los Angeles port complex by California's purse seine fleet, 2005–06.

	2005			2006		
	Landings		Ex-vessel	Landings		Ex-vessel
Month	(mt)[1]	(number)	($)[2]	(mt)[1]	(number)	($)[2]
February	0	0	0	0	0	0
March	0	0	0	0	0	0
April	*	*	*	0	0	0
May	*	*	*	0	0	0
June	*	*	*	0	0	0
July	0	0	0	0	0	0
August	82	6	53,765	0	0	0
September	12	4	7,744	0	0	0
October	0	0	0	0	0	0
November	0	0	0	*	*	*
Total	94	10	61,509	*	*	*

Source: California's Commercial Fisheries Information System (CFIS), market receipt data, extracted July 2, 2007.
Additional processing information:
[1]-Landings in pounds are converted to round weight mt by dividing the landed weights by 2,000 for ton, and then multiplying the conversion factor of 0.9072 for mt.
[2]-Ex-vessel revenues are nominal (not adjusted for inflation).
* -Withheld for data confidentiality reasons.

Skipjack Tuna: In 2006, less than three vessels landed skipjack, compared to 10 vessels that landed 522 mt in 2005 with an ex-vessel revenue of $291,183 (Table 2–4). Landings and revenue for skipjack tuna in 2006 could not be reported because of Federal data confidentiality rules that do not allow reporting information unless aggregated for three or more vessels. However, the annual landings trend has been one of decline following the historic high of 79,111 mt in 1980. Annual landings and ex-vessel revenues have been relatively flat since 1985, averaging 2,641 mt and $2.7 million. Skipjack landed in California are caught primarily in the SCB and seaward of the Mexican EEZ, as in April and May of 2005. No exports of skipjack tuna from California were reported in 2006.

Table 2–4. Monthly commercial landings (round mt), number of deliveries, and ex-vessel revenue for skipjack tuna landed at sites within the Los Angeles port complex by California's purse seine fleet, 2005–06.

	2005			2006		
	Landings		Ex-vessel	Landings		Ex-vessel
Month	(mt)[1]	(number)	($)[2]	(mt)[1]	(number)	($)[2]
February	0	0	0	0	0	0
March	0	0	0	0	0	0
April	*	*	*	0	0	0
May	*	*	*	0	0	0
June	0	0	0	0	0	0
July	0	0	0	0	0	0
August	200	8	90,149	0	0	0
September	165	5	96,842	0	0	0
October	0	0	0	*	*	*
Total	365	13	186,991	*	*	*

Source: California's Commercial Fisheries Information System (CFIS), market receipt data, extracted July 2, 2007.
Additional processing information:
[1]-Landings in pounds are converted to round weight mt by dividing the landed weights by 2,000 for ton, and then multiplying the conversion factor of 0.9072 for mt.
[2]-Ex-vessel revenues are nominal (not adjusted for inflation).
* -Withheld for data confidentiality reasons.

Bluefin Tuna: In 2006, no purse seine vessels landed bluefin in California, compared to seven vessels in 2005; however, there were small amounts (<1 mt total) landed by other gears (Tables 2–5).

Table 2–5. Monthly commercial landings (round mt), number of deliveries, and ex-vessel revenue for bluefin tuna landed at sites within the Los Angeles port complex by California's purse seine fleet, 2005–06.

	2005			2006		
	Landings		Ex-vessel	Landings		Ex-vessel
Month	(mt)[1]	(number)	($)[2]	(mt)[1]	(number)	($)[2]
February	0	0	0	0	0	0
March	0	0	0	0	0	0
April	0	0	0	0	0	0
May	0	0	0	0	0	0
June	0	0	0	0	0	0
July	0	0	0	0	0	0
August	201	7	119,162	0	0	0
September	0	0	0	0	0	0
Total	201	7	119,162	0	0	0

Source: California's Commercial Fisheries Information System (CFIS), market receipt data, extracted July 2, 2007.
Additional processing information:
[1]-Landings in pounds are converted to round weight mt by dividing the landed weights by 2,000 for ton, and then multiplying the conversion factor of 0.9072 for mt.
[2]-Ex-vessel revenues are nominal (not adjusted for inflation).

2.1.1.3 Harpoon Fishery for Swordfish

California's harpoon fishery for swordfish developed in the early twentieth century. Prior to 1980, harpoon and hook-and-line were the only legal gear types for commercially harvesting swordfish. At that time, harpoon gear accounted for the majority of swordfish landings in California ports. In the early 1980s, a limited entry drift gill net fishery was authorized by the State Legislature and soon afterward drift gillnets replaced harpoons as the primary method for catching swordfish, and the number of harpoon

permits decreased from a high of 1,223 in 1979 to a low of 23 in 2001. Fishing effort typically occurs in the SCB from May to December, peaking in August, depending on weather conditions and the availability of fish in coastal waters. Some vessel operators work in conjunction with a spotter airplane to increase the search area and to locate swordfish difficult to see from the vessel. This practice tends to increase the catch-per-unit-effort (CPUE) compared to vessels that do not use a spotter plan. To participate in the harpoon fishery a state permit and logbook are required in addition to a general resident or non-resident commercial fishing license and a current CDFG vessel registration. Additionally, the HMS FMP requires a Federal permit with a harpoon gear endorsement for all U.S. vessels that fish for HMS within the West Coast EEZ and to U.S. vessels that pursue HMS on the high seas (seaward of the EEZ) and land their catch in California, Oregon, and Washington.

Table 2–6. Annual commercial landings (round mt) and number of deliveries for swordfish landed in California's major port complexes by the harpoon fleet, 2005–06.

	2005 Landings		2006 Landings	
Port Complex[1]	(mt)[2]	(number)	(mt)[2]	(number)
Santa Barbara	0	0	*	*
Los Angeles	55	205	54	208
San Diego	22	119	15	86
Total	77	324	69	294

Source: California's Commercial Fisheries Information System (CFIS), market receipt data, extracted July 2, 2007.
Additional processing information:
[1]- Port Complex: composed of two or more ports within one of the nine geographic statistical reporting areas.
[2]-Landings in pounds are converted to round weight mt by dividing the landed weights by 2,000 for ton, and then multiplying the conversion factor of 0.9072 for mt. A conversion factor of 1.45 was multiplied by the reported dressed weight to obtain a round weight.
* -Withheld for data confidentiality reasons.

Table 2–7. Monthly commercial landings (round mt) and ex-vessel revenue (dollars) for swordfish landed in California by the harpoon fleet, 2005–06.

	2005		2006	
Month	Landings (mt)[1]	Ex-vessel ($)[2]	Landings (mt)[1]	Ex-vessel ($)[2]
January	0	0	< 1	1,767
February	0	0	0	0
March	0	0	0	0
April	0	0	0	0
May	< 1	5,823	0	0
June	3	37,706	5	60,096
July	19	198,924	12	130,638
August	25	231,191	9	99,199
September	7	66,593	14	139,046
October	7	61,253	20	167,278
November	9	67,947	9	59,873
December	6	39,651	1	5,209
Total	76	709,088	70	663,106

Source: California's Commercial Fisheries Information System (CFIS), market receipt data, extracted July 2, 2007.
Additional processing information:
[1]-Landings in pounds are converted to round weight mt by dividing the landed weights by 2,000 for ton, and then multiplying the conversion factor of 0.9072 for mt. A conversion factor of 1.45 was multiplied by the reported dressed weight to obtain a round weight.
[2]-Ex-vessel revenues are nominal (not adjusted for inflation).

In 2006, 23 harpoon vessels landed 47 mt of swordfish compared to 23 vessels that landed 53 mt in 2005 (Table 2–6). Fishing effort was concentrated in coastal waters off San Diego and Orange Counties in the SCB and landings occurred May through December, peaking in August (Table 2–7).

The ex-vessel revenue for 2006 was $663,106 compared to $709,088 in 2005 (Table 2–7). Because harpoon vessels spend less time on the water and are a low-volume fishery, their catch is often fresher than drift-gillnet-caught fish, so markets tend to pay more for harpooned fish. The average ex-vessel price-per-pound for harpooned fish was $6.15 compared to $2.89 for drift gillnet caught fish in 2006. Harpooned swordfish support domestic seafood restaurant businesses and is advertised as a bycatch-free fishery.

2.1.1.4 Drift Gillnet Fishery for Swordfish and Shark

Swordfish: California's swordfish fishery transformed from primarily a harpoon fishery to a drift gillnet fishery in the early 1980s and landings soared to a historical high of 2,371 mt by 1985. The drift gillnet fishery is a limited entry program, managed with gear, season, and area closures. A limited entry program was established in 1980 and about 150 permits were initially issued. The permit is transferable under very limited conditions and it is linked to an individual fisherman, not a vessel; thus the value of the vessel does not become artificially inflated, allowing permittees to buy new vessels as needed. Since 1984, the number of permits has declined from a high of 251 in 1986 to a low of 89 in 2006; however, only 38 vessels participated in the swordfish fishery in 2006 (Table 2–8). Annual fishing effort has also decreased from a high of 11,243 sets in the 1986 fishing season to 1,043 sets in 2005. Industry representatives attribute the decline in vessel participation and annual effort to regulations implemented to protect threatened and endangered marine mammals, sea turtles, and seabirds. To keep a permit active, current permittees are required to purchase a permit from one consecutive year to the next; however, they are not required to make landings using drift gillnet gear. In addition, a general resident or non-resident commercial fishing license and a current vessel registration are required to catch and land fish caught in drift gillnet gear. A logbook is also required. The HMS FMP requires a Federal permit with a drift gillnet gear endorsement for all U.S. vessels that fish for HMS within the West Coast EEZ and to U.S. vessels that pursue HMS on the high seas (seaward of the EEZ) and land their catch in California, Oregon, and Washington.

Historically, the California drift gillnet fleet has operated within EEZ waters adjacent to the state and as far north as the Columbia River, Oregon, during El Niño years. Fishing activity is highly dependent on seasonal oceanographic conditions that create temperature fronts that concentrate feed for swordfish. Because of the seasonal migratory pattern of swordfish and seasonal fishing restrictions, over 90 percent of the fishing effort occurs August 15 through January 31.

Table 2–8. Annual drift gillnet permits issued and number of active vessels, 1981–2006.

Year	Active[1] Vessels	Permits Issued		Year	Active[1] Vessels	Permits Issued
1980	100	*		1994	138	162
1981	118	*		1995	117	185
1982	166	*		1996	111	167
1983	193	*		1997	108	120
1984	214	226		1998	98	148
1985	228	229		1999	84	136
1986	204	251		2000	78	127
1987	185	218		2001	69	114
1988	154	207		2002	50	106
1989	144	189		2003	43	100
1990	134	183		2004	40	96
1991	114	165		2005	42	90
1992	119	149		2006	45	89
1993	123	117				

Source: CDFG License and Revenue Branch (LRB), extracted August 24, 2007.
Additional processing information:
[1]-some vessels only land thresher and/or swordfish from year to year so the highest number of active vessels for both components of the fishery were reported for this gear.
*-actual number of permits issued by LRB not available but the California State Legislature set a cap of 150 in 1982.

Table 2–9. Annual commercial landings (round mt) and number of deliveries for swordfish landed in California's major port complexes by the drift gillnet fleet, 2005–06.

	2005 Landings		2006 Landings	
Port Complex[1]	(mt)[2]	(number)	(mt)[2]	(number)
San Francisco	0	0	*	*
Monterey	30	23	24	10
Morro Bay	30	25	63	32
Santa Barbara	5	20	12	19
Los Angeles	9	21	55	69
San Diego	144	320	284	557
Total	218	409	438	687

Source: California's Commercial Fisheries Information System (CFIS), market receipt data, extracted July 2, 2007.
Additional processing information:
[1]- Port Complex: composed of two or more ports within one of the nine geographic statistical reporting areas.
[2]-Landings in pounds are converted to round weight mt by dividing the landed weights by 2,000 for ton, and then multiply the conversion factor of 0.9072 for mt. A conversion factor of 1.45 was multiplied by the reported dressed weight to obtain a round weight.
* -Withheld for data confidentiality reasons.

Table 2–10. Monthly commercial landings (round mt) and ex-vessel revenue for swordfish landed in California by the drift gillnet fleet, 2005–06.

	2005		2006	
Month	Landings (mt)[1]	Ex-vessel ($)[2]	Landings (mt)[1]	Ex-vessel ($)[2]
January	15	109,273	20	130,852
February	*	*	*	*
March	0	0	0	0
April	0	0	0	0
May	*	*	0	0
June	0	0	0	0
July	*	*	*	*
August	*	*	0	0
September	4	21,907	13	88,980
October	32	184,876	95	455,812
November	86	440,719	148	610,634
December	81	420,380	165	697,314
Total	218	1,177,155	441	1,983,592

Source: California's Commercial Fisheries Information System (CFIS), market receipt data, extracted July 2, 2007.
Additional processing information:
[1]-Landings in pounds are converted to round weight mt by dividing the landed weights by 2,000 for ton, and then multiplying the conversion factor of 0.9072 for mt. A conversion factor of 1.45 was multiplied by the reported dressed weight to obtain a round weight.
[2]-Ex-vessel revenues are nominal (not adjusted for inflation).
* -Withheld for data confidentiality reasons.

In 2001, NMFS implemented two Pacific sea turtle conservation areas on the West Coast with seasonal drift gillnet restrictions to protect endangered leatherback and loggerhead turtles. The larger of the two closures spans the EPO north of Point Conception, California (34°27' N. latitude) to mid-Oregon (45° N. latitude) and west to 129° W. longitude. Drift gillnet fishing is prohibited annually within this conservation area from August 15 to November 15 to protect leatherbacks sea turtles. A smaller closure was implemented to protect Pacific loggerhead turtles from drift gillnet gear during a forecasted or occurring El Niño event, and is located south of Point Conception, California and west of 120° W. longitude from June 1 to August 31 (72 FR 31756). Since 2000, the number of vessels participating in the swordfish fishery has decreased from 69 in 2001 to 38 in 2006.

In 2006, 38 drift gillnet vessels landed 442 mt of swordfish compared to 38 vessels that landed 220 mt in 2005 (Table 2–9). Landings occurred at ports from San Diego to Monterey and the majority occurred from September to December. Over 73 percent of the reported effort occurred in the SCB.

The ex-vessel revenue was nearly $2 million in 2006 compared to $1.2 million in 2005 (Table 2–10). Most of the swordfish landed in California supports domestic seafood restaurant businesses.

Thresher Shark: Initial development of the drift gillnet fishery in the late 1970s was founded on catches of common thresher shark. The thresher shark fishery rapidly expanded, peaking in 1985, when 228 vessels landed more than 1,000 mt of shark. Following 1985, swordfish replaced thresher shark as the primary target species because there was a greater demand for swordfish and it commands a higher price-per-pound. Annual thresher shark landings declined in subsequent years because of the switch to swordfish to maximize economic returns and the implementation of management measures to protect the thresher shark resource.

Table 2–11. Annual commercial landings (round mt) and number of deliveries for common thresher shark landed in California's major port complexes by the drift gillnet fleet, 2005–06.

Port Complex[1]	2005 Landings (mt)[2]	2005 Landings (number)	2006 Landings (mt)[2]	2006 Landings (number)
San Francisco	0	0	*	*
Monterey	5	8	*	*
Morro Bay	*	*	5	8
Santa Barbara	17	50	12	75
Los Angeles	25	39	16	34
San Diego	103	158	64	165
Total	150	255	97	282

Source: California's Commercial Fisheries Information System (CFIS), market receipt data, extracted July 2, 2007.
Additional processing information:
[1]- Port Complex: composed of two or more ports within one of the nine geographic statistical reporting areas.
[2]-Landings in pounds are converted to round weight mt by dividing the landed weights by 2,000 for ton, and then multiplying the conversion factor of 0.9072 for MT. A conversion factor of 1.70 was multiplied by the reported dressed weight to obtain a round weight.
* -Withheld for data confidentiality reasons.

In 2006, 42 drift gillnet vessels landed 58 mt of common thresher shark compared to 42 vessels that landed 88 mt in 2005 (Table 2–11). Landings occurred throughout the open season but a majority occurred October through December at ports from San Diego to Monterey (Table 2–11). Fishing effort was focused in the SCB.

The ex-vessel revenue for 2006 was $181,184 compared to $224,334 in 2005 (Table 2–12). Fresh thresher shark support domestic seafood restaurant businesses.

Table 2–12. Monthly commercial landings (round mt) and ex-vessel revenue for common thresher shark landed in California ports by the drift gillnet fleet, 2005–06.

Month	2005 Landings (mt)[1]	2005 Ex-vessel ($)[2]	2006 Landings (mt)[1]	2006 Ex-vessel ($)[2]
January	8	16,024	19	32,875
February	0	0	3	750
March	0	0	0	0
April	<1	60	0	0
May	3	5,116	7	11,155
June	18	30,717	5	9,601
July	1	2,360	1	2,336
August	<1	306	2	4,286
September	7	14,029	21	40,899
October	26	48,966	10	18,943
November	57	73,060	14	29,636
December	35	33,694	16	30,703
Total	125	224,332	98	181,184

Source: California's Commercial Fisheries Information System (CFIS), market receipt data, extracted July 2, 2007.
Additional processing information:
[1]-Landings in pounds are converted to round weight mt by dividing the landed weights by 2,000 for ton, and then multiplying the conversion factor of 0.9072 for MT. A conversion factor of 1.70 was multiplied by the reported dressed weight to obtain a round weight.
[2]-Ex-vessel revenues are nominal (not adjusted for inflation).

2.1.1.5 High Seas Longline Fishery for Swordfish

California prohibits pelagic longline fishing within the EEZ and the retention of striped marlin. Vessels operating outside of the EEZ can land fish in California ports if the operator has a general resident or non-resident commercial fishing license and a current CDFG vessel registration. The operator must comply with the High Seas Fishing Compliance Act, which requires U.S. vessel operators to maintain logbooks if they fish beyond the EEZ. Additionally, the HMS FMP requires a Federal permit with a pelagic longline gear endorsement for all U.S. vessels that pursue HMS on the high seas (seaward of the EEZ) and land their catch in California, Oregon, and Washington.

In recent years, Federal regulations promulgated to protect endangered sea turtles east and west of 150° W longitude and north of the equator have impacted the number of landings of swordfish in California ports. In 2006, three longline vessels landed 25 mt; landings in 2005 could not be reported because of Federal data confidentiality rules that do not allow reporting information unless aggregated for three or more vessels (Table 2–13). The relatively low landings reported in 2005 and 2006 are reminiscent of the 1980s when only three vessels participated in the high seas fishery and landings ranged from 0 to 12 mt.

Annual landings and ex-vessel revenues have been declining since 2000 when landings and ex-vessel revenue totaled 1,885 mt and $8.1 million, respectively (Tables 4–13 and 4–19).

Table 2–13. Annual commercial landings (round mt) and number of deliveries for swordfish landed in California's major port complexes by the longline fleet, 2005-06.

	2005 Landings		2006 Landings	
Port Complex[1]	(mt)[2]	(number)	(mt)[2]	(number)
Santa Barbara	*	*	*	*
Los Angeles	*	*	*	*
San Diego	*	*	0	0
Total	*	*	*	*

Source: California's Commercial Fisheries Information System (CFIS), market receipt data, extracted July 2, 2007.
Additional processing information:
[1]- Port Complex: composed of two or more ports within one of the nine geographic statistical reporting areas.
[2]-Landings in pounds are converted to round weight mt by dividing the landed weights by 2,000 for ton, and then multiplying the conversion factor of 0.9072 for mt. A conversion factor of 1.45 was multiplied by the reported dressed weight to obtain a round weight.
* -Withheld for data confidentiality reasons.

Table 2–14. Monthly commercial landings (round mt) and ex-vessel revenue for swordfish landed in California ports by the longline fleet, 2005–06.

	2005		2006	
Month	Landings (mt)[1]	Ex-vessel ($)[2]	Landings (mt)[1]	Ex-vessel ($)[2]
January	*	*	0	0
February	*	*	*	*
March	*	*	24	58,112
April	*	*	*	*
May	*	*	*	*
June	*	*	0	0
July	*	*	0	0
August	*	*	0	0
September	*	*	0	0
October	*	*	0	0
November	*	*	0	0
December	*	*	*	*
Total	*	*	24	58,112

Source: California's Commercial Fisheries Information System (CFIS), market receipt data, extracted July 2, 2007.
Additional processing information:
[1]-Landings in pounds are converted to round weight mt by dividing the landed weights by 2,000 for ton, and then multiply the conversion factor of 0.9072 for mt. A conversion factor of 1.45 was multiplied by the reported dressed weight to obtain a round weight.
[2]-Ex-vessel revenues are nominal (not adjusted for inflation).
* -Withheld for data confidentiality reasons.

2.1.2 Oregon

2.1.2.1 Surface Hook-and-Line Fishery for Albacore

Albacore has been fished commercially off of Oregon since the mid-1930s when the fishery expanded north from the traditional grounds off southern California. For many years, both bait boats and jig boats fished for albacore off Oregon, but in recent years predominantly jig-caught (troll-caught) fish have been landed. The current fleet consists primarily of small to medium (20 ft to 60 ft) "combination" boats, which may fish crab, salmon, or bottom fish at other times of the year, and large freezer boats (most longer than 60 ft) that travel the North and South Pacific, fishing principally albacore.

Oregon albacore landings have been highly variable through the years, ranging from a low of 12.5 mt in 1936 to a high of over 17,000 mt in 1968. In the last decade, annual landings in Oregon have averaged about 3,700 mt.

Sampling of Oregon's commercial albacore fishery is a cooperative effort between the Oregon Department of Fish and Wildlife (ODFW), NMFS, and the Pacific States Marine Fisheries Commission (PSMFC).

Commercial landings of albacore into Oregon totaled 3,864 mt in 2006, 5 percent more than the 3,665 mt landed in 2005 (Table 2-15) but near the long-term average. Ocean conditions were relatively good for most of the season. Poor market conditions kept some boats (mainly brine frozen) from landing in Oregon ports or fishing altogether. Fuel prices remained high.

Landings of albacore into Oregon ports began with a small landing in mid June. The main fishery began

in early July and continued into early November. The peak of landings occurred in early August (Table 2-15). Landings remained steady through September and tapered off in October. A total of 352 vessels made an estimated 932 landings in 2006, down from 981 landings in 2005.

Newport generally receives the majority of Oregon deliveries, followed by Astoria and Charleston. However, in 2006 Astoria was the top port for Oregon deliveries, with Newport second and Charleston a distant third. Astoria accounted for 46 percent of total landings and received several landings over 40 mt during September and October. Nine other ports also received deliveries in 2006 (Table 2-16). In recent years, the number of landings has been declining and the average size of landings is increasing. The estimated number of trips landed into Oregon ports decreased from 981 trips in 2005 to 933 in 2006, below the average of 1,081 trips during the previous five years. The average landing in 2006 was 4.0 mt; higher than the average for 2005 and 2004, of 3.7 mt and 3.1 mt respectively.

Table 2-15. Oregon commercial albacore landings (mt) by month, 2004–06.

Month	2004	2005	2006
May	0.2		
June	215.7	23.5	6.7
July	1,537.2	498.6	704.7
August	1,358.7	1,612.3	1,261.5
September	1,173.2	857.7	1,043.3
October	516.7	664.6	816.4
November	4.0	7.8	17.1
Total	**4,805.7**	**3,664.5**	**3,864.2**

Data source: ODFW fish ticket landings data, extracted April 2007.

Table 2-16. Oregon commercial albacore landings (mt) by port, 2004–06.

Port	2004	2005	2006
Astoria	974.3	1260.2	1795.0
Garibaldi	79.3	89.8	97.2
Pacific City	2.4	0.5	1.2
Depoe Bay	5.4	1.2	0.6
Newport	2,214.6	1,364.1	1,307.2
Florence	23.3	10.3	19.9
Winchester Bay	44.8	70.9	89.3
Charleston	1,427.7	847.6	532.1
Bandon	1.0		1.0
Port Orford	5.2	2.0	15.3
Gold Beach	2.1		0.4
Brookings	25.7	17.6	4.6
Total	**4,805.8**	**3,664.5**	**3,864.2**

Data source: ODFW fish ticket landings data, extracted April 2007.

Albacore markets were unstable during the 2006 season. Prices dropped substantially in early August for all grades of fish. The supply of fish was also highest in August. The blast/bled market began to recover in September as fat content and demand from Japanese markets increased. Although prices recovered and ended higher than at the start of the season, they were well below prices paid in 2005 (Table 2-17). Ice boats turned to local marketers for better prices but at times could only sell limited amounts. European

markets were fully supplied with record catches from Spain.

Table 2-17. Ex-vessel* price-per-pound for albacore tuna in Oregon, 2004–06.

Product Form	2004	2005	2006
frozen	$0.75 to $1.50	$1.10 to $1.45	$0.60 to $1.00
fresh	$0.65 to $1.00	$0.75 to $1.50	$0.60
off-vessel (whole)	$1.75	$1.75 to $1.90	$1.75 to $2.00
off-vessel (loins)	$3.50		$4.00

*Ex-vessel revenue are nominal values (not adjusted for inflation).
Data source: ODFW fish ticket landings data, extracted August 2007.

2.1.2.2 Drift Gillnet Fishery for Swordfish and Shark

The Oregon commercial drift gillnet fishery is an extension of the California fishery. However, with implementation of the seasonal Pacific Leatherback Conservation Area off northern California and southern Oregon, fishing effort off Oregon has dropped considerably. In Oregon, the drift gillnet fishery for swordfish is managed under the Developmental Fisheries Program, which limits the number of permits available. Although 10 permits are available each year, no permits were issued and no landings were made in 2006 (Table 2-18).

Table 2-18. Oregon landings (mt) with drift gillnet gear, 2004–06.

Species	2004	2005	2006
Swordfish	0.03		
Thresher shark	0.07		
Bluefin tuna			
Shortfin mako			
Opah			
Total	**0.10**	**0**	**0**

Data source: ODFW developmental fisheries permits, August 2007.

2.1.3 Washington

The commercial and recreational highly migratory species fisheries off the Washington coast are primarily for albacore tuna, although there are occasional, smaller landings of thresher shark and blue shark. While there is not a fixed season, albacore fisheries generally begin in early to mid-July and continue until the tuna are no longer accessible off Washington, usually around late September.

The albacore fisheries off Washington include commercial troll, bait boats, charter boats, and recreational fishing boats. There is no state commercial fishing license requirement for albacore tuna in Washington; however, as of June 2006 a recreational fishing license is now required.

The two major ports along Washington's coast that have the highest HMS landings from the surface hook-and-line fishery for albacore are Westport and Ilwaco. There are several other ports along the coast and in Puget Sound that typically receive albacore landings as well (Table 2–19). Landings at individual ports vary and are a direct reflection of market conditions. Many vessels, particularly in Westport, sell their product directly to the public off the dock rather than to a fish buyer for processing.

Table 2–19. Washington commercial albacore landings (mt) by port, 2004–06.

Port	2004	2005	2006
Anacortes	6.7	2.1	24.2
Bellingham Bay	309.5	233.2	314.1
Port Angeles	5.8	1.9	4.5
Port Townsend	8.5	7.5	6.2
Seattle[1]	7.8	5.8	63.3
Olympia	0.0	1.0	3.4
Neah Bay	1.2	3.9	7.2
La Push	7.3	5.1	1.1
Aberdeen	1.2	20.0	0.0
Westport	3,179.0	2,803.9	2,665.3
Tokeland/Grayland	4.9	31.3	8.9
Bay Center	0.0	0.3	5.3
Long Beach	0.2	0.3	1.0
Chinook	29.7	13.9	22.3
Ilwaco	3,746.0	1,271.2	5,359.9
Pacific County (other)[2]	0.5	0.0	15.1
Cathlamet	0.8	0.0	0.6
Total	**7,309.1**	**4,401.6**	**8,502.4**

Data source: WDFW fish ticket landings data, extracted August 2007
(1) Includes Tacoma.
(2) Includes South Bend, Raymond, and Nachotta.

Large amounts of albacore tuna have been landed in Washington in recent years and, in general, the tuna fishery has remained stable since the early 1990s. In recent years, variability in tuna landings has likely been an indication of changes in availability of tuna, rather than effort, as the number of participating vessels has been fairly consistent.

As provided for under the U.S./Canada albacore treaty, some Washington ports also receive albacore landings from Canadian vessels, although the majority of Washington's albacore landings come from U.S. vessels fishing in U.S. waters (Table 2–20).

Table 2–20. U.S. and Canadian albacore landings into Washington, 2004–06.

	U.S. Vessels		Canadian Vessels		Total	
	mt	$	mt	$	mt	$
2004	7369.6	13,396,313	875.8	2,367,778	8245.5	15,764,091
2005	4462.2	9,781,600	383.5	1,069,562	4845.6	10,851,162
2006	8512.4	14,709,198	164.5	355,611	8676.8	15,064,809

Data source: WDFW fish ticket landings data, extracted August 2007.

2.2 Description of West Coast Recreational Fisheries

2.2.1 California

Recreational anglers in California take all of the management unit species (MUS) included within the HMS FMP using rod-and-reel gear almost exclusively; a nominal amount of fish, primarily tunas, are taken by free divers using spear guns. Fishing occurs in the EEZ waters of the U.S. as well as Mexico

aboard CPFVs and private boats. A fishing season is dependent on oceanographic conditions, which strongly influence the occurrence of fish within range of the California-based fleet, but a typical season begins in late spring and runs through fall. Anglers 16 years and older must have a resident or non-resident annual or short-term recreational fishing license to catch and land any ocean fish in California, and an Ocean Enhancement Stamp is required if fishing within ocean waters south of Point Arguello, southern California. California does not have size or slot limit restrictions but it does have daily possession limits for some of the MUS. Table 2–21 shows the daily possession limits for MUS for California recreational anglers for 2006.

Table 2–21. California's recreational daily possession limits for highly migratory MUS included within the fishery management plan.

Species	No limit[1]	1-Fish	2-fish	10-fish[2]
Tunas				
Albacore[c]	X			
Bigeye				X
Bluefin[3]	X			
Skipjack	X			
Yellowfin				X
Billfishes				
Striped Marlin		X		
Swordfish			X	
Sharks				
Blue			X	
Common Thresher			X	
Mako			X	
Other Fish				
Dorado				X

[1]-In general, no more than 20 finfish in combination of all species, with not more than 10 of any one species, may be taken or possessed by any one person, unless otherwise authorized, e.g., albacore, bluefin, and skipjack tunas (CCR, Title 14, 27.60).
[2]-California authorizes boat limits for two or more persons that are licensed to fish in ocean waters off California (CCR, Title 14, Section 27.60). This authorization does not apply to fishing trips originating in California where fish are taken in other jurisdictions.
[c]- In 2007, California will enact albacore and bluefin bag limits to match Federal regulations; bluefin tuna - 10 fish, albacore south of Point Conception – 10 fish, albacore north of Point Conception – 25 fish. These limits are in addition to the general 20 fish bag limit.

Vessel operators that charge a fee to passengers to sport fish from any vessel must have a CPFV license, a current CDFG vessel registration, and the operator must submit a monthly log of their fishing activity. Additionally, the HMS FMP requires a Federal permit with a recreational gear endorsement for all U.S. CPFVs that fish for HMS within the West Coast EEZ and that pursue HMS on the high seas and land their catch in California, Oregon, and Washington.

Fishery statistics are available from both PSMFC, through their Recreational Fisheries Information Network (RecFIN) website (www.psmfc.org/recfin), and the CDFG CPFV logbook program. RecFIN provides estimates based on field sampling of catch and a telephone survey for effort, while the state's logbook program provides a census of fishing activity for most CPFVs. The fact that catches of highly migratory MUS constitute a relatively rare event is why logbooks are preferred over RecFIN in determining the catch of these species by anglers fishing from CPFVs. Logbooks also have the advantage of supplying catch information on MUS taken in Mexico. However, RecFIN data are the best available for making catch estimates of anglers fishing from private boats.

Table 2-22. Annual number of highly migratory MUS kept and thrown back by recreational anglers fishing from commercial passenger fishing vessels (CPFV) in U.S. EEZ waters, 2005–06.

Species	2005 Number of Fish (kept)	2005 Number of Fish (thrown back[2])	2006 Number of Fish (kept)	2006 Number of Fish (thrown back[2])
Tunas				
Albacore	15,758	73	3,365	3
Bigeye	2	0	4	0
Bluefin	723	1	1,349	7
Skipjack	2,224	535	1,735	463
Yellowfin	5,630	20	5,255	57
Billfishes				
Striped Marlin	4	6	2	3
Swordfish	0	0	3	1
Sharks				
Blue	26	77	18	204
Common Thresher[1]	24	10	33	4
Shortfin Mako	121	35	177	106
Other Fish				
Dorado	673	12	11,312	253
Total	25,185	769	23,253	1101

Source: California's Commercial Fisheries Information System (CFIS), CPFV logbook data, extracted August 8, 2007
Additional processing information:
[1]-The annual totals for common thresher shark included one pelagic thresher thrown back in 2005; and six bigeye thresher kept in 2006 and one kept in 2005.
[2]-The condition (live or dead) of fish thrown back fish is not available.

With the exception of sharks, most HMS MUS are caught by anglers fishing from CPFVs in the Mexican EEZ (Table 4–47). But for some species reported catches from the U.S. EEZ can sometimes reach 100 percent of the yearly total for the fleet. In 2006, approximately 148 CPFVs logged 1,218 days at-sea within the U.S. EEZ compared to 133 CPFVs that logged 866 days at-sea in 2005. The total number of MUS kept by anglers declined from 25,185 fish in 2005 to 23,253 fish in 2006 (Table 2–22). Dorado was the leading species in 2006, followed by yellowfin, albacore (only a fifth of the 2005 total), and skipjack tuna; most tuna numbers declined except for bluefin.

In recent years, the CPFV fleet experienced some of the best fishing ever for several MUS species when the U.S. and Mexican EEZ catches are combined (Table 4–47). Over 312,700 albacore were landed in 2002 while 1999, 2003, and 2001 produced the second through fourth best years in history. Exceptional bluefin tuna catches also occurred during this period. During 1999, 36,390 fish were landed making it the best year in history while 2002, 2003, 2001, and 2000 produced the third through sixth best years in history. CPFV anglers caught 86,737 yellowfin tuna in 2000 making it the fourth best year on record while 1998 produced the fifth best year on record for this species.

Catch estimates for private boats are presented in Table 2–23. The estimates are for vessels fishing exclusively in the U.S. EEZ. Many private vessels fish in the EEZ of Mexico but the number and catch of these vessels is unknown. In 2006, about 26,000 MUS were caught by private boaters compared to 18,000 MUS caught in 2005. Despite the overall increase in MUS catches from 2005 to 2006, estimates of shortfin mako shark catches dropped by nearly two-thirds. The number of blue sharks released also decreased. Sharks assume much greater importance when ranking catches among private boaters because they are best fished by one or two anglers from a small vessel. By contrast, CPFVs are two to three times larger than private boats and may carry 20 times the number of anglers as a private boat. Private boat

catch estimates from RecFIN must be used with caution because sampling anglers that pursue HMS is a rare occurrence and as such can lead to unusually high or low catch estimates with high variances.

Table 2–23. Estimated number of highly migratory MUS kept and thrown back alive by recreational anglers fishing from private vessels in U.S. EEZ waters, 2005–06.

	2005 Number of Fish (x1,000)		2006 Number of Fish (x1,000)	
Species	**(kept)**	**(thrown back alive)**	**(kept)**	**(thrown back alive[1])**
Tunas				
Albacore	4	< 1	6	< 1
Bigeye	0	0	0	0
Bluefin	< 1	0	< 1	< 1
Skipjack	< 1	<1	1	8
Yellowfin	< 1	0	1	1
Billfishes				
Striped Marlin	< 1	<1	< 1	<1
Swordfish	0	0	0	0
Sharks				
Blue	< 1	25	< 1	3
Common Thresher	< 1	3	< 1	1
Shortfin Mako	14	7	5	6
Other Fish				
Dorado	< 1	0	13	2
Total	18	35	26	21

Source: Pacific States Marine Fisheries Commission, Recreational Fisheries Information System, California Recreational Fisheries Survey data, extracted August 24, 2007.
Additional Processing Information:
[1]-The angler reported the fish was thrown back alive after capture.

2.2.2 Oregon

In 2006, the recreational albacore fishery off Oregon increased from 2005, both in number of trips (Table 2–24) and in number of fish (Table 2–25). Overall, catch and effort continued to increase after 2003, especially in the private boat sector. Catch per unit of effort rose in 2006 (3.5 fish/trip) from 2005 (2.1 fish/trip) (Table 2–26). During 2006, recreational anglers landed an estimated 11,629 albacore tuna, more than double the 2005 catch. Private boats accounted for approximately 77 percent of the total recreational landings. Newport accounted for 39 percent of the trips and 30 percent of the catch. Private boat effort and catch picked up markedly in Garibaldi in 2006.

Table 2–24. Oregon albacore fishing effort (angler trips) for charter and private boats, and combined, by year and port, 2004–06.

Port	Charter			Private			Combined		
	2004	2005	2006	2004	2005	2006	2004	2005	2006
Astoria	58	72	108	95	175	188	153	247	296
Garibaldi	57	80	36	88	120	642	145	200	678
Pacific City	12	5	0	132	57	80	144	62	80
Depoe Bay	255	151	94	420	405	385	675	556	479
Newport	679	611	646	700	587	646	1,379	1,198	1,292
Winchester Bay	156	77	0	98	14	12	254	91	12
Coos Bay	68		10	565	19	145	633	19	155
Bandon	48	14	83	54		76	102	14	159
Port Orford			0			0			0
Gold Beach			0			6			6
Brookings	47	12	0	505	39	179	552	51	179
Total	**1,380**	**1,022**	**977**	**2,657**	**1,416**	**2,359**	**4,037**	**2,438**	**3,336**
Private boat (%)							**65.8%**	**58.1%**	**70.7%**

Data Source: ODFW Ocean Recreational Boat Survey, extracted February 2007.

Table 2–25. Oregon albacore catch (number of fish) for charter and private boats, and combined, by year and port, 2004–06.

Port	Charter			Private			Combined		
	2004	2005	2006	2004	2005	2006	2004	2005	2006
Astoria	188	275	231	499	317	804	687	592	1035
Garibaldi	183	170	204	819	155	3,160	1,002	325	3,364
Pacific City	62	3		1,932	53	92	1,994	56	92
Depoe Bay	592	186	113	2,259	943	1,413	2,851	1,129	1,526
Newport	2,498	1,043	1653	2,894	1,472	1,875	5,392	2,515	3,528
Winchester Bay	768	327		624	8	0	1,392	335	0
Coos Bay	192		50	2,258	12	816	2,450	12	866
Bandon	216	46	398	167		517	383	46	915
Port Orford									
Gold Beach						0			0
Brookings	273	3		812	2	303	1085	5	303
Total	**4,972**	**2,053**	**2,649**	**12,264**	**2,962**	**8,980**	**17,236**	**5,015**	**11,629**
Private boat (%)							**71.2%**	**59.1%**	**77.2%**

Data Source: ODFW Ocean Recreational Boat Survey, extracted February 2007.

Table 2–26. Oregon albacore catch per unit of effort (number of fish/angler trip), for charter and private boats, and combined, by year, by port, 2004–06.

Port	Charter			Private			Combined		
	2004	2005	2006	2004	2005	2006	2004	2005	2006
Astoria	3.2	3.8	2.1	5.3	1.8	4.3	4.5	2.4	3.5
Garibaldi	3.2	2.1	5.7	9.3	1.3	4.9	6.9	1.6	5.0
Pacific City	5.2	0.6		14.6	1.0	1.2	13.8	0.9	1.2
Depoe Bay	2.3	1.2	1.2	5.4	2.3	3.7	4.2	2.0	3.2
Newport	3.7	1.7	2.6	4.1	2.5	2.9	3.9	2.1	2.7
Winchester Bay	4.9	4.2		6.4	0.6	0.0	5.5	3.7	0.0
Coos Bay	2.8		5.0	4.0	0.6	5.6	3.9	0.6	5.6
Bandon	4.5	3.3	4.8	3.1		6.8	3.8	3.3	5.8
Port Orford									
Gold Beach						0.0			0.0
Brookings	5.8	0.2		1.6	0.1	1.7	2.0	0.1	1.7
Total	**3.6**	**2.0**	**2.7**	**4.6**	**2.1**	**3.8**	**4.3**	**2.1**	**3.5**

Data Source: ODFW Ocean Recreational Boat Survey, extracted February 2007.

2.2.3 Washington

In 2006, there was a 75 percent increase in the number of recreational albacore fishery trips taken off Washington compared to 2005 (Table 2–27). The increased effort and an improved catch per unit effort (Table 2–28) resulted in a doubling of the recreational albacore catch (Table 2–29).

Table 2-27. Washington albacore fishing effort (angler trips) for charter and private boats, and combined, by year and port area, 2004–06.

Port Area	Charter			Private			Combined		
	2004	2005	2006	2004	2005	2006	2004	2005	2006
North Coast	16	40	44	39	64	101	55	104	145
Westport	937	817	1,207	57	163	199	994	980	1,406
Ilwaco	264	185	556	188	240	540	452	425	1,096
Total	1,217	1,042	1,807	284	467	840	1,501	1,509	2,647
Private boat (%)	—	—	—	—	—	—	18.9%	30.9%	31.7%

Data source: WDFW Ocean Sampling Program, extracted August 2007.

Table 2–28. Washington albacore catch per unit of effort (number of fish/angler trip) for charter and private boats, and combined, by year and port, 2004–06.

Port Area	Charter			Private			Combined		
	2004	2005	2006	2004	2005	2006	2004	2005	2006
North Coast	12.0	3.3	5.3	1.8	2.4	4.4	4.8	2.8	4.7
Westport	12.8	12.5	15.3	2.7	2.8	3.7	12.2	10.9	13.7
Ilwaco	3.4	3.8	4.3	4.9	2.2	4.2	4.1	2.9	4.2
Total	10.7	10.6	11.7	4.1	2.4	4.1	9.5	8.1	9.3

Data source: WDFW Ocean Sampling Program, extracted August 2007.

Charter boat trips make up the majority of albacore trips in Washington and generally tend to have higher catches per angler (Table 2–28). Beginning in 2005, a mandatory charter boat tuna logbook program was

implemented to provide additional information on location and effort in the charter albacore fishery.[1] Average catch per angler reported in the 2005 logbook data was 12 fish while the 2006 logbook data reported a slightly higher average of 12.8 fish per angler. The average weight of albacore reported in the logbooks was 19.1 lbs in 2005 and 16.1 lbs in 2006.

Table 2–29. Washington albacore catch (number of fish) for charter and private boats, and combined, by year and port area, 2004–06.

Port Area	Charter			Private			Combined		
	2004	2005	2006	2004	2005	2006	2004	2005	2006
North Coast	192	133	234	70	155	445	262	288	679
Westport	11,948	10,198	18,517	156	450	734	12,104	10,648	19,251
Ilwaco	905	711	2,395	928	516	2,254	1,833	1,227	4,649
Total	13,045	11,042	21,146	1,154	1,121	3,433	14,199	12,163	24,579
Private boat (%)	—	—	—	—	—	—	8.1%	9.2%	14.0%

Data source: WDFW Ocean Sampling Program, extracted August 2007.

[1] This logbook data does not factor into Washington's official catch of record, which is calculated from data collected and analyzed by the Ocean Sampling Program (OSP).

3.0 REGULATIONS CURRENTLY IN PLACE

3.1 Summary of the HMS FMP Management Measures and Regulations

On April 7, 2004, NMFS published a final rule to implement the approved provisions of the HMS FMP (69 FR 18444), with the exception of the Reports and Record Keeping requirements, which were granted a delayed effectiveness pending collection-of-information clearance by the Office of Management and Budget (OMB). Clearance of these delayed requirements, which covers logbooks, permits, vessel monitoring systems, and pre-trip notifications, was received by OMB and became effective on February 10, 2005 (70 FR 7022). In addition, two HMS FMP regulatory amendments have been prepared and finalized since the original final rule was put in place. The first deals with corrections and clarifications to drift gillnet regulations pertaining to the Pacific Loggerhead Sea Turtle Conservation Area with an effective date of July 9, 2007 (72 FR 31756). The second deals with providing an exemption for HMS-permitted Recreational Charter vessels with complying for the mandatory Vessel Marking requirements with an effective date of September 5, 2007 (72 FR 43563). A third HMS FMP regulatory amendment is in the works to establish daily bag limits for sport caught albacore and bluefin tuna harvested in the West Coast EEZ (3-200 nm). It is anticipated that these daily bag limits will be finalized in late September 2007, and be effective for the 2008 fishing season. The state of California is drafting companion regulations for the establishment of daily bag limits for albacore and bluefin tuna to cover nearshore waters under their jurisdiction (0-3 nm).

Copies of the current suite of HMS FMP regulations along with an abridged HMS FMP Compliance Guide, can be found on the NMFS Southwest Region website at: http://swr.nmfs.noaa.gov. Since fishery rules frequently change, fishermen must familiarize themselves with the latest regulations and are responsible for complying with the current official regulations set forth in the Code of Federal Regulations at 50 CFR Part 660.[1]

The HMS FMP regulations are necessary for Federal management of U.S. fishing vessels targeting HMS within the West Coast EEZ of California, Oregon, and Washington and the adjacent high seas waters. This HMS FMP applies to all U.S. vessels that fish for HMS within the EEZ off California, Oregon, or Washington and to U.S. vessels that pursue HMS on the high seas (seaward of the EEZ) and land their fish in California, Oregon, or Washington. The HMS FMP does not apply to U.S. vessels that fish for HMS on high seas and land into a non-U.S. port. Additional restrictions apply under the High Seas Fishing Compliance Act[2] and for Western Pacific longline permitted vessels landing into West Coast ports.[3]

Regulations for HMS in Washington, Oregon, and California vary from state to state. The HMS FMP contains Federal measures for HMS fisheries, which 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. Some of the state regulations are inconsistent from state to state, but these inconsistencies do not pose management problems that require immediate Federal action.

The HMS FMP, under the management auspices of the Pacific Council, serves as a mechanism to cooperate with other regional and international management bodies to work towards consistent

1 50 CFR part 660 is available online at http://www.access.gpo.gov/nara/cfr/waisidx_03/50cfr660_03.html
2 http://www.nmfs.noaa.gov/ia/services/highseas.htm
3 http://www.wpcouncil.org/pelagic.htm

management of U.S. fisheries in the Pacific Ocean. Federal measures impacting these fisheries, which arise from several different Federal laws, may be more efficiently addressed within the Council framework, and related regulations can be viewed together. An important goal of the HMS FMP is to assure that issues of national and international concern are addressed, and to determine how recommendations of international bodies should be applied to domestic fisheries of the West Coast.

The HMS FMP identifies 13 highly migratory species as management unit species (listed in Table 1–1) and defines the legal gear types and management measures used to harvest them.

The fishing gears described below are authorized for the commercial and recreational harvest of HMS in the EEZ by all permitted vessels, and beyond the EEZ by vessels landing into West Coast ports. Gear that is not defined as legal gear is prohibited from harvesting HMS under the HMS FMP. Specific management measures regulating the use of legal gear types will be developed if necessary, using the framework procedures of the HMS FMP.

3.1.1 HMS 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[4]). Surface hook-and-line is always attached to the vessel.

Drift Gillnet: A panel of netting, suspended vertically in the water by floats along the top and weights along the bottom, which is neither stationary nor anchored to the bottom. The HMS FMP final rule defines drift gillnet gear as 14 inch (35.56 cm) stretched mesh or greater.

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, lampara net).

Pelagic Longline: A main line that is suspended horizontally in the water column, which is neither stationary nor anchored, and from which dropper lines with hooks (gangions) are attached.

3.1.2 HMS 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).

[4] 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.

3.1.3 Landings and Gear Use Regulations

At this time there are no quotas for HMS species, although there are harvest guidelines. A quota is a specified numerical harvest objective, the attainment of which triggers the 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. If the harvest guidelines have been reached, NMFS will initiate a review of the species according to provisions in the HMS FMP and in consideration of Council guidance. The HMS FMP establishes annual harvest guidelines of 340 mt for common thresher sharks and 150 mt for shortfin mako sharks. Because total catches and basic population dynamic parameters for these shark species are poorly known, they are being managed using precautionary harvest guidelines.

The HMS FMP final rule prohibits the retention of the species listed below in Table 3–1. In general, prohibited species must be released immediately if caught, unless other provisions for their disposition are established in accordance with HMS FMP guidelines.

In addition, U.S. citizens fishing in waters covered under the HMS FMP are bound by the rules and regulations set forth in the Shark Finning Prohibition Act of 2002.[5] The Act prohibits, among other things, any person subject to U.S. jurisdiction from: 1) engaging in shark finning, 2) possessing shark fins aboard a U.S. fishing vessel without the corresponding carcass, or 3) landing shark fins without a corresponding carcass.

Table 3–1. Prohibited Species covered under the HMS FMP final rule.

Common Name	Scientific Name
great white shark	*Carcharodon carcharias*
basking shark	*Cetorhinus maximus*
megamouth shark	*Megachasma pelagio*
Pacific halibut	*Hippoglossus stenolepis*
pink salmon	*Onchorhynchus gorbuscha*
Chinook salmon	*O. tshawytscha*
chum salmon	*O. keta*
sockeye salmon	*O. nerka*
coho salmon	*O. kisutch*

The HMS FMP prohibits the sale of striped marlin by all vessels as a means to provide for and maximize recreational fishing opportunities for this species. Striped marlin is considered to have far greater value as a recreational target species than as a commercial target species. Prohibiting sale removes the incentive for commercial fishermen to take striped marlin.

3.1.4 Incidental Landings

The HMS FMP authorizes 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. Incidental catch refers to harvest of HMS that are unavoidably caught while fishing for other species or fishing with gear that is not legal for the harvest of HMS.

1. Small-mesh gillnetters and set net gillnetters *will not* be permitted to land swordfish but would be

[5] Copies of the Act can be downloaded at: http://www.nmfs.noaa.gov/sfa/hms/hmsdocuments.html. Copies of the Small Entity Compliance Guide Outlining the Regulations to Implement Shark Finning Prohibition Act can be viewed at: http://swr.nmfs.noaa.gov/pir/cg2.htm.

permitted to land other HMS, with the restriction of 10 fish per landing of each non-swordfish HMS.

2. Bottom longline (set line) fishery landings are restricted to three HMS sharks, or 20 percent of total landings by weight of HMS sharks, whichever is greater.

3. For trawl, pot gear, and other non-HMS gear, a maximum of 1 percent of total weight per landing for all HMS shark species combined is allowed (i.e., blue shark, shortfin mako shark, and bigeye, pelagic, and common thresher sharks) or two HMS sharks, whichever is greater.

A drift gillnet vessel with a stretched mesh size less than 14 inches will not be able to target HMS, although an incidental landing of 10 HMS per trip, other than swordfish, will be allowed to minimize bycatch while fishing for state managed species.

Albacore surface hook-and-line vessels may not deploy small-mesh drift gillnets to target albacore as was customarily practiced by selected vessels prior to passage of the HMS FMP final rule.

In Washington, it is unlawful to land thresher shark taken by any means from state and offshore waters of the Pacific Ocean north of the Washington-Oregon boundary and south of the U.S.-Canada boundary. It is unlawful to land any thresher shark in Washington taken south of the Washington-Oregon boundary unless each thresher shark landed is accompanied by a minimum of two swordfish.

In Oregon, it is unlawful to take thresher shark for commercial purposes with gillnets, except as bycatch in the swordfish fishery. In the swordfish fishery, under a developmental fisheries permit, thresher shark may be retained at a ratio of one thresher for every two swordfish retained. Thresher shark, taken with gear legal for other ocean food fish and within catch and season restrictions for other food fish, may be landed in Oregon.

3.1.5 Status of HMS Permits

The reporting and recordkeeping requirements of the HMS FMP became effective February 10, 2005, and formalized, among other things, the requirement for an HMS permit. Title 50, Section 660.707 of the Coder of Federal Regulations outlines the required HMS permit with an endorsement for a specific gear for all U.S. commercial and recreational charter fishing vessels fishing for and/or landing HMS off the States of California, Oregon, and Washington. The permit requirements also apply for U.S. commercial fishing vessels that land or transship HMS shoreward of the outer boundary of the U.S. EEZ off the States of California, Oregon, and Washington. The permit must be on board the vessel and available for inspection by an authorized officer. Table 3–2 shows the number of HMS permits issued to date.

Table 3–2 HMS permits recorded in the permit database for each year since the regulation became effective on February 10, 2005.

	California	Oregon	Washington	Other	Total
2005	677	626	298	135	1,736
2006	800	684	339	152	1,975
2007	700	549	294	125	1,668

Notes: The permits are issued to the vessel owner(s) not to the vessels themselves. The totals indicate the number of permits outstanding in each year and cannot be added across years. "Other" column includes non-West Coast home ports/states and permits issued with no home port/state designated.

3.1.6 HMS Data Collection

Catch, effort, and catch disposition data are critical for monitoring HMS fisheries, assessing the status of the stocks, and evaluating the effectiveness of management. All commercial fishing and recreational charter vessels are required to maintain logbooks. All information specified on the logbook forms must be recorded on the forms within 24 hours after the completion of each fishing day. The original logbook form for each day of the fishing trip must be submitted to NMFS or the appropriate state management agency within 30 days of each landing or transshipment of HMS. Each form must be signed and dated by the fishing vessel operator.

A total of 1,362 albacore logbooks from 402 vessels were submitted to the NMFS Southwest Fisheries Science Center (SWFSC) in La Jolla, California, in 2006 compared to 1,189 logbooks from 385 vessels in 2005. A total of 12,590 mt of albacore was landed and reported on the PacFIN fish ticket system for 2006 compared to 8,413 mt in 2005. A total of 8,254 mt of albacore were recorded as catch in mandatory logbook submissions for 2006 compared to 5,440 mt in 2005. This equates to a 66 percent logbook compliance rate estimate for 2006 using the landed catch versus logbook reported catch methodology. The 2005 logbook compliance rate using this same methodology was 65 percent. Catch sampling for sizes of albacore caught, or size composition, was about 2 percent of the catch (in numbers of fish). In 2006, port samplers measured 43,203 albacore from troll vessel landings in California, Oregon, and Washington compared to 20,434 measured in 2005.

CDFG implemented a harpoon logbook and permit program in 1974. The logbook has been modified over time, but the primary focus has been to document catch, effort, and oceanographic conditions on the fishing grounds. According to logbook and market receipt data, 21 of 24 active vessels submitted logbooks and logged 1,056 days at-sea in 2006 compared to 21 of 24 active vessels that logged 1,154 days at-sea in 2005. CDFG will be looking into logbook compliance in the near future.

The gillnet logbook program was implemented in 1980 to study the development of the drift gillnet shark fishery to determine the effects of the fishery on swordfish and striped marlin. According to logbook records, 43 drift gillnet vessels made 1,433 sets for swordfish and/or thresher shark in 2006 compared to 42 drift gillnet vessels that made 1,043 sets in 2005.

Washington recreational charter fishing vessels began completing and submitting logbooks for albacore tuna trips in 2005. According to the logbooks received for 2006, 25 charter vessels completed a total of 181 trips and landed 19,793 albacore. This was an increase in effort and catch from 2005 when 18 charter vessels completed 120 trips and landed 11,999 albacore. While logbook data are providing additional information on location, effort, and landings in Washington's charter albacore fishery, the official record of catch for albacore comes from dockside sampling by the Washington Ocean Sampling Program (OSP). Results from the OSP data are reported in chapter 2 for 2004–06.

Oregon recreational charter fishing vessels began completing and submitting logbooks for albacore tuna trips in 2005. According to the logbooks received for 2006, three charter vessels fished for albacore completing 28 trips landing 956 albacore compared to 2005 when eight vessels completed 56 trips landing 1,176 albacore. The average weight for the landed albacore was 17.0 lb in 2006 compared to 20.5 lb in 2005.

In 2006, 148 California-based CPFVs targeted HMS in U.S. waters and logged 1,218 days at-sea compared to 133 vessels that logged 866 days at sea in 2005. In addition to the CPFV logbook program, CDFG implemented its California Recreation Fishery Survey (CRFS) in 2004 to provide catch and effort estimates for marine recreational finfish fisheries. It is a collaborative effort between the CDFG and the PSMFC, and is funded by state and Federal sources. In 2006, CRFS field samplers interviewed 98 CPFV

tuna anglers compared to 49 in 2005.

3.1.7 Observer Requirements

All U.S. fishing vessels operating in HMS fisheries (including catcher/processors, at-sea processors, and vessels that embark from a port in Washington, Oregon, or California and land catch in another area), may be required to carry a NMFS-certified observer on board to collect scientific data when directed to do so by the NMFS Regional Administrator. NMFS shall advise the permit holder or the designated agent of any observer requirement at least 24 hours (not including weekends and Federal holidays) before any trip. Pre-season informational letters were sent out to the various HMS fleets explaining the requirements for carrying an observer, which includes, among other things, providing bunk space and food equivalent to that given crew members.

During 2006, the NMFS Southwest Region Observer Program observed the following HMS fisheries:

- Drift gillnet: 47 trips and 235 sets for a coverage rate of approximately 20 percent.
- Albacore troll: Two trips and 7 days of fishing effort; the coverage rate was much less than 1 percent.
- Tuna Purse Seine: No tuna trips conducted by local purse seine fleet in 2006.
- Pelagic tuna longline: Five trips and 63 sets, 100 percent coverage.
- HMS CPFV: 18 trips and 42 fishing days in California; 7 trips and 7 fishing days in Oregon; and 11 trips in and 22 fishing days Washington.

3.1.8 Enforcement of Regulations

Penalties for violating the regulations and prohibitions outlined in the HMS FMP final rule are determined on a case-by-case basis; they can include significant civil penalties and permit sanctions. NOAA has implemented a summary settlement penalty program to increase compliance with logbook reporting requirements, and is developing a civil administrative penalty schedule for the HMS FMP Final Rule, which will be available to the public at: http://www.gc.noaa.gov/enforce-office3.html.

The NOAA Summary Penalty Program for the West Coast HMS fishery can be found at 50 CFR 660, Subpart K. The Program focuses on the reporting compliance for logbooks and sets the penalty schedule for failure to timely complete, or timely submit, a logbook as required by regulation as follows: 1–5 days late, $500; 6 or more days late, $100/day.

3.1.9 Changes in State HMS Regulations

Since implementation of the HMS FMP in 2004 an HMS-related change, described below, was made to Oregon sportfishing regulations.

Prior to 2003, tuna and miscellaneous species (which included sharks and billfish) were included in Oregon's 25 fish-in-aggregate bag limit along with flounder, surfperch, sole greenling, rockfish, and cabezon. In 2003, tuna, surfperch, and sanddab were put into one category with a 25 fish in aggregate limit, and rockfish, greenling, flounder, sole, cabezon, and miscellaneous species were in a second category with a 10 fish in aggregate bag limit. In 2004, an "offshore pelagic species" category was created, which is defined as "all species of tuna and mackerel (family Scombridae), swordfish, all species of billfish (family Istiophoridae), all species of jacks (family Carangidae), opah, dorado, Pacific pomfret, and all species of sharks." This offshore pelagic species category has a bag limit of 25 in the aggregate. White shark and basking shark are prohibited and must be immediately released unharmed. The 2007 Oregon sport fishing pamphlet is available online at http://www.dfw.state.or.us/resources/fishing/.

Regulations for "offshore pelagic species" are on page 91 of the pamphlet.

There were no changes to HMS state regulations in California or Oregon for 2006. Washington did have one significant change that instituted a recreational license requirement for albacore effective June 7, 2006. Washington law requires a recreational license to fish for, take, or harvest fish, shellfish, and seaweed except for specific exemptions provided for in statute (*see* Wash. Rev. Code § 77.32.010). The Washington State Legislature removed albacore for the list of exempted species during its 2006 Regular Session (*see* Washington State Legislature, Senate Bill 6159.SL).

3.2 Protected Resources Regulations

Longline and drift gillnet vessels encounter endangered and threatened species of sea turtles and marine mammals while targeting HMS. Longline vessels also encounter a number of sea birds, including the endangered short-tailed albatross. Endangered and threatened marine species are protected through a number of Federal laws, including the ESA and the MMPA. The HMS FMP final rule adopted measures to minimize interactions of HMS gears with protected species and to ensure that the fisheries are operating consistent with Federal law. These measures include time and area closures, gear requirements, and safe handling and release techniques for protected seabirds and sea turtles. Refer to 50 CFR 660.712, 713, and 720 and 50 CFR 229.31 and 223.206 for the complete list and text of the regulations.

Impacts to ESA-listed protected resources were analyzed as part of the section 7 consultation and 2004 biological opinion (BO) on the HMS FMP. The BO included an Incidental Take Statement with anticipated mortalities and entanglements of ESA-listed marine mammals and sea turtles that are likely to interact with the drift gillnet vessels targeting HMS species (see Table 3–3). The BO considered the impacts of the then proposed shallow-set longline fishery and found that the fishery would result in jeopardy to threatened loggerhead sea turtles. As a result, this component of the proposed HMS fishery was prohibited.

Table 3–3. Anticipated incidental takes of listed species in the HMS fisheries.

Species	Estimated Entanglement	Estimated Mortalities	Conditions Resulting in Take
Fin whale	4 in 3 years	2 in 3 years	
Humpback whale	4 in 3 years	0	
Sperm whale	4 in 3 years	2 in 3 years	
Green turtle	4	1	SSTs in fishing area similar to Nov 99
Leatherback turtle	3	2	
Loggerhead turtle	5	2	Only in El Niño years
Olive ridley turtle	4	1	SSTs in fishing area similar to Nov 99

Note: SST – sea surface temperature.

Except where noted, the anticipated mortalities are annual estimates. Takes of listed marine mammals are rare events and are calculated over a three-year time period, consistent with the MMPA permit required under section 101(a)(5)(E) for incidental take of ESA-listed marine mammals in fisheries. Takes of green, olive ridley, and loggerhead sea turtles are uncommon except under certain environmental conditions (e.g., El Niño or higher than usual sea surface temperatures) when turtles may move into the areas of drift gillnet fishing.

The MMPA requires that all commercial fisheries in the U.S. be categorized and included on an annual

List of Fisheries (LOF). The fisheries are placed in one of three categories based upon the level of serious injury and mortality of marine mammals that occurs incidental to each fishery. The current 2007 LOF was published March 28, 2007 (72 FR 14466). The drift gillnet fishery is listed as a category I fishery; the pelagic longline fishery and tuna purse seine fishery are both listed at category II fisheries. Owners of vessels in these fisheries are required to register with NMFS and obtain a marine mammal authorization to lawfully incidentally take marine mammals. They may also be required to accommodate an observer aboard the vessel upon request by NMFS. Other HMS fisheries are listed under category III. Any incidental injuries or mortalities of marine mammals occurring during fishing operations must be reported to NMFS. Injury/mortality report forms and instructions for submitting forms to NMFS can be downloaded from: http://www.nmfs.noaa.gov/pr/interactions/mmap/.

3.2.1 Drift Gillnet Fishery

The HMS FMP final rule contains measures to protect marine mammals and sea turtles that may interact with the drift gillnet fishery. A suite of time and area drift gillnet closures to protect marine mammals in the U.S. EEZ were adopted into the HMS FMP (see 50 CFR 660.713). Additional protections for marine mammals include the use of pingers and extenders as specified in the Pacific Offshore Cetacean Take Reduction Plan, found at 50 CFR 229.31.

The HMS FMP includes a time and area closure for the drift gillnet fishery from August 15 to November 15 in the area north of Point Conception to approximately central Oregon to protect endangered leatherback sea turtles. In addition, drift gillnet fishing is prohibited in an area east of the 120° W longitude during forecasted or declared El Niño events to protect loggerhead sea turtles. See 50 CFR 660.713(c) for specific areas and terms of the closures. A final rule correcting text in the HMS FMP related to the loggerhead closure became effective on June 8, 2007 (72 FR 31756). Drift gillnet fishing is also prohibited north of 46°16' N latitude (off Washington) to address bycatch of sea turtles and marine mammals, and to minimize incidental catch of thresher shark.

In October 2006, a loggerhead was observed taken in the drift gillnet fishery. The animal was released alive and reportedly uninjured. This take was consistent with the terms of the incidental take statement since it occurred during a declared El Niño event.

In April 2007, the Pacific Offshore Cetacean Take Reduction Team (POCTRT) met for the first time since 2003. The team met for two days in Long Beach, California, and developed recommendations related to the drift gillnet fishery that focused primarily on compliance with the take reduction plan regulations and enhancing enforcement, data gathering, and continued research on pingers (e.g., testing different pinger frequencies to more effectively reduce marine mammal entanglement and/or entanglements of sea turtles and large whales). The tentative date of the next POCTRT meeting is April 2008.

3.2.2 Shallow-set Longline Fishery

The HMS FMP final rule prohibits the use of shallow-set longline gear targeting HMS west of 150° W longitude. A separate rule, promulgated under the ESA, prohibits this gear type east of 150° W longitude in order to protect threatened loggerhead sea turtles. The HMS FMP rule includes regulations for longline fisheries. These regulations include details on proper handling and release requirements for incidentally-captured sea turtles and seabirds, require vessel monitoring systems (VMS) on vessels if requested to carry one by NMFS Office of Law Enforcement, and require vessel owners and operators to attend a NMFS protected species workshop. Complete details are found at 50 CFR 660.712 and 223.206. They are also posted on the NMFS Southwest Region website.

3.2.3 Deep-set Tuna Longline Fishery

A single West Coast-based U.S. longline vessel was active in 2006 using deep-set tuna longline gear. The vessel operated in the high seas zone outside of the U.S. EEZ. NMFS policy on data confidentiality precludes release of catch and landing information for this single vessel.

3.3 International Regulatory Aspects of the HMS FMP

Management of HMS fisheries is complicated by the wide-ranging behavior of the stocks and the many jurisdictions that are involved. The fish are distributed throughout the Pacific Ocean and vessels from the U.S. and many other nations harvest them. Effective management of the stocks throughout their ranges requires international cooperation. The HMS FMP and associated fisheries are affected by international regulations, primarily resolutions enacted by the Inter-American Tropical Tuna Commission (IATTC), but also by other regional fisheries management organizations (RFMOs) and treaties. These include the recently formed Western and Central Pacific Fisheries Commission (WCPFC) and the U.S.-Canada Albacore Treaty.

3.3.1 The Inter-American Tropical Tuna Commission

The IATTC is an international convention that was established in 1950 for the conservation and management of fisheries for tunas, tuna-like species, and other species of fish taken incidentally by tuna-fishing vessels in the EPO. There are 14 member nations to the IATTC Convention: Costa Rica, Ecuador, El Salvador, France, Guatemala, Japan, Mexico, Nicaragua, Panama, Peru, Spain, Republic of Korea, United States, Vanuatu, and Venezuela. Belize, Canada, China, the European Union, and Chinese Taipei are cooperating non-parties or cooperating fishing entities.

The IATTC has a variety of responsibilities, including the scientific study of tunas and tuna-like species, recommending conservation and management measures, and implementing programs to reduce bycatch. The Tuna Convention Act of 1950 provides limited Federal authority to regulate activities of U.S. fishing vessels in the EPO. Under this authority, NMFS promulgates regulations to implement recommendations of the IATTC that have been approved by the U.S. Department of State. The HMS 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.

Under the Agreement on the International Dolphin Conservation Program, the IATTC has significant responsibilities for the implementation of the International Dolphin Conservation Program. More information on the IATTC and the current resolutions can be found at www.IATTC.org.

3.3.1.1 Summary of IATTC Resolutions with Implications for the HMS FMP

The full texts of IATTC resolutions may be accessed at http://www.iattc.org/ResolutionsENG.htm.

IATTC Resolution C-05-02 on Northern Albacore Tuna

The Resolution on Northern Albacore Tuna was agreed to at the June 2005 IATTC meeting in Lanzarote, Spain, and calls upon nations to not increase the total level of fishing effort for North Pacific albacore tuna in the EPO. Resolution C-05-02 on northern albacore tuna calls upon all Parties (CPCs) to take the necessary measures to ensure that the level of fishing effort by their vessels fishing for North Pacific albacore tuna is not increased. It also calls upon all CPCs to report all catches of North Pacific albacore, by gear type, to the IATTC every six months. The IATTC reports that it is very difficult, if not impossible, to monitor compliance with this resolution because of the way that it is structured and given

the requirement to limit effort without effort data being available whereas catch data are available. Another complicating factor is that the resolution calls for limiting effort to "current" levels, but to date "current" has not been defined. The IATTC Secretariat asked the Parties to include a definition of "current effort" for albacore tuna under resolution C-05-02 Northern Albacore Tuna. This request from the Secretariat was introduced during the Eigth Meeting of the Permanent Working Group on Compliance at which point the U.S. indicated it had begun formulating a definition; however, the task has proved to be complex. Discussion of this issue was contained in the committee report of the Eighth Meeting of the Permanent Working Group on Compliance and then referred to the Plenary. However, no action was taken. In regards to compliance, Canada, Chinese Taipei, Japan, Korea, the United States, and Vanuatu submitted the required catch reports for 2006. China did not submit the required biannual reports. The United States reported its catch for the entire North Pacific, whereas other CPCs reported catches from the EPO only.

IATTC Resolution C-06-02 on Tuna Conservation Measures

The Resolution on Tuna Conservation Measures was originally adopted in June 2004, establishing a multi-annual program on the conservation of tuna in the EPO for 2004, 2005, and 2006. The resolution includes conservation measures for yellowfin, bigeye, and skipjack tunas. Purse seine vessels fishing in the EPO are affected by these conservation measures. The conservation resolution includes a national choice of one of two possible 6-week closures of the Convention Area. The possible choices are either a 6-week closure in the summer or winter. Longline vessels fishing for bigeye tuna are restricted to a national catch not to exceed their national catch for the year 2001. The 2004 conservation resolution introduced a precedent-setting multi-year management framework with a review of the stocks' response in 2005 and 2006. The multi-annual plan allows the industry to plan and minimize economic impacts. Pole-and-line and sportfishing vessels are not subject to this resolution. Also, members of the IATTC agreed to compliance measure prohibiting landings, transshipments, and commercial transactions involving tunas caught in contravention of the conservation measures in this resolution.

In June 2006, the IATTC adopted a *Resolution for a Program on the Conservation of Tuna in the Eastern Pacific Ocean for 2007*. The June 2006 resolution is a 1-year program on the conservation of tuna in the EPO for 2007. This resolution offers a choice for closing the purse seine fishery: either a 6-week closure beginning August 1, 2007, or a 6-week closure beginning November 20, 2007

For 2007, NMFS has selected the closure beginning August 1, 2007, through September, 11, 2007. All purse seine gear used to target yellowfin, bigeye, and skipjack tunas must be out of the water in the EPO and no yellowfin, bigeye, or skipjack tunas may be retained for the 6-week period beginning August 1, 2007, through September 11, 2007. The final rule also provides that the U.S. longline fishery for bigeye tuna in the EPO will close for the remainder of the calendar year 2007 after the catch of bigeye by U.S. longline vessels reaches 500 mt (72 FR 30711). This closure will prohibit deepset longline gear from being deployed and retaining bigeye tuna in the EPO. Longline vessels will not be subjected to this closure if the permit holder declares to NMFS under the Fishery Management Plan for the Pelagic Fisheries of the Western Pacific Region that they intend to shallow-set to target swordfish (50 CFR 665.23). NMFS will close the longline fishery through appropriate procedures so that the 500 mt limit is not exceeded. These actions ensure that U.S. vessels fish in accordance with the conservation and management measures that the IATTC recommended in June 2006.

IATTC Resolution C-05-03 on the Conservation of Sharks Caught in Association with Fisheries in the Eastern Pacific Ocean

The Resolution on the Conservation of Sharks passed at the June 2005 meeting in Lanzarote, Spain,

banning the practice of shark finning. The resolution mandates shark data collection and assessment programs while encouraging research into shark nursery areas and ways to avoid incidental bycatch of sharks. The resolution, co-sponsored by the United States, the European Union, Japan, and Nicaragua, calls upon nations to implement National Plans of Action for Shark Conservation in accordance with the United Nations Food and Agricultural Organization 1999 International Plan of Action for Sharks.

Resolution C-05-03 on the conservation of sharks caught in association with fisheries in the EPO includes the following reporting requirements: "each CPC shall annually report data for catches, effort by gear type, landing and trade of sharks by species, where possible, in accordance with IATTC reporting procedures, including available historical data. CPCs shall send to the Director, by May 1, at the latest, a comprehensive annual report of the implementation of this Resolution during the previous year." To date, only the United States and Chinese Taipei have submitted reports pursuant to this Resolution.[6]

IATTC Resolution C-04-05 (Revised) on Bycatch

The IATTC originally adopted resolutions pertaining to bycatch in 2000, 2001, and 2002. The current revised resolution on bycatch was passed at the 2005 meeting with the intent to consolidate the operative parts of the earlier resolutions into one comprehensive resolution on bycatch. The revised resolution on bycatch continues to include full retention of juvenile tunas and non-target species. The revised resolution expires January 2008. This resolution requires full retention of juvenile tunas and non-target species of fish, and provides for a review of compliance on this full retention measure. Compliance in the past has been very poor.

IATTC Resolution C-07-03 to Mitigate the Impact of Tuna Fishing Vessels on Sea Turtles.

This is one of the strongest resolutions passed by a regional fishery management organization to reduce bycatch of sea turtles in tuna purse seine and longline fisheries. It calls on parties to expeditiously undertake fishing trials to determine the feasibility and effectiveness of circle hooks and other methods to reduce sea turtle bycatch, injury, and mortality on longlines and conduct research on modified fish aggregating devices to reduce sea turtle entanglement in purse seine nets.

3.3.2 Western and Central Pacific Fishery Commission

The international Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean entered into force on April 19, 2004. The Convention established a Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, now more commonly referred to as the Western and Central Pacific Fishery Commission. A noteworthy aspect of the Convention is that it will exercise management control into the high seas zones outside national EEZs in contrast to other regional fishery management organizations.

The participation of the United States as a full member became effective on June 27, 2007. There are 30 member nations in total. In addition to its primary objective of supporting a consultative framework for cooperation on the sustainable use and long-term conservation of the region's HMS resources, the Commission maintains a record of fishing vessels authorizing vessels to fish in the Convention Area. The most current binding decisions relating to the conservation and management of tuna stocks in the Convention Area entered into force in February 2007. These measures address a number of issues including the conservation and management of bigeye and yellowfin tuna and North and South Pacific albacore, as well as swordfish in the South West Pacific. Other measures include vessel monitoring

[6] http://www.iattc.org/PDFFiles2/COM-8-04-Compliance-report-2006.pdf

system requirements and provisions for an observer program. Details on these measures and others can be found at the Commission's website: http://www.wcpfc.int.

3.3.3 The U.S.-Canada Albacore Treaty

The U.S.-Canada Albacore Treaty is a 1981 agreement between the governments of Canada and the United States, amended in 2002, and codified by law in April 2004 (69 FR 23715). It allows U.S. vessels to fish for albacore in Canadian waters seaward of 12 miles from shore and Canadian vessels to fish for albacore in U.S. waters seaward of 12 miles from shore. The treaty also allows Canadian vessels to use certain U.S. ports to obtain supplies and services and to land fish, and it allows U.S. vessels to use certain Canadian ports for the same purposes. The treaty also calls for exchange of fisheries data between the governments of the two nations.

Regulations pursuant to the treaty establish vessel marking, record keeping, and reporting requirements for U.S. albacore tuna fishing vessel operators and for Canadian albacore tuna fishing vessel operators when they are fishing in U.S. waters. In addition, the U.S. and Canada have agreed to establish limits on reciprocal fishing access so that, over a period of three years, the number of fishing vessels that will be permitted to fish under the Treaty will decrease. The fishing access limit can be set by each nation as either a maximum number of individual vessels from one nation that can fish in waters of the other nation for up to four months in a single year, or a maximum number of vessel months that vessels of one nation can spend in the waters of the other nation in a single year.

The mandatory reporting requirement calls for United States albacore fishing vessels to report to ShipCom, LLC, the company selected to accept hail-in, hail-out messages, 24 hours before entering Canadian waters and within 24 hours after leaving Canadian waters. In addition, Canadian regulations require vessels to report to the Canadian Coast Guard at least 24 hours prior to entering Canadian waters and 72 hours before leaving Canadian waters.

The preliminary Canadian north Pacific albacore tuna catch in 2006 was 5,819 mt (Stocker, et. al. 2007). The catch in 2006 increased by 20 percent from the 4,829 mt caught in 2005. In 2006, 18 percent of the catch came from the Canadian EEZ, 71 percent from the U.S. EEZ, and 11 percent from the high seas. The effort percentage estimates are similar to the catch percentage estimates (i.e., 72 percent of troll effort in the U.S. EEZ). Logbook coverage for the Canadian troll fleet was 94 percent for the 149 Canadian vessels that fished in U.S. waters in 2005. Approximately 30 U.S. vessels fished in Canadian waters in 2006.

The last U.S./Canada Albacore Tuna Treaty consultation occurred in La Jolla, California in December 2006. The Canadians sought agreement on a fishing regime of around 140 vessels (or 560 vessel months) for both the 2007 fishing season as well as for the long term, but the U.S. side was unable to agree given the range of views on the treaty within the processing and harvesting sectors of industry. Consequently, the U.S. government stated its intention to exercise the treaty's Annex C default setting (i.e., 94 Canadian vessels allowed in U.S. waters for four months or 375 vessel months) for 2007. Both parties did agree to revisit options for a long-term regime as well as conduct the annual exchange of catch and effort data, and exchange scientific updates in Victoria, Canada in April 2007. However, both sides agreed to postpone the meeting until January 2008 because no new information had been generated and the results of a new northern albacore stock assessment would not be available until late July 2007.

4.0 STATISTICAL SUMMARIES OF CATCH, REVENUE, AND EFFORT

4.1 Commercial Fisheries

Table 4–1. West Coast commercial HMS landings, revenues, and average price by species, 2005–06.

	2005			2006		
Species	**Landings (round mt)**	**Ex-vessel revenue ($1000)**	**Average price ($/ round lb)**	**Landings (round mt)**	**Ex-vessel revenue ($1000)**	**Average price ($/ round lb)**
Tunas						
Albacore	9055	$20,958	$1.05	12749	$23,759	$0.85
Yellowfin	285	$316	$0.50	77	$176	$1.04
Skipjack	523	$292	$0.25	48	$40	$0.38
Bigeye	10	$60	$2.72	35	$206	$2.67
Bluefin	207	$137	$0.30	1	$4	$1.81
Unspecified Tuna	<0.5	$1		1	$2	$0.91
Tunas subtotal	**10,080**	**$21,764**	**$0.98**	**12,911**	**$24,187**	**$0.85**
Swordfish	**297**	**$1,899**	**$2.90**	**539**	**$2,695**	**$2.27**
Sharks						
Common Thresher	179	$272	$0.69	159	$300	$0.86
Pelagic Thresher	<0.5	$1	NA	<0.5	$0	NA
Bigeye Thresher	10	$6	$0.27	4	$5	$0.57
Shortfin Mako	33	$58	$0.80	46	$79	$0.78
Blue	1	$2	$0.91	<0.5	$1	NA
Sharks subtotal	**223**	**$339**	**$0.69**	**209**	**$385**	**$0.84**
Dorado	**<0.5**	**$1**	**NA**	**3**	**$18**	**$2.72**
Total HMS	**10,600**	**$24,003**	**$1.03**	**13,662**	**$27,285**	**$0.91**

Interpretation: The total West Coast commercial HMS catch was 13.6 thousand mt in 2006, up 29 percent from 10.6 thousand mt in 2005. Tunas represented 95 percent of the total catch by weight. Albacore tuna catch was up 41 percent from the catch observed in the previous year, and was once again the largest component of tuna catch representing about 99 percent of the total by weight. Yellowfin was the next largest component of tuna catch.

Swordfish was the category with the next largest share of landings behind tuna at less than 4 percent of the total weight. Swordfish landings by weight were up by 82 percent (242 metric tons) from 2005 to 2006. The common thresher shark comprised the largest component of commercial shark landings by weight in 2006. Total commercial shark landings by weight decreased by 6 percent (14 mt) from 2005 to

2006.

Total current dollar West Coast commercial HMS ex-vessel revenue of $27.3 million increased from $24.0 million in the previous year, for an increase of 14 percent ($3.3 million). Tunas comprised 89 percent of the 2006 revenue total. Albacore generated by far the most important component of revenue for any single species, at $23.7 million. Swordfish was the next highest contributor to total revenue at $2.7 million.

The average price for tuna was 13 percent lower in 2006 than in 2005. The overall decrease in price was largely driven by the 20 percent decrease in the price of albacore from $1.03 in 2005 to $0.91 in 2006.

The overall average West Coast commercial HMS fish price decreased from $1.03 in 2005 to $0.91 in 2006, or 12 percent. The decrease in overall average price was sufficient to more than offset the effect on revenue of the 29 percent increase in landings by weight.

Source and Calculations: The data were extracted from PacFIN on June 13, 2007 (landings) and June 19, 2007 (revenues), and represent the latest two years of current dollar revenues and landings data in Tables 4-4 and 4–5. Landings in pounds were converted to round weight in metric tons by multiplying the landed weights by the conversion factors in each fish ticket line then dividing by 2204.6. Revenues were computed for each species as the sum total of landed weights in pounds multiplied by the prices per pound in each fish ticket line. Aquaculture fish ticket / fish ticket line information is excluded from the data. Average prices are estimated as revenue divided by round pounds, where the latter are metric tons multiplied by 2204.6. Estimated averages are subject to rounding error for categories with small revenues or landings.

Table 4–2. West Coast commercial highly migratory species landings, revenues, and average prices by fishery, 2005–06.

	2005			2006		
Fishery	Landings (round mt)	Ex-vessel revenue ($1000)	Average price ($/ round lb)	Landings (round mt)	Ex-vessel revenue ($1000)	Average price ($/ round lb)
Surface Hook-and-line	8,218	$18,650	$1.03	12,344	$22,835	$0.84
Drift Gillnet	470	$1,684	$1.63	696	$2,543	$1.66
Harpoon	78	$713	$4.15	74	$642	$3.94
Pelagic longline	25	$106	$1.93	107	$489	$2.07
Purse seine	1,026	$716	$0.32	*	*	*
Total HMS	**9,817**	**$21,869**	**$1.01**	**13,221†**	**$26,508†**	**$0.91†**

*Not reported due to data confidentiality requirements.
†Total does not include purse seine.

Interpretation: Table 4–2 shows the total West Coast commercial HMS catch for the indicated fisheries was 13.2 thousand mt in 2006, up 35 percent (3.4 thousand metric tons) from 2005. The surface hook-and-line fishery represented 93 percent of the total catch.

Total current dollar West Coast commercial HMS ex-vessel revenue for these fisheries of $26.5 million increased from $21.9 million in the previous year, for a percentage increase of 21 percent ($4.6 million). The overall average West Coast commercial HMS fish price for these fisheries increased from $1.01 in 2005 to $0.91 in 2006. The decrease in average price was insufficient to offset the effect of increased catch by weight on total revenues.

Source and Calculations: The data were extracted from PacFIN in July-August 2007, and represent the latest two years of current dollar revenues and landings data in Tables 4-4 and 4–5. Landings in pounds were converted to round weight in metric tons by multiplying the landed weights by the conversion factors in each fish ticket line then dividing by 2204.6. Revenues were computed for each species as the sum total of landed weights in pounds multiplied by the prices per pound in each fish ticket line. Aquaculture fish ticket / fish ticket line information is excluded from the data. Average prices are estimated as revenue divided by round pounds, where the latter are metric tons multiplied by 2204.6. Estimated averages are subject to rounding error for categories with small revenues or landings. Data for Canadian surface hook-and-line vessels fishing in the U.S. EEZ are excluded from the table.

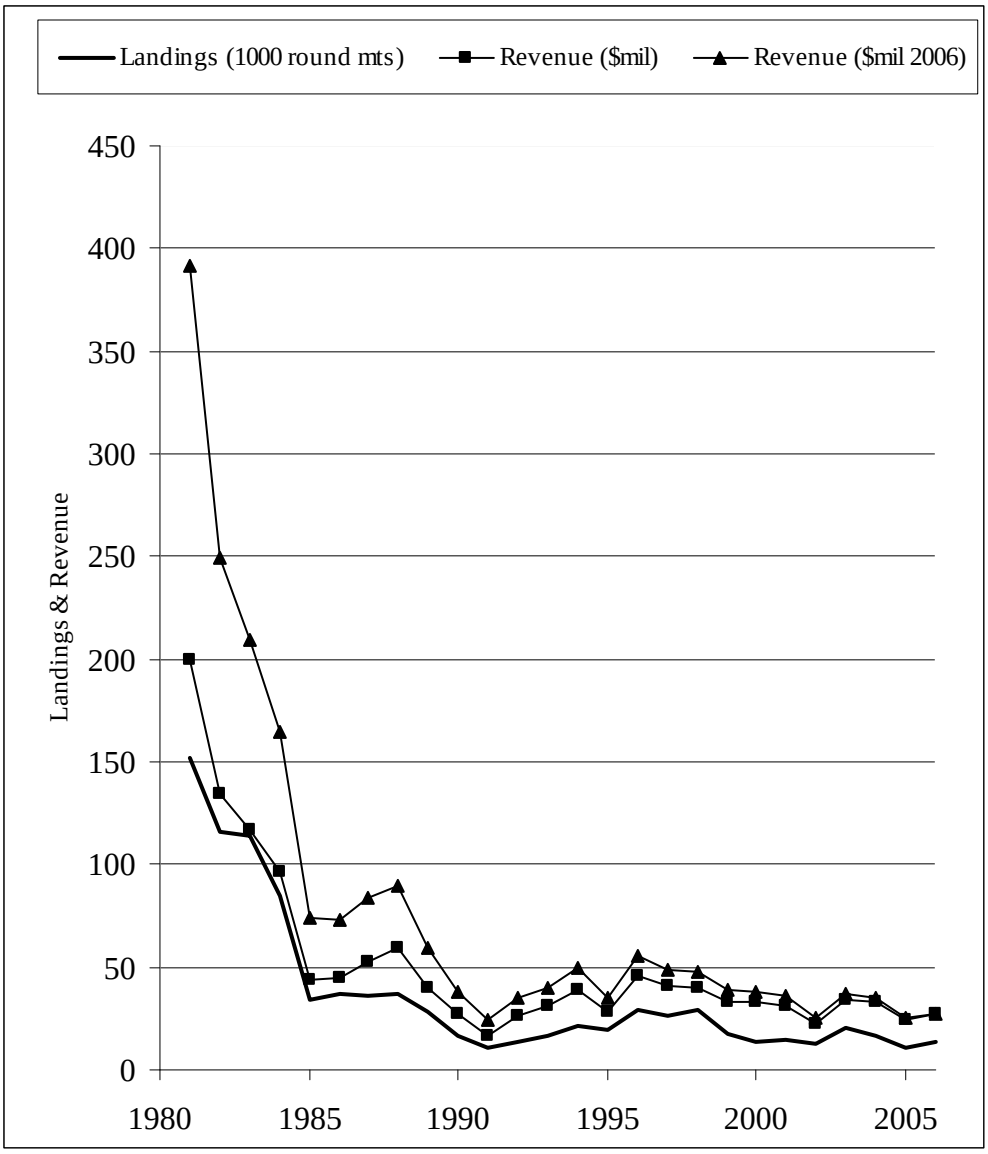

Figure 4–1. West Coast commercial HMS landings and revenues, 1981–2006.

Interpretation: Figure 4–1 shows aggregate Pacific Coast HMS commercial landings in thousands of round metric tons against aggregate revenues in millions of both current and 2006 dollars from 1981 through 2006, and the accompanying tables below (Tables 4–3 through 4–6) show commercial landings and revenues by species. Data for the graph are displayed in the far right columns of the three accompanying tables.

The most striking feature of the graph is a precipitous drop in both commercial landings and revenues over the period from 1981 through 1985. Landings fell from a level of about 150,000 mt in 1981 to a level which remained permanently below 50,000 mt from 1985 onwards. Revenues in real (2006) dollars fell from $392 million in 1981 to a level permanently below $100 million after 1984. The drops in landings and revenues are primarily explained by the substantial decline in tuna landings during the 1980s for species other than albacore.

Source and Calculations: The data were extracted from PacFIN on July 13, 2007 (landings) and July 19, 2007 (revenues). Landings in pounds were converted to round weight in metric tons by multiplying the landed weights by the conversion factors in each fish ticket line then dividing by 2204.6. Current dollar revenues were computed as the sum total of landed weights in pounds multiplied by the prices per pound in each fish ticket line. Aquaculture fish ticket / fish ticket line information is excluded from the data. Revenues in current dollars were adjusted to 2006 dollars using the implicit GDP deflator as calculated by the Bureau of Economic Analysis. Data for the graph were calculated by summing revenues and landings across all species in each year.

Table 4–3. West Coast commercial HMS landings and revenues, 1981–2006.

Year	Landings (1000 round mts)	Revenue ($mil)	Revenue (2006 $mil)
1981	152	$200	$392
1982	116	$134	$249
1983	114	$117	$209
1984	85	$96	$165
1985	34	$44	$74
1986	37	$45	$73
1987	36	$53	$84
1988	37	$59	$90
1989	28	$40	$59
1990	17	$27	$38
1991	11	$17	$24
1992	14	$26	$35
1993	17	$31	$40
1994	21	$39	$50
1995	19	$28	$35
1996	29	$46	$56
1997	26	$41	$49
1998	29	$40	$48
1999	18	$33	$39
2000	14	$33	$38
2001	15	$31	$36
2002	13	$22	$25
2003	20	$34	$37
2004	17	$33	$35
2005	11	$24	$25
2006	14	$27	$27

Table 4–4. West Coast commercial landings of HMS by all HMS and non-HMS gears, 1981–2006.

	Landings (round mt)													
	Tunas							Sharks						
Year	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	Unspecified	Swordfish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Dorado	Total
1981	13,712	76,091	57,869	1,168	868	40	749	1,521			182	92	4	152,296
1982	5,410	61,769	41,904	968	2,404	51	1,112	1,848		28	351	27	1	115,873
1983	9,578	55,482	44,591	21	764	55	1,761	1,331	9	96	217	7	1	113,913
1984	12,654	35,063	31,251	126	635	1,014	2,890	1,279	9	57	160	2	4	85,144
1985	7,301	15,025	2,977	7	3,252	468	3,418	1,190	<0.5	95	149	1	<0.5	33,883
1986	5,243	21,517	1,361	29	4,731	143	2,530	974	<0.5	48	312	2	2	36,892
1987	3,160	23,201	5,724	50	823	129	1,803	562	2	20	403	2	<0.5	35,879
1988	4,908	19,520	8,863	6	804	11	1,636	500	1	9	322	3	<0.5	36,583
1989	2,214	17,615	4,505	1	1,019	77	1,358	504	<0.5	17	255	6	<0.5	27,571
1990	3,028	8,509	2,256	2	925	46	1,236	357	1	31	373	20	1	16,785
1991	1,676	4,178	3,407	7	104	11	1,029	584		32	219	1	<0.5	11,248
1992	4,902	3,350	2,586	7	1,087	10	1,546	292	<0.5	22	142	1	3	13,948
1993	6,151	3,795	4,539	26	559	16	1,767	275	1	44	122	<0.5	17	17,312
1994	10,686	5,056	2,111	47	916	33	1,700	330	<0.5	37	128	12	41	21,097
1995	6,528	3,038	7,037	49	714	1	1,162	270	5	31	95	5	5	18,940
1996	14,173	3,347	5,455	62	4,688	3	1,198	319	1	20	96	1	10	29,373
1997	11,292	4,775	6,070	82	2,251	11	1,459	320	35	32	132	1	5	26,465
1998	13,801	5,799	5,846	53	1,949	12	1,408	361	2	11	100	3	3	29,348
1999	9,770	1,353	3,759	108	186	12	2,033	320	10	5	63	<0.5	17	17,636
2000	9,042	1,158	780	87	312	1	2,657	296	3	5	80	1	43	14,465
2001	11,194	655	58	53	196	1	2,195	373	2	2	46	2	16	14,793
2002	10,029	544	236	10	11	2	1,714	301	2		82	41	<0.5	12,972
2003	16,671	465	349	35	36	<0.5	2,135	301	4	6	70	1	6	20,079
2004	14,540	488	307	22	10	9	1,186	115	2	5	54	1	1	16,740
2005	9,055	285	523	10	207	<0.5	297	179	<0.5	10	33	1	<0.5	10,600
2006	12,749	77	48	35	1	1	539	159	<0.5	4	46	<0.5	3	13,662

Source: PacFIN, extracted July 13, 2007.

Additional processing info:

Landings in lbs are converted to round weight in mt by multiplying the landed weights by the conversion factors in each fish ticket line and then dividing by 2204.6.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–5. West Coast nominal commercial ex-vessel revenues from HMS landings by all HMS and non-HMS gears, 1981–2006.

	Revenues ($)													
	Tunas							Sharks						
Year	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	Unspecified	Swordfish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Dorado	Total
1981	26,524,145	98,722,280	66,331,030	1,569,755	1,239,005	72,694	3,355,010	1,475,634			162,347	59,064	2,801	199,513,765
1982	8,033,073	74,468,306	40,507,405	1,208,147	2,690,102	98,923	5,115,995	1,980,592		15,168	339,209	18,826	956	134,476,702
1983	12,240,375	59,190,758	36,248,835	45,946	1,062,909	95,490	6,794,263	1,474,213	8,449	91,455	229,826	4,645	695	117,487,859
1984	17,208,633	37,038,204	24,790,704	174,405	904,956	2,590,391	11,621,524	1,642,178	7,723	47,119	189,794	2,470	4,272	96,222,373
1985	8,293,123	14,690,108	2,118,170	17,693	2,817,610	1,028,867	13,415,105	1,817,135	716	96,433	192,129	2,132	377	44,489,598
1986	6,178,085	18,079,443	904,609	90,227	4,636,698	198,248	12,726,490	1,690,483	194	66,647	428,259	1,320	757	45,001,460
1987	5,127,832	27,878,667	4,426,717	176,504	2,057,402	448,231	11,115,940	1,183,866	1,840	22,123	715,138	1,853	357	53,156,470
1988	9,110,214	27,030,132	9,249,827	26,156	2,070,411	80,548	9,719,489	979,905	821	9,764	649,799	2,258	527	58,929,851
1989	3,785,598	20,824,242	3,944,894	2,415	1,271,718	127,320	8,259,204	944,159	149	24,711	552,576	3,465	485	39,740,936
1990	5,619,553	9,383,584	1,898,875	8,771	1,149,381	56,750	7,146,946	638,630	1,682	34,628	739,193	10,303	1,943	26,690,239
1991	2,823,937	3,996,935	2,692,345	42,810	116,371	21,161	6,342,361	968,877		25,179	415,168	894	1,167	17,447,205
1992	11,483,392	3,677,441	1,410,546	44,731	1,129,626	21,228	7,566,616	464,018	602	14,629	231,063	1,810	6,247	26,051,949
1993	11,667,651	4,821,735	3,282,778	211,513	752,369	72,678	8,953,927	458,513	462	28,190	221,401	608	42,223	30,514,048
1994	20,070,706	4,522,321	1,751,209	307,147	1,674,099	55,245	9,596,037	584,318	42	33,478	247,088	16,057	74,889	38,932,636
1995	11,570,364	3,044,670	4,752,641	258,727	1,057,948	5,136	6,569,507	477,755	8,777	24,896	165,215	2,796	5,479	27,943,911
1996	27,222,294	3,230,957	3,986,113	260,306	4,035,455	28,296	6,063,794	603,006	1,557	17,745	167,111	587	9,815	45,627,036
1997	19,924,121	4,991,131	5,504,526	359,780	2,773,705	21,895	6,147,707	591,268	62,496	34,768	227,426	278	10,858	40,649,959
1998	18,733,488	5,861,959	5,213,131	271,919	2,965,485	61,688	5,981,719	625,489	2,584	9,428	176,313	5,977	10,492	39,919,672
1999	17,767,485	1,468,209	2,748,208	657,121	1,061,233	60,572	8,445,728	617,691	18,424	5,876	111,119	73	47,854	33,009,593
2000	17,156,838	1,321,954	483,242	579,384	577,458	2,298	11,792,948	589,105	2,738	4,636	133,619	867	63,293	32,708,380
2001	20,715,878	465,558	33,633	320,855	473,821	3,069	8,696,689	595,542	2,767	8,428	75,799	1,520	19,397	31,412,956
2002	14,296,619	588,677	128,245	87,304	43,512	6,325	6,374,092	503,487	1,946		124,521	18,659	725	22,174,112
2003	24,478,655	451,273	159,961	262,768	76,121	21	7,851,693	487,796	2,814	3,779	115,728	876	10,370	33,901,855
2004	27,479,468	446,577	109,254	147,696	38,312	54,879	4,835,931	197,835	2,500	4,060	98,827	1,066	5,637	33,422,042
2005	20,958,047	315,699	292,193	60,141	136,847	913	1,899,245	271,735	588	6,234	57,766	1,597	1,290	24,002,295
2006	23,759,098	175,646	40,384	205,677	3,790	1,895	2,695,302	299,709	271	4,509	79,313	632	17,945	27,284,171

Source: PacFIN, extracted July 19, 2007.

Additional processing info:

Landed weights in lbs are multiplied by the prices per pound in each fish ticket line.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–6. West Coast real commercial ex-vessel revenues (2006 $) from HMS landings by all HMS and non-HMS gears, 1981–2006.

	Revenues (2006 $)													
	Tunas							Sharks						
Year	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	Unspecified	Swordfish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Dorado	Total
1981	52,059,167	193,763,062	130,188,478	3,080,971	2,431,807	142,676	6,584,906	2,896,239			318,641	115,925	5,497	391,587,369
1982	14,862,300	137,776,700	74,944,320	2,235,239	4,977,063	183,021	9,465,300	3,664,371		28,063	627,584	34,830	1,768	248,800,559
1983	21,783,903	105,340,378	64,511,184	81,768	1,891,634	169,942	12,091,587	2,623,622	15,037	162,760	409,015	8,267	1,237	209,090,334
1984	29,517,381	63,530,367	42,522,648	299,150	1,552,241	4,443,210	19,934,003	2,816,771	13,246	80,821	325,547	4,238	7,327	165,046,950
1985	13,803,466	24,450,913	3,525,583	29,449	4,689,764	1,712,496	22,328,737	3,024,525	1,192	160,507	319,789	3,548	627	74,050,596
1986	10,062,027	29,445,346	1,473,305	146,949	7,551,625	322,880	20,727,182	2,753,229	316	108,545	697,490	2,151	1,233	73,292,278
1987	8,129,094	44,195,730	7,017,623	279,810	3,261,575	710,575	17,621,972	1,876,769	2,917	35,071	1,133,701	2,938	566	84,268,341
1988	13,966,295	41,438,192	14,180,327	40,098	3,174,017	123,483	14,900,336	1,502,231	1,259	14,968	996,165	3,461	807	90,341,639
1989	5,591,725	30,759,590	5,827,023	3,567	1,878,461	188,065	12,199,711	1,394,622	220	36,500	816,212	5,119	717	58,701,532
1990	7,992,537	13,346,016	2,700,718	12,475	1,634,733	80,714	10,164,907	908,306	2,392	49,250	1,051,334	14,654	2,763	37,960,799
1991	3,880,634	5,492,558	3,699,801	58,830	159,917	29,079	8,715,627	1,331,424		34,600	570,520	1,228	1,604	23,975,822
1992	15,426,372	4,940,141	1,894,877	60,090	1,517,499	28,516	10,164,718	623,345	809	19,652	310,401	2,431	8,392	34,997,243
1993	15,319,919	6,331,059	4,310,370	277,723	987,880	95,429	11,756,732	602,038	606	37,015	290,705	798	55,440	40,065,714
1994	25,804,456	5,814,247	2,251,490	394,891	2,152,351	71,027	12,337,409	751,245	54	43,042	317,675	20,644	96,283	50,054,814
1995	14,577,755	3,836,047	5,987,956	325,976	1,332,932	6,471	8,277,065	601,934	11,058	31,367	208,159	3,523	6,903	35,207,146
1996	33,657,634	3,994,754	4,928,428	321,842	4,989,435	34,985	7,497,272	745,556	1,925	21,940	206,616	726	12,136	56,413,249
1997	24,232,694	6,070,458	6,694,875	437,583	3,373,517	26,630	7,477,143	719,129	76,010	42,286	276,607	338	13,206	49,440,476
1998	22,535,172	7,051,556	6,271,059	327,101	3,567,286	74,206	7,195,620	752,423	3,109	11,341	212,093	7,190	12,621	48,020,777
1999	21,066,499	1,740,821	3,258,487	779,133	1,258,279	71,819	10,013,906	732,383	21,845	6,967	131,751	87	56,740	39,138,717
2000	19,910,454	1,534,123	560,801	672,373	670,138	2,667	13,685,677	683,654	3,177	5,380	155,064	1,006	73,451	37,957,965
2001	23,476,743	527,605	38,115	363,616	536,968	3,477	9,855,722	674,911	3,136	9,551	85,901	1,722	21,983	35,599,450
2002	15,924,058	655,688	142,844	97,242	48,465	7,046	7,099,679	560,801	2,167		138,696	20,783	807	24,698,276
2003	26,697,191	492,173	174,459	286,583	83,020	23	8,563,304	532,006	3,068	4,122	126,217	955	11,310	36,974,431
2004	29,140,475	473,571	115,858	156,623	40,628	58,196	5,128,241	209,793	2,651	4,305	104,800	1,131	5,978	35,442,250
2005	21,572,874	324,961	300,765	61,906	140,861	939	1,954,962	279,707	605	6,417	59,461	1,644	1,328	24,706,430
2006	23,759,098	175,646	40,384	205,677	3,790	1,895	2,695,302	299,709	271	4,509	79,313	632	17,945	27,284,171

Source: PacFIN, extracted July 19, 2007.

Additional processing info:

Real values are calculated to eliminate the effects of inflation by dividing current nominal values by the current year GDP implicit price deflator, with a base year of 2006.

Landed weights in lbs are multiplied by the prices per pound in each fish ticket line and then divided by the corresponding deflator.

Aquaculture fish ticket/fish ticket line info is excluded.

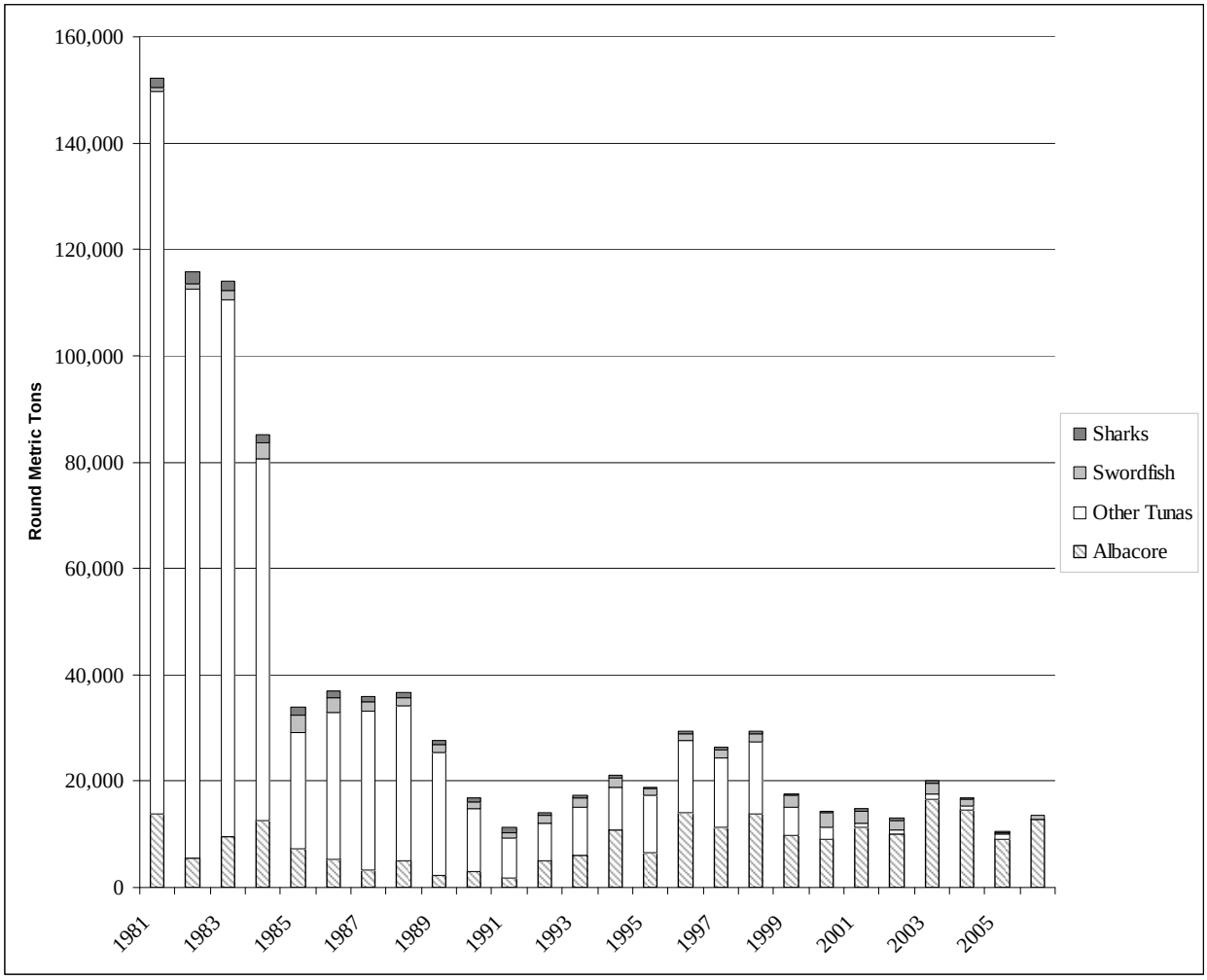

Figure 4–2. West Coast commercial landings of albacore, other tunas, swordfish, and sharks, 1981–2006.

Interpretation: Figure 4–2 shows West Coast HMS commercial landings in round metric tons grouped into categories of similar species. The accompanying table shows the numeric values for the landings in metric tons.

The principal species targeted are the tunas, with albacore gradually supplanting other tunas as a share of the catch over the period from 1981 through 2006. Swordfish, followed by sharks, comprise a far smaller share of recent total landings, with a steadily declining share over time.

The most striking feature of the graph is a large drop in aggregate commercial landings from a level of about 150 thousand mt in 1981 to a level which stabilized near 20 thousand mt by 1990. The drop is primarily explained by the substantial decline in tuna landings during the 1980s for species other than albacore.

Source and Calculations: The data were extracted from PacFIN on July 13, 2007. They represent a portion of the table of West Coast commercial landings of HMS by species displayed in Table 4–4. Landings in pounds were converted to round weight in metric tons by multiplying the landed weights by the conversion factors in each fish ticket line and then dividing by 2204.6. Aquaculture fish ticket / fish ticket line information is excluded from the data.

Table 4–7. West Coast commercial landings of albacore, other tunas, swordfish, and sharks, 1981–2006.

Year	Landings (round mt)				
	Albacore	Other Tunas	Swordfish	Sharks	Total
1981	13,712	136,036	749	1,795	152,292
1982	5,410	107,096	1,112	2,254	115,872
1983	9,578	100,913	1,761	1,660	113,912
1984	12,654	68,089	2,890	1,507	85,140
1985	7,301	21,729	3,418	1,435	33,883
1986	5,243	27,781	2,530	1,336	36,890
1987	3,160	29,927	1,803	989	35,879
1988	4,908	29,204	1,636	835	36,583
1989	2,214	23,217	1,358	782	27,571
1990	3,028	11,738	1,236	782	16,784
1991	1,676	7,707	1,029	836	11,248
1992	4,902	7,040	1,546	457	13,945
1993	6,151	8,935	1,767	442	17,295
1994	10,686	8,163	1,700	507	21,056
1995	6,528	10,839	1,162	406	18,935
1996	14,173	13,555	1,198	437	29,363
1997	11,292	13,189	1,459	520	26,460
1998	13,801	13,659	1,408	477	29,345
1999	9,770	5,418	2,033	398	17,619
2000	9,042	2,338	2,657	385	14,422
2001	11,194	963	2,195	425	14,777
2002	10,029	803	1,714	426	12,972
2003	16,671	885	2,135	382	20,073
2004	14,540	836	1,186	177	16,739
2005	9,055	1,025	297	223	10,600
2006	12,749	162	539	209	13,659

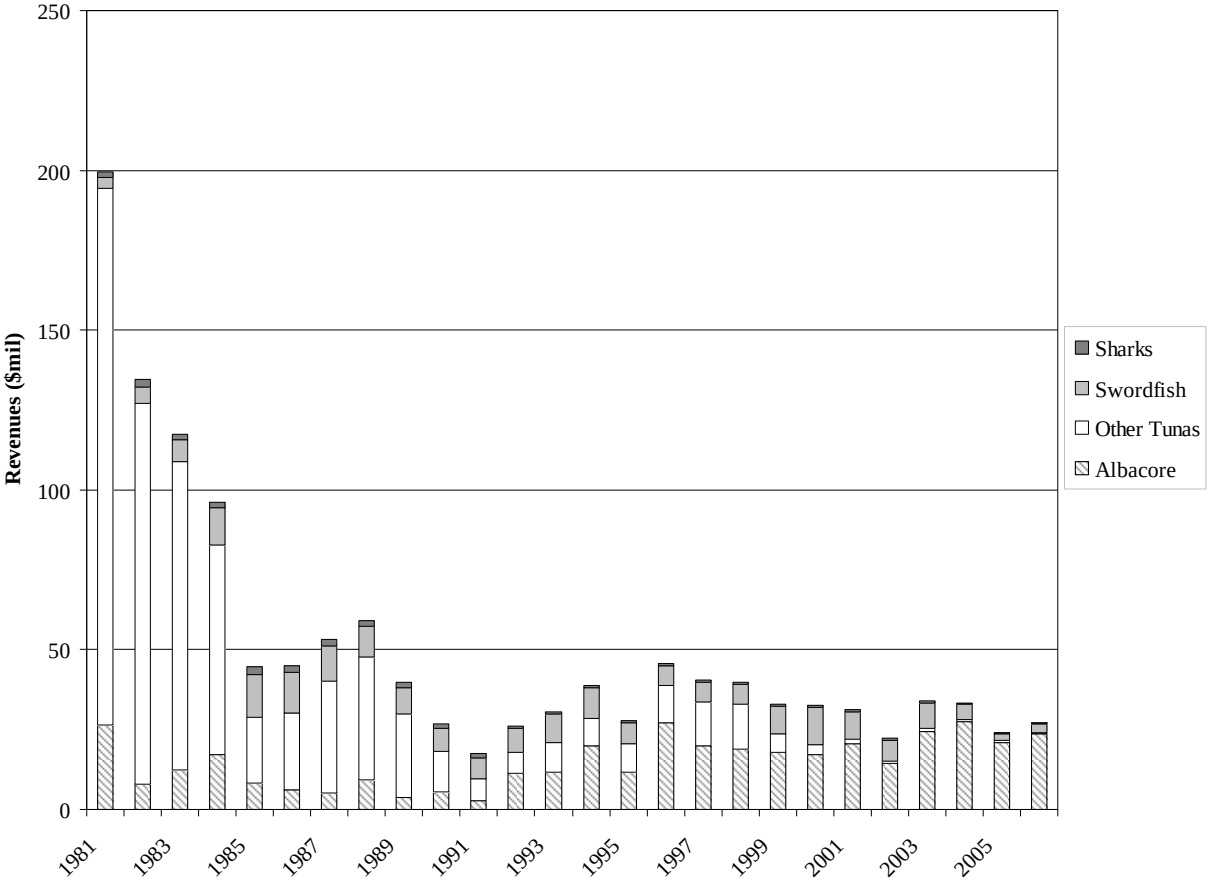

Figure 4–3. West Coast commercial revenues for albacore, other tunas, swordfish, and sharks, 1981–2006.

Interpretation: Figure 4–3 shows West Coast HMS commercial revenues in current dollars grouped into categories of similar species. Table 4–8 shows the numeric values for the revenues. Tables 4–9 through 4–26 show landings and nominal and real ex-vessel revenue by fishery.

The principal component of revenues is the tunas, with albacore gradually supplanting other tunas as a share of the revenues over the period from 1981 through 2006.

Source and Calculations: The data were extracted from PacFIN on July 19, 2007. Aquaculture fish ticket / fish ticket line information is excluded from the data. Data were obtained by copying from or summing across applicable columns of Table 4–5. Current dollar revenues were computed as the sum total of landed weights in pounds multiplied by the prices per pound in each fish ticket line. Aquaculture fish ticket / fish ticket line information is excluded from the data.

Table 4–8. West Coast commercial revenues for albacore, other tunas, swordfish, and sharks, 1981–2006.

Year	Revenues ($)				
	Albacore	Other Tunas	Swordfish	Sharks	Total
1981	26,524,145	167,934,764	3,355,010	1,697,045	199,510,964
1982	8,033,073	118,972,883	5,115,995	2,353,795	134,475,746
1983	12,240,375	96,643,938	6,794,263	1,808,588	117,487,164
1984	17,208,633	65,498,660	11,621,524	1,889,284	96,218,101
1985	8,293,123	20,672,448	13,415,105	2,108,545	44,489,221
1986	6,178,085	23,909,225	12,726,490	2,186,903	45,000,703
1987	5,127,832	34,987,521	11,115,940	1,924,820	53,156,113
1988	9,110,214	38,457,074	9,719,489	1,642,547	58,929,324
1989	3,785,598	26,170,589	8,259,204	1,525,060	39,740,451
1990	5,619,553	12,497,361	7,146,946	1,424,436	26,688,296
1991	2,823,937	6,869,622	6,342,361	1,410,118	17,446,038
1992	11,483,392	6,283,572	7,566,616	712,122	26,045,702
1993	11,667,651	9,141,073	8,953,927	709,174	30,471,825
1994	20,070,706	8,310,021	9,596,037	880,983	38,857,747
1995	11,570,364	9,119,122	6,569,507	679,439	27,938,432
1996	27,222,294	11,541,127	6,063,794	790,006	45,617,221
1997	19,924,121	13,651,037	6,147,707	916,236	40,639,101
1998	18,733,488	14,374,182	5,981,719	819,791	39,909,180
1999	17,767,485	5,995,343	8,445,728	753,183	32,961,739
2000	17,156,838	2,964,336	11,792,948	730,965	32,645,087
2001	20,715,878	1,296,936	8,696,689	684,056	31,393,559
2002	14,296,619	854,063	6,374,092	648,613	22,173,387
2003	24,478,655	950,144	7,851,693	610,993	33,891,485
2004	27,479,468	796,718	4,835,931	304,288	33,416,405
2005	20,958,047	805,793	1,899,245	337,920	24,001,005
2006	23,759,098	427,392	2,695,302	384,434	27,266,226

Table 4–9. Commercial landings (round mt) in the West Coast albacore surface hook-and-line (troll and baitboat) fishery, with Canadian vessels excluded, 1981–2006.

Year	Albacore	Other Tunas	Swordfish	HMS Sharks	Dorado	Groundfish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	13,493	14		<0.5	<0.5	4	2		37	1	13,551
1982	4,977	4	4	2	1	4	<0.5		3	<0.5	4,995
1983	9,309	16	3	1	<0.5	23	34		14	1	9,401
1984	8,909	13	25	5	<0.5	5	2		1	4	8,964
1985	7,010	2	11	4	<0.5	4	<0.5		2	2	7,035
1986	4,980	2	1	<0.5		20	<0.5	<0.5	2	1	5,006
1987	2,891	<0.5	5	2		2	1		1	1	2,903
1988	4,625	<0.5	18	2		1	<0.5		2	1	4,649
1989	2,167	1	7	8	<0.5	10	<0.5	<0.5	2	2	2,197
1990	2,926	<0.5	2	<0.5	<0.5	3	<0.5		1	1	2,933
1991	1,641	<0.5	2	1		<0.5		<0.5	1	<0.5	1,645
1992	4,754	1	13	2	<0.5	7			1	<0.5	4,778
1993	5,763	18	90	5	9	4			3	1	5,893
1994	10,541	<0.5	1	<0.5	<0.5	1			<0.5	<0.5	10,543
1995	6,405	1	1	<0.5	<0.5	<0.5	<0.5		8	<0.5	6,415
1996	13,263	42	<0.5	<0.5		<0.5			10	2	13,317
1997	10,825	8	1	1	<0.5	5	<0.5		12	2	10,854
1998	12,611	116	4	3	<0.5	2	<0.5		5	1	12,742
1999	8,793	24	15	1	<0.5	1	<0.5		2	4	8,840
2000	8,059	2	22	<0.5	<0.5	1	<0.5		3	3	8,090
2001	10,218	10	<0.5	1	<0.5	3	<0.5		9	5	10,246
2002	9,311	2	2	<0.5	<0.5	<0.5	<0.5		7	5	9,327
2003	13,473	3		<0.5	<0.5	1	<0.5		4	2	13,483
2004	13,374	1		<0.5	<0.5	<0.5	<0.5		4	3	13,382
2005	8,213	<0.5		<0.5		1			3	1	8,218
2006	12,342	1		<0.5	<0.5	<0.5	<0.5		<0.5	1	12,344

Source: PacFIN, extracted August 24, 2007.

Additional processing info:

Only fish tickets where at least 1 lb of albacore was landed for the albacore surface hook-and-line (troll and baitboat) fishery were used.

Landings in lbs are converted to round weight in mt by multiplying the landed weights by the conversion factors in each fish ticket line and then dividing by 2204.6.

Canadian vessels were excluded by outer joining the fish ticket tables with the state vessel table and checking the "idtype."

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–10. Commercial landings (round mt) in the West Coast albacore surface hook-and-line (troll and baitboat) fishery, 1981–2006.

Year	Albacore	Other Tunas	Swordfish	HMS Sharks	Dorado	Groundfish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	13,493	14		<0.5	<0.5	4	2		37	1	13,551
1982	4,988	4	4	2	1	4	<0.5		3	<0.5	5,006
1983	9,341	16	3	1	<0.5	23	34		14	1	9,433
1984	8,912	13	25	5	<0.5	5	2		1	4	8,967
1985	7,010	2	11	4	<0.5	4	<0.5		2	2	7,035
1986	4,980	2	1	<0.5		20	<0.5	<0.5	2	1	5,006
1987	2,891	<0.5	5	2		2	1		1	1	2,903
1988	4,626	<0.5	18	2		1	<0.5		2	1	4,650
1989	2,167	1	7	8	<0.5	10	<0.5	<0.5	2	2	2,197
1990	2,926	<0.5	2	<0.5	<0.5	3	<0.5		1	1	2,933
1991	1,641	<0.5	2	1		<0.5		<0.5	1	<0.5	1,645
1992	4,815	1	13	2	<0.5	7			1	<0.5	4,839
1993	5,785	18	90	5	9	4			3	1	5,915
1994	10,564	<0.5	1	<0.5	<0.5	1			<0.5	<0.5	10,566
1995	6,473	1	1	<0.5	<0.5	<0.5	<0.5		8	1	6,484
1996	14,075	42	<0.5	<0.5		<0.5			10	1	14,128
1997	11,223	8	1	1	<0.5	5	<0.5		12	3	11,253
1998	13,571	116	4	3	<0.5	2	<0.5		5	2	13,703
1999	9,506	24	15	1	<0.5	1	<0.5		2	5	9,554
2000	8,955	2	22	<0.5	<0.5	1	<0.5		3	3	8,986
2001	11,018	10	<0.5	1	<0.5	3	<0.5		9	6	11,047
2002	9,995	2	2	<0.5	<0.5	<0.5	<0.5		7	4	10,010
2003	16,608	3		<0.5	<0.5	1	<0.5		4	2	16,618
2004	14,523	1		<0.5	<0.5	<0.5	<0.5		4	3	14,531
2005	9,028	<0.5		<0.5		1			3	1	9,033
2006	12,740	1		<0.5	<0.5	<0.5	<0.5		<0.5	1	12,742

Source: PacFIN, extracted August 13, 2007.

Additional processing info:

Only fish tickets where at least 1 lb of albacore was landed for the albacore surface hook-and-line (troll and baitboat) fishery were used.

Landings in lbs are converted to round weight in mt by multiplying the landed weights by the conversion factors in each fish ticket line and then dividing by 2204.6.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–11. Commercial landings (round mt) in the West Coast drift gillnet fishery, 1981–2006.

		Sharks					Tunas								
Year	Sword-fish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Albacore	Other	Dorado	Ground-fish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	270	808			91	9		6		6	7			88	1,285
1982	208	634		13	125	1	5	10		5	2			14	1,017
1983	242	150		17	38		6	11		<0.5	7	<0.5		20	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			4	110
1988	1	81					4			<0.5				<0.5	86
1989		*													*
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	762	268	<0.5	32	71	<0.5	52	27	<0.5	4	2			112	1,330
1995	701	202	5	29	75	<0.5	31	31	<0.5	2	2	<0.5		92	1,170
1996	734	241	1	20	80	<0.5	63	41		1	6	<0.5		131	1,318
1997	664	249	34	27	114	<0.5	43	58	<0.5	1	4			109	1,303
1998	906	281	2	9	81	1	63	45	<0.5	2	2	<0.5		151	1,543
1999	597	152	7	4	46	<0.5	94	19		1	<0.5	<0.5		105	1,025
2000	635	156	3	3	52	<0.5	40	30	<0.5	2	2	<0.5		84	1,007
2001	351	273	1	<0.5	26		51	16		2	1			64	785
2002	298	216	2		59		14	4		3	1			71	668
2003	198	241	4	6	50	<0.5	8	22		1	1			54	585
2004	182	68	<0.5	5	23		10	10		2	1			44	345
2005	220	155		9	18		8	6	<0.5	1	<0.5	<0.5		53	470
2006	442	99	<0.5	4	35		3	4	<0.5	1	2			106	696

* Not reported due to data confidentiality requirements (fewer than three vessels).

Source: PacFIN, extracted August 7, 2007.

Note 1: There is no drift gillnet gear for Washington.

Note 2: Significant swordfish and shark landings by drift gillnet gear prior to 1994 have been mis-assigned to California entangling net, trammel net, several trawl, encircling net, set gillnet and unknown gears, and therefore are not reported here.

Additional processing info:

Only fish tickets where at least 1 lb of swordfish or any HMS shark was landed for the drift gillnet fishery were used.

Landings in lbs are converted to round weight in mt by multiplying the landed weights by the conversion factors in each fish ticket line and then dividing by 2204.6.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–12. Commercial landings (round mt) in the West Coast harpoon fishery, 1981–2006.

Year	Swordfish	HMS Sharks	Tunas		Dorado	Other	Total
			Albacore	Other			
1981	272	10	2	<0.5		4	288
1982	156	2		<0.5		1	159
1983	58	1				44	103
1984	105	7	<0.5	<0.5		1	113
1985	275	1	<0.5	<0.5		1	277
1986	296	1	<0.5	<0.5		1	298
1987	237	3	1	1		40	282
1988	199	3	1			<0.5	203
1989	62	1	<0.5	<0.5		<0.5	63
1990	65	3		<0.5		<0.5	68
1991	20	1				<0.5	21
1992	75	3	<0.5	<0.5		1	79
1993	169	1	1			1	172
1994	157	1	<0.5			<0.5	158
1995	97	2				<0.5	99
1996	81	1	<0.5			1	83
1997	84	3	<0.5		<0.5	<0.5	87
1998	48	1				<0.5	49
1999	81	<0.5				2	83
2000	90	<0.5	<0.5			5	95
2001	52	1			<0.5	1	54
2002	90	1				1	92
2003	107	<0.5				<0.5	107
2004	69	1				<0.5	70
2005	76	1				1	78
2006	71	3				<0.5	74

Source: PacFIN, extracted August 3, 2007.

Note 1: Only California has harpoon landings.

Note 2: 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.

Additional processing info:

Landings in lbs are converted to round weight in mt by multiplying the landed weights by the conversion factors in each fish ticket line and then dividing by 2204.6.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–13. Commercial landings (round mt) in the West Coast longline fisheries, 1981–2006.

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

Source: PacFIN, extracted July 31, 2007.

Additional processing info:

Only fish tickets where at least 1 lb of any highly migratory species (except striped marlin) was landed for the longline fishery were used.

Landings in lbs are converted to round weight in mt by multiplying the landed weights by the conversion factors in each fish ticket line and then dividing by 2204.6.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–14. Commercial landings (round mt) in the West Coast purse seine fishery, 1981–2006.

	Tunas						Sword-	HMS		Ground-	Coastal				
Year	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	Unspecified	fish	sharks	Dorado	fish	Pelagics	Crab	Salmon	Other	Total
1981	181	75,063	54,338	1,156	854	28					203			2	131,825
1982	367	60,665	39,905	962	2,400	27					29				104,355
1983	11	51,960	41,787		754	12	1	<0.5			25			<0.5	94,550
1984	3,552	33,326	29,941	117	624	1,011	23	1			268			2	68,865
1985	22	14,609	2,504	1	3,240	467	1	<0.5			308			<0.5	21,152
1986	54	21,018	977	8	4,698	136	41	2			65			1	27,000
1987	43	21,527	5,353	42	820	122		3			13			8	27,931
1988	151	18,470	7,391	<0.5	795	7					63				26,878
1989	24	16,118	3,565		1,007	70	1	<0.5	<0.5		29			<0.5	20,814
1990	71	8,354	2,244		876	39					137				11,721
1991		3,497	2,957		100	8					94			3	6,659
1992	8	1,721	1,159	1	1,064	3	10	2	1	<0.5	323			7	4,299
1993	1	951	1,619	2	497	<0.5	17	1	<0.5	<0.5	91			11	3,190
1994		3,566	1,283		880	8					66			123	5,926
1995		2,795	5,616		689						38			39	9,177
1996	11	2,683	5,049		4,639						244			53	12,679
1997	2	4,659	5,926		2,189	7	1	1	1		33			73	12,892
1998	136	3,753	5,310		1,739						256			159	11,353
1999	48	1,297	3,742		99						56	1		88	5,331
2000	4	1,152	775		255						218				2,404
2001	51	631	55		149						42				928
2002	<0.5	541	236				1							<0.5	778
2003	44	463	337		19										862
2004	1	484	306												791
2005		283	522		201						19				1,026
2006		*	*												*

* Not reported due to data confidentiality requirements (fewer than three vessels).

Source: PacFIN, extracted August 9, 2007.

Note: There is no purse seine gear for Washington.

Additional processing info:

Only fish tickets where at least 1 lb of any HMS tuna was landed for the purse seine fishery were used.

Landings in lbs are converted to round weight in mt by multiplying the landed weights by the conversion factors in each fish ticket line and then dividing by 2204.6.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–15. Nominal commercial ex-vessel revenues ($) for the West Coast albacore surface hook-and-line (troll and baitboat) fishery, with Canadian vessels excluded, 1981–2006.

Year	Albacore	Other Tunas	Swordfish	HMS Sharks	Dorado	Groundfish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	26,087,739	17,982		173	72	2,508	991		133,177	1,406	26,244,048
1982	7,349,782	5,500	13,219	2,771	557	5,676	13		13,834	535	7,391,887
1983	11,877,767	14,586	7,531	1,597	33	20,309	15,495		36,075	3,880	11,977,273
1984	12,147,062	20,053	96,217	6,080	706	6,947	928		6,422	4,278	12,288,693
1985	7,995,264	4,278	30,921	7,017	6	6,384	239		10,802	2,311	8,057,222
1986	5,867,829	7,248	6,427	180		19,050	160	26	9,451	634	5,911,005
1987	4,690,640	1,150	33,310	3,440		2,305	657		6,838	436	4,738,776
1988	8,539,846	952	96,331	3,566		766	614		11,362	538	8,653,975
1989	3,692,144	1,833	34,556	11,295	31	18,112	1	19	8,305	2,485	3,768,781
1990	5,413,557	79	13,332	560	74	6,163	85		2,792	1,529	5,438,171
1991	2,760,714	71	11,721	602		189		562	3,479	522	2,777,860
1992	11,073,621	2,195	55,452	2,361	281	6,144			6,120	670	11,146,844
1993	10,852,169	154,056	442,687	7,992	23,216	4,992			10,385	1,806	11,497,303
1994	19,817,924	603	6,797	302	180	590			537	344	19,827,277
1995	11,355,237	914	3,260	173	21	152	16		22,290	3,029	11,385,092
1996	25,588,951	38,596	2,608	295		440			26,524	997	25,658,411
1997	19,093,866	14,949	4,390	1,628	371	11,951	89		37,637	3,725	19,168,606
1998	17,341,958	138,138	17,122	5,018	525	4,788	279		16,340	5,263	17,529,431
1999	16,133,740	115,448	77,899	2,623	1,413	4,347	455		9,742	7,708	16,353,375
2000	15,297,868	4,497	100,831	252	298	1,927	522		9,445	5,233	15,420,873
2001	18,768,337	27,752	2,037	2,210	544	7,797	178		33,158	12,397	18,854,410
2002	13,239,791	6,838	9,996	664	170	916	1,241		21,889	7,792	13,289,297
2003	19,643,368	11,045		62	567	2,764	558		14,013	5,758	19,678,135
2004	24,340,689	2,513		520	655	1,834	1,241		22,741	3,315	24,373,508
2005	18,630,662	1,437		181		1,587			12,332	3,318	18,649,517
2006	22,827,308	1,607		252	167	985	127		3,480	991	22,834,917

Source: PacFIN, extracted August 29, 2007.

Additional processing info:

Only fish tickets where at least 1 lb of albacore was landed for the albacore surface hook-and-line (troll and baitboat) fishery were used.

Landed weights in lbs are multiplied by the prices per pound in each fish ticket line.

Canadian vessels were excluded by outer joining the fish ticket tables with the state vessel table and checking the "idtype."

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–16. Nominal commercial ex-vessel revenues ($) for the West Coast albacore surface hook-and-line (troll and baitboat) fishery, 1981–2006.

Year	Albacore	Other Tunas	Swordfish	HMS Sharks	Dorado	Groundfish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	26,087,739	17,982		173	72	2,508	991		133,177	1,406	26,244,048
1982	7,364,640	5,500	13,219	2,771	557	5,676	13		13,834	535	7,406,745
1983	11,915,817	14,586	7,531	1,597	33	20,309	15,495		36,075	3,879	12,015,322
1984	12,150,346	20,053	96,217	6,080	706	6,947	928		6,422	4,278	12,291,977
1985	7,995,264	4,278	30,921	7,017	6	6,384	239		10,802	2,311	8,057,222
1986	5,867,829	7,248	6,427	180		19,050	160	26	9,451	634	5,911,005
1987	4,690,640	1,150	33,310	3,440		2,305	657		6,838	436	4,738,776
1988	8,542,696	952	96,331	3,566		766	614		11,362	538	8,656,825
1989	3,692,144	1,833	34,556	11,295	31	18,112	1	19	8,305	2,485	3,768,781
1990	5,413,557	79	13,332	560	74	6,163	85		2,792	1,529	5,438,171
1991	2,760,714	71	11,721	602		189		562	3,479	522	2,777,860
1992	11,218,614	2,195	55,452	2,361	281	6,144			6,120	670	11,291,837
1993	10,893,637	154,056	442,687	7,992	23,216	4,992			10,385	1,806	11,538,771
1994	19,859,543	603	6,797	302	180	590			537	345	19,868,897
1995	11,479,040	914	3,260	173	21	152	16		22,290	3,029	11,508,895
1996	27,080,019	38,596	2,608	295		440			26,524	997	27,149,479
1997	19,811,178	15,026	4,390	1,628	484	11,951	89		37,637	3,725	19,886,108
1998	18,442,370	138,138	17,122	5,018	525	4,788	279		16,340	5,264	18,629,844
1999	17,398,920	115,448	77,899	2,623	1,413	4,347	455		9,742	7,708	17,618,555
2000	17,009,755	4,497	100,831	252	298	1,927	522		9,445	5,233	17,132,760
2001	20,441,923	27,752	2,037	2,210	544	7,797	178		33,158	12,398	20,527,997
2002	14,250,013	6,838	9,996	664	170	916	1,241		21,889	7,792	14,299,519
2003	24,428,533	11,045		62	567	2,764	558		14,085	5,758	24,463,372
2004	27,440,986	2,513		520	655	1,834	1,241		22,741	3,315	27,473,805
2005	20,897,418	1,437		181		1,587			12,332	3,319	20,916,274
2006	23,726,402	1,607		252	167	985	127		3,480	991	23,734,011

Source: PacFIN, extracted August 15, 2007.

Additional processing info:

Only fish tickets where at least 1 lb of albacore was landed for the albacore surface hook-and-line (troll and baitboat) fishery were used.

Landed weights in lbs are multiplied by the prices per pound in each fish ticket line.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–17. Nominal commercial ex-vessel revenues ($) for the West Coast drift gillnet fishery, 1981–2006.

		Sharks					Tunas								
Year	Sword-fish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Albacore	Other	Dorado	Ground-fish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	1,110,316	766,185			78,538	5,109		12,191		6,569	4,419			144,187	2,127,514
1982	1,000,168	675,288		6,837	116,517	653	7,330	17,851		5,820	904			19,748	1,851,116
1983	952,577	166,931		25,634	37,715		11,115	18,232		714	5,677	10		20,143	1,238,748
1984	1,096,570	144,390		2,427	13,638		15,242	6,022		8,410	293			9,482	1,296,474
1985	793,604	181,145		2,456	19,129		7,399	911		1,151	126			12,258	1,018,179
1986	377,053	673,561		2,756	29,629		8,793	4,777		311	65			10,566	1,107,511
1987	37,173	160,473	104	1,649	3,517		1,710	82		4,792	122			5,242	214,864
1988	3,324	134,924					7,092			444				140	145,924
1989		*													*
1990															
1991	361,574	11,891		1,849	3,238		851	1,205						707	381,315
1992	241,122	2,748		74	7,744		1,080	2,559			310			3,498	259,135
1993	918,433	25,086	118	5,221	21,315		23,922	23,511		1,019				10,951	1,029,576
1994	4,536,655	489,369	42	27,214	128,789	7	91,871	132,327	40	5,531	851			155,818	5,568,514
1995	4,190,568	347,696	8,681	22,921	131,822	105	49,903	87,312	13	1,961	1,654	15		136,998	4,979,649
1996	3,919,232	448,255	1,557	16,802	138,997	56	106,175	123,890		1,084	2,557	492		205,498	4,964,595
1997	3,166,095	438,184	61,815	24,976	192,721	6	69,147	259,817	494	2,268	3,506			143,233	4,362,262
1998	3,967,255	484,999	2,440	7,744	139,393	4,810	76,514	208,872	2,457	3,411	1,761	88		212,476	5,112,220
1999	2,785,199	277,240	13,704	3,899	80,790	19	101,957	89,334		1,304	122	715		187,884	3,542,167
2000	2,747,621	287,686	2,143	2,999	86,541	164	66,184	123,217	545	1,293	2,253	20		138,928	3,459,594
2001	1,541,152	449,885	465	402	42,706		70,729	38,695		1,273	399			107,927	2,253,633
2002	1,499,163	368,415	1,725		86,811		19,494	11,258		2,429	833			199,253	2,189,381
2003	1,025,092	390,859	2,676	3,577	81,652	11	13,466	67,074		825	279			133,917	1,719,428
2004	944,391	111,497	227	3,795	40,804		23,390	31,916		2,024	386			120,036	1,278,466
2005	1,184,545	225,273		6,094	29,998		17,819	20,780	90	1,182	9	4		198,238	1,684,032
2006	1,990,574	184,337	218	3,828	56,975		4,079	7,683	87	1,346	1,951			291,809	2,542,887

* Not reported due to data confidentiality requirements (fewer than three vessels).

Source: PacFIN, extracted August 7, 2007.

Note 1: There is no drift gillnet gear for Washington.

Note 2: Significant swordfish and shark landings by drift gillnet gear prior to 1994 have been mis-assigned to California entangling net, trammel net, several trawl, encircling net, set gillnet and unknown gears, and therefore corresponding revenues are not reported here.

Additional processing info:

Only fish tickets where at least 1 lb of swordfish or any HMS shark was landed for the drift gillnet fishery were used.

Landed weights in lbs are multiplied by the prices per pound in each fish ticket line.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–18. Nominal commercial ex-vessel revenues ($) for the West Coast harpoon fishery, 1981–2006.

Year	Swordfish	HMS Sharks	Tunas		Dorado	Other	Total
			Albacore	Other			
1981	1,371,646	10,204	3,952	385		12,029	1,398,216
1982	839,886	1,988		146		1,233	843,253
1983	318,044	1,962				9,752	329,758
1984	583,079	8,473	330	150		2,026	594,058
1985	1,280,993	1,721	225	247		1,751	1,284,937
1986	1,796,277	2,433	53	337		1,203	1,800,303
1987	1,647,710	5,053	4,150	2,076		84,568	1,743,557
1988	1,477,860	6,429	8,552			882	1,493,723
1989	500,435	1,527	2,106	65		1,256	505,389
1990	539,322	5,869		108		811	546,110
1991	179,949	2,025				70	182,044
1992	586,740	6,126	1,236	133		1,336	595,571
1993	1,132,762	1,890	7,730			1,000	1,143,382
1994	1,273,087	1,613	2,490			2,888	1,280,078
1995	760,108	4,078				1,752	765,938
1996	633,027	3,217	216			652	637,112
1997	683,211	5,567	200		90	675	689,743
1998	402,914	1,603				766	405,283
1999	608,982	811				5,851	615,644
2000	750,533	798	302			8,259	759,892
2001	468,289	1,152			50	2,748	472,239
2002	678,934	1,259				1,141	681,334
2003	840,133	562				1,768	842,463
2004	670,001	2,457				1,643	674,101
2005	709,760	1,229				1,921	712,910
2006	636,273	5,013				709	641,995

Source: PacFIN, extracted August 3, 2007.

Note 1: Only California has revenues from harpoon landings.

Note 2: 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.

Additional processing info:

Landed weights in lbs are multiplied by the prices per pound in each fish ticket line.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–19. Nominal commercial ex-vessel revenues ($) for the West Coast longline fisherises, 1981–2006.

		Sharks					Tunas								
Year	Sword-fish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Albacore	Other	Dorado	Ground-fish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	1,544				16,874	47,633	48,207	1,270		2,579	114			1,155	119,376
1982	306	1,422			5,442	12,083	73,415	1,957	314	24	21			231	95,215
1983	506	44			878	435	11,969	7,857	13	204	35			2,882	24,823
1984	62,804	3,979		334	3,325		2,831	7,567	2,693	1,855	3			5,252	90,643
1985	752	1,923			25	88	740			8,727				163	12,418
1986		3,843			1,634	104				5,549	33			10,302	21,465
1987		286			6,950	396	164			72,173				5,921	85,890
1988	1,601	2,322			321,911	542		395		44,957	25			5,539	377,292
1989					11,692	445				30					12,167
1990		534			31,154	2,330	45	4,018		194	5			196	38,476
1991	146,305	199			44,731	355	528	16,726	36	4,576				80,015	293,471
1992	298,852	3,302		365	3,348	184	1,790	5,204		29,917	2			2,760	345,724
1993	153,383	63			1,350	20	545	37,080	1,937	4,110	951			2,993	202,432
1994	3,401,896	14,328		3,532	31,969	15,812	81,097	339,409	57,737	11,850	120			18,662	3,976,412
1995	1,064,427	17,409		360	6,685	2,318	5,351	311,205	5,365	17,114	7,223			7,224	1,444,681
1996	1,319,868	4,255			6,349	44	3,702	310,754	9,077	12,759	88			5,709	1,672,605
1997	2,115,438	8,211		7,342	3,992	6	10,507	367,004	2,707	110,693	140			2,819	2,628,859
1998	1,454,529	5,286			9,372	116	21,315	540,202	3,995	24,087	1,010			62,470	2,122,382
1999	4,893,372	7,067			11,204		133,630	1,188,768	44,608	2,317				6,667	6,287,633
2000	8,067,896	8,318	404	655	9,283	94	37,304	674,861	53,566	52,271		776		14,687	8,920,115
2001	6,527,196	20,572		7,380	9,680	1,206	39,876	392,412	17,425	14,348	997			69,995	7,101,087
2002	4,161,507	3,024			5,068	18,253	1,882	101,166	555	43,730	24			9,072	4,344,281
2003	5,886,380	621			5,415		3,685	227,083	1,556	12,944				10,294	6,147,978
2004	3,160,052	2,305		65	4,816		4,363	202,879	3,224	53,520	360			7,079	3,438,663
2005	4,939	32			500		19,542	61,908	109	7,525				11,626	106,181
2006	68,553	2,941			2,735		39,157	309,561	5,265	23,182	400			36,729	488,523

Source: PacFIN, extracted August 1, 2007.

Additional processing info:

Only fish tickets where at least 1 lb of any highly migratory species (except striped marlin) was landed for the longline fishery were used.

Landed weights in lbs are multiplied by the prices per pound in each fish ticket line.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–20. Nominal commercial ex-vessel revenues ($) for the West Coast purse seine fishery, 1981–2006.

	Tunas						Sword-	HMS		Ground-	Coastal				
Year	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	Unspecified	fish	Sharks	Dorado	fish	Pelagics	Crab	Salmon	Other	Total
1981	362,636	97,391,144	62,318,736	1,552,545	1,219,984	54,643					119,029			1,456	163,020,173
1982	575,736	73,205,578	38,822,258	1,196,824	2,680,401	54,040					5,155				116,539,991
1983	15,349	55,696,219	33,973,771		1,042,089	24,989	1,796	261			6,638			586	90,761,698
1984	4,822,262	35,503,573	23,741,980	143,266	878,031	2,580,939	87,097	651			60,118			6,054	67,823,971
1985	28,953	14,191,940	1,713,118	810	2,797,571	1,026,024	7,080	460			50,191			956	19,817,103
1986	64,622	17,655,730	643,905	13,335	4,575,913	182,575	182,606	2,595			8,204			2,452	23,331,937
1987	69,499	26,028,704	4,116,606	150,602	2,049,722	427,505		900			2,005			8,980	32,854,523
1988	266,685	25,754,782	7,772,435	680	2,037,504	67,724					25,342				35,925,150
1989	45,978	19,139,726	3,113,729		1,231,363	112,194	6,955	270	128		6,300			138	23,656,781
1990	139,859	9,225,983	1,889,065		1,069,829	32,343					43,459				12,400,537
1991		3,399,732	2,298,693		98,226	7,985					36,458			3,315	5,844,409
1992	19,291	1,686,917	551,315	2,927	1,087,353	2,936	51,873	3,524	2,597	220	62,091			11,397	3,482,441
1993	1,202	1,051,265	1,047,039	4,229	569,367	880	98,722	1,599	175	14	16,833			10,658	2,801,983
1994		3,135,039	1,078,217		1,463,167	3,393					36,342			125,354	5,841,512
1995		2,811,700	3,801,888		943,602						15,670			20,463	7,593,323
1996	875	2,669,391	3,643,203		3,865,969						69,959			25,249	10,274,646
1997	3,654	4,795,089	5,326,959		2,504,396	4,195	6,666	1,909	1,425		17,321			51,754	12,713,368
1998	162,925	3,808,379	4,717,085		2,294,031						165,275			109,262	11,256,957
1999	33,416	1,397,578	2,732,409		360,132						5,340	720		59,188	4,588,783
2000	6,615	1,306,040	475,592		296,687						24,484				2,109,419
2001	62,841	411,133	28,595		336,831						5,092				844,492
2002	358	577,814	128,094				2,623							45	708,934
2003	16,462	442,370	152,188		14,874										625,893
2004	1,537	435,085	108,853												545,475
2005		304,037	291,183		119,162						1,708				716,090
2006		*	*												*

* Not reported due to data confidentiality requirements (fewer than three vessels).

Source: PacFIN, extracted August 9, 2007.

Note: There is no purse seine gear for Washington.

Additional processing info:

Only fish tickets where at least 1 lb of any HMS tuna was landed for the purse seine fishery were used.

Landed weights in lbs are multiplied by the prices per pound in each fish ticket line.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–21. Real commercial ex-vessel revenues (2006 $) for the West Coast albacore surface hook-and-line (troll and baitboat) fishery, 1981–2006.

Year	Albacore	Other Tunas	Swordfish	HMS Sharks	Dorado	Groundfish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	51,202,627	35,294		339	141	4,922	1,946		261,387	2,762	51,509,418
1982	13,625,605	10,175	24,457	5,126	1,031	10,502	23		25,595	992	13,703,506
1983	21,206,294	25,958	13,402	2,843	59	36,144	27,576		64,202	6,904	21,383,382
1984	20,841,073	34,397	165,039	10,428	1,212	11,916	1,591		11,016	7,337	21,084,009
1985	13,307,696	7,120	51,467	11,680	10	10,626	398		17,980	3,844	13,410,821
1986	9,556,725	11,804	10,467	293		31,027	261	43	15,393	1,031	9,627,044
1987	7,436,017	1,822	52,805	5,453		3,654	1,041		10,840	696	7,512,328
1988	13,096,268	1,459	147,679	5,467		1,175	941		17,419	824	13,271,232
1989	5,453,684	2,708	51,043	16,684	45	26,753	1	28	12,267	3,672	5,566,885
1990	7,699,555	112	18,961	796	105	8,765	121		3,971	2,177	7,734,563
1991	3,793,753	97	16,107	827		260		773	4,781	717	3,817,315
1992	15,070,680	2,949	74,492	3,172	378	8,253			8,222	899	15,169,045
1993	14,303,620	202,279	581,259	10,493	30,483	6,555			13,636	2,372	15,150,697
1994	25,532,968	775	8,739	388	231	759			691	443	25,544,994
1995	14,462,694	1,152	4,107	217	26	191	20		28,084	3,817	14,500,308
1996	33,481,725	47,721	3,224	364		544			32,795	1,232	33,567,605
1997	24,095,328	18,275	5,340	1,980	588	14,535	109		45,776	4,530	24,186,461
1998	22,184,975	166,171	20,596	6,037	631	5,760	336		19,655	6,333	22,410,494
1999	20,629,499	136,884	92,363	3,109	1,676	5,154	539		11,551	9,141	20,889,916
2000	19,739,765	5,219	117,014	292	346	2,237	606		10,961	6,071	19,882,511
2001	23,166,277	31,450	2,308	2,505	616	8,837	201		37,577	14,051	23,263,822
2002	15,872,146	7,616	11,134	739	189	1,020	1,383		24,380	8,681	15,927,288
2003	26,642,528	12,046		68	618	3,015	609		15,361	6,278	26,680,523
2004	29,099,667	2,665		551	695	1,945	1,316		24,115	3,515	29,134,469
2005	21,510,467	1,479		186		1,633			12,694	3,416	21,529,875
2006	23,726,402	1,607		252	167	985	127		3,480	991	23,734,011

Source: PacFIN, extracted August 13, 2007.

Additional processing info:

Only fish tickets where at least 1 lb of albacore was landed for the albacore surface hook-and-line (troll and baitboat) fishery were used.

Real values are calculated to eliminate the effects of inflation by dividing current nominal values by the current year GDP implicit price deflator, with a base year of 2006.

Landed weights in lbs are multiplied by the prices per pound in each fish ticket line and then divided by the corresponding deflator.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–22. Real commercial ex-vessel revenues (2006 $) for the West Coast drift gillnet fishery, 1981–2006.

		Sharks					Tunas								
Year	Sword-fish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Albacore	Other	Dorado	Ground-fish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	2,179,227	1,503,798			154,148	10,028		23,927		12,894	8,673			282,994	4,175,689
1982	1,850,449	1,249,377		12,649	215,573	1,208	13,562	33,026		10,768	1,672			36,538	3,424,822
1983	1,695,279	297,082		45,620	67,120		19,781	32,448		1,270	10,104	18		35,848	2,204,570
1984	1,880,908	247,667		4,163	23,393		26,144	10,329		14,426	503			16,265	2,223,798
1985	1,320,912	301,507		4,088	31,839		12,315	1,517		1,916	210			20,401	1,694,705
1986	614,092	1,097,004		4,488	48,256		14,321	7,781		507	106			17,209	1,803,764
1987	58,930	254,396	164	2,614	5,575		2,711	130		7,597	194			8,310	340,621
1988	5,096	206,843					10,872			681				215	223,707
1989		*													*
1990															
1991	496,872	16,340		2,540	4,449		1,169	1,656						974	524,000
1992	323,914	3,692		100	10,403		1,451	3,438			416			4,698	348,112
1993	1,205,926	32,938	155	6,855	27,987		31,410	30,871		1,337				14,380	1,351,859
1994	5,832,675	629,171	54	34,988	165,582	8	118,116	170,129	51	7,111	1,094			200,335	7,159,314
1995	5,279,788	438,069	10,937	28,878	166,085	132	62,874	110,006	16	2,471	2,084	19		172,610	6,273,969
1996	4,845,737	554,222	1,925	20,774	171,856	69	131,274	153,178		1,340	3,161	609		254,078	6,138,223
1997	3,850,760	532,941	75,182	30,376	234,397	7	84,100	316,002	601	2,758	4,265			174,208	5,305,597
1998	4,772,351	583,423	2,935	9,315	167,681	5,786	92,042	251,260	2,955	4,103	2,118	105		255,595	6,149,669
1999	3,302,346	328,717	16,248	4,622	95,791	23	120,888	105,921		1,546	145	848		222,771	4,199,866
2000	3,188,605	333,859	2,487	3,480	100,430	190	76,806	142,993	632	1,500	2,614	23		161,228	4,014,847
2001	1,746,546	509,842	527	455	48,398		80,156	43,852		1,443	452			122,310	2,553,981
2002	1,669,818	410,353	1,921		96,693		21,713	12,539		2,705	927			221,938	2,438,607
2003	1,117,998	426,283	2,919	3,901	89,052	12	14,687	73,153		900	304			146,053	1,875,262
2004	1,001,475	118,237	240	4,025	43,271		24,804	33,845		2,146	409			127,291	1,355,743
2005	1,219,295	231,882		6,273	30,878		18,342	21,389	93	1,217	9	4		204,053	1,733,435
2006	1,990,574	184,337	218	3,828	56,975		4,079	7,683	87	1,346	1,951			291,809	2,542,887

* Not reported due to data confidentiality requirements (fewer than three vessels).

Source: PacFIN, extracted August 7, 2007.

Note 1: There is no drift gillnet gear for Washington.

Note 2: Significant swordfish and shark landings by drift gillnet gear prior to 1994 have been mis-assigned to California entangling net, trammel net, several trawl, encircling net, set gillnet and unknown gears, and therefore corresponding revenues are not reported here.

Additional processing info:

Only fish tickets where at least 1 lb of swordfish or any HMS shark was landed for the drift gillnet fishery were used.

Real values are calculated to eliminate the effects of inflation by dividing current nominal values by the current year GDP implicit price deflator, with a base year of 2006.

Landed weights in lbs are multiplied by the prices per pound in each fish ticket line and then divided by the corresponding deflator.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–23. Real commercial ex-vessel revenues (2006 $) for the West Coast harpoon fishery, 1981–2006.

Year	Swordfish	HMS Sharks	Tunas		Dorado	Other	Total
			Albacore	Other			
1981	2,692,141	20,028	7,757	756		23,608	2,744,290
1982	1,553,905	3,678		271		2,281	1,560,135
1983	566,015	3,491				17,356	586,862
1984	1,000,135	14,533	566	257		3,476	1,018,967
1985	2,132,145	2,865	375	411		2,913	2,138,709
1986	2,925,532	3,963	86	549		1,959	2,932,089
1987	2,612,096	8,010	6,579	3,291		134,066	2,764,042
1988	2,265,614	9,856	13,110			1,352	2,289,932
1989	739,196	2,256	3,111	96		1,853	746,512
1990	767,063	8,347		153		1,154	776,717
1991	247,285	2,783				96	250,164
1992	788,205	8,230	1,661	179		1,793	800,068
1993	1,487,344	2,482	10,149			1,315	1,501,290
1994	1,636,779	2,073	3,201			3,714	1,645,767
1995	957,677	5,138				2,208	965,023
1996	782,674	3,977	267			807	787,725
1997	830,955	6,771	243		109	821	838,899
1998	484,680	1,928				921	487,529
1999	722,056	962				6,936	729,954
2000	870,992	926	350			9,584	881,852
2001	530,699	1,305			57	3,115	535,176
2002	756,219	1,403				1,270	758,892
2003	916,276	613				1,928	918,817
2004	710,499	2,605				1,744	714,848
2005	730,582	1,265				1,977	733,824
2006	636,273	5,013				709	641,995

Source: PacFIN, extracted August 3, 2007.

Note 1: Only California has revenues from harpoon landings.

Note 2: 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.

Additional processing info:

Real values are calculated to eliminate the effects of inflation by dividing current nominal values by the current year GDP implicit price deflator, with a base year of 2006.

Landed weights in lbs are multiplied by the prices per pound in each fish ticket line and then divided by the corresponding deflator.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–24. Real commercial ex-vessel revenues (2006 $) for the West Coast pelagic fisheries, 1981–2006.

		Sharks					Tunas								
Year	Sword-fish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Albacore	Other	Dorado	Ground-fish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	3,030				33,120	93,490	94,616	2,493		5,061	224			2,266	234,300
1982	566	2,632			10,068	22,355	135,828	3,621	580	44	38			430	176,162
1983	900	78			1,562	774	21,300	13,983	23	363	63			5,130	44,176
1984	107,725	6,825		574	5,703		4,857	12,979	4,619	3,182	5			9,008	155,477
1985	1,251	3,200			41	147	1,232			14,526				272	20,669
1986		6,260			2,661	169				9,037	54			16,778	34,959
1987		454			11,017	628	260			114,415				9,386	136,160
1988	2,455	3,559			493,502	831		606		68,921	38			8,490	578,402
1989					17,270	658				44					17,972
1990		760			44,310	3,313	64	5,714		276	7			280	54,724
1991	201,051	273			61,470	488	725	22,984	49	6,289				109,957	403,286
1992	401,467	4,435		491	4,497	247	2,405	6,990		40,190	3			3,708	464,433
1993	201,395	83			1,773	26	716	48,687	2,543	5,396	1,249			3,930	265,798
1994	4,373,742	18,421		4,541	41,101	20,329	104,265	436,371	74,231	15,236	154			23,993	5,112,384
1995	1,341,094	21,934		453	8,423	2,921	6,742	392,094	6,760	21,562	9,100			9,102	1,820,185
1996	1,631,884	5,260			7,850	54	4,577	384,216	11,223	15,776	109			7,059	2,068,008
1997	2,572,900	9,987		8,930	4,855	7	12,780	446,368	3,292	134,631	170			3,427	3,197,347
1998	1,749,704	6,359			11,274	140	25,640	649,828	4,805	28,976	1,215			75,147	2,553,088
1999	5,801,959	8,379			13,285		158,442	1,409,495	52,890	2,747				7,905	7,455,102
2000	9,362,767	9,653	469	760	10,773	109	43,291	783,174	62,163	60,661		900		17,044	10,351,764
2001	7,397,095	23,314		8,364	10,970	1,367	45,190	444,710	19,748	16,260	1,130			79,321	8,047,469
2002	4,635,227	3,368			5,645	20,330	2,096	112,682	618	48,708	26			10,107	4,838,807
2003	6,419,871	678			5,905		4,019	247,664	1,697	14,117				11,227	6,705,178
2004	3,351,063	2,444		68	5,107		4,626	215,142	3,418	56,755	382			7,509	3,646,514
2005	5,084	32			514		20,116	63,724	112	7,745				11,969	109,296
2006	68,553	2,941			2,735		39,157	309,561	5,265	23,182	400			36,729	488,523

Source: PacFIN, extracted August 1, 2007.

Additional processing info:

Only fish tickets where at least 1 lb of any highly migratory species (except striped marlin) was landed for the longline fishery were used.

Real values are calculated to eliminate the effects of inflation by dividing current nominal values by the current year GDP implicit price deflator, with a base year of 2006.

Landed weights in lbs are multiplied by the prices per pound in each fish ticket line and then divided by the corresponding deflator.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–25. Real commercial ex-vessel revenues (2006 $) for the West Coast purse seine fishery, 1981–2006.

	Tunas						Sword-	HMS		Ground-	Coastal				
Year	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	Unspecified	fish	Sharks	Dorado	fish	Pelagics	Crab	Salmon	Other	Total
1981	711,750	191,150,430	122,313,514	3,047,194	2,394,474	107,249					233,619			2,855	319,961,085
1982	1,065,192	135,440,478	71,826,564	2,214,291	4,959,113	99,981					9,537				215,615,155
1983	27,316	99,121,229	60,462,309		1,854,581	44,472	3,195	464			11,814			1,045	161,526,425
1984	8,271,462	60,898,068	40,723,809	245,740	1,506,056	4,426,996	149,394	1,116			103,118			10,384	116,336,143
1985	48,190	23,621,738	2,851,394	1,347	4,656,410	1,707,763	11,784	765			83,540			1,595	32,984,526
1986	105,247	28,755,261	1,048,705	21,718	7,452,628	297,353	297,404	4,226			13,361			3,994	37,999,897
1987	110,175	41,263,005	6,526,008	238,747	3,249,401	677,719		1,427			3,178			14,239	52,083,899
1988	408,838	39,483,032	11,915,430	1,042	3,123,568	103,823					38,850				55,074,583
1989	67,914	28,271,383	4,599,305		1,818,852	165,722	10,273	398	189		9,306			205	34,943,547
1990	198,917	13,121,865	2,686,765		1,521,589	46,000					61,811				17,636,947
1991		4,671,886	3,158,847		134,981	10,973					50,100			4,557	8,031,344
1992	25,915	2,266,144	740,617	3,932	1,460,711	3,944	69,684	4,734	3,489	296	83,410			15,309	4,678,185
1993	1,578	1,380,337	1,374,789	5,553	747,593	1,155	129,625	2,100	230	18	22,102			13,994	3,679,074
1994		4,030,649	1,386,239		1,881,162	4,363					46,724			161,164	7,510,301
1995		3,542,523	4,790,082		1,188,865						19,743			25,781	9,566,994
1996	1,082	3,300,434	4,504,454		4,779,883						86,498			31,217	12,703,568
1997	4,444	5,832,023	6,478,910		3,045,970	5,102	8,108	2,322	1,733		21,066			62,944	15,462,622
1998	195,988	4,581,233	5,674,348		2,759,570						198,815			131,435	13,541,389
1999	39,621	1,657,076	3,239,754		427,000						6,331	854		70,178	5,440,814
2000	7,677	1,515,655	551,923		344,305						28,414				2,447,974
2001	71,216	465,926	32,406		381,722						5,771				957,040
2002	398	643,589	142,675				2,921							51	789,634
2003	17,954	482,463	165,981		16,222										682,619
2004	1,630	461,384	115,432												578,446
2005		312,956	299,725		122,658						1,758				737,097
2006		*	*												*

* Not reported due to data confidentiality requirements (fewer than three vessels).

Source: PacFIN, extracted August 9, 2007.

Note: There is no purse seine gear for Washington.

Additional processing info:

Only fish tickets where at least 1 lb of any HMS tuna was landed for the purse seine fishery were used.

Real values are calculated to eliminate the effects of inflation by dividing current nominal values by the current year GDP implicit price deflator, with a base year of 2006.

Landed weights in lbs are multiplied by the prices per pound in each fish ticket line and then divided by the corresponding deflator.

Aquaculture fish ticket/fish ticket line info is excluded.

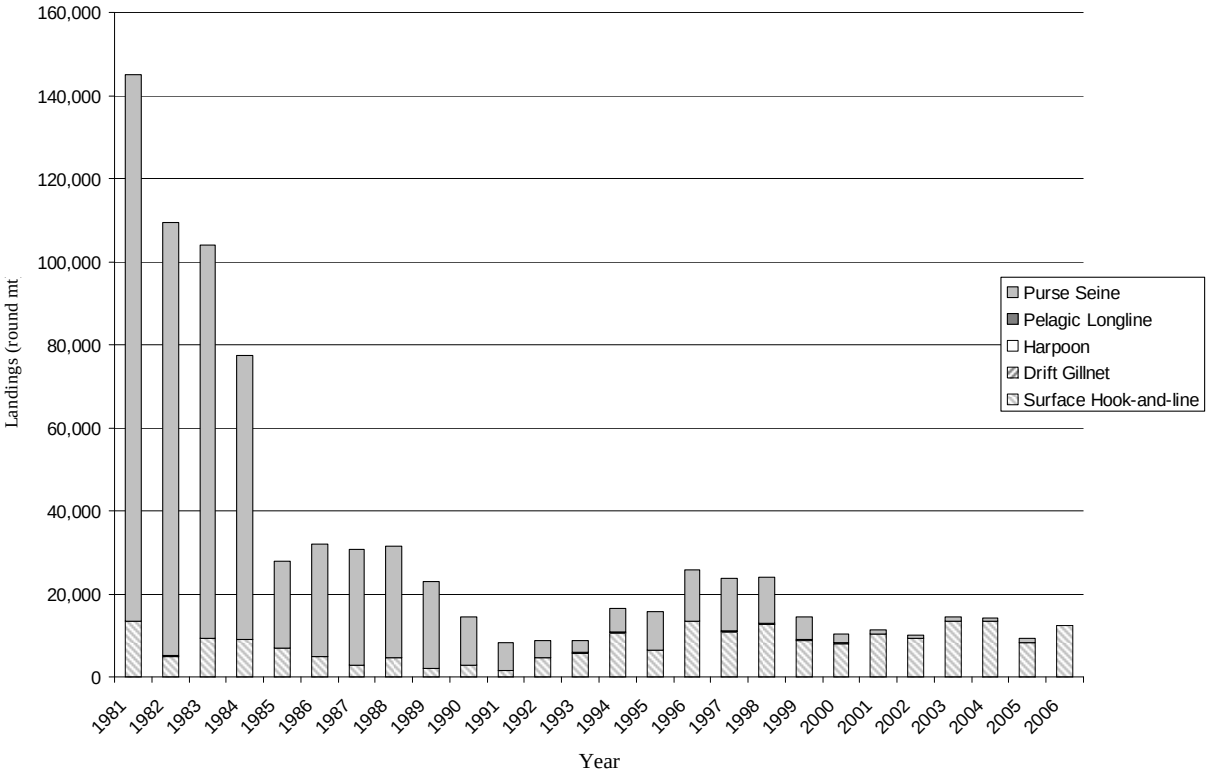

Figure 4–4. West Coast commercial tuna landings by fishery, 1981–2006.

Interpretation: Figure 4–4 and Table 4–27 display West Coast commercial tuna landings by fishery over the years 1981–2006 for the surface hook-and-line, drift gillnet, harpoon, pelagic longline, and purse seine fisheries, respectively.

Source and Calculations: The data were extracted from PacFIN in July and August 2007 (various dates). Landings in pounds were converted to round weight in metric tons by multiplying the landed weights by the conversion factors in each fish ticket line and then dividing by 2204.6. Aquaculture fish ticket / fish ticket line information is excluded from the data. Canadian surface hook-and-line fishery data are also excluded.

Table 4–26. West Coast commercial tuna landings by fishery, 1981–2006.

Year	Landings (round mt)					
	Surface Hook-and-line	Drift Gillnet	Harpoon	Pelagic Longline	Purse Seine	Total
1981	13,507	6	2	26	131,620	145,161
1982	4,981	15	<0.5	43	104,326	109,365
1983	9,325	17	<0.5	9	94,524	103,875
1984	8,922	14	<0.5	4	68,571	77,511
1985	7,012	7	<0.5	<0.5	20,843	27,862
1986	4,982	10	<0.5	<0.5	26,891	31,883
1987	2,891	1	2	<0.5	27,907	30,801
1988	4,625	4	1	<0.5	26,814	31,444
1989	2,168	<0.5	<0.5	<0.5	20,784	22,952
1990	2,926	<0.5	<0.5	1	11,584	14,511
1991	1,641	<0.5	<0.5	2	6,562	8,205
1992	4,755	2	<0.5	1	3,956	8,714
1993	5,781	22	1	5	3,070	8,879
1994	10,541	79	<0.5	105	5,737	16,462
1995	6,406	62	<0.5	62	9,100	15,630
1996	13,305	104	<0.5	71	12,382	25,862
1997	10,833	101	<0.5	89	12,783	23,806
1998	12,727	108	<0.5	105	10,938	23,878
1999	8,817	113	<0.5	227	5,186	14,343
2000	8,061	70	<0.5	121	2,186	10,438
2001	10,228	67	<0.5	95	886	11,276
2002	9,313	18	<0.5	13	777	10,121
2003	13,476	30	<0.5	31	863	14,400
2004	13,375	20	<0.5	33	791	14,219
2005	8,213	14	<0.5	18	1,006	9,251
2006	12,343	7	<0.5	65	<0.5	12,415

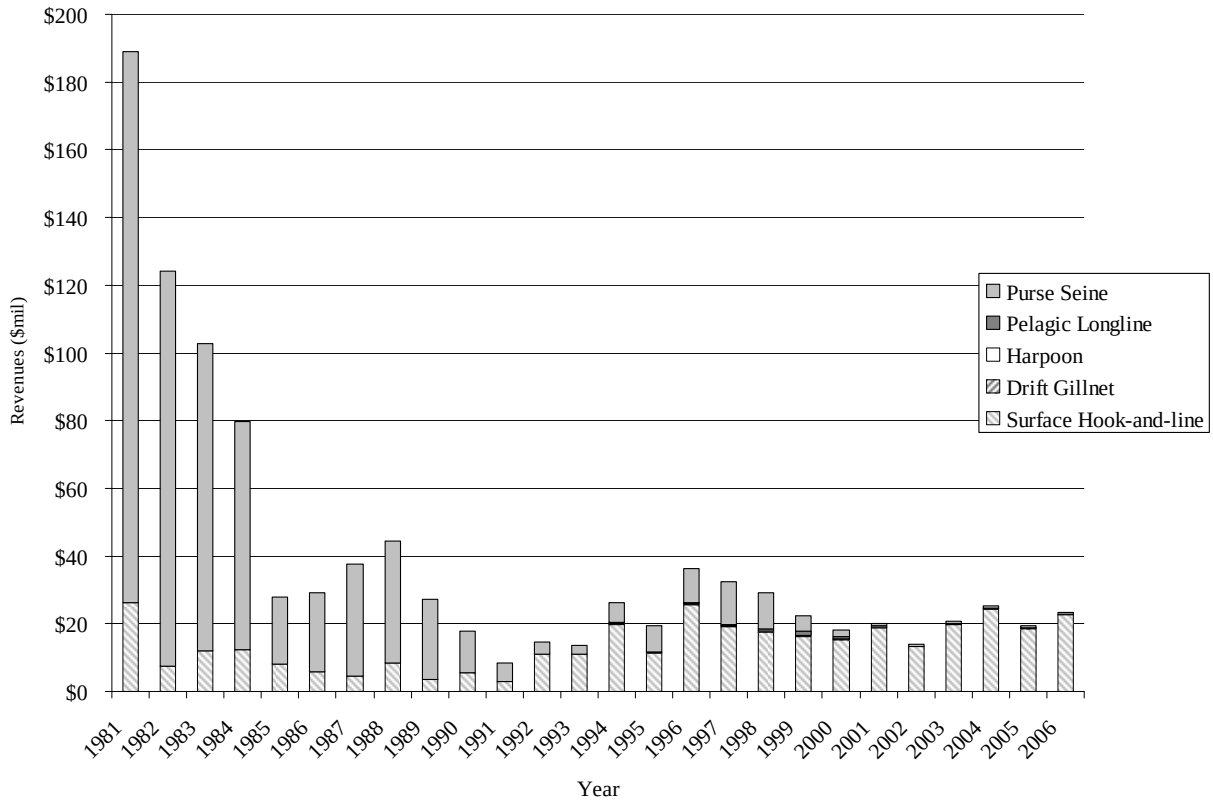

Figure 4–5. West Coast commercial tuna revenues by fishery, 1981–2006.

Interpretation: Figure 4–5 and Table 4–28 display West Coast commercial tuna revenues by fishery over the years 1981–2006 for the surface hook-and-line, drift gillnet, harpoon, pelagic longline, and purse seine fisheries, respectively.

Source and Calculations: The data were extracted from PacFIN in August 2007 (various dates). Aquaculture fish ticket / fish ticket line information is excluded from the data. Canadian surface hook-and-line fishery data are also excluded.

Table 4–27. West Coast commercial tuna revenues by fishery, 1981–2006.

	Revenues ($)					
Year	Surface Hook-and-line	Drift Gillnet	Harpoon	Pelagic Longline	Purse Seine	Total
1981	26,105,721	12,191	4,337	49,477	162,899,688	189,071,414
1982	7,355,282	25,181	146	75,372	116,534,837	123,990,818
1983	11,892,353	29,347		19,826	90,752,417	102,693,943
1984	12,167,115	21,264	480	10,398	67,670,051	79,869,308
1985	7,999,542	8,310	472	740	19,758,416	27,767,480
1986	5,875,077	13,570	390		23,136,080	29,025,117
1987	4,691,790	1,792	6,226	164	32,842,638	37,542,610
1988	8,540,798	7,092	8,552	395	35,899,810	44,456,647
1989	3,693,977		2,171		23,642,990	27,339,138
1990	5,413,636		108	4,063	12,357,079	17,774,886
1991	2,760,785	2,056		17,254	5,804,636	8,584,731
1992	11,075,816	3,639	1,369	6,994	3,350,739	14,438,557
1993	11,006,225	47,433	7,730	37,625	2,673,982	13,772,995
1994	19,818,527	224,198	2,490	420,506	5,679,816	26,145,537
1995	11,356,151	137,215		316,556	7,557,190	19,367,112
1996	25,627,547	230,065	216	314,456	10,179,438	36,351,722
1997	19,108,815	328,964	200	377,511	12,634,293	32,449,783
1998	17,480,096	285,386		561,517	10,982,420	29,309,419
1999	16,249,188	191,291		1,322,398	4,523,535	22,286,412
2000	15,302,365	189,401	302	712,165	2,084,934	18,289,167
2001	18,796,089	109,424		432,288	839,400	20,177,201
2002	13,246,629	30,752		103,048	706,266	14,086,695
2003	19,654,413	80,540		230,768	625,894	20,591,615
2004	24,343,202	55,306		207,242	545,475	25,151,225
2005	18,632,099	38,599		81,450	714,382	19,466,530
2006	22,828,915	11,762		348,718		23,189,395

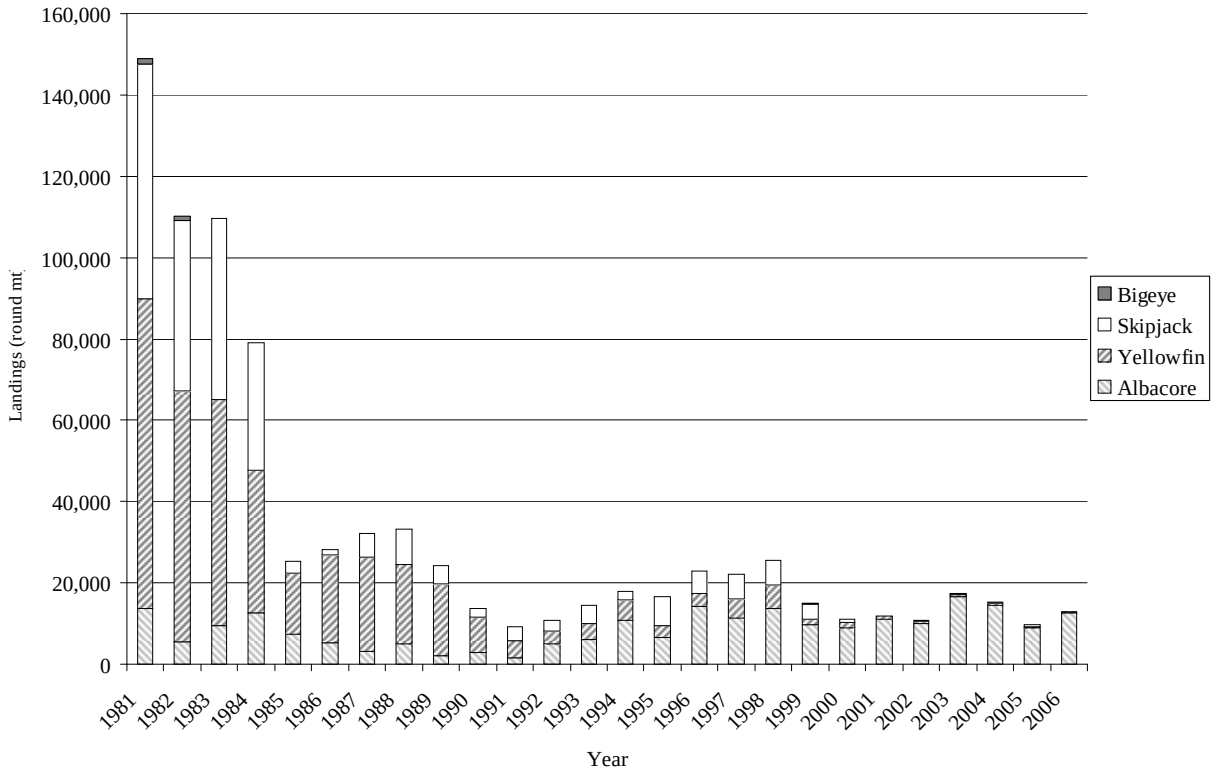

Figure 4–6. Species composition of coastwide commercial tuna landings, 1981–2006.

Interpretation: Figure 4–6 shows West Coast HMS commercial tuna landings in round metric tons for all gear types from 1981 through 2006 for the four principal species. The landings of these species and other tuna species, which comprise a smaller part of the catch, are shown in the accompanying table.

The principal species of tuna targeted by commercial fishers consisted of four varieties: albacore, yellowfin, skipjack, and bluefin. The levels of yellowfin and skipjack landings declined precipitously during the 1980s, and by 1995 were supplanted by albacore as the most important constituent of commercial landings. By 2000, yellowfin, skipjack, and bluefin landings had all declined to far below their levels in the early 1980s and only albacore landings remained near their long-term average.

Source and Calculations: The data were extracted from PacFIN on July 13, 2007. They represent a portion of the table of West Coast commercial landings by species in Table 4–4. Landings in pounds were converted to round weight in metric tons by multiplying the landed weights by the conversion factors in each fish ticket line and then dividing by 2204.6. Aquaculture fish ticket / fish ticket line information is excluded from the data.

Table 4–28. Species composition of coastwide commercial tuna landings, 1981–2006.

Year	Landings (round mt)						
	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	Unspecified Tuna	Total
1981	13,712	76,091	57,869	1,168	868	40	149,748
1982	5,410	61,769	41,904	968	2,404	51	112,506
1983	9,578	55,482	44,591	21	764	55	110,491
1984	12,654	35,063	31,251	126	635	1,014	80,743
1985	7,301	15,025	2,977	7	3,252	468	29,030
1986	5,243	21,517	1,361	29	4,731	143	33,024
1987	3,160	23,201	5,724	50	823	129	33,087
1988	4,908	19,520	8,863	6	804	11	34,112
1989	2,214	17,615	4,505	1	1,019	77	25,431
1990	3,028	8,509	2,256	2	925	46	14,766
1991	1,676	4,178	3,407	7	104	11	9,383
1992	4,902	3,350	2,586	7	1,087	10	11,942
1993	6,151	3,795	4,539	26	559	16	15,086
1994	10,686	5,056	2,111	47	916	33	18,849
1995	6,528	3,038	7,037	49	714	1	17,367
1996	14,173	3,347	5,455	62	4,688	3	27,728
1997	11,292	4,775	6,070	82	2,251	11	24,481
1998	13,801	5,799	5,846	53	1,949	12	27,460
1999	9,770	1,353	3,759	108	186	12	15,188
2000	9,042	1,158	780	87	312	1	11,380
2001	11,194	655	58	53	196	1	12,157
2002	10,029	544	236	10	11	2	10,832
2003	16,671	465	349	35	36	<0.5	17,556
2004	14,540	488	307	22	10	9	15,376
2005	9,055	285	523	10	207	<0.5	10,080
2006	12,749	77	48	35	1	1	12,911

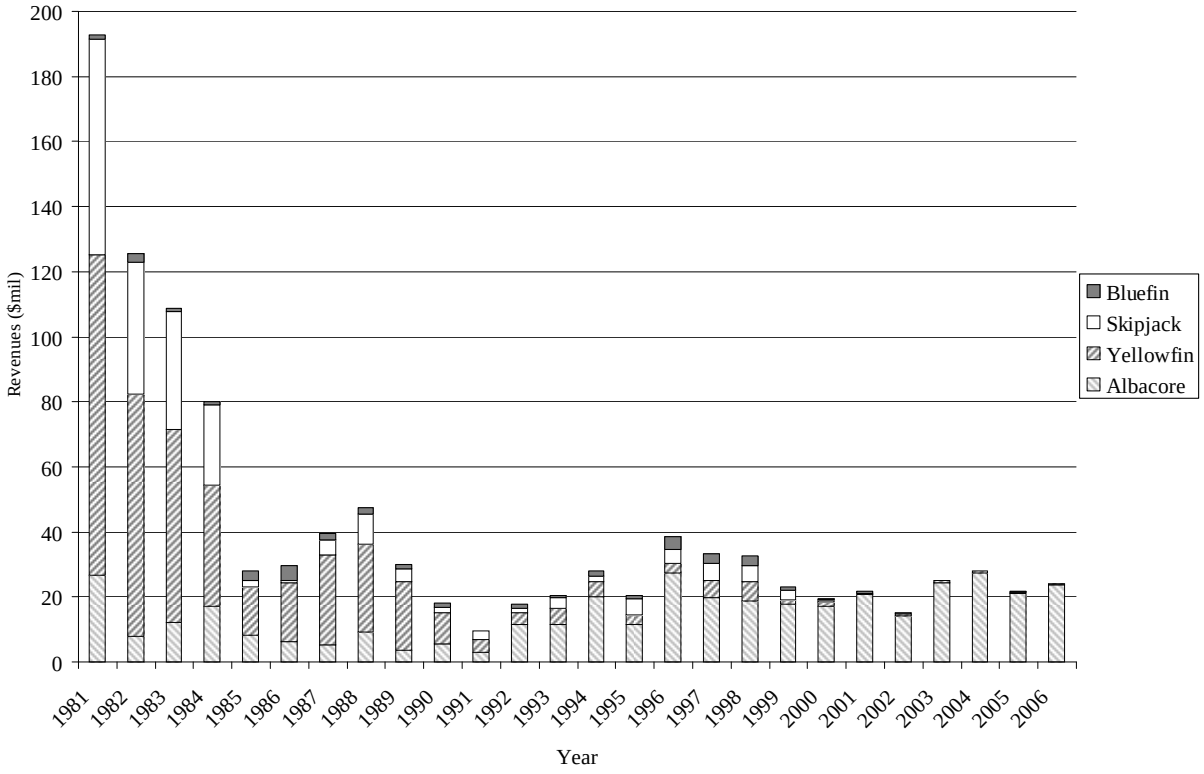

Figure 4–7. Species composition of coastwide commercial tuna revenues, 1981–2006.

Interpretation: Figure 4–7 shows West Coast HMS commercial tuna revenues in current dollars from 1981 through 2006 for the four principal species across all gear types. The revenues of these species and other tuna species, which comprise a smaller part of the catch, are shown in the accompanying table.

The principal species of tuna targeted by commercial fishers consisted of four varieties: albacore, yellowfin, skipjack, and bluefin. The levels of yellowfin and skipjack revenues declined precipitously during the 1980s, and by 1995 were supplanted by albacore as the most important constituent of commercial revenues. By 2000, yellowfin, skipjack, and bluefin revenues had all declined to far below their levels in the early 1980s and albacore revenues were an increasingly dominant share of the total.

Source and Calculations: The data were extracted from PacFIN on July 19, 2007. They represent a portion of Table 4–6, which tabulates West Coast commercial current dollar revenues by species. Current dollar revenues were computed as the sum total of landed weights in pounds multiplied by the prices per pound in each fish ticket line. Aquaculture fish ticket / fish ticket line information is excluded from the data.

Table 4–29. Species composition of coastwide commercial tuna revenues, 1981–2006.

	Revenues ($)						
Year	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	Unspecified Tuna	Total
1981	26,524,145	98,722,280	66,331,030	1,569,755	1,239,005	72,694	194,458,909
1982	8,033,073	74,468,306	40,507,405	1,208,147	2,690,102	98,923	127,005,956
1983	12,240,375	59,190,758	36,248,835	45,946	1,062,909	95,490	108,884,313
1984	17,208,633	37,038,204	24,790,704	174,405	904,956	2,590,391	82,707,293
1985	8,293,123	14,690,108	2,118,170	17,693	2,817,610	1,028,867	28,965,571
1986	6,178,085	18,079,443	904,609	90,227	4,636,698	198,248	30,087,310
1987	5,127,832	27,878,667	4,426,717	176,504	2,057,402	448,231	40,115,353
1988	9,110,214	27,030,132	9,249,827	26,156	2,070,411	80,548	47,567,288
1989	3,785,598	20,824,242	3,944,894	2,415	1,271,718	127,320	29,956,187
1990	5,619,553	9,383,584	1,898,875	8,771	1,149,381	56,750	18,116,914
1991	2,823,937	3,996,935	2,692,345	42,810	116,371	21,161	9,693,559
1992	11,483,392	3,677,441	1,410,546	44,731	1,129,626	21,228	17,766,964
1993	11,667,651	4,821,735	3,282,778	211,513	752,369	72,678	20,808,724
1994	20,070,706	4,522,321	1,751,209	307,147	1,674,099	55,245	28,380,727
1995	11,570,364	3,044,670	4,752,641	258,727	1,057,948	5,136	20,689,486
1996	27,222,294	3,230,957	3,986,113	260,306	4,035,455	28,296	38,763,421
1997	19,924,121	4,991,131	5,504,526	359,780	2,773,705	21,895	33,575,158
1998	18,733,488	5,861,959	5,213,131	271,919	2,965,485	61,688	33,107,670
1999	17,767,485	1,468,209	2,748,208	657,121	1,061,233	60,572	23,762,828
2000	17,156,838	1,321,954	483,242	579,384	577,458	2,298	20,121,174
2001	20,715,878	465,558	33,633	320,855	473,821	3,069	22,012,814
2002	14,296,619	588,677	128,245	87,304	43,512	6,325	15,150,682
2003	24,478,655	451,273	159,961	262,768	76,121	21	25,428,799
2004	27,479,468	446,577	109,254	147,696	38,312	54,879	28,276,186
2005	20,958,047	315,699	292,193	60,141	136,847	913	21,763,840
2006	23,759,098	175,646	40,384	205,677	3,790	1,895	24,186,490

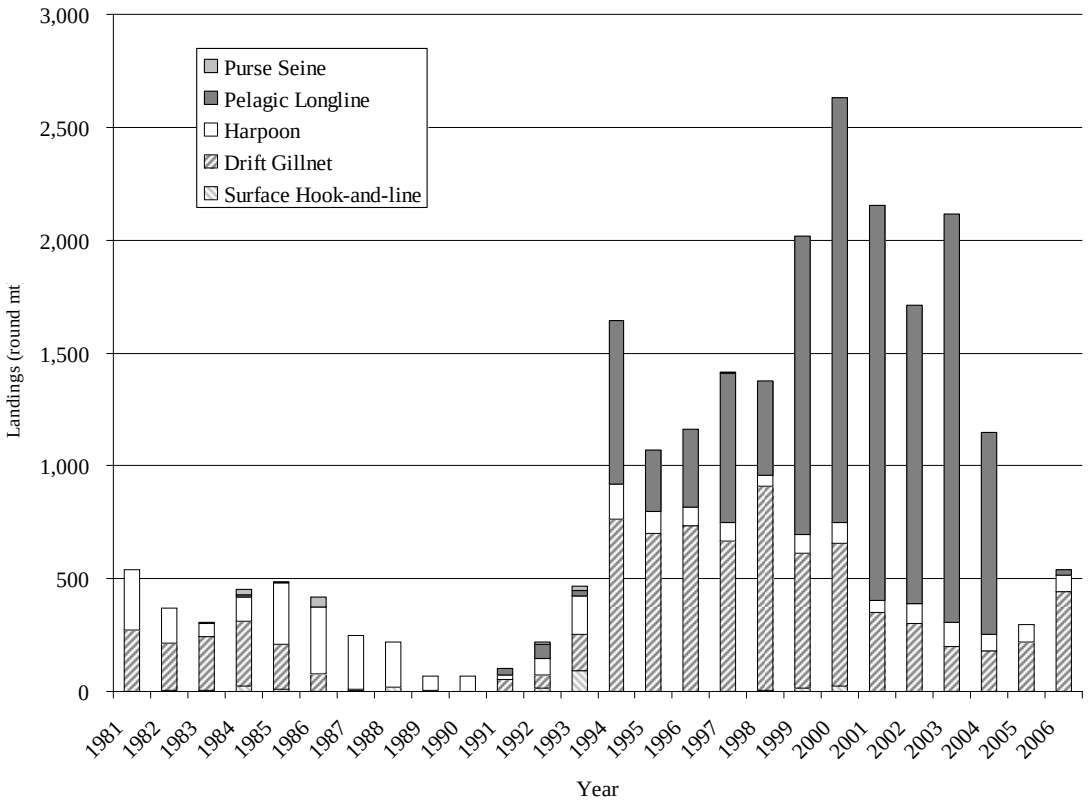

Figure 4–8. West Coast commercial swordfish landings by fishery, 1981–2006.

Interpretation: Figure 4–8 and Table 4–30 display West Coast commercial swordfish landings by fishery over the years 1981–2006 for the surface hook-and-line, drift gillnet, harpoon, pelagic longline, and purse seine fisheries, respectively.

Source and Calculations: The data were extracted from PacFIN in July and August 2007 (various dates). Landings in pounds were converted to round weight in metric tons by multiplying the landed weights by the conversion factors in each fish ticket line and then dividing by 2204.6. Aquaculture fish ticket / fish ticket line information is excluded from the data. Canadian surface hook-and-line fishery data are also excluded.

Table 4–30. West Coast commercial swordfish landings by fishery, 1981–2006.

	Landings (round mt)					
Year	Surface Hook-and-line	Drift Gillnet	Harpoon	Pelagic Longline	Purse Seine	Total
1981		270	272	<0.5		542
1982	4	208	156	<0.5		368
1983	3	242	58	<0.5	1	304
1984	25	286	105	12	23	451
1985	11	197	275	<0.5	1	484
1986	1	78	296		41	416
1987	5	6	237			248
1988	18	1	199	<0.5		218
1989	7		62		1	70
1990	2		65			67
1991	2	51	20	27		100
1992	13	60	75	63	10	221
1993	90	162	169	27	17	465
1994	1	762	157	722		1,642
1995	1	701	97	271		1,070
1996	<0.5	734	81	346		1,161
1997	1	664	84	663	1	1,413
1998	4	906	48	418		1,376
1999	15	597	81	1,325		2,018
2000	22	635	90	1,885		2,632
2001	<0.5	351	52	1,749		2,152
2002	2	298	90	1,320	1	1,711
2003		198	107	1,811		2,116
2004		182	69	898		1,149
2005		220	76	1		297
2006		442	71	25		538

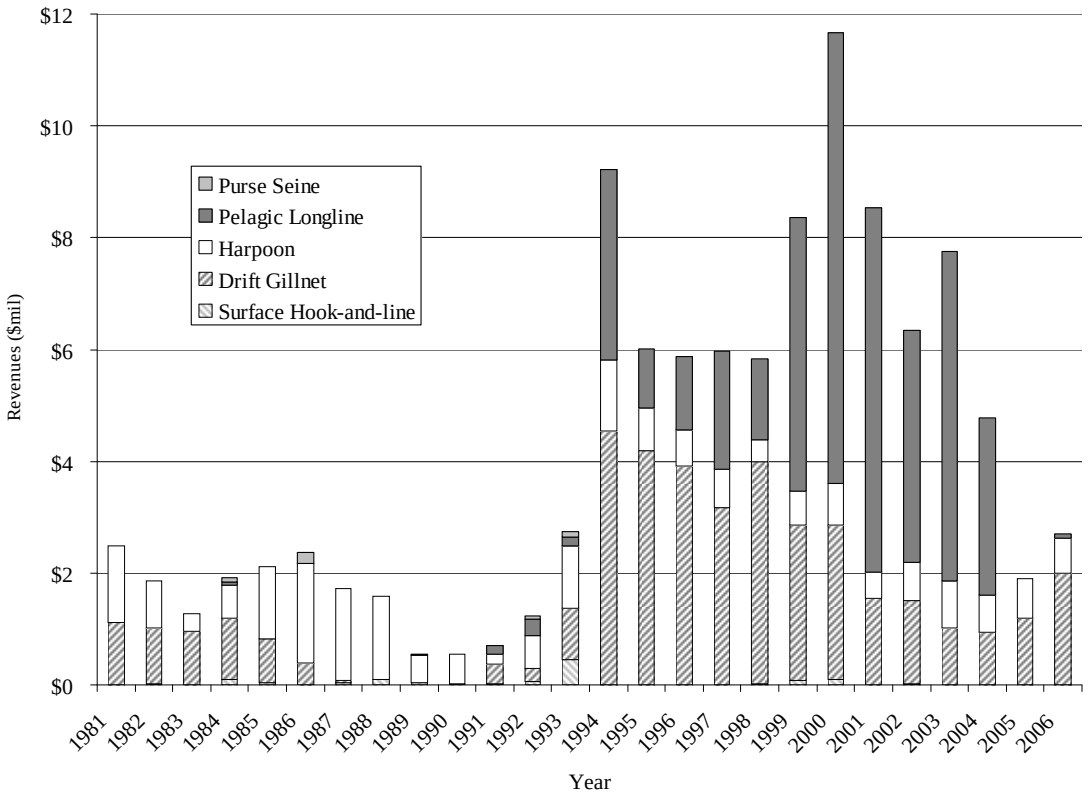

Figure 4–9. West Coast commercial swordfish revenues by fishery, 1981–2006.

Interpretation: Figure 4–9 and Table 4–31 display West Coast commercial swordfish revenues by fishery in current dollars over the years 1981–2006 for the surface hook-and-line, drift gillnet, harpoon, pelagic longline, and purse seine fisheries, respectively.

Source and Calculations: The data were extracted from PacFIN in August 2007 (various dates). Aquaculture fish ticket / fish ticket line information is excluded from the data. Canadian surface hook-and-line fishery data are also excluded.

Table 4–31. West Coast commercial swordfish revenues by fishery, 1981–2006.

	Revenues ($)					
Year	Surface Hook-and-line	Drift Gillnet	Harpoon	Pelagic Longline	Purse Seine	Total
1981		1,110,316	1,371,646	1,544		2,483,506
1982	13,219	1,000,168	839,886	306		1,853,579
1983	7,531	952,577	318,044	506	1,796	1,280,454
1984	96,217	1,096,570	583,079	62,804	87,097	1,925,767
1985	30,921	793,604	1,280,993	752	7,080	2,113,350
1986	6,427	377,053	1,796,277		182,606	2,362,363
1987	33,310	37,173	1,647,710			1,718,193
1988	96,331	3,324	1,477,860	1,601		1,579,116
1989	34,556		500,435		6,955	541,946
1990	13,332		539,322			552,654
1991	11,721	361,574	179,949	146,305		699,549
1992	55,452	241,122	586,740	298,852	51,873	1,234,039
1993	442,687	918,433	1,132,762	153,383	98,722	2,745,987
1994	6,797	4,536,655	1,273,087	3,401,896		9,218,435
1995	3,260	4,190,568	760,108	1,064,427		6,018,363
1996	2,608	3,919,232	633,027	1,319,868		5,874,735
1997	4,390	3,166,095	683,211	2,115,438	6,666	5,975,800
1998	17,122	3,967,255	402,914	1,454,529		5,841,820
1999	77,899	2,785,199	608,982	4,893,372		8,365,452
2000	100,831	2,747,621	750,533	8,067,896		11,666,881
2001	2,037	1,541,152	468,289	6,527,196		8,538,674
2002	9,996	1,499,163	678,934	4,161,507	2,623	6,352,223
2003		1,025,092	840,133	5,886,380		7,751,605
2004		944,391	670,001	3,160,052		4,774,444
2005		1,184,545	709,760	4,939		1,899,244
2006		1,990,574	636,273	68,553		2,695,400

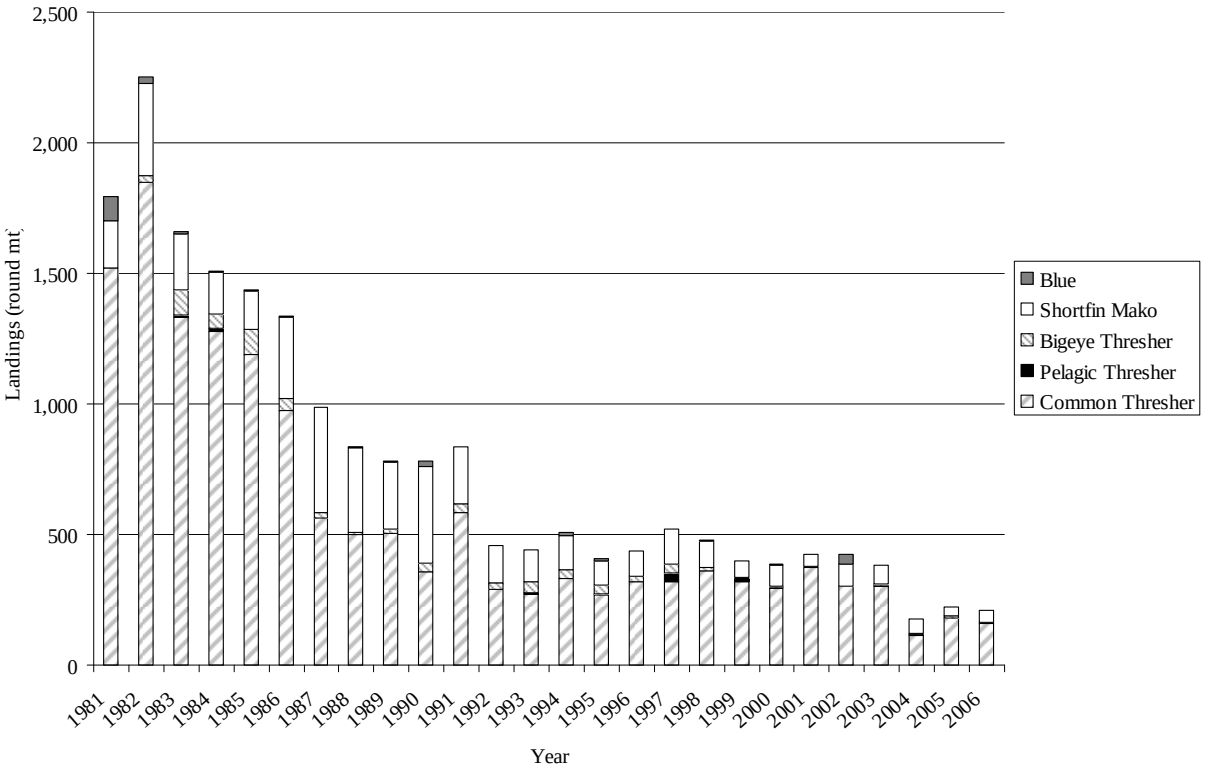

Figure 4–10. Species composition of coastwide commercial shark landings, 1981–2006.

Interpretation: Figure 4–10 shows West Coast commercial shark landings in round metric tons for all gear types from 1981 through 2006. The numeric data used to produce the graph are shown below in Table 4–32.

The graph shows a general pattern of decline in landings from the a level as high as 2,000 metric tons in the early 1980s down to a level near 500 metric tons or below from 1992 onwards. The decline was primarily driven by a downward trend in common thresher landings, and to a lesser extent by a similar decline in shortfin mako landings. For 2004–06 total West Coast commercial shark landings were below 250 mt in each year. In a broader sense, the decline in landings reflects fewer drift gillnet vessels.

Source and Calculations: The data were extracted from PacFIN on July 13, 2007. They represent a portion of the Table 4–4, which displays West Coast commercial landings by species. Landings in pounds were converted to round weight in metric tons by multiplying the landed weights by the conversion factors in each fish ticket line and then dividing by 2204.6. Aquaculture fish ticket / fish ticket line information is excluded from the data.

Table 4–32. Species composition of coastwide commercial shark landings, 1981–2005.

	Landings (round mt)					
Year	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Total
1981	1,521			182	92	1,795
1982	1,848		28	351	27	2,254
1983	1,331	9	96	217	7	1,660
1984	1,279	9	57	160	2	1,507
1985	1,190	<0.5	95	149	1	1,435
1986	974	<0.5	48	312	2	1,336
1987	562	2	20	403	2	989
1988	500	1	9	322	3	835
1989	504	<0.5	17	255	6	782
1990	357	1	31	373	20	782
1991	584		32	219	1	836
1992	292	<0.5	22	142	1	457
1993	275	1	44	122	<0.5	442
1994	330	<0.5	37	128	12	507
1995	270	5	31	95	5	406
1996	319	1	20	96	1	437
1997	320	35	32	132	1	520
1998	361	2	11	100	3	477
1999	320	10	5	63	<0.5	398
2000	296	3	5	80	1	385
2001	373	2	2	46	2	425
2002	301	2		82	41	426
2003	301	4	6	70	1	382
2004	115	2	5	54	1	177
2005	179	<0.5	10	33	1	223
2006	159	<0.5	4	46	<0.5	209

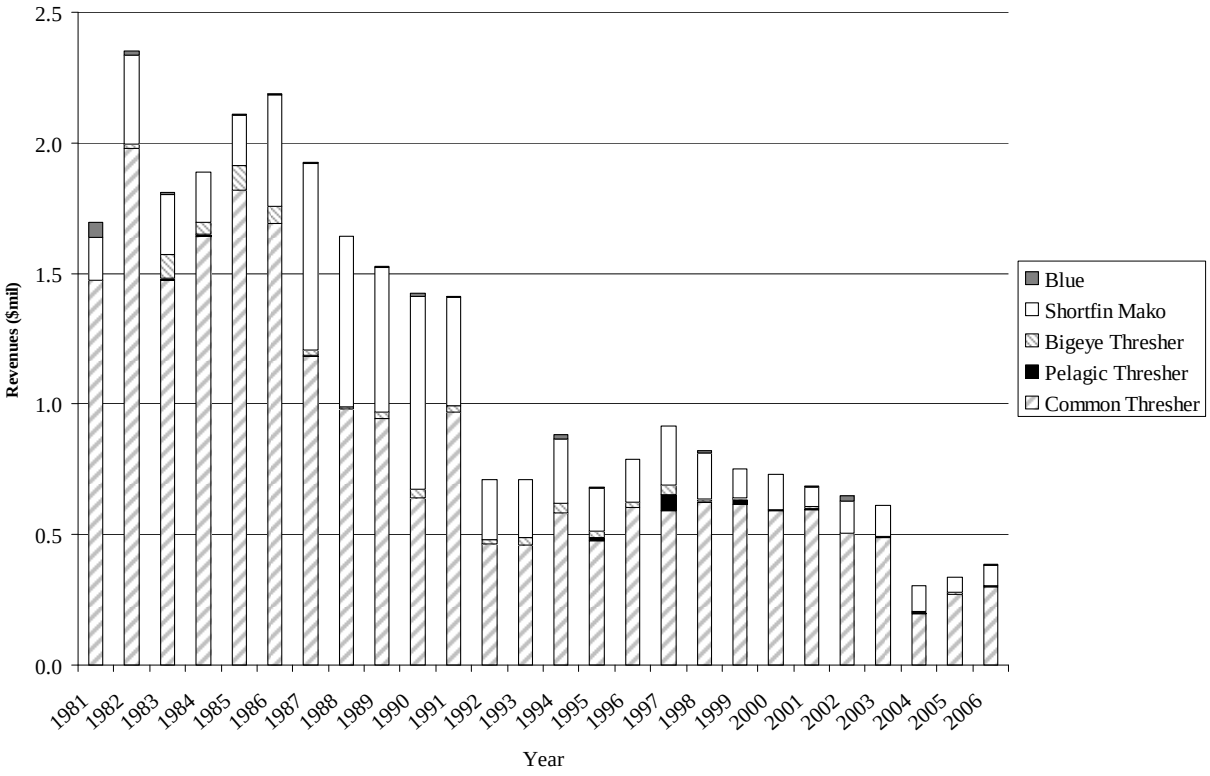

Figure 4–11. Species composition of coastwide commercial shark revenues, 1981–2006.

Interpretation: Figure 4–11 shows West Coast commercial shark revenues in current dollars by species for all gear types from 1981 through 2005. The numeric data used to produce the graph are shown in Table 4–33.

The graph shows a long-term downward trend in commercial shark revenues from levels approaching $2.5 million in the early 1980s to a level below $500 thousand in 2005 and 2006. The decline was primarily driven by a downward trend in bigeye thresher revenue, and to a lesser extent by a similar decline in shortfin mako revenue. A key factor underlying the decline in revenues is a drop in the number of drift gillnet vessels.

Source and Calculations: The data were extracted from PacFIN on July 19, 2007. They represent a portion of the Table 4–6, which displays West Coast commercial current dollar revenues by species. Current dollar revenues were computed as the sum total of landed weights in pounds multiplied by the prices per pound in each fish ticket line. Aquaculture fish ticket / fish ticket line information is excluded from the data.

Table 4–33. Species composition of coastwide commercial shark revenues, 1981–2006.

Year	Revenues ($)					
	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue	Total
1981	1,475,634	0	0	162,347	59,064	1,697,045
1982	1,980,592	0	15,168	339,209	18,826	2,353,795
1983	1,474,213	8,449	91,455	229,826	4,645	1,808,588
1984	1,642,178	7,723	47,119	189,794	2,470	1,889,284
1985	1,817,135	716	96,433	192,129	2,132	2,108,545
1986	1,690,483	194	66,647	428,259	1,320	2,186,903
1987	1,183,866	1,840	22,123	715,138	1,853	1,924,820
1988	979,905	821	9,764	649,799	2,258	1,642,547
1989	944,159	149	24,711	552,576	3,465	1,525,060
1990	638,630	1,682	34,628	739,193	10,303	1,424,436
1991	968,877	0	25,179	415,168	894	1,410,118
1992	464,018	602	14,629	231,063	1,810	712,122
1993	458,513	462	28,190	221,401	608	709,174
1994	584,318	42	33,478	247,088	16,057	880,983
1995	477,755	8,777	24,896	165,215	2,796	679,439
1996	603,006	1,557	17,745	167,111	587	790,006
1997	591,268	62,496	34,768	227,426	278	916,236
1998	625,489	2,584	9,428	176,313	5,977	819,791
1999	617,691	18,424	5,876	111,119	73	753,183
2000	589,105	2,738	4,636	133,619	867	730,965
2001	595,542	2,767	8,428	75,799	1,520	684,056
2002	503,487	1,946	0	124,521	18,659	648,613
2003	487,796	2,814	3,779	115,728	876	610,993
2004	197,835	2,500	4,060	98,827	1,066	304,288
2005	271,735	588	6,234	57,766	1,597	337,920
2006	299,709	271	4,509	79,313	632	384,434

Table 4–34. Commercial landings (round mt) of the albacore surface hook-and-line (troll and baitboat) fishery in California, 1981–2006.

Year	Albacore	Other Tunas	Swordfish	HMS Sharks	Dorado	Groundfish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	9,113	14		<0.5	<0.5	1	2		3	2	9,135
1982	3,859	3	4	2	1	4	<0.5		2	<0.5	3,875
1983	7,270	16	3	1	<0.5	20	34		4	1	7,349
1984	8,109	13	25	5	<0.5	5	2		<0.5	4	8,163
1985	6,147	2	11	4	<0.5	4	<0.5		2	1	6,171
1986	3,019	2	1	<0.5		20	<0.5	<0.5	2	<0.5	3,044
1987	1,324	<0.5	5	2		2	1		1	<0.5	1,335
1988	931	<0.5	17	2		<0.5			<0.5	1	951
1989	823	1	7	8	<0.5	10	<0.5	<0.5	2	1	852
1990	758	<0.5	2	<0.5	<0.5	3	<0.5		<0.5	2	765
1991	642	<0.5	2	1		<0.5		<0.5		1	646
1992	1,184	<0.5	13	2	<0.5	6			<0.5	2	1,207
1993	1,461	18	89	5	9	3				1	1,586
1994	3,055	<0.5	1	<0.5	<0.5	1			<0.5	<0.5	3,057
1995	777	<0.5	<0.5	<0.5		<0.5	<0.5		<0.5	3	780
1996	5,047	42	<0.5	<0.5		<0.5			<0.5	2	5,091
1997	3,290	7	1	1	<0.5	5	<0.5		3	1	3,308
1998	2,232	116	4	3	<0.5	1	<0.5		1	2	2,359
1999	5,360	6	15	1	<0.5	1	<0.5		<0.5	5	5,388
2000	1,798	2	22	<0.5	<0.5	1	<0.5		1	3	1,827
2001	2,796	8	<0.5	1	<0.5	2	<0.5		3	6	2,816
2002	2,659	2	2	<0.5	<0.5	<0.5	<0.5		3	3	2,669
2003	1,696	3		<0.5	<0.5	1	<0.5		2	3	1,705
2004	1,336	1		<0.5	<0.5	<0.5	<0.5		2	2	1,341
2005	455	<0.5				1			<0.5	1	457
2006	194	1		<0.5	<0.5	<0.5	<0.5		<0.5	1	196

Source: PacFIN, extracted August 24, 2007.

Additional processing info:

Only fish tickets where at least 1 lb of albacore was landed for the albacore surface hook-and-line (troll and baitboat) fishery were used.

Landings in lbs are converted to round weight in mt by multiplying the landed weights by the conversion factors in each fish ticket line and then dividing by 2204.6.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–35. Commercial landings (round mt) of the albacore surface hook-and-line (troll and baitboat) fishery in Oregon, 1981–2006.

Year	Albacore	Other Tunas	Swordfish	HMS Sharks	Dorado	Groundfish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	3,505					1			25		3,531
1982	863	<0.5				<0.5			1		865
1983	1,540	<0.5				3	<0.5		5		1,549
1984	736	<0.5				<0.5			1		737
1985	692					<0.5			<0.5		692
1986	1,116	<0.5				<0.5			1		1,117
1987	1,038								1		1,038
1988	1,795					<0.5			2		1,797
1989	490					<0.5			<0.5		490
1990	943					<0.5	<0.5		1		944
1991	571								1		572
1992	1,767			<0.5		<0.5			1		1,768
1993	2,157					1			3		2,160
1994	2,131			<0.5					<0.5		2,131
1995	2,283	1			<0.5	<0.5			6		2,290
1996	4,059	<0.5				<0.5			10		4,069
1997	4,158	<0.5			<0.5	1			9		4,169
1998	4,810			<0.5		1			4		4,814
1999	2,065	6		<0.5		<0.5			2		2,073
2000	3,972	<0.5		<0.5		<0.5			2		3,974
2001	4,064	<0.5		<0.5		<0.5			6		4,070
2002	1,978								3		1,982
2003	4,118	<0.5							1		4,120
2004	4,878	<0.5		<0.5		<0.5	<0.5		2		4,880
2005	3,668			<0.5		<0.5			1		3,670
2006	3,869	<0.5		<0.5		<0.5	<0.5				3,869

Source: PacFIN, extracted August 24, 2007.
Additional processing info:
Only fish tickets where at least 1 lb of albacore was landed for the albacore surface hook-and-line (troll and baitboat) fishery were used.
Landings in lbs are converted to round weight in mt by multiplying the landed weights by the conversion factors in each fish ticket line and then dividing by 2204.6.
Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–36. Commercial landings (round mt) of the albacore surface hook-and-line (troll and baitboat) fishery in Washington, 1981–2006.

Year	Albacore	Other Tunas	Swordfish	HMS Sharks	Dorado	Groundfish	Coastal Pelagics	Crab	Salmon	Other	Total
1981	875				N.A.	1			9		885
1982	266				N.A.						266
1983	530				N.A.	1			4		535
1984	67				N.A.						67
1985	172				N.A.						172
1986	845				N.A.						845
1987	529				N.A.						529
1988	1,900		1		N.A.	<0.5	<0.5		<0.5		1,902
1989	855				N.A.	<0.5					855
1990	1,225				N.A.						1,225
1991	428	<0.5			N.A.	<0.5			<0.5		428
1992	1,864	<0.5			N.A.	<0.5					1,864
1993	2,167		1	<0.5	N.A.	<0.5			<0.5		2,169
1994	5,377				N.A.						5,377
1995	3,413		<0.5		N.A.				1		3,414
1996	4,969				N.A.						4,969
1997	3,775				N.A.	<0.5					3,775
1998	6,530				N.A.						6,530
1999	2,081	12			N.A.						2,093
2000	3,185				N.A.						3,185
2001	4,158	1			N.A.	1			<0.5		4,160
2002	5,358				N.A.	<0.5			1		5,359
2003	10,793				N.A.				<0.5		10,793
2004	8,310				N.A.						8,310
2005	4,904				N.A.				1		4,905
2006	8,677				N.A.						8,677

Source: PacFIN, extracted August 24, 2007.

Additional processing info:

Only fish tickets where at least 1 lb of albacore was landed for the albacore surface hook-and-line (troll and baitboat) fishery were used.

Landings in lbs are converted to round weight in mt by multiplying the landed weights by the conversion factors in each fish ticket line and then dividing by 2204.6.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–37. Commercial catch and effort fishery statistics for the U.S. South Pacific albacore troll fishery, 1986-2006.

Fishing Season	No. Trips	Catch (mt)	No. Days	No. Vessels
1986-1987	16	751	565	7
1987-1988	91	3,558	3,163	43
1988-1989	80	3,239	3,749	43
1989-1990	76	3,995	3,537	39
1990-1991	78	5,221	6,996	56
1991-1992	65	3,097	6,867	55
1992-1993	45	1,036	4,687	44
1993-1994	17	2,236	3,848	14
1994-1995	29	1,953	1,894	21
1995-1996	55	1,964	4,145	53
1996-1997	26	1,617	3,063	26
1997-1998	38	1,701	5,384	36
1998-1999	24	1,241	2,505	21
1999-2000	39	2,562	4,957	36
2000-2001	39	2,128	6,377	33
2001-2002	12	1,218	3,602	12
2002-2003	14	1,678	2,286	14
2003-2004	12	995	1,487	11
2004-2005	8	725	1,494	8
2005-2006	10	601	1,266	8

Source: Coan and Childers, SWFSC, August 9, 2007.

Note 1: Total catches for the U.S. South Pacific albacore troll fishery may include catch from catch from November and December of the previous year.

Note 2: Total catches for seasons before 1996-97 may contain catch from non-U.S. vessels.

Table 4–38. Percentages of commercial catch and effort by fishing areas for U.S. albacore troll vessels, 1981–2006.

	Catch				Effort			
Year	U.S. EEZ	Canada EEZ	High-Seas	Total	U.S. EEZ	Canada EEZ	High-Seas	Total
1981	52	0	48	100	63	1	36	100
1982	37	0	63	100	46	0	54	100
1983	46	1	53	100	60	2	38	100
1984	35	0	65	100	51	0	49	100
1985	49	0	51	100	52	0	48	100
1986	22	0	78	100	44	0	56	100
1987	73	0	27	100	70	0	30	100
1988	91	1	8	100	91	2	7	100
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	62	1	37	100	61	2	37	100
2000	65	<1	35	100	64	<1	36	100
2001	54	<1	46	100	63	1	36	100
2002	60	2	38	100	69	2	29	100
2003	81	1	18	100	83	1	16	100
2004	93	1	6	100	88	2	10	100
2005	92	2	6	100	89	3	8	100
2006	82	1	17	100	89	1	10	100

Source: Childers and Wallace, SWFSC, August 8, 2007.

Note: Data are from voluntary logbooks through 2004 with trip coverage rates of 8-40% per year.

Table 4–39. Number of vessels with West Coast commercial HMS landings by fishery (HMS gear & species), 1981-2006.

Year	Albacore Surface Hook-and-Line	Swordfish & HMS Shark Drift Gillnet[1]	Any Species Harpoon[2]	HMS Species Longline	HMS Tuna Purse Seine[3]	Any HMS Fishery
1981	1837	130	190	27	135	2170
1982	761	130	162	28	124	1113
1983	1629	121	93	19	111	1887
1984	1126	103	114	14	78	1310
1985	792	97	101	12	53	994
1986	419	64	114	6	51	621
1987	486	36	101	8	47	655
1988	532	6	84	14	43	671
1989	338	*	45	4	38	422
1990	368		52	5	33	453
1991	172	12	33	13	18	240
1992	610	19	48	20	29	704
1993	609	74	42	12	26	725
1994	716	151	51	44	25	904
1995	477	134	43	36	22	657
1996	728	132	31	29	23	872
1997	1202	121	32	52	34	1349
1998	868	113	30	70	33	1022
1999	829	97	33	53	14	925
2000	761	91	36	70	16	893
2001	980	82	25	56	15	1074
2002	736	63	32	36	4	829
2003	889	54	35	41	3	976
2004	780	45	29	40	11	877
2005	599	45	25	9	8	664
2006	632	44	25	19	*	706

* Not reported due to data confidentiality requirements (fewer than three vessels).

Source: PacFIN, extracted June 13-14, 2007.

[1]There is no drift gillnet gear for Washington. Significant swordfish and shark landings by drift gillnet gear prior to 1994 have been mis-assigned to California entangling net, trammel net, several trawl, encircling net, set gillnet and unknown gears, and therefore are not reported here.

[2]Only California has harpoon landings. 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.

[3]There is no purse seine gear for Washington.

Additional processing info:

Only fish tickets where at least 1 lb of albacore was landed for the albacore surface hook-and-line (troll and baitboat) fishery were used.

Only fish tickets where at least 1 lb of swordfish or any HMS shark was landed for the drift gillnet fishery were used.

Only fish tickets where at least 1 lb of any highly migratory species (except striped marlin) was landed for the longline fishery were used.

Only fish tickets where at least 1 lb of any HMS tuna was landed for the purse seine fishery were used.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–40. Number of vessels with commercial HMS landings in California by fishery (HMS gear & species), 1981-2006.

Year	Albacore Surface Hook-and-Line	Swordfish & HMS Shark Drift Gillnet[1]	Any Species Harpoon[2]	HMS Species Longline	HMS Tuna Purse Seine	Any HMS Fishery
1981	1310	130	190	27	135	1646
1982	602	130	162	28	124	954
1983	1243	121	93	19	111	1501
1984	993	103	114	14	78	1178
1985	724	*	101	6	53	919
1986	344	35	114	*	51	525
1987	289	16	101	*	47	445
1988	149	*	84	*	43	286
1989	180	*	45	4	38	264
1990	103		52	5	33	189
1991	76	12	33	*	18	143
1992	139	19	48	*	29	237
1993	202	74	42	12	26	319
1994	271	151	51	44	25	466
1995	137	134	43	36	22	331
1996	290	132	31	*	23	439
1997	612	121	32	52	34	768
1998	382	112	30	*	33	550
1999	446	95	33	53	14	544
2000	349	*	36	*	16	483
2001	474	82	25	*	15	571
2002	321	63	32	*	4	416
2003	325	*	35	41	*	416
2004	191	*	29	*	11	291
2005	97	45	25	9	8	169
2006	79	44	25	19	*	160

* Not reported due to data confidentiality requirements (fewer than three vessels).

Source: PacFIN, extracted June 13-14, 2007.

[1]Significant swordfish and shark landings by drift gillnet gear prior to 1994 have been mis-assigned to California entangling net, trammel net, several trawl, encircling net, set gillnet and unknown gears, and therefore are not reported here.

[2]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.

Additional processing info:

Only fish tickets where at least 1 lb of albacore was landed for the albacore surface hook-and-line (troll and baitboat) fishery were used.

Only fish tickets where at least 1 lb of swordfish or any HMS shark was landed for the drift gillnet fishery were used.

Only fish tickets where at least 1 lb of any highly migratory species (except striped marlin) was landed for the longline fishery were used.

Only fish tickets where at least 1 lb of any HMS tuna was landed for the purse seine fishery were used.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–41. Number of vessels with commercial HMS landings in Oregon by fishery (HMS gear & species), 1981-2006.

Year	Albacore Surface Hook-and-Line	Swordfish & HMS Shark Drift Gillnet	HMS Species Pelagic Longline	HMS Tuna Purse Seine	Any HMS Fishery
1981	681				681
1982	192				192
1983	407				407
1984	177				177
1985	89	*			*
1986	90	33			122
1987	170	20	*		187
1988	262	*			*
1989	134				134
1990	211				211
1991	71				71
1992	352				352
1993	367				367
1994	326				326
1995	230	3			231
1996	385	3			385
1997	498	4			499
1998	373	6			374
1999	309	4			309
2000	375	*			*
2001	473		*		*
2002	269				269
2003	385	*		*	*
2004	450	*			*
2005	383				383
2006	366				366

* Not reported due to data confidentiality requirements (fewer than three vessels).

Source: PacFIN, extracted June 13-14, 2007.

Additional processing info:

Only fish tickets where at least 1 lb of albacore was landed for the albacore surface hook-and-line (troll and baitboat) fishery were used.

Only fish tickets where at least 1 lb of swordfish or any HMS shark was landed for the drift gillnet fishery were used.

Only fish tickets where at least 1 lb of any highly migratory species (except striped marlin) was landed for the pelagic longline fishery were used.

Only fish tickets where at least 1 lb of any HMS tuna was landed for the purse seine fishery were used.

Aquaculture fish ticket/fish ticket line info is excluded.

Table 4–42. Number of vessels with commercial HMS landings in Washington by fishery (HMS gear & species), 1981-2006.

Year	Albacore Surface Hook-and-Line	HMS Species Longline	Any HMS Fishery
1981	251		251
1982	61		61
1983	157		157
1984	45		45
1985	32	6	38
1986	47	*	*
1987	89	*	*
1988	222	*	*
1989	77		77
1990	103		103
1991	42	*	*
1992	229	*	*
1993	207		207
1994	263		263
1995	206		206
1996	216	*	*
1997	249		249
1998	220	*	*
1999	189		189
2000	179	*	*
2001	205	*	*
2002	241	*	*
2003	325		325
2004	301	*	*
2005	225		225
2006	312		312

* Not reported due to data confidentiality requirements (fewer than three vessels).

Source: PacFIN, extracted June 13, 2007.

Additional processing info:

Only fish tickets where at least 1 lb of albacore was landed for the albacore surface hook-and-line (troll and baitboat) fishery were used.

Only fish tickets where at least 1 lb of any highly migratory species (except striped marlin) was landed for the longline fishery were used.

Aquaculture fish ticket/fish ticket line info is excluded.

4.2 Recreational Fisheries

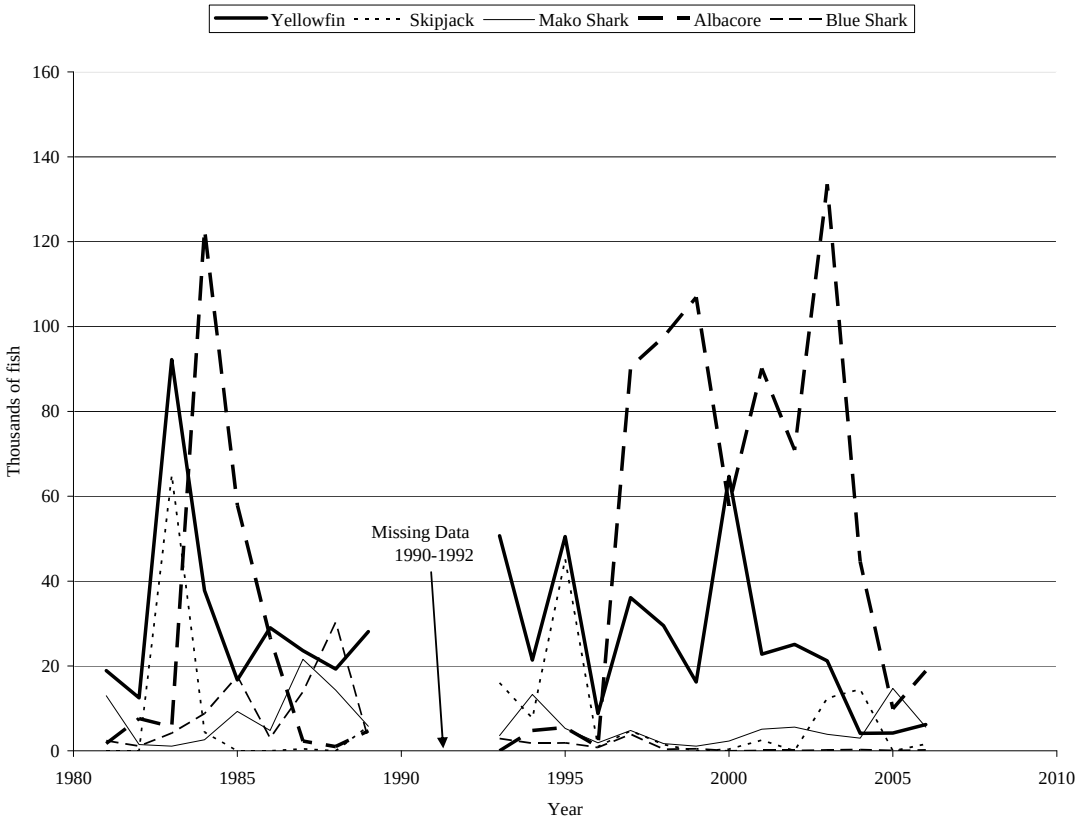

Figure 4–12. Catches by species (thousands of fish) for the West Coast recreational private sport fishing fleet, 1981–2006.

Interpretation: Figure 4–12 shows West Coast recreational private sport fishing fleet HMS catches by species, in thousands of fish. Table 4–43 shows the numeric values, with added columns for species representing negligible shares of the overall catch (bluefin tuna, bigeye tuna, marlin, common thresher shark, and dorado).

The principal species targeted are the tunas, with albacore and yellowfin comprising the most important components of the number of fish caught, with albacore representing the largest share of overall private sport fishing boat catch in 2006. Skipjack tuna was next most important historically, although it appears to represent a declining share of recent catch. Mako shark was the most important shark species included in the HMS private boat catch in 2006.

Source and Calculations: The data were extracted from RecFIN. The data represent thousands of fish caught for each species. Tables were created for each species by requesting "examined" and "dead" catch types (RecFIN codes A + B1) summed across the range of waves within each year from 1981 through 2006, then copied to a Microsoft Excel notebook where they were compiled. The primary source for the data was the Marine Recreational Fisheries Statistics Survey (MRFSS) survey for years through 2003 and CRFS for 2004–06. MRFSS and CRFS data are generally not comparable due to different sampling methodologies. Blank table entries represent missing values (including the years 1990–92 for which no data is available). No catch records were available in RecFIN for swordfish or dorado. Data for 2003–06 are preliminary and may be incomplete.

Table 4–43. Catches by species (thousands of fish) for the West Coast recreational private sport fishing fleet, 1981–2006.

Year	Yellowfin	Skipjack	Bluefin	Albacore	Bigeye Tuna	Marlin	Mako	Common Thresher	Blue Shark	Dorado
1981	18.9			1.7			13.0		2.4	
1982	13			7.6	2.5	0.8	1.5	2.2	1.1	
1983	92.2	65.0	0.6	5.7	0.6	0.4	1.1	2.4	4.2	4.7
1984	37.8	4.4	0.6	123.0	0.6	1.2	2.6	0.8	8.8	4.5
1985	16.7			57.9		0.7	9.3	0.4	17.6	
1986	29.0			26.7			4.8	1.4	3.0	
1987	23.6	0.5		2.3		0.9	21.6	4.8	13.9	
1988	19.3			1.0		0.8	14.3	0.9	30.3	
1989	28.1	5.8		4.7			5.8	0.8	2.6	
1990										
1991										
1992										
1993	50.7	16.0		0.0		0.3	3.6	2.6	2.9	6.2
1994	21.4	7.7		4.8		0.4	13.3	3.6	1.8	1
1995	50.5	45.2		5.5		0.3	5.3	2.7	1.9	
1996	8.8	1.0		1.0			1.9	0.7	0.8	2.7
1997	36.1	4.7		90.5		0.4	4.8	0.5	3.9	19.8
1998	29.5	1.5	1.6	97.5			1.7	0.6	0.4	11.1
1999	16.2			106.9			1.1	1.3	0.5	1.1
2000	64.7	0.4		57.9	0.4		2.3	1.7	0.0	61
2001	22.8	2.5	1.0	90.1			5.1	2.2	0.1	
2002	25.1		0.9	70.9			5.6	1.6	0.1	0.2
2003	21.2	12.4		133.5	0.2		3.9	2.0	0.2	0.2
2004	4.1	14.5	0.1	44.6	0.0	0.0	3.0	4.5	0.3	3.2
2005	4.2	0.0	0.2	9.9		0.0	14.7	0.4	0.1	0.2
2006	6.2	1.6	0.1	18.8		0.0	5.6	0.4	0.2	21

Source: RecFin (extracted August 2007)

No private recreational vessel catch data were available for the years from 1990-1992.

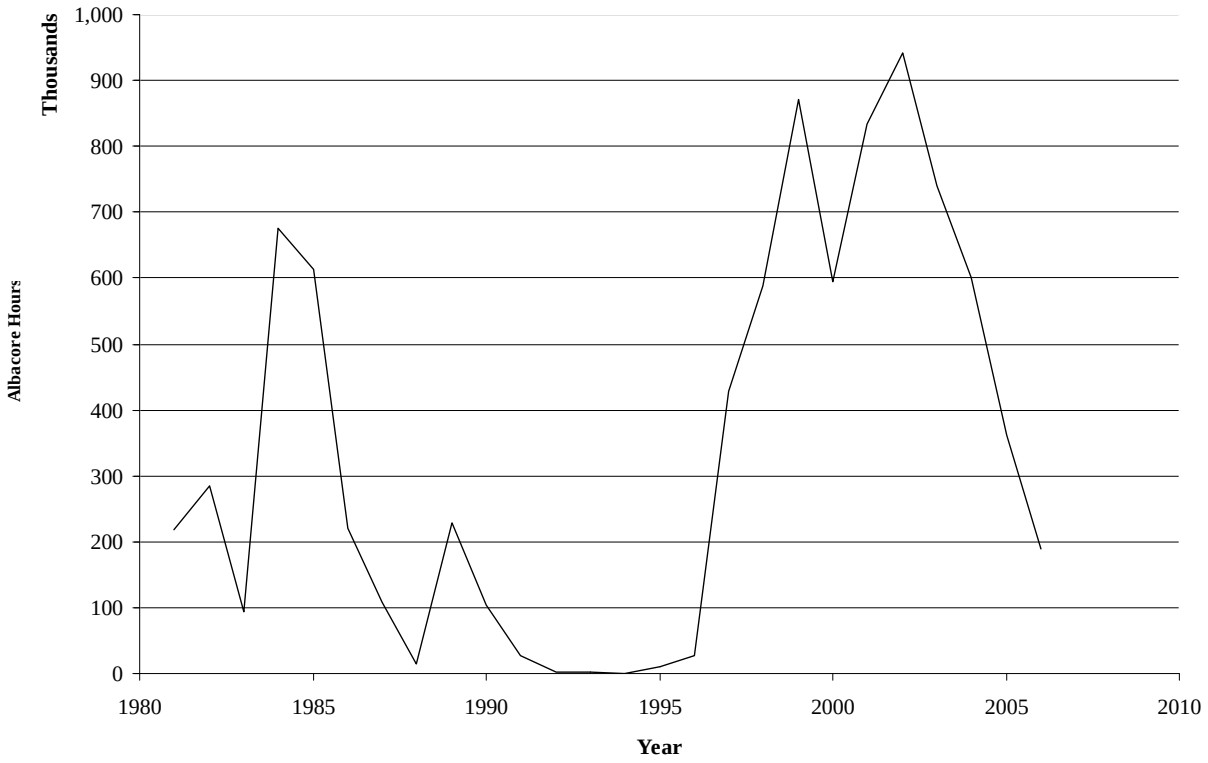

Figure 4–13. Albacore fishing hours for the California CPFV fleet, 1981–2006.

Interpretation: Figure 4–13 shows the total number of recorded hours of albacore fishing time for passengers on boats in the CPFV fleet for each year from 1981–2006. Table 4–44 shows the numeric values which are displayed in the graph. The fishing time shows a wide range of variation over the period, from a low of 891 hours in 1994 to a high of 942,626 hours in 2002, with a steady decline from 2002 through 2006.

Source and Calculations: The data were extracted from the CPFV logbook database, by selecting on trip logs with market code indicating albacore was caught. For the selected records, albacore hours were computed as number of fishing hours multiplied by the number of passengers. The computed albacore hours were summarized in a Microsoft Excel notebook to produce the data shown in the graph above and in the table below.

Table 4–44. Albacore fishing hours for the California CPFV fleet, 1981–2006.

Year	Albacore Hours
1981	219,274
1982	284,584
1983	94,051
1984	675,921
1985	614,060
1986	219,414
1987	108,287
1988	14,775
1989	227,960
1990	103,158
1991	26,487
1992	2,248
1993	1,458
1994	891
1995	10,464
1996	26,380
1997	428,852
1998	589,374
1999	871,013
2000	595,624
2001	834,407
2002	942,626
2003	739,622
2004	600,482
2005	361,734
2006	189,244

Source: CPFV Logbook Database.

Extracted August 8, 2007.

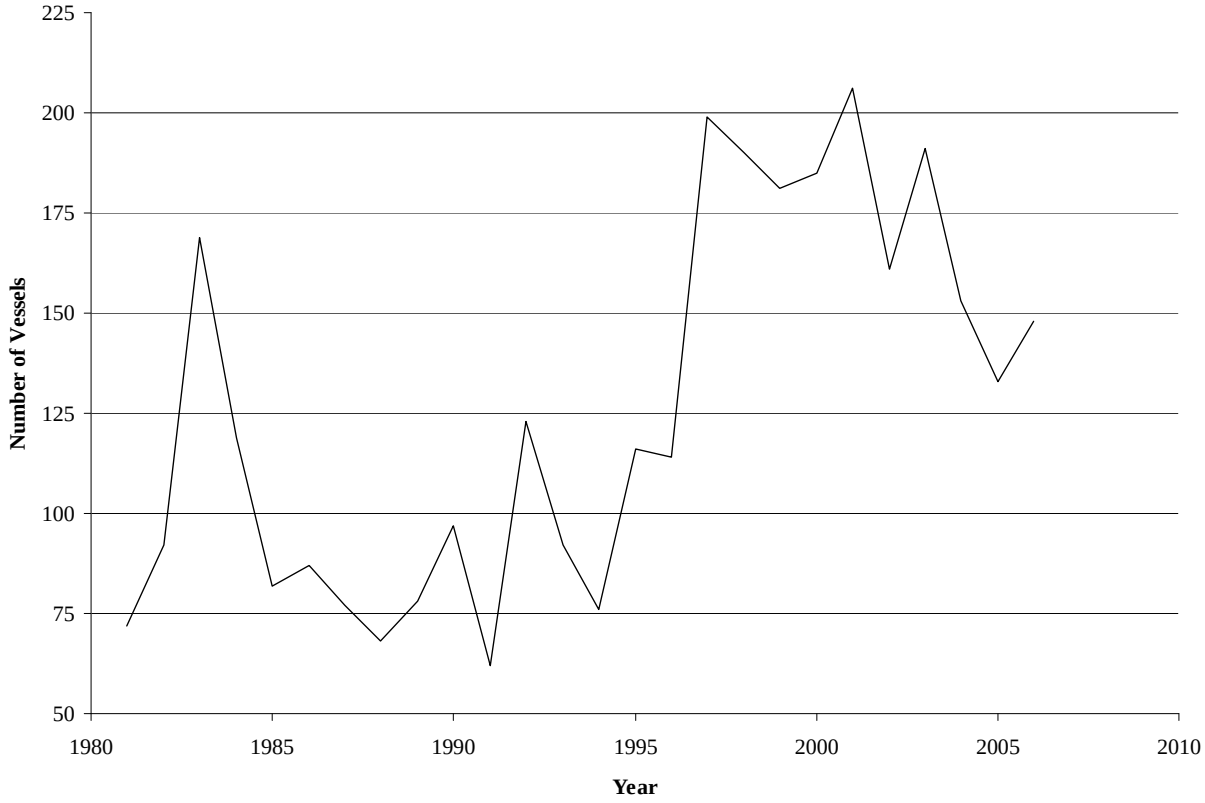

Figure 4–14. Number of vessels targeting HMS in California waters, 1981–2006.

Interpretation: Figure 4–14 shows the number of vessels in the California CPFV fleet which targeted HMS in California waters within each year from 1981 through 2006. The accompanying Table 4–45 displays the numeric values.

The number of vessels targeting HMS in California waters peaked at 206 in 2001 before falling off to a recent level near 150 vessels.

Source and Calculations: The data were extracted from the CPFV logbook database. The raw data were copied to a Microsoft Excel notebook where they were tabulated and graphed.

Table 4–45. Number of vessels targeting HMS in California waters, 1981–2006.

Year	Vessels
1981	72
1982	92
1983	169
1984	119
1985	82
1986	87
1987	77
1988	68
1989	78
1990	97
1991	62
1992	123
1993	92
1994	76
1995	116
1996	114
1997	199
1998	190
1999	181
2000	185
2001	206
2002	161
2003	191
2004	153
2005	133
2006	148

Source: CPFV Logbook Database.

Extracted August 8, 2007.

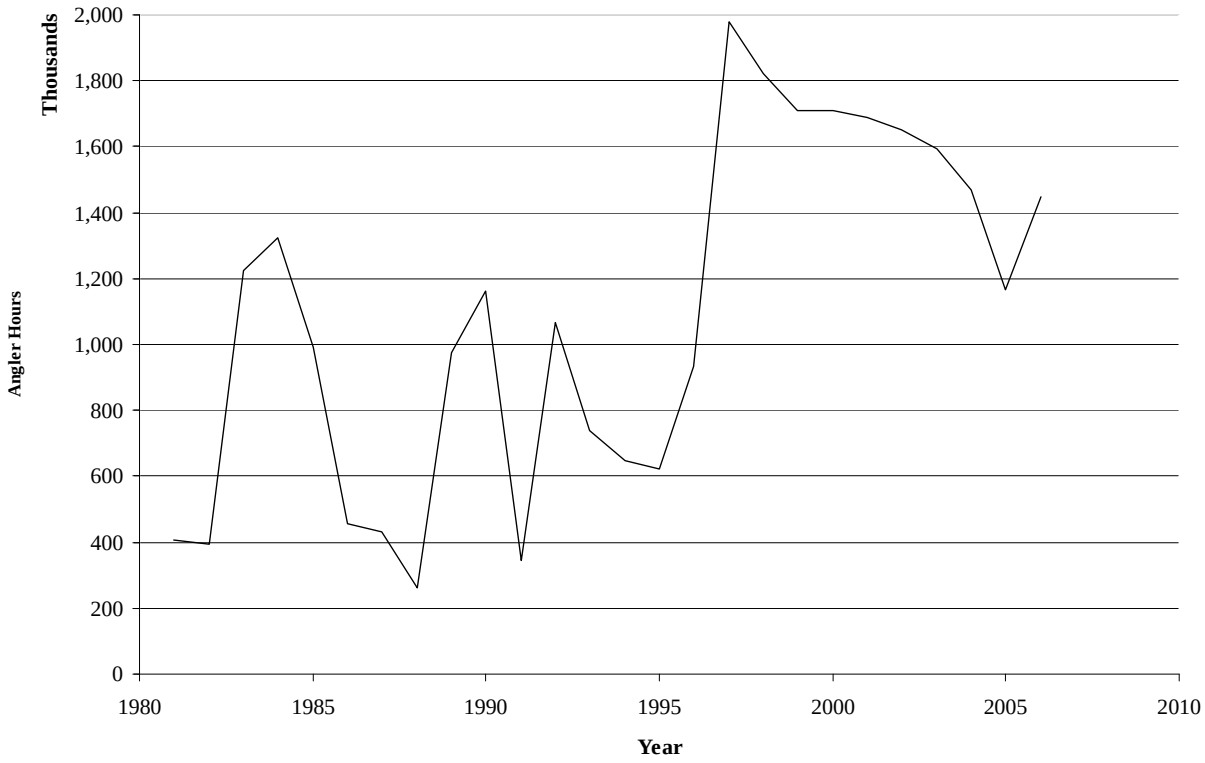

Figure 4–15. Number of angler hours for the California CPFV Fleet, 1981–2006.

Interpretation: Figure 4–15 shows the number of angler hours for the California CPFV fleet which targeted HMS in each year from 1981 to 2006. Table 4–46 displays the numeric values.

The number of angler hours shows a sizable amount of annual variation, from as low as 263,433 in 1988 to as high as 1,978,722 in 1997. Since 1997, the number of angler hours has gradually declined to a recent level below 1.5 million hours.

Source and Calculations: The data were extracted from the CPFV logbook database. The raw data were copied to a Microsoft Excel notebook where they were tabulated and graphed.

Table 4–46. Number of angler hours for the California CPFV Fleet, 1981–2006.

Year	Angler Hours
1981	405,035
1982	393,176
1983	1,224,248
1984	1,324,407
1985	991,618
1986	458,373
1987	430,448
1988	263,433
1989	975,309
1990	1,162,097
1991	343,925
1992	1,068,365
1993	739,969
1994	646,909
1995	622,048
1996	935,102
1997	1,978,722
1998	1,820,244
1999	1,708,357
2000	1,709,667
2001	1,688,049
2002	1,650,525
2003	1,591,377
2004	1,470,493
2005	1,166,333
2006	1,446,130

Source: CPFV Logbook Database.
Extracted August 8, 2007.

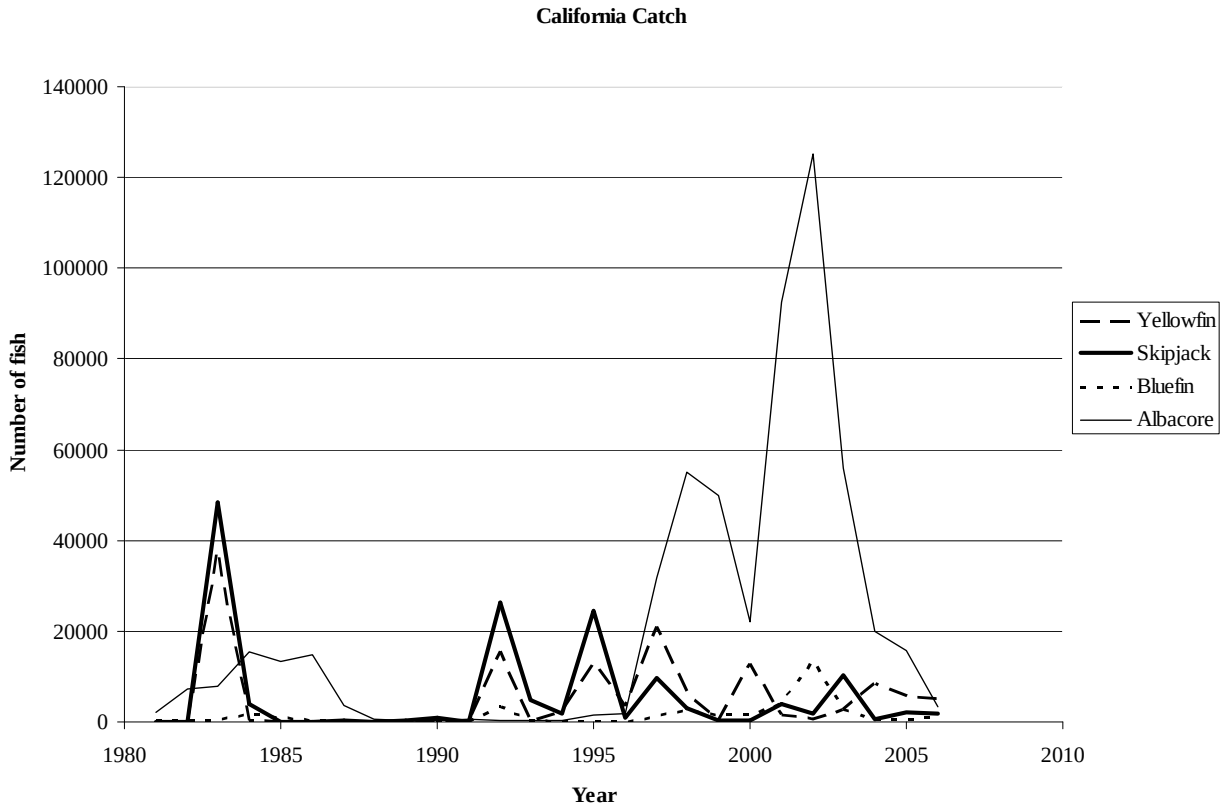

Figure 4–16. Catch by species for the California CPFV fleet in California waters, 1981–2006.

Interpretation: Figure 4–16 shows California CPFV fleet HMS catches by species which were caught in California waters. The graph only displays the four most important constituents of the catch, which are all tuna species.

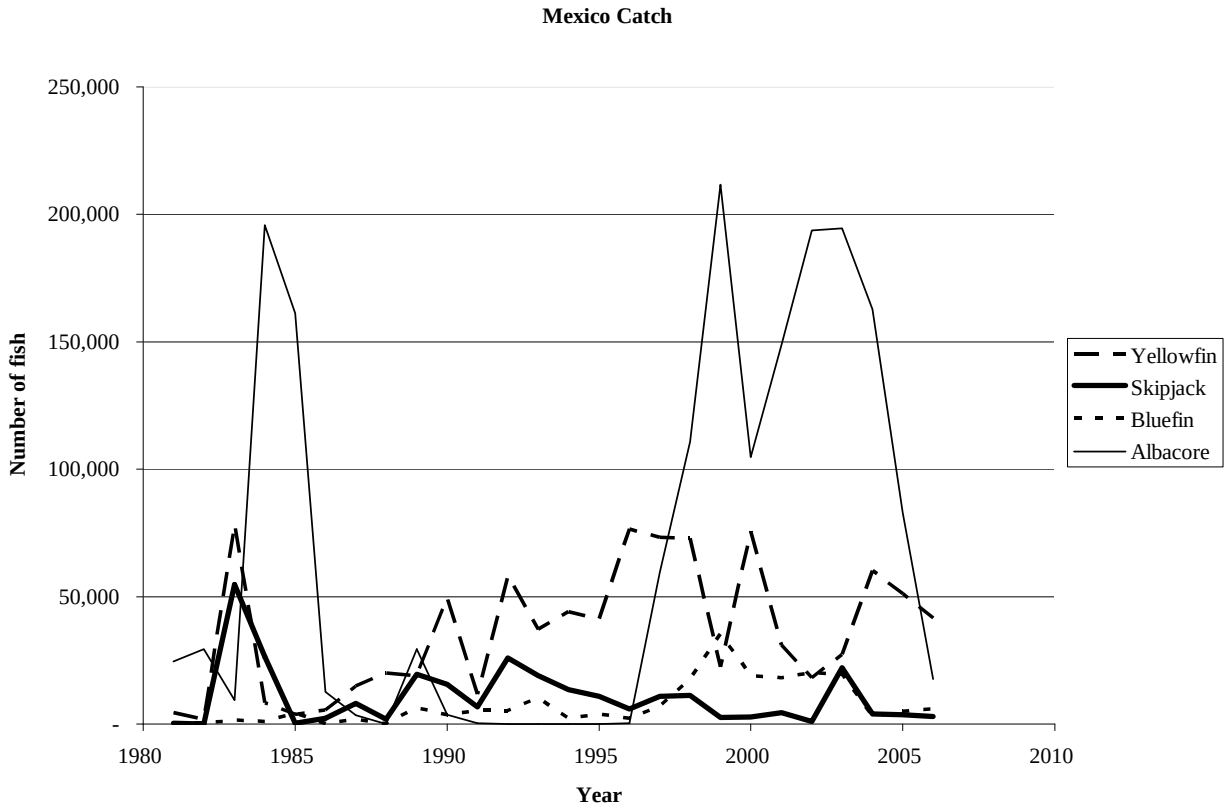

Figure 4–17. Catch by species for the California CPFV fleet in Mexico waters, 1981–2006.

Interpretation: Figure 4–17 shows California CPFV fleet HMS catches by species which were caught in Mexico waters. The graph only displays the four most important constituents of the catch, which are all tuna species.

Table 4–47, shown below, displays the numeric values, with added columns for species representing negligible shares of the overall catch (bluefin tuna, bigeye tuna, marlin, thresher shark, and dorado). The table additionally displays catch data for California CPFVs fishing in Mexican waters. For several species (e.g., dorado and the tunas), recent catch in Mexican waters far exceeds that taken in U.S. waters for the CPFV fleet.

The principal species targeted are the tunas, with albacore of increasing importance relative to other species of tuna in recent years. Blue shark was the most important shark species of the late 1980s, but has steeply declined as a share of the catch in recent periods.

Source and Calculations: The data were extracted from the CPFV logbook database. Blank table entries represent year / species combinations for which no catch was recorded.

Table 4–47. Catch by species for the California Commercial Passenger Fishing Vessel fleet in California and Mexico waters, 1981–2006.

Year	Yellowfin	Skipjack	Bluefin	Albacore	Bigeye	Swordfish	Marlin	Mako	Thresher	Blue Shark	Dorado
California											
1981	81	17	419	2127	25		37	34	7	100	35
1982	129	8	392	7352	9		13	18	36	83	
1983	37816	48254	443	7833	176		28	28	136	22	1258
1984	421	3993	1765	15527	26	2	9	49	16	35	527
1985	43	40	850	13309	10		7	18	30	19	5
1986			443	14706	37		13	58	13	217	11
1987	1	167	5	3580	7		8	296	15	645	
1988	9	2	147	547	2	2	2	115	29	882	1
1989	17	165	88	367	2		7	302	46	4469	1
1990	216	1008	198	275	5		7	231	78	2675	7147
1991	60	18		741			1	129	50	5802	
1992	15457	26326	3325	379	7		12	130	29	1109	1912
1993	73	4743	316	393		3	1	297	176	694	707
1994	2285	1797	10	171			5	269	30	497	64
1995	13015	24541	100	1554	1		7	144	62	494	12
1996	3349	1045	84	1825			5	235	32	439	353
1997	20782	9569	1354	31685	32		12	356	47	500	5635
1998	6339	3162	2828	55065	27		6	150	28	94	378
1999	230	171	1623	49954	14		1	70	47	150	392
2000	12786	190	1562	22150	60		2	83	41	149	4343
2001	1385	4080	3829	92519	2	1		193	17	140	755
2002	509	1817	13245	125138	2	2	2	189	11	15	298
2003	2788	10363	2859	56004				79	29	47	74
2004	8330	735	483	20092	63	2	1	250	20	6	671
2005	5630	2224	723	15748	2		4	121	24	26	673
2006	5255	1735	1349	3365	4	3	2	177	33	18	11312
Mexico											
1981	4,478	418	123	24,521	217	1	30	3		1	1,246
1982	1,906	24	273	29,338	129		20	8		2	1,099
1983	78,482	54,786	1,469	9,328	2,077		37	1		6	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	1,357
1986	5,505	2,249	250	12,616	1,478		30	8		2	1,855
1987	14,796	8,038	1,946	3,466	628		160	8		6	3,518
1988	20,056	1,896	183	12	426		132	17		62	3,348
1989	19,059	19,571	6,431	29,361	42		33	8	1	6	2,340
1990	49,524	15,523	3,558	3,568	2,191		101	12		2	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	1	20,815
1993	37,069	19,080	10,219		46		29	11		1	8,245
1994	43,999	13,513	2,233		15		37	17		4	5,151
1995	41,271	10,904	3,963	1	27		18	17		10	3,971
1996	76,511	5,791	2,230	346	132		16	53	1	55	24,284
1997	73,326	10,804	6,983	59,520	253		12	19	2	32	24,162
1998	72,952	11,298	17,597	110,823	1,939	3	11	34		88	6,372
1999	22,418	2,632	35,174	211,663	1,092	1	2	27		72	3,745
2000	75,660	2,834	19,044	104,738	503		1	36		9	12,101
2001	30,924	4,564	18,055	148,957	9			49		72	3,448
2002	18,085	1,113	20,139	193,655	6		1	24			2,409
2003	27,267	22,189	19,487	194,501	60	2	4	37			3,143
2004	60,095	3,933	2,877	162,719	400		3	54			7,668
2005	51,186	3,682	5,025	82,863	37		14	41			5,981
2006	41,587	2,894	6,014	17,655	7		13	65		7	34,674

Extracted from CPFV logbook data base August 8, 2007

4.3 Information and Sources

Table 4–48. PacFIN species codes used to extract commercial fisheries data for this HMS SAFE report.

AGID	CATEGORY	SPID	MGRP[1]	DESCRIPTION
C	5	ALBC	HMSP	TUNA, ALBACORE
O	375	ALBC	HMSP	TUNA, ALBACORE
W	101	ALBC	HMSP	ALBACORE TUNA THUNNUS ALALUNGA
C	1	YTNA	HMSP	TUNA, YELLOWFIN
O	376	YTNA	HMSP	TUNA, YELLOWFIN
C	2	STNA	HMSP	TUNA, SKIPJACK
O	372	STNA	HMSP	TUNA, SKIPJACK
W	104	STNA	HMSP	SKIPJACK TUNA
C	8	ETNA	HMSP	TUNA, BIGEYE
O	377	ETNA	HMSP	TUNA, BIGEYE
C	4	BTNA	HMSP	TUNA, BLUEFIN
O	378	BTNA	HMSP	TUNA, BLUEFIN
W	102	BTNA	HMSP	BLUEFIN TUNA (THUNNUS THYNNUS)
C	6	UTNA	HMSP	TUNA, UNSPECIFIED
C	91	SWRD	HMSP	SWORDFISH
O	385	SWRD	HMSP	SWORDFISH
W	106	SWRD	HMSP	SWORDFISH XIPHIAS GLADIUS
C	155	TSRK	HMSP	SHARK, COMMON THRESHER
O	023	TSRK	HMSP	SHARK, THRESHER
W	287	TSRK	HMSP	THRESHER SHARK ALOPIUS VULPINUS
W	387	TSRK	HMSP	THRESHER SHARK (REDUCTION) ALOPIUS VULPINUS
W	487	TSRK	HMSP	THRESHER SHARK (ANIMAL FOOD) ALOPIUS VULPINUS
C	98	PSRK	HMSP	SHARK, PELAGIC THRESHER
C	97	ISRK	HMSP	SHARK, BIGEYE THRESHER
C	151	MAKO	HMSP	SHARK, BONITO (MAKO)
O	026	MAKO	HMSP	SHARK, SHORTFIN MAKO
C	167	BSRK	HMSP	SHARK, BLUE
O	031	BSRK	HMSP	SHARK, BLUE
W	282	BSRK	HMSP	BLUE SHARK PRIONACE GLAUCA
W	382	BSRK	HMSP	BLUE SHARK (REDUCTION) PRIONACE GLAUCA
W	482	BSRK	HMSP	BLUE SHARK (ANIMAL FOOD) PRIONACE GLAUCA
C	481	DRDO	HMSP	DOLPHINFISH
O	292	DRDO	HMSP	DOLPHINFISH

AGID = agency id (C=CDFG, O=ODFW, W=WDFW)
CATEGORY = state species character code
SPID = PacFIN species ID
MGRP = PacFIN species management group
DESCRIPTION = state species description

[1]PacFIN species codes in the HMSP management group that are not used include:

C	92	MRLN	HMSP	MARLIN, STRIPED
O	388	MRLN	HMSP	MARLIN, STRIPED

Table 4–49. PacFIN gear codes used to extract commercial fisheries data for this HMS SAFE report.

AGID	GEAR	GRID	GRGROUP	DESCRIPTION
SURFACE HOOK AND LINE (ALBACORE)				
C	001	POL	HKL	HOOK AND LINE
C	002	POL	HKL	LIVE BAIT
C	006	POL	HKL	JIG (ALBACORE)
C	007	TRL	TLS	TROLL (ALBACORE)
C	009	TRL	TLS	TROLL, (SALMON)
O	120	TRL	TLS	OCEAN TROLL
O	170	POL	HKL	TUNA BAITBOAT
W	41	TRL	TLS	TROLL (SALMON)
DRIFT GILLNET (SWORDFISH & SHARK)				
C	065	DGN	NET	GILL NET, DRIFT
O	140	GLN	NET	OCEAN GILLNET
HARPOON				
C	012	OTH	MSC	HARPOON/SPEAR
PURSE SEINE (TUNA)				
C	070	SEN	NET	ENCIRCLING NETS
C	071	SEN	NET	PURSE SEINE
C	073	SEN	NET	DRUM PURSE SEINE
C	075	SEN	NET	LAMPARA NET
O	160	SEN	NET	TUNA SEINE
LONGLINE (HMS)				
C	005	LGL	HKL	LONG LINE, SET
O	150	LGL	HKL	PELAGIC LONGLINE
W	43	LGL	HKL	SET LINE/LONG LINE

AGID = agency id (C=CDFG, O=ODFW, W=WDFW)
GEAR = state gear character code
GRID = PacFIN gear ID
GRGROUP = PacFIN gear group
DESCRIPTION = state gear description

5.0 UPDATED STATUS OF THE HIGHLY MIGRATORY SPECIES MANAGEMENT UNIT SPECIES

This chapter contains a brief review of the stock status for each species with respect to the Council-adopted Control Rules. First (Section 5**.1**), the adopted Control Rules and the Status Determination Criteria are summarized. Secondly (Section 5**.2**), a table of the recent and upcoming assessment efforts of various international scientific bodies responsible for assessing several of the stocks is presented. The third section (Section 5**.3**) contains selected excerpts from the results of stock assessments conducted in 2006. These excerpts are taken directly from executive summaries of the assessments or reports of working group meetings associated with the assessments and do not necessarily represent the conclusions of the Council's HMS Management Team or NMFS. In many cases there has been minimal outside review of the assessment. Nevertheless, the excerpts represent the most recent available information for those species to compare to past and future work. A table summarizes the current stock status of the management unit species with respect to overfishing and overfished criteria. The conclusions presented in the table should be reasonably accurate, but should also be treated 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" (i.e., comparing assessment estimates to actual population counts) will never be possible over the broad range occupied by HMS species. Furthermore, for most of these species, the scientific bodies developing the assessments have not agreed upon an appropriate biological reference point for use in the context of managing fisheries. Therefore, explicit definitions for both overfished and sustainable exploitation levels are not currently available. Finally, a fourth section (Section 5.**4**) has been included this year which provides some information on assessments which have already been produced in 2007 but may not yet be endorsed by the plenary bodies of the respective RFMOs. This information is provided so that readers can access the most recent publicly available assessments of the management unit species. However, keep in mind that these assessment results are preliminary until endorsed by the respective RFMOs and published in final form. These assessments will be reported on in the 2007 HMS SAFE Report.

5.1 Control Rules for Management

The Control Rules and Status Determination Criteria implemented in the HMS FMP are based on the Technical Guidance for National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act (Restrepo, et al. 1998). The following is a summary of the Control Rules for Management adopted for the HMS FMP.

In general, a default maximum sustainable yield (MSY) control rule was adopted for most MUS, with an optimum yield (OY) target control rule for the vulnerable species (Figure 5–1).

For the less vulnerable species managed under the MSY Control Rule, the minimum stock size threshold (MSST), 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 (fishing mortality) is reduced to zero (to the extent possible).

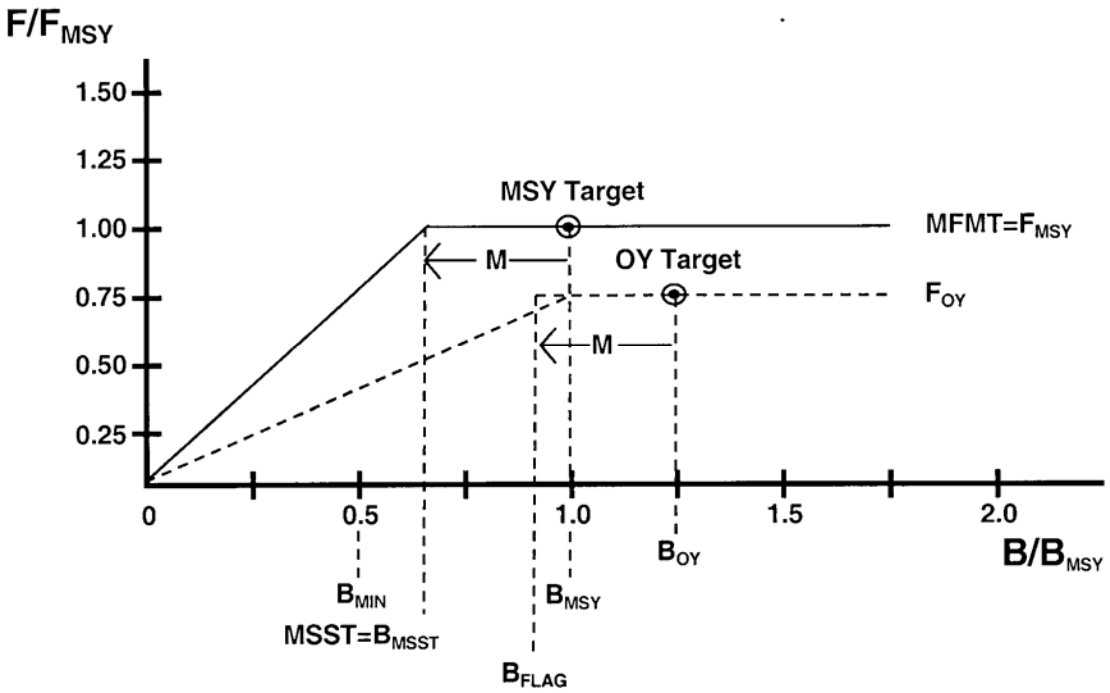

Figure 5–1. General model of MSY and OY Control Rules, from Restrepo, et al. 1998.

For the vulnerable species, which in this FMP includes the pelagic sharks, bluefin tuna, and striped marlin, 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). 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 (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) on average. In this FMP, the OY for vulnerable species is set at 0.75MSY (or MSY proxy), and any harvest guideline is set equal to OY.

Rebuilding of overfished stocks is a unilateral requirement by the Magnuson-Stevens Act, but 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.

5.2 Recent and Projected Assessment Schedule

Species (Stock)	Date (Next Anticipated)	Organization Responsible for the Assessment
TUNAS		
Albacore (NPO)	2004 (2007)	North Pacific Albacore Workshop (ISC)
Bluefin (NPO)	2006 (2008)	ISC (ISC)
Bigeye (EPO)	2006 (2007)	IATTC (IATTC)
Bigeye (WCPO)	2006 (2008)	WCPFC (WCPFC)
Skipjack (EPO)	2004	IATTC (IATTC)
Skipjack (WCPO)	2005	WCPFC (WCPFC)
Yellowfin (EPO)	2006 (2007)	IATTC (IATTC)
Yellowfin (WCPO)	2006 (2007)	WCPFC (WCPFC)
BILLFISHES		
Striped Marlin (EPO)	2003	IATTC
Striped Marlin (NPO)	2006 (2007)	ISC (ISC)
Swordfish (SEPO)	2006	IATTC
Swordfish (NPO)	2004 (2009)	ISC (ISC)
SHARKS		
Common Thresher (WA/OR/CA EEZ)	2001	NMFS
Pelagic Thresher		
Bigeye Thresher		
Shortfin Mako		
Blue (NPO)	2001 (2008)	NMFS and NRIFSF Japan (NMFS and NRIFSF Japan)
OTHER		
Dorado (EPO)		

Note: Text in parentheses indicates the year the next assessment is anticipated and the organization expected to conduct the assessment. The acronyms listed in this table are defined in Section 8.0.

5.3 Conclusions from 2006 Pacific HMS stock assessments

5.3.1 Bluefin Tuna

5.3.1.1 Bluefin Tuna (NPO)

An updated assessment of bluefin tuna in the North Pacific Ocean (NPO) was conducted by the Pacific Bluefin Tuna Working Group of the ISC in January, 2006 and presented at the ISC Plenary meeting in March, 2006. There is considerable uncertainty in the assessment and the results are considered provisional. Nonetheless, the results are the best available information on the status of northern bluefin tuna. Below is a summary of the results excerpted from the Report of the Working Group.

From ISC, 2006a.

The assessment was conducted with a VPA model using the ADAPT framework, and six CPUE indices were used to tune the estimates of terminal year F (fishing mortality) for ages 1, 3, 6 and 9. The unstandardized CPUE for the EPO was used, rather than the standardized catch per unit of effort (CPUE) index which was developed during the meeting. The program used in the study was also developed to handle the discontinuous CPUE series and to give confidence intervals on the point estimates through bootstrap simulation. The VPA was conducted with data from the period 1952-2004.

The VPA analysis showed that the total biomass shows decadal changes from the level of 60,000 mt to the level of 160,000 mt. Recent total biomass recovered from the historical low level in late 1980s, and seems to be stable at or above the level of around 100,000 mt. The SSB trend was roughly similar with that of total biomass. Historical lower levels appeared in 1970 and 1985. The SSB recovered around 40–50 thousand mt in 1995 from lower levels in mid 1980s, then decreased to the level of 30 thousand mt in 2002, which is about the middle level of SSB through the period analyzed.

The fishing mortalities of ages 0 and 1 in 1990s were higher than those in 1980s. The current fishing mortalities of fish older than age 5 were estimated to increase to the level of early 1980s from the lower level of early 1990s. The strong year cohort observed in 1994 did not substantially contribute to prevent SSB from declining from a peak at that time to the current level because of the recent high fishing mortality of juvenile.

The yield per recruitment analysis showed that the magnitude of fishing mortality in each decade has been two times higher than F_{MAX} during the analysis period since 1952. However, recruitment overfishing does not seem to have occurred. Although the highest historical recruitment in 2001 would maintain biomass above the level of the current biomass by 2010 based on the future projection run, continuous careful monitoring of the stock is necessary to keep the stock sustainable, considering the lower reliability of the most recent years in the VPA estimates.

Despite the efforts of this working group, the stock assessment still involves large uncertainties, including lack of precise information on numbers at length, catch, and reliable abundance indices in earlier time periods, and uncertainty about age and growth of larger fish. Therefore the stock condition from the 1950s to the 1980s is uncertain. Nevertheless, results from the multiple models converged to some common conclusions: biomass has local peaks in the late 1970s and late 1990s, with decline after the second peak. Recruitment in recent decades has largely fluctuated, and the 2001 year class appears to be strong. We have no evidence of recruitment failure in recent years.

Outlook for the stock in the short term depends upon the contribution to the total biomass of the 2001 year class, which might be poorly estimated. Despite this, if fishing mortality remains at the current level, the strong 2001 year class may maintain spawning biomass above the current level by 2010. However, if the fishing mortality increases by 20 percent, the spawning biomass can drop below the current biomass, even with the strong 2001 year cohort. Therefore the working group recommends not increasing the fishing mortality any more. There remain other uncertainties such as age and growth, which can affect the outlook of the stock. Careful and continuous monitoring of the fisheries, and directed research, are necessary to obtain more precise assessments of the outlook of the stock and appropriate reference points.

5.3.2 Bigeye Tuna

5.3.2.1 Bigeye Tuna (EPO)

An updated assessment of bigeye tuna in the EPO was conducted by the IATTC in May, 2006. Below is a summary of the results excerpted from the IATTC Fishery Status Report No. 4.

From IATTC, 2006.

An age-structured catch-at-length analysis, A-SCALA, was used to assess bigeye tuna in the eastern Pacific Ocean (EPO). The stock assessment details are available on the IATTC web site, www.iattc.org.

Bigeye are distributed across the Pacific Ocean, but the bulk of the catch is made to the east and to the west. Purse-seine catches of bigeye tuna are substantially lower close to the western boundary (150º W

longitude) of the EPO; longline catches are more continuous, but show lower levels between 160º W longitude and 180º longitude. Bigeye tuna do not show large movements (95 percent of tagged bigeye showed net movements of less than 1,000 nautical miles), and current information indicates little exchange between the eastern and western Pacific Ocean. This is consistent with the fact that longline CPUE trends differ among areas. It is likely that there is a continuous stock throughout the Pacific Ocean, with exchange of individuals at a local level. The assessment reported here is conducted as if there were a single stock in the EPO. Its results are consistent with results of other analyses of bigeye tuna on a Pacific-wide basis. In addition, analyses have shown that the results are insensitive to the spatial structure of the analysis. Currently, there are not enough tagging data to provide adequate estimates of movement between the eastern and western Pacific.

Several inputs into the latest assessment differ from that for 2004. Recent catch and effort data have been incorporated. Earlier data have been updated.

There are several important features in the estimated time series of bigeye recruitment. First, estimates of recruitment before 1993 are very uncertain, as the floating-object fisheries, which catch small bigeye, were not operating. There was a period of above-average recruitment in 1995–98, followed by a period of below-average recruitment in 1999–2000. The recruitments were above average in 2001 and 2002. The most recent recruitment is very uncertain, due to the fact that recently-recruited bigeye are represented in only a few length-frequency data sets. The extended period of relatively large recruitments in 1995 to 1998 coincided with the expansion of the fisheries that catch bigeye in association with floating objects.

The biomass of bigeye in the EPO has been declining since 1987, initially because of the impact of longline fishing and, since 1993, purse seining, which now has a greater impact. The decline was interrupted by strong recruitment during 1995–98, which produced a peak biomass in 2000, and (with less certainty) strong recruitment during 2004 and 2005.

At the beginning of 2006, the spawning biomass of bigeye tuna in the EPO was recovering from the lowest level previously seen. At that time the spawning biomass ratio (the ratio of current spawning biomass to biomass of spawners in the absence of fishing mortality; SBR) was estimated to be slightly less than the level corresponding to the AMSY (SBR_{AMSY}), with a confidence interval (±2 standard deviations) overlapping the SBR_{AMSY}.

Estimates of the average SBR projected to occur during 2006–11 indicate that the SBR is likely to increase to the level corresponding to the AMSY and subsequently continue its decline unless fishing mortality is greatly reduced.

The average weight of fish in the catch of all fisheries combined declined substantially in 1993 and 1994, and has remained at that lower level since then. The recent age-specific pattern of fishing mortality is not satisfactory from a yield-per-recruit perspective.

In the base case assessment, recent catches are estimated to have been at about the level corresponding to the AMSY. If fishing mortality is proportional to fishing effort, and the current patterns of age-specific selectivity are maintained, the level of fishing effort corresponding to the AMSY is about 69 percent of the recent (2003–04) level of effort. Decreasing the effort to 69 percent of its present level would increase the long-term average yield by about 5 percent and would increase the spawning potential of the stock by about 75 percent. The AMSY of bigeye in the EPO could be maximized if the age-specific selectivity pattern were similar to that for the longline fishery that operates south of 15° N latitude because it catches larger individuals. Before the expansion of the floating-object fishery that started in 1993, AMSY was greater than the current AMSY and the fishing mortality was less than that

corresponding to AMSY.

Several sensitivity analyses were performed that investigated incorporating a stock-recruitment relationship in the assessment and changing the average maximum length of bigeye.

All analyses considered, except one with a low maximum length, suggested that at the start of 2006 the spawning biomass was below the level corresponding to the AMSY. AMSY and the fishing mortality (F) multiplier are sensitive to how the assessment model is parameterized, the data that are included in the assessment, and the periods assumed to represent average fishing mortality, but under all but one of the scenarios considered, fishing mortality is well above the level corresponding to the AMSY.

The estimates of recruitment and biomass were not sensitive to the steepness of the stock-recruitment relationship. The current status and future projections are considerably more pessimistic, in terms of stock status relative to the levels that support AMSY, if a stock-recruitment relationship ($h = 0.75$) exists.

The effects of Resolution C-04-09 are insufficient to maintain the stock at levels that will permit the AMSY. If the effort is reduced to levels corresponding to AMSY, the stock will rebuild to SBR_{AMSY} by 2007 and remain above that until 2011.

Summary:

1. Recent fishing mortality levels are nearly 50 percent greater than those corresponding to the AMSY.
2. As a consequence, if fishing effort is not reduced, total biomass and spawning biomass will eventually decline to levels at least as low as that observed in 2004.
3. The current status and future projections are considerably more pessimistic in terms of stock status if a stock-recruitment relationship ($h = 0.75$) exists.
4. These conclusions are robust to all but one alternative model and data formulations considered in this and previous analyses.

5.3.2.2 Bigeye Tuna (WCPO)

An updated assessment of bigeye tuna in the Western and Central Pacific Ocean (WCPO) was conducted by the WCPFC's Scientific Committee in July, 2006. Below is a summary of the results excerpted from the Working Paper prepared for the Scientific Committee meeting.

From Hampton, et al., 2006a.

The assessment uses the stock assessment model and computer software known as MULTIFAN-CL. The bigeye tuna model is age (40 age-classes) and spatially structured (six regions) and the catch, effort, size composition and tagging data used in the model are classified by 20 fisheries and quarterly time periods from 1952 through 2005.

The catch, size, and tagging data used in the assessment were the same as those used last year, with the exception that additional recent fishery data (2004 for longline, 2004 for Philippines and Indonesia, 2005 for purse seine) were included. It should be noted that 2005 data are not complete for some fisheries. The estimation of standardized effort for the main longline fisheries used the GLM approach similar to the 2005 assessment, with a minor refinement to the method for scaling indices of abundance among regions. Other refinements to the conversion of length to weight and processed weight to whole weight were included in the assessment.

The sensitivity of the assessment model to the relative weighting applied to size-frequency data was investigated through changing the effective sample size applied to the size-frequency data. The impact of a key structural assumption in the model was investigated through a reconfiguration of the spatial stratification of the model with the inclusion of an additional region (seven-region model).

In summary, the sensitivity analyses carried out were:

LOWSAMP Six-region spatial stratification, general linear model standardised effort for "main" longline fisheries, *M*-at-age assumed at fixed levels, lower effective sample size applied to the length and weight frequency samples.

HIGHSAMP Six-region spatial stratification, general linear model standardised effort for "main" longline fisheries, *M*-at-age assumed at fixed levels, higher effective sample size applied to the length and weight frequency samples. This analysis approximates the base-case model run (GLM-MFIX) from the 2005 assessment. The only significant difference is the parameterisation of the selectivity functions for the principal longline fisheries — allowing a decline in the selectivity for the oldest age classes.

7REGION Seven-region spatial stratification, general linear model standardised effort for "main" longline fisheries, *M*-at-age assumed at fixed levels, lower effective sample size applied to the length and weight frequency samples.

The main conclusions of the current assessment are as follows:

1. Recruitment in all analyses is estimated to have increased since about 1980. This result was very similar to that for the 2005 assessment. However, while the seven-region model exhibits a comparable temporal trend in recruitment, the recent increase in recruitment is less pronounced as the recruitment in region 3 represents a smaller proportion of the total recruitment. The overall magnitude of recruitment is considerably higher for the seven-region model than for the six-region model.

2. For the three analyses, total biomass for the WCPO is estimated to have declined to about half of its initial level by about 1970 and has been fairly stable or subject to slight decline since then. Adult biomass has declined by about 20 percent over the last decade.

3. The biomass trends in the model are strongly driven by the time-series of catch and GLM standardised effort from the principal longline fisheries. For some of the main longline fisheries, there is an apparent inconsistency between the trends in the size-frequency data and the trends in longline catch and effort; i.e., the two types of data are providing inconsistent information about the relative level of fishing mortality in the region. The LOWSAMP model was adopted as the base case because it was considered that the catch and effort data are more informative than the size-frequency data in the estimation of trends in fishing mortality. However, further research is required to explore the relationship between longline CPUE and bigeye abundance and the methodology applied to standardize the longline CPUE data, particularly to account for temporal trends in fishing efficiency. The latter issue was examined by way of a sensitivity analysis in the 2005 assessment and shown to be highly influential in the conclusions of the assessment.

4. Fishing mortality for adult and juvenile bigeye tuna is estimated to have increased continuously since the beginning of industrial tuna fishing. For the two models with lower effective sample sizes (LOWSAMP and 7REGION), fishing mortality on adult bigeye is relatively comparable to that for juvenile bigeye, whereas, the HIGHSAMP model predicts a higher level of exploitation on the adult

component of the stock.

5. The ratios $B_t / B_{t,F=0}$ provide a time-series index of population depletion by the fisheries. Overall, depletion is estimated to have been rapid, particularly since the mid-1980s. Even though the estimated total biomass has remained fairly stable since 1970, it appears to have been sustained only by above average recruitment. If recruitment were to return to the average level estimated in this assessment, biomass decline would be rapid, as suggested by the stock projections. The current level of biomass is 28 percent of the unexploited level ($B_{current} / B_{current,F=0}$ = 0.28) for the six-region models and 44 percent for the 7REGION model. Depletion is more extreme for some individual model regions, notably region 3 (recent $B_t / B_{t,F=0}$ ratios around 0.20 in the base-case model) and region 4 (0.25). Other regions are less depleted, with recent $B_t / B_{t,F=0}$ ratios of around 0.4 or greater.

6. The attribution of depletion to various fisheries or groups of fisheries indicates that the longline fishery has the greatest impact throughout the model domain. The purse seine and Philippines/Indonesian domestic fisheries also have substantial impact in region 3 and to a lesser extent in region 4.

7. The reference points that predict the status of the stock under equilibrium conditions are $\tilde{B}_{F_{current}} / \tilde{B}_{MSY}$ and $S\tilde{B}_{F_{current}} / S\tilde{B}_{MSY}$. For the six-region models, these ratios are 0.79 and 0.68, respectively, indicating that the long-term average biomass would fall below that capable of producing *MSY* at 2001−04 average fishing mortality. For all analyses undertaken in this assessment, current biomass exceeds the biomass yielding *MSY* ($B_{current} / \tilde{B}_{MSY}$ > 1.0) with a high probability; i.e., **the bigeye stock in the WCPO is not in an overfished state** due to above average recruitment. However, biomass levels in recent years have been declining under increasing levels of fishing mortality, and the probability of the stock becoming overfished is increasing over time.

8. The estimate of $F_{current} / \tilde{F}_{MSY}$ reveals that **overfishing of bigeye is occurring in the WCPO** with high probability. While the stock is not yet in an overfished state ($B_{current} / \tilde{B}_{MSY}$ > 1), further biomass decline is likely to occur at 2001−04 levels of fishing mortality at long-term average levels of recruitment.

9. Stock projections for 2006–15 — that attempt to simulate the conservation and management measures adopted at WCPFC2 — indicate that $B_t / \tilde{B}_{MSYfinal}$ falls below 1.0 under long-term average recruitment with high probability but remains above 1.0 if 1995–2004 average recruitment is assumed to continue throughout the projection period. The projections based on long-term average recruitment indicate a strong shift in the spatial distribution of biomass with continued depletion occurring in the equatorial regions due to constant high longline catches.

10. At the request of the Commission (IATTC), various levels of purse seine effort reduction (which could be implemented by time closures) were investigated using stock projections. The projections indicated that, under assumed long-term average recruitment and maintenance of non-purse seine fisheries at 2004 catch/effort levels, a purse seine effort reduction (closure) of 75 percent would be required to maintain biomass above $\tilde{B}_{MSYfinal}$ for the 10-year projection period.

11. The 7REGION model provides a more optimistic assessment of the status of the stock than the base-

case model, although the probability of $F_{current} / \tilde{F}_{MSY} > 1$ (overfishing) is still significant (49 percent). However, because of the lack of a reliable index of abundance since the late-1980s and weak data generally for the additional region (western tropical Pacific incorporating Philippines and Indonesia), we do not have sufficient confidence in the 7REGION model to use it as the main management advisory model at this time. Subject to further model testing and the incorporation of improved data from the western tropical region, it may be possible in the future to adopt the 7REGION model structure for the assessment.

5.3.3 Yellowfin Tuna

5.3.3.1 Yellowfin Tuna (EPO)

An updated assessment of yellowfin tuna in the EPO was conducted by the IATTC in May, 2006. Below is a summary of the results excerpted from the IATTC Fishery Status Report No. 4.

From IATTC, 2006.

An age-structured, catch-at-length analysis (A-SCALA) was used to assess yellowfin tuna in the eastern Pacific Ocean (EPO). The stock assessment details are available on the IATTC web site, www.iattc.org.

The assessment reported here is based on the assumption that there is a single stock of yellowfin tuna in the EPO. Yellowfin are distributed across the Pacific Ocean, but the bulk of the catch is made to the east and to the west. Purse-seine catches of yellowfin tuna are lower close to the western boundary (150º W longitude) of the EPO. The movements of tagged yellowfin tuna are generally over hundreds, rather than thousands, of kilometers, and exchange between the eastern and western Pacific Ocean appears to be limited. This is consistent with the fact that the longline CPUE trends differ among areas. It is likely that there is a continuous stock throughout the Pacific Ocean, with exchange of individuals at a local level, although there is some genetic evidence for local isolation. Movement rates between the EPO and the western Pacific could not be estimated with currently-available tagging data.

The stock assessment requires a substantial amount of information. This includes data on retained catch, discards, fishing effort, and the size compositions of the catches from several different fisheries. Assumptions have been made about processes such as growth, recruitment, movement, natural mortality, fishing mortality, and stock structure. Several inputs into the latest assessment differ from that for 2004. Recent catch and effort data (2005 for purse-seine and 2004 for most of the longline catches) have been incorporated. Earlier data have been updated.

Significant levels of fishing mortality have been observed in the yellowfin tuna fishery in the EPO. These levels are highest for middle-aged yellowfin. Both recruitment and exploitation have had substantial impacts on the yellowfin biomass trajectory. Most of the yellowfin catch is taken by catching schools associated with dolphins, and, accordingly, this fishery has the greatest impact on the yellowfin tuna population, although it has almost the least impact per weight captured of all fisheries. It appears that the yellowfin population has experienced two different productivity regimes (1975–83 and 1984–2005), with greater recruitment during the second regime. The two recruitment regimes correspond to two regimes in biomass, the high-recruitment regime corresponding to greater biomasses. The spawning biomass ratio (the ratio of the current spawning biomass to that for the unfished stock; SBR) of yellowfin in the EPO was below the level that would permit the average maximum sustainable yields (AMSYs) during the low-recruitment regime, but close to that level during the high-recruitment regime. The two different productivity regimes may support two different levels of AMSY and associated SBRs, and the AMSY reported here is an average for the 1975–2005 period.

The current SBR is above the SBR level at AMSY. However, there is substantial uncertainty in the most recent estimate of SBR, and there is a moderate probability that the current SBR is below the level that would support the AMSY. The effort levels are estimated to be about those capable of supporting the AMSY (based on the recent [2003–04] distribution of effort among the different fisheries). Future projections under the current effort levels and average recruitment indicate that the population will remain at approximately the same level over the next 5 years. These simulations were carried out using the average recruitment for the 1975–2005 period. Both the purse-seine and longline catches are expected to remain, on average, close to 2005 levels.

AMSY has been stable during the assessment period, which suggests that the overall pattern of selectivity has not varied a great deal through time.

The analysis indicates that strong cohorts entered the fishery in 1998–2000, and that these cohorts increased the size of the spawning stock during 1999-2001. However, they have now moved through the population, so the size of the spawning stock decreased during 2002–05.

The overall average weights of yellowfin tuna that are caught have consistently been much less than those that would maximize the AMSY, indicating that, from the yield-per-recruit standpoint, the yellowfin in the EPO are not harvested at the optimal size. There is substantial variability in the average weights of the yellowfin taken by the different fisheries, however. In general, the floating-object, unassociated, and pole-and-line fisheries capture younger, smaller fish than do the dolphin-associated and longline fisheries. The longline fisheries and the purse-seine sets in the southern area on yellowfin associated with dolphins capture older, larger yellowfin than do the coastal and northern dolphin-associated fisheries. The AMSY calculations indicate that the yield levels could be increased if the fishing effort were diverted to the fisheries that catch larger yellowfin, or would be diminished if fishing effort were diverted to catching smaller fish. Any such changes would also affect the SBR levels in a similar way.

The conservation measures imposed in 2004 under Resolution C-04-09 are predicted to maintain the stock at about the AMSY level, slightly higher than would otherwise have been the case.

Catches during the first quarter of 2006 have been markedly less than those of the same period in 2004 and 2005. The estimates of the stock size in 2005 and 2006 are similar in both the base case and the sensitivity analysis with a stock-recruitment relationship. The most likely cause of lesser catches is a decline in catchability.

A sensitivity analysis was carried out to estimate the effect of a stock-recruitment relationship and alternative average maximum lengths of yellowfin. The results suggest that the model with a stock-recruitment relationship fits the data slightly better than the base case, but this result could also be explained by the regime shift, since spawning biomass is low during the period of low recruitment and high during that of high recruitment. The results from the analysis with a stock-recruitment relationship are more pessimistic, suggesting that the effort level is greater than that which would produce the AMSY. The spawning stock is estimated to have been less than the biomass that would permit the AMSY for most of the modeling period, except during 2000–02.

Summary

1. The biomass is estimated to have declined very slightly in 2005.
2. There is uncertainty about recent and future recruitment and biomass levels.

3. The estimate of current SBR is above that required to permit AMSY, but its confidence interval encompasses the AMSY.
4. The recent fishing mortality rates are about those required to produce AMSY.
5. Increasing the average weight of the yellowfin caught could substantially increase AMSY.
6. There have been two different productivity regimes, and the levels of AMSY and the biomass required to produce AMSY may differ between the regimes.
7. The results are more pessimistic if a stock-recruitment relationship is assumed.

5.3.3.2 Yellowfin Tuna (WCPO)

An updated assessment of yellowfin tuna in the WCPO was conducted by the WCPFC's Scientific Committee in July, 2006. Below is a summary of the results excerpted from the Working Paper prepared for the Scientific Committee meeting.

From Hampton, et al., 2006b.

The assessment uses the stock assessment model and computer software known as MULTIFAN-CL. The yellowfin tuna model is age (28 age-classes) and spatially structured (six regions) and the catch, effort, size composition and tagging data used in the model are classified by 19 fisheries and quarterly time periods from 1952 through 2005.

The catch, size, and tagging data used in the assessment were the same as those used last year, with the exception that additional recent fishery data (2004 for longline, 2004 for Philippines and Indonesia, 2005 for purse seine) were included. It should be noted that 2005 data are not complete for some fisheries. The estimation of standardized effort for the main longline fisheries used the GLM approach similar to the 2005 assessment, with a minor refinement to the method for scaling indices of abundance among regions. Other refinements to the conversion of length to weight and processed weight to whole weight were included in the assessment.

The sensitivity of the assessment model to the relative weighting applied to size-frequency data was investigated through changing the effective sample size applied to the size-frequency data. The impact of a key structural assumption in the model was investigated through a reconfiguration of the spatial stratification of the model with the inclusion of an additional region (seven-region model).

In summary, the sensitivity analyses carried out were:

LOWSAMP Six-region spatial stratification, general linear model standardised effort for "main" longline fisheries, *M*-at-age assumed at fixed levels, lower effective sample size applied to the length and weight frequency samples.

HIGHSAMP Six-region spatial stratification, general linear model standardised effort for "main" longline fisheries, *M*-at-age assumed at fixed levels, higher effective sample size applied to the length and weight frequency samples. This analysis approximates the base-case model run (GLM-MFIX) from the 2005 assessment. The only significant difference is the parameterisation of the selectivity functions for the principal longline fisheries — allowing a decline in the selectivity for the oldest age classes.

7REGION Seven-region spatial stratification, general linear model standardised effort for "main" longline fisheries, *M*-at-age assumed at fixed levels, lower effective sample size applied

to the length and weight frequency samples.

The main conclusions of the current assessment are as follows:

1. For the three analyses, there was a strong temporal trend in recruitment. Initial recruitment was relatively high but declined to a lower level during the early 1970s. Recruitment subsequently increased during the late-1970s and remained relatively high during the 1980s and 1990s. This is a similar, albeit weaker, pattern to that obtained in previous assessments and is largely attributable to the trends in the principal longline CPUE indices, particularly from regions 3 and 4.

2. For all analyses, the trends in biomass are generally comparable prior to the mid-1980s and were consistent with the underlying trends in recruitment, with biomass declining during the initial period to a low level in the early–mid 1970s, before increasing in the mid-1970s. Biomass levels remained relatively stable during the 1980s. For all model options, biomass is estimated to have declined steadily since 1990, largely due to the decline in the biomass within region 3 but also evident in most other regions.

3. The biomass trends in the model are strongly driven by the time-series of catch and GLM standardised effort from the principal longline fisheries. For some of the main longline fisheries, there is an apparent inconsistency between the trends in the size-frequency data and the trends in longline catch and effort; i.e., the two types of data are providing inconsistent information about the relative level of fishing mortality in the region. The LOWSAMP model was adopted as the 1 base case because it was considered that the catch and effort data are more informative than the size-frequency data in the estimation of trends in fishing mortality.

4. Fishing mortality for adult and juvenile yellowfin tuna is estimated to have increased continuously since the beginning of industrial tuna fishing. A significant component of the increase in juvenile fishing mortality is attributable to the Philippines and Indonesian surface fisheries, which have the weakest catch, effort, and size data. There has been recent progress made in the acquisition of a large amount of historical length frequency data from the Philippines and these data were incorporated in the assessment. However, there is an ongoing need to improve estimates of recent and historical catch from these fisheries and maintain the current fishery monitoring program within the Philippines. Many of the key conclusions of the assessment are strongly influenced by the current assumptions regarding historical and current catches from these fisheries.

5. The ratios $B_t / B_{t,F=0}$ provide a time-series index of population depletion by the fisheries. Depletion has increased steadily over time, reaching a level of 50% of unexploited biomass (a fishery impact of 50 percent) in 2004. This represents a moderate level of stock-wide depletion that is approaching the equivalent equilibrium-based limit reference point ($\tilde{B}_{MSY} / \tilde{B}_0$ = 0.42). Further, depletion is somewhat greater for some individual model regions, notably in the equatorial region 3 where recent depletion levels are approximately 0.3 (a 70 percent reduction from the unexploited level). Other regions are less depleted, with indices of 0.8 or greater for all other regions except for region 4 (0.5). If stock-wide over-fishing criteria were applied at the level of our model regions, we would conclude that region 3 is over-exploited, region 4 is fully exploited, and the remaining regions are under-exploited.

6. The attribution of depletion to various fisheries or groups of fisheries indicates that the Indonesian fishery has the greatest impact, particularly in its home region (3) and is contributing significantly to the impact in adjacent regions 1, 4, and 5. The purse seine fishery also has a high impact in regions 3 and 4 and accounts for a significant component of the recent impacts in all other regions, except

region 6. It is notable that the composite longline fishery is responsible for biomass depletion of only 10% in the WCPO during recent years.

7. The reference points that predict the status of the stock under equilibrium conditions are $\tilde{B}_{F_{current}} / \tilde{B}_{MSY}$ (0.91) and $S\tilde{B}_{F_{current}} / S\tilde{B}_{MSY}$ (0.87), which indicate that the long-term average biomass would approximate or fall below that capable of producing *MSY* at 2001−2004 average fishing mortality. Overall, current biomass exceeds the biomass yielding *MSY* ($B_{current} / \tilde{B}_{MSY} > 1.0$); i.e., **the yellowfin stock in the WCPO is not in an overfished state**. However, biomass levels in recent years have been declining under increasing levels of fishing mortality, and the probability of the stock becoming overfished is increasing over time.

8. The estimate of $F_{current} / \tilde{F}_{MSY}$ reveals that **overfishing of yellowfin is likely to be occurring in the WCPO**. While the stock is not yet in an overfished state ($B_{current} / \tilde{B}_{MSY} > 1$), further biomass decline is likely to occur at 2001−04 levels of fishing mortality.

9. Stock projections for 2006–10 — that attempt to simulate the conservation and management measures adopted at WCPFC2 — indicate that the point estimate of $B_t / \tilde{B}_{MSY}$ remains above 1.0 throughout the projection period. However, the increasing uncertainty in the future projections results in a greater probability of the biomass declining below $\tilde{B}_{MSY}$ by the end of the projection period. The projections indicate a strong shift in the spatial distribution of biomass with continued depletion occurring in the equatorial regions.

10. The 7REGION model provides a slightly more optimistic assessment of the status of the stock than the base-case model, although the probability of $F_{current} / \tilde{F}_{MSY} > 1$ (overfishing) is still significant (49 percent). However, because of the lack of a reliable index of abundance since the late- 2 1980s and weak data generally for the additional region (western tropical Pacific incorporating Philippines and Indonesia), we do not have sufficient confidence in the 7REGION model to use it as the main management advisory model at this time. Subject to further model testing and the incorporation of improved data from the western tropical region, it may be possible in the future to adopt the 7REGION model structure for the assessment.

5.3.4 Striped Marlin

5.3.4.1 Striped Marlin (NPO)

Assessment modeling efforts for striped marlin in the NPO were conducted by the Marlin Working Group of the ISC in March, 2006. These were the first striped marlin assessment efforts by the ISC Working Group, and although considered provisional due to uncertainties associated with the time series and some assessment parameters, they nonetheless represent the best available information on the status of the north Pacific-wide striped marlin stock. Below is a summary of the results excerpted from the Report of the Working Group.

From ISC 2006b.

A Bayesian surplus production model was applied to striped marlin (*Tetrapturus audax*) in the North Pacific and used to estimate current and future values of stock status. This model's main strengths lie in the simplicity of its data requirements (catch data and at least one annual catch rate series) and its ability

to incorporate existing information in the form of prior probability distributions for estimated parameters. This function facilitates fitting to times series that are less informative or have incomplete catch histories. The model incorporated a catch series in number (1952–2003), and was successfully fitted to an abundance index based on GLM standardized CPUE (in number) provided in the database that resulted from the November 2005 meeting. Alternative scenarios, including one based on catch in biomass, were tested to determine the sensitivity of the results to various assumptions. Results based on the available data suggest that the current stock is between 30–40 percent the stock at maximum sustainable yield (MSY stock) and the fishing mortality rate (F), estimated at 0.13 yr-1, slightly exceeds F_{MSY}.

Another application of a production model analysis to annual catch (mt) and abundance index data of the North Pacific striped marlin stock was presented. Two data sets were applied; one was created at the striped marlin stock assessment workshop in November 2005; the other contains corrections to this database by Japan. Logistic and FOX models were fitted to these data sets using ASPIC software ver.5. This assessment indicates that North Pacific striped marlin is currently depleted. However, this result has a great deal of uncertainty because the abundance index underestimates current stock level, and the reliability of catch data is rather low. The relatively lower values (0.3–0.5) of B1/K (ratio of biomass in starting year to the initial biomass) could mainly be attributed to the fact that the trend of annual abundance index did not reflect the historical change of the stock size of the North Pacific striped marlin. The GLM model currently used in the standardization of CPUE could not fully account for the effect of high CPUE values obtained by the directed sets in the northeast Pacific during the 1960s and the 1980s. As a consequence, the current level of the stock would be underestimated. Further study on the CPUE standardization of Japanese longline vessels and availability of catch data of countries that have not submitted Category I data is necessary to obtain more clear and reliable stock assessment results.

An assessment of North Pacific striped marlin using an age-structured production model formulated within Stock Synthesis 2 was presented. A Beverton and Holt spawner recruit (S/R) relationship was assumed and recruitment was deterministic. Selectivity patterns for fisheries were estimated using proportion at length data, but the contribution of the length data to the total likelihood was down-weighted. The Japanese distant water longline fleet was the primary tuning CPUE series. The model estimates a population that declined to 10–40 percent of unfished spawning biomass by 2005. In this approach, the estimates of S/R steepness, h, and unfished recruitment were highly correlated; thus more work is necessary to eliminate these correlations. Additional uncertainty remains about the assumption of constant catchability of the CPUE data series.

The results of all models indicated that stock biomass has been reduced. For models that provide estimates of current biomass relative to starting biomass, the results indicated the population has declined to 10–45 percent of initial biomass. In contrast, "splitting" the abundance series in the mid 1970s, and assuming this represents a change in targeting, indicated a more optimistic view (current biomass above biomass at MSY). While the results of the current assessments are provisional due to a suite of unresolved issues, the MARWG recommends that fishing mortality not exceed current levels.

5.3.5 Swordfish

5.3.5.1 Swordfish (SEPO)

Based on genetic and fisheries data, there may be two stocks of swordfish in the EPO: north and south of 3º S latitude. An assessment of swordfish in the SEPO was conducted by the IATTC in May, 2006. Below is a summary of the results excerpted from the IATTC Fishery Status Report No. 4.

From IATTC 2006.

An assessment of the southern stock of swordfish in the EPO was carried out using Stock Synthesis II (SS2), version 1.23b, with the following preliminary results. The population has undergone considerable changes in biomass, and is currently at a moderate level of depletion. There is strong evidence of one or two large cohorts entering the fishery recently, but their strength is uncertain. The trend in spawning biomass ratio (SBR: the ratio of the spawning biomass of the current stock to that of the unfished stock) for this stock is estimated to have been between about 0.5 and 0.9 during the entire period of monitoring (1945–2003), and to have dipped to its lowest levels in the mid-1960s and again in the mid-1990s.

The AMSY for the southern EPO swordfish stock is about 13–14 thousand mt, and the SBR at AMSY is about 0.26. The current spawning biomass is estimated to be well above the biomass that would provide the AMSY.

The average annual catch from this stock during 1993–2000 was about 6,900 mt (range ~ 4,800–8,600 mt). Catches in recent years have been on the order of 12,000–13,000 mt, which is about the estimated AMSY catch. There have been indications of increasing efficiency at targeting of swordfish in the southern EPO, which has resulted in increased harvests of this stock. Some of the increased catch may have resulted from the above-average recruitment noted previously. It is not expected that further increases in the catch levels observed in recent years would be sustainable.

No attempts have been made to estimate the level of AMSY that could be obtained by each fishery operating exclusively. However, it is likely that the fisheries that capture younger fish (e.g., the longline fisheries of Chile, Japan, and Spain) are less efficient at maximizing yield.

5.4 Links to Information on Recent Pacific HMS Stock Assessments Through August 2007

Species (Stock)	Organization Responsible for Assessment	Link to Assessment Report
TUNAS		
Albacore (NPO)	ISC	Available at http://www.pcouncil.org/hms/hmssafe.html
Bigeye (EPO)	IATTC	http://iattc.org/IATTCandAIDCPMeetingMay07ENG.htm
Yellowfin (EPO)	IATTC	http://iattc.org/IATTCandAIDCPMeetingMay07ENG.htm
Yellowfin (WCPO)	WCPFC	http://www.wcpfc.int/sc3/pdf/WCPFC-SC3%20SA-SWG%20WP-01.pdf
BILLFISHES		
Striped Marlin (NPO)	ISC	Available at http://www.pcouncil.org/hms/hmssafe.html

Table 5-1. Recent stock status with respect to management criteria.

Note that for most of these species, the scientific bodies developing the assessments do not have a consensus biological reference point for use in the context of managing the fisheries.

Species (stock)	F_{Recent}/F_{MSY}[1]	Overfishing? ($F/F_{MSY}>1.0$)	B_{Recent}/B_{MSY}[1]	B_{MSST}/B_{MSY}	Overfished? ($B_{Recent}<B_{MSST}$)	B_{FLAG}[2] ($1.25B_{MSST}/B_{MSY}$)	Assessment
TUNAS							
Albacore (NPO)	1.02–2.26[3]	Unknown[3]	0.67–1.07[3]	0.7	Unknown[3]		Nineteenth NPALBW, Stocker 2005
Bluefin (NPO)	>1.0[4]	Unknown[4]	Unknown	0.75	Unknown	0.94	ISC 2006a
Bigeye (EPO)	1.47[5]	Y	1.10[5]	0.6	N		IATTC, Maunder and Hoyle 2006
Bigeye (WCPO)	1.32[6]	Y	1.27[6]		N		WCPFC, Hampton, et al. 2006a
Skipjack (EPO)	Unknown[7]	Unlikely[7]	Unknown[7]	0.5	Unlikely[7]		IATTC, Maunder and Harley 2004
Skipjack (WCPO)	0.17[8]	N	3.01[8]		N		WCPFC, Langley, et al. 2005
Yellowfin (EPO)	0.98[5]	N	1.0[5]	0.5	N		IATTC, Hoyle and Maunder 2006
Yellowfin (WCPO)	1.11[6]	Y	1.17[6]		N		WCPFC, Hampton, et al. 2006b
BILLFISHES							
Striped Marlin (NPO)	Unknown[9]	Unknown	Unknown	0.5	Unknown		ISC 2006b
Striped Marlin (EPO)	<1.0[10]	N	≥1.0		N	0.63	IATTC, Hinton and Maunder 2003
Swordfish (NWPO)	Unknown[11]	Unlikely	Unknown	0.61-0.8	Unlikely		ISC 2004b
Swordfish (SEPO)	Unknown[12]	Unknown	>1.0		N		IATTC, Hinton and Maunder 2006
SHARKS							
C. Thresher (CA,OR,WA)	<1.0[13]	N	~1.10	0.77	N	0.96	NMFS, PFMC HMS plan development team 2002
Pelagic Thresher	Unknown[14]	Unknown	Unknown	0.85	Unknown	1.06	
Bigeye Thresher	Unknown[15]	Unknown	Unknown	0.78	Unknown	0.97	
Shortfin Mako	<1.0[16]	N	>1.0	0.71	N	0.89	NMFS, PFMC HMS plan development team 2002
Blue	<0.5[17]	N	>1.0	0.78	N	0.97	NMFS and NRIFSF Japan, Kleiber, et al. 2001
OTHER							
Dorado	Unknown[18]	Unknown	Unknown	0.5	Unknown		

Notes:

1 Measures of F_{MSY} and B_{MSY} are not available for all species. Various proxies for these values have been used in preparing this table. However, PFMC has not adopted the use of a particular proxy; hence the designation of Overfishing and Overfished should be considered preliminary.

2 For vulnerable species managed under the OY control rule only: bluefin tuna, striped marlin, and pelagic sharks.

3 Albacore results are based on a suite of F_{MSY} proxies ($F_{40\%}$, $F_{30\%}$ and $F_{0.1}$), two estimated levels of recent fishing pressure (F=0.43 and F=0.68), and two scenarios of productivity (high R = 31 million recruits and low R = 22.5 million recruits). However, "Unknown" is indicated because of the lack of a PFMC reference point for management.

4 Bluefin analyses indicated that F has exceeded F_{Max} 2-fold during the last 2 decades. However, "Unknown" is indicated because of the lack of a PFMC reference point for management.

(Continued on next page.)

[5] EPO bigeye and EPO yellowfin results are based on base-case assessments assuming no stock-recruitment relationships.

[6] WCPO bigeye and yellowfin results are based on the base-case assessments (LOWSAMP).

[7] Because of uncertainties in the estimates of growth and natural mortality, MSY-proxy reference points could not be calculated for EPO skipjack; however, the IATTC does not consider there to be a need for management due to low fishing mortalities and high biomass estimates relative to historical levels.

[8] CWPO skipjack results are from the base-case assessment.

[9] Assessment results from three production models for NPO striped marlin are provisional, but F was shown to be slightly greater than F_{MSY} in one case and slightly lower than F_{MSY} in a second case. The ISC recommended that F not be increased.

[10] Two production models demonstrate that the EPO striped marlin population is in good condition with fishing effort and landings in decline since the early 1990s.

[11] Standardized CPUEs from swordfish fisheries indicate declining trends in the northwest Pacific; however, the fisheries are causing, at worst, modest declines in abundance.

[12] Specific values for F/F_{AMSY} and B/B_{AMSY} are not available; however the assessment results indicate that stock biomass is well above the level which would support AMSY.

[13] U.S. West Coast EEZ regional catch and CPUE demonstrated the population increasing from estimated low levels in the early 1990s. Recent (2000-03). West Coast commercial landings average 318 mt, which is less than 0.75 × MSY proxy (MSY proxy = LMSY from the Population Growth Rate method).

[14] Status unknown, but catches are incidental and occur on the edge of the species' range, predominately during warm water years.

[15] Status unknown, but catches are incidental and occur on the edge of the species' range.

[16] Tentative results based on commercial landings and CPUE calculations. Recent (2000–03) West Coast commercial landings average 70 mt, which is less than 0.75 × MSY proxy (MSY proxy = average landings 1981–99).

[17] Analyses demonstrated that for north Pacific blue shark, fishing pressure is 2 to 15 times below F_{MSY}. West Coast catch is poorly documented because the fish are not landed.

[18] Status unknown, but dorado are highly productive and widely distributed throughout tropical/subtropical Pacific. Recent West Coast landings average 16 mt.

Table 5-2. Stockwide and regional catches for HMS management unit species (x1,000 mt round weight), 2001–05.

Species (stock)	Stockwide Catch	U.S. West Coast Catch		Average Annual Fractional Catch
		Commercial	Recreational	
TUNAS				
Albacore (NPO)	64–105[1]	9–17	0.8–2.7	0.16
Bluefin (NPO)	17–29[2]	<0.3	0.03–0.30	0.01
Bigeye (EPO)	111–132[3]	<0.1	<0.01	<0.01
Skipjack (EPO)	146–279[3]	<0.6	0.01–0.1	<0.01
Yellowfin (EPO)	282–439[3]	<0.7	0.1–0.4	<0.01
BILLFISHES				
Striped Marlin (EPO)	1.5–2.2[3]	<0.01[4]	0.02[5]	0.01
Swordfish (EPO)	13–20[3]	0.3–2.2	<0.01	0.09
SHARKS				
Common Thresher	Unknown	0.1–0.4	0.01–0.13	
Pelagic Thresher	Unknown	<0.01		
Bigeye Thresher	Unknown	≤0.01		
Shortfin Mako	Unknown	<0.03–0.08	0.05–0.25	
Blue (NPO)	Unknown	0.01–0.06[4]	<0.01	
OTHER				
Dorado	5–14[6]	<0.02	0.01–0.05	<0.01

Notes:
Data are from updated commercial (Table 4–4), CPFV (Table 4–47), and private recreational (Table 4–43) catches with weight conversions of 8.6 kg/albacore, 8.9 kg/bluefin, 10.0 kg/bigeye tuna, 3.1 kg/skipjack, 5.4 kg/yellowfin, 59 kg/striped marlin, 113 kg/swordfish, 28.1 kg/common thresher, 16.7 kg/mako, 8 kg/blue shark, and 5.3 kg/dorado.

1 International Scientific Committee Seventh Plenary Report Catch Tables, July 2007.
2 International Scientific Committee Report of the Marlin and Swordfish Working Group, April 2007.
3 IATTC catch tables extracted 9/3/07.
4 Striped marlin and blue shark commercial catches include estimates from the drift gillnet observed catch.
5 Striped marlin recreational catch is estimated at 300 fish/year based on club records plus CPFV logbook recorded catch.
6 FAO Area 77 catch extracted 9/3/07.

6.0 RESEARCH AND DATA NEEDS AND MONITORING REPORTS

6.1 Research and Data Needs

6.1.1 Stock Status and Distribution

There is substantial uncertainty on the status of stocks and estimates of MSY and/or 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. There is also a lack of fishery independent indexes of abundance.

Species-specific stock information needs include:

<u>All tunas</u>

- The distribution of adults in the north Pacific by season and age, including within the West Coast EEZ

<u>Albacore tuna</u>

- Whether there are multiple sub-stocks with juveniles having different migratory behaviors (i.e., juveniles from different spawning localities with different migration routes and timetables)

<u>All thresher sharks</u>

- The stock structures and boundaries of the species and relationships to other populations
- The pattern of seasonal migrations for feeding and reproduction, and where and when life stages may be vulnerable
- Aging and growth rate, including comparisons of growth rates in other areas
- Maturity and reproductive schedules

<u>Shortfin mako shark</u>

- Distribution, abundance, and size in areas to the south and west of West Coast EEZ
- Age and growth rates (current growth estimates differ widely)

<u>Blue shark</u>

- Sex and size composition of catches (unknown because of high discard rate)
- Migratory movements of maturing fish from EEZ to high seas

<u>Swordfish</u>

- Age and growth data from locally-caught fish
- Distribution by season and age within the outer portions of the EEZ and high seas

<u>Striped marlin</u>

- Age and growth data from locally caught fish
- Stock structure differences between populations to south and west of EEZ
- Season migration differences by size, age, and sex (archival tagging)

Dorado

- Stock structure of eastern Pacific population

6.1.2 Management Unit Species Catch Data

Total catch data are likely inaccurate for most HMS fisheries due to a inadquate at-sea data collection programs, logbook programs, and shoreside sampling programs for West Coast fisheries and unreported catch by international fisheries. Catch data needs include:

1. Total catch information (including incidental and bycatch) and protected species interactions for surface hook-and-line, purse seine, and recreational fisheries, and additional at-sea sampling of drift gillnet fisheries
2. Catch composition data for harpoon gear
3. Size composition of bycatch in drift gillnet fisheries
4. Condition (e.g., live, dead, good, poor) of discarded catch in all HMS fisheries

Additional work needs to be done to develop ways to adequately sample recreational fisheries, particularly shore-based anglers and private vessels. There is a need to develop methods for sampling private marinas and boat ramps to determine catch, and the level of bycatch and protected species interactions, as well as sample the catch for length and weight of fish caught to convert catches reported in numbers to catches by weight. Better catch and effort estimates are also needed for HMS recreational fishing tournaments, in particular those tournaments focusing on common thresher and mako sharks.

6.1.3 Survivability of Released Fish

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. Appropriate discard mortality rates, by species, need to be identified in order to quantify total catch (including released catch).

6.1.4 Essential Fish Habitat (EFH)

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 EFH and to identify specific habitat areas of particular concern (HAPCs), such as pupping grounds, key migratory routes, feeding areas, and where adults aggregate for reproduction. A particularly important need is to identify the pupping areas of thresher and mako sharks, which are presumed to be within the southern portion of the West Coast EEZ, judging from the occurrence of post-partum and young pups in the areas (e.g., NMFS driftnet observer data). Areas where pregnant females congregate may be sensitive to perturbation, and the aggregated females and pups there may be vulnerable to fishing. Species-specific EFH information needs include:

All tunas

- How oceanographic changes affect stock production, recruitment success, and migratory patterns
- Whether certain prey species are key for survivability and/or reproductive success

Bigeye, Skipjack, and Yellowfin tunas and dorado

- The significance of floating objects and other-species associations relative to life history

Common thresher shark

- The extent of pupping and nursery grounds off northern Mexico, and their relationship to those of southern California

Bigeye and Pelagic thresher sharks

- How the different ecologies of these species compare with that of common thresher shark

Shortfin mako shark

- Pupping areas off southern California and northern Mexico, and whether any are critical for stock health

6.1.5 Interactions with Protected Species and Prohibited Species

More complete catch information and data on interactions with protected and prohibited species are needed for most HMS fisheries. 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. These fisheries are likely affecting both protected species and prohibited species of fish.

More work is needed to better understand possible impacts of the HMS fisheries on protected species of sea turtles, birds, and marine mammals. For example, there is a need to investigate the hooking survivorship of protected species, such as turtles and seabirds that are caught as bycatch in the HMS fisheries. In addition, fisheries-independent research is required to better understand distribution and habitat use by turtles and to determine the linkages to ecosystem parameters (oceanographic and biological). This includes data on turtle migration seasonality and routes, genetic stock composition of populations by species, and habitat use in order to better understand likely periods of interaction with fisheries and turtle life histories. Development of predictive models that integrate oceanography, ecosystem parameters (e.g., prey distribution), and habitat use of turtles are needed. More work on the sizes and structures of turtle populations by species would also enable improved application of the ESA and other laws and regulations to HMS fisheries. Continued research on the abundance and distribution of marine mammals is also critical, particularly for HMS fisheries operating within the West Coast EEZ.

6.1.6 Effects of Management Measures

For sharks, the size/age groups contributing most to population growth and maintenance need to be determined by demographic studies in order to determine how best to apply management measures, such as season and area closures, and 'slot' size and appropriate daily bag 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 markets 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.

6.1.7 Economic Information

There is a general need for more and improved economic information for HMS fisheries, particularly the pelagic longline, harpoon, purse seine, and recreational fisheries.

6.2 Research Updates

The following sections summarize some, but not all, of the research projects being conducted at the NMFS Southwest Fisheries Science Center and Southwest Regional Office to study HMS MUS, fisheries, and fishery-related species. Research on other MUS not reported here is ongoing at a number of U.S. West Coast research institutions. See chapter 8 for a list of links to websites of research institutions conducting research on HMS.

6.2.1 Albacore

SWFSC scientists are working with the American Fishermen's Research Foundation (AFRF) on monitoring programs and other research efforts to improve knowledge of the biology and migration of North Pacific albacore in the waters off the U.S. Pacific Coast. The cooperative research includes a port sampling program, a voluntary logbook program which preceded the mandated logbook program instituted under the FMP, and an archival tagging program.

Port sampling: The port sampling program has been in place since 1961 for collecting size data from albacore landings made by the U.S. and Canadian troll fleets at ports along the U.S. Pacific Coast. State fishery personnel collect the biological data from Washington, Oregon and California according to sampling and data processing instructions provided by the SWFSC. A database has been developed and is maintained at the SWFSC. These data provide the basis for developing catch-at-age-matrices for the U.S. and Canada troll fisheries and are critical for stock assessment purposes.

Logbook Program: The logbook sampling program also has been in place through the AFRF since 1961. Fishermen have been voluntarily submitting their fishing records to the SWFSC for decades prior to implementation of the HMS FMP. These data are primarily used to develop relative indices of abundance, which subsequently provide valuable auxiliary information for fine-tuning stock assessment models. A database for logbook data is also maintained at the SWFSC. In recent years, the SWFSC has also been working with AFRF in the design and testing of an electronic logbook to facilitate submission and data entry for the albacore troll fishery data.

Archival Tagging: The SWFSC and AFRF have been working together since 2001 to use archival tags to study movement patterns and general life history strategies of juvenile (ages 2-5) North Pacific albacore. Archival tag data provide detailed information of North Pacific albacore migratory behavior and distribution. Through October 2006, 504 archival tags have been deployed in cooperation with the commercial albacore fishing fleet. There have been 19 recoveries, most of which were at liberty for over a year and have provided over 5,000 days of data and nearly 8 million samples of water depth, water temperature, and body temperature from tagged fish. Daily location estimates from the tagged fish and the minute-by-minute depth and temperature data are providing new insights regarding their vertical and

horizontal movements and feeding behavior which were impossible to obtain without this technology. Ultimately, the data will help determine stock structure and improve CPUE standardization based on habitat-use patterns, information critical to developing sound stock assessments regarding the status of this valuable marine resource. For more information see http://swfsc.noaa.gov/albacore_tag.aspx.

6.2.2 Common Thresher Shark

Nursery Survey and Pup Abundance Index: In 2003, the SWFSC began a survey to (1) determine the continuity of thresher pup distribution along the coast of the Southern California Bight and (2) develop a pup abundance index. In September 2006, the fourth year of sampling took place in inshore waters out to 25 fathoms from Point Conception south to the U.S.-Mexico border. Fifty nearshore longline sets were conducted with a total of 4,950 hooks fished. Overall, 266 common threshers, of which roughly 60 percent were young-of-the-year pups were caught. The pups are patchily distributed making a discrete definition of the nursery areas difficult; however, the survey is ongoing and should provide a reliable estimate of the nursery habitat with a few more years of sampling. Through a collaborative program, scientists from Scripps Institution of Oceanography and CICESE in Ensenada, Mexico are using the same methods to survey the nearshore areas south of the U.S. border in order to better map the nursery habitat throughout its extent.

Tagging: The majority of threshers caught during the survey are tagged with conventional tags and oxytetracycline for age validation studies, DNA sampled and then released. Seven of the larger thresher sharks were tagged with satellite tags as part of a collaborative project with the Tagging of Pacific Pelagics program (TOPP). Six of seven tags deployed in September 2006 popped up in the southern California Bight after 8 months. Preliminary results confirm their preference for coastal waters with occasional forays into offshore areas and to depths exceeding 500 m.

Post-release Survival in the Recreational Fishery: In early 2007, a collaborative study was initiated by the Pfleger Institute of Environmental Research, the Southwest Fisheries Science Center and the NMFS Southwest Region Sustainable Fisheries Division to examine post-release survival of common thresher sharks. In response to the growing recreational fishery for HMS sharks, this pilot project used pop-up satellite archival transmitters (PSAT) to study the movement patterns and post-release survivability of rod-and-reel caught common thresher sharks. Four PSATs, set to release after 10 days at liberty, were deployed on thresher sharks captured in the Southern California Bight. The recovery of all four transmitters provided high-resolution temperature and depth data and determined that one of the sharks, a mature female estimated at 335 pounds, died within 48 hours of release. Preliminary results suggest that capture stress, especially in large individuals, may lead to increased mortality in this fishery. Expanded tagging is being proposed for the spring of 2008 to better document post-release survivability in the recreational thresher shark fishery. A final report on the pilot project will be posted on the SWR website in the fall of 2007.

6.2.3 Shortfin Mako and Blue Sharks

***Juvenile Mako and Blue Shark Abundance Survey*:** In 2006, the SWFSC conducted its thirteenth juvenile pelagic shark survey since 1994. A team of scientists and students deployed a total of 5,733 hooks at the 28 survey sampling stations in the southern California Bight. Catch for the 2006 survey included 90 mako sharks and 272 blue sharks, as well as a few pelagic rays and mola molas. An index of relative abundance for blue and mako sharks, defined as catch per 100 hook-hours, was calculated for the seven target survey areas. The CPUEs for both species were somewhat higher than in 2004 and 2005; however there is a declining trend in CPUE for both species over the time series of the survey. These data now represent the longest time series of fishery-independent data for mako and blue sharks off the West Coast and are currently being analyzed as components in population dynamics models for these

species.

Secondary objectives of the annual abundance pelagic shark survey include deploying conventional and satellite tags for migration and stock structure studies, conducting oxytetracycline (OTC) marking for age and growth studies, and collecting biological samples for studies on feeding habits, reproduction, population genetics and comparative physiology. Over the course of the 2006 cruise, 111 mako sharks were tagged with conventional tags and DNA sampled for analysis of movement and stock structure. Of these, 93 mako sharks were also marked with OTC for age and growth studies. Two blue sharks, 12 makos and one thresher shark were tagged with satellite tags to study their vertical and horizontal movements as part of an ongoing collaboration with the TOPP program. Preliminary analysis of the satellite tagging data demonstrates that these pelagic sharks are extremely wide ranging, particularly the blue sharks; makos tagged in the Southern California Bight show a preference to remain in the productive waters of the California Current system.

6.2.4 Bigeye Thresher Shark

Feeding habits: Bigeye thresher sharks are occasionally taken in the drift gillnet fishery for swordfish along with the three more common pelagic sharks: mako, common thresher and blue sharks. Scientists at the SWFSC have been studying the feeding habits of all four shark species from samples collected by fishery observers. To date, 26 bigeye thresher stomachs have been examined. While there is overlap in the diets of bigeye threshers with the three other species, the diet of bigeye threshers appears to be more diverse. During the 2005-2006 season, when 15 bigeye thresher stomachs containing prey were collected, 14 prey taxa were identified. In contrast, 41 stomachs containing prey were collected from common thresher sharks during the same season, and only five prey taxa were identified. These results may reflect a more opportunistic feeding behavior and consequently the ability of bigeye threshers to exploit a greater niche.

6.2.5 Sea Turtles

NMFS, in cooperation with researchers around the world, continues to conduct sea turtle research in the Pacific. Due in part to this work, the understanding of Pacific sea turtles has increased substantially over the past several years. The SWFSC has contributed much to the sea turtle literature including a number of papers in the recently published special edition of Chelonian Conservation and Biology (see Volume 6, Number 1) that focused on endangered leatherback sea turtles. While insights have been gained on seasonal habitat use of nearshore foraging areas off Central California, gaps in knowledge remain on fine scale habitat use and distribution in offshore areas (more than 60 miles offshore) from the West Coast. Significant findings include population linkages between breeding sites in Indonesia and foraging areas off the West Coast as a result of genetic studies and satellite telemetry.

6.2.6 Drift Gillnet Electronic Monitoring Pilot Project

During the fall of 2006, electronic monitoring (EM) systems were installed on cooperative drift gillnet (DGN) fishing vessels based out of southern California ports. Archipelago Marine Research Ltd. was contracted by NMFS Southwest Region to evaluate EM as a tool to monitor the DGN fishery in California. EM systems consisted of up to three closed circuit television cameras, a GPS receiver, a hydraulic pressure sensor, winch sensors, and system control box. EM systems and observers were in place on five vessels for 11 trips and 53 fishing events, resulting in over 450 catch items assessed by both methods. EM system performance was high on all participating vessels although data loss occurred from vessels where operators manually powered down EM systems when the vessel was idle. EM sensor data was very useful in detecting vessel location and activities such as transit, standby, and net setting and hauling. In terms of catch, both EM and observer methods were within 4 percent and protected species

detection was identical. Catch totals by set were very close for most sets and the major cause for outliers was due to the inability of EM to detect tunas and mackerel. Counts of shark, swordfish, opah and common mola were very similar between EM and observers. Observers typically speciated catch to a higher level than EM viewers as a result of image resolution issues for small catch items and EM viewers being less familiar with DGN catch species as compared to observers. Overall, EM was considered suitable for the DGN fleet, although future work with these vessels should include discussion to improve EM installations and better align deck activities with monitoring needs from EM imagery. A final report will be posted on the NMFS Southwest Region website in the fall of 2007.

6.3 Monitoring Reports

The HMS FMP specifies the MUS, which are those species actively managed under the FMP. The Council considered many combinations of the following criteria in their selection of MUS, with the stipulation that any species that met the first three criteria would be included:

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 Fishery Management Council
6. Sufficient data exists to calculate a bio-analytically based MSY, including a reasonable MSY proxy that is based 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 MUS are:

Tunas:

North Pacific albacore (*Thunnus alalunga*)
yellowfin tuna (*Thunnus albacares*)
bigeye tuna (*Thunnus obsesus*)
skipjack tuna (*Thunnus pelamis*)
northern bluefin tuna (*Thunnus orientalis*)

Billfish/Swordfish:

striped marlin (*Tetrapturus audax*)
swordfish (*Xiphias gladius*)

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*)

Other:

dorado or dolphinfish (*Coryphaena hippurus*)

The HMS FMP also lists species that are included for monitoring purposes. The criteria for species included in the FMP for monitoring are those species that: (1) have a record of being caught in an HMS

fishery; (2) are not covered by another FMP or state management regime; and (3) are of special concern (e.g., elasmobranches, which have relatively low productivity). The HMS FMP notes that these species, which often occur as bycatch in an HMS fishery, should be monitored on a consistent and routine basis to the extent practicable. Sampling periodically 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. A list of monitored species is contained in Chapter 3 of the FMP, Table 3–2.

According to the FMP, the HMSMT will deliver a SAFE report that follows guidelines specified in National Standard 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 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.

Since the drafting of the FMP through 2004, the only HMS fishery to have routine Federal observer coverage has been the drift gillnet and deep-set longline fisheries. DGN observer data can be found at the SWR website: http://swr.nmfs.noaa.gov/psd/codgftac.htm.

With regard to bycatch and incidental catch monitoring, in June 2005 the HMSMT reviewed and discussed the conclusions presented in the report entitled, "Recommendations for U.S. West Coast Highly Migratory Species Observer Programs with Options for Levels of Significance," which was developed by an independent contractor at the request of NMFS SWFSC. The report authors reviewed the available data for West Coast HMS fisheries and provided recommendations on the administration, oversight, and coverage levels for HMS observer programs. The proposed pilot observer programs were developed to provide statistically reliable indices of bycatch to assist managers in selecting coverage levels based on effort, fishery characteristics, and costs; the programs also include alternatives to stratify coverage proportional to fleet effort across port, vessel class, fishing area, season, and fishing gear.

Most of the administrative recommendations in the report have been adopted and implemented by NMFS. These recommendations included, among other things, establishment of an outside contractor to supply observers through a NMFS-administrated contract.

There are some state observer programs currently in place (e.g., CRFS coverage of the California CPFV fleet) to supplement the contracted HMS observer program. Regarding the duration of observer coverage, the policy is for vessels to carry an observer upon request on a per-trip basis. To minimize changes in vessel effort when observed, a minimum number of sets (five) will be used to determine the duration of individual vessel coverage in the drift gillnet fishery. A similar approach for other HMS fisheries is being considered, based on an average number of sets per trip (which can be calculated using logbook and/or previous observer information).

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ISC 2006b. ANNEX 10 (Report of the Marlin and Swordfish Working Group Joint Meeting, March 20-22, 2006, La Jolla, California, U.S.A.) *of* Report of the sixth meeting of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean, March 23-27, 2006, La Jolla, California U.S.A.

ISC 2007a. Report of the seventh meeting of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean, July 25-30, Busan, Korea, 46 pp. (Available at http://www.pcouncil.org/hms/hmssafe.html.)

ISC 2007b. ANNEX 6 (Report of the Pacific Bluefin Tuna Working Group Workshop, April 16-23, 2007; Shimizu, Japan) *of* Report of the seventh meeting of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean, July 25-30, Busan, Korea. (Available at http://www.pcouncil.org/hms/hmssafe.html.)

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8.0 COMMONLY-USED WEB LINKS IN HIGHLY MIGRATORY SPECIES MANAGEMENT

International Regional Fishery Management Organizations and Scientific Bodies

Inter- American Tropical Tuna Commission	http://iattc.org/
Western and Central Pacific Fisheries Commission	http://www.wcpfc.int/
International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean	http://isc.ac.affrc.go.jp/

U.S. West Coast Regional Fishery Management Councils

Pacific Fishery Management Council	http://www.pcouncil.org/
Western Pacific Fishery Management Council	http://www.wpcouncil.org/

State and Interstate Fisheries Commissions

California Department of Fish and Game	http://www.dfg.ca.gov/
Oregon Department of Fish and Wildlife	http://www.dfw.state.or.us/
Pacific States Marine Fisheries Commission	http://www.psmfc.org
Washington Department of Fish and Wildlife	http://wdfw.wa.gov/

Institutions Conducting HMS Research

American Fishermen's Research Foundation	http://www.afrf.org/
California State University, Long Beach	http://www.csulb.edu
Centro de Investigación Científica y Educación Superior de Ensenada	http://www.cicese.mx/
Inter- American Tropical Tuna Commission	http://www.iattc.org
Monterey Bay Aquarium	http://www.mbayaq.org/
Monterey Bay Aquarium Tuna Research and Conservation Center	http://www.tunaresearch.org
Moss Landing Marine Lab	http://www.mlml.calstate.edu/
NOAA Southwest Fisheries Science Center	http://swfsc.noaa.gov
NOAA Southwest Regional Office	http://swr.nmfs.noaa.gov
Pacific Islands Fisheries Science Center	http://www.pifsc.noaa.gov
Pfleger Institute of Environmental Research	http://www.pier.org
Scripps Institute of Oceanography	http://www-sio.ucsd.edu
Southern California Elasmobranch Consortium	http://www.sharkbight.com
Tagging of Pacific Pelagics	http://www.toppcensus.org

Sport and Commercial Fishing Industry Related Associations

American Albacore Fishing Association	http://www.americanalbacore.com

Oregon Albacore Commission	http://www.oregonalbacore.org/
Sportfishing Association of California	http://www.sacemup.org
United Anglers of Southern California	http://www.unitedanglers.com
Western Fishboat Owner's Association	http://www.wfoa-tuna.org