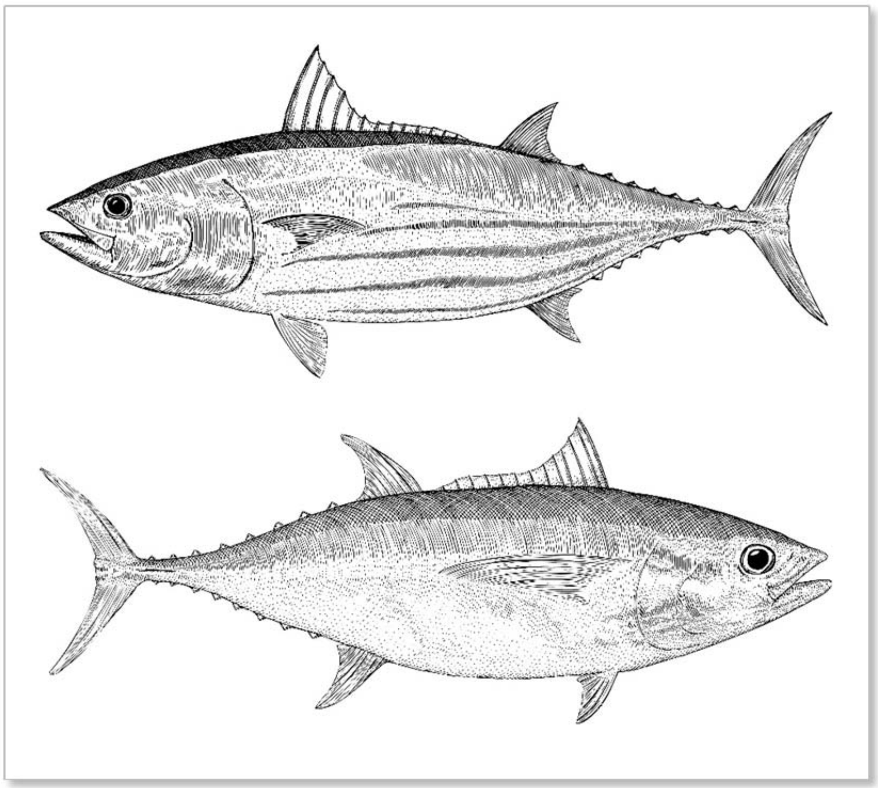
Stock Assessment and Fishery Evaluation (SAFE) Report Pacific Island Pelagic Fisheries 2015



Western Pacific Regional Fishery Management Council
1164 Bishop St., Suite 1400
Honolulu, HI 96813
PHONE: (808) 522-8220
FAX: (808) 522-8226
www.wpcouncil.org

Cover image: Skipjack and Bigeye Tuna, iStock Photos (http://www.istockphoto.com/)

The Western Pacific Regional Fishery Management Council prepared this report using Federal funds under award NA15NMF4410008, from NOAA's National Marine Fisheries Service, U.S. Department of Commerce, with support from the Pacific States Marine Fisheries Commission under NOAA award NA14NMF4370120. The statements, findings, conclusions, and recommendations are those of the authors and do not necessarily reflect the views of NOAA, NMFS, or the U.S. Department of Commerce.

Stock Assessment and Fishery Evaluation (SAFE) Report

Pacific Island Pelagic Fisheries

January 31, 2017

Prepared by the Pelagics Plan Team and Council Staff

for the

Western Pacific Regional Fishery Management Council
1164 Bishop Street, Suite 1400, Honolulu, Hawai`i 96813

CONTENTS

Table **Page**

Figure **Page**

GLOSSARY OF TERMS AND LIST OF ACRONYMS

Term	Definition
Alia	Samoan fishing catamaran, about 30 ft long, constructed of aluminum or wood with fiberglass. Used for various fisheries including trolling, longline, and bottomfishing
Bycatch	Fish caught in a fishery but discarded or released, except in a recreational fisheries catch and release program.
Commercial	Commercial fishing, where the catch is intended to be sold, bartered, or traded.
Guam	A U.S. territory in the Marianas Archipelago. South of and adjacent to the Commonwealth of Northern Marianas Islands.
Hawai`i	U.S. state. See MHI, NWHI. Composed of the islands, atolls and reefs of the Hawaiian Archipelago from Hawai`i to Kure Atoll, except the Midway Islands. Capitol - Honolulu.
Ika-shibi	Hawaiian term for night tuna handline fishing method. Fishing for tuna using baited handlines at night with a nightlight and chumming to attract squid and tuna.
Incidental Catch	Fish caught that are retained in whole or part, though not necessarily the targeted species. Examples include monchong, opah and sharks.
Interaction	Catch of protected species, which is required to be released. Examples: Hawaiian monk seals, marine turtles and albatrosses.
Logbook	Journal kept by fishing vessels for each fishing trip; records catch data, including bycatch and incidental catch. Required in the federally regulated longline and crustacean fisheries in the Hawaiian EEZ.
Longline	Fishing method utilizing a main line that exceeds 1 nm in length, is suspended horizontally in the water column either anchored, floating, or attached to a vessel, and from which branch or dropper lines with hooks are attached; except that, within the protected species zone, longline gear means a type of fishing gear consisting of a main line of any length that is suspended horizontally in the water column either anchored, floating, or attached to a vessel, and from which branch or dropper lines with hooks are attached.
Longliner	Fishing vessel specifically adapted to use the longline fishing method.

Term	**Definition**
Palu-ahi	Hawaiian term for day tuna handline fishing. Fishing for tuna using baited handlines and chumming with cut bait in a chum bag or wrapped around a stone. Also, drop-stone, make-dog, etc.
Pelagic	The pelagic habitat is the upper layer of the water column from the surface to the thermocline. The pelagic zone is separated into several subzones depending on water depth: epipelagic - ocean surface to 200 meters depth; mesopelagic – 200 to 1,000 meters depth; bathypelagic – 1,000 to 4,000 meters depth; and abyssopelagic – 4,000 to 6,000 meters depth. The pelagic species include all commercially targeted highly migratory species such as tuna, billfish and some incidental-catch species such as sharks, as well as coastal pelagic species such as akule and opelu.
Pole-and-Line	Fishing for tuna using poles and fixed leaders with barbless lures and chumming with live baitfish. Poles can be operated manually or mechanically. Also, fishing vessels called baitboats or aku-boats (Hawai`i).
Protected	Refers to species which are protected by federal legislation such as the Endangered Species Act, Marine Mammal Protection Act, and Migratory Bird Treaty Act. Examples: Black-footed and Laysan albatrosses, marine turtles, dolphins.
Purse seine	Fishing for tuna by surrounding schools of fish with a very large net and trapping them by closing the bottom of the net.
Recreational	Recreational fishing for sport or pleasure, where the catch is not sold, bartered or traded.
Sanctuary	Protected area. Commercial/recreational fishing may be restricted.
Secretary	When capitalized and used in reference to fisheries within the U.S. EEZs, it refers to the U. S. Secretary of Commerce.
Small pelagics	Species such as akule (big-eye scad - Selar spp.) And opelu (mackerel scad - Decapterus spp). These fish occur mainly in shallow inshore waters but may also be found in deeper offshore waters. Not part of the PMUS.
Trolling	Fishing by towing lines with lures or live-bait from a moving vessel.

Acronym	Meaning
ACE	Accumulated Cyclone Energy
ACL	Annual catch limit
AS	American Samoa. Includes the islands of Tutuila, Manua, Rose and Swains Atolls.
ASG	American Samoa Government
AVHRR	Advanced Very High Resolution Radiometer
BiOp	Biological Opinion
BOEM	Bureau of Ocean Energy Management
BSIA	Best Scientific Information Available
CFR	Code of Federal Regulations
CML	Commercial Marine License data
CNMI	Commonwealth of the Northern Mariana Islands. Also, Northern Mariana Islands, Northern Marianas, and NMI. Includes the islands of Saipan, Tinian, Rota, and many others in the Marianas Archipelago.
CO_2	Carbon Dioxide
COS	Chicken-of-the-Sea
CPI	Consumer price index
CPUE	Catch-Per-Unit-Effort. A standard fisheries index usually expressed as numbers of fish caught per unit of gear per unit of time, e.g., number of fish per hook per line-hour or number of fish per 1,000 hooks.
DAWR	Division of Aquatic & Wildlife Resources, Territory of Guam.
DFW	Division of Fish & Wildlife, Northern Mariana Islands.
DMWR	Department of Marine & Wildlife Resources, American Samoa.
DOC	Department of Commerce. In this annual report, it refers to the American Samoa Government.
DOD	Department of Defense

Acronym	Meaning
DPS	Distinct population segment
EEZ	Exclusive Economic Zone, refers to the sovereign waters of a nation, recognized internationally under the United Nations Convention on the Law of the Sea as extending out 200 nautical miles from shore. Within the U.S., the EEZ is typically between three and 200 nautical miles from shore.
EFH	Essential fish habitat
EIS	Environmental impact statement
EPO	East Pacific Ocean
ENSO	El Nino–Southern Oscillation Index
ESA	Endangered Species Act. An Act of Congress passed in 1966 that establishes a federal program to protect species of animals whose survival is threatened by habitat destruction, overutilization, disease, etc.
FAD	Fish Aggregating Device; a raft or pontoon, usually tethered, and under which, pelagic fish will concentrate.
FEP	Fisheries Ecosystem Plan
FMP	Fishery Management Plan.
ft	Feet
GAC	Global area coverage
GRT	Gross registered tonnes
HAPC	Habitat Areas of Particular Concern
HDAR	Hawai`i Division of Aquatic Resources. Also, DAR.
HMRFS	Hawai`i Marine Recreational Fishing Survey
ISC	International Scientific Committee
ITS	Incidental Take Statement
JIMAR	Joint Institute for Marine and Atmospheric Research, University of Hawai`i.

Acronym	Meaning
IATTC	Inter-American Tropical Tuna Commission.
Km^2	Square kilometers
LAA	Likely to adversely affect
lbs	Pounds
LOC	Letter of Concurrence
LOF	List of Fisheries
LVPA	Large Vessel Protected Area
m	Meter
M&SI	Mortality and serious injury
MSA	Magnuson-Stevens Fishery Conservation and Management Act of 1996. Sustainable Fisheries Act.
ME	McCracken estimates
MFMT	maximum fishing mortality threshold
MHI	Main Hawaiian Islands (comprising the islands of Hawai`i, Mau’i, Lana’i, Moloka’i, Kaho’olawe, O’ahu, Kauai’, Ni’ihau and Ka’ula).
MITT	Mariana Islands Training and Testing
MMA	Marine managed area
MMPA	Marine Mammal Protection Act
MPA	Marine Protected Area
MPCC Committee	Marine Planning and Climate Change Committee
MRFSS	Marine Recreational Fishing Statistical Survey
MSST	Minimum stock size threshold
MSY	Maximum Sustainable Yield.
mt	Metric tons

Acronym	Meaning
MUS	Management Unit Species
NCADAC	National Climate Assessment and Development Advisory Committee
NCDC	National Climatic Data Center
NEPA	National Environmental Policy Act
NLAA	Not likely to adversely affect
NMFS	National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce. Also NOAA Fisheries.
nmi	Nautical miles
NOAA	National Oceanic and Atmospheric Administration, U.S. Department of Commerce.
NESDIS	National Environmental Satellite, Data, and Information Service
NWHI	Northwestern Hawaiian Islands. All islands in the Hawaiian Archipelago, other than the Main Hawaiian Islands (MHI)
NWR	National Wildlife Refuge
NS2	National Standard 2
OFP-SPC	Oceanic Fisheries Program of the Secretariat of the Pacific Community.
ONI	Oceanic Niño Index
OR&R	NOAA's Office of Response and Restoration
OSDPD	Office of Satellite Data Processing and Distribution
OY	Optimum Yield
PBR	Potential Biological Removal
PDO	Pacific Decadal Oscillation
PIFSC	Pacific Islands Fisheries Science Center
PIRO	Pacific Islands Regional Office, National Marine Fisheries Service. Also, NMFS PIRO.

Acronym	Meaning
PFRP	Pacific Pelagic Fisheries Research Program, JIMAR, University of Hawai`i
PMUS	Pacific Pelagic Management Unit Species. Also, PPMUS. Species managed under the Pelagic FEP
POES	Polar Operational Environmental Satellites
PPGFA	Pago Pago Game Fishing Association
ppm	parts per million
RPB	Regional Planning Body
PRIA	Pacific Remote Island Area
ROD	Record of Decision
SAFE	Stock Assessment and Fishery Evaluation
SAR	Stock Assessment Report
SB	Spawning biomass
SC	Standing Committee of the Western and Central Pacific Fisheries Commission
SDC	Status Determination Criteria
SPC	Secretariat of the Pacific Community. A technical assistance organization comprising the independent island states of the tropical Pacific Ocean, dependent territories and the metropolitan countries of Australia, New Zealand, USA, and France.
SPR	Spawning Potential Ratio. A term for a method to measure the effects of fishing pressure on a stock by expressing the spawning potential of the fished biomass as a percentage of the unfished virgin spawning biomass. Stocks are deemed to be overfished when the SPR<20%.
SSC	Scientific & Statistical Committee, an advisory body to the Council comprising experts in fisheries, marine biology, oceanography, etc.
SST	Sea Surface Temperature
STF	Subtropical Font

Acronym	Meaning
TZCF	Transition Zone Chlorophyll Front
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish & Wildlife Service, Department of Interior. Also, FWS.
WCNPO	Western and Central North Pacific
WCP–CA	Western and Central Pacific Fisheries Commission Convention Area
WCPFC	Western and Central Pacific Fisheries Commission
WCPO	western and central Pacific Ocean
WPacFIN	Western Pacific Fishery Information Network, NMFS
WPRFMC	Also, the Council. Western Pacific Regional Fishery Management Council. One of eight nationwide fishery management bodies created by the Magnuson Fisheries Conservation and Management Act of 1976 to develop and manage domestic fisheries in the U.S. EEZ. Composed of American Samoa, Guam, Hawai`i, and Commonwealth of Northern Mariana Islands.

EXECUTIVE SUMMARY

The Western Pacific Regional Fishery Management Council (Council) manages the pelagic resources covered under the Magnuson-Stevens Fishery Conservation and Management Act of 1976 (MSA) and that occur in the United States (U.S.) Exclusive Economic Zone (EEZ) around American Samoa, the Commonwealth of the Northern Mariana Islands (CNMI), Guam, Hawai`i, and the U.S. possessions in the Western Pacific Region (Johnston Atoll, Kingman Reef and Palmyra, Jarvis, Howland, Baker, Midway, and Wake Islands). The Council developed and the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) implemented the Fishery Management Plan (FMP, now Fishery Ecosystem Plan [FEP]) for Pelagic Fisheries of the Western Pacific Region in 1987. Since this time, the Council has generated an Annual Report that provides fishery performance data, including but not limited to landings, value of the fishery, and catch rates, for each of the areas the Council manages.

This 2015 Stock Assessment and Fisheries Evaluation (SAFE) Report for Pacific Pelagic Fisheries of the Western Pacific Region is the first for this fishery. In July 2013, NMFS issued a final rule (78FR43066) that revised National Standard 2 (NS2) guidelines and clarify the content and purpose of the SAFE Report to manage fisheries using of the best scientific available information (see Title 50 Code of Federal Regulations [CFR] Part 600.315). In 2015, the Council, in partnership with NMFS Pacific Islands Fisheries Science Center, local fishery resource management agencies, and the NMFS Pacific Islands Regional Office (PIRO), agreed to revise and expand the contents of future annual reports to include the range of ecosystem elements, including protected species interactions, oceanographic parameters, essential fish habitat review, and marine planning activities. SAFE reports provide regional fishery management councils and NMFS with information for determining the annual catch limits for each stock in the fishery, documenting significant trends or changes in the resource, marine ecosystems, and fishery over time, implementing required essential fish habitat (EFH) provisions, and assessing the relative success of existing relevant state and Federal fishery management programs. The SAFE is intended to serve as a source document for developing FMPs (or FEPs) and amendments, and other analytical documents needed for management decisions.

This year marks the first report that combines the requirements of reporting for the FEP with those required under the national SAFE report guidelines. Table ES-1 was developed from a review of NS2 guidelines and the 2013 revisions from the Final Rule for Provisions on Scientific Information for NS2 (78 FR 43066). Future Pelagic Fisheries SAFE reports will also include a Data Integration chapter that intends to analyze fishery performance data against ecosystem parameters to improve ecosystem-based fishery management.

Table ES-1. Fulfillment of National Standard 2 Requirements within this Report

Requirement	Data Needs	Citation for Additional Guidance	Section
Condition of stocks and stock complexes			
Description of the Status Determination Criteria (SDC)	maximum fishing mortality threshold (MFMT), OFL, and minimum stock size threshold (MSST)	600.310(e)(2)	2.6.5.1
Information on Overfishing Level (OFL)	Data collection, estimation methods, and consideration of uncertainty	600.310(f)(2)	2.6.6
Information determining Annual Catch Limits (ACL)	Needed for each stock to document significant trends or changes in the resource or marine ecosystem	600.310(f)(5)	2.6.6
Information on Optimum Yield (OY)	The harvest level for a species that achieves the greatest overall benefits, including economic, social, and biological considerations	600.310	N/A[1]
Information on Acceptable Biological Catch	Most recent stock assessment	600.310(c) 600.310(f)(2)	2.6.7
Fishing mortality	Sources of fishing mortality (both landed and discarded), including commercial and recreational catch and bycatch in other fisheries	600.310(i)	Ch. 2
Bycatch by fishery	Including target and non-target species		Ch. 2
Rebuilding overfished stocks	Best Scientific Information Available (BSIA)[2] on biological condition of stocks		N/A
Condition of ecosystems	BSIA to assess success of FEP		N/A
Condition of EFH	Report on Review of available information; full review every 5 years	600.815(a)(10)	3.4
Socioeconomic conditions of fishery	BSIA to assess success of FEP		3.1
Socioeconomic conditions of fishing communities	BSIA to assess success of FEP		3.1
Socioeconomic conditions of processing industry	BSIA to assess success of FEP		N/A
Safety at sea by fishery	BSIA to assess success of FEP		NA
Information/data gaps	Explanation of data gaps and emphasis on future scientific work to address gaps		NA

N/A Not Applicable

[1] OY is not currently used to manage pelagic fisheries in the Pacific Islands Region.

[2] The National Standard 2 Guidelines define BSIA as: "Relevance, inclusiveness, objectivity, transparency, timeliness, verification, validation, and peer review of fishery management information as appropriate. The revised NS2 guidelines do not prescribe a static definition of BSIA because science is a dynamic process involving continuous improvements." (78 Federal Register 43067)

SUMMARY OF SAFE STOCK ASSESSMENT REQUIREMENTS

It is important to note that all fish managed under the Pelagic FEP are also managed under the international agreements governing the Western and Central Pacific Fisheries Commission (WCPFC) and/or the Inter-American Tropical Tuna Commission (IATTC) to which the U.S. is a party. Both the WCPFC and IATTC have adopted criteria for overfishing and overfished for certain species that differ from those under the Pacific Pelagic FEP. For the purposes of stock status determinations, NMFS will determine stock status of Pelagic MUS using the Status Determination Criteria (SDC) described in the Pelagic FEP.

For all pelagic management unit species (MUS), the Council adopted a maximum sustainable yield (MSY) control rule (see Figure 127). The Council has also adopted a warning reference point, B_{FLAG}, set equal to B_{MSY} to provide a trigger for consideration of management action before a stock's biomass reaches the MSST. A stock is approaching an overfished condition when there is more than a 50 percent chance that the biomass will decline below the MSST within two years.

For pelagic species in the Pacific Island Region, most stock assessments are conducted by several international organizations. In the Eastern Pacific Ocean (EPO), IATTC staff conduct stock assessments for bigeye, yellowfin, skipjack, striped marlin, and swordfish. In the Western Central Pacific Ocean (WCPO), the Secretariat of the Pacific Community Oceanic Fisheries Program conducts stock assessments on tropical tunas, as well as for South Pacific albacore, southwest Pacific swordfish and striped marlin.. In the North Pacific Ocean, the International Scientific Committee (ISC) for Tuna and Tuna-like Species in the North Pacific Ocean conducts similar stock assessments. In 2015, stock assessments were completed for the South Pacific albacore (Harley *et al.* 2015) and the Western and Central North Pacific striped marlin (ISC Billfish Working Group 2015).

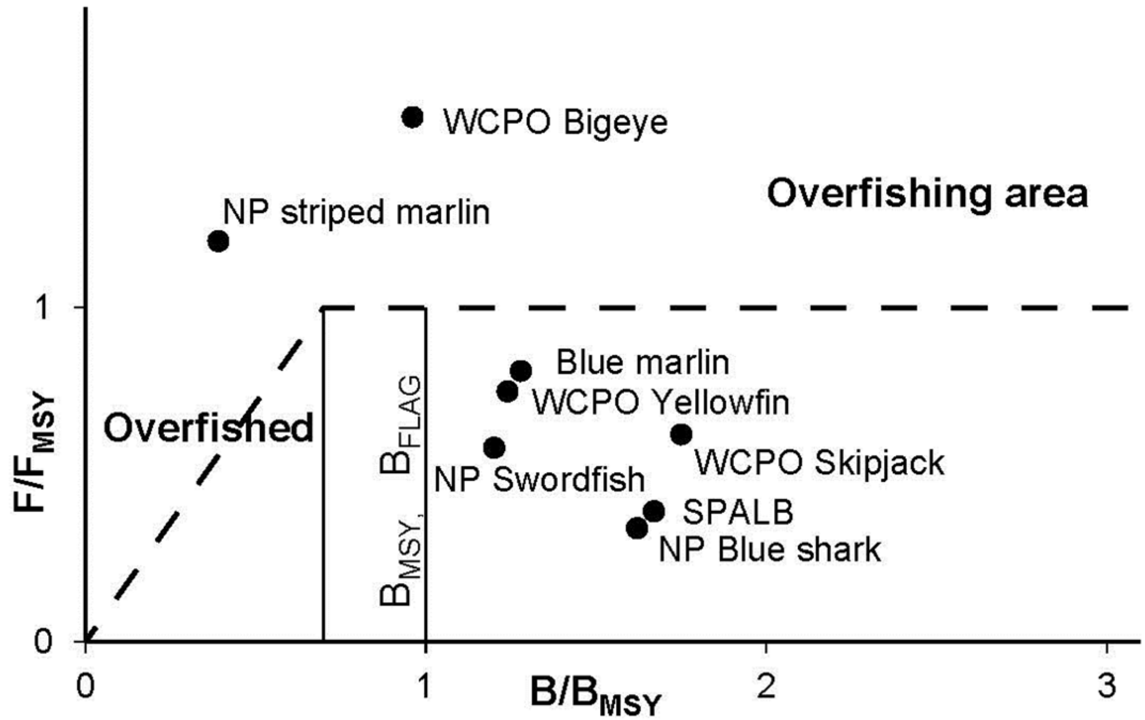
For the South Pacific albacore, the estimated MSY of 76,800 metric tons (mt) is lower than in the previous 2012 assessment (2012 MSY = 99,085 mt). This reduction was primarily caused by: 1) the exclusion of catches from the eastern Pacific outside the WCPFC Convention area; and 2) a reduction in the assumed value of natural mortality. Current catch is expected to be at or slightly less than MSY. The WCPFC Scientific Committee recommended that longline fishing mortality and longline catch be reduced to avoid further decline in the vulnerable biomass so that economically viable catch rates can be maintained.

For the Western and Central North Pacific striped marlin, population biomass has exhibited a long-term decline. Spawning stock biomass was estimated at 1,094 mt in 2013, 39% of the spawning stock biomass to produce MSY. Multiple causes for this status include a high fishing mortality, a low spawning potential ratio, and low recruitment. The status of the stock is highly dependent on the magnitude of recruitment which, with the exception of 2010, has been below its long-term average since 2007. Overfishing is occurring relative to Council adopted MSY-based reference points and the stock is overfished.

Table 43 in Section 2.6.7 provides an overview of stock status in relation to overfishing and overfished reference points for 12 species managed under this Pacific Pelagic Fishery Ecosystem Plan.

Figure ES-1 provides the current stock status for all species in the Pelagic FEP for which stock assessments have been completed.

Figure ES-1. Specification of fishing mortality and biomass reference points in the Pelagic FEP and current stock status in the WCPO and EPO.



SUMMARY OF FISHERY DATA IN THE PACIFIC ISLAND REGION

Table ES-2 provides a summary of the total pelagic landings during 2015 in the Western Pacific and the percentage change between 2014 and 2015.

Table ES-2. Total pelagic landings for fisheries managed by WPRFMC in the Western Pacific Region in 2015

	American Samoa		Guam		CNMI		Hawai`i	
Species	Lbs	% change	Lbs	% change	Lbs	% change	Lbs	% change
Swordfish	16,324	-22.73	0	0.00	0	0	3,372,000	-8.62
Blue marlin	51,533	-12.65	37,646	36.41	0	-100.00	1,786,000	18.20
Striped marlin	7,499	-48.59	0	0.00	0	0.00	1,115,000	15.31
Other billfish*	7,622	29.94	0	-100.00	0	0.00	651,000	17.72
Mahimahi	12,021	-47.21	159,146	-16.87	97,928	12.53	1,486,000	-18.31
Wahoo	139,050	-6.53	31,497	-66.37	3,705	-65.29	1,221,000	3.83
Opah (moonfish)	3,803	50.97	0	0.00	0	0.00	2,659,000	18.60
Sharks (whole wt)	2,060	26.77	0	0.00	0	0.00	146,000	13.18
Albacore	3,476,583	8.59	0	0.00	0	0.00	676,000	22.46
Bigeye tuna	151,073	-18.68	160	NA	0	0.00	19,962,000	20.51
Bluefin tuna	0	NA	0	0.00	0	0.00	0	NA
Skipjack tuna	199,861	-22.93	601,716	54.28	292,951	21.65	721,000	11.27
Yellowfin tuna	703,697	-25.53	111,509	227.82	16,220	-12.65	4,030,000	14.42
Other pelagics**	1,632	-16.95	5955	384.93	0	-100.00	1,869,000	8.35
Total	4,772,758	-1.99	947,629	28.41	410,804	11.93	39,694,000	13.09

Note: Total Pelagic Landings based on commercial reports or creel surveys; % change based on 2014 landings.

*Other billfish include: black marlin, spearfish, and sailfish

**Other pelagics include: kawakawa, unknown tunas, pelagic fishes (dogtooth tuna, rainbow runner, barracudas), oilfish, and pomfret. Of these, only oilfish and pomfret are Pelagic MUS. While other tables in Chapter 2 excluded or separated out non-MUS, data could not accurately provide individual landings data for these species presented in this total landings table.

AMERICAN SAMOA

Pago Pago Harbor on the island of Tutuila is a regional base for the trans-shipment and processing of tuna taken by domestic fleets from other South Pacific nations, the distant-waters longline fleets, and purse seine fleets. As NMFS Pacific Island Region does not directly manage these fisheries, data on the purse seine and non-U.S. vessel landings are not included in this report.

Participation. The largest fishery in American Samoa directly managed as part of this FEP is the American Samoa longline fishery. The majority of these vessels are greater than 50 ft, are required to fish beyond 50 nautical miles (nmi) from shore, and sell the majority of their catch, primarily albacore, to the Pago Pago canneries. In 2015, there were 18 active longline vessels, with 10 vessels greater than 70 ft and six vessels between 50 and 70 ft. Smaller longline vessels (locally built, twin-hulled vessels about 30 ft long, powered by 40HP gasoline outboard engines) can fish within 50 nmi from shore, but due to the low participation, these data are confidential and are reported only as combined with the large vessel fishery. Troll and handline fishing is the next largest fishery with 11 boats that landed pelagic species in 2015. Recreational fisheries in American Samoa are rare.

Landings. In 2015, total landings in American Samoa were estimated at 4.8 million lbs, with tuna species, albacore, yellowfin, skipjack and bigeye, comprising 95% of all landings. The longline fishery accounted for more than 99.5% of total landings, while the troll fishery accounted for 0.3% of landings. Albacore made up 77% of the tuna species. Wahoo, swordfish and blue marlin made up most of the non-tuna species landings. 2015 saw the lowest total landings in 15 years and, which contributed to the lowest estimated revenue since 2000.

Bycatch. Bycatch in American Samoan fisheries remains low, with no recorded bycatch in the troll fishery and sharks and oilfish comprising 70% of the released species in the longline fishery. Total bycatch constituted 11% of all caught fish.

Effort. The 18 vessels that fished in 2015 made 168 trips (average 9 trips/vessel), deployed 2,407 sets, (133 sets/vessel) using 6.7 million hooks. The troll and handline fishery conducted 167 trips that landed pelagic species.

Catch Rate. Longline catch rates increased moderately in 2015 to 13.1 fish per 1,000 hooks, boosted by an increase in the catch rate for tuna of 1.4 fish per 1,000 hooks. Overall, catch rates in this fishery have been steady for over the past 10 years. In contrast, trolling catch rates have shown substantial fluctuation over the years and have been decreasing since 2012, with 2015 catch rates one-third the 2012 peak. The 2015 catch rates were the lowest recorded for the 34-year time series.

Fish Size. Average weight-per-fish for all tuna species has been nearly the same in the last five years, with a slight decrease for bigeye and yellowfin tuna. Mean weight for mahimahi and wahoo decreased slightly.

Revenue. While revenues were down in 2015, revenues per trip were at an all-time high for the longline fishery, at $62,573 per trip. Although this is likely a reflection of the increase in larger vessel participation and increased overall average days per trip. Revenue per trolling trip has fluctuated substantially each year due to changes in catch rates, fish prices, and trip costs.

Protected Species Interactions. Protected species interactions are monitored in the American Samoa longline fishery with a mandatory observer coverage at approximately 20% of all trips. Mitigation measures have been implemented to reduce green turtle interactions in this fishery. Sea turtle interaction levels in 2015 remained well below the Incidental Take Statements (ITSs) specified in the 2015 Biological Opinion. Observed marine mammal interactions with the American Samoa longline fishery are relatively infrequent, usually no more than two of all species combined in any given year. This report also includes observed interactions with seabird and the ESA-listed Indo-west Pacific distinct population segment (DPS) of scalloped hammerhead, both of which have infrequent interactions in the American Samoa longline fishery.

CNMI

The CNMI's pelagic fisheries occur primarily from the island of Farallon de Medinilla south to the Island of Rota.

Participation. Currently, there are no commercial longline vessels operating out of the CNMI. Trolling is the primary fishing method, conducted by vessels less than 24 ft in length, limited to fishing within 20 miles of Saipan. There is a small but important charter boat fishery, although due to low participation, data are reported as part of the commercial fishery due to confidentiality requirements. The year 2015 marked the lowest participation level in the 33-year time series, with only 14 fishers reporting landings and 2,640 trips totaling 14,302 hours of trolling based on the creel survey expansion.

Landings. The primary target and most marketable species is skipjack tuna, which are usually common in near shore waters for these small vessels. Skipjack constituted over 71% of landings in 2015, totaling 292,951 lbs. Despite the continuously decreasing level of effort, total landings for all species was 412,022 lbs, very close to the five-year average. Mahimahi comprised almost 24% of the landings, totaling 97,928 lbs, while yellowfin comprised about 4%, or 16,220 lbs of the total pelagic landings in 2015. Other species contributed just over 1% of the total landings.

Bycatch. Bycatch is not a significant issue in the CNMI, as fishermen retain their catch regardless of species, size or condition. Based on creel survey interviews, only six fish were released out of an estimated 58,435, or 0.1%. This included four mahimahi, one yellowfin, and one skipjack.

Effort. The number of trips has steadily declined since the late 1990s, dropping to a 33-year low in 2015 with an estimated 2,640 trips based on the creel survey. This represents only 60% effort of the time-series average. Total hours trolling was similarly low in 2015, with 14,302 hours accounting for 66% of the long-term average.

Catch Rate. Average catch rates were at an 8-year high for all species and skipjack at 28.7 lbs per hour, while mahimahi catch rate has been steadily increasing over the past four years and was at an all-time high at 6.7 lbs per hour.

Revenue. Commercial revenues, at $315,765, were near an all-time low in 2015, although a lag in data entry indicates that this likely does not reflect all sales for 2015. The average price per pound for all species were all lower than the long-term average, with a combined average of $2.31 per pound.

Protected Species Interactions. There have not been any reported or observed interactions with protected species in the CNMI fisheries.

GUAM

Guam's pelagic fishery consists of small, primarily recreational, trolling boats that fish within the local waters of Guam's EEZ or the adjacent EEZ of the Northern Mariana Islands.

Participation. There were 372 boats involved in Guam's pelagic fishery in 2015, relatively high for the time-series, but 25% lower than that the highest participation recorded in 2013. A majority of fishing boats are less than 10 m (33 ft) in length and are usually owner-operated by fishermen who earn a living outside of fishing. Most fishermen sell a portion of their catch at one time or another and it is difficult to make a distinction between recreational, subsistence, and commercial fishers. A small (~5%) but economically significant segment of the pelagic group is made up of marina-berthed charter boats that are operated primarily by full-time captains and crews.

Landings and Bycatch. Pelagics landings in 2015 were estimated at 947,627 lbs, the highest reported landings over the 34-year time series. Of this total, 61,000 lbs were caught by the charter fishery. Charter vessel landings were substantially higher in the mid-1990s but have been relatively stable over the past 15 years. Landings consisted primarily of five major species: mahimahi, wahoo, skipjack tuna, yellowfin tuna, and Pacific blue marlin, with skipjack comprising over 60% (601,716 lbs) of total landings. Mahimahi (17%, 159,146 lbs) and yellowfin (12% 111,509 lbs) contributed the second and third most landings. There was no reported bycatch in the troll fishery in 2015.

Effort. While participation decreased, overall effort, as determined by number of hours spent trolling, increased by 28% to 62,568 hours. This represents the third highest effort in the 34-year time series. The year 2015 also marked the longest average trip length of 6.8 hours, almost 50% longer than the time-series average.

Catch Rate. Trolling catch rates (lbs per hour fished) showed a slight decrease from 2014, but very close to the long-term average. Total Catch-Per-Unit-Effort (CPUE) decreased 1.9%. Yellowfin and skipjack CPUE increased, while wahoo and mahimahi CPUEs decreased and marlin remained unchanged. The fluctuations in CPUE are probably due to variability in the year-to-year abundance and availability of the stocks.

Revenue. Commercial revenues in Guam are relatively low, possibly because the majority of troll fishermen do not rely on the catch or selling of fish as their primary source of income.

Protected Species Interactions. There have not been any reported or observed interactions with protected species in the Guam fisheries.

HAWAI`I

Compared to the other regions, Hawai`i has a diverse fishery sector which includes deep-set and shallow-set longline, Main Hawaiian Islands (MHI) troll and handline, offshore handline, and the aku boat (pole and line) fisheries. The Hawai`i longline fishery is by far the most important economically, accounting in 2015 for about 89% percent of the estimated ex-vessel value of the total commercial fish landings in the State. The MHI troll was the second largest fishery in Hawai`i. The shallow-set longline, MHI handline, aku boat, offshore handline fisheries and other gear types made up the remainder.

Participation. A total of 3,691 fishermen were licensed in 2015, including 2,045 (55%) who indicated that their primary fishing method and gear were intended to catch pelagic fish. Most licenses that indicated pelagic fishing as their primary method were issued to trollers (50%) and longline fishermen (36%). The remainder was issued to ika shibi and palu ahi (handline) (13%) and aku boat fishers (1%).

Landings. Hawai`i commercial fisheries landed 39,695,000 lbs of pelagic species in 2015, with the deep-set commercial longline fishery comprising over 80% (32,039,000 lbs) of the total. Deep-set longliners target bigeye and yellowfin tuna. The shallow-set longline fishery landed 2,791,000 lbs, or 7% of all commercial landings. The main Hawai`i Islands troll fishery landed 3,067,000 lbs of pelagic species, or 7.7% of the total. MHI handline fishery and offshore handline fishery accounted for 1,182,000 and 408,000 lbs (3% and 1% of the total landings), respectively.

The largest component of the pelagic catch was tunas, which comprised 64% of the total in 2015. Bigeye tuna alone accounted for 79% of the tunas and 50% of all pelagic catch. Billfish catch made up 17% of the total catch in 2015. Swordfish was the largest of these, at 49% of the billfish and 8% of the total catch. Catches of other pelagic management unit species (PMUS) represented 18% of the total catch in 2015 with moonfish being the largest component at 36% of the other PMUS and 7% of the total catch. The deep-set longline fishery catches about 98% of all moonfish and 96% of all pomfret landed, while the MHI troll fishery and deep-set longline fishery represented 49% and 47% of mahimahi catch in 2015.

Bycatch. A total of 114,670 fish were released in the deep and shallow-set longline fisheries in 2015. With the exception of sharks, there is minimal bycatch in Hawai`i permitted longline fisheries. Sharks contribute more than 86% (98,922) of the released catch in both the deep and shallow-set fisheries. With the exception of mako and thresher sharks, other shark species have no market so they are released. Only 2.2% of all other PMUS are released by the deep-set fishery, while approximately 10% of other PMUS are released by the shallow-set fishery. The higher release rate by the shallow-set sector is to conserve space for swordfish and forego keeping other species due to their short shelf life.

Effort. There were 143 active Hawai`i-based deep-set longline vessels in 2015, three more vessels than the previous year, and the most in the past 10 years. The number of deep-set trips (1,452) and sets (18,519) were also among the highest over the past ten years. The Hawai`i-based shallow-set longline fishery operates mainly in the first half of the year. In 2015, 22 vessels completed 68 trips and made 1,129 sets, which was among the lowest participation and effort for this segment of the fishery. The number of days fished by MHI troll fishers has been dropping since a peak in 2012, with 1,564 fishers logging 24,974 days fished around the MHI in 2015. There were 467 MHI handline fishers that fished 4,632 days in 2015, both close to their long-term averages. At 8 fishers and 253 days fished in 2015, the offshore handline fishery had its lowest effort since 2009.

Catch Rate. The deep-set longline fishery targets bigeye tuna and this species had significantly higher CPUE (4.8 fish per 1,000 hooks) compared to albacore (0.2) and yellowfin tuna (0.6). CPUE of billfish for the deep-set fishery is similar to that of albacore (0.1 - 0.3 fish per 1,000 hooks), while the CPUE for blue shark, a bycatch species, is second only to bigeye at 1.4 fish per 1,000 hooks. The Hawai`i-based shallow-set longline fishery targets swordfish, which exhibited the highest CPUE (11.9 fish per 1,000 hooks) of this fishery. Blue sharks were caught at 10.0 fish per 1,000 hooks, bigeye at 1.1, while all other species were caught at less than 0.2 fish per 1,000 hooks. The 2015 CPUE for all species in the MHI troll fishery was above the long-term average for all species, with the highest CPUE for yellowfin at 7.0 lbs per hour trolled. MHI handline CPUE for yellowfin tuna peaked at 186 lbs per day fished in 2015. Albacore and bigeye tuna CPUE was substantially lower compared to yellowfin tuna but have shown no clear trend in recent years. CPUE of the offshore handline fishery has been steady for the past eight years, with bigeye catch rates an order of magnitude higher than that of yellowfin (1,471 and 99 lbs per trip, respectively) in 2015.

Fish Size. Average weight, as determined in the deep and shallow-set fisheries, was fairly close to the long-term average for all commonly-caught species. Bigeye tuna caught in the deep-set fishery were 84 lbs, 2% greater than the long-term average. Yellowfin tuna in the deep-set fishery averaged 73 lbs per fish, right at the long-term average. While catching much fewer total fish, the shallow-set fishery consistently catches yellowfin that are 60% larger than the deep-set fishery. The 2015 average weight was also relatively high at 126 lbs, 10% higher than the long-term average. Swordfish average weight in the shallow-set fishery was 167 lbs, 11% lower than the long-term average. Opah and blue marlin, incidental catch in the deep-set fishery, averaged 90 and 172 lbs in 2015, very close to the long-term average of 88.6 and 183.1 lbs, respectively. The mean weight for most species caught by the troll and handline fisheries was close to their long-term average except for bigeye tuna, blue marlin and swordfish which were below their respective long-term average in 2015.

Revenue. The deep-set longline fishery accounted for over 86% ($91.5 million) of the $106 million ex-vessel value of the entire commercial pelagic fishery, a significant increase from 2014. The shallow-set longline fishery contributed 2.6% ($2.8 million) to the total ex-vessel revenue, approximately the same amount as the MHI handline fishery. MHI trolling accounted for just over 7% ($7.7 million), slightly above the long-term average. Total estimated revenue of the MHI handline fishery was $2.8 million in 2015, above its long-term average. The offshore handline fishery was worth $811,000 in 2015. Bigeye tuna alone accounted for $71 million of the total revenue, while yellowfin and billfish contributed $11.1 and 8.3 million, respectively.

Protected Species Interactions. Protected species interactions are monitored in the Hawai`i-based longline fishery with a mandatory observer coverage at 100% for the shallow-set vessels and a minimum of 20% for the deep-set vessels. Both and the deep- and shallow-set fisheries are required to adhere to a suite of conservation measures aimed at reducing seabird, sea turtle and marine mammal interactions.

In 2015, there were 1,178 sets and 1,286,628 hooks observed in the shallow-set fishery. Since the most recent Biological Opinion for the shallow-set fishery in 2012 through the end of 2015, the fishery has not exceeded the two-year Incidental Take Statement (ITS) for any turtle species or for the humpback whale. Interactions of ESA-listed species remained under the Incidental Take Statements (ITS). Marine mammal interactions remain low in this fishery, with the level of mortality and serious injury well below the corresponding potential biological removal (PBR) determined in the marine mammal Stock Assessment Reports (SARs). Seabird interactions have remained relatively stable over time in this fishery, with a possible marginal increase in black-footed albatrosses after 2008.

Because the deep-set longline fishery operates under a 20% observer coverage requirement, an extrapolation is used to estimate total takes in the fishery. In 2015, there were 3,728 sets and 9,393,234 hooks observed in the deep-set fishery. For 20.6% observer coverage in 2015, the ITSs for loggerhead and green turtles were exceeded during the fourth quarter of 2015 and the ITS for olive ridley turtle was exceed during the first quarter of 2016. Re-consultation for these species is underway. No other ITSs were exceeded during 2015. Marine mammal interactions are generally rare in this fishery, with the level of mortality and serious injury for secies other than false killer whales being well below the corresponding potential biological removal (PBR) determined in the marine mammal Stock Assessment Reports (SARs). The False Killer Whale Take Reduction Plan is currently in effect due to the M&SI for this species exceeding PBR. Interactions with black-footed albatrosses were substantially higher in 2015 compared to previous years. Recent analysis of albatross interactions in the deep-set fishery suggest that the higher interactions observed in this fishery may be related to oceanographic factors.

CLIMATE CHANGE AND OCEAN INDICATORS

In an effort to improve ecosystem-based fishery management, the Council is utilizing a conceptual model that allows for the application of data from specific climate change indicators that may affect marine systems and ultimately the productivity or catchability of managed stocks. While the indicators that the Council monitors may change as the Council continues to improve ecosystem-based management, those described in this 2015 report provide an initial list of climate and oceanic indicators to track:

- Atmospheric Concentration of Carbon Dioxide
- Oceanic pH (at Station ALOHA)
- Sea Surface Temperature
- Oceanic Niño Index (ONI)
- Pacific Decadal Oscillation (PDO)
- Tropical Cyclones
- Oligotrophic Area (North Pacific)

- Ocean Color (Chlorophyll-a concentration)
- Subtropical Front/Transition Zone Chlorophyll Front
- Fish Community Size Structure

Section 3.3 provides a description of each of these indicators, a 2015 snapshot of the current conditions, and a rationale for how these data may progress ecosystem-based fishery management. As described earlier, a Data Integration chapter will be included in future SAFE reports to provide information on the analyses of chosen indicators f and fishery data within the context of related decision-making.

ESSENTIAL FISH HABITAT

NS2 requires that the Council review and revise EFH provisions periodically and report on this review as part of the annual SAFE report, with a complete review conducted as recommended by the Secretary at least once every five years. The pelagic EFH information was not reviewed during preparation of the 2015 SAFE report, as the precious corals fishery was prioritized for the EFH review. The non-fishing impact and cumulative impacts components are scheduled for review in 2016.

MARINE PLANNING

The Council recently approved a new FEP objective to "consider the implications of spatial management arrangements in Council decision-making". To monitor implementation of this objective, this 2015 SAFE report includes the Council's spatially-based fishing restrictions or marine managed areas, the goals associated with those, and the most recent evaluation.

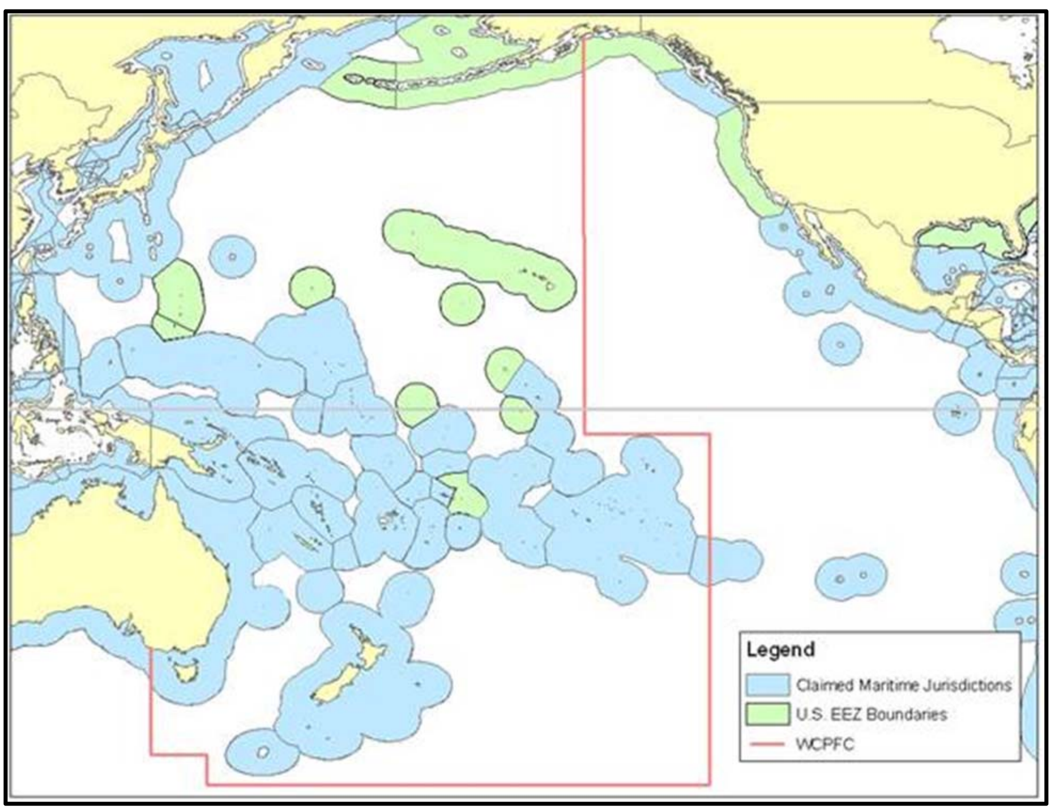
In addition, to meet EFH and National Environmental Policy Act (NEPA) mandates, this SAFE report tracks activities that occur in the ocean that are of interest to the Council and incidents that may contribute to cumulative impact. This includes monitoring fishing and non-fishing activities and facilities, including aquaculture facilities, alternative energy facilities, military training and testing activities, oil spill and other emergency responses. Information on these activities is provided in Section 3.5.

1 INTRODUCTION

The Fishery Management Plan (FMP) for Pelagic Fisheries of the Western Pacific Region was implemented by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) on 23 March 1987. The Western Pacific Regional Fishery Management Council (WPRFMC or Council) developed the FMP to manage the pelagic resources that are covered by the Magnuson Fishery Conservation and Management Act of 1976 (MSA) and that occur in the U.S. Exclusive Economic Zone (EEZ) around American Samoa, the Commonwealth of the Northern Mariana Islands (CNMI), Guam, Hawai`i, and the U.S. possessions in the Western Pacific Region (Johnston Atoll, Kingman Reef and Palmyra, Jarvis, Howland, Baker, Midway, and Wake Islands). In 2010, the Council and NMFS implemented the Fishery Ecosystem Plan (FEP) for the Pacific Pelagic Fisheries that manages the fisheries while integrating vital ecosystem elements important to decision-making, including social, cultural, and economic dimensions, protected species, habitat considerations, climate change effects, and the implications to fisheries from various spatial uses of the marine environment.

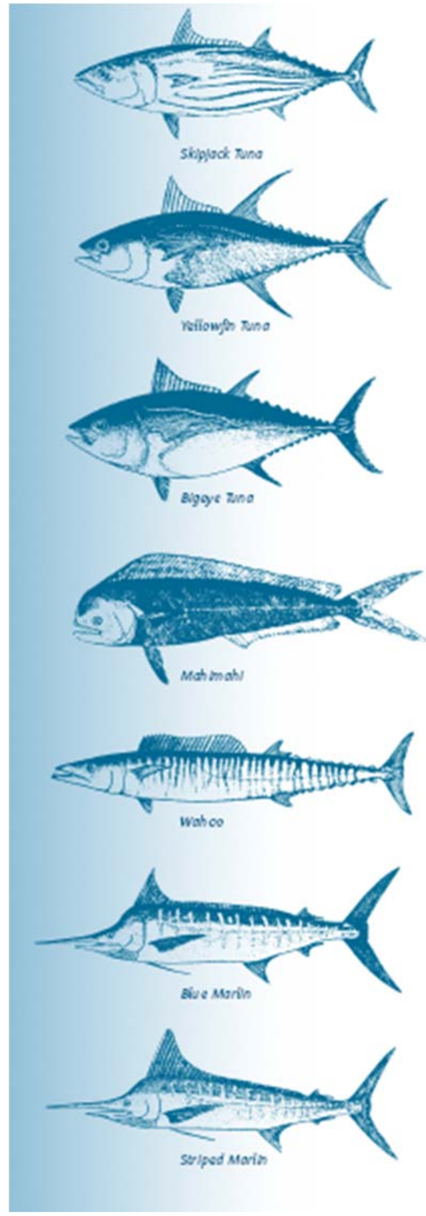
For more information regarding the plan's objectives, past amendments, and other information, refer to the Pelagic FEP found on Council website and regulations at 50 CFR 665.

Figure 1. Map of the Western Pacific Region



1.1 BACKGROUND TO THE SAFE REPORT

Following the Pelagic FEP requirements, the Council has been generating annual reports that assist the Council and NMFS in assessing the status of the stocks, fisheries, and effectiveness of the management regime. In July 2013, NMFS issued a final rule (78FR43066) that revised National Standard 2 (NS2) guidelines to manage fisheries using of the best scientific available information and clarify the content and purpose of the Stock Assessment and Fishery Evaluation (SAFE) Report. In 2015, the Council, in partnership with NMFS Pacific Islands Fisheries Science Center, local fishery resource management agencies, and the NMFS Pacific Islands Regional Office (PIRO), agreed to revise and expand the contents of future annual reports to include the range of ecosystem elements described above. This year marks the first iteration of the SAFE report that combines the requirements of reporting for the FEP with those required under NS2 guidelines.



1.2 PELAGIC MUS LIST

The Management Unit Species (MUS) managed under the Pelagic FEP in 2015 include large pelagic species such as tunas (tribe Thunnini), billfishes (Istiophoridae and Xiphiidae), and other harvested species with distribution straddling domestic and international waters. The MUS excludes some scombrids found predominantly near land, such as the bonitos (tribe Sardini, e.g., dogtooth tuna *Gymnosarda unicolor*). Although they are sometimes caught by the FEP-managed fisheries and reported herein, the MUS also excludes all jacks (Carangidae, e.g., rainbow runner *Elagatis bipinnulata*) all barracudas (Sphyraenidae) and all sharks except the following nine species: pelagic thresher shark (*Alopias pelagicus*), bigeye thresher shark (*Alopias superciliosus*), common thresher shark (*Alopias vulpinus*), silky shark (*Carcharhinus falciformis*), oceanic whitetip shark, (*Carcharhinus longimanus*), blue shark (*Prionace glauca*), shortfin mako shark (*Isurus oxyrinchus*), longfin mako shark (*Isurus paucus*), salmon shark (*Lamna ditropis*), and squid (family cephalopods) (Table 1). Although caught frequently, most shark MUS are discarded now that finning is illegal.

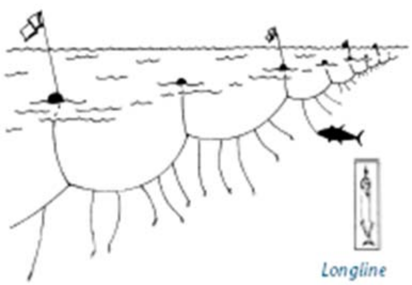
Table 1. Names of Pacific Pelagic Management Unit Species

English Common Name	Scientific Name	Samoan or AS local	Hawaiian or HI local	Chamorroan or Guam local	S. Carolinian or CNMI local	N. Carolinian or CNMI local
Mahimahi (dolphinfishes)	*Coryphaena* spp.	Masimasi	Mahimahi	Botague	Sopor	Habwur
Wahoo	*Acanthocybium solandri*	Paala	Ono	Toson	Ngaal	Ngaal
Indo-Pacific blue marlin Black marlin	*Makaira mazara:* *M. indica*	Sa'ula	A'u, Kajiki	Batto'	Taghalaar	Taghalaar
Striped marlin	*Tetrapturus audax*		Nairagi			
Shortbill spearfish	*T. angustirostris*	Sa'ula	Hebi	Spearfish		
Swordfish	*Xiphias gladius*	Sa'ula malie	A'u kū, Broadbill, Shutome	Swordfish	Taghalaar	Taghalaar
Sailfish	*Istiophorus platypterus*	Sa'ula	A'u lepe	Guihan layak	Taghalaar	Taghalaar
Pelagic thresher shark Bigeye thresher shark Common thresher shark Silky shark Oceanic whitetip shark Blue shark Shortfin mako shark Longfin mako shark Salmon shark	*Alopias pelagicus* *Alopias superciliosus* *Alopias vulpinus* *Carcharhinus falciformis* *Carcharhinus longimanus* *Prionace glauca* *Isurus oxyrinchus* *Isurus paucus* *Lamna ditropis*	Malie	Mano	Halu'u	Paaw	Paaw
Albacore	*Thunnus alalunga*	Apakoa	'Ahi palaha, Tombo	Albacore	Angaraap	Hangaraap
Bigeye tuna	*T. obesus*	Asiasi, To'uo	'Ahi po'onui, Mabachi	Bigeye tuna	Toghu, Sangir	Toghu, Sangir
Yellowfin tuna	*T. albacares*	Asiasi, To'uo	'Ahi shibi	'Ahi, Shibi	Yellowfin tuna	Toghu
Northern bluefin tuna	*T. thynnus*		Maguro			
Skipjack tuna	*Katsuwonus pelamis*	Atu, Faolua, Ga'oga	Aku	Bunita	Angaraap	Hangaraap
Kawakawa	*Euthynnus affinis*	Atualo, Kavalau	Kawakawa	Kawakawa	Asilay	Hailuway
Moonfish	*Lampris* spp	Koko	Opah		Ligehrigher	Ligehrigher
Oilfish family	Gempylidae	Palu talatala	Walu, Escolar		Tekiniipek	Tekiniipek
Pomfret	family Bramidae	Manifi moana	Monchong			
Other tuna relatives Neon flying squid	*Auxis* spp, *Scomber* spp; *Allothunus* spp Ommastrephes Bartamii	(various)	Ke'o ke'o, saba (various) Squid, ika	(various)	(various)	(various)

English Common Name	Scientific Name	Samoan or AS local	Hawaiian or HI local	Chamorroan or Guam local	S. Carolinian or CNMI local	N. Carolinian or CNMI local
Diamondback squid	Thysanoteuthis rhombus		Squid, ika			
Purple flying squid	Sthenoteuthis oualaniensis		Squid, ika			

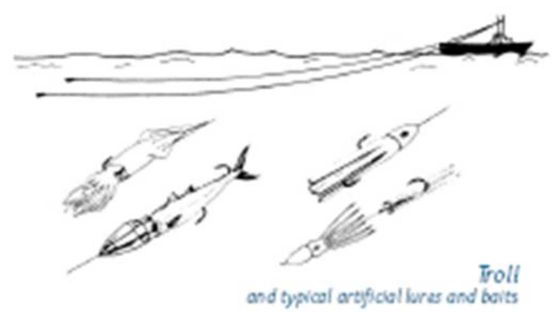
1.3 BRIEF LIST OF PELAGIC FISHERIES/GEAR TYPES MANAGED UNDER THE FEP

U.S. pelagic fisheries in the Western Pacific Region are, with the exception of purse seining, primarily variations of hook-and-line fishing. These include longlining, trolling, handlining, and pole-and-line fishing. The U.S. Purse-seine fishery is managed under an international convention and is therefore not discussed in this report. In addition, while the U.S. fleet of albacore trollers, based at West Coast ports, occasionally operates in the Western Pacific, this fishery is not directly managed by the Western Pacific Fishery Management Council, and is also not described in this report.



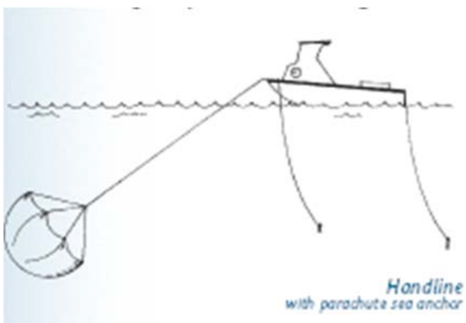
U.S. longline vessels in the Western Pacific Region are based primarily in Hawai`i and American Samoa, although Hawai`i-based vessels targeting swordfish and bigeye tuna have also fished seasonally out of California. The Hawai`i fishery, with 135 vessels, targets a range of species, with vessels setting shallow longlines to catch swordfish or fishing deep to maximize catches of bigeye tuna. Catches by the Hawai`i fleet also include yellowfin tuna, mahimahi, wahoo, blue and striped marlins, opah (moonfish) and monchong (pomfret). The Hawai`i fishery does not freeze its catch, which is sold to the fresh fish and sashimi markets in Hawai`i, Japan, and the U.S. mainland. The total catch in 2015 for the Hawai`i-based fleet was 26 million lbs, with 87% caught by the deep-set fishery.

The American Samoa fleet with 20 active vessels in 2015, down from a peak of 70 in 2001, fishes almost exclusively for albacore, which is landed to two tuna canneries in American Samoa. The estimated pelagic fishery landings in 2015 amounted to 4.7 million lbs. Pelagic landings consisted primarily of four tuna species: albacore, yellowfin, bigeye, and skipjack. The pelagic species wahoo, blue marlin, and mahimahi comprised most of the non-tuna landings.



Trolling and, to lesser extent, handline fishing for pelagics is the largest commercial fishery in terms of participation, although it catches annually a relative modest volume of fish amounting to about 6.0 million lbs in 2015, with approximately 50% of the landings from the Hawai`i troll fishery. Part of this catch is made by charter or for-hire fishing vessels. In 2015, there were 1,564 troll vessels and 467 handline vessels in Hawai`i, 372 troll vessels in Guam, 14 troll vessels in CNMI and 11 troll vessels in American Samoa. Troll and handline catches are dominated by yellowfin tuna in Hawai`i, by skipjack tuna in Guam, and skipjack and yellowfin tuna in American Samoa. Other commonly caught troll catches include mahimahi, wahoo, and blue marlin. About 80 percent of the troll and handline landings are made by Hawai`i vessels.

Troll fishing for pelagics is the commonest recreational fishery in the islands of the Western Pacific Region. The definition of recreational fishing, however, continues to be problematic in a region where many fishermen who are fishing primarily for recreation may sell their fish to cover their expenses. Hawaii's 2015 boat-based recreational fishery landings amounted to almost 16 million lbs, based on surveys of fishermen, with skipjack tuna are the most commonly recreationally caught pelagic fish by number, and yellowfin tuna dominating the catch in terms of weight. Recreational or non-commercial landings from boats in Guam were estimated at 712,351 lbs in 2015, with mahimahi, blue marlin and skipjack the principal species caught. Recreational landings in CNMI were estimated at 4,922 lbs. Recreational landings from boats in American Samoa were about 663 lbs in 2015.



In 2014, tuna fisheries in the Western Pacific Ocean as a whole catch about 2.9 million mt of fish, with U.S. fisheries in the Western Pacific Region catching about 8.6% (248,115 mt) of the total. Most of the catch is taken by fleets of high seas longliners and purse seiners from countries such as Japan, Taiwan, Korea. Small scale artisanal longlining is also conducted in Pacific Island countries like Samoa and in South America, where there are thousands of small scale longline vessels fishing in coastal waters.

Fishing has been a way of life for millennia across the Pacific Island Region. Each of the archipelagos within this region have a rich and fascinating history, where fishing maintains a critical part in the cultural identity and health of the people. Today, fishing is both a modern enterprise, sustaining an important industry and providing fresh seafood to all of the region's inhabitants, as well as an important pastime that maintains connections to the environment around us.

1.3.1 AMERICAN SAMOA

The islands of American Samoa are an area of modest productivity relative to areas to the north and west. The region is traversed by two main currents: the southern branch of the westward-flowing South Equatorial Current during June - October and the eastward-flowing South Equatorial Counter Current during November - April. Surface temperatures vary between 27°-29° C and are highest in the January - April period. The upper limit of the thermocline in ocean areas is relatively shallow (27° C isotherm at 100 m (approx. 328 ft) depth) but the thermocline itself is diffuse (lower boundary at 300 m (approx. 984 ft) depth).

1.3.1.1 TRADITIONAL AND HISTORICAL PELAGIC FISHERIES

The pelagic fishery in American Samoa is and has been an important component of the American Samoan domestic economy. American Samoan dependence on fishing undoubtedly goes back as far as the peopled history of the islands of the Samoan archipelago, about 3,500 years ago. Many aspects of the culture have changed in contemporary times but American Samoans have retained a traditional social system that continues to strongly influence and depend upon the culture of fishing. Centered around an extended family (`aiga) and allegiance to a hierarchy of chiefs (matai), this system is rooted in the economics and politics of communally-held village land. It has effectively resisted Euro-American colonial influence and has contributed to a contemporary cultural resiliency unique in the Pacific islands region.

American Samoa is a landing and canning port for the U.S. Purse seine fishery for skipjack and yellowfin tuna, with the largest catch of all U.S. pelagic fisheries in the region. The U.S. longline fishery for South Pacific albacore conducted primarily in the American Samoa EEZ comprises the second-largest of the U.S. longline fisheries in the FEP (after Hawai`i). The ecosystem based fishery management approach to regulation under the MSA has focused on the socioeconomics of allocating catch and access to EEZ areas by fleet sectors, and creating domestic regulations to monitor and mitigate longline fishery impacts to sea turtles and other protected species. American Samoa is a participating U.S. territory in the Western and Central Pacific Fisheries Commission (WCPFC) which status exempts it from certain WCPFC measures so as not to restrict responsible fishery development. The WCPFC establishes conservation and management measures that NMFS implements under its authorities, including the MSA.

Prior to 1995, the pelagic fishery was largely a troll fishery. Horizontal longlining was introduced to the Territory by Western Samoan fishermen in 1995. Local fishers have found longlining worthwhile as they land more lbs with less effort and use less gasoline for trips. Initially the vessels used in longlining were “alias,” locally built, twin-hulled (wood with fiberglass or aluminum) vessels about 30 ft long, powered by 40HP gasoline outboard engines. Larger monohull vessels capable of longer multi-day trips began joining the longline fleet soon after the alias. The number of alias participating in the fishery decreased to below three by 1995 and due to confidentiality requirements cannot be directly reported. Landings from these vessels are added to the total landings. The number of commercial troll vessels has also declined.

Vessels longer than 50 ft are restricted from fishing within 50 nautical miles of Tutuila, Manu‘a, Swains Island and Rose Atoll (see Marine Planning Section for details). Albacore is the primary species caught longlining, with the bulk of the longline catch sold to the Pago Pago canneries. Remaining catch is sold to stores, restaurants and local residents or donated for customary trade or traditional functions. Pago Pago Harbor on the island of Tutuila is a regional base for the trans-shipment and processing of tuna taken by domestic fleets from other South Pacific nations, the distant-waters longline fleets, and purse seine fleets. Purse seine vessels land skipjack, yellowfin and other tunas, with little albacore.

1.3.1.2 CURRENT PELAGIC FISHERIES

Small-scale longline: This fishery is almost defunct with only one vessel still operating. Most participants in the small-scale domestic longline fishery were indigenous American Samoans with vessels under 50 ft in length, most of which are alia boats under 40 ft in length. The stimulus for American Samoa’s commercial fishermen to shift from troll or handline gear to longline gear in the mid-1990s was the fishing success of 28-foot alia catamarans that engaged in longline fishing in the EEZ around Independent Samoa. Following this example, the fishermen in American Samoa deployed a short monofilament longline, with an average of 350 hooks per set, from a hand-powered reel (WPRFMC, 2000). An estimated 90 percent of the crews working in the American Samoa small-scale alia longline fleet were from Independent Samoa. Like the conventional monohull longline fishery (see below) the predominant catch from the small-scale fishery is albacore, which is marketed to the local tuna canneries.

Large-scale longline: American Samoa's domestic longline fishery expanded rapidly in 2001. Much of the recent (and anticipated future) growth is due to the entry of monohull vessels larger than 50 ft in length. The number of permitted longline vessels in this sector increased from seven in 2000 to 38 by 2003. Of these, five permits for vessels between 50.1 ft - 70 ft and five permits for vessels larger than 70 ft were believed to be held by indigenous American Samoans as of March 21, 2002. Economic barriers have prevented more substantial indigenous participation in the large-scale sector of the longline fishery. The lack of capital appears to be the primary constraint to substantial indigenous participation in this sector. In 2015, there were 18 active longline vessels, with 10 vessels greater than 70 ft and six vessels between 50 and 70 ft.

While the smallest (less than or equal to 40 ft) vessels average 350 hooks per set, vessels over 50 ft can set 5-6 times more hooks and has a greater fishing range and capacity for storing fish (8-40 mt as compared to 0.5-2 mt on a small-scale vessel). Larger vessels are also outfitted with hydraulically-powered reels to set and haul mainline, and modern electronic equipment for navigation, communications and fish finding. Most are presently being operated to freeze albacore onboard, rather than to land chilled fish.

Troll and handline fishery: From October 1985 to the present, catch and effort data in American Samoa fisheries have been collected through a creel survey that includes subsistence and recreational fishing, as well as commercial fishing. However, differentiating commercial troll fishing activity from non-commercial activity can be difficult.

Recreational fishing: Recreational fishing underwent a renaissance in American Samoa with the establishment of the Pago Pago Game Fishing Association (PPGFA), founded in 2003 by a group of recreational anglers. The motivation to form the PPGFA was the desire to host regular fishing competitions. There are about 15 recreational fishing vessels ranging from 10 ft single engine dinghies to 35 ft twin diesel engine cabin cruisers. The PPGFA has annually hosted international tournaments over the past 15 years, including the Steinlager I'a Lapo'a Game Fishing Tournament (a qualifying event for the International Game Fish Association's Offshore World Championship in Cabo San Lucas, Mexico). The recreational vessels use anchored FADs extensively, and on tournaments venture to the various outer banks which include the South Bank (35 miles), North East Bank (40 miles NE), South East bank (37 miles SE), 2% bank (40 miles), and East Bank (24 miles East).

There was no full-time regular charter fishery in American Samoa similar to those in Hawai`i or Guam. However, Pago Pago Marine Charters now operates a full-time charter fishery.

Estimates of the volume and value of recreational fishing in American Samoa are not precise. A volume approximation of boat based recreational fishing is generated in this annual report based on the annual sampling of catches conducted by WPacFIN. While, boat-based recreational catches were as high as 46,462 lbs and averaged about 14,000 lbs in the last ten years, the 2015 recreational catch in 2015 was 663 lbs.

While no permits have been issued to date, non-commercial fishing and recreational charter fishing is permitted within the Rose Atoll Marine National Monument. These permits are available only to a community resident of American Samoa or a charter business established legally under the laws of American Samoa.

1.3.2 GUAM

Generally, the major surface current affecting Guam is the North Equatorial Current, which flows westward through the islands. Sea surface temperatures off Guam vary between 80.9° – 84.9° Fahrenheit, depending on the season. The mixed layer extends to depths between 300 and 400 ft.

1.3.2.1 TRADITIONAL AND HISTORICAL PELAGIC FISHERIES

Fishing in Guam continues to be important not only in terms of contributing to the subsistence needs of the Chamorro people but also in terms of preserving their history and identity. Fishing assists in perpetuating traditional knowledge of marine resources and maritime heritage of the Chamorro culture.

1.3.2.2 CURRENT PELAGIC FISHERIES

Pelagic fishing vessels based on Guam are classified into two general groups: distant-water purse seiners and longliners that fish outside Guam's EEZ and transship through the island; and small, primarily recreational, trolling boats that are either towed to boat launch sites or berthed in marinas and fish only within local waters, either within Guam's EEZ or on some occasions in the adjacent EEZ of the Northern Mariana Islands. This annual report covers primarily the local, Guam-based, small-boat pelagic fishery.

Landings consisted primarily of five major species: mahimahi (*Coryphaena hippurus*), wahoo (*Acanthocybium solandri*), skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), and Pacific blue marlin (*Makaira mazara*). Other minor pelagic species caught include rainbow runner (*Elagatis bipinnulatus*), great barracuda (*Sphyraena barracuda*), kawakawa (*Euthynnus affinis*), dogtooth tuna (*Gymnosarda unicolor*), double-lined mackerel *(Grammatorcynus bilineatus*), oilfish (*Ruvettus pretiosus*), and three less common species of barracuda.

The number of boats involved in Guam's pelagic or open ocean fishery gradually increased from about 200 vessels in 1982. There were 372 boats active in Guam's domestic pelagic fishery in 2015. A majority of the fishing boats are less than 10 m (33 ft) in length and are usually owner-operated by fishermen who earn a living outside of fishing. Most fishermen sell a portion of their catch and it is difficult to make a distinction between recreational, subsistence, and commercial fishers. A small, but significant, segment of Guam's pelagic fishery is made up of marina-berthed charter boats that are operated primarily by full-time captains and crews.

1.3.3 HAWAI`I

The archipelago's position in the Pacific Ocean lies within the clockwise rotating North Pacific Subtropical Gyre, extending from the northern portion of the North Equatorial Current into the region south of the Subtropical High, where the water moves eastward in the

North Pacific Current. At the pass between the Main Hawaiian Islands (MHI) and the Northwestern Hawaiian Islands (NWHI) there is often a westward flow from the region of Kauai along the lee side of the lower NWHI. This flow, the North Hawaiian Ridge Current, is extremely variable and can also be absent at times. The analysis of 10 years of shipboard acoustic Doppler current profiler data collected by the NOAA Ship Townsend Cromwell shows mean flow through the ridge between Oahu and Nihoa, and extending to a depth of 200 m.

Embedded in the mean east-to-west flow are an abundance of mesoscale eddies created from a mixture of wind, current, and sea floor interactions. The eddies, which can rotate either clockwise or counter clockwise, have important biological impacts. For example, eddies create vertical fluxes, with regions of divergence (upwelling) where the thermocline shoals and deep nutrients are pumped into surface waters enhancing phytoplankton production, and also regions of convergence (downwelling) where the thermocline deepens. Sea surface temperatures around the Hawaiian Archipelago experience seasonal variability, but generally vary between 18°-28° C (64°-82° F) with the colder waters occurring more often in the NWHI.

A significant source of inter-annual physical and biological variation around Hawai`i are El Niño and La Niña events. During an El Niño, the normal easterly trade winds weaken, resulting in a weakening of the westward equatorial surface current and a deepening of the thermocline in the central and eastern equatorial Pacific. Water in the central and eastern equatorial Pacific becomes warmer and more vertically stratified with a substantial drop in surface chlorophyll.

Physical and biological oceanographic changes have also been observed on decadal time scales. These low frequency changes, termed regime shifts, can impact the entire ocean ecosystem. Recent regime shifts in the North Pacific have occurred in 1976 and 1989, with both physical and biological (including fishery) impacts. In the late 1980's an ecosystem shift from high carrying capacity to low carrying capacity occurred in the NWHI. The shift was associated with the weakening of the Aleutian Low Pressure System (North Pacific) and the Subtropical Counter Current. The ecosystem effects of this shift were observed in lower nutrient and productivity levels and decreased abundance of numerous species in the NWHI including the spiny lobster, the Hawaiian monk seal, various reef fish, the red-footed booby, and the red-tailed tropic bird.

1.3.3.1 TRADITIONAL AND HISTORICAL PELAGIC FISHERIES

In old Hawai`i, fishing in nearshore waters (from the shoreline to the edges of the reefs and where there happens to be no reef, to a distance of mile from the beach) was regulated by the chiefs and closed seasons were determined by the life history of specific organisms. Areas known as nurseries were not used for fishing. This understanding of natural forces has been captured in the Hawaiian moon calendar, which incorporates the tides and seasons to explain the cycles of scarcity and abundance and provide guidance on what activities should occur at what times of the year. Deep sea fishing (beyond the reefs) was available and open to everyone and conducted based on annual/seasonal weather conditions. Those who fished in the deep ocean sought out these fishing grounds and kept them secret (Kahaulelio 2006). Fish caught in the deep sea included skipjack (aku), dolphinfish (mahimahi), billfish (a‘u), tuna (ahi) and other pelagic species.

1.3.3.2 CURRENT PELAGIC FISHERIES

Hawaii’s pelagic fisheries, which include the longline, Main Hawai`ian Islands (MHI) troll and handline, offshore handline, and the aku boat (pole and line) fisheries, are the state’s largest and most valuable fishery sector. The target species are tunas and billfish, but a variety of other species are also important. Collectively, these pelagic fisheries made approximately 39.7 million lbs of commercial landings with a total ex-vessel value of $106 million in 2015. The deep-set longline fishery was the largest of all commercial pelagic fisheries in Hawai`i and represented 81% of the total commercial pelagic catch and 86% of the ex-vessel revenue. The MHI troll was the second largest fishery in Hawai`i and accounted for 8% and 7% of the catch and revenue, respectively. The shallow-set longline, MHI handline, aku boat, offshore handline fisheries and other gear types made up the remainder.

The largest component of pelagic catch in 2015 was tunas. Bigeye tuna was the largest component, both in lbs and revenue accounting for 79% of the tunas and 50% of all pelagic catch. Billfish catch made up 17% of the total catch in 2015. Swordfish was the largest of these, at 49% of the billfish and 8% of the total catch. Mahimahi was the traditionally largest component of the non-tuna and non-billfish catch, but is now has been exceeded by moonfish (opah) (1,614,000 lbs and 2,086,000 lbs respectively). Catches of other PMUS represented 18% of the total catch in 2015 with moonfish being the largest component at 36% of the other PMUS and 7% of the total catch.

The Hawai`i longline fishery is by far the most important economically, accounting in 2015 for about 89% percent of the estimated ex-vessel value of the total commercial fish landings in the state. In 2013, it is estimated that the commercial seafood industry in Hawai`i generated sales impacts of $855 million and income impacts of $262 million while supporting approximately 11,000 full and part time jobs in the State of Hawai`i. The commercial harvest sector generated 3,800 jobs, $196 million in sales, $71 million in income, and $102 million in value added impacts (NMFS 2012[3]).

Recreational fisheries are also extremely important in the State of Hawai`i economically, socially, and culturally. The total estimated pelagic recreational fisheries production in 2015 was 15.8 million lbs. The number of small vessels in Hawai`i has declined to approximately 11,000 since a peak of over 16,000 vessels in 2008. Boat-based anglers took 273,190 fishing trips in 2015, with only 8,070 designated charter vessel trips. The total value of the recreational catch, which includes pelagics, bottomfish and reef fish was $5.54 million.

1.3.4 COMMONWEALTH OF THE NORTHERN MARIANAS ISLANDS

Generally, the major surface current affecting CNMI is the North Equatorial Current, which flows westward through the islands, however the Subtropical Counter Current affects the

3 National Marine Fisheries Service. 2014. Fisheries Economics of the United States, 2012. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-F/SPO-137, 175p.

Northern Islands and generally flows in an easterly direction. Depending on the season, sea surface temperatures near the Northern Mariana Islands vary between 80.9° – 84.9° Fahrenheit. The mixed layer extends to between depths of 300-400 ft.

1.3.4.1 TRADITIONAL AND HISTORICAL PELAGIC FISHERIES

Fishery resources have played a central role in shaping the social, cultural and economic fabric of the CNMI. The aboriginal peoples indigenous to these islands relied on seafood as their principal source of protein and developed exceptional fishing skills. Later immigrants to the islands from East and Southeast Asia also possessed a strong fishing tradition. Under the MSA, the CNMI is defined as a fishing community.

1.3.4.2 CURRENT PELAGIC FISHERIES

The CNMI's pelagic fisheries occur primarily from the island of Farallon de Medinilla south to the island of Rota. Trolling is the primary fishing method utilized in the pelagic fishery. The pelagic fishing fleet consists primarily of vessels less than 24 foot in length, which usually have a limited 20-mile travel radius from Saipan.

The primary target and most marketable species for the pelagic fleet is skipjack tuna (71% of 2015 commercial landings). Schools of skipjack tuna have historically been common in near shore waters, providing an opportunity to catch numerous fish with a minimum of travel time and fuel costs. Skipjack is readily consumed by the local populace and restaurants, primarily as sashimi. Yellowfin tuna and mahimahi are also easily marketable species but are seasonal. During their seasonal runs, these fish are usually found close to shore and provide easy targets for the local fishermen.

Yellowfin tuna and mahimahi are also easily marketable species but are seasonal. During their runs, these fish are usually found close to shore and provide easy targets for the local fishermen. In addition to the economic advantages of being near shore and their relative ease of capture, these species are widely accepted by all ethnic groups which has kept market demand fairly high.

In late 2007, Crystal Seas became the first established longline fishing company in the CNMI to begin its operation out of the island of Rota. However, by 2009 Crystal Seas had become Pacific Seafood and relocated its operation to Saipan. In 2011, there were four licensed longline fishing vessels stationed in the CNMI. But these vessels did not do well, and found it very difficult to market their catch. By 2014, there were no active longliners in the CNMI, although a few of the original vessels were experimenting (unsuccessfully) with other types of fishing.

1.3.5 PACIFIC REMOTE ISLAND AREAS

Baker Island lies within the westward flowing South Equatorial Current. Baker Island also experiences an eastward flowing Equatorial Undercurrent that causes upwelling of nutrient and plankton rich waters on the west side of the island (Brainard *et. al* 2005). Sea surface temperatures of pelagic EEZ waters around Baker Island are often near 30° C. Although the depth of the mixed layer in the pelagic waters around Baker Island is seasonally variable, average mixed layer depth is around 100 m.

Howland Island lies within the margins of the eastward flowing North Equatorial Counter Current and the margins of the westward flowing South Equatorial Current. Sea surface temperatures of pelagic EEZ waters around Baker Island are often near 30° C. Although the depth of the mixed layer in the pelagic waters around Howland Island is seasonally variable, average mixed layer depth is around 70 m – 90 m.

Jarvis Island lies within the South Equatorial Current which runs in a westerly direction. Sea surface temperatures of pelagic EEZ waters around Jarvis Island are often 28°- 30° C. Although depth of the mixed layer in the pelagic waters around Jarvis Island is seasonally variable, average mixed layer depth is around 80 m.

Palmyra Atoll and Kingman Reef lie in the North Equatorial Counter-current, which flow in a west to east direction. Sea surface temperatures of pelagic EEZ waters around Palmyra Atoll are often 27°- 30° C. Although the depth of the mixed layer in the pelagic waters around Kingman Reef is seasonally variable, average mixed layer depth is around 80 m.

Sea surface temperatures of pelagic EEZ waters around Johnston Atoll are often 27°- 30° C. Although the depth of the mixed layer in the pelagic waters around Johnston Atoll is seasonally variable, average mixed layer depth is around 80 m.

Sea surface temperatures of pelagic EEZ waters around Wake Island are often 27°- 30° C. Although the depth of the mixed layer in the pelagic waters around Wake Atoll is seasonally variable, average mixed layer depth is around 80 m.

1.3.5.1 TRADITIONAL AND HISTORICAL PELAGIC FISHERIES

As many tropical pelagic species (e.g. skipjack tuna) are highly migratory, the fishing fleets targeting them often travel great distances. Although the EEZ waters around Johnston Atoll and Palmyra Atoll are over 750 nm and 1000 nm (respectively) away from Honolulu, the Hawai`i longline fleet does seasonally fish in those areas. For example, the EEZ around Palmyra is visited by Hawai`i-based longline vessels targeting yellowfin tuna, whereas at Johnston Atoll, albacore is often caught in greater numbers than yellowfin or bigyeye tuna. Similarly, the U.S. purse seine fleet also targets pelagic species (primarily skipjack tuna) in the EEZs around some Pacific Remote Island Areas (PRIAs), specifically, the equatorial areas of Howland, Baker, and Jarvis Islands. The combined amount of fish harvested from these areas from the U.S. purse seine on average is less than five percent of their total annual harvest.

1.3.5.2 CURRENT PELAGIC FISHERIES

The U.S. Fish & Wildlife Service (USFWS) prohibits fishing within the Howland Island, Jarvis Island, and Baker Island National Wildlife Refuge (NWR) boundaries. Currently, Jarvis Island, Howland Island and Baker Island are uninhabited. The USFWS manages Johnston Atoll as a National Wildlife Refuge, but does allow some recreational fishing within the Refuge boundary.

1.4 FMP/FEP AMENDMENTS AND NMFS ACTIONS IMPLEMENTED IN 2015

There were no amendments to the FEP in 2015, but NMFS did take final action on several issues listed below, including the closure of the bigeye tuna fishery:

- 80 FR 15693: NMFS issued a final rule establishing requirements for fishing in the Pacific Remote Islands Marine National Monument Expansion. This rule was necessary for the expanded monument area to have rules consistent with the Proclamation 9173, including a prohibition on commercial fishing and permit and reporting requirements for non-commercial and recreational fishing.

- 80 FR 44883: NMFS issued a temporary rule fishery closure of the pelagic longline fishery for bigeye tuna in the western and central Pacific Ocean as a result of the fishery reaching the 2015 catch limit. This closure occurred between August 5 and December 31, 2015.

- 80 FR 46515: NMFS issued a temporary rule to close the U.S. pelagic longline fishery for bigeye tuna for vessels over 24 m in overall length in the eastern Pacific Ocean as a result of the fishery reaching the 2015 catch limit. This closure occurred between August 12 and December 31, 2015.

- 80 FR 61767: NMFS issued final specifications a 2015 limit of 2,000 mt of longline-caught bigeye tuna for CNMI, allowing the territory to allocate up to 1,000 mt each year to U.S. longline fishing vessels in a specified fishing agreement that meets established criteria. This is effective October 9 through December 31, 2015.

- 80 FR 68788: NMFS issued final specifications a 2015 limit of 2,000 metric tons of longline-caught bigeye tuna for Guam, allowing the territory to allocate up to 1,000 mt each year to U.S. longline fishing vessels in a specified fishing agreement that meets established criteria. This is effective November 6 through December 31, 2015.

- 80 FR 74002: NMFS issued a temporary rule fishery closure of the U.S. pelagic longline fishery for bigeye tuna in the western and central Pacific Ocean as a result of the fishery reaching the 2015 CNMI allocation limit. This closure occurred between November 30 and December 31, 2015.

1.5 TOTAL PELAGIC LANDINGS IN WPR FOR ALL FISHERIES

A summary of the total pelagic landings during 2013 in the Western Pacific and the percentage change between 2012 and 2013 is shown in Table 2.

Table 2. Total pelagic landings in the Western Pacific Region in 2015

Species	American Samoa		Guam		CNMI		Hawai`i	
	Lbs	% change	Lbs	% change	Lbs	% change	Lbs	% change
Swordfish	16,324	-22.73	0	0.00	0	0	3,372,000	-8.62
Blue marlin	51,533	-12.65	37,646	36.41	0	-100.00	1,786,000	18.20
Striped marlin	7,499	-48.59	0	0.00	0	0.00	1,115,000	15.31
Other billfish*	7,622	29.94	0	-100.00	0	0.00	651,000	17.72
Mahimahi	12,021	-47.21	159,146	-16.87	97,928	12.53	1,486,000	-18.31
Wahoo	139,050	-6.53	31,497	-66.37	3,705	-65.29	1,221,000	3.83
Opah (moonfish)	3,803	50.97	0	0.00	0	0.00	2,659,000	18.60
Sharks (whole wt)	2,060	26.77	0	0.00	0	0.00	146,000	13.18
Albacore	3,476,583	8.59	0	0.00	0	0.00	676,000	22.46
Bigeye tuna	151,073	-18.68	160	NA	0	0.00	19,962,000	20.51
Bluefin tuna	0	NA	0	0.00	0	0.00	0	NA
Skipjack tuna	199,861	-22.93	601,716	54.28	292,951	21.65	721,000	11.27
Yellowfin tuna	703,697	-25.53	111,509	227.82	16,220	-12.65	4,030,000	14.42
Other pelagics**	1,632	-16.95	5955	384.93	0	-100.00	1,869,000	8.35
Total	4,772,758	-1.99	947,629	28.41	410,804	11.93	39,694,000	13.09

Note: Total Pelagic Landings are based on commercial reports and/or creel surveys. % change based on 2014 landings.

*Other billfish include: black marlin, spearfish, and sailfish

**Other pelagics include: kawakawa, unknown tunas, pelagic fishes (dogtooth tuna, rainbow runner, barracudas), oilfish, and pomfret. Of these, only oilfish and pomfret are Pelagic MUS. While other tables in Chapter 2 excluded or separated out non-MUS, for this total landings table, the data could not accurately provide individual landings data for these species.

1.6 COUNCIL RECOMMENDATIONS

There were no recommendations by the Pelagics Plan Team in 2016 to be forwarded to the Council, only Action Items to Pelagic Plan Team members on improvements to modules.

2 DATA MODULES

2.1 AMERICAN SAMOA

2.1.1 DATA SOURCES

This report contains the most recently available information on American Samoa's pelagic fisheries, as compiled from data generated by the Department of Marine and Wildlife Resources (DMWR) through a program established in conjunction with the Western Pacific Fishery Information Network (WPacFIN) and the Council. Purse seine and non-U.S. vessel landings are not included in this module, but are discussed in general in the international module (Section 2.6).

Prior to 1985, only commercial landings were monitored. From October 1985 to the present, data have been collected through the Tutuila and Manu'a boat-based creel survey to include subsistence, recreational, as well as commercial fishing. Total number of sampling days, interviews, and observed trips are used to estimate annual catch, effort, bycatch, and other fishery metrics in this section. The number of days sampled decreased 8% from 2014 to 2015 from 237 to 218. The survey sampled approximately 60% of the total estimated trolling trips and interviewed nearly 50% of the fishermen. Surveyors have noted that fishermen may not accurately report the number of fish released at sea, although the troll fishery in American Samoa has never been known to release fish.

In September 1990, a Commercial Purchase System (receipt book) was instituted requiring all businesses that buy fish commercially in American Samoa, with an exception for the canneries, to submit a copy of their purchase receipts to the DMWR. In January 1996, NMFS implemented a federal longline logbook system. All longline fishermen are required to obtain a federal permit and to submit logs containing detailed data on each of their sets and the resulting catch, including the number of hooks set and number of fish released as bycatch. Confidentiality requirements prohibit providing a breakdown of the alia and monohull longline vessels. Changes to the data collection and analysis methodology have occurred periodically and are described in previous annual reports. No changes to the data collection or analysis were made in 2015.

Participation (number of boats) is determined through both logbook entries and creel interviews. Effort (number of trips, hooks) is determined by direct reporting for longline trips, but is indirectly calculated for trolling trips, based on total lbs landed (reported), and average hourly catch rate and duration for trip (creel interviews). Since 2009 (the year of the tsunami), only the longline logbook database has been useful in determining the number of active boats. Prior to that, DMWR's boat-based creel survey data were also used to assess whether or not longline vessels were active. This helped include information from alia longline vessels that did not frequent the canneries, and was designed to exclude alias that exclusively conducted bottomfishing and/or trolling.

Average pound per fish is calculated directly from creel-weighed fish sampled over the year, while cannery fish weight is determined based on a length to weight conversion, as longline boats have been landing their catches gilled and gutted since 1999.

Total landings data cover all fish caught and brought back to shore whether it enters the commercial market or not. Commercial landings cover the portion of the total landings that was sold both to the canneries and other smaller local business. The difference between total landings and commercial landings is the recreational/subsistence component of the fishery.

This module was prepared by DMWR and WPacFIN, and was reviewed by the Pelagics Plan Team, Scientific and Statistical Committee, and the Council.

2.1.2 SUMMARY OF AMERICAN SAMOAN PELAGIC FISHERY

Landings. The estimated annual pelagic landings have varied widely, from 1 to 15 million lbs since 1998. The 2015 landings were approximately 4.7 million lbs, which contributes to the declining trend since peak landings in 2002 (Figure 5). Pelagic landings consist mainly of four tuna species – albacore, yellowfin, skipjack and bigeye – which when combined with other tuna species made up 95% of the total landings. Albacore made up 77% of the tuna species. Wahoo, swordfish and blue marlin made up most of the non-tuna species landings.

Effort. There were 18 active vessels of all Class sizes in 2015, (Table 7). Class D vessels (> 70 foot) were the most active boats, followed by Class C (50 - 60 foot) with 6 active vessels. There was no fishing by Class B vessels (40 - 50 foot). Class A (< 40 foot) had 2 active vessels. The number of longline boats decreased from 22 in 2014 to 18 in 2015. The 18 vessels that fished in 2015 made 168 trips (average 9 trips/vessel), deployed 2,407 sets, (133 sets/vessel) using 6.7 million hooks (Table 8).

Longline Catch-Per-Unit-Effort (CPUE). The total pelagic catch rate by all longline vessels increased by 1.7/1,000 Hooks in 2015. The tuna catch rate also increased by 1.4 fish/1,000 Hooks in 2015. Non-tuna and other pelagic species all showed relatively constant catch rates from 2009 to 2015. The longline catch rate for tuna species have fluctuated during the past ten years. Albacore, the species targeted by longline boats, have increased this year (13.1 fish/1,000 Hooks). The catch rate for all pelagic species slightly changed in 2015 from 2014.

Lbs-Per-Hour Trolling. Trolling catch rate increased steeply from 2010 to 2011 and increased slightly to its long-term peak in 2012. The catch rate has decreased every year since, and in 2015 was one-third the 2012 rate despite a 61 hour increase in trolling effort.

While troll trips have decreased 17% from the previous year and troll hours increased by 6%, the average catch per troll hour for all pelagic species have still decreased (Figure 23). The catch rates for blue marlin has increased whereas catch rates for mahimahi, wahoo, skipjack and yellowfin have decreased (Figure 24 and Figure 25).

Fish Size. Average weight-per-fish from the cannery samples for all tuna species are nearly the same in the last five years, especially for albacore and skipjack tuna (Table 6), with a slight decrease for bigeye and yellowfin tuna. Albacore weight ranged from 38-39 lbs. There has been a slight variation for yellowfin and bigeye tunas in the past four years. For yellowfin, weight varied from 50-60 lbs and for bigeye tuna, it varied from 45-54 lbs. Mean weight for mahimahi and wahoo decreased slightly.

Revenues. Commercial landings of tuna species continue to decline, with the 2015 landings the lowest in the past ten years (Figure 6). Tunas accounted for 96% of total pelagic landings with an estimated adjusted revenue of $4.7 million in 2015, and an accumulated average $1.10 price per pound. Albacore accounted for 79% of the revenue, with an estimated price of $1.28 per pound. See Human Dimensions (section 3.1) for a full accounting of the socio-economic data for all American Samoa fisheries.

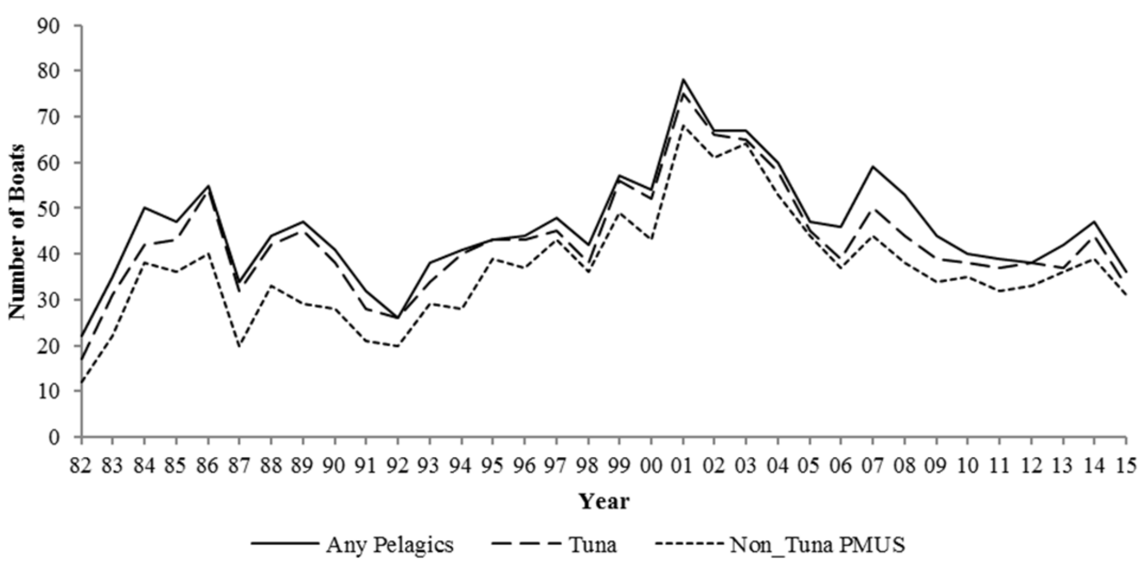
Bycatch. There was no recorded bycatch for the troll fishery in 2015 (Table 15). The number of sharks released by longline vessels has increased, whereas fewer tunas, non-tunas, and other pelagics have been released compared to 2014. Only 1% of the tuna bycatch was released. But this could also mean that the boats caught less bycatch. Skipjack and albacore were the most released bycatch tuna species, while sharks, oilfish and blue marlin had the highest numbers of non-tuna released fish, accounting for 68% release of non-tuna species. In total, only 9% of all pelagic species caught were released. Fish are released for various reasons including quality, handling and storage difficulties, and marketing problems. Investigation into the reasons for releasing pelagic species are recommended because of the high release rate for many non-tuna Pacific Pelagic Management Unit Species (PMUS) and releases of some tuna.

2.1.3 PLAN TEAM RECOMMENDATIONS

There were no recommendations by the Pelagics Plan Team in 2016 to be forwarded to the Council, only Action Items to Pelagic Plan Team members on improvements to modules

2.1.4 OVERVIEW OF PARTICIPATION – ALL FISHERIES

Figure 2. Number of American Samoa boats landing any pelagic species, tunas and non-tuna PMUS

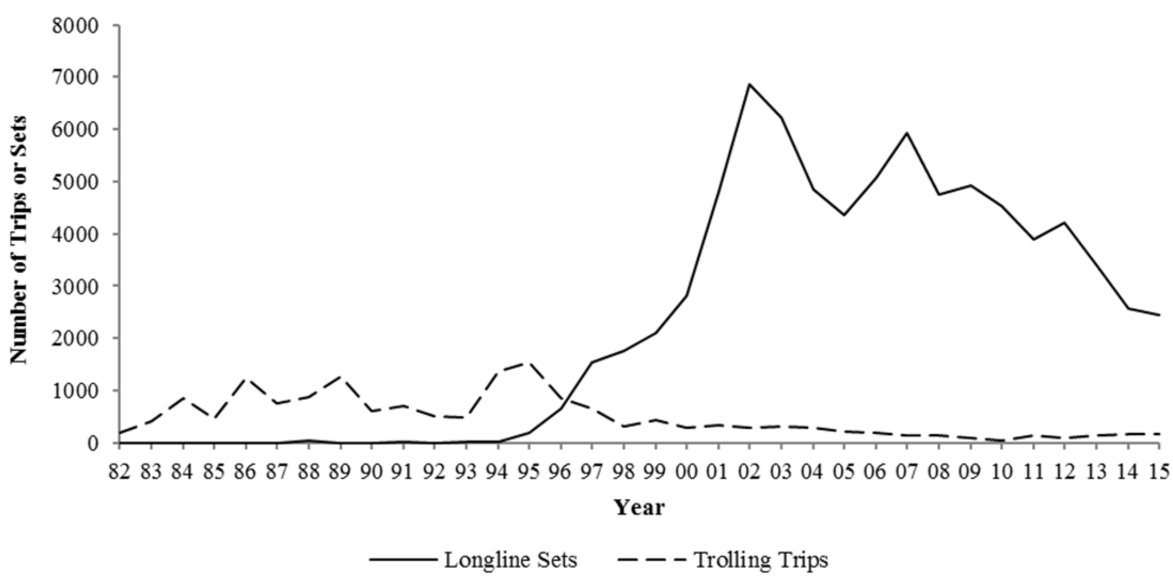


Supporting data shown in Table A-1.

Figure 3. Number of American Samoa boats landing any pelagic species by longlining, trolling and all methods

Supporting data shown in Table A-2.

Figure 4. Number of American Samoa fishing trips or sets for all pelagic species by method



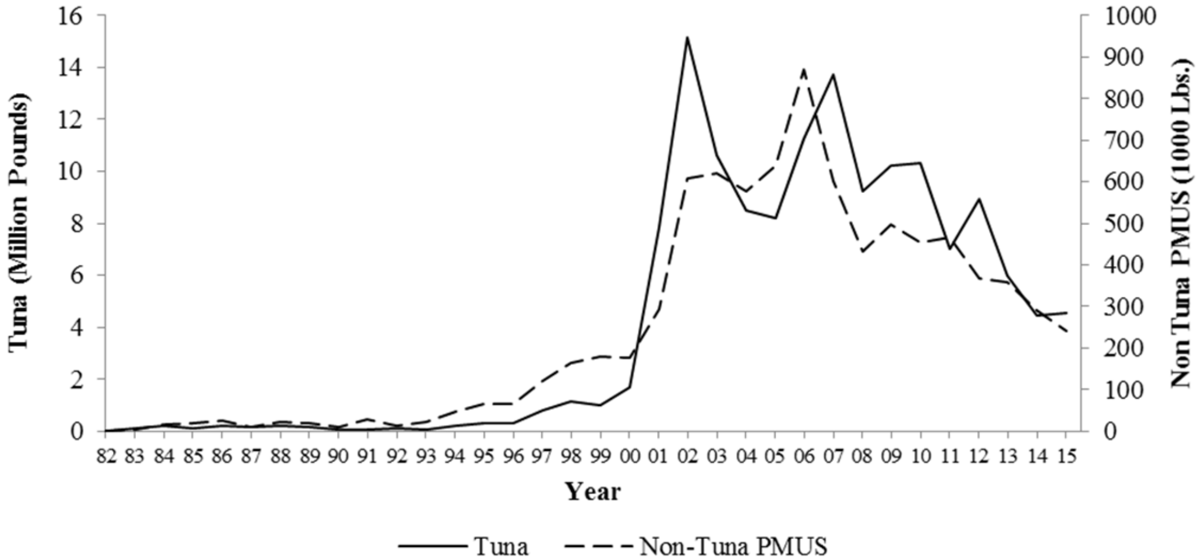
Supporting data shown in Table A-3.

2.1.5 OVERVIEW OF LANDINGS – ALL FISHERIES

Table 3. American Samoa 2015 estimated total landings of pelagic species by gear type.

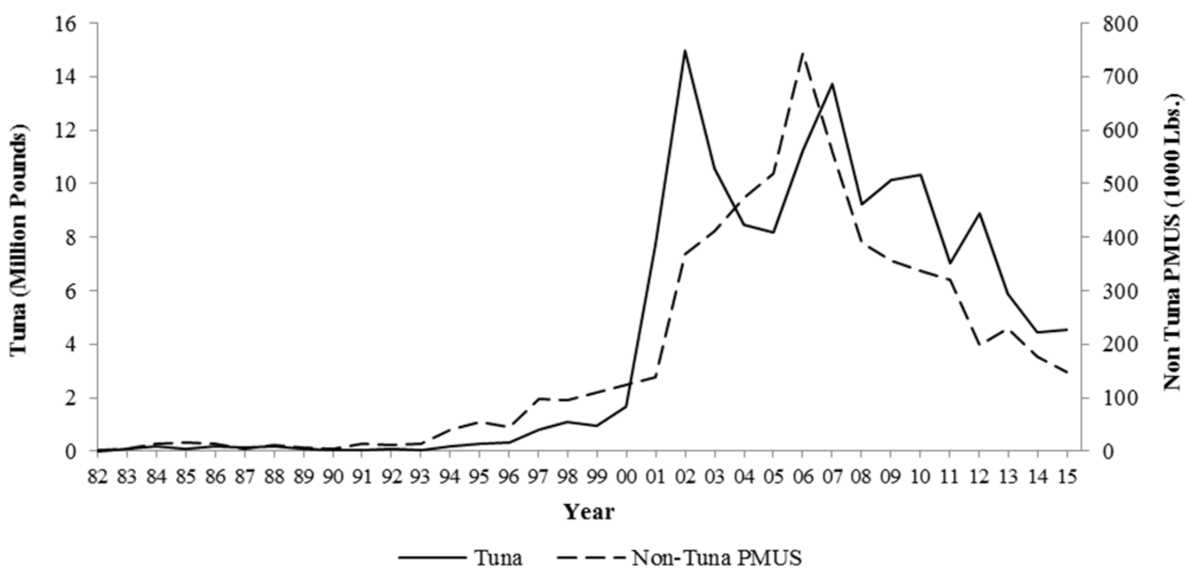
Species	Longline Lbs	Troll Lbs	Other Gear Lbs	Total Lbs
Skipjack tuna	192,494	6,881	486	199,861
Albacore	3,475,631	0	0	3,475,631
Yellowfin tuna	699,660	4,011	26	703,697
Kawakawa	0	11	0	11
Bigeye tuna	151,073	0	0	151,073
Tunas (unknown)	952	0	0	952
Tunas Subtotals	4,519,810	10,903	513	4,531,226
Mahimahi	11,050	883	87	12,021
Blue marlin	49,766	1,767	0	51,533
Striped marlin	7,499	0	0	7,499
Wahoo	138,319	505	226	139,050
Sharks (unknown coastal)	1,885	0	175	2,060
Swordfish	16,324	0	0	16,324
Sailfish	3,517	1,391	0	4,908
Spearfish	2,714	0	0	2,714
Moonfish	3,704	0	99	3,803
Oilfish	613	0	15	627
Pomfret	898	0	0	898
Non-Tuna PMUS Subtotals	236,289	4,546	602	241,436
Pelagic fishes (unknown)	96	0	0	96
Other Pelagics Subtotals	96	0	0	96
Total Pelagics	4,756,195	15,449	1,114	4,772,758

Figure 5. American Samoa annual estimated total landings of Tuna and Non-Tuna PMUS



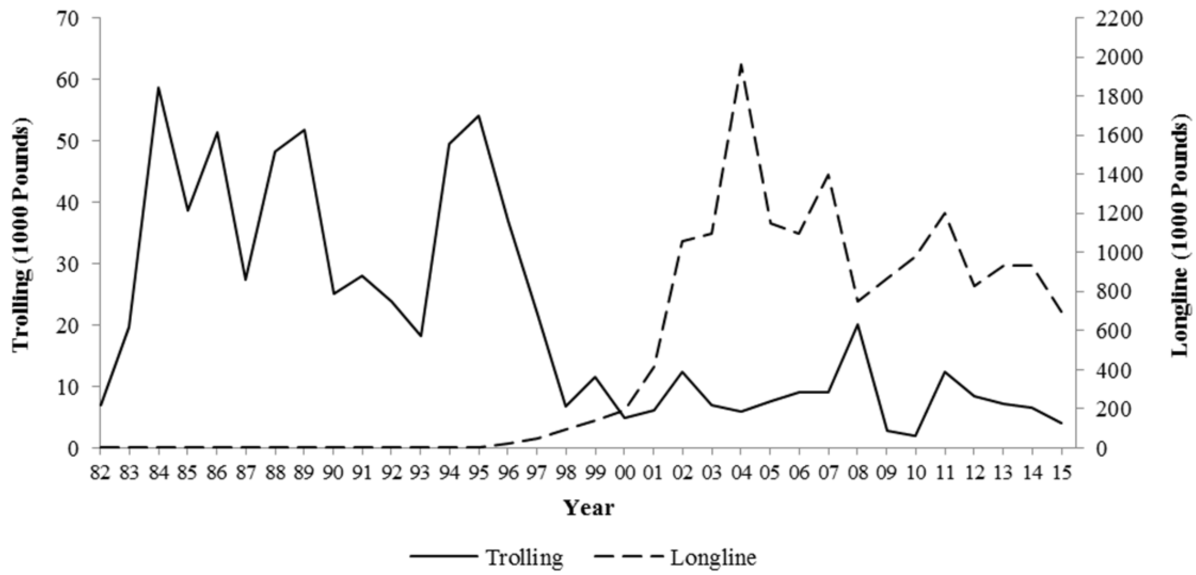
Supporting data shown in Table A-4.

Figure 6. American Samoa annual commercial landings of Tunas and Non-Tuna PMUS



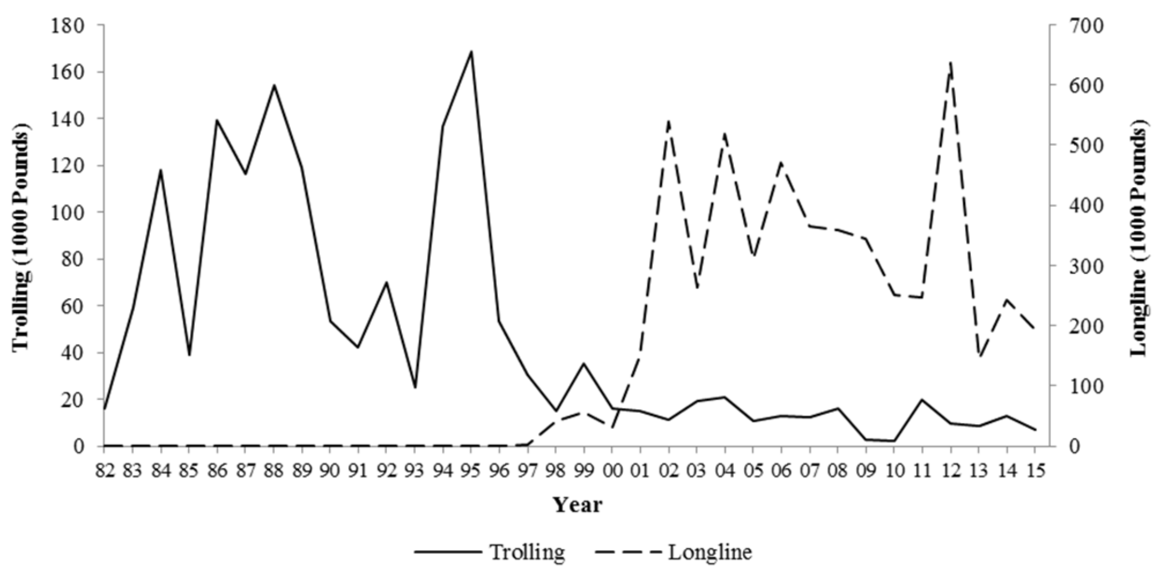
Supporting data shown in Table A-5.

Figure 7. American Samoa annual estimated total landings of Yellowfin Tuna by gear



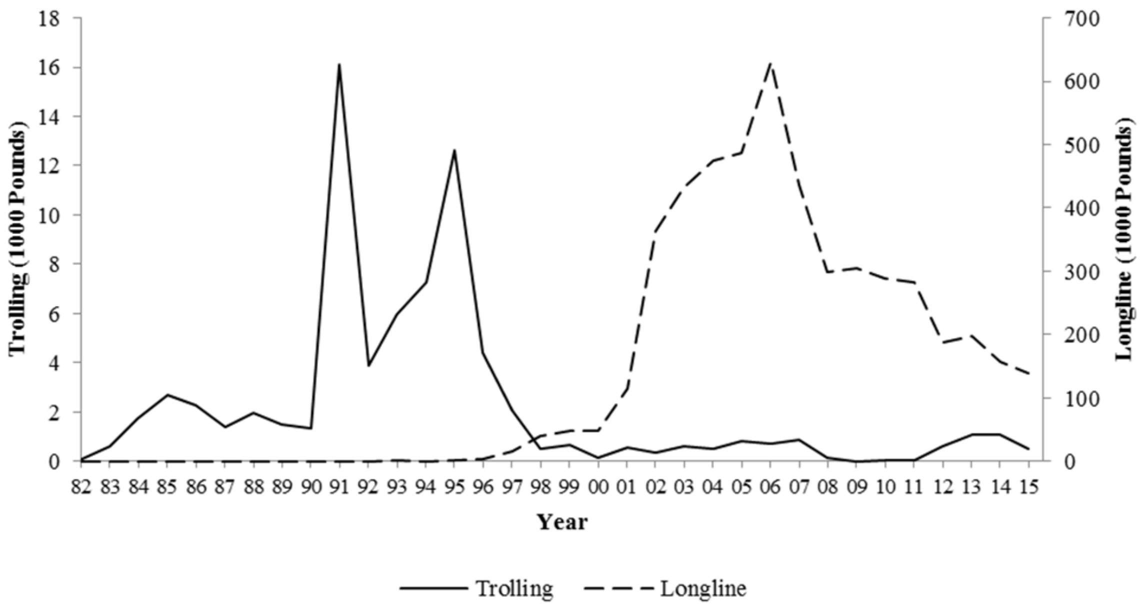
Supporting data shown in Table A-6.

Figure 8. American Samoa annual estimated total landings of Skipjack Tuna by gear



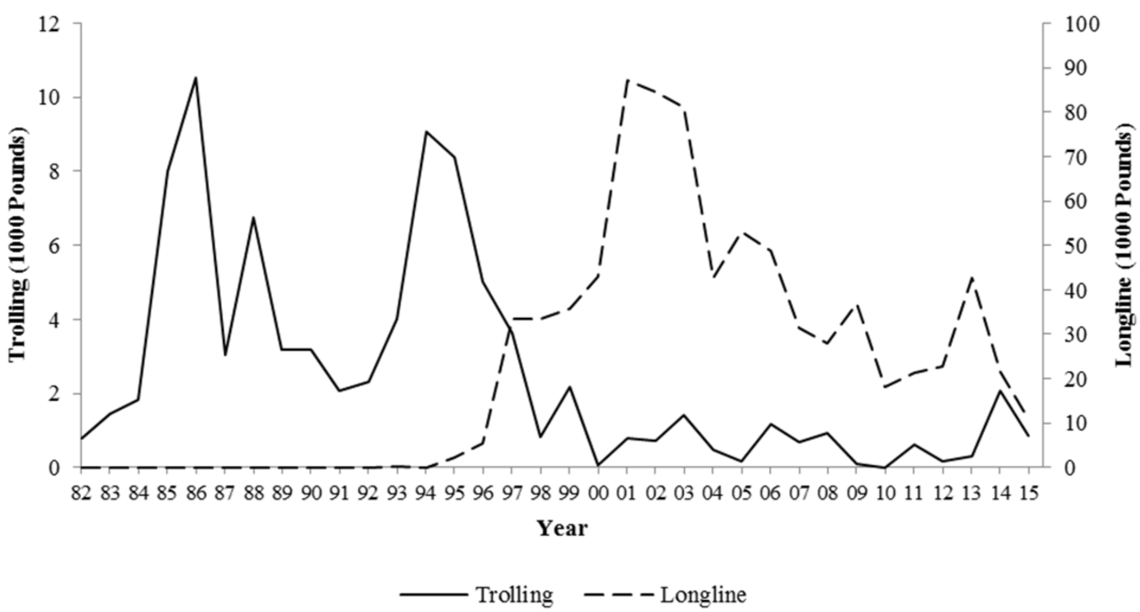
Supporting data shown in Table A-7.

Figure 9. American Samoa annual estimated total landings of Wahoo by gear



Supporting data shown in Table A-8.

Figure 10. American Samoa annual estimated total landings of Mahimahi by gear

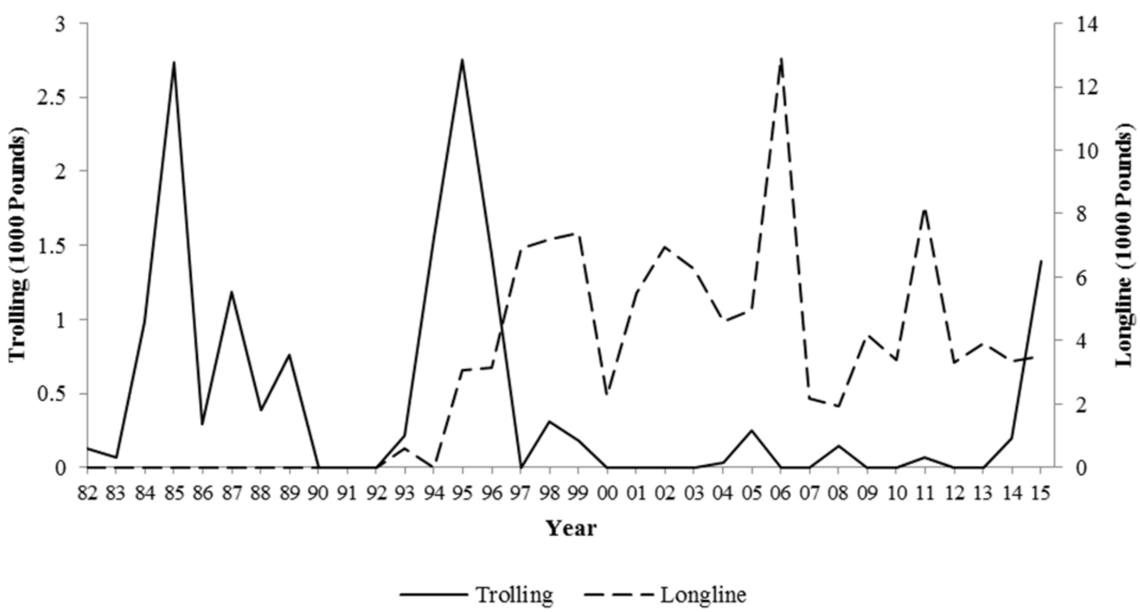


Supporting data shown in Table A-9.

Figure 11. American Samoa annual estimated total landings of Blue Marlin by gear

Supporting data shown in Table A-10.

Figure 12. American Samoa annual estimated total landings of Sailfish by gear



Supporting data shown in Table A-11.

2.1.6 WEIGHT-PER-FISH – ALL FISHERIES

Figure 13. Average Albacore Weight-per-fish

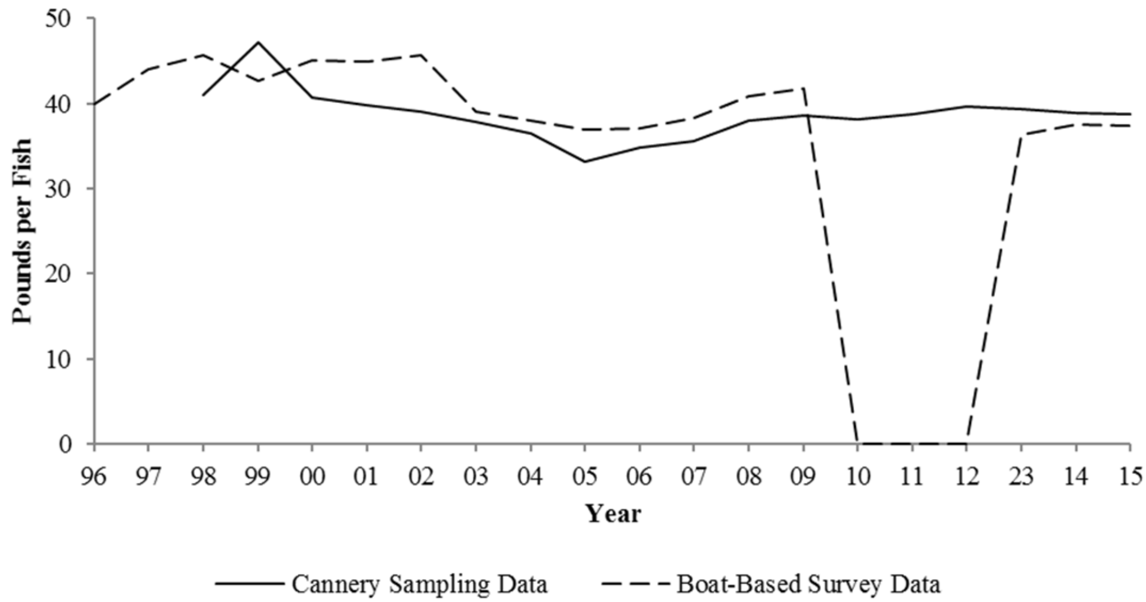


Figure 14. Average Cannery Sampled Weight-per-fish for Other Tunas and Wahoo

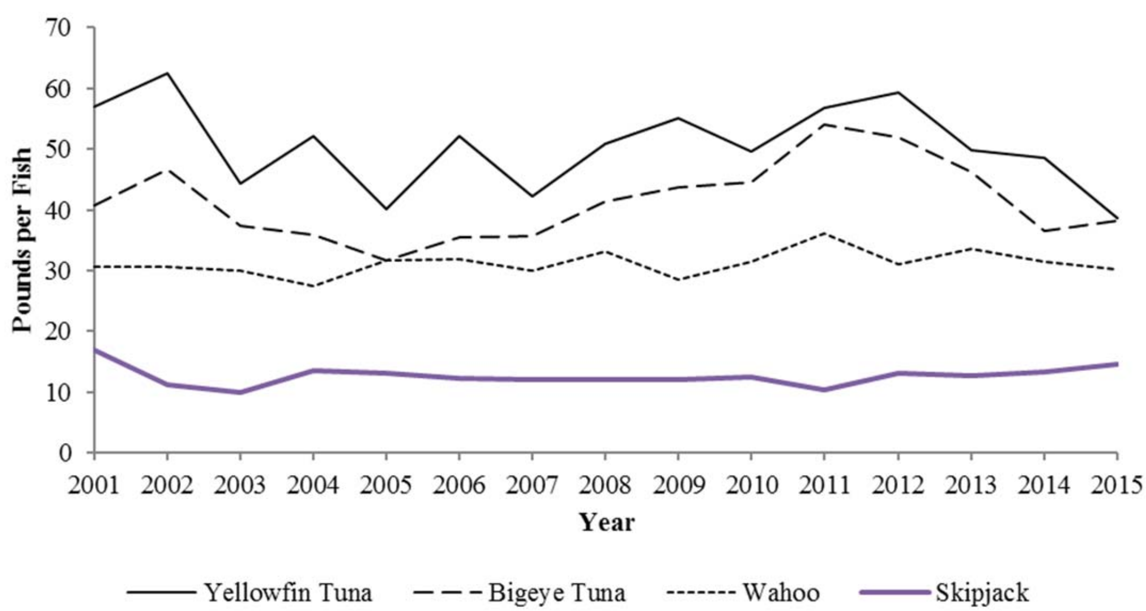


Table 4. Cannery Sampled Average Weight-per-fish (1998-2003)

Species	1998	1999	2000	2001	2002	2003
Skipjack tuna				16.8	11.3	9.9
Albacore	41.0	47.2	40.7	39.8	39.1	37.8
Yellowfin tuna				57.0	62.4	44.3
Bigeye tuna				40.7	46.8	37.4
Mahimahi				16.2	13.5	20.7
Black marlin				36.3		
Wahoo				30.6	30.7	30.0
Sailfish					27.4	
Moonfish				147.6	117.6	
Pomfret				5.1	6.2	
Rainbow runner					9.4	

Table 5. Cannery Sampled Average Weight-per-fish (2004-2009)

Species	2004	2005	2006	2007	2008	2009
Skipjack tuna	13.6	13.1	12.3	12.1	12.0	12.1
Albacore	36.5	33.2	34.8	35.6	37.9	38.7
Yellowfin tuna	52.1	40.1	52.1	42.2	50.9	55.2
Bigeye tuna	35.9	31.6	35.5	35.6	41.4	43.7
Mahimahi	13.0	17.2	13.4	13.5	19.1	15.1
Blue marlin		45.8				
Wahoo	27.4	31.7	31.9	29.9	33.2	28.5
Swordfish	72.3		90.3			
Sailfish		22.9	21.7			
Moonfish		95.5	34.7			
Pomfret		7.8		5.4		
Rainbow runner	10.8					

Table 6. Cannery Sampled Average Weight-per-fish (2010-2014)

Species	2010	2011	2012	2013	2014	2015
Skipjack tuna	12.4	10.4	13.2	12.8	13.4	14.5
Albacore	38.2	38.7	39.7	39.3	38.9	38.8
Yellowfin tuna	49.5	56.7	59.4	49.8	48.6	38.7
Bigeye tuna	44.6	54.0	52.0	46.2	36.6	38.3
Mahimahi	23.7	21.6	22.8	22.4	14.1	
Blue marlin		48.9				
Wahoo	31.4	36.2	31.1	33.5	31.6	30.1

2.1.7 AMERICAN SAMOA LONGLINE PARTICIPATION, EFFORT, LANDINGS, BYCATCH, AND CPUE

Table 7. Number of permitted and active longline fishing vessels by size class

	Class A <= 40 Ft		Class B <= 50 Ft		Class C <= 70 Ft		Class D > 70 Ft	
Year	Permits	Active	Permits	Active	Permits	Active	Permits	Active
1994	0	0	0	0	0	0	0	0
1995	14	4	0	0	0	0	0	0
1996	26	11	1	0	1	0	0	0
1997	35	19	1	0	1	1	2	2
1998	37	21	1	0	1	1	1	1
1999	45	35	2	1	2	2	1	1
2000	45	37	2	2	5	3	2	2
2001	61	37	6	6	11	9	23	18
2002	55	32	6	6	14	6	25	18
2003	31	17	5	4	15	9	23	22
2004	11	9	2	2	13	8	22	21
2005	8	5	3	2	11	9	20	18
2006	21	3	5	0	10	6	24	19
2007	18	2	6	0	9	5	26	22
2008	17	1	6	0	9	5	26	22
2009	1	1	1	1	8	5	26	22
2010	12	1	0	0	12	5	26	20
2011	12	1	1	0	12	5	27	18
2012	5	3	5	0	11	8	27	14
2013	5	1	5	0	11	7	26	14
2014	0	2	0	0	0	7	0	13
2015	0	6	0	0	0	6	0	12

Note: Number of permits in 2014 and 2015 is unavailable; These data are used for Figure 15 and Figure 16 that follow.

Figure 15. Number of permitted and active longline fishing vessels in size classes A (< 40 ft) and D (> 70 ft)

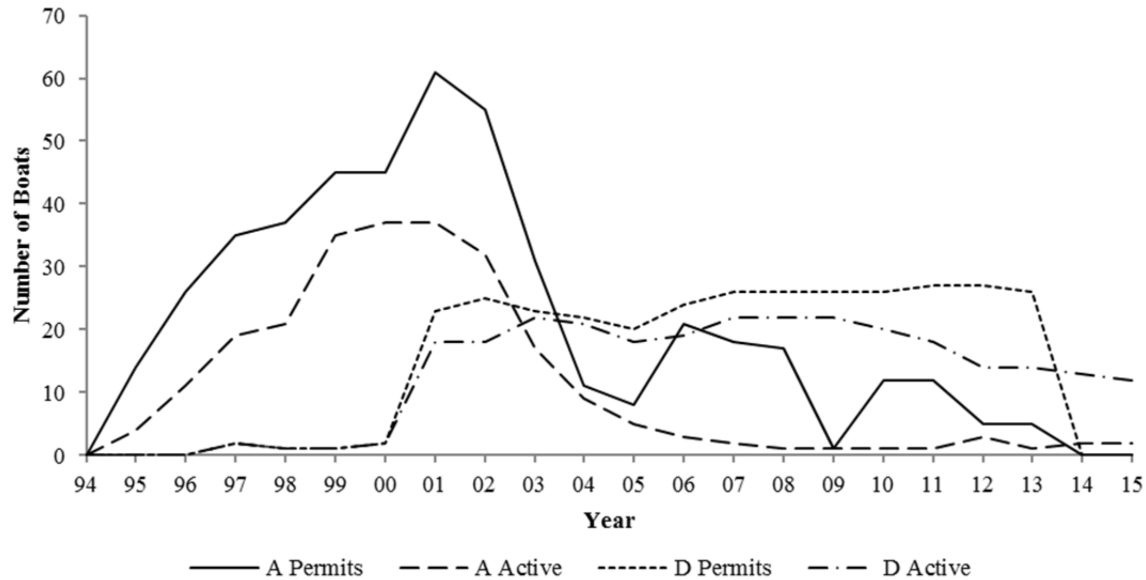


Figure 16. Number of permitted and active longline fishing vessels in size classes B (40-50 ft) and C (51-70 ft)

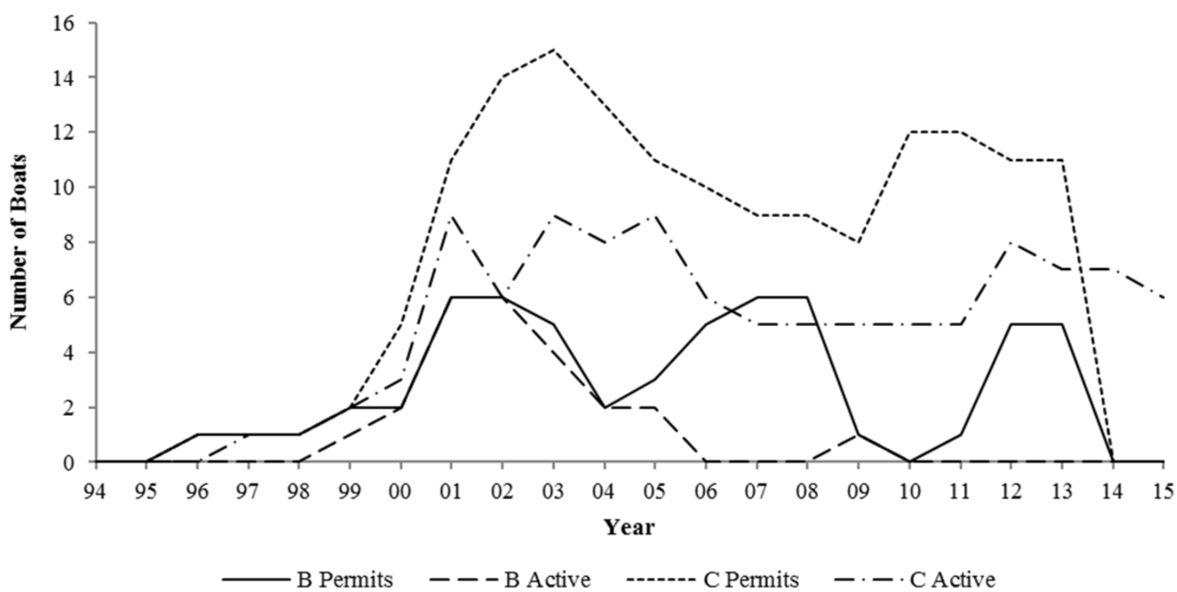


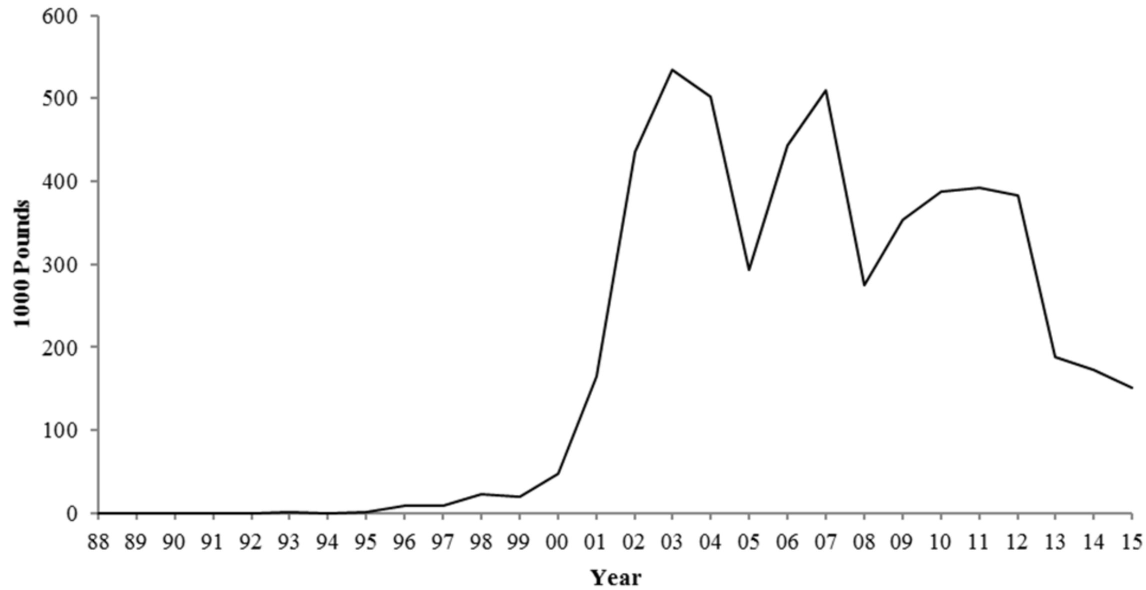
Table 8. Longline Effort by American Samoan Vessels during 2015

	All Vessels
Boats	18
Trips	169
Sets	2,452
1,000 Hooks	6,922
Lightsticks	0

Figure 17. Thousands of American Samoa longline hooks set (Federal Logbook Data)

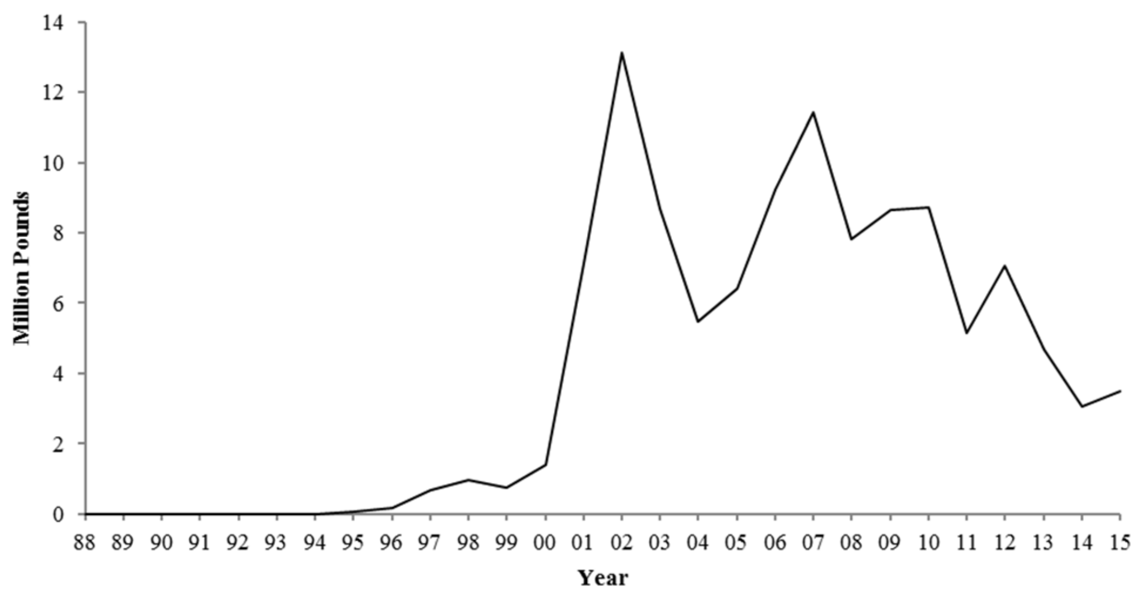
Supporting data shown in Table A-12.

Figure 18. American Samoa annual estimated total landings of Bigeye Tuna by longlining



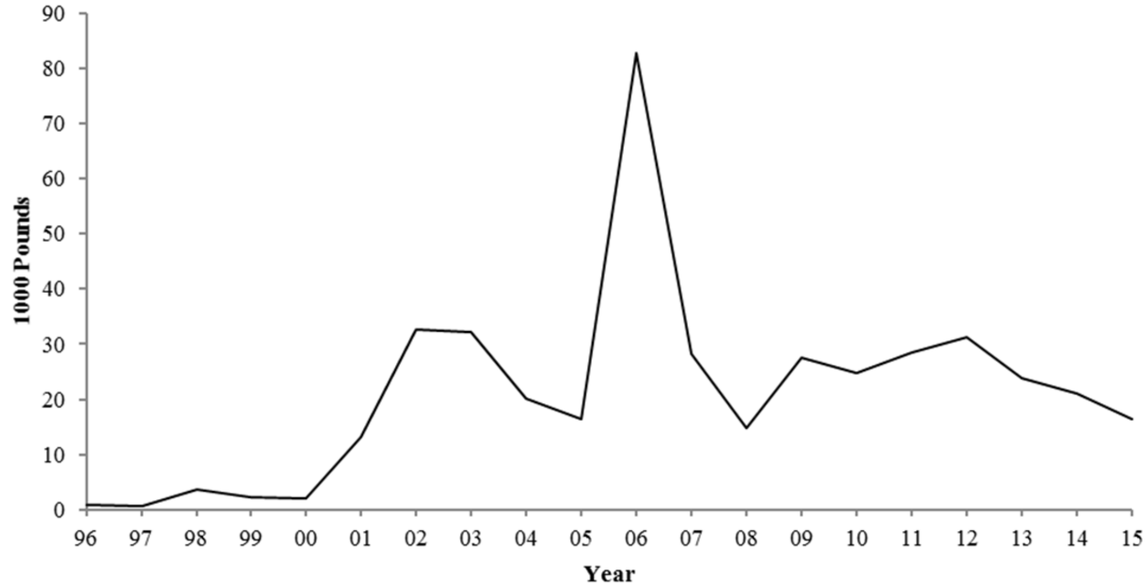
Supporting data shown in Table A-13.

Figure 19. American Samoa annual estimated total landings of Albacore by longlining



Supporting data shown in Table A-14.

Figure 20. American Samoa annual estimated total landings of Swordfish by longlining

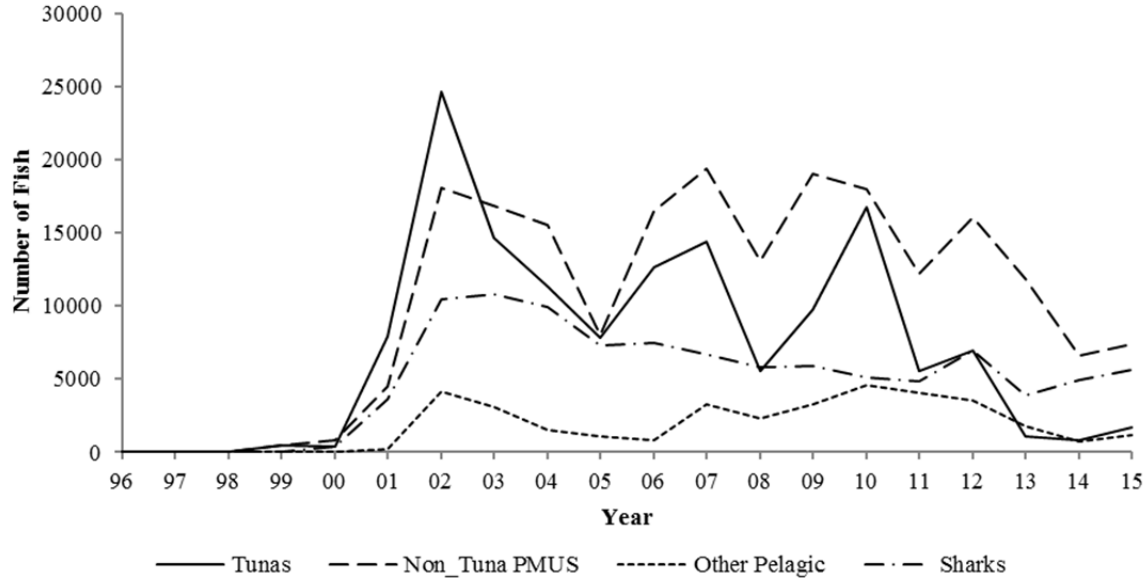


Supporting data shown in Table A-15.

Table 9. Number of fish kept, released and percent released for all American Samoa longline vessels during 2015

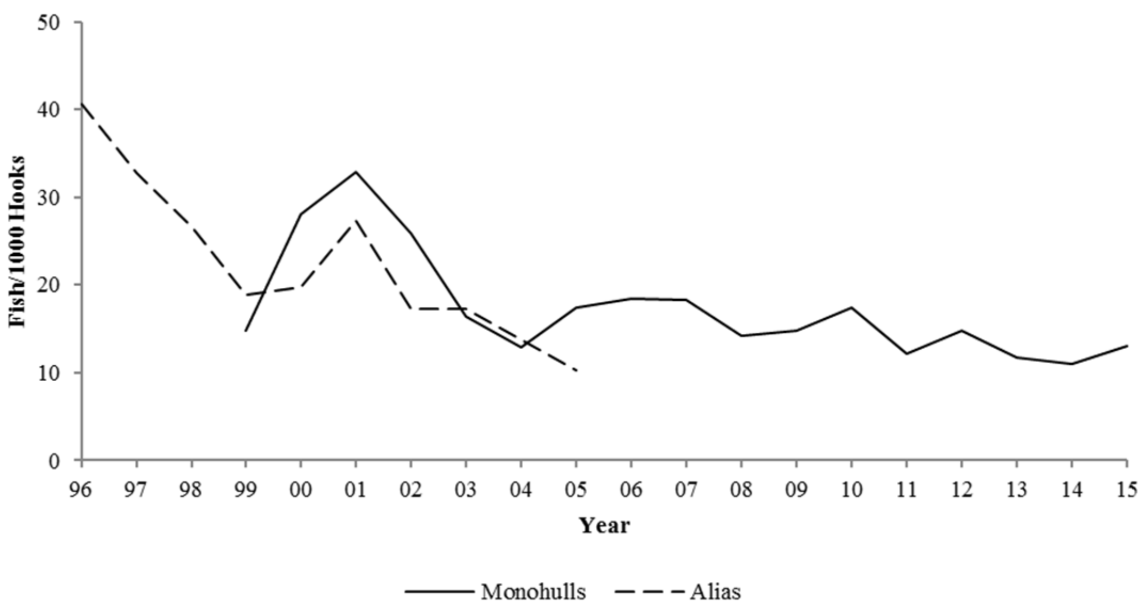
Species	Number Kept	Number Released	Total Caught	Percent Released
Skipjack tuna	13,303	315	13,618	2
Albacore	89,904	456	90,360	1
Yellowfin tuna	17,977	725	18,702	4
Bigeye tuna	3,933	171	4,104	4
Tunas (unknown)	53	0	53	0
Tunas Subtotals	125,170	1,667	126,837	1
Mahimahi	506	44	550	8
Blue marlin	370	352	722	49
Striped marlin	109	61	170	36
Wahoo	4,591	142	4,733	3
Sharks (unknown coastal)	29	5,634	5,663	99
Swordfish	129	45	174	26
Sailfish	68	104	172	60
Spearfish	59	346	405	85
Moonfish	76	140	216	65
Oilfish	31	5,559	5,590	99
Pomfret	102	594	696	85
Non-Tuna PMUS Subtotals	6,070	13,021	19,091	68
Pelagic fishes (unknown)	2	1,153	1,155	100
Other Pelagics Subtotals	2	1,153	1,155	100
Total Pelagics	131,242	15,841	147,083	11

Figure 21. Number of Fish Released by American Samoa Longline Vessels



Supporting data shown in Table A-16.

Figure 22. American Samoa Albacore catch per 1,000 Hooks by Alias and Monohull Vessels from Longline Logbook Data



Supporting data shown in Table A-17.

Table 10. American Samoa Catch/1,000 Hooks for two types of longline vessels from 1996 to 1999

	1996	1997	1998	1999	
Species	Alias	Alias	Alias	Alias	Monhulls
Skipjack tuna	0.1	1.2	3.7	5.0	4.5
Albacore	40.6	32.8	26.6	18.8	14.8
Yellowfin tuna	6.5	2.7	2.2	6.7	2.1
Bigeye tuna	1.3	0.3	0.3	0.7	0.5
Tunas Subtotal	48.5	37.0	32.8	31.2	21.9
Mahimahi	2.3	2.2	1.7	2.2	0.3
Black marlin	0.0	0.1	0.0	0.2	0.1
Blue marlin	0.9	0.7	0.6	0.5	0.1
Striped marlin	0.0	0.0	0.0	0.0	0.2
Wahoo	0.8	0.9	2.2	2.1	1.2
Sharks (unknown coastal)	0.7	0.1	0.1	0.1	1.2
Sailfish	0.2	0.2	0.1	0.0	0.1
Spearfish	0.0	0.0	0.0	0.0	0.1
Moonfish	0.0	0.1	0.1	0.1	0.1
Oilfish	0.0	0.0	0.0	0.0	0.6
Pomfret	0.0	0.0	0.0	0.0	0.2
Non-Tuna PMUS Subtotal	4.9	4.3	4.8	5.2	4.2
Pelagic fishes (unknown)	0.0	0.0	0.2	0.3	0.2
Other Pelagics Subtotal	0.0	0.0	0.2	0.3	0.2
Total Pelagic	53.4	41.3	37.7	36.7	26.3

Table 11. American Samoa Catch/1,000 Hooks for two types of longline vessels from 2000 to 2002

Species	2000		2001		2002	
	Alias	Monhulls	Alias	Monhulls	Alias	Monhulls
Skipjack tuna	2.0	1.7	3.1	2.1	6.0	4.9
Albacore	19.8	28.0	27.3	32.9	17.2	25.8
Yellowfin tuna	6.2	3.1	3.3	1.4	7.1	1.3
Bigeye tuna	0.4	1.0	0.6	1.0	0.6	0.9
Tunas Subtotal	28.4	33.8	34.3	37.4	30.9	32.9
Mahimahi	1.7	0.4	3.4	0.5	4.0	0.6
Black marlin	0.1	0.1	0.1	0.0	0.0	0.0
Blue marlin	0.5	0.2	0.4	0.2	0.2	0.3
Striped marlin	0.1	0.3	0.0	0.1	0.1	0.0
Wahoo	1.2	1.1	1.5	0.6	2.7	1.0
Sharks (unknown coastal)	0.0	0.7	0.0	0.7	0.0	0.8
Swordfish	0.0	0.0	0.1	0.0	0.1	0.0
Spearfish	0.0	0.1	0.0	0.0	0.0	0.0
Moonfish	0.1	0.2	0.1	0.1	0.1	0.1
Oilfish	0.0	0.1	0.0	0.2	0.0	0.5
Pomfret	0.0	0.1	0.0	0.1	0.0	0.1
Non-Tuna PMUS Subtotal	3.6	3.3	5.6	2.6	7.2	3.5
Barracudas	0.0	0.0	0.0	0.0	0.0	0.1
Pelagic fishes (unknown)	0.0	0.0	0.0	0.0	0.0	0.3
Other Pelagics Subtotal	0.0	0.0	0.1	0.1	0.0	0.3
Total Pelagic	32.0	37.0	40.0	40.1	38.1	36.6

Table 12. American Samoa Catch/1,000 Hooks for two types of longline vessels from 2003 to 2005

Species	2003		2004		2005	
	Alias	Monhulls	Alias	Monhulls	Alias	Monhulls
Skipjack tuna	4.7	2.9	3.0	3.9	1.0	2.7
Albacore	17.3	16.4	13.7	12.9	10.3	17.4
Yellowfin tuna	5.9	2.0	8.8	3.2	7.0	2.6
Bigeye tuna	1.6	1.1	0.8	1.3	1.0	0.9
Tunas Subtotal	29.5	22.4	26.3	21.2	19.3	23.7
Mahimahi	2.2	0.4	2.1	0.2	2.0	0.3
Blue marlin	0.2	0.2	0.1	0.2	0.2	0.2
Striped marlin	0.0	0.0	0.1	0.0	0.1	0.0
Wahoo	1.8	1.1	3.1	1.6	2.3	1.4
Sharks (unknown coastal)	0.3	0.8	0.1	0.9	0.0	0.7
Swordfish	0.1	0.0	0.1	0.0	0.1	0.0
Sailfish	0.1	0.0	0.0	0.1	0.1	0.1
Spearfish	0.1	0.0	0.0	0.1	0.0	0.1
Moonfish	0.1	0.1	0.1	0.1	0.1	0.1
Oilfish	0.3	0.5	0.0	0.7	0.0	0.3
Pomfret	0.1	0.1	0.0	0.1	0.1	0.1
Non-Tuna PMUS Subtotal	5.2	3.3	5.7	3.8	4.8	3.1
Pelagic fishes (unknown)	0.2	0.2	0.0	0.1	0.0	0.1
Other Pelagics Subtotal	0.2	0.2	0.0	0.1	0.0	0.1
Total Pelagic	34.9	25.8	32.0	25.2	24.2	26.9

Table 13. American Samoa Catch/1,000 Hooks for two types of longline vessels from 2006 to 2011

	2006	2007	2008	2009	2010	2011
Species	All Vessels	All Vessels	All Vessels	All Vessels	All Vessels	All Vessels
Skipjack tuna	3.2	2.3	2.4	2.3	2.4	2.5
Albacore	18.5	18.3	14.2	14.8	17.4	12.1
Yellowfin tuna	1.6	1.9	1.0	1.1	1.8	2.0
Bigeye tuna	1.0	0.9	0.5	0.6	0.8	0.7
Tunas Subtotal	24.2	23.5	18.2	18.8	22.4	17.3
Mahimahi	0.4	0.1	0.1	0.2	0.2	0.1
Blue marlin	0.2	0.2	0.2	0.2	0.2	0.2
Wahoo	1.5	1.0	0.7	1.0	1.0	0.9
Sharks (unknown coastal)	0.5	0.4	0.4	0.4	0.4	0.5
Swordfish	0.1	0.0	0.0	0.0	0.0	0.0
Spearfish	0.1	0.0	0.1	0.1	0.1	0.1
Oilfish	0.5	0.5	0.4	0.5	0.6	0.6
Pomfret	0.1	0.1	0.1	0.1	0.1	0.1
Non-Tuna PMUS Subtotal	3.3	2.4	2.0	2.5	2.5	2.4
Pelagic fishes (unknown)	0.1	0.2	0.1	0.2	0.3	0.4
Other Pelagics Subtotal	0.1	0.2	0.1	0.2	0.3	0.4
Total Pelagic	27.5	26.0	20.3	21.5	25.2	20.0

Table 14. American Samoa Catch/1,000 Hooks for two types of longline vessels from 2012 to 2015

Species	2012	2013	2014	2015
	All Vessels	All Vessels	All Vessels	All Vessels
Skipjack tuna	4.3	1.2	2.6	2.0
Albacore	14.8	11.7	11.0	13.1
Yellowfin tuna	1.2	1.9	2.7	2.7
Bigeye tuna	0.7	0.4	0.7	0.6
Tunas Subtotal	21.0	15.2	16.9	18.3
Mahimahi	0.1	0.2	0.2	0.1
Blue marlin	0.2	0.1	0.1	0.1
Wahoo	0.7	0.7	0.7	0.7
Sharks (unknown coastal)	0.6	0.4	0.7	0.8
Spearfish	0.1	0.1	0.1	0.1
Oilfish	0.8	0.7	0.6	0.8
Pomfret	0.1	0.1	0.1	0.1
Non-Tuna PMUS Subtotal	2.5	2.3	2.5	2.7
Pelagic fishes (unknown)	0.3	0.2	0.1	0.2
Other Pelagics Subtotal	0.3	0.2	0.1	0.2
Total Pelagic	23.7	17.7	19.5	21.1

2.1.8 AMERICAN SAMOA TROLLING BYCATCH AND CPUE

Data for participation, effort, landings and revenue are found in this modules overview sections. Due to the relatively small size of the troll fishery, tables and figures generally combined troll data with the longline data.

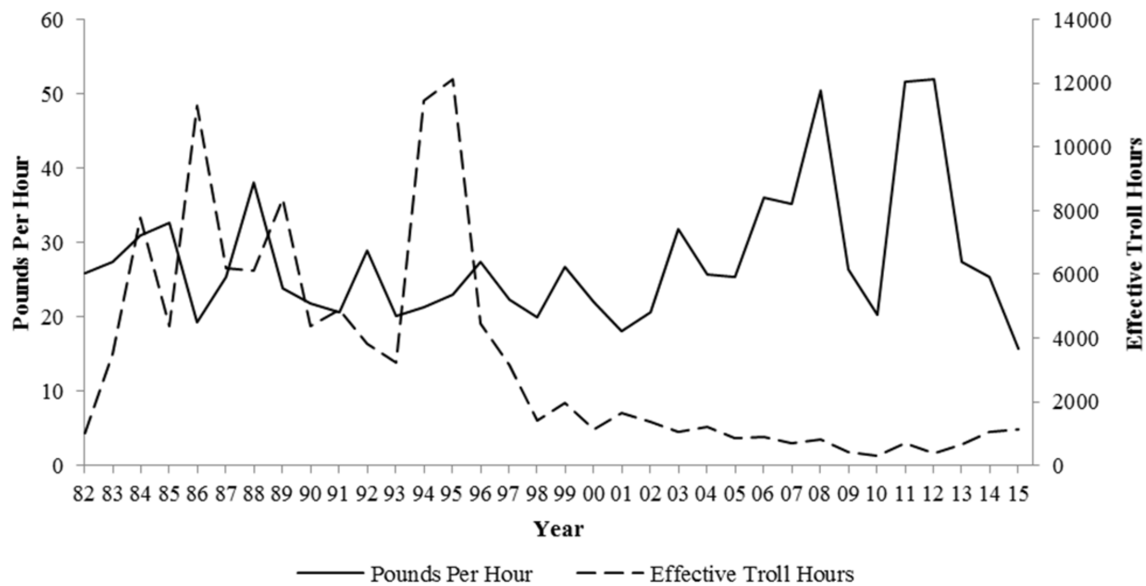
Table 15. American Samoa 2015 Trolling Bycatch Summary (Released Fish)

	Released						Interviews		
Species	Alive	Dead Inj	Unk	Total	Catch	%BC	With BC	All	%BC
All Species (Comparison)					670	0.000	0	51	0.00

Note:

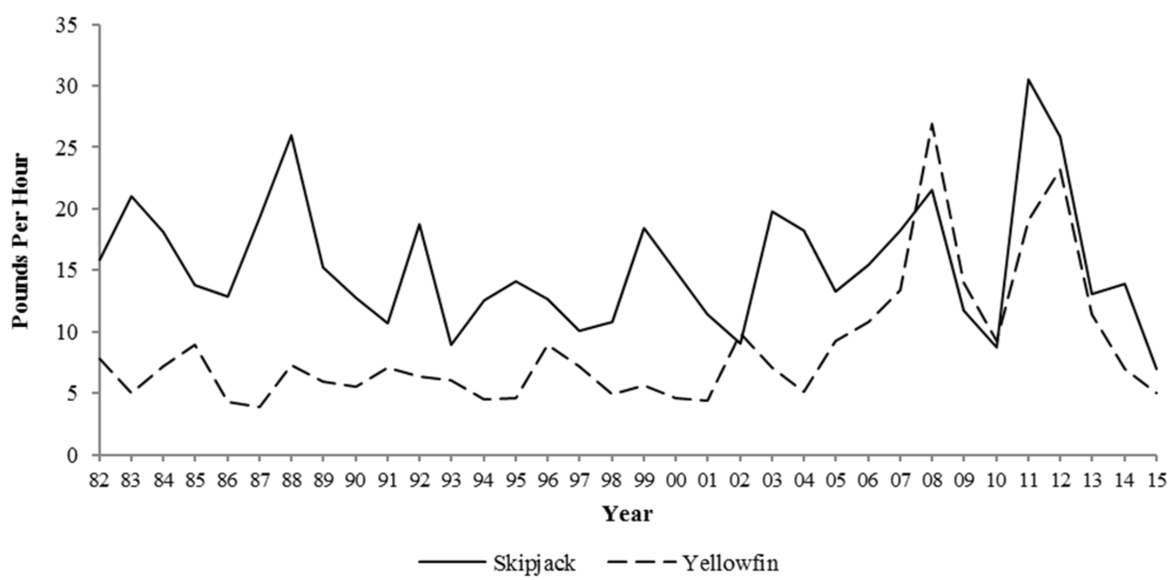
1. "Catch" is the total number of fish counted and estimated in interviews (Tutuila & Manu'a islands) for trolling method.
2. Bycatch information is calculated from raw interview data and represents the % of fish caught or % of interviews (trolling trips) with bycatch.
3. Abbreviations: Dead Inj; released dead or injured; Unk: Released unknown condition; With BC: Number of fisherman interviewed during creel survey who reported bycatch.

Figure 23. American Samoa pelagic catch per hour of trolling and number of trolling hours



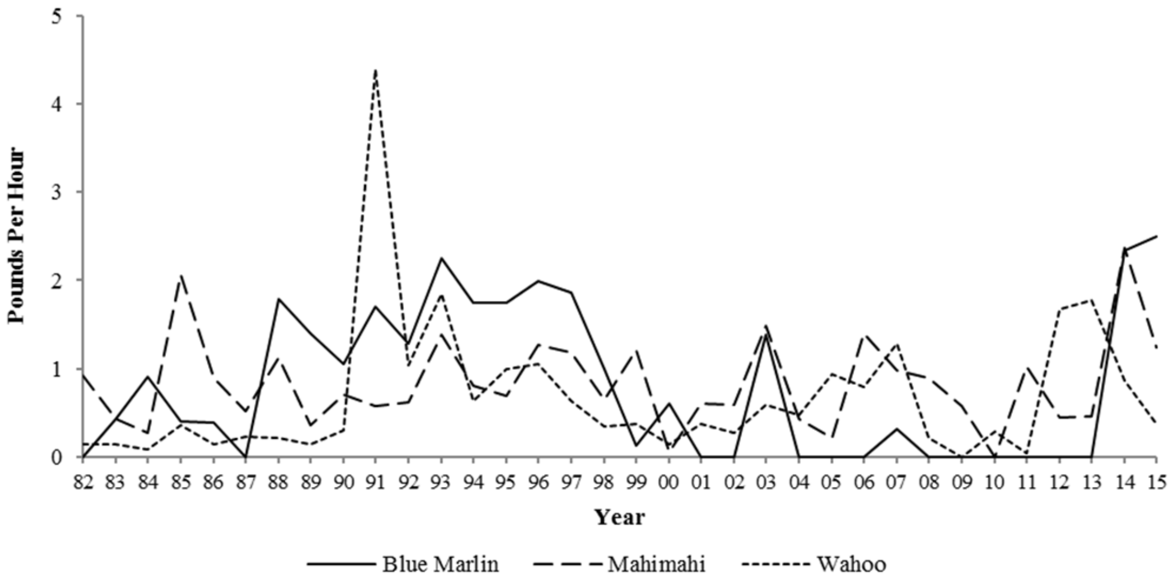
Supporting data shown in Table A-18.

Figure 24. American Samoa trolling catch rates for Skipjack and Yellowfin Tuna



Supporting data shown in Table A-19.

Figure 25. American Samoa trolling catch rates for Blue Marlin, Mahimahi, and Wahoo



Supporting data shown in Table A-20.

2.2 COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS

2.2.1 DATA SOURCES

This fishery is characterized by the CNMI Department of Lands and Natural Resources, Division of Fish and Wildlife (DFW), using data from its Commercial Receipt Invoice Database and the Boat-based Creel Survey. The commercial purchase data collection system is dependent upon first-level purchasers of local fresh fish to accurately record all fish purchases by species categories on specially designed invoices. DFW staff routinely distributes and collects invoice books from participating local fish purchasers on Saipan. This is a voluntary data collection program that includes purchasers at fish markets, stores, restaurants and hotels, as well as roadside vendors ("fish-mobiles").

Currently, DFW’s Commercial Purchase Data Collection System and the boat-based Creel Survey are documenting landings only on the island of Saipan. Although the Saipan Commercial Purchase Data Collection System has been in operation since the mid-1970s, only data collected since 1983 are considered accurate enough to be used. It is believed that the 2015 Commercial Purchase Data includes about 50-60% of commercial landings for pelagic species on Saipan, based on the following estimates. In addition to unreported fish sales by official vendors (10-20%), there is also a subsistence fishery on Saipan, which profits by selling a small portion of the catch to cover fishing expenses. Some fishermen sell their catch by going door to door. This commercial catch comprises about 30% of unreported commercial landings, since it is not sold to fish purchasers participating in the invoice book program. Combined with the 10-20% of data from official commercial fish purchasers (fish vendors) that DFW is unable to capture for a variety of reasons (no forms returned, vendors missed, nonparticipation), an estimated 40-50% of total commercial sales are not included in the Commercial Purchase Data reported here for Saipan.

In addition to Commercial Purchase data, the boat-based creel survey has been continuously implemented since April 2000. Creel data only analyzes fishing activity on the island of Saipan, as there are no boat-based creel survey programs for Tinian and Rota. One of DFW's goals is to expand the data collection program to the islands of Tinian and Rota, however securing long term funding is challenging. Pilot boat-based creel surveys are currently being conducted on Tinian and Rota, although these data are incomplete and not included in this analysis. The creel survey targets both charter and non-charter vessels. DFW staff conducted 67 survey days in 2015, slightly fewer than the previous five years, which ranged from 70 to 74 survey days (see Table A-21). Due to significantly fewer total trips in 2015 than previous years (107 vs. 156 and 163 trips in 2013-2014, respectively), staff conducted only 97 interviews, which was the lowest number since the survey began in 2000. 2015 interviews were 30% lower than those of 2014. Between 2013 and 2015, DFW staff intercepted fewer than 3 charter vessels for interviews. Due to confidentiality requirements, these data cannot be reported, and are combined with the non-charter data, where appropriate. A 365-day annual expansion is run for each calendar year of DFW boat-based creel survey data to produce catch and effort estimates for the pelagic fishery, while avoiding over-estimating landings due to seasonal runs of pelagic species.

This report does not include any data from longline vessels.

Effort (number of fishermen) is determined by tallying unique fishermen as recorded on the Commercial Receipt Invoice, while number of trips is assumed to equal the number of invoices submitted, assuming that all sales from a single trip are made on a single day. Percent species composition is calculated by weight for the sampled catch (raw interview data) for each method and applied to the lbs landed to produce catch estimates by species for the expansion period. CPUE data are calculated from the total annual landings of each fishery, divided by the total number of hours spent fishing (gear in use), or by trip assuming that a trip is one day in length. Bycatch data are not expanded to the level of estimated annual trips, and are reported as a direct summary of raw interview data. Some tables include landings of non-PMUS that may not be included in other tables in this report. This artifact of the reporting method results in a slight difference in the total landings and other values within a single table and between tables in this section.

2.2.2 SUMMARY OF CNMI PELAGIC FISHERIES

Both the commercial receipt data and the creel survey data likely underestimate effort and landings due to staffing shortages at the DFW; these data were not available at the time this report was prepared. The number of interviews conducted for the creel surveys was low in 2015. Nevertheless, landings and effort data were adjusted for the creel data, while no adjustment was made for the commercial receipt data. As such, the landings and effort creel data are more accurate estimates than the commercial receipt data.

Landing. As noted above, skipjack is the principal species landed, comprising over 71% of the entire pelagic landings in 2015 based on creel data. Skipjack landings were up more than 21% (292,951 lbs) and total landings were up 12% (412,022 lbs) over 2014. Conversely, the commercial receipt data shows 2015 landings 39% lower than 2014, although this is due to a backlog of receipts yet to be entered into the database. For more current updates, please consult the WPacFIN website.

Landings of mahimahi and yellowfin tuna ranked second and third, respectively, by weight of landings during 2014. Creel data estimated 97,928 lbs of mahimahi, a 160% increase from 2014. There was 16,220 lbs of yellowfin landed in 2015, nearly the same amount as that landed in 2014. The only other species recorded in the creel survey data is wahoo at 3,705 lbs.

Skipjack tuna are easily caught in near shore waters throughout the year. Mahimahi is seasonal with peak catch usually from February through April. Yellowfin tuna season usually runs from April to September.

Effort. The number of boats involved in CNMI's pelagic fishery has been steadily decreasing since 2001, when there were 113 fishermen reporting commercial pelagic landings. In 2015, only 14 fishermen reported landings, down from 20 in 2014. The number of trips, based on both the commercial data receipts and the creel survey, has also steadily declined since the late 1990s, dropping to a 33-year low in 2015 with only 352 trips recorded in the database and only 2,640 estimated from the creel survey. This represents only 25% and 60% effort of the time-series average for commercial receipt and creel survey data, respectively. Total hours trolling was similarly low in 2015, with 14,302 hours accounting for 66% of the long-term average. Average trip length has remained steady, averaging between 5.1 and 5.5 hours per trip since 2008. As noted above, charter fishing is a very small overall component of the trolling fishery, and due to confidentiality, cannot be reported independently.

CPUE. In 2015, trolling catch rates rebounded to 28.7 lbs per trolling hour, a level slightly above 2013 levels after a significant drop in 2014. The skipjack catch rate, the primary target species in CNMI, was nearly double 2014 level at 20.5 lbs per hour fished. Yellowfin catch rate was near the long-term average at 1.1 lbs per hour, while the mahimahi catch rate has risen for four years to an all-time high at 6.7 lbs per hour fished.

Revenues. Commercial revenues, based on the commercial receipts, at $315,765, were near an all-time low in 2015, although as noted, not all 2015 receipts have been entered into the database. Average price per pound for all pelagics, tuna and non-tuna pelagics, were all lower than the long-term average. The average price for all pelagics was $2.31 driven by the low ($2.29) price for skipjack. The highest average price of identified pelagic species was $2.84/lb for saba (kawakawa). Revenue per trip was 8% below the long-term average at $345.

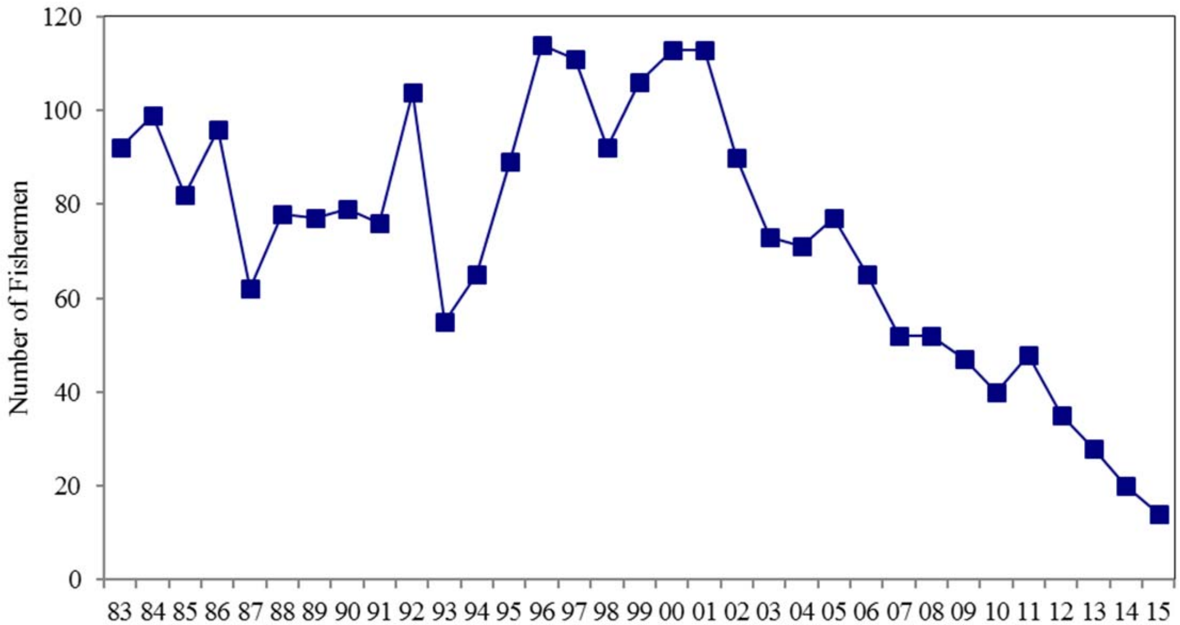
Bycatch. Bycatch is not a significant issue in the CNMI, as fishermen retain their catch regardless of species, size or condition. Based on creel survey interviews, only six fish were released out of an estimated 58,435, or 0.1%. This included four mahimahi, one yellowfin, and one skipjack.

2.2.3 PLAN TEAM RECOMMENDATIONS

There were no recommendations by the Pelagics Plan Team in 2016 to be forwarded to the Council, only Action Items to Pelagic Plan Team members on improvements to modules.

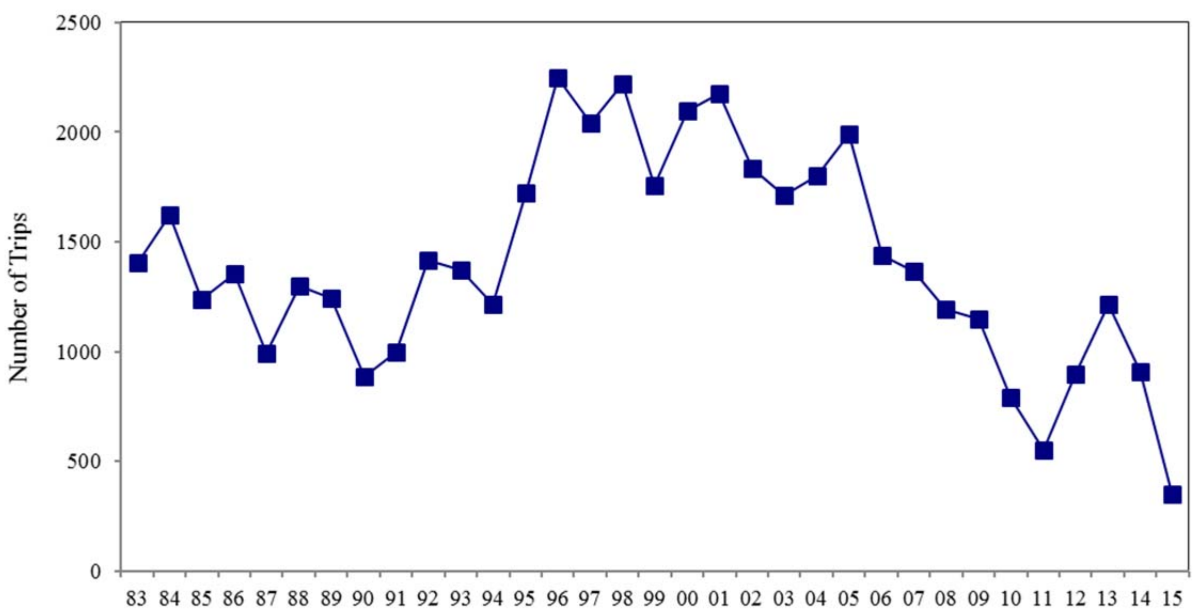
2.2.4 OVERVIEW OF PARTICIPATION AND EFFORT – NON-CHARTER AND CHARTER

Figure 26. Number of CNMI Fishermen (Boats) Making Commercial Pelagic Landings



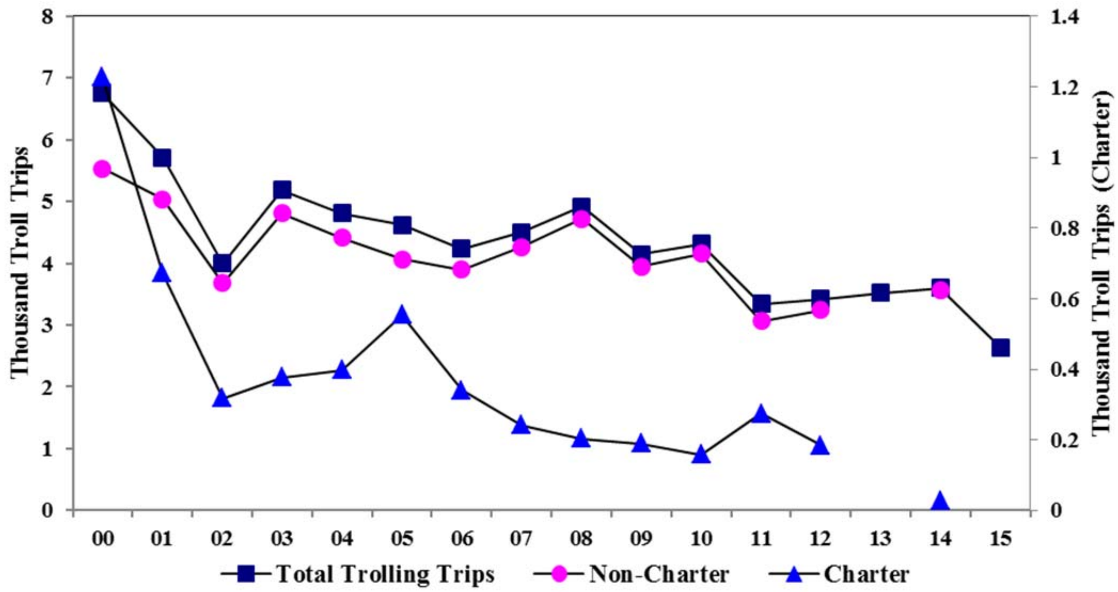
Supporting data shown in Table A-22.

Figure 27. CNMI Numbers of Trips Catching Any Pelagic Fish from Commercial Receipt Invoices



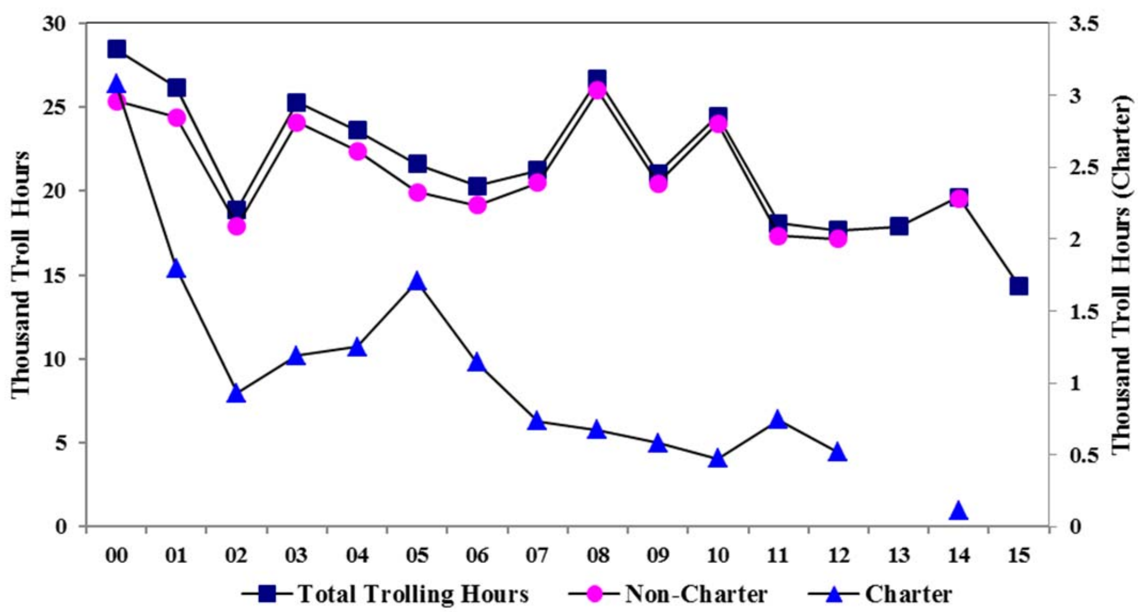
Supporting data shown in Table A-23.

Figure 28. CNMI Boat-based Creel Estimated Number of Trolling Trips



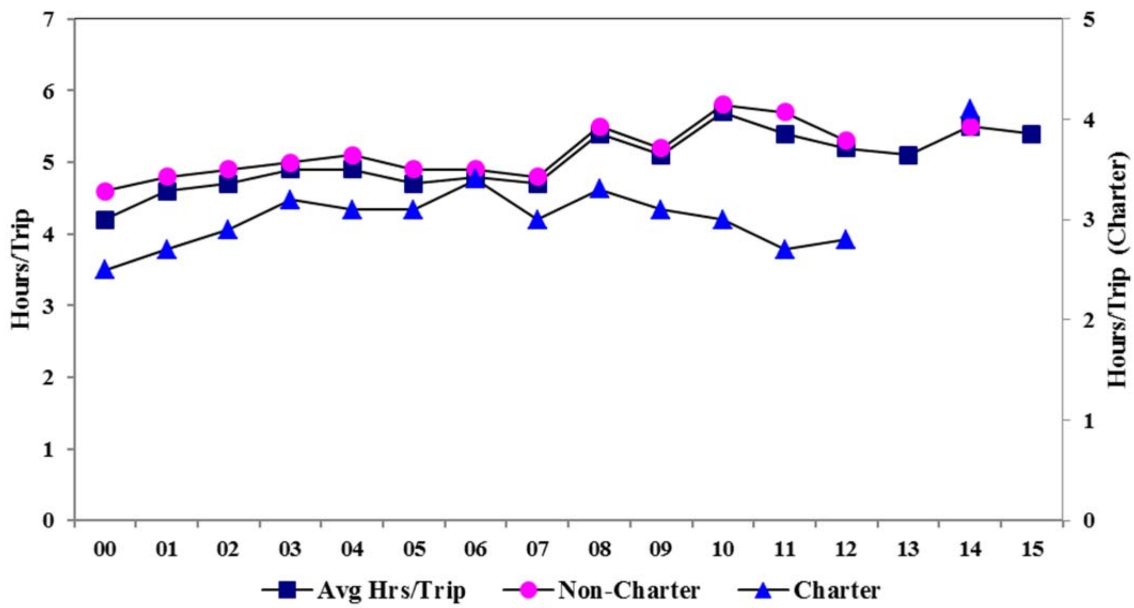
Supporting data shown in Table A-24.

Figure 29. CNMI Boat-based Creel Estimated Number of Trolling Hours



Supporting data shown in Table A-25.

Figure 30. CNMI Boat-Based Creel Average Trip Length – Hours per Trip



Supporting data shown in Table A-26.

2.2.5 OVERVIEW OF LANDINGS – NON CHARTER AND CHARTER

Table 16. CNMI 2015 Creel Survey – Pelagic Species Composition

Species	Total Landing (Lbs)
Skipjack Tuna	292,951
Yellowfin Tuna	16,220
Kawakawa	0
Tuna PMUS	309,171
Mahimahi	97,928
Wahoo	3,705
Blue Marlin	0
Sailfish	0
Shortbill Spearfish	0
Non-tuna PMUS	101,633
Total Pelagics	412,022

Note: Total pelagic landings is greater than the sum of the individual species due to an artifact in reporting process, where the difference accounts for non-PMUS reported as part of the creel survey.

Table 17. CNMI 2015 Commercial Pelagic Landings, Revenues and Price

Species	Landing (Lbs)	Value ($)	Avg Price ($/Lb)
Skipjack Tuna	90,838	208,300	2.29
Yellowfin Tuna	10,576	25,449	2.41
Saba (kawakawa)	83	237	2.84
Tuna PMUS	101,496	233,986	2.31
Mahimahi	34,582	80,766	2.34
Wahoo	361	883	2.44
Non-tuna PMUS	34,943	81,649	2.34
Total Pelagics	136,483	315,765	2.31

Note: Total pelagic landings is greater than the sum of the individual species due to an artifact in reporting process, where the difference accounts for non-PMUS reported as part of the creel survey.

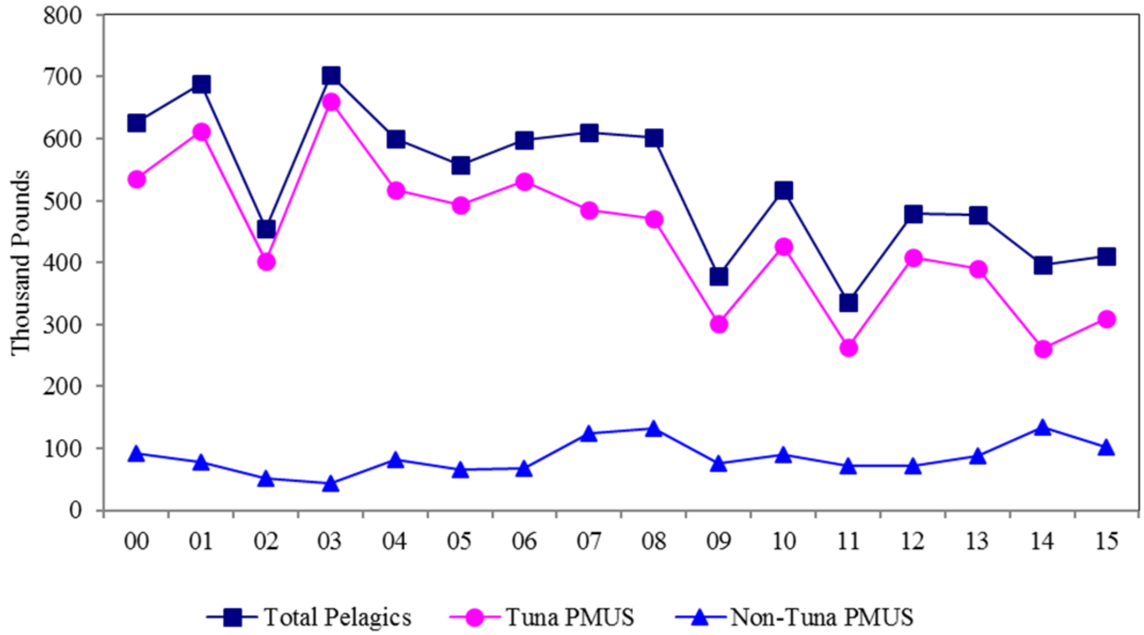
Table 18. Offshore Daytime Creel Survey Bycatch Summary

	Number Caught						Trip		
	Species	Released	Dead/ Injured	Both	All	BC%	With BC	All	BC%
Combined Charter & Non-Charter							3	2,386	0.126
	Mahimahi	4		4	3,979	0.101			
	Yellowfin	1		1	2,700	0.037			
	Skipjack		1	1	48,427	0.002			
	Total			6	55,106	0.011			
	Compared With All Species			6	58,688	0.010			

Note:

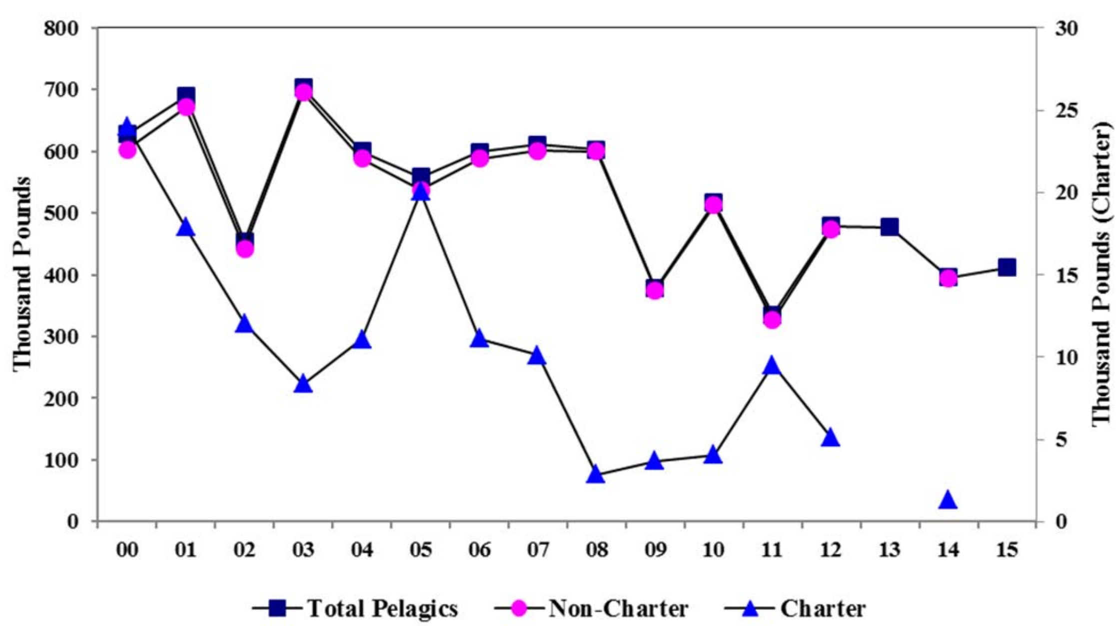
1. “Catch” is the total number of fish counted and estimated in interviews for trolling method.
2. Bycatch information is calculated from raw interview data and represents the % of fish caught or % of interviews (trolling trips) with bycatch.
3. Abbreviations: Dead Inj; released dead or injured; Unk: Released unknown condition; With BC: Number of fisherman interviewed during creel survey who reported bycatch.

Figure 31. CNMI Annual Estimated Total Landings: All Pelagics, Tunas PMUS, and Non-Tuna PMUS



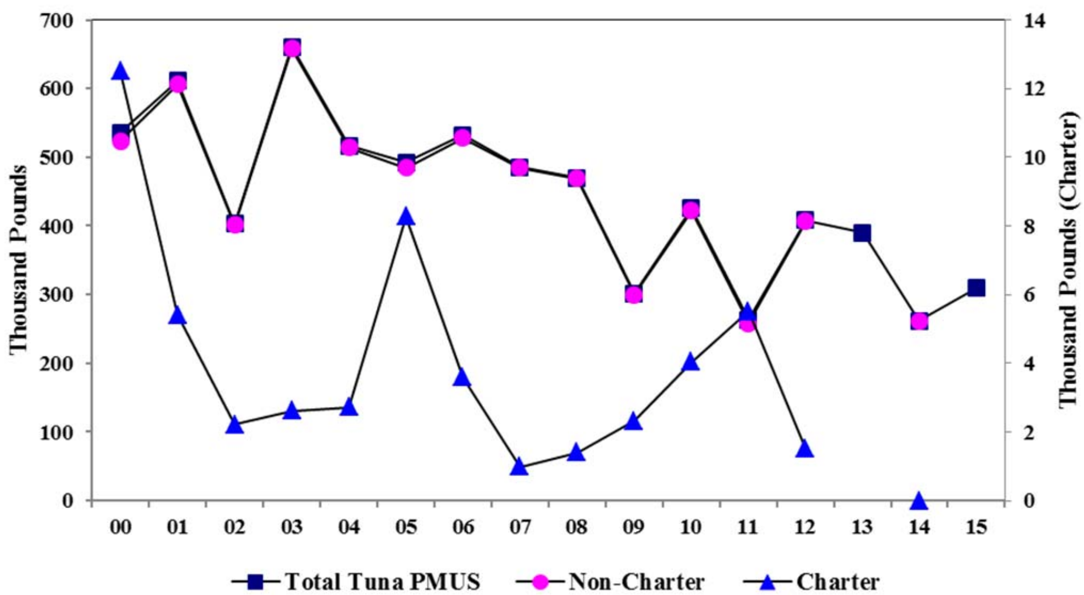
Supporting data shown in Table A-27.

Figure 32. CNMI Annual Estimated Total Pelagic Landings: Total, Non-Charter, and Charter



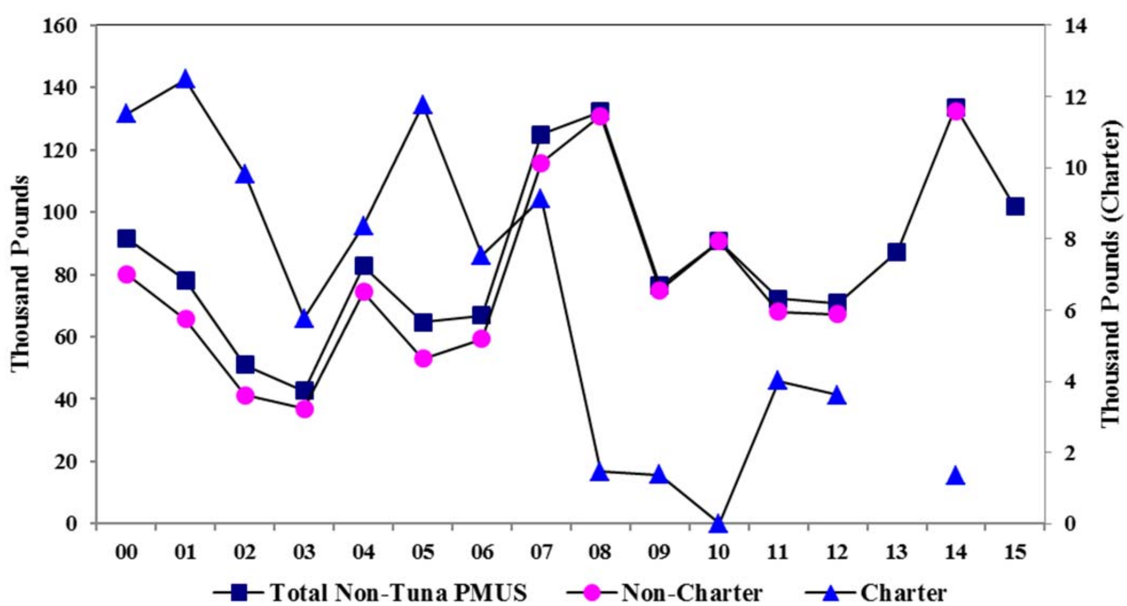
Supporting data shown in Table A-28.

Figure 33. CNMI Annual Estimated Total Tuna PMUS Landings: Total, Non-Charter, and Charter



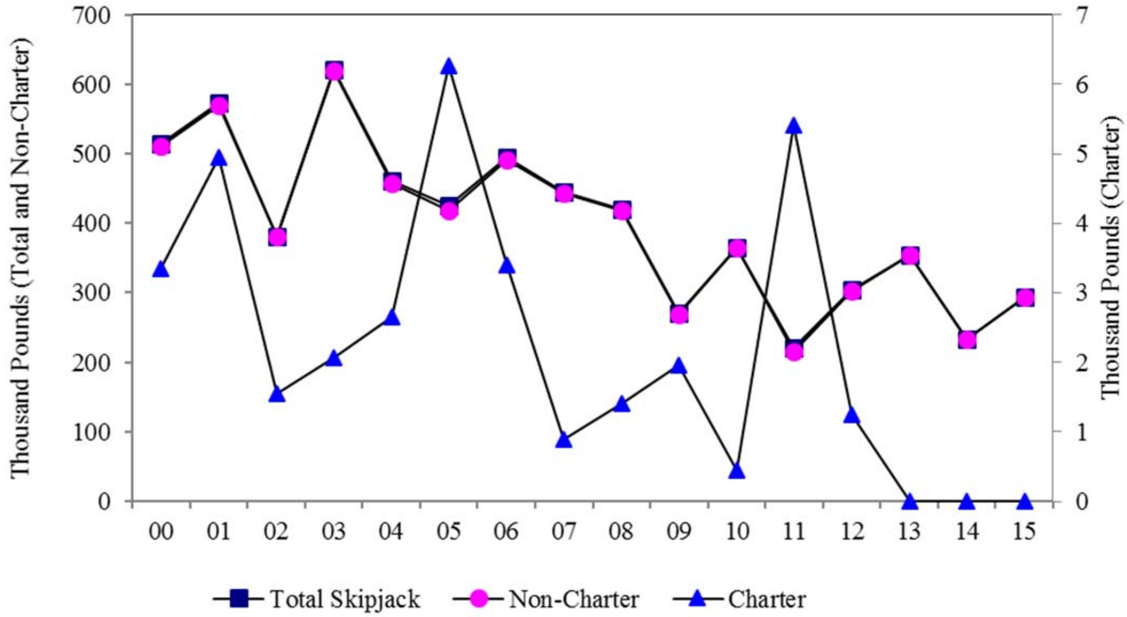
Supporting data shown in Table A-29.

Figure 34. CNMI Annual Estimated Total Non-Tuna PMUS Landings: Total, Non-Charter, and Charter



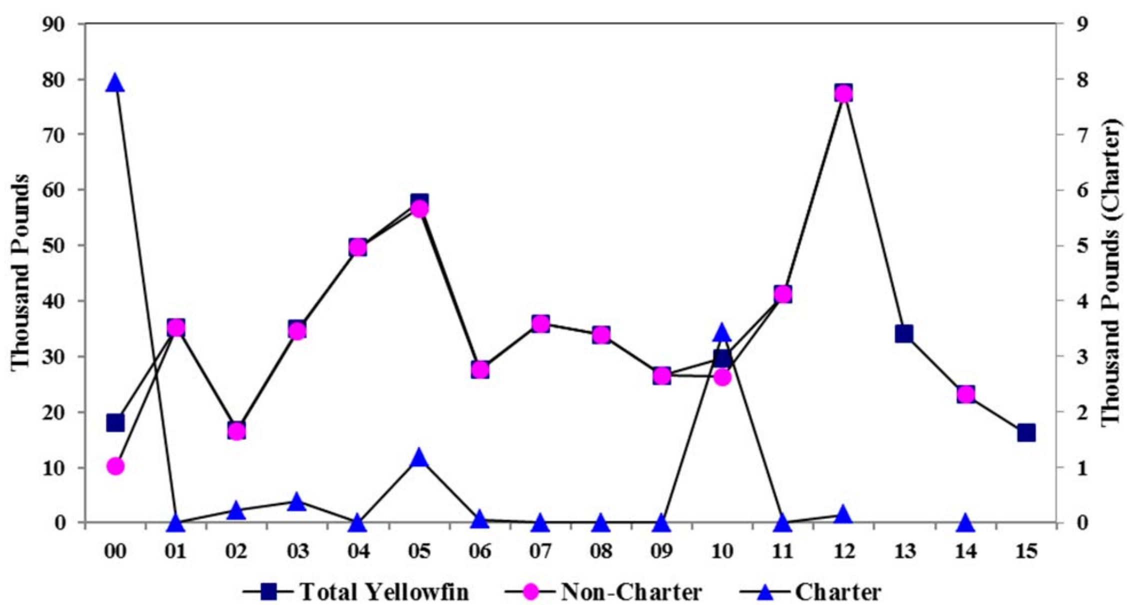
Supporting data shown in Table A-30.

Figure 35. CNMI Annual Estimated Total Skipjack Landings: Total, Non-Charter, and Charter



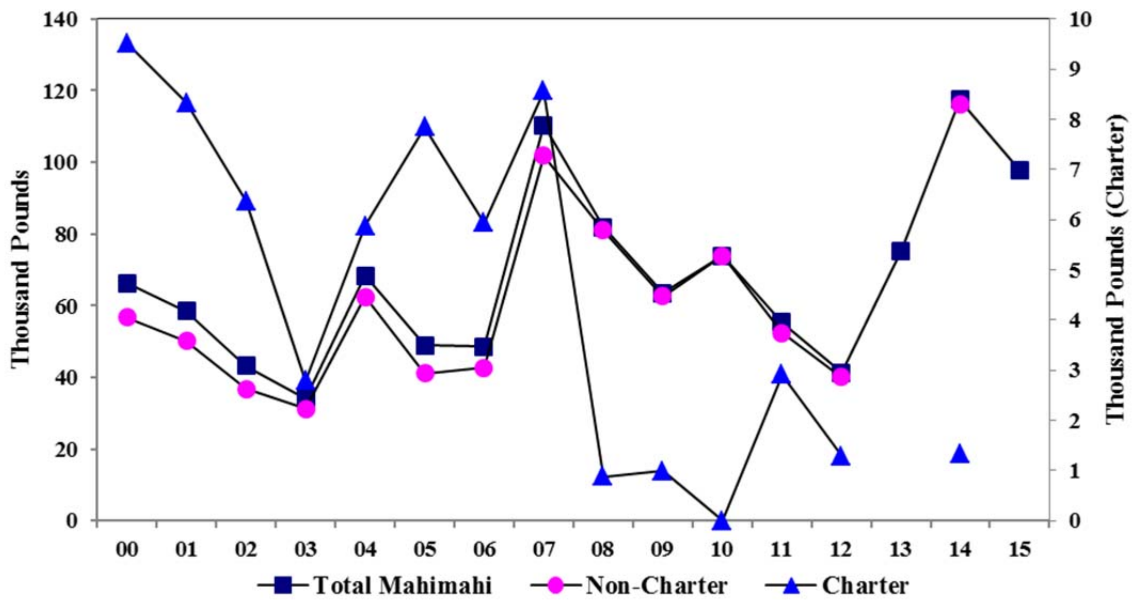
Supporting data shown in Table A-31.

Figure 36. CNMI Annual Estimated Total Yellowfin Landings: Total, Non-Charter, and Charter



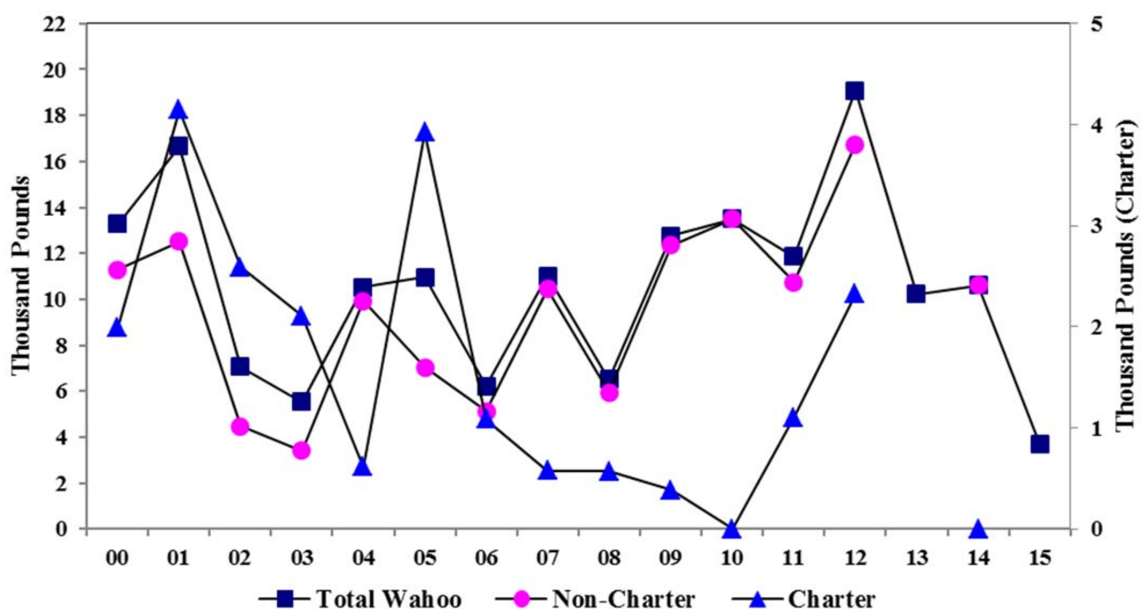
Supporting data shown in Table A-32.

Figure 37. CNMI Annual Estimated Total Mahimahi Landings: Total, Non-Charter, and Charter



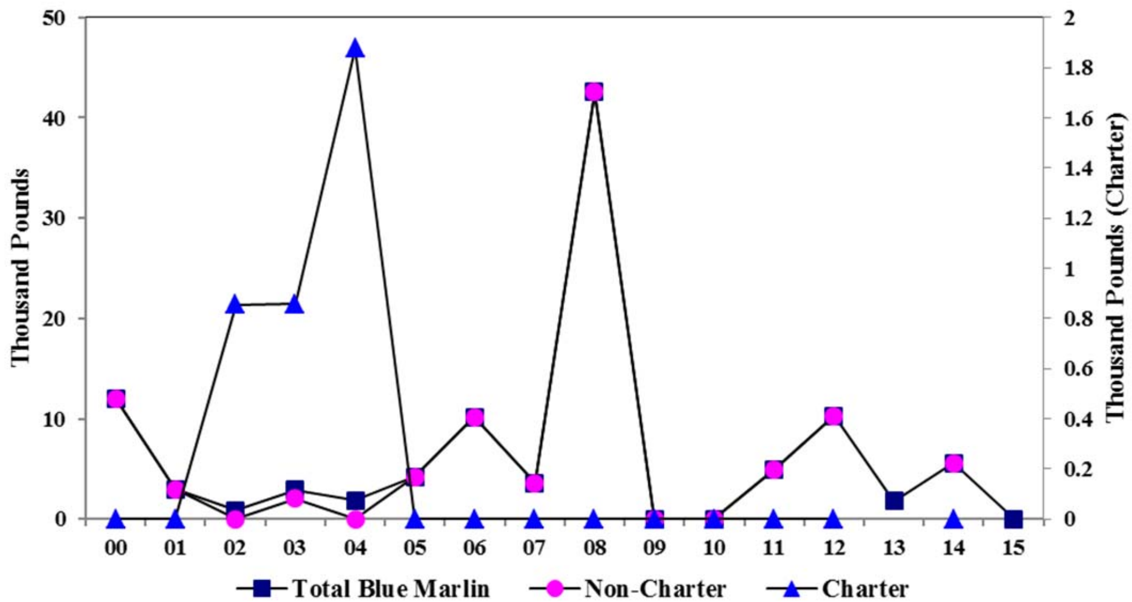
Supporting data shown in Table A-33.

Figure 38. CNMI Annual Estimated Total Wahoo Landings: Total, Non-Charter, and Charter



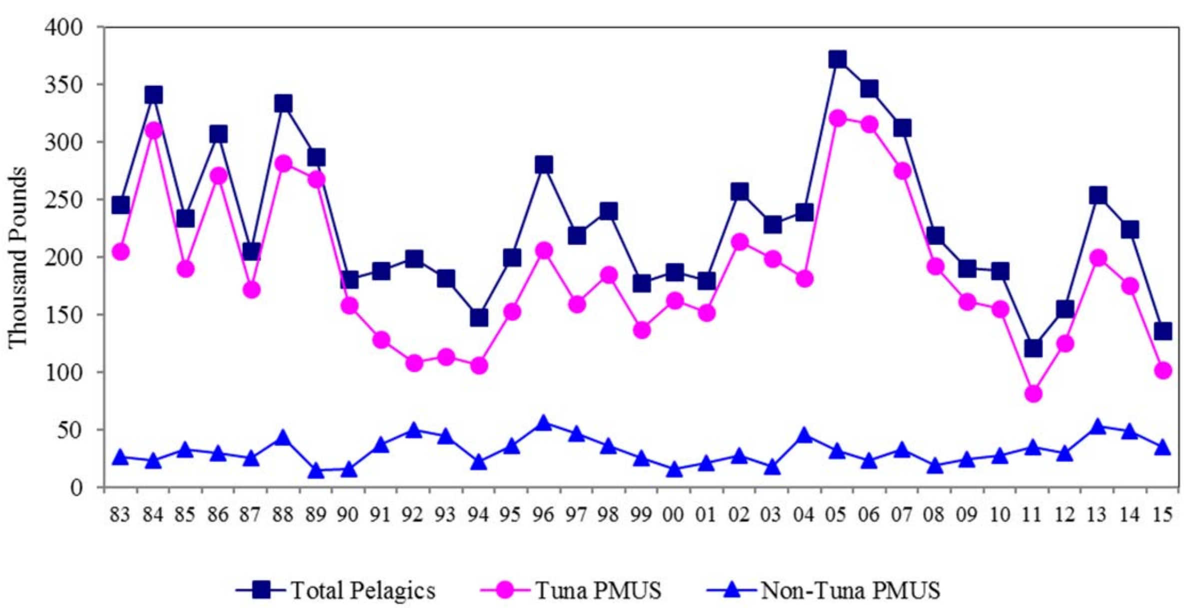
Supporting data shown in Table A-34.

Figure 39. CNMI Annual Estimated Total Blue Marlin Landings: Total, Non-Charter, and Charter



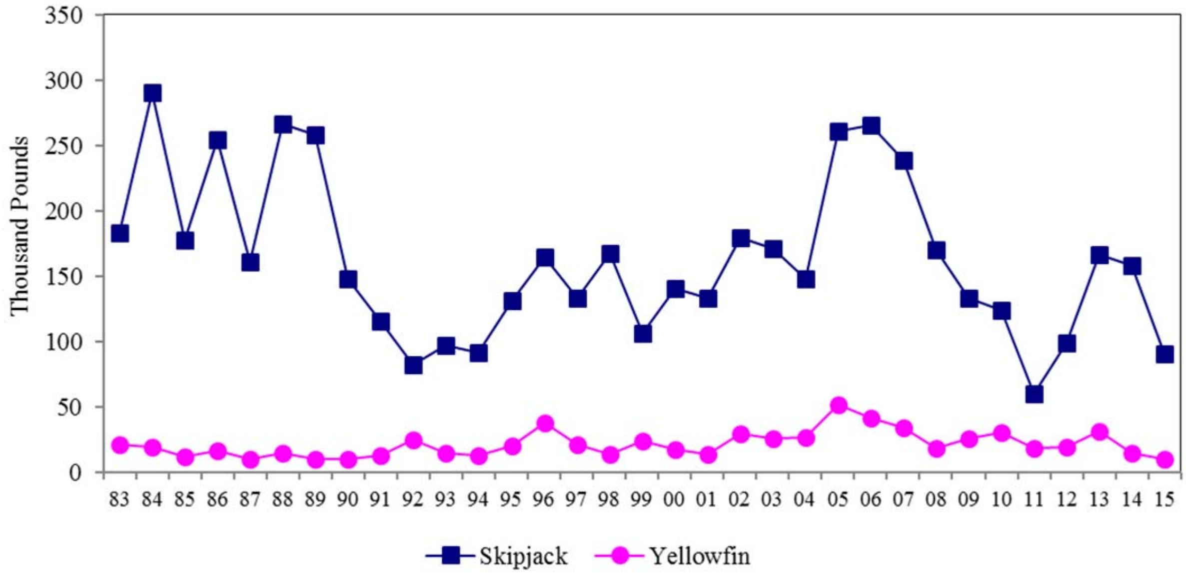
Supporting data shown in Table A-35.

Figure 40. CNMI Annual Commercial Landings: All Pelagics, Tuna PMUS, and Non-Tuna PMUS



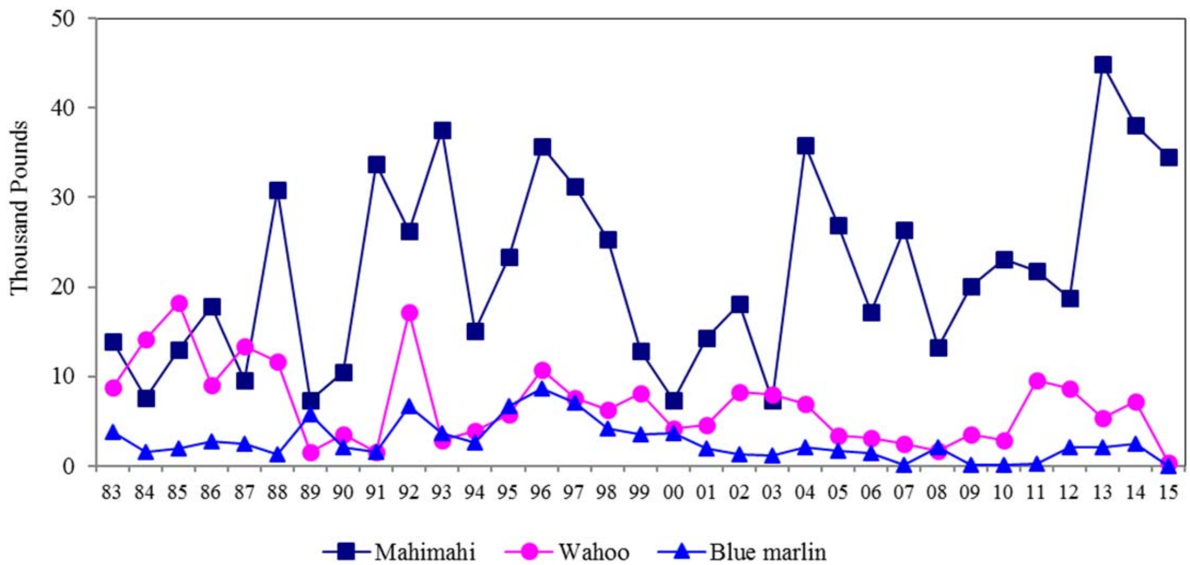
Supporting data shown in Table A-36.

Figure 41. CNMI Annual Commercial Landings: Skipjack and Yellowfin



Supporting data shown in Table A-37.

Figure 42. CNMI Annual Commercial Landings: Mahimahi, Wahoo, and Blue Marlin

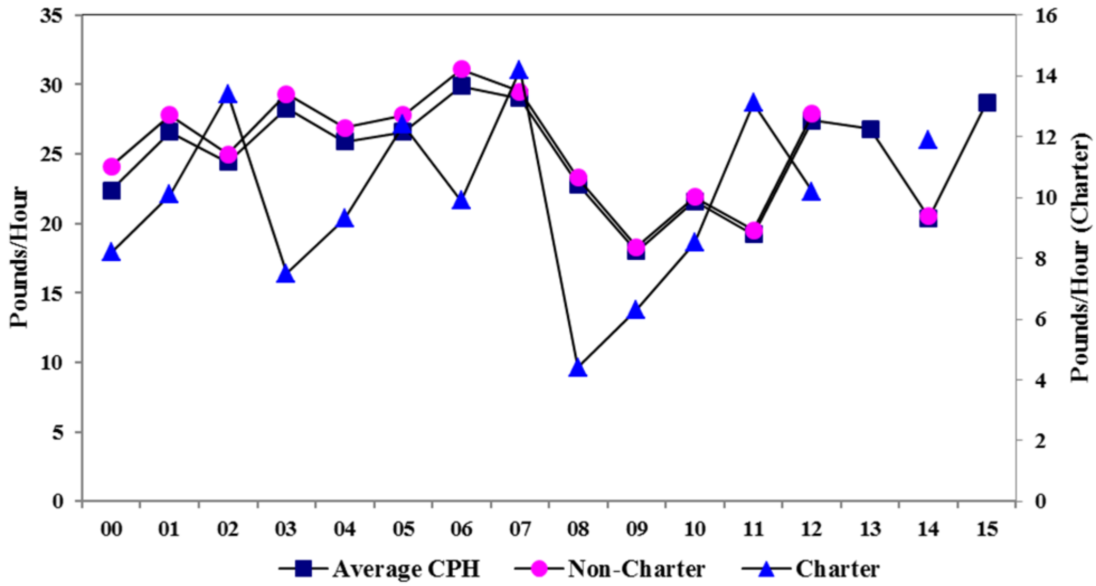


Supporting data shown in Table A-38.

2.2.6 OVERVIEW OF CATCH PER UNIT EFFORT – ALL FISHERIES

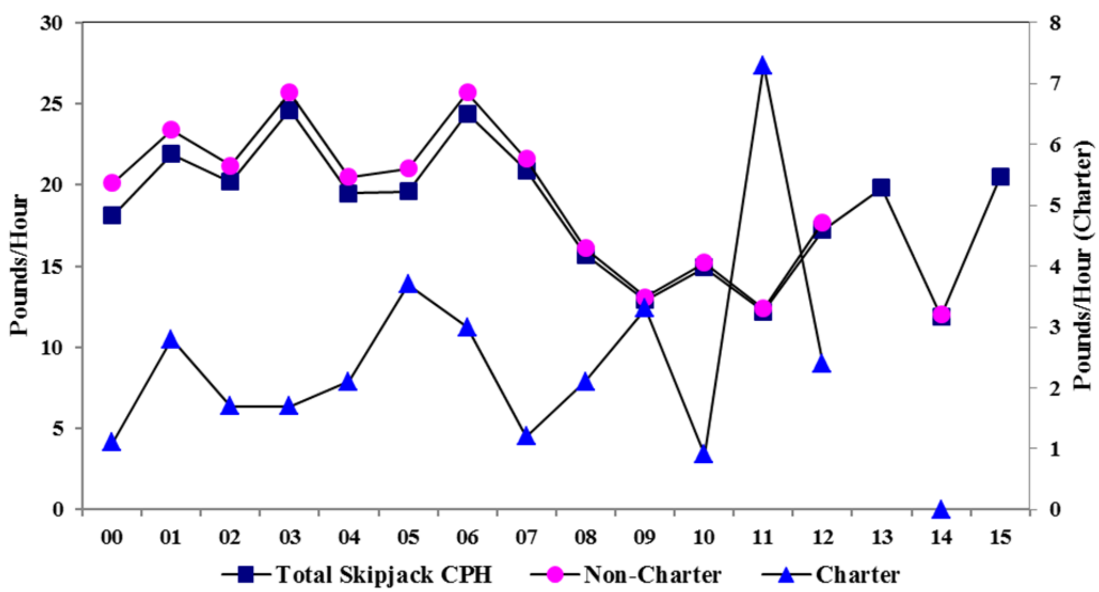
This section provides catch rates for the five main species landed by trolling. Lbs per hour trolled are determined from creel survey interviews and include charter and non-charter sectors, while lbs per trip are determined from commercial invoice receipts.

Figure 43. CNMI Boat-based Creel Trolling Catch Rates (lbs per hour)



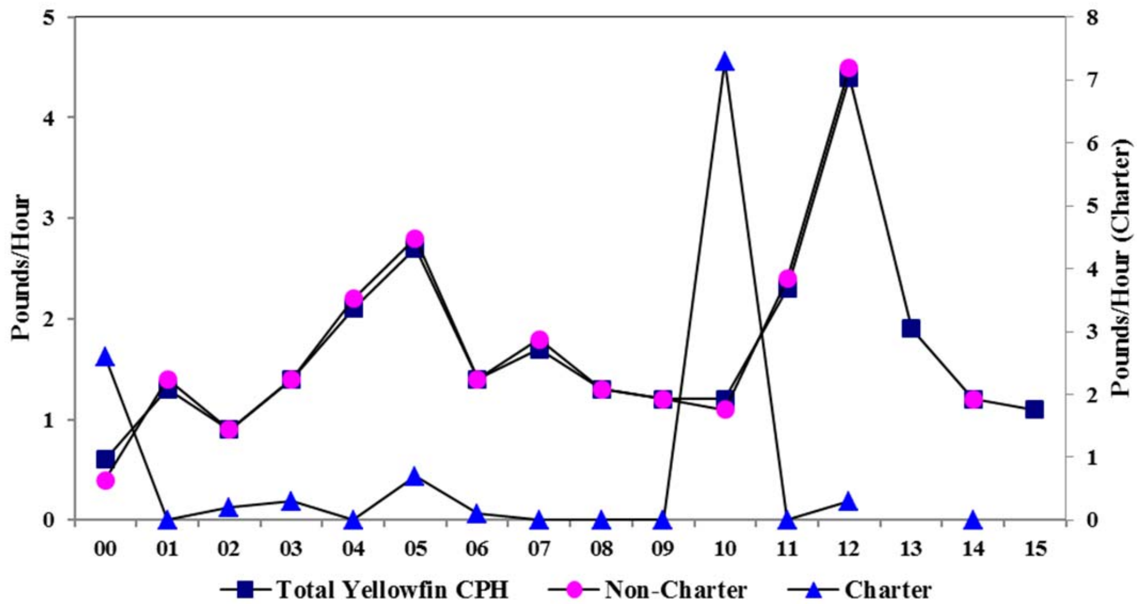
Supporting data shown in Table A-39.

Figure 44. CNMI Boat-based Creel Trolling Catch Rates (lbs/hr): Skipjack



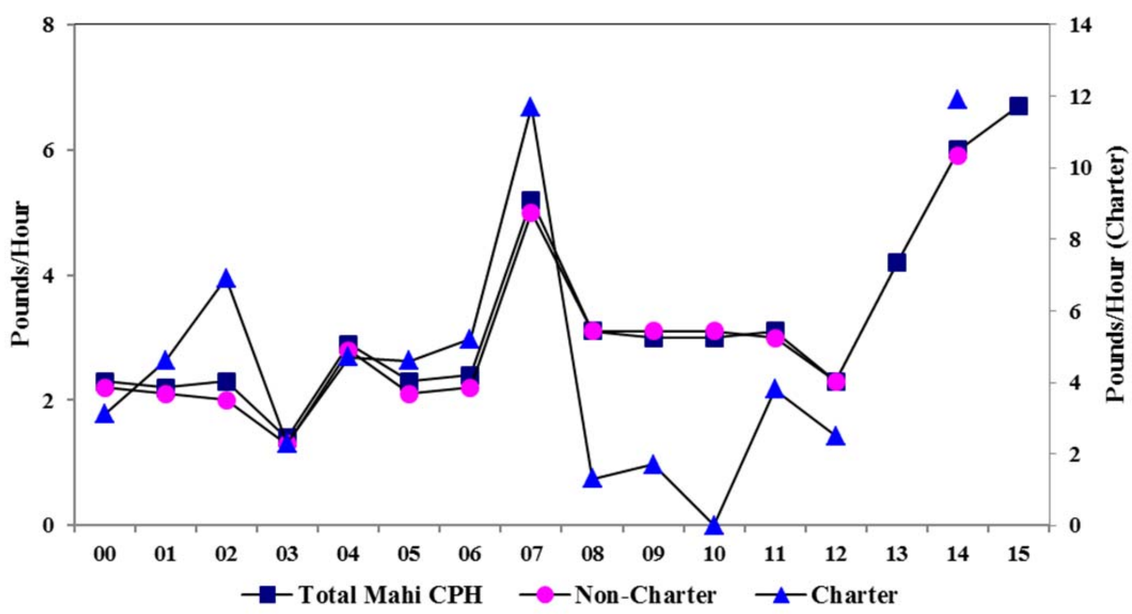
Supporting data shown in Table A-40.

Figure 45. CNMI Boat-based Creel Trolling Catch Rates (lbs/hr): Yellowfin



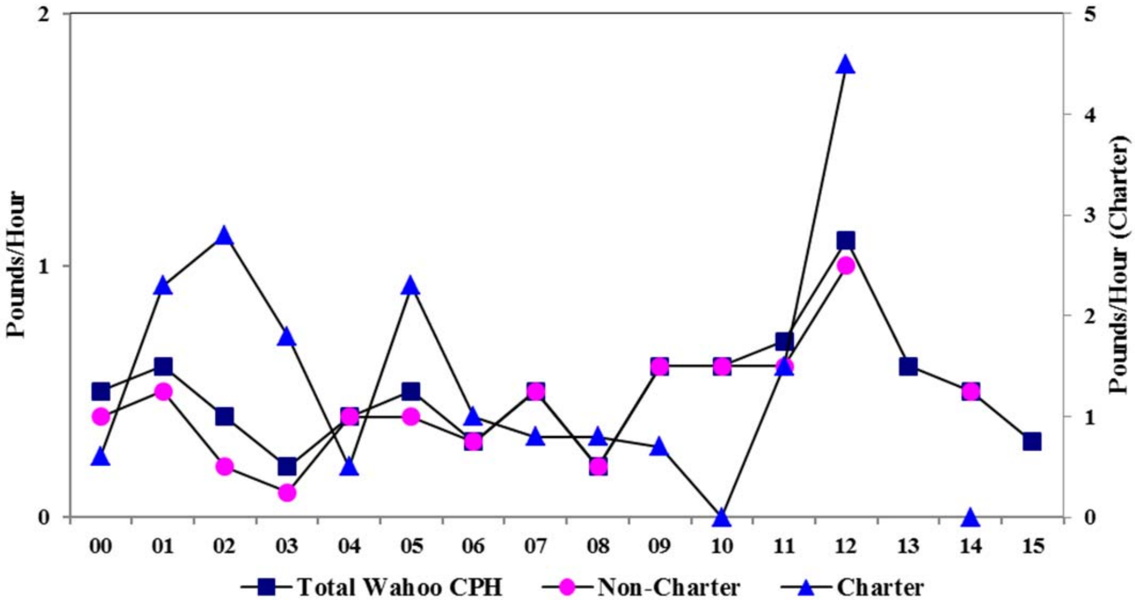
Supporting data shown in Table A-41.

Figure 46. CNMI Boat-based Creel Trolling Catch Rates (lbs/hr): Mahimahi



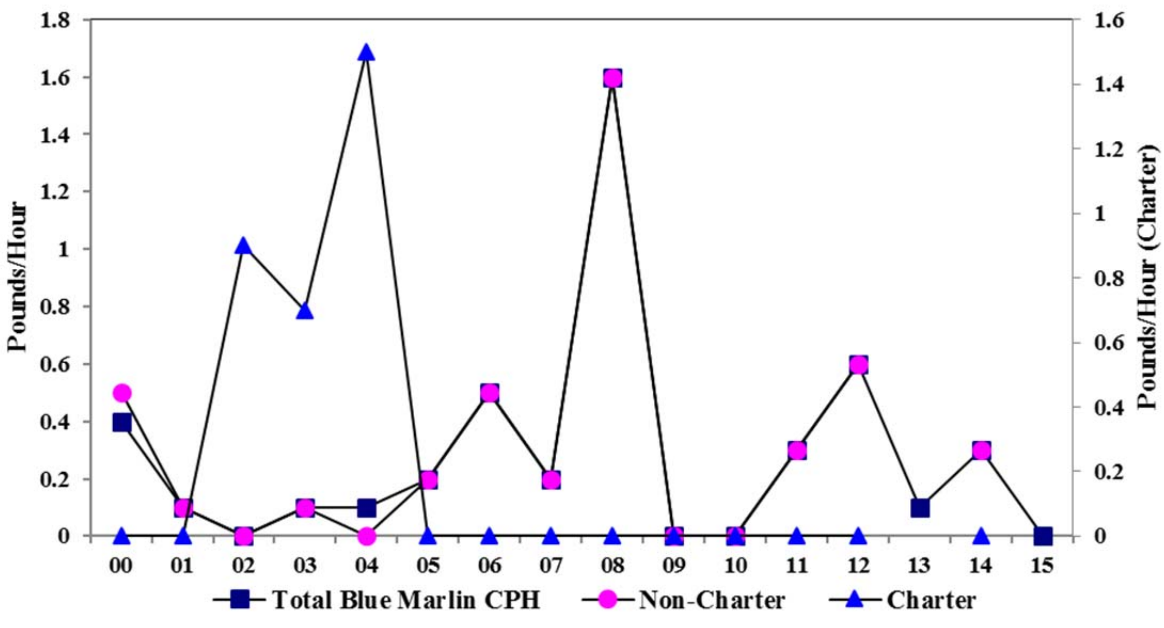
Supporting data shown in Table A-42.

Figure 47. CNMI Boat-based Creel Trolling Catch Rates (lbs/hr): Wahoo



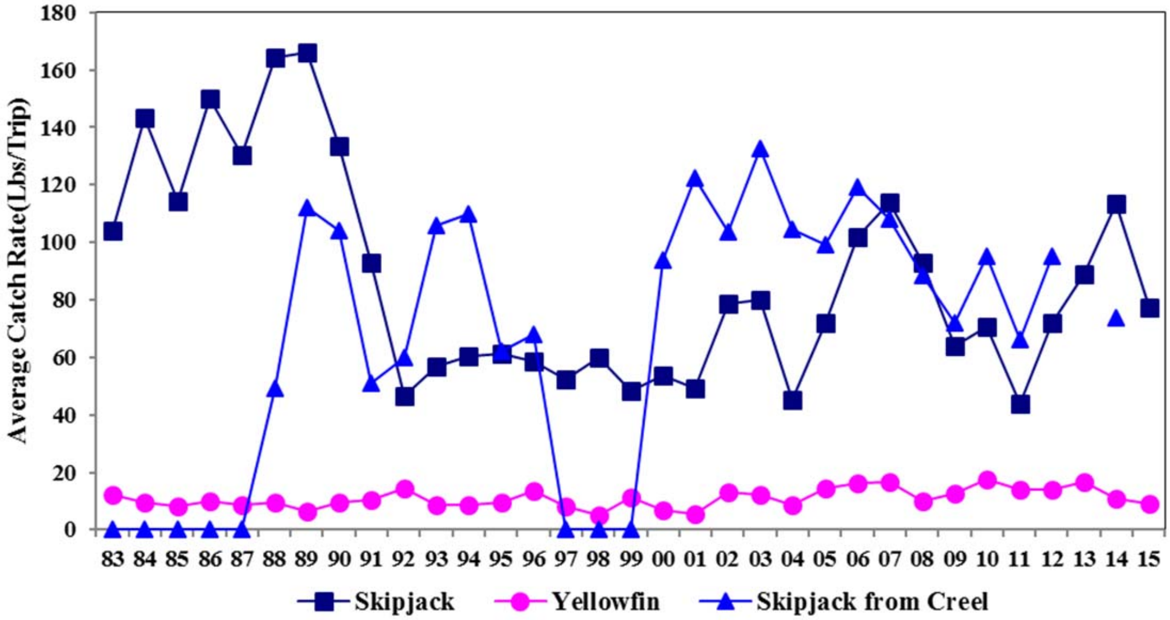
Supporting data shown in Table A-43.

Figure 48. CNMI Boat-based Creel Trolling Catch Rates (lbs/hr): Blue Marlin



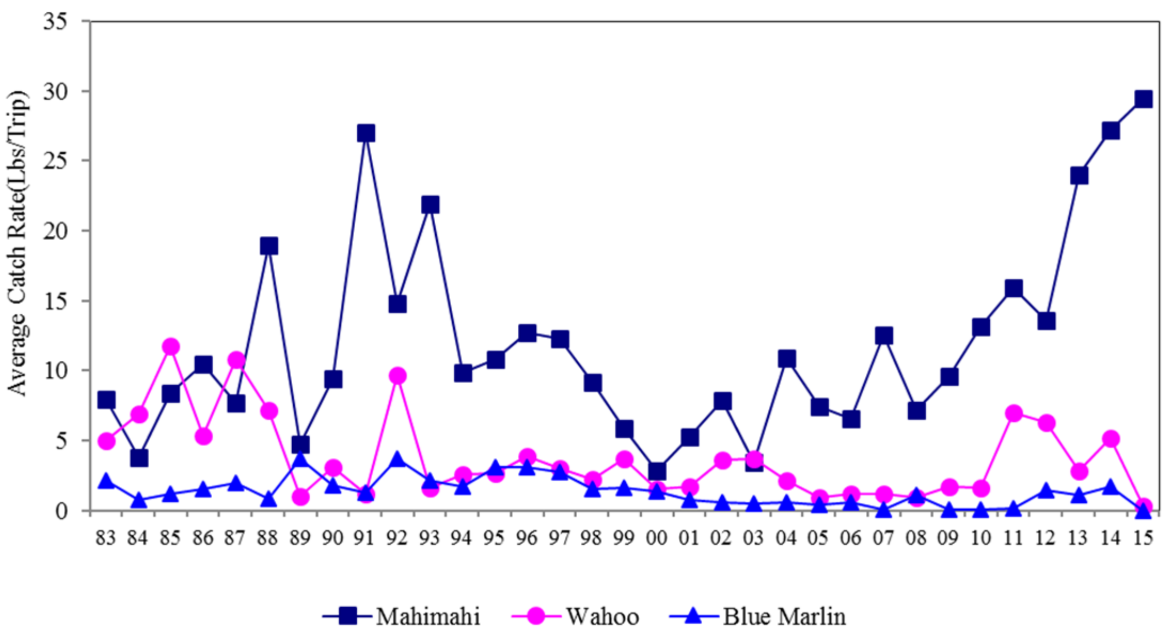
Supporting data shown in Table A-44.

Figure 49. CNMI Trolling Catch Rates of Skipjack and Yellowfin Tuna (lbs/trip)



Supporting data shown in Table A-45.

Figure 50. CNMI Trolling Catch Rate of Mahimahi, Wahoo, and Blue Marlin (lbs/trip)



Supporting data shown in Table A-46.

2.3 GUAM

2.3.1 DATA SOURCES

This report contains the most recently available information on Guam's pelagic fisheries, as compiled from data generated by the Division of Aquatic and Wildlife Resources (DAWR) through a program established in conjunction with WPacFIN and the WPRFMC. Data are gathered through the offshore creel survey data program. In the past 10 years, DAWR staff have logged between 90 and 97 survey days (see Table A-47). The number of trips logged in boat logs has varied from 498 to 1134 during that period, with the number of interviews slightly greater than have of that year's total trips. In 2015, DAWR logged 95 survey days, noting 903 trips during that time, and conducted 539 interviews. Participation, total landings, effort, CPUE, and bycatch are generated from the creel survey. Using the DAWR computerized data expansion system files (with the assistance of NMFS to avoid over-estimating seasonal pelagic species), a 365-day quarterly expansion of survey data is run for each calendar year to produce catch and effort estimates for the pelagic fishery. Commercial landings, revenue, and price per pound data are obtained from the WPacFIN-sponsored commercial landings system through the commercial receipt book. Transshipment landings data are obtained from the Bureau of Statistics and Plans. Some tables include landings of several species of barracuda and the double-lined mackerel that may not be included in other tables in this report. This artifact of the reporting method results in a slight difference in the total landings and other values between tables.

The shortage of staff biologists has been significant in the past several years. DAWR staff biologists continue to oversee several projects simultaneously, while providing on-going training to ensure the high quality of data being collected by all staff. All fisheries staff are trained to identify the most commonly caught fish to the species level. New staff are mentored by biologists and senior technicians in the field before conducting creel surveys on their own.

Total commercial landings are estimated by summing the weight fields in the commercial landings database from the principal fish wholesalers on Guam, and then multiplying by an estimated percent coverage expansion factor. The annual expansion factor (described above) is subjectively created based on the available information in a given year including: an analysis of the "disposition of catch" data available from the DAWR offshore creel survey; an evaluation of the fishermen in the fishery and their entry/exit patterns; general "dock side" knowledge of the fishery and the status of the marketing conditions and structure; the overall number of records in the database; and a certain measure of best guesses.

2.3.2 SUMMARY OF GUAM PELAGIC FISHERIES

Landings. The estimated annual pelagic landings have varied widely, ranging between 322,000 and 1,049,133 lbs in the 34-year time series. The average total catch has shown a slowly increasing trend over the reporting period. The 2015 total expanded pelagic landings were 947,627 lbs, an increase of 26.97% compared with 2014, and the second highest total in the time series. Tuna PMUS increased 63%, while non-tuna PMUS decreased 25.54%. Landings consisted primarily of five major species: mahimahi, wahoo, bonita or skipjack tuna, yellowfin tuna, and Pacific blue marlin, with skipjack comprising over 60% of total landings. Other minor species caught include rainbow runner, kawakawa, Short-Billed

Spearfish, and oilfish. Sailfish and sharks were also caught during 2015, with sailfish appearing in reported commercial landing and sharks noted in specific fishermen interviews conducted in 2015 regarding shark encounters (see bycatch below). However, these species were not encountered during offshore creel surveys and were not available for expansion for this year's report. While sailfish is kept, sharks are often discarded as bycatch. In addition to the above pelagic species, approximately half a dozen other species were landed incidentally this year.

There are wide year-to-year fluctuations in the estimated landings of the five major pelagic species. Landings for three of the five common species increased from 2014 levels: blue marlin increased 28.8%, yellowfin tuna increased 233%, skipjack increased 49.3%, and represents the highest catch in the time series. Yellowfin catch was the highest since 1999. Mahimahi catch, which accounts for the largest percentage of non-tuna PMUS landed on Guam, decreased 16.2%, while wahoo decreased by 64.4%. Both mahimahi and wahoo catches fluctuate erratically from year to year, although both appear to be experiencing a long-term downward trend.

Transshipment Landings. Transshipment, the offloading or otherwise transferring MUS or products thereof to a receiving vessel, has had a mandatory data submission program since 1999. These vessels fish on the high sea outside Guam's EEZ, but transship their catch through Guam. The amount of transshipped fish has ranged between 2,016 and 2,342 mt over the past five years.

Effort. The number of boats involved in Guam's pelagic fishery gradually increased from 193 in 1983 to a high of 496 in 2013. There were 372 boats involved in Guam's pelagic fishery in 2015, a decrease of 16.8% from 2014. The majority of the fishing boats are less than 10 m (33 ft) in length and are usually owner-operated by fishermen who earn a living outside of fishing. Most fishermen sell a portion of their catch and it is difficult to make a distinction between recreational, subsistence, and commercial fishers. A small (~5%), but economically significant, segment of the pelagic group is made up of marina-berthed charter boats that are operated primarily by full-time captains and crews. Data and graphs for non-charters, charters, and bycatch are represented in this report.

The number of trolling boats reporting pelagic catch decreased 16.8% from 2014. The number of trolling trips decreased by 5.9% and hours spent trolling increased by 28.0%. Weather did not seem to affect fishing activity as much in 2014 as in previous years. There were 21 separate events covering 122 high surf advisory days in 2015, an increase from 102 in 2014. 119 of these involved the north and west sides of Guam, where the majority of pelagic fishing occurs. Guam was struck by Typhoon Dolphin in May 2015.

In early 2010, the U.S. military began exercises in an area south and southeast of Guam designated W-517. W-517 is a special use airspace (approximately 14,000 nm^2) that overlays deep open ocean approximately 50 miles south-southwest of Guam. Exercises in W-517 generally involve live fire and/or pyrotechnics When W-517 is in use, a notice to mariners is issued, and vessels attempting to use the area are advised to be cautious of objects in the water and other small vessels. This discourages access to virtually all banks south of Guam, including Galvez, Santa Rosa, White Tuna, and other popular fishing areas. From 1982-2015, DAWR surveys recorded more than 2,930 trolling and bottom fishing trips to these southern banks, an average of more than 83 trips per year. The number of notices to mariners in 2015 was 69, equaling 109 closure days. This certainly impacted the number of fishing days south of Guam.

CPUE. Trolling catch rates (lbs per hour fished) showed a slight decrease from 2014. Total CPUE decreased 1.9%. Yellowfin and skipjack CPUE increased, while wahoo and mahimahi CPUEs decreased and marlin remained unchanged. The fluctuations in CPUE are probably due to variability in the year-to-year abundance and availability of the stocks.

Revenues. Commercial revenues decreased in 2015, with total adjusted revenues decreasing 15.1%. Adjusted revenue per trolling trip decreased 4.8% for all pelagics, with an increase of 39.5% for tuna PMUS, and a decrease of 11% for non-tuna PMUS. Commercial landings have shown a decreasing trend over the past twenty years. A majority of troll fishermen do not rely on the catch or selling of fish as their primary source of income. Previously, Guam law required the government of Guam to provide locally caught fish to food services in government agencies, such as Department of Education and Department of Corrections. In 2002, the government of Guam began implementing cost-saving measures, including privatization of food services. The requirement that locally-caught fish be used for food services, while still a part of private contracts, is not being enforced. This has allowed private contractors to import cheaper foreign fish, and reduced the sales of vendors selling locally caught fish. This represented a substantial portion of sales of locally caught pelagic fish. The decrease in commercial sales seen following 2002 may be, in part, due to this change.

Bycatch. There is virtually no bycatch in the charter fishery and none has been recorded since 2009. Bycatch occasionally occurs in the troll fishery including sharks, shark-bitten and undersized fish. There was no reported bycatch in the troll fishery in 2015.

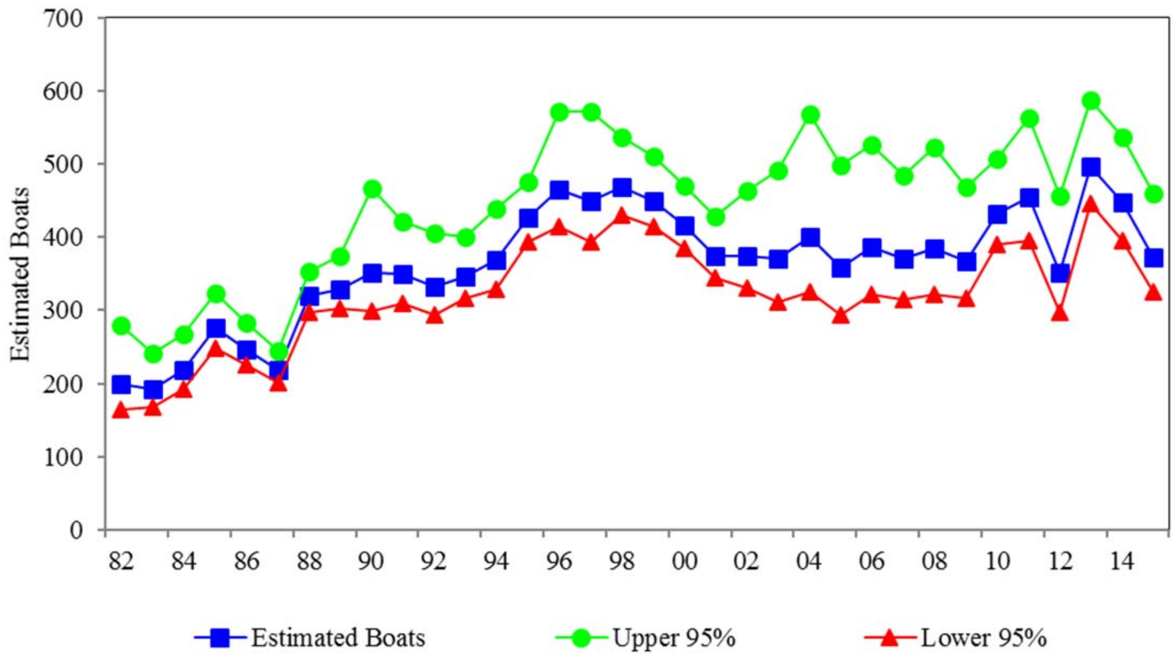
In 2015, fishers were asked if they experienced a shark interaction. There were a total of 617 interviews for boat based fishing in 2015, with 279 of these inappropriate for determining shark interaction. Of the remaining 338 interviews, 164 reported interactions with sharks, 174 reported no interactions with sharks, a 48.5% rate for interviews where fishers were asked about shark interactions.

2.3.3 PLAN TEAM RECOMMENDATIONS

There were no recommendations by the Pelagics Plan Team in 2016 to be forwarded to the Council, only Action Items to Pelagic Plan Team members on improvements to modules.

2.3.4 OVERVIEW OF PARTICIPATION - NON-CHARTER AND CHARTER FISHERIES

Figure 51. Guam Estimated Number of Trolling Boats



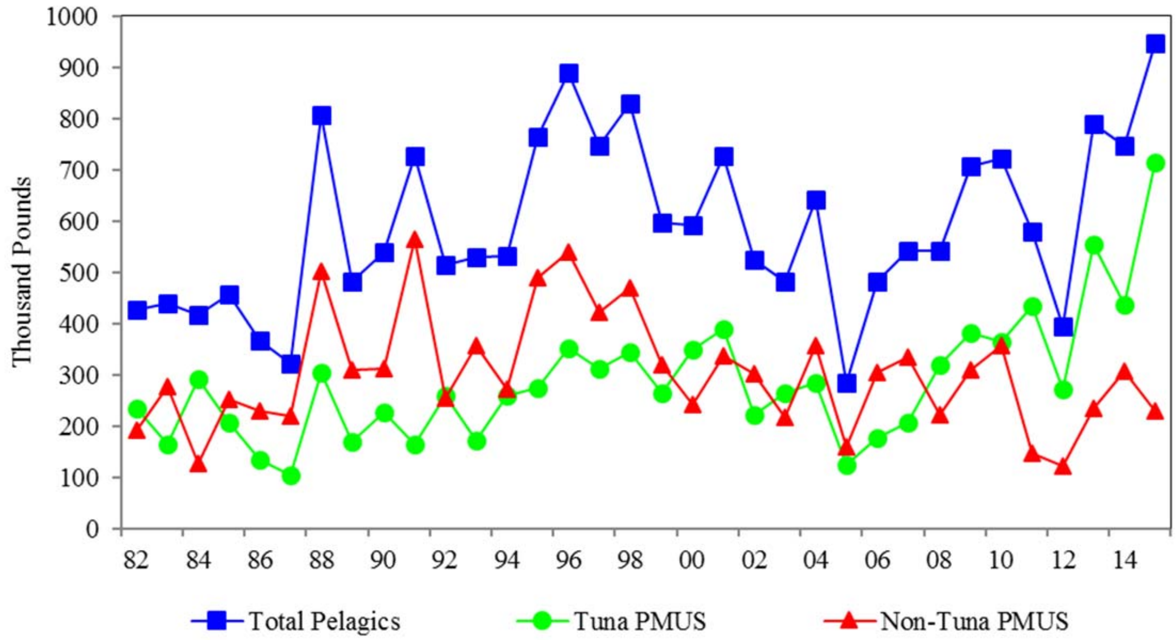
Supporting data shown in Table A-48.

2.3.5 OVERVIEW OF TOTAL AND REPORTED COMMERCIAL LANDINGS – NON-CHARTER AND CHARTER FISHERIES

Table 19. Guam 2015 estimated total landings, non-charter and charter

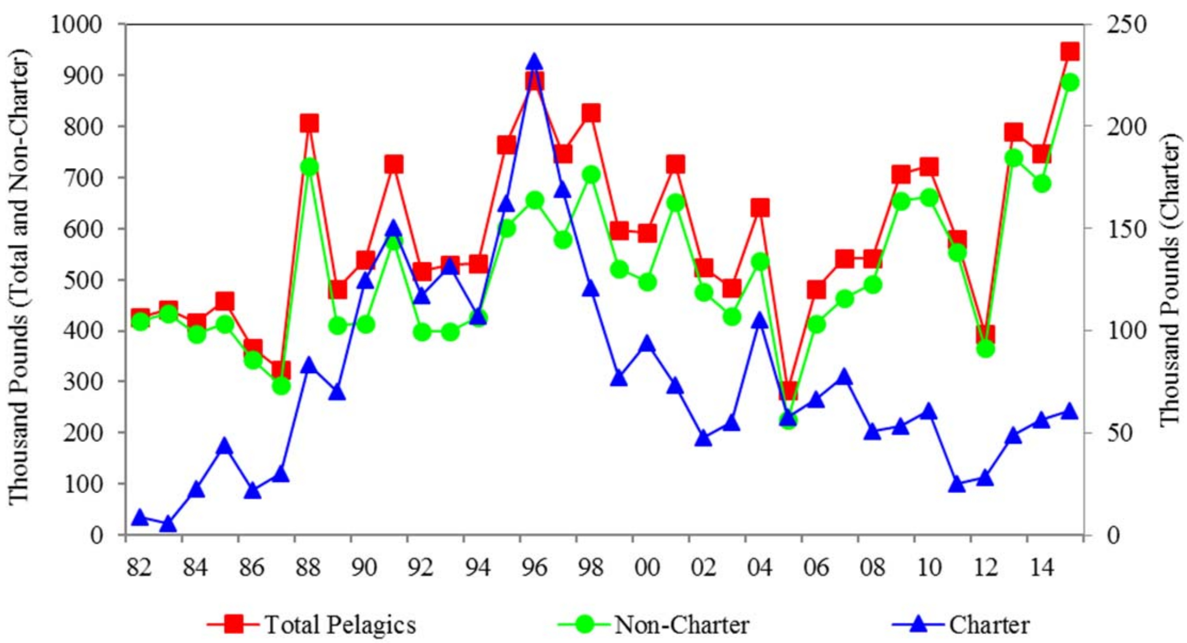
Species	Total Landings (Lbs)	Non-Charter	Charter
Tuna PMUS			
Skipjack Tuna	601,716	596,912	4,804
Yellowfin Tuna	111,509	110,722	787
Kawakawa	396	396	0
Albacore	0	0	0
Bigeye Tuna	160	160	0
Other Tuna PMUS	0	0	0
Tuna PMUS Total	713,781	708,190	5,591
Non-Tuna PMUS			
Mahimahi	159,146	122,231	36,915
Wahoo	31,497	23,995	7,502
Blue Marlin	37,646	27,129	10,517
Black Marlin	0	0	0
Striped Marlin	0	0	0
Sailfish	1	0	1
Shortbill Spearfish	0	0	0
Swordfish	0	0	0
Oceanic Sharks	0	0	0
Pomfrets	704	704	0
Oilfish	0	0	0
Moonfish	0	0	0
Misc. Longline Fish	0	0	0
Non-Tuna PMUS Total	228,994	174,059	54,935
Non-PMUS Pelagics			
Oceanic Sharks	0	0	0
Misc. Troll Fish	4,854	4,381	473
Non-PMUS Pelagics Total	4,854	4,381	473
Total Pelagics	947,629	886,630	60,999

Figure 52. Guam Annual Estimated Total Landings: All Pelagics, Tuna PMUS, and Non-Tuna PMUS



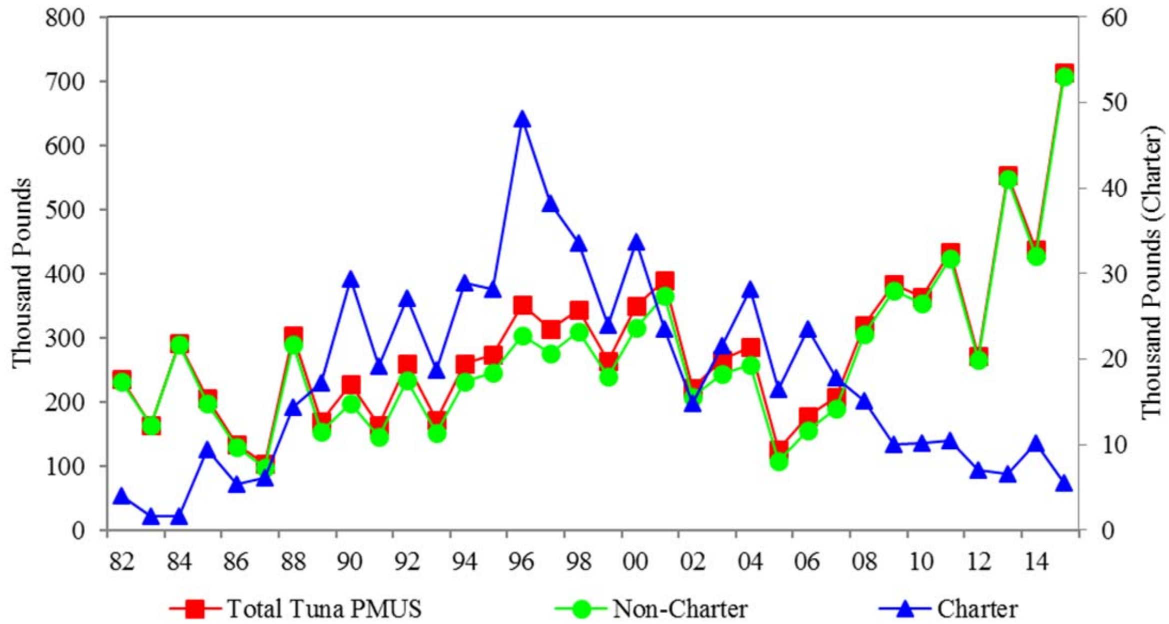
Supporting data shown in Table A-49.

Figure 53. Guam Annual Estimated Total Landings by Method



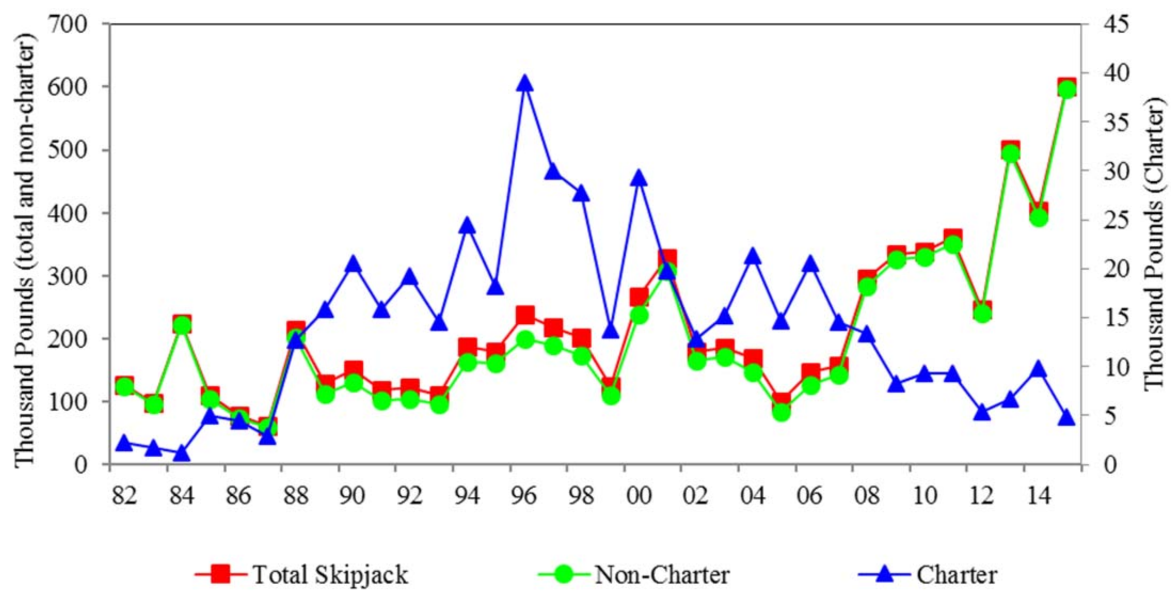
Supporting data shown in Table A-50.

Figure 54. Guam Annual Estimated Tuna PMUS Landings by Method



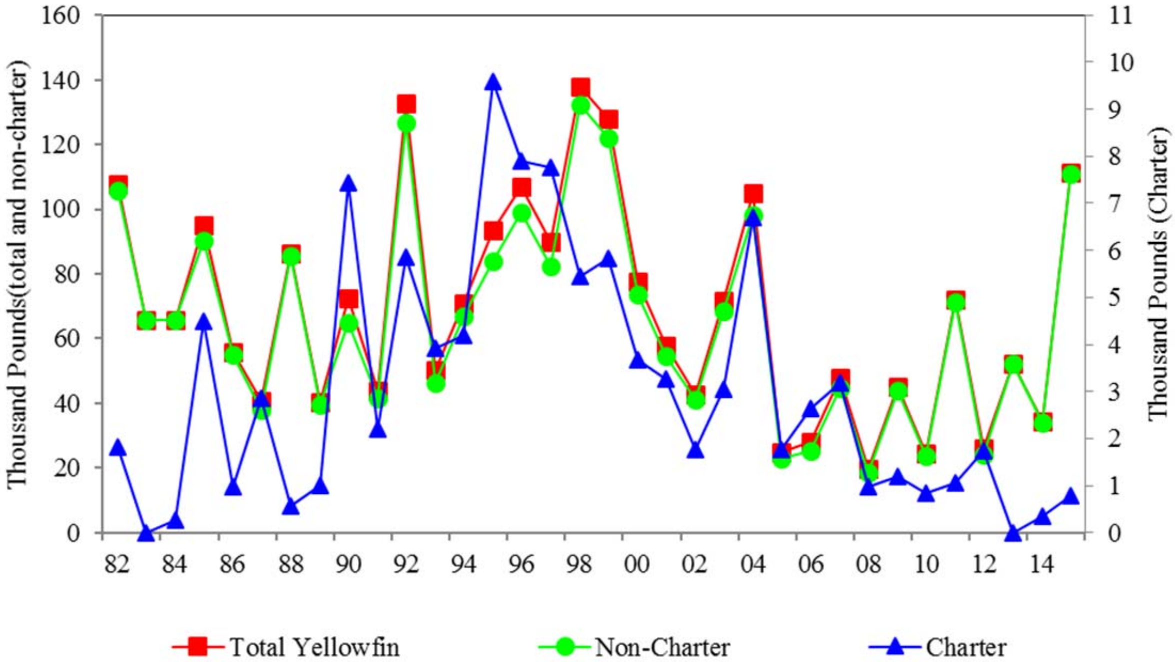
Supporting data shown in Table A-51.

Figure 55. Guam Annual Estimated Landings of Skipjack Tuna by Fishing by Method



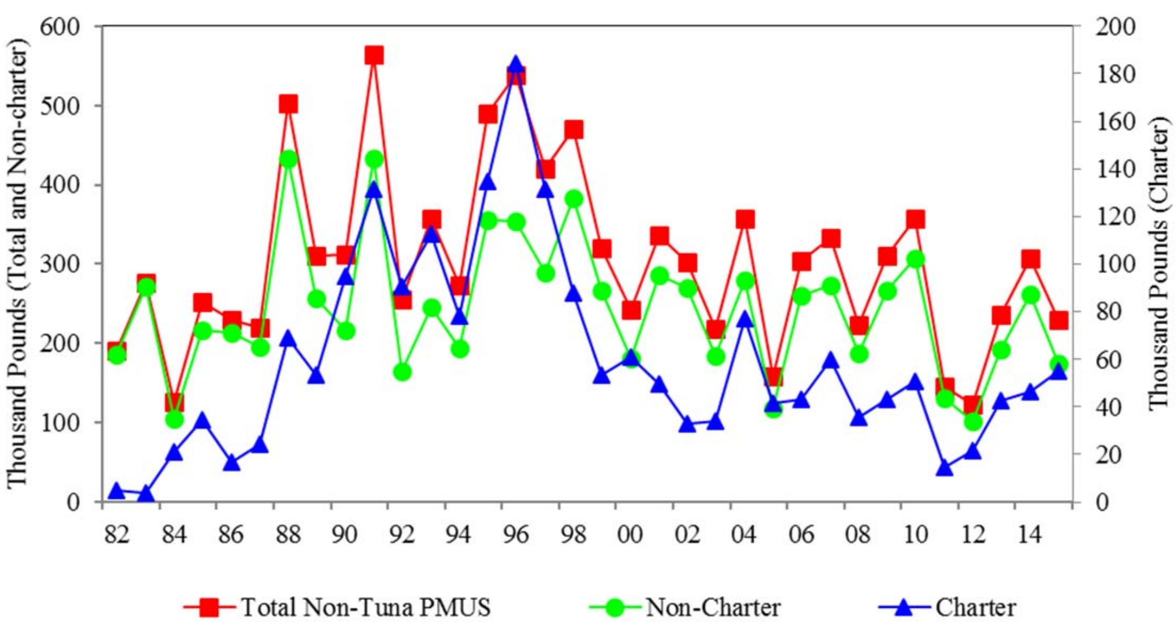
Supporting data shown in Table A-52.

Figure 56. Guam Annual Estimated Total Yellowfin Landings by Method



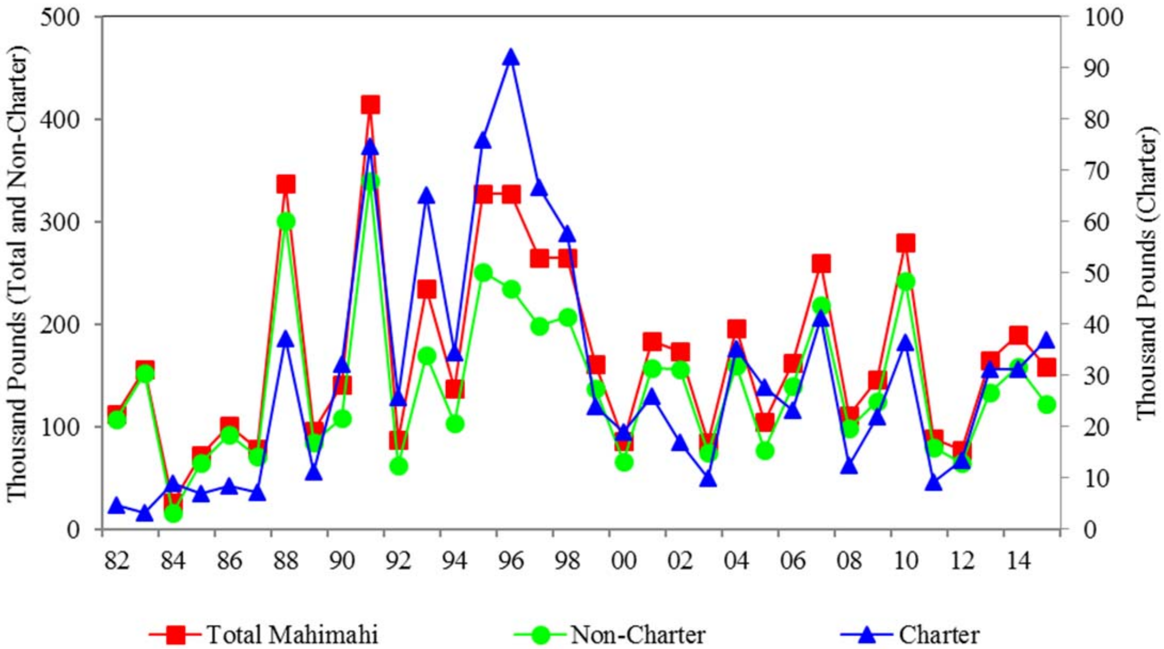
Supporting data shown in Table A-53.

Figure 57. Guam Annual Estimated non-Tuna PMUS Landings by Method



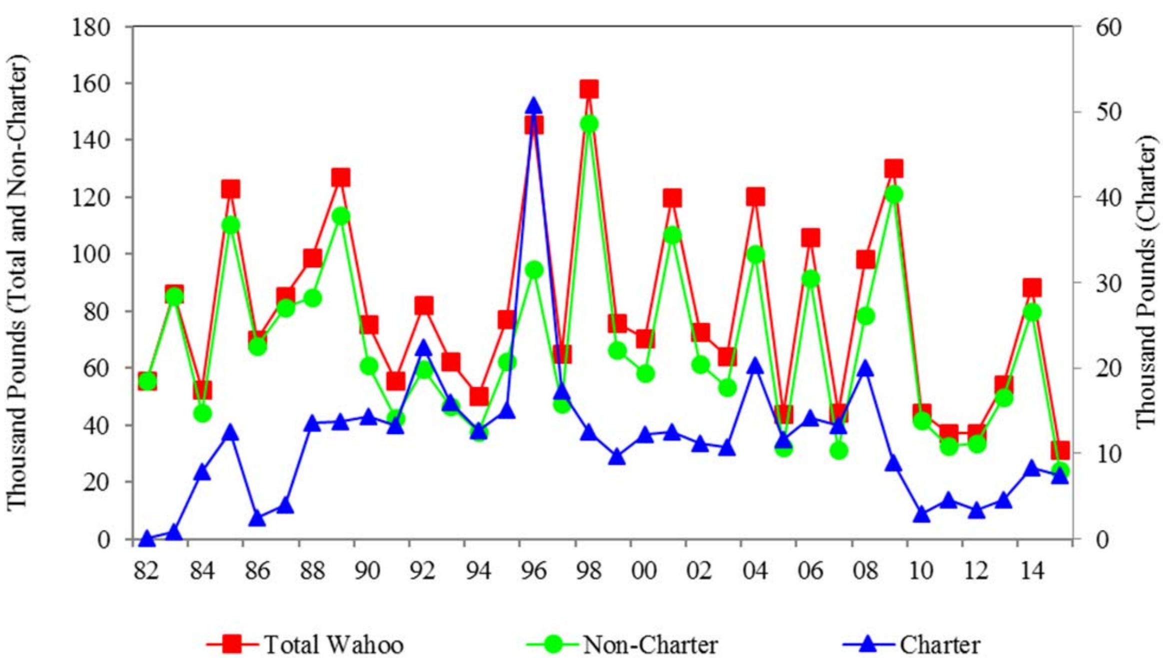
Supporting data shown in Table A-54.

Figure 58. Guam Annual Estimated Total Mahimahi Landings by Method



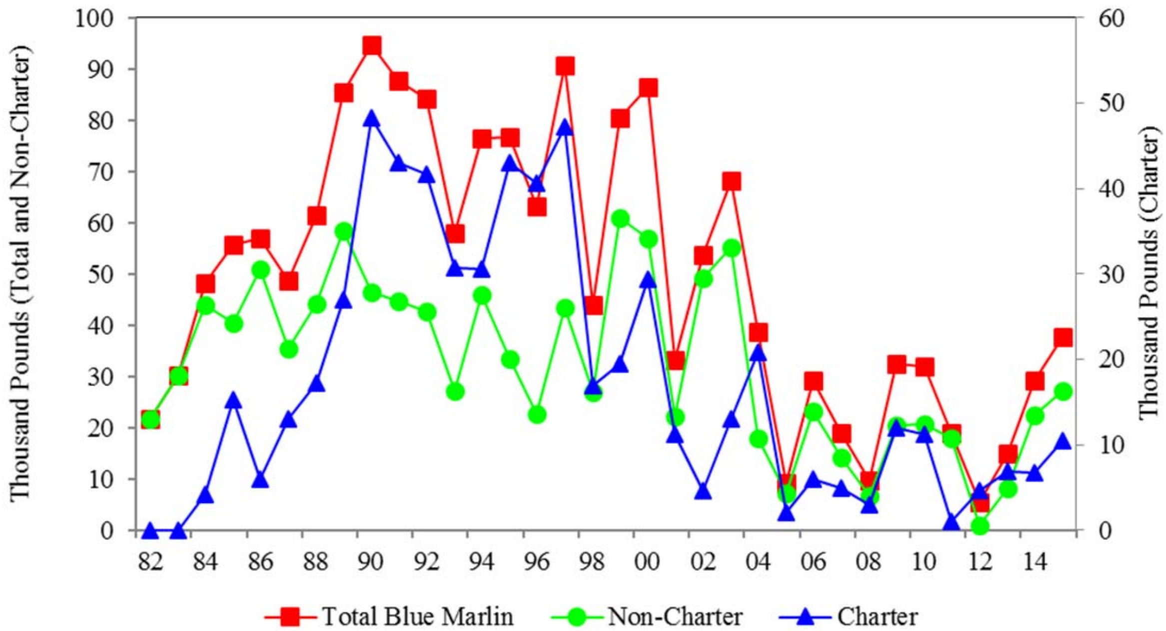
Supporting data shown in Table A-55.

Figure 59. Guam Annual Estimated Total Wahoo Landings by Method



Supporting data shown in Table A-56.

Figure 60. Guam Annual Estimated Total Blue Marlin Landings by Method



Supporting data shown in Table A-57.

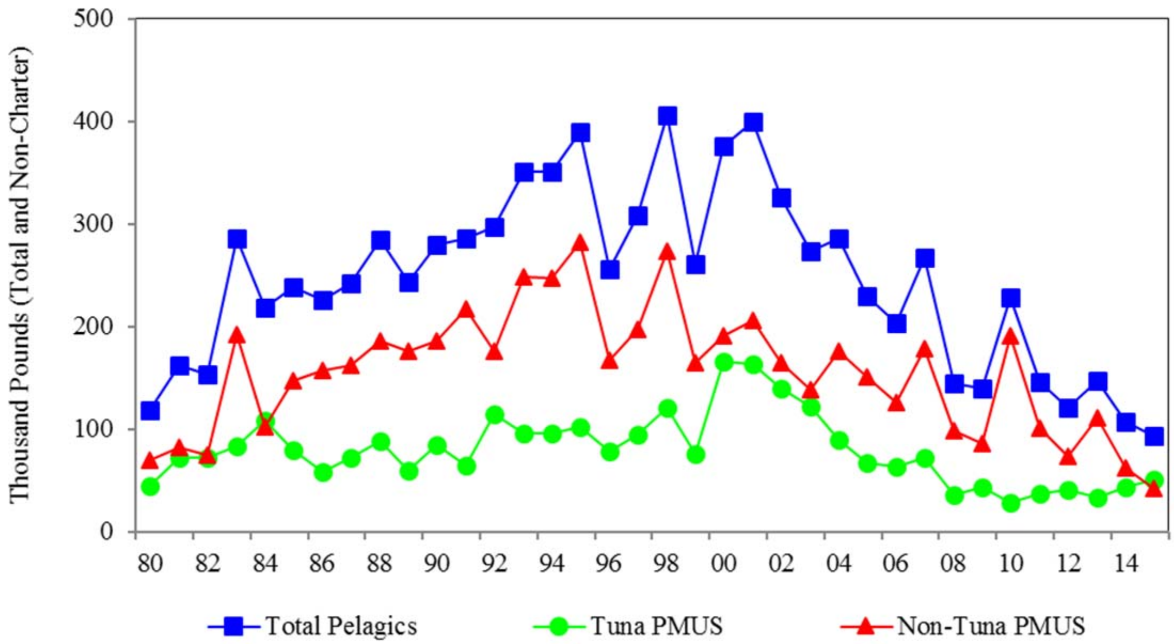
Table 20. Guam Bycatch Summary for Trolling Non-Charter and Charter Fisheries

Year	Species	Number Released	Percent Released*	Number Kept	Number Caught
Non-Charter Fisheries					
2000	K. pelamis	4	0.14	2,799	2,803
2001	C. falciformes	1	100	0	1
2001	Carangid	1	100	0	1
2001	A. solandri	1	0.28	358	359
2001	T. albacores	3	1.12	265	268
2002	C. melanopterus	1	100	0	1
2002	K. pelamis	1	0.06	1,783	1,784
2002	T. albacores	1	0.41	240	241
2003	C. hippurus	1	1.94	257	258
2004	No bycatch in 2004	0	0	0	0
2005	C. melanopterus	1	100	0	1
2006	K. pelamis	2	0.11	1,764	1,766
2007	C. hippurus	1	0.12	805	806
2007	K. pelamis	11	0.58	1,872	1,883
2007	T. albacores	10	2.73	356	366
2008	No bycatch in 2008	0	0	0	0
2009	M. mazara	3	23.08	10	13
2010	No bycatch in 2010	0	0	0	0

Year	Species	Number Released	Percent Released*	Number Kept	Number Caught
2011	K. pelamis	1	0.01	7,262	7263
2012	No bycatch in 2012	0	0	0	0
2013	K. pelamis	6	0.11	5,292	5,298
2013	T. albacores	4	1.08	365	369
2014	S. barracuda	1	2.78	35	36
2014	K. pelamis	7	0.18	3,953	3,960
2014	T. albacores	1	0.36	274	275
2015	No bycatch in 2015	0	0	6,867	6,867
	Non-charter Total	62		34,557	34,619
Charter Fisheries					
2000	M. mazara	4	14.29	24	28
2001	C. hippurus	1	0.60	166	167
2001	M. mazara	2	22.22	7	9
2001	T. angustirostris	1	100	0	1
2002	No bycatch in 2002	0	0	0	0
2003	No bycatch in 2003	0	0	0	0
2004	No bycatch in 2004	0	0	0	0
2005	C. amblyrhynchos	1	100	0	1
2005	M. mazara	1	33.33	2	3
2006	T. angustirostris	1	50	1	2
2007	S. lysan	1	33.33	2	3
2008	M. mazara	1	20	4	5
2009	No bycatch in 2009	0	0	0	0
2010	No bycatch in 2010	0	0	0	0
2011	No bycatch in 2011	0	0	0	0
2012	No bycatch in 2012	0	0	0	0
2013	No bycatch in 2013	0	0	0	0
2014	No bycatch in 2014	0	0	0	0
2015	No bycatch in 2015	0	0	446	446
	Charter Total	13		206	219
	Grand Total	75		28,342	28,417

*"percent released" represents the number of pieces that were discarded compared to the total number of fish caught trolling. The bycatch information is from unexpanded data, taken only from actual interviews that reported bycatch.

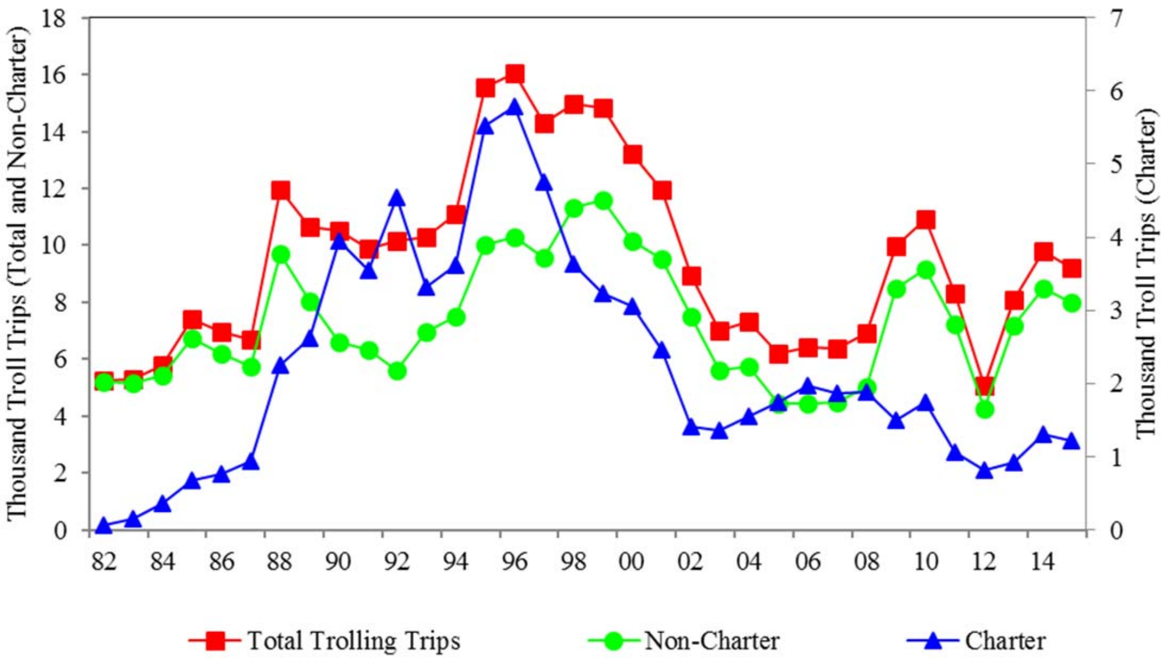
Figure 61. Guam Annual Estimated Commercial Landings: All Pelagics, Tuna PMUS, and Non-tuna PMUS



Supporting data shown in Table A-58.

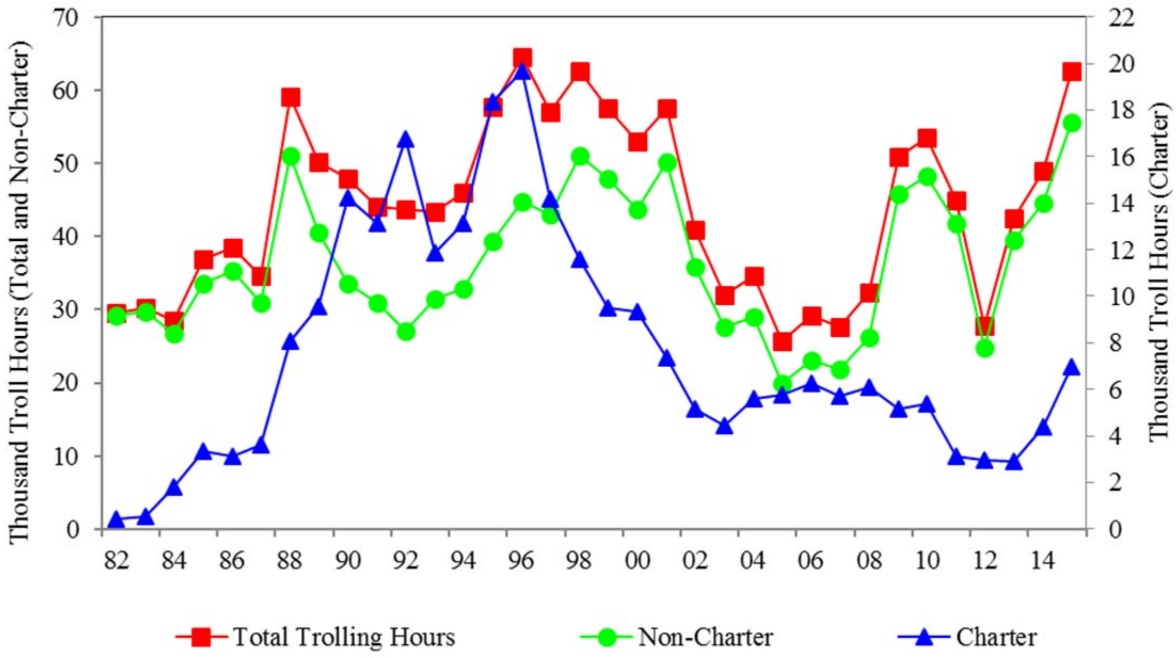
2.3.6 OVERVIEW OF EFFORT AND CPUE – NON-CHARTER AND CHARTER FISHERIES

Figure 62. Guam Estimated Number of Trolling Trips



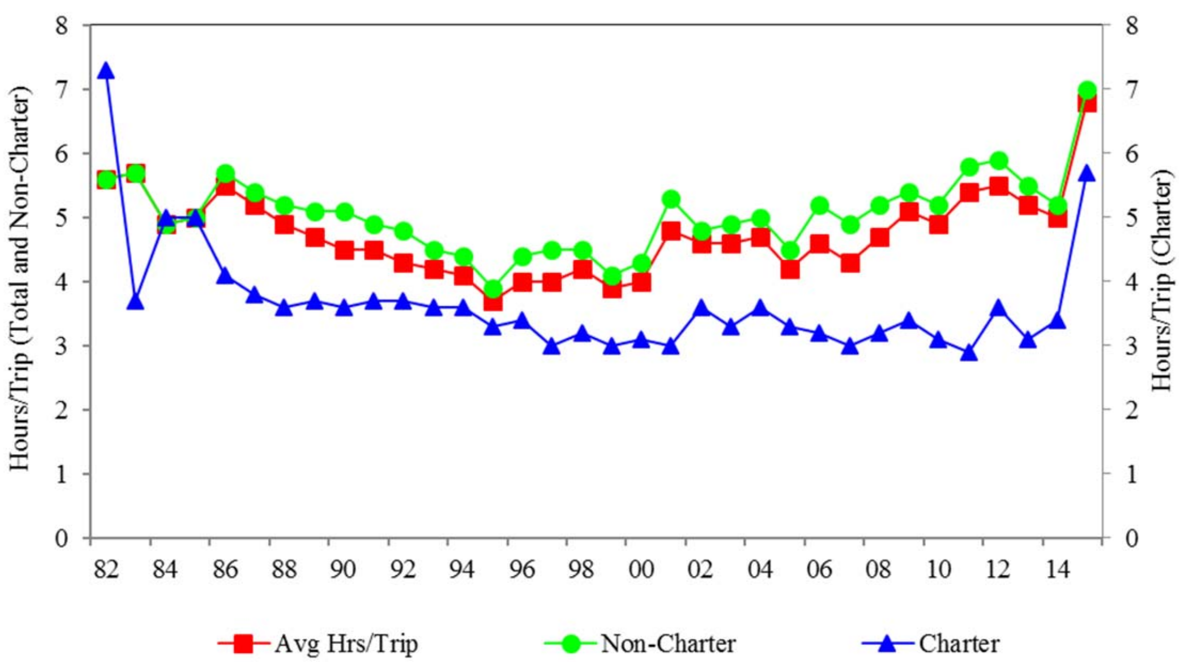
Supporting data shown in Table A-59.

Figure 63. Guam Estimated Number of Trolling Hours



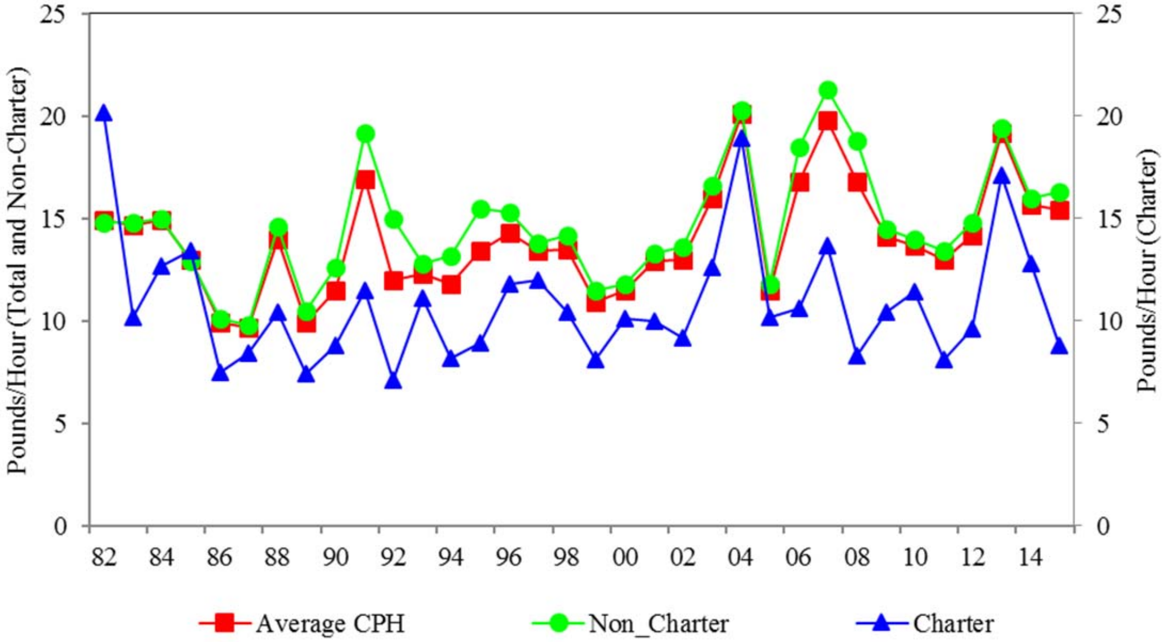
Supporting data shown in Table A-60.

Figure 64. Guam Estimated Number of Trip Length



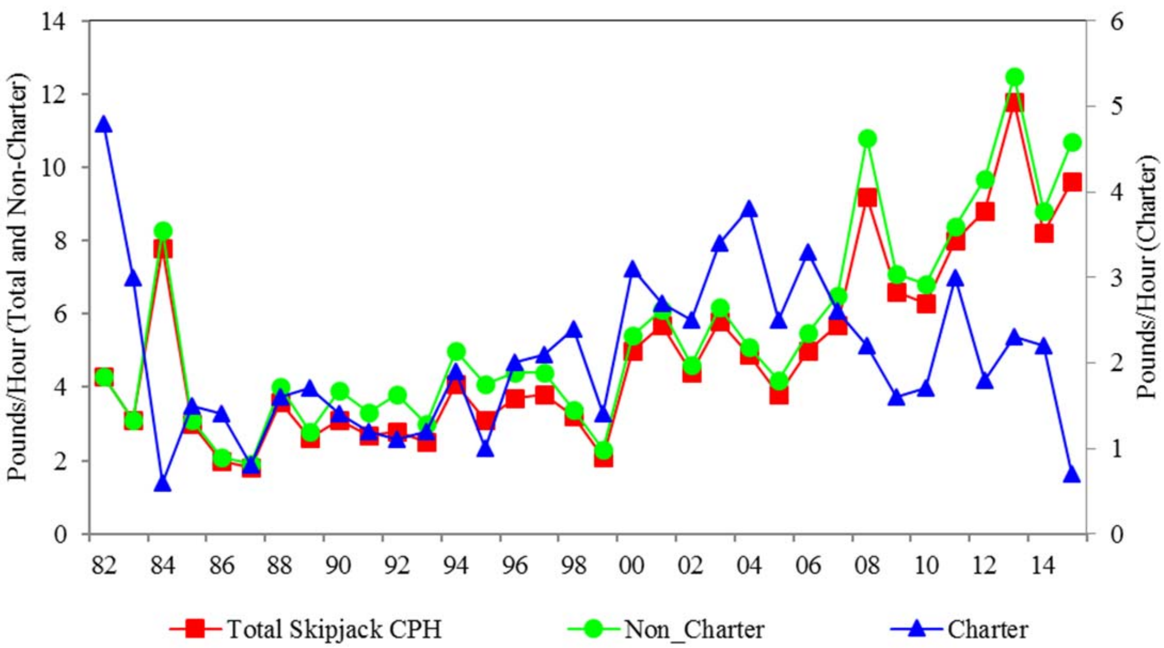
Supporting data shown in Table A-61.

Figure 65. Guam Trolling Catch Rates (lbs per hour)



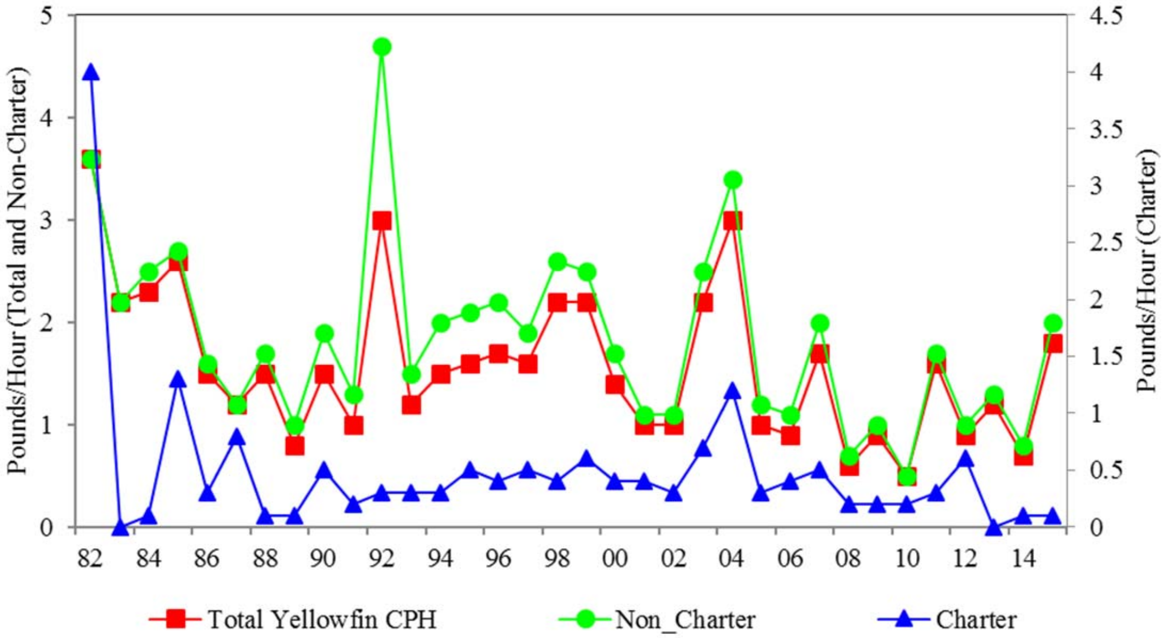
Supporting data shown in Table A-62.

Figure 66. Guam Trolling Catch Rates (lbs per hour): Skipjack



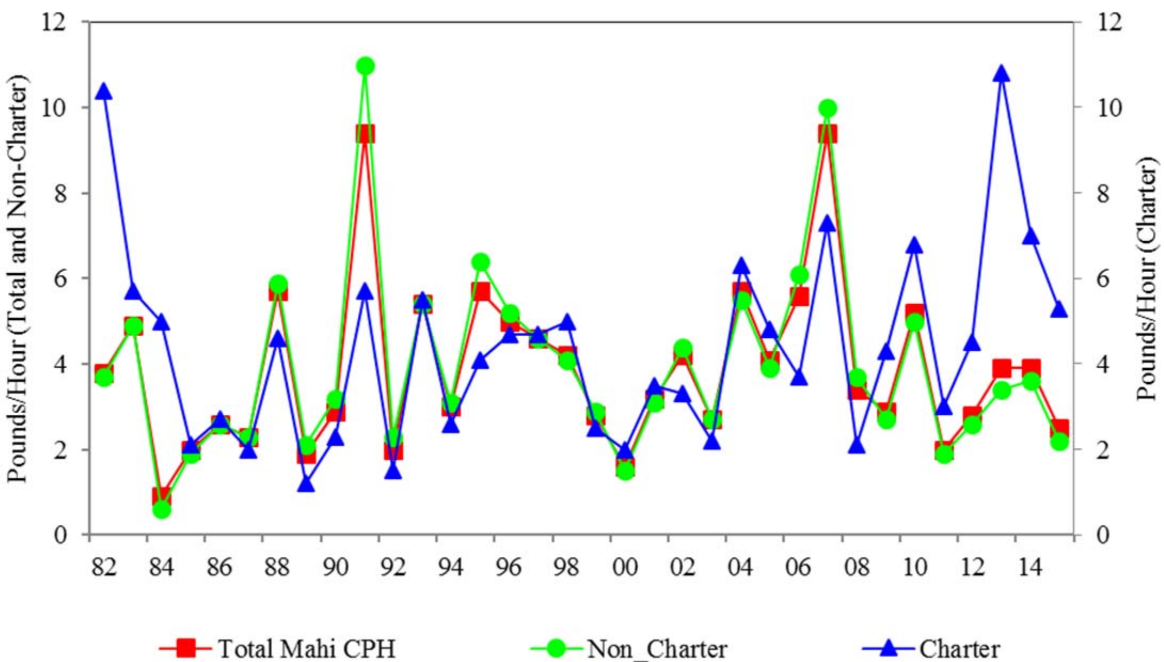
Supporting data shown in Table A-63.

Figure 67. Guam Trolling Catch Rates (lbs per hour): Yellowfin



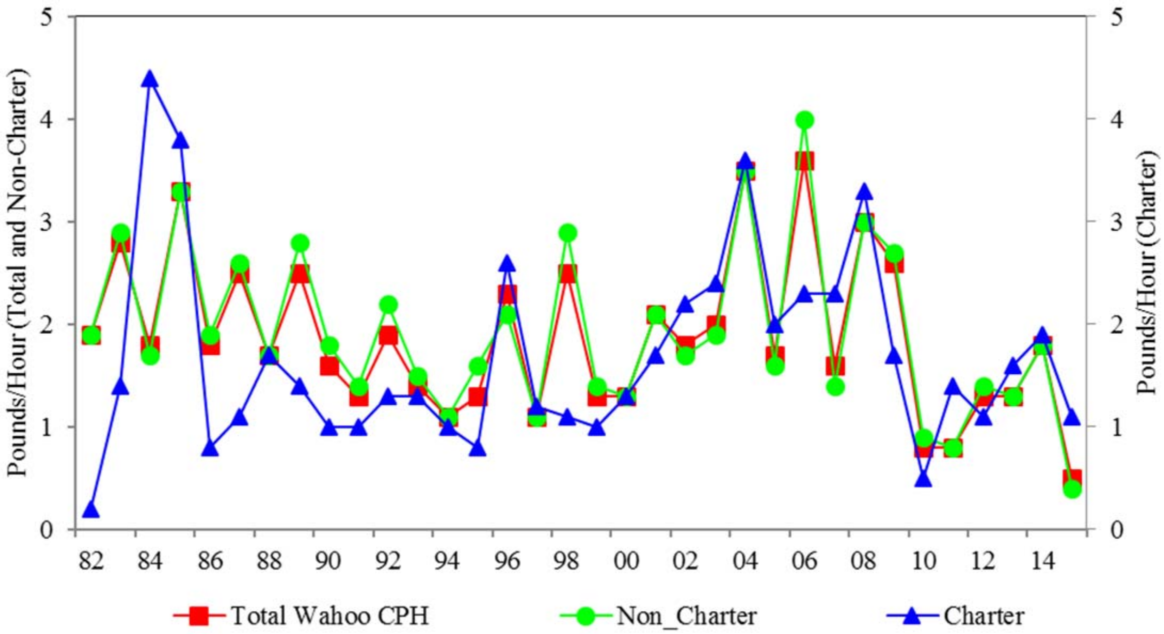
Supporting data shown in Table A-64.

Figure 68. Guam Trolling Catch Rates (lbs per hour): Mahimahi



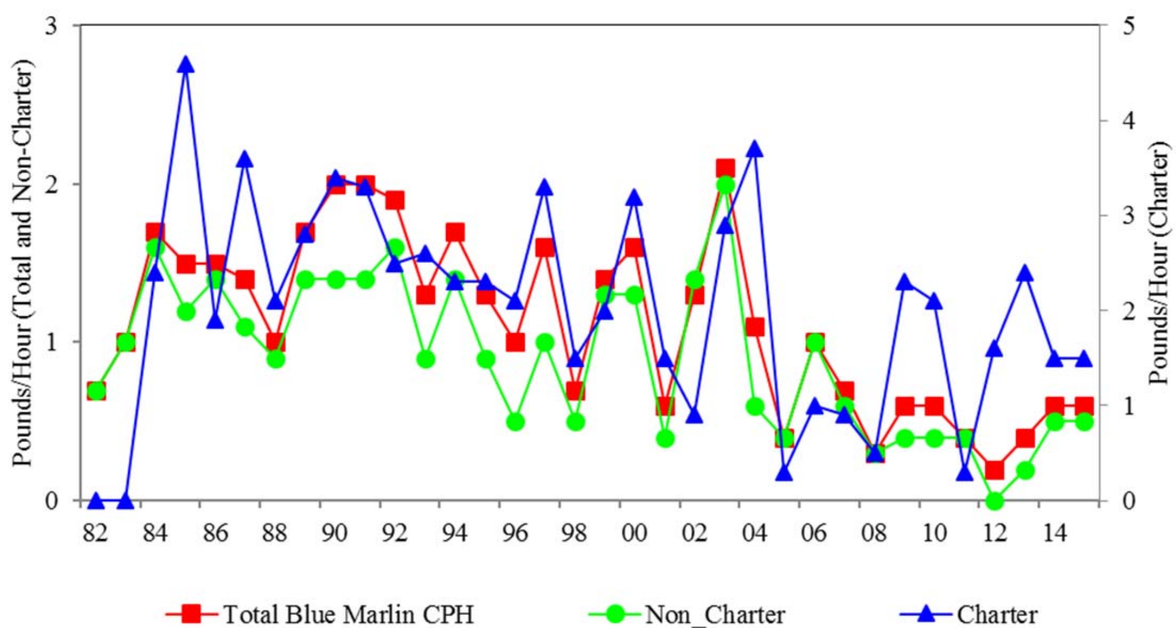
Supporting data shown in Table A-65.

Figure 69. Guam Trolling Catch Rates (lbs per hour): Wahoo



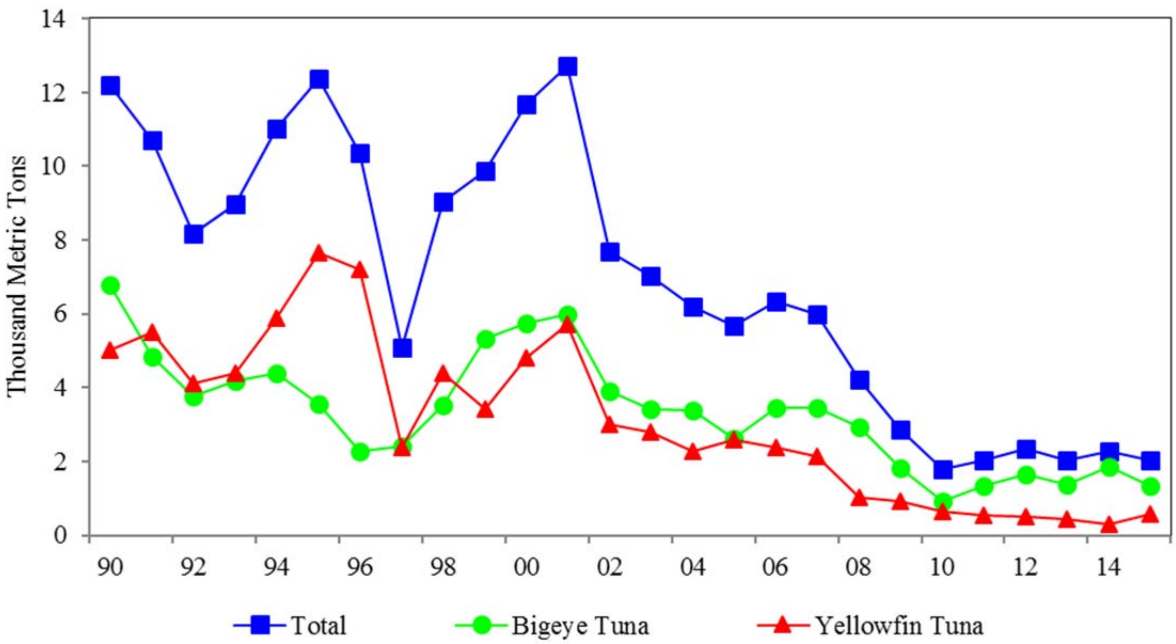
Supporting data shown in Table A-66.

Figure 70. Guam Trolling Catch Rates (lbs per hour): Blue Marlin



Supporting data shown in Table A-67.

Figure 71. Guam Foreign Longline Transshipment Landings: Longliners Fishing Outside the Guam EEZ



Supporting data shown in Table A-68.

2.4 HAWAI`I

2.4.1 DATA SOURCES

This report contains the most recently available information on Hawaii's commercial pelagic fisheries, as compiled from four data sources: The State of Hawaii's Division of Aquatic Resources (HDAR) Commercial Marine License data (CML), Commercial Fishing Report data (Fishing Report), HDAR Commercial Marine Dealer's Report data (Dealer), and NMFS, Pacific Islands Fisheries Science Center's (PIFSC) longline logbook data.

Any fisherman who takes marine species for commercial purposes is required byHDAR to have a CML and submit a monthly catch report. An exception to this rule is that should a fishing trip occur on a boat, only one person per vessel is required to submit a catch report. This person is usually, but not necessarily, the captain. Crew members do not ordinarily submit catch reports. HDAR asks fishermen to identify their primary fishing gear or method on the CML at time of licensing. This does not preclude fishermen from using other gears or methods. Data sources and estimation procedures are described below.

The Hawai`i-permitted Longline Fishery: The federal longline logbook system was implemented in December 1990 and it is the main source of the data used to determine longline vessel activity, effort, and fish catches. Logbook data have detailed operational information and catch in number of fish. Longline vessel operators are required to declare whether they will be making a deep-set or shallow-set trip prior to their departure. A deep-set is defined as a set with 15 or more hooks between floats as opposed to a shallow-set that is characterized by setting less than 15 hooks between floats.

Number of fish caught by Hawai`i-permitted longline fishery is a sum of the number of fish kept and released whereas the calculation of weight for longline catch only includes the number of fish kept. Another important data set is the HDAR Commercial Dealer data. Dealer data dates back to 1990 with electronic submission beginning in mid-1999. Revenue, average weight and average price are derived from the Dealer data.

The logbook and Dealer data were used to calculate the weight of longline catch. Longline purchases in the Dealer data was identified and separated out by matching longline trips based on a specific vessel name and its return to port date in the logbook data with the corresponding vessel name and purchase date(s) in the Dealer data. The general procedure of estimating longline catch for each species was done by first calculating an average weight by dividing the longline Dealer data "LBS. BOUGHT" by the "NO. BOUGHT". This average weight was multiplied by the total number kept from the longline logbook data to estimate the total weigh of catch kept. Revenue was the simple sum of "AMOUNT PAID" from the Dealer data based on longline trips which were matched with logbook data. Swordfish are processed at sea and landed headed and gutted. Tunas and mahimahi that weighed more than 20 lbs and marlins greater than 40 lbs must be gilled and gutted prior to sale. A conversion factor is applied to processed fish to estimate whole weight. Average weight statistics were calculated separately for the deep-set and shallow-set longline fisheries. Each species needed a minimum of 20 samples within a month of each RFMO area, i.e., WCPO or EPO, in order to calculate a mean weight. If this criterion was not met, the time strata was increased to a quarter, year or multi-year period until there were enough samples to calculate a mean weight. Some species which were landed in low numbers needed to be aggregated to a multi-year period. Consequently, their respective annual mean weights are the same from year to year or repeat over time.

Catch and effort summaries in this Module were based on RFMO standards and business rules. Longline catch and efforts statistics in this Module consists of U.S. longline fisheries in the North Pacific Ocean, attributions from CNMI, Guam and American Samoa in the North Pacific Ocean. Longline vessels operating from California were also included in this report to satisfy RFMO data reporting and NOAA confidentiality standards. Most of these vessels had Hawai`i limited-entry permits. The only exception to summaries using RFMO standards was catch and effort statistics using boundaries within or outside of U.S. EEZs. Since there were substantial differences in operational characteristics and catch between the deep-set longline fishery targeting tunas and the shallow-set longline fishery targeting swordfish, separate summaries were provided for each longline fishery.

MHI Troll Fishery: Catch and effort by the MHI troll fishery was defined as using a combination of pelagic species, gear and area codes from the HDAR Fishing Report data. The HDAR codes for the MHI troll fishery includes summaries of PMUS caught by Miscellaneous Trolling Methods (gear code 6), Lure Trolling (61), Bait Trolling (62), Stick Trolling (63), Casting, Light Tackle, Spinners or Whipping (10) and Hybrid Methods (97) in HDAR statistical areas 100 through 642. These are areas that begin from the shoreline out to 20 minute squares around the islands of Hawai`i, Maui, Kahoolawe, Lanai, Mokolai, Oahu, Kauai and Niihau.

MHI Handline Fishery: The MHI handline fishery includes PMUS caught by Deep Sea or Bottom Handline Methods (HDAR gear code 3), Inshore Handline or Cowrie Shell (Tako) Methods (4), Ika_Shibi (8), Palu-Ahi, Drop Stone or Make Dog Methods (9), Drifting Pelagic Handline Methods (35) and Floatline Methods (91) in HDAR statistical areas 100 to 642 except areas 175, 176, and 181.

Offshore Handline Fishery: The offshore handline fishery includes PMUS caught by Ika-Shibi (HDAR gear code 8), Palu-Ahi, Drop Stone or Make Dog Methods (9), Drifting Pelagic Handline Methods (35), Miscellaneous Trolling Methods (6), Lure Trolling (61), and Hybrid Methods (97) in Areas 15217 (NOAA Weather Buoy W4), 15717 (NOAA Weather Buoy W2), 15815, 15818 (Cross Seamount) , 16019 (NOAA Weather Buoy W3), 16223 (NOAA Weather Buoy W1), 175, 176, 181, 804, 807, 816, 817, 825, 839, 842, 892, 893, 894, 898, 900, 901, 15416, 15417, 15423, 15523, 15718, 15918, 15819, and 16221. This fishery also includes pelagic species caught by Deep Sea or Bottom Handline Methods (3) in Area 16223.

Other Gear: This category represents pelagic species caught by methods or in areas other than those methods mentioned above. Catch and revenue from this category is primarily composed of PMUS caught by the aku boat fishery, fishers trolling in areas outside of the MHI (the distant water albacore troll fishery) or PMUS caught close to shore by diving, spearfishing, squidding, or netting inside of the MHI.

Calculations: Pelagic catch by the MHI troll, MHI handline, offshore handline, and other gear were calculated by summing "Lbs Landed" from the HDAR Fishing Report data based on the gear and area codes used to define each gear type. The percent of catch for each pelagic species was calculated from the "Lbs Landed" by the MHI troll, MHI handline offshore handline and other gear and used to estimate the revenue of each fishery.

Catch in the HDAR Dealer data, referred to as "LBS. BOUGHT", by each fishery was not clearly differentiated however, "LBS. BOUGHT" by the longline and aku boat fisheries were identified by CML numbers and/or vessel names and kept separate from the "non-longline & non-aku boat" Dealer data. This remaining "LBS. BOUGHT" along with the "AMOUNT PAID" from Dealer data for the "non-longline and non-aku boat" fisheries was used to calculate average weight, revenue and average price for the MHI troll, MHI handline, offshore handline fisheries and other gear category. "LBS. BOUGHT" from this Dealer data was summed on a species specific basis. The percent of catch calculated from the HDAR Fishing Report "Lbs Landed" for each species and by each fishery was used in conjunction with total "LBS. BOUGHT" from the HDAR Dealer data to apportion "AMOUNT PAID" or revenue accordingly to each respective fishery. This process was repeated on a monthly basis to account for the seasonality of catch and variability of activity for each fishery. Revenue and average price are inflation-adjusted by the Honolulu CPI.

2.4.2 SUMMARY OF HAWAI`I PELAGIC FISHERIES

The following is a summary of landings, effort, CPUE, fish size, revenue and bycatch for the main pelagic fisheries (deep set and shallow set longline, MHI troll, MHI handline, and offshore handline).

Participation. A total of 3,691 fishermen were licensed in 2015, including 2,045 (55%) who indicated that their primary fishing method and gear were intended to catch pelagic fish. Most licenses that indicated pelagic fishing as their primary method were issued to trollers (50%) and longline fishermen (36%). The remainder was issued to ika shibi and palu ahi (handline) (13%) and aku boat fishers (1%).

Landings. Hawai`i commercial fisheries landed 39,695,000 lbs of pelagic species in 2015, with the deep-set commercial longline fishery comprising over 80% (32,039,000 lbs) of the total. Deep-set longliners target bigeye and yellowfin tuna. The shallow-set longline fishery landed 2,791,000 lbs, or 7% of all commercial landings. The main Hawai`i Islands troll fishery landed 3,067,000 lbs of pelagic species, or 7.7% of the total. MHI handline fishery and offshore handline fishery accounted for 1,182,000 and 408,000 lbs (3% and 1% of the total landings), respectively.

The largest component of the pelagic catch was tunas, which comprised 64% of the total in 2015. Bigeye tuna alone accounted for 79% of the tunas and 50% of all pelagic catch. Billfish catch made up 17% of the total catch in 2015. Swordfish was the largest of these, at 49% of the billfish and 8% of the total catch. Catches of other PMUS represented 18% of the total catch in 2015 with moonfish being the largest component at 36% of the other PMUS and 7% of the total catch. The deep-set longline fishery catches about 98% of all moonfish and 96% of all pomfret landed, while the MHI troll fishery and deep-set longline fishery represented 49% and 47% of mahimahi catch in 2015.

Effort. There were 143 active Hawai`i-permitted deep-set longline vessels in 2015, three more vessels than the previous year, and the most in the past 10 years. The number of deep-set trips (1,452) and sets (18,519) were also among the highest over the past ten years. The Hawai`i-permitted shallow-set longline fishery operates mainly in the first half of the year. In 2015, 22 vessels completed 68 trips and made 1,129 sets, which was among the lowest participation and effort for this segment of the fishery. The number of days fished by MHI troll fishers has been dropping since a peak in 2012, with 1,564 fishers logging 24,974 days fished around the MHI in 2015. There were 467 MHI handline fishers that fished 4,632 days in 2015, both close to their long-term averages. At 8 fishers and 253 days fished in 2015, the offshore handline fishery had its lowest effort since 2009.

CPUE. The deep-set longline fishery targets bigeye tuna and this species had higher CPUE (4.8 fish per 1,000 hooks) compared to albacore (0.2) and yellowfin tuna (0.6). CPUE of billfish for the deep-set fishery is similar to that of albacore (0.1 - 0.3 fish per 1,000 hooks), while the CPUE for blue shark, a bycatch species, is second only to bigeye at 1.4 fish per 1,000 hooks. The Hawai`i-permitted shallow-set longline fishery targets swordfish, which exhibited the highest CPUE (11.9 fish per 1,000 hooks) of this fishery. Blue sharks were caught at 10.0 fish per 1,000 hooks, bigeye at 1.1, while all other species were caught at less than 0.2 fish per 1,000 hooks. The 2015 CPUE for all species in the MHI troll fishery was above the long-term average for all species, with the highest CPUE for yellowfin at 7.0 lbs per hour trolled. MHI handline CPUE for yellowfin tuna peaked at 186 lbs per day fished in 2015. Albacore and bigeye tuna CPUE was substantially lower compared to yellowfin tuna but have shown no clear trend in recent years. CPUE of the offshore handline fishery has been steady for the past eight years, with bigeye catch rates an order of magnitude higher than that of yellowfin (1,471 and 99 lbs per trip, respectively) in 2015.

Fish Size. Average weight, as determined in the deep and shallow-set fisheries, was fairly close to the long-term average for all commonly-caught species. Bigeye tuna caught in the deep-set fishery were 84 lbs, 2% greater than the long-term average. Yellowfin tuna in the deep-set fishery averaged 73 lbs per fish, consistent with the long-term average. While catching much fewer total fish, the shallow-set fishery consistently catches yellowfin 60% larger than the deep-set fishery. The 2015 average weight was also relatively high at 126 lbs, 10% higher than the long-term average. Swordfish average weight in the shallow-set fishery was 167 lbs, 11% lower than the long-term average. Opah and blue marlin, incidental catch in the deep-set fishery, averaged 90 and 172 lbs in 2015, very close to the long-term average of 88.6 and 183.1 lbs, respectively. The mean weight for most species caught by the troll and handline fisheries was close to their long-term average except for bigeye tuna, blue marlin and swordfish which were below their respective long-term average in 2015.

Revenue. The deep-set longline fishery accounted for over 86% ($91.5 million) of the $106 million ex-vessel value of the entire commercial pelagic fishery, an increase from 2014. The shallow-set longline fishery contributed 2.6% ($2.8 million) to the total ex-vessel revenue, approximately the same amount as the MHI handline fishery. Main Hawai`i Island trolling accounted for just over 7% ($7.7 million), slightly above the long-term average. Total estimated revenue of the MHI handline fishery was $2.8 million in 2015, above its long-term average. The offshore handline fishery was worth $811,000 in 2015. Bigeye tuna alone accounted for $71 million of the total revenue, while yellowfin and billfish contributed $11.1 and 8.3 million, respectively.

Bycatch. A total of 114,670 fish were released in the deep and shallow-set longline fisheries in 2015. With the exception of sharks, there is minimal bycatch in Hawai`i permitted longline fisheries. Sharks contribute more than 86% (98,922) of the released catch in both the deep and shallow-set fisheries. With the exception of mako and thresher sharks, other shark species have no market so they are released. Only 2.2% of all other PMUS are released by the deep-set fishery, while approximately 10% of other PMUS are released by the shallow-set fishery. The higher release rate by the shallow-set sector is to conserve space for swordfish and forego keeping other species due to their short shelf life.

2.4.3 PLAN TEAM RECOMMENDATIONS

There were no recommendations by the Pelagics Plan Team in 2016 to be forwarded to the Council, only Action Items to Pelagic Plan Team members on improvements to modules

2.4.4 OVERVIEW OF PARTICIPATION – ALL FISHERIES

Table 21. Number of HDAR Commercial Marine Licenses, 2014-2015.

	Number of licenses	
Primary Fishing Method	2014	2015
Trolling	1,138	1,019
Longline	786	741
Ika Shibi & Palu Ahi	278	269
Aku Boat (Pole and Line)	14	16
Total Pelagic	2,216	2,045
Total All Methods	3,794	3,691

2.4.5 OVERVIEW OF LANDINGS AND ECONOMIC DATA

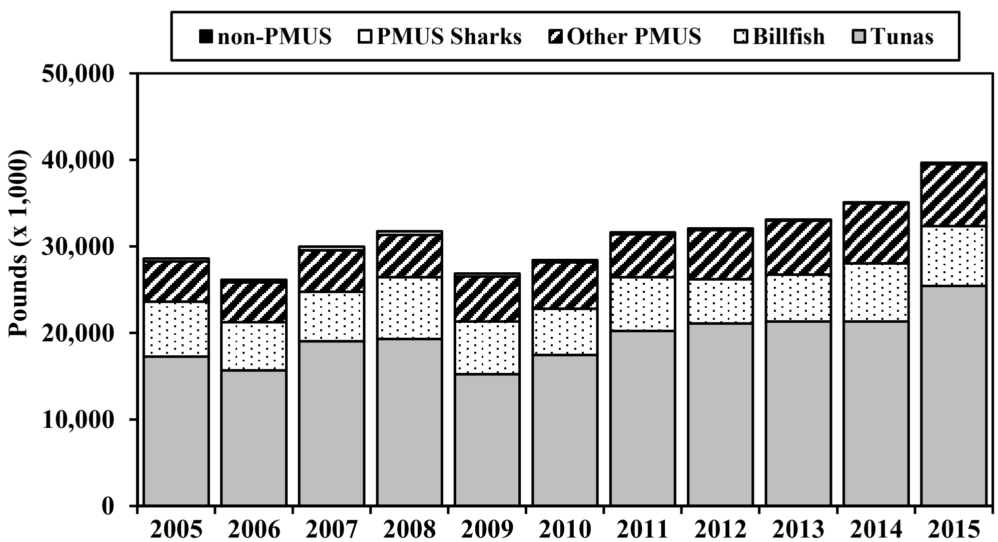
Table 22. Hawai`i commercial pelagic catch, revenue, and average price by species, 2014-2015.

Species	2014			2015		
	Catch (1,000 lbs)	Ex-vessel revenue ($1,000)	Average price ($/lb)	Catch (1,000 lbs)	Ex-vessel revenue ($1,000)	Average price ($/lb)
Tuna PMUS						
Albacore	552	$1,005	$2.02	676	$1,058	$1.60
Bigeye tuna	16,564	$60,812	$3.89	19,962	$71,008	$3.78
Bluefin tuna	1	$8	$7.88	0	$4	$8.70
Skipjack tuna	648	$665	$1.29	721	$660	$1.38
Yellowfin tuna	3,522	$11,281	$3.56	4,030	$11,122	$3.00
Other tunas	30	$37	$2.02	37	$55	$2.80
Tuna PMUS subtotal	21,317	$73,809	$3.72	25,426	$83,908	$3.55
Billfish PMUS						
Swordfish	3,690	$5,453	$2.20	3,372	$4,634	$2.26
Blue marlin	1,511	$1,605	$1.25	1,786	$1,717	$1.15
Spearfish (hebi)	501	$522	$1.05	604	$547	$0.91
Striped marlin	967	$1,561	$1.47	1,115	$1,369	$1.17
Other marlins	52	$70	$1.22	47	$49	$1.01
1Billfish PMUS subtotal	6,721	$9,211	$1.71	6,925	$8,315	$1.55
Other PMUS						
Mahimahi	1,819	$4,437	$2.88	1,486	$4,585	$3.32
Ono (wahoo)	1,176	$2,784	$2.76	1,221	$2,769	$2.52
Opah (moonfish)	2,242	$2,919	$1.47	2,659	$3,160	$1.53
Oilfish	516	$407	$0.77	525	$276	$0.57
Pomfrets (monchong)	1,179	$2,474	$2.00	1,285	$2,966	$2.18
PMUS Sharks	129	$113	$1.11	146	$97	$0.95
Other PMUS subtotal	7,061	$13,133	$2.05	7,322	$13,853	$2.13
Other pelagics	18	$14	$0.84	22	$12	$0.59
Total pelagics	35,116	$96,167	$3.04	39,695	$106,089	$2.99

Table 23. Hawai`i commercial pelagic catch, revenue, and average price by fishery, 2014-2015.

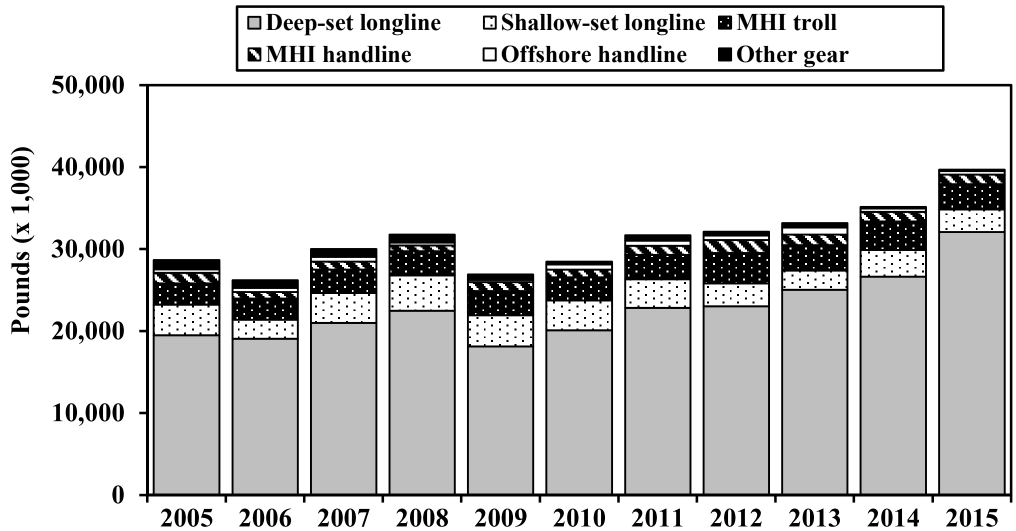
Fishery	2014			2015		
	Catch (1,000 lbs)	Ex-vessel revenue ($1,000)	Average price ($/lb)	Catch (1,000 lbs)	Ex-vessel revenue ($1,000)	Average price ($/lb)
Deep-set longline	26,615	$79,442	$3.10	32,039	$91,490	$3.04
Shallow-set longline	3,255	$4,117	$2.12	2,791	$2,810	$2.09
MHI trolling	3,486	$8,456	$3.01	3,067	$7,684	$2.91
MHI handline	1,161	$2,971	$2.88	1,182	$2,832	$2.71
Offshore handline	416	$786	$2.34	408	$811	$2.27
Other gear	182	$395	$2.34	207	$461	$2.66
Total	35,116	$96,167	$3.04	39,695	$106,089	$2.99

Figure 72. Hawai`i commercial tuna, billfish, other PMUS and PMUS shark catch, 2005-2015.



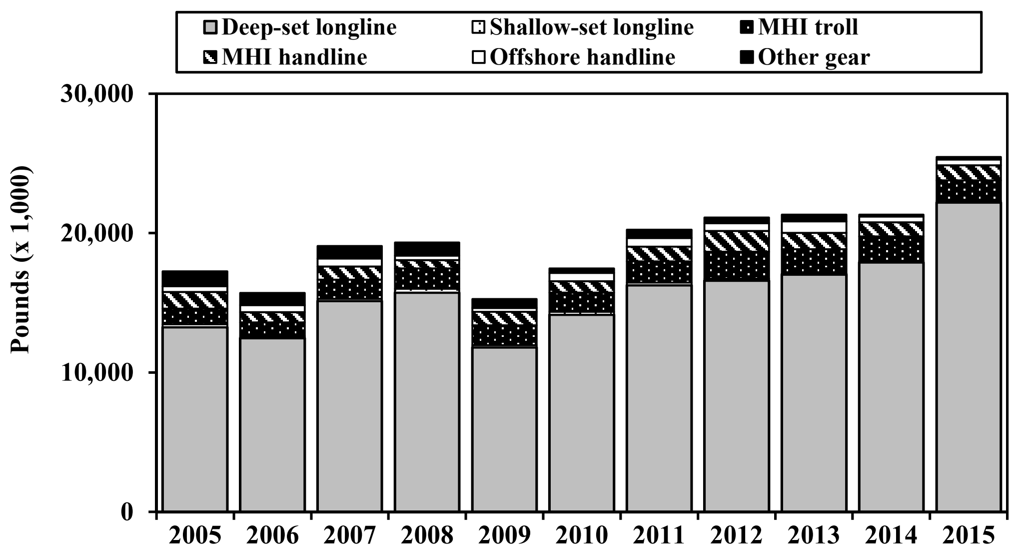
Supporting data shown in Table A-69.

Figure 73. Total commercial pelagic catch by gear type, 2005-2015.



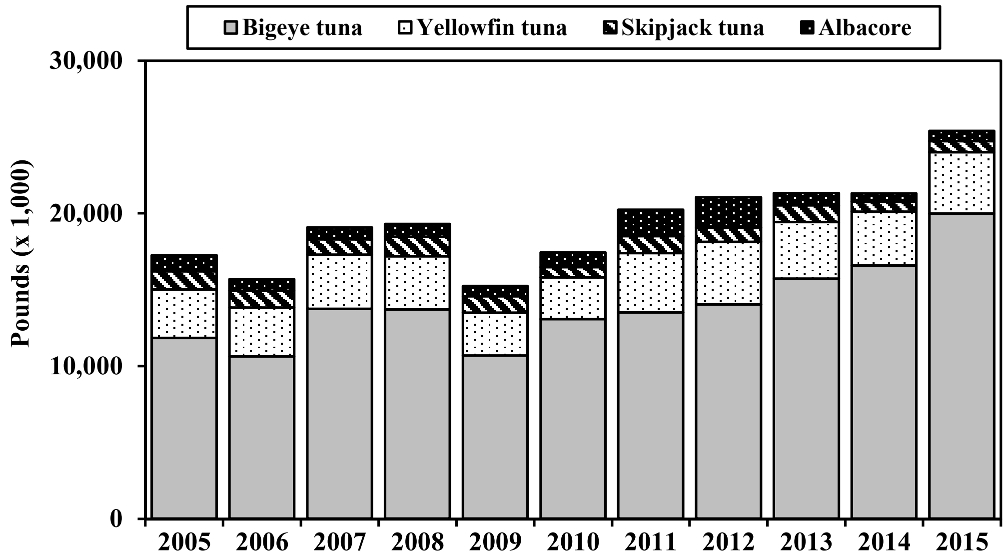
Supporting data shown in Table A-70.

Figure 74. Hawai`i commercial tuna catch by gear type, 2005-2015.



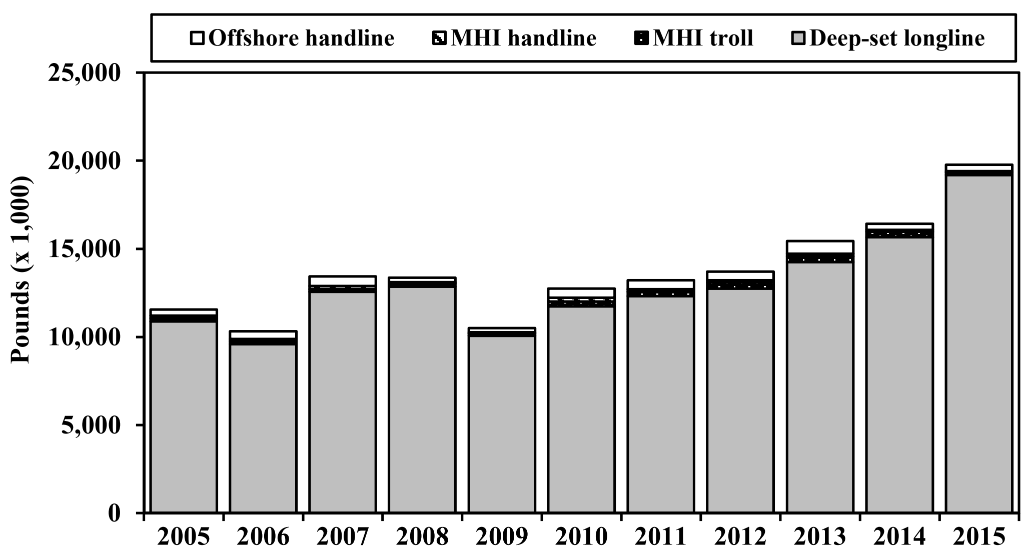
Supporting data shown in Table A-71.

Figure 75. Species composition of the tuna catch, 2005-2015.



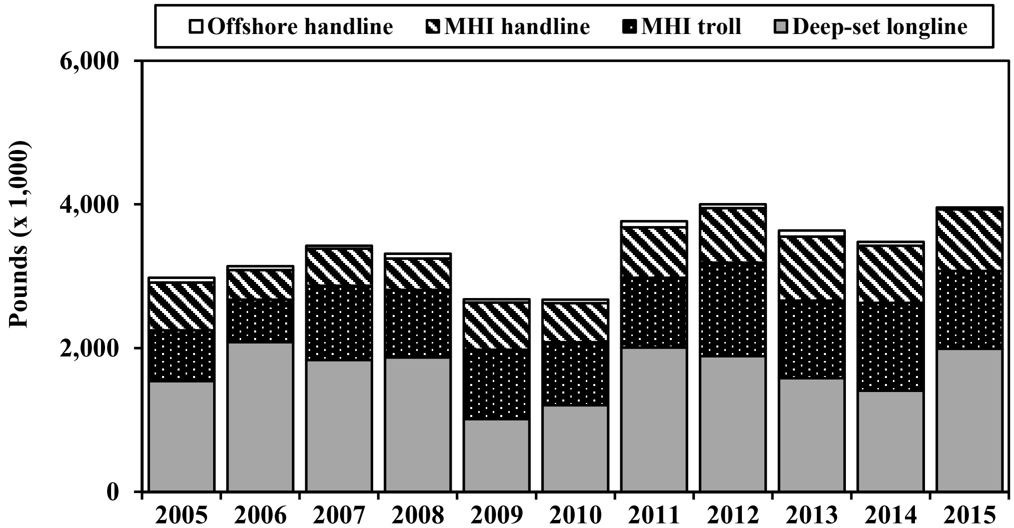
Supporting data shown in Table A-72.

Figure 76. Hawai`i bigeye tuna catch by gear type, 2005-2015.



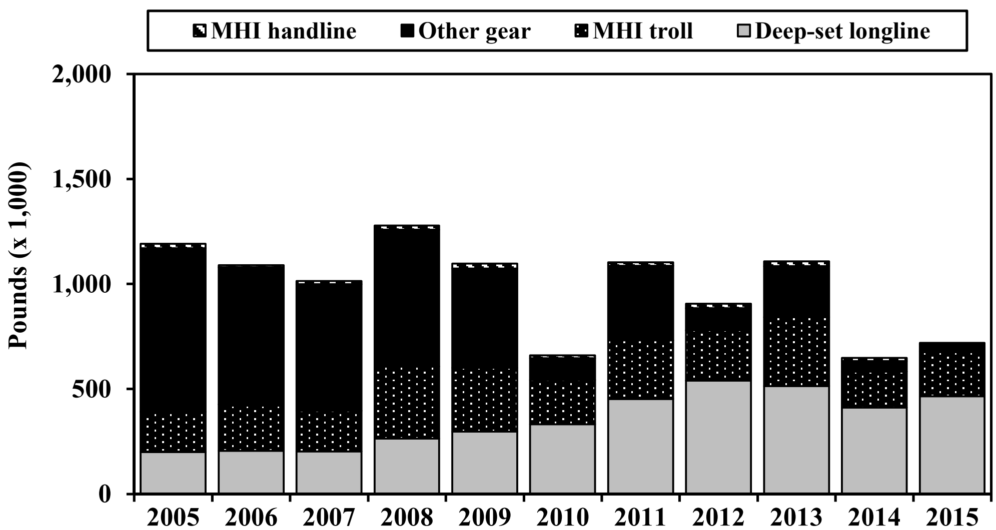
Supporting data shown in Table A-73.

Figure 77. Hawai`i yellowfin tuna catch by gear type, 2005-2015.



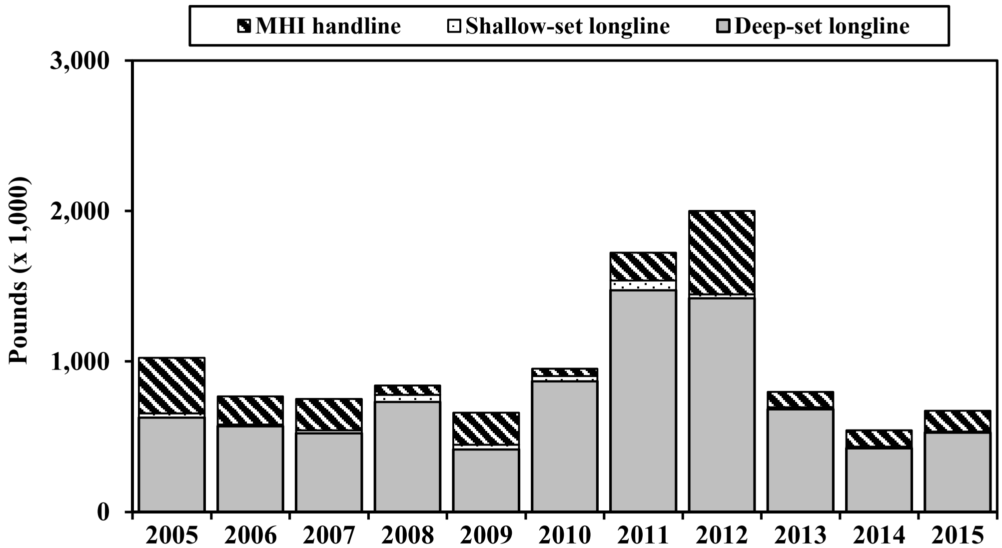
Supporting data shown in Table A-74.

Figure 78. Hawai`i skipjack tuna catch by gear type, 2005-2015.



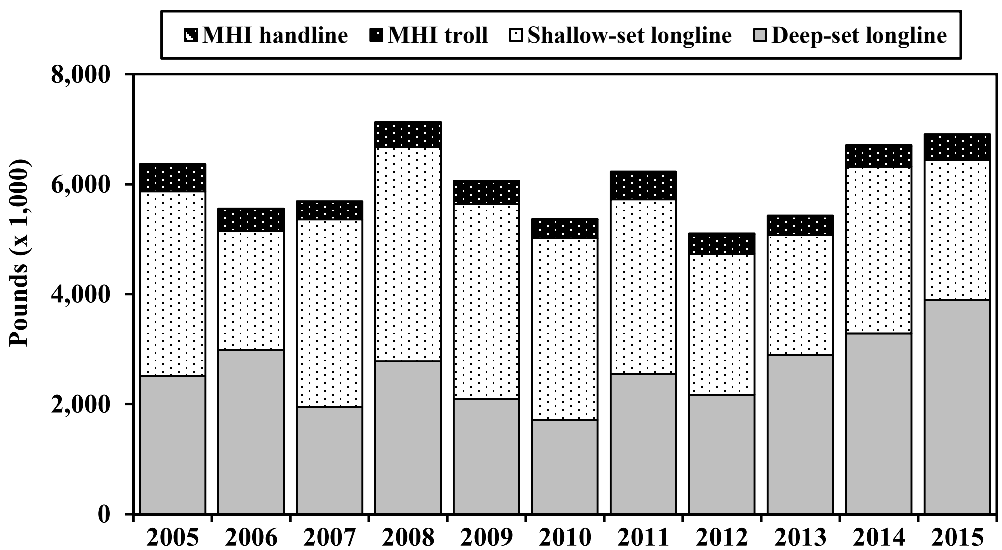
Supporting data shown in Table A-75.

Figure 79. Hawai`i albacore catch by gear type, 2005-2015.



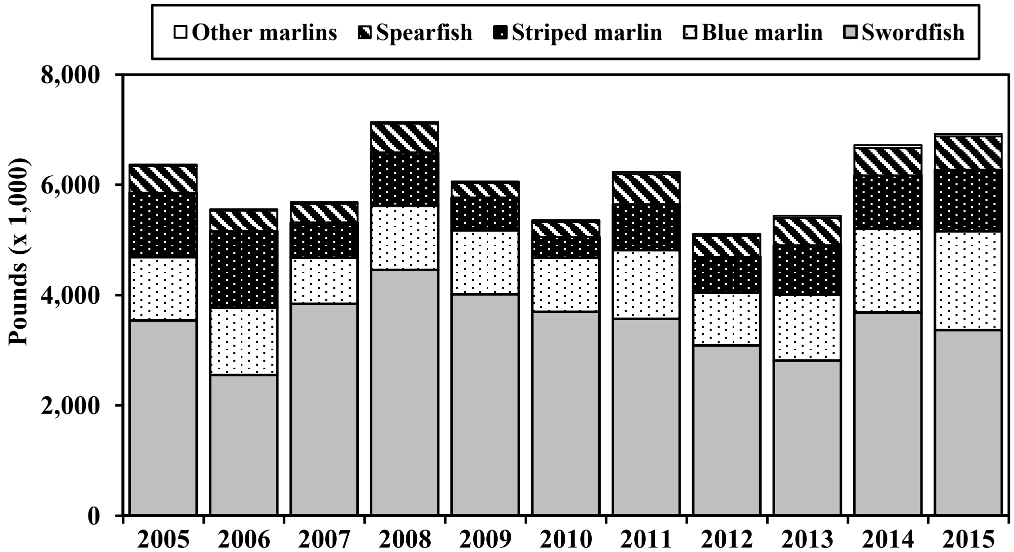
Supporting data shown in Table A-76.

Figure 80. Hawai`i commercial billfish catch by gear type, 2005-2015.



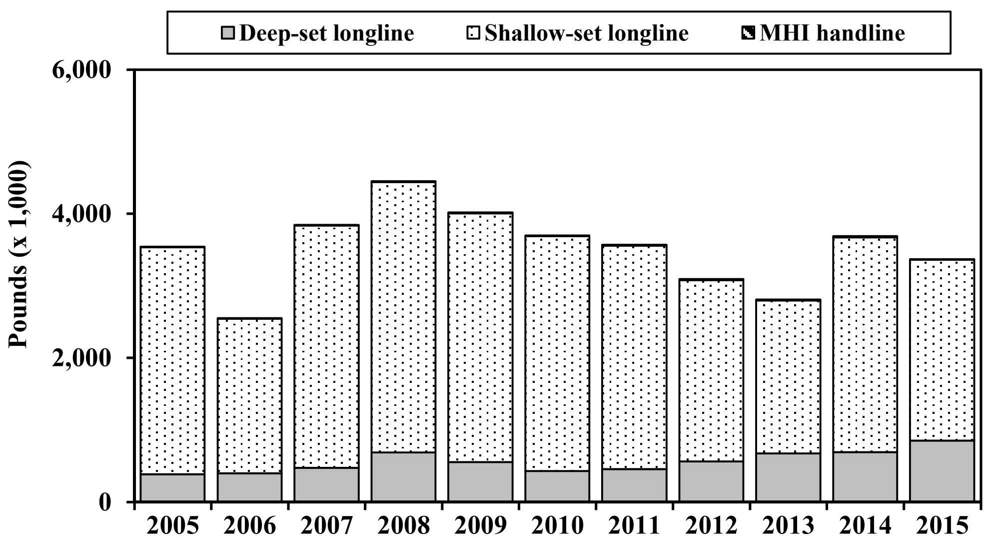
Supporting data shown in Table A-77.

Figure 81. Species composition of the billfish catch, 2005-2015.



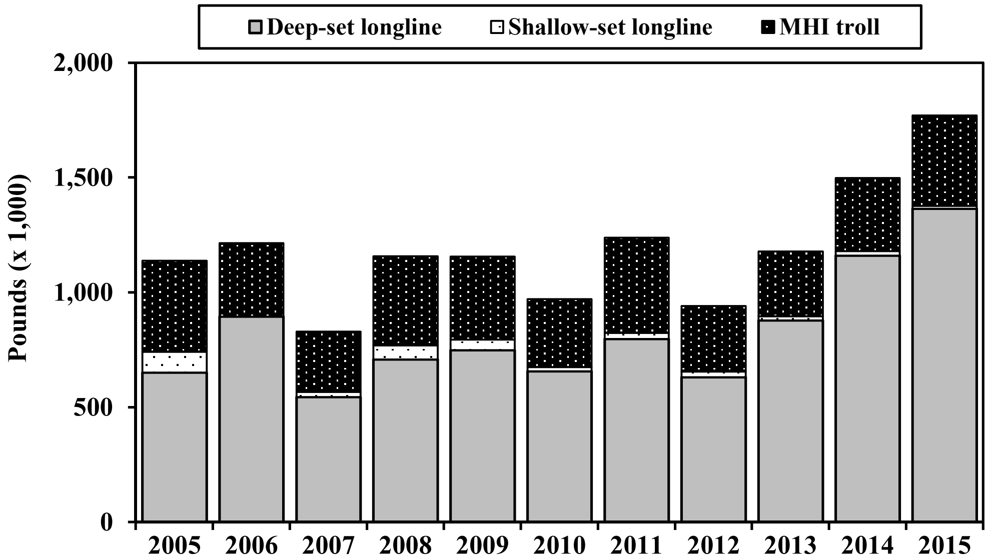
Supporting data shown in Table A-78.

Figure 82. Hawai`i swordfish catch by gear type, 2005-2015.



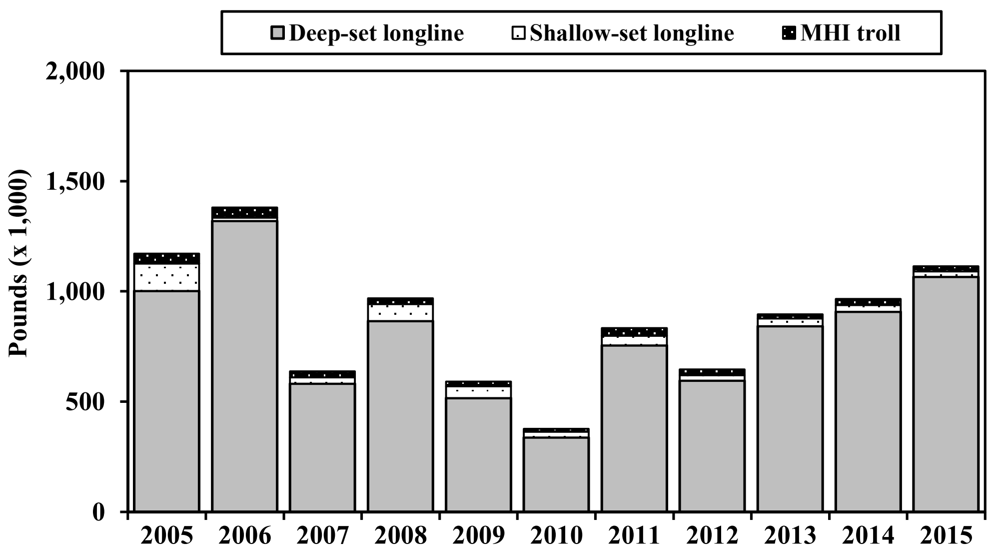
Supporting data shown in Table A-79.

Figure 83. Hawai`i blue marlin catch by gear type, 2005-2015.



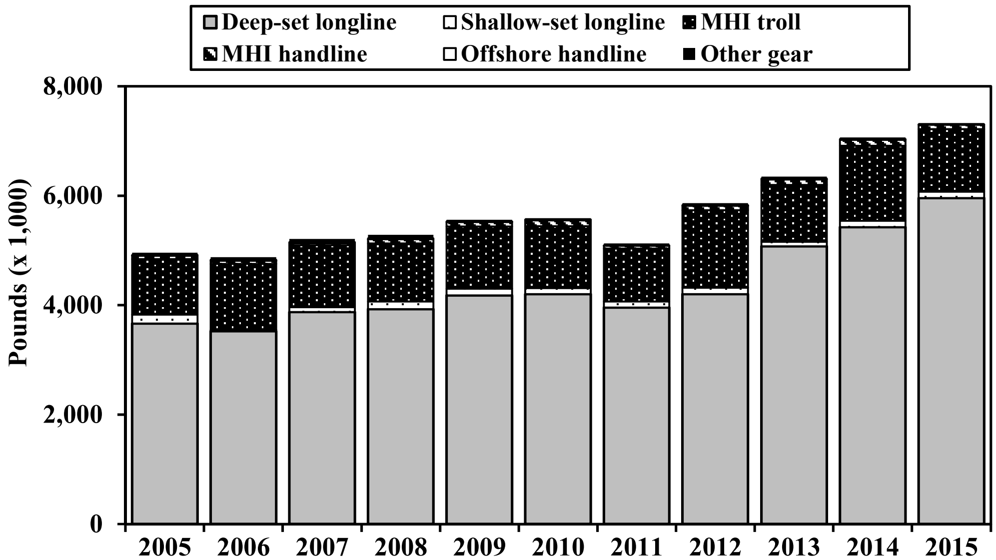
Supporting data shown in Table A-80.

Figure 84. Hawai`i striped marlin catch by gear type, 2005-2015.



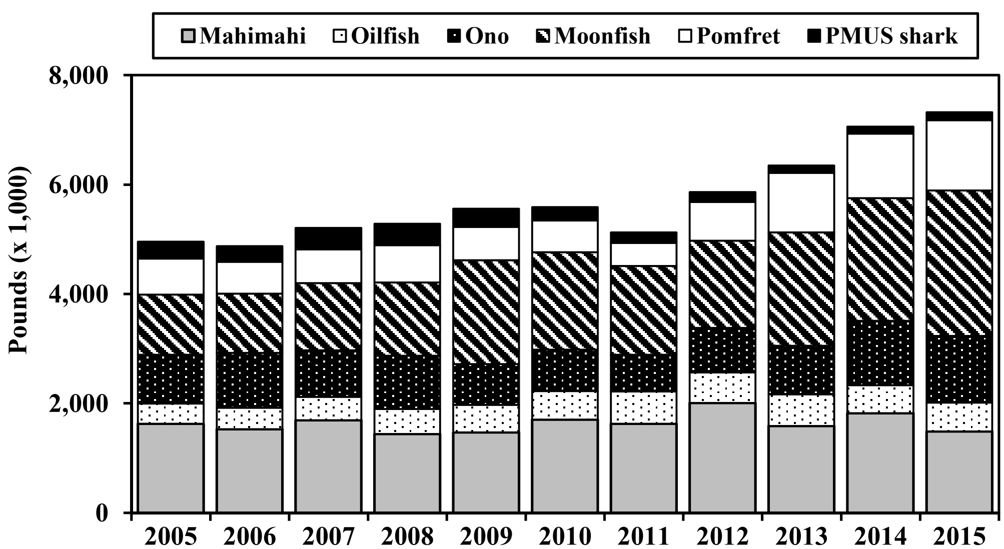
Supporting data shown in Table A-81.

Figure 85. Hawai`i commercial catch of other PMUS by gear type, 2005-2015.



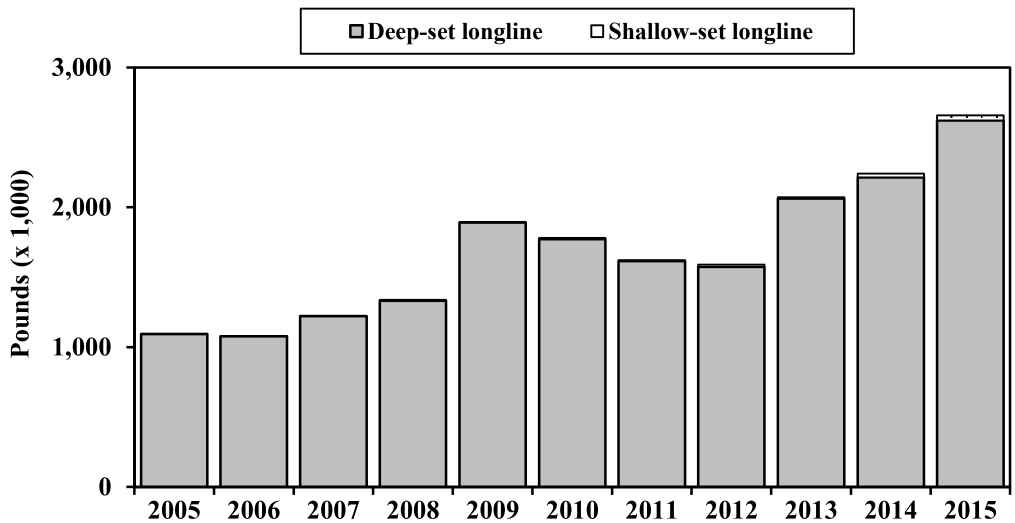
Supporting data shown in Table A-82.

Figure 86. Species composition of other PMUS catch, 2005-2015.



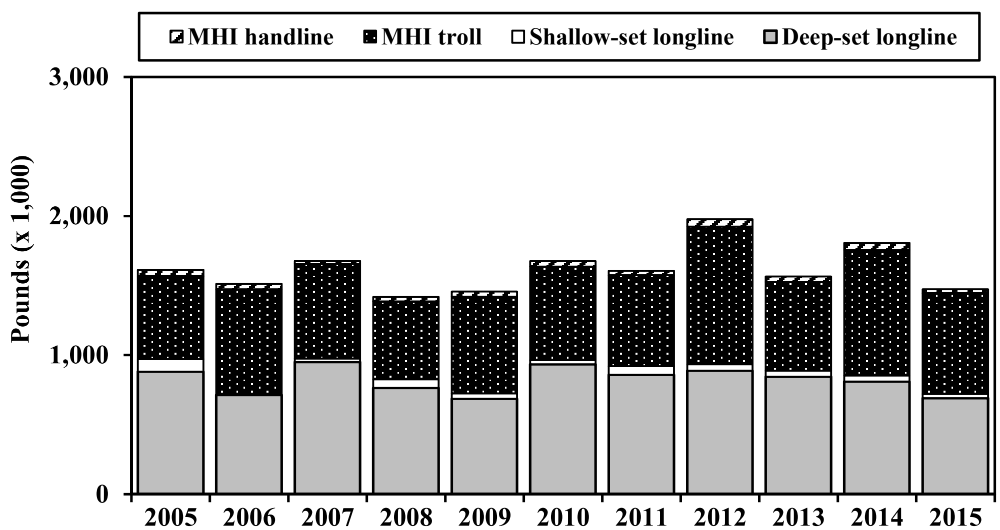
Supporting data shown in Table A-83.

Figure 87. Hawai`i moonfish catch by gear type, 2005-2015.



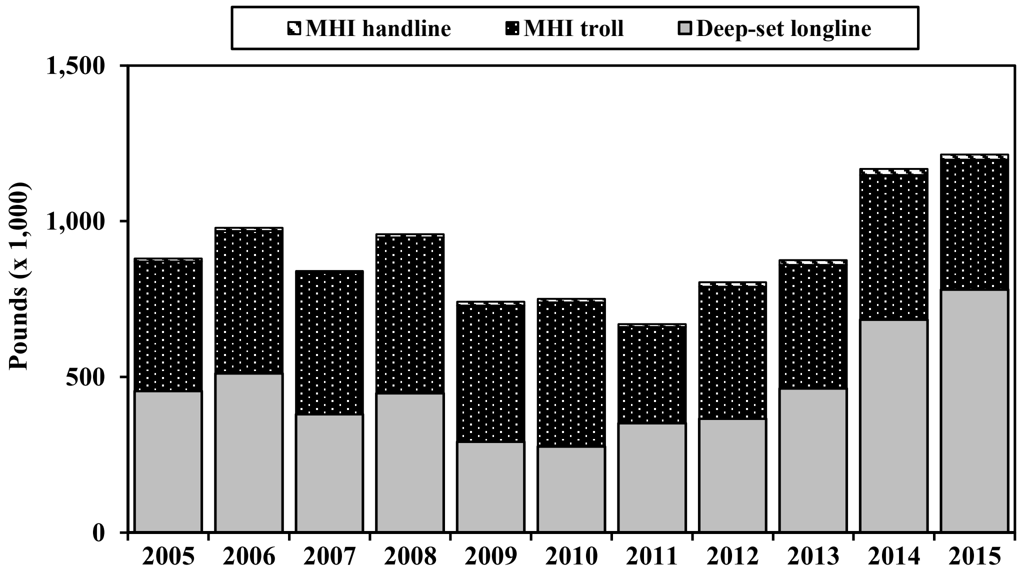
Supporting data shown in Table A-84.

Figure 88. Hawai`i mahimahi catch by gear type, 2005-2015.



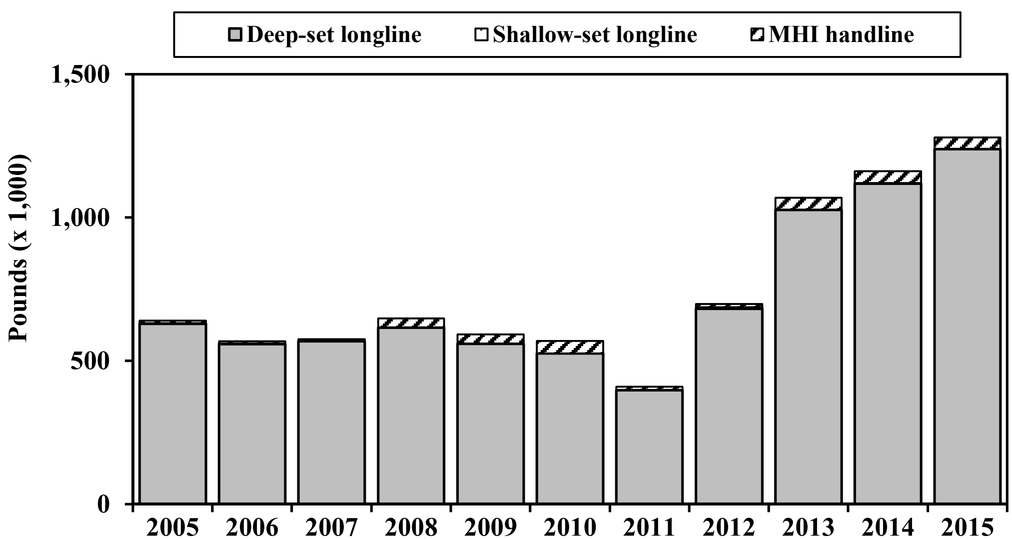
Supporting data shown in Table A-85.

Figure 89. Hawai`i ono (wahoo) catch by gear type, 2005-2015.



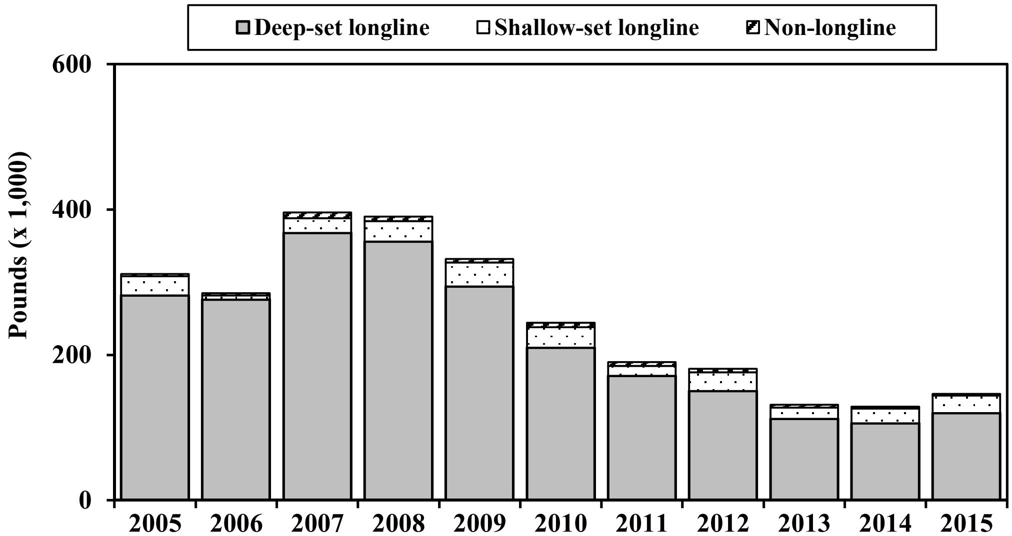
Supporting data shown in Table A-86.

Figure 90. Hawai`i pomfret catch by gear type, 2005-2015.



Supporting data shown in Table A-87.

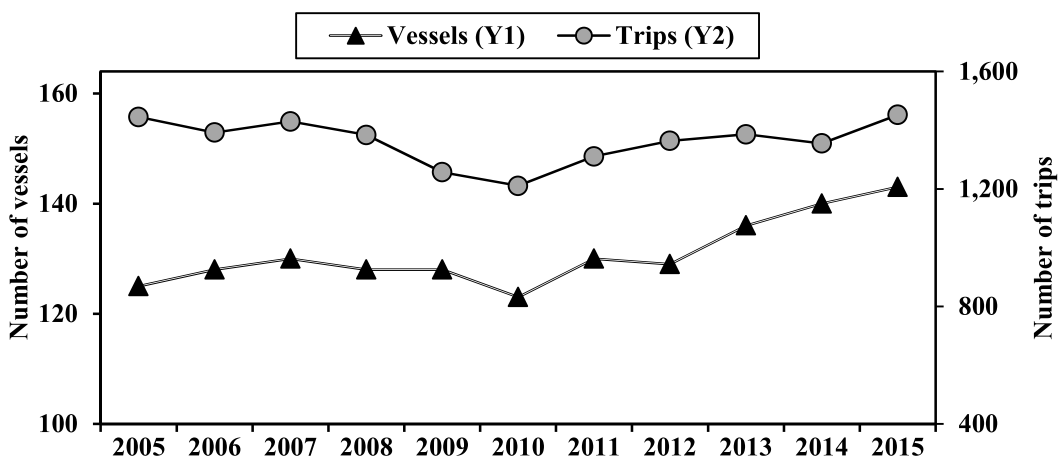
Figure 91. Hawai`i PMUS shark catch by gear type, 2005-2015.



Supporting data shown in Table A-88.

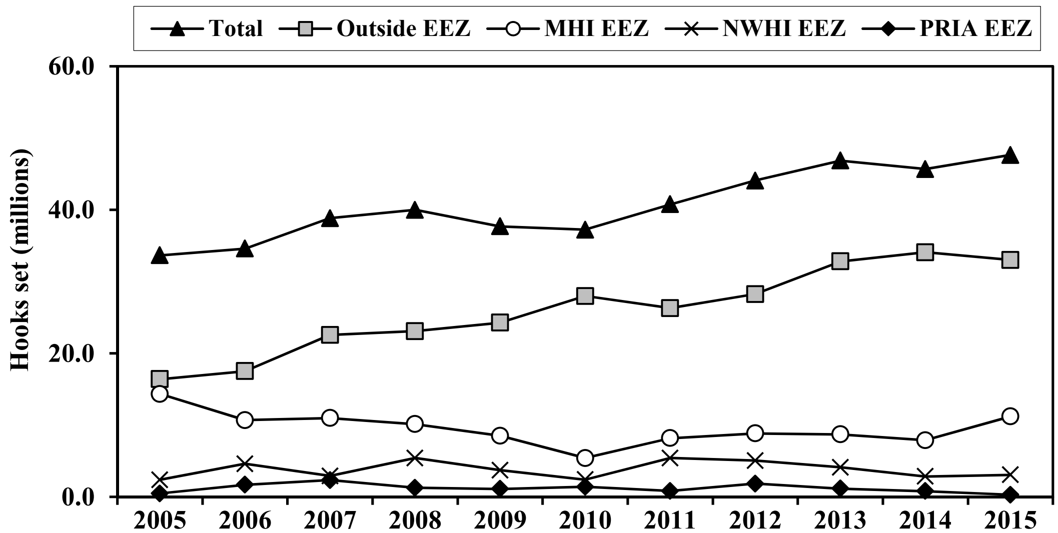
2.4.6 HAWAI`I DEEP-SET LONGLINE FISHERY EFFORT, LANDINGS. REVENUE AND CPUE

Figure 92. Number of Hawai`i-permitted deep-set longline vessels, trips and sets 2005-2015.



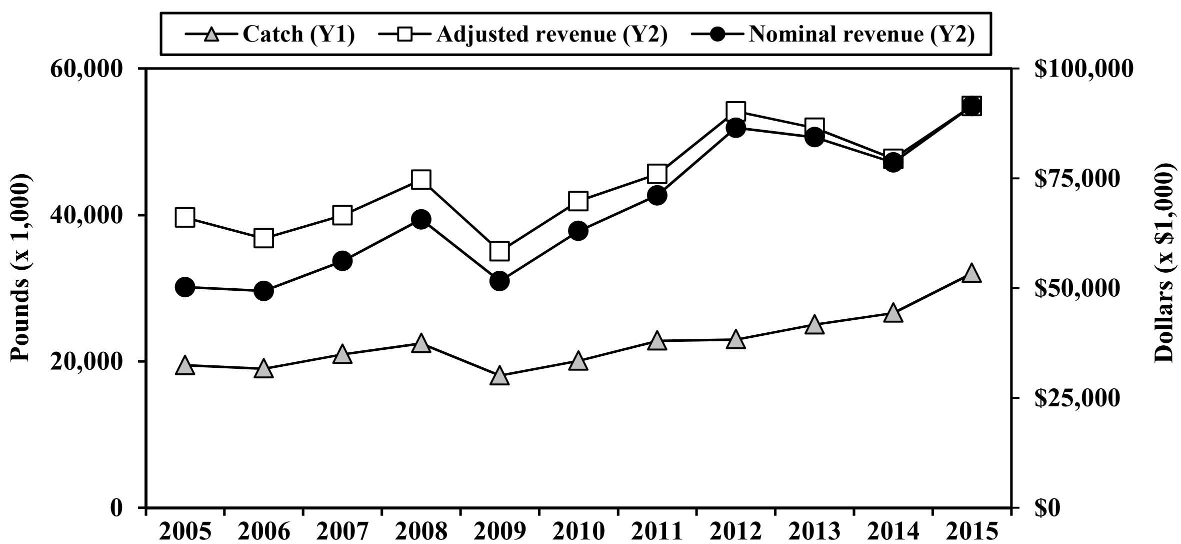
Supporting data shown in Table A-89.

Figure 93. Number of hooks set by the Hawai`i-permitted deep-set longline fishery, 2005-2015.



Supporting data shown in Table A-90.

Figure 94. Catch and revenue for the Hawai`i-permitted deep-set longline fishery, 2005-2015.



Supporting data shown in Table A-91.

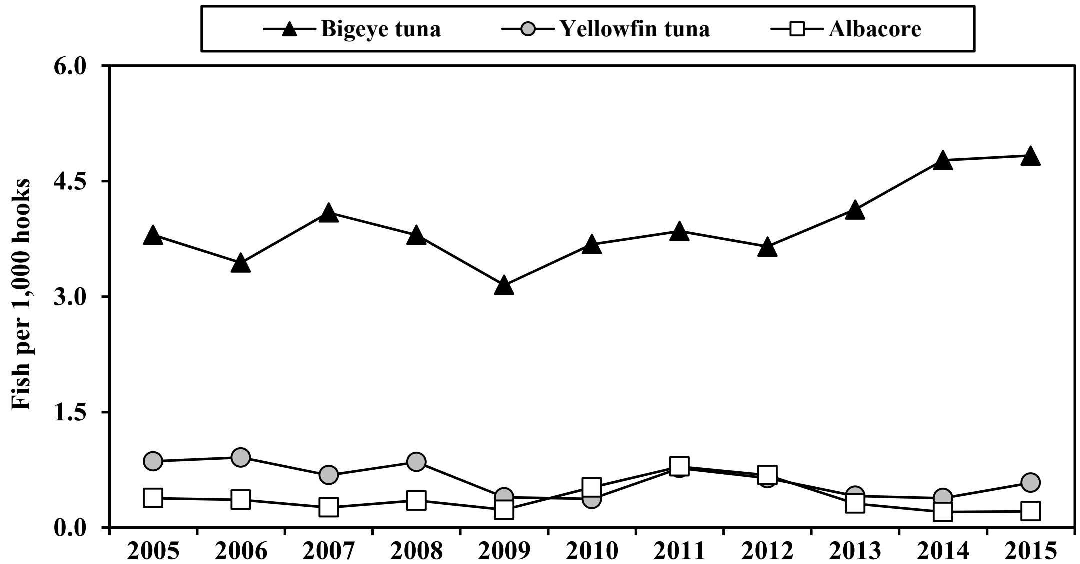
Table 24. Hawai`i-permitted deep-set longline catch (number of fish) by area, 2005-2015.

Year	Tunas			Billfish				Other PMUS				PMUS sharks
	Bigeye tuna	Yellowfin tuna	Albacore	Swordfish	Blue marlin	Striped marlin	Spearfish	Mahimahi	Ono (Wahoo)	Moonfish	Pomfrets	
MHI EEZ												
2005	50,364	12,440	4,054	1,156	1,382	6,233	6,892	37,928	5,015	4,039	18,456	24,439
2006	30,045	6,031	1,445	819	1,453	6,839	3,412	16,113	3,805	3,056	13,862	16,053
2007	41,570	5,547	1,024	764	584	2,185	2,899	20,878	2,642	2,757	9,533	14,795
2008	31,310	11,000	974	540	735	2,876	4,142	13,282	2,140	2,251	9,259	11,536
2009	22,358	2,454	422	529	513	1,624	1,651	9,169	1,144	2,327	5,482	9,645
2010	14,461	2,797	1,057	372	381	580	1,210	6,414	930	1,210	3,375	7,393
2011	24,343	7,209	3,096	486	755	3,388	2,486	13,078	1,100	1,713	7,907	12,078
2012	30,538	6,294	1,845	568	506	2,309	2,215	11,487	1,337	1,654	7,543	11,244
2013	32,485	4,508	1,271	660	791	3,522	3,278	13,070	1,925	1,838	7,846	12,396
2014	29,799	3,142	538	623	748	3,451	2,868	7,379	2,857	1,371	8,304	15,062
2015	46,884	8,413	1,389	963	2,033	4,299	5,485	13,660	5,362	1,902	19,474	18,758
Northwestern Hawaiian EEZ												
2005	8,852	3,243	1,542	157	384	1,785	1,580	4,608	991	1,062	1,921	10,156
2006	23,277	4,874	1,155	354	583	3,956	1,921	4,835	1,654	1,540	3,310	14,199
2007	13,732	2,517	1,167	216	186	1,314	944	3,322	671	1,120	2,363	8,099
2008	21,560	9,898	1,581	405	925	3,924	3,101	7,191	1,970	1,578	4,373	9,813
2009	12,789	1,886	1,852	314	248	1,319	802	1,717	581	1,167	2,739	6,180
2010	8,407	1,586	2,778	271	167	452	539	748	499	1,202	1,613	4,202
2011	19,851	5,675	8,005	387	697	3,837	3,399	8,917	922	1,420	2,814	10,771
2012	18,457	4,322	4,679	377	262	1,746	1,409	4,811	855	1,423	4,585	9,809
2013	16,639	3,192	2,190	262	386	2,120	2,156	3,641	987	1,125	3,201	8,370
2014	13,634	2,057	1,226	243	288	1,569	1,380	1,519	1,233	801	2,616	5,465
2015	14,103	3,429	1,700	361	528	1,646	1,602	1,700	1,026	852	2,486	6,637

Year	Tunas			Billfish				Other PMUS				PMUS sharks
	Bigeye tuna	Yellowfin tuna	Albacore	Swordfish	Blue marlin	Striped marlin	Spearfish	Mahimahi	Ono (Wahoo)	Moonfish	Pomfrets	
Pacific Remote Islands Area EEZ												
2005	1,398	1,667	1,073	60	137	154	147	313	554	46	380	851
2006	6,652	7,093	2,348	137	602	510	498	1,116	1,468	310	901	3,257
2007	14,419	3,226	1,420	243	423	378	521	866	1,661	135	1,585	4,191
2008	5,908	2,129	2,394	119	310	292	578	1,513	1,108	127	931	2,623
2009	3,911	1,910	1,057	135	288	202	383	342	547	159	1,366	3,161
2010	7,393	1,572	770	164	333	128	201	326	623	131	1,842	3,002
2011	3,968	2,509	925	88	182	374	280	561	617	106	978	1,529
2012	6,397	5,040	3,075	191	232	283	604	1,965	1,176	222	2,761	3,054
2013	4,445	942	1,435	112	201	171	482	966	783	116	2,467	1,959
2014	4,121	621	442	110	184	226	242	466	750	47	1,834	1,280
2015	1,406	97	46	25	86	21	59	74	174	2	132	964
Outside EEZ												
2005	67,113	11,479	5,962	1,726	1,960	6,022	5,964	28,559	9,460	8,216	26,426	23,244
2006	59,098	13,329	7,642	1,843	3,046	9,603	6,088	30,319	10,229	8,057	24,912	23,855
2007	89,183	15,223	6,467	2,218	2,046	4,011	5,601	56,412	7,519	10,699	26,030	31,527
2008	93,258	11,094	8,901	2,596	1,904	6,386	7,481	40,881	8,900	11,277	28,433	24,430
2009	79,630	8,292	5,360	2,369	3,044	4,221	5,937	49,477	6,599	18,249	27,315	31,747
2010	106,767	7,923	14,910	2,131	2,515	2,514	6,425	84,974	6,724	17,361	30,905	36,592
2011	108,790	16,114	20,080	2,295	2,793	8,653	9,392	52,687	7,822	14,931	21,748	31,525
2012	105,336	12,454	20,310	2,431	2,296	4,759	7,068	59,774	8,096	14,247	37,030	33,053
2013	140,034	10,592	9,837	3,230	2,563	6,717	8,959	59,124	10,654	20,386	64,971	34,102
2014	170,269	11,406	6,756	3,604	4,475	9,558	11,348	61,366	18,296	23,564	69,312	51,064
2015	167,550	15,745	7,072	4,048	4,868	7,155	10,707	44,946	18,337	26,593	75,363	59,757

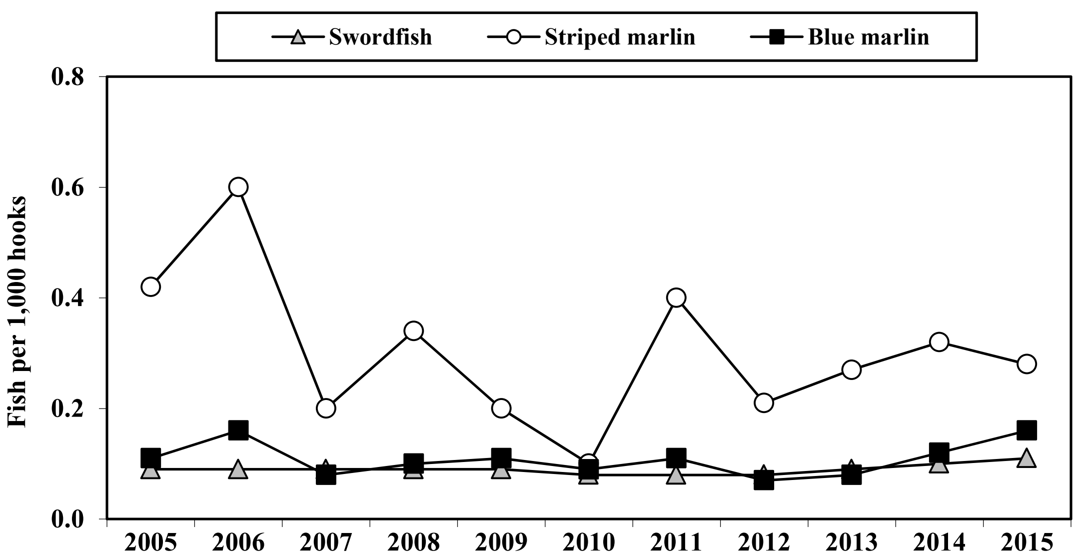
Year	Tunas			Billfish				Other PMUS				PMUS sharks
	Bigeye tuna	Yellowfin tuna	Albacore	Swordfish	Blue marlin	Striped marlin	Spearfish	Mahimahi	Ono (Wahoo)	Moonfish	Pomfrets	
All areas												
2005	127,727	28,829	12,631	3,099	3,863	14,194	14,583	71,408	16,020	13,363	47,183	58,690
2006	119,072	31,327	12,590	3,153	5,684	20,908	11,919	52,383	17,156	12,963	42,985	57,364
2007	158,904	26,513	10,078	3,441	3,239	7,888	9,965	81,478	12,493	14,711	39,511	58,612
2008	152,036	34,121	13,850	3,660	3,874	13,478	15,302	62,867	14,118	15,233	42,996	48,402
2009	118,688	14,542	8,691	3,347	4,093	7,366	8,773	60,705	8,871	21,902	36,902	50,733
2010	137,028	13,878	19,515	2,938	3,396	3,674	8,375	92,462	8,776	19,904	37,735	51,189
2011	156,952	31,507	32,106	3,256	4,427	16,252	15,557	75,243	10,461	18,170	33,447	55,903
2012	160,728	28,110	29,909	3,567	3,296	9,097	11,296	78,037	11,464	17,546	51,919	57,160
2013	193,603	19,234	14,733	4,264	3,941	12,530	14,875	76,801	14,349	23,465	78,485	56,827
2014	217,823	17,226	8,962	4,580	5,695	14,804	15,838	70,730	23,136	25,783	82,066	72,871
2015	229,943	27,684	10,207	5,397	7,515	13,121	17,853	60,380	24,899	29,349	97,455	86,116

Figure 95. Tuna CPUE for the Hawai`i-permitted deep-set longline fishery, 2005-2015.



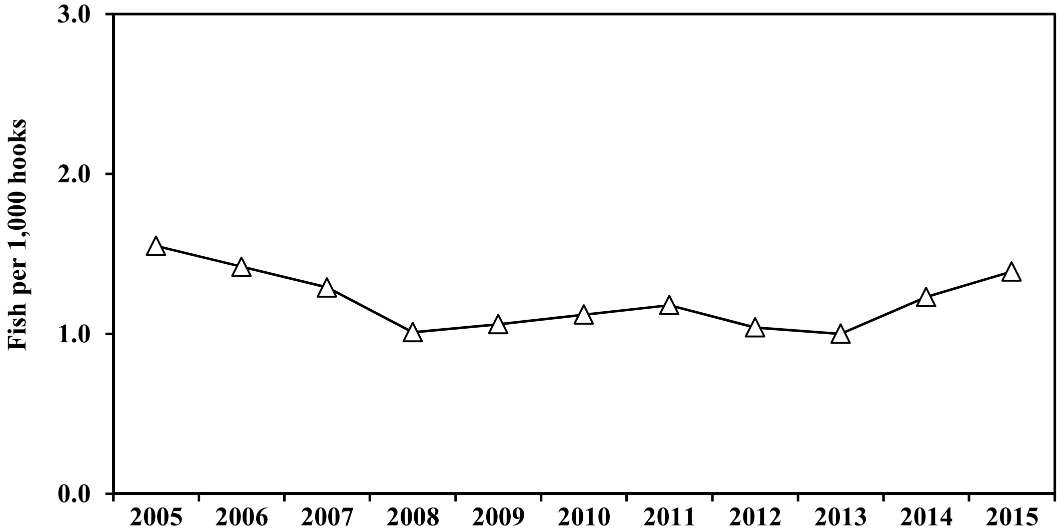
Supporting data shown in Table A-92.

Figure 96. Billfish CPUE for the Hawai`i-permitted deep-set longline fishery, 2005-2015.



Supporting data shown in Table A-93.

Figure 97. Blue shark CPUE for the Hawai`i-permitted deep-set longline fishery, 2005-2015.



Supporting data shown in Table A-94.

Table 25. Released catch, retained catch, and total catch for the Hawai`i-permitted deep-set longline fishery, 2015.

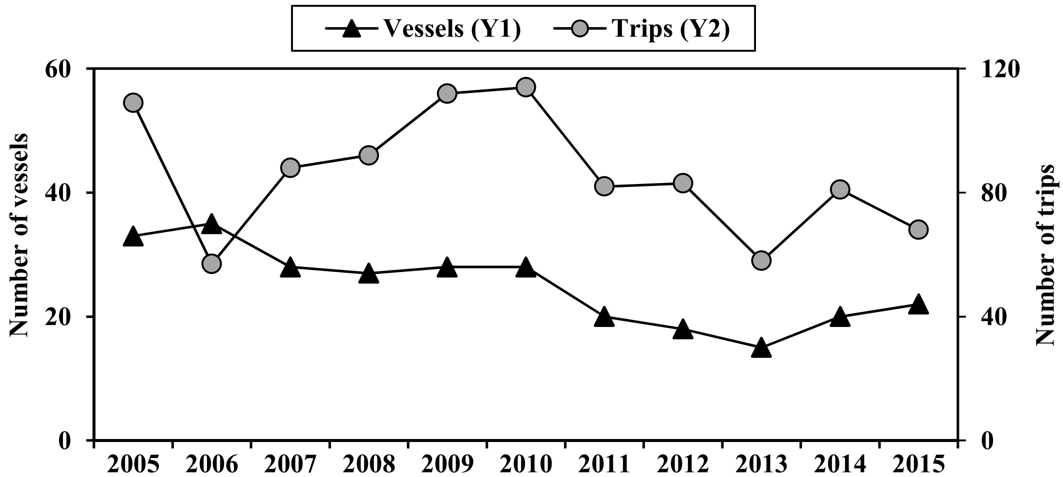
	Deep-set longline fishery			
	Released catch	Percent released	Retained catch	Total Catch
Tuna				
Albacore	25	0.2	10,114	10,139
Bigeye tuna	3,399	1.5	225,851	229,250
Bluefin tuna	0	0.0	2	2
Skipjack tuna	586	2.2	26,312	26,898
Yellowfin tuna	692	2.5	26,903	27,595
Other tuna	0	0.0	3	3
Total tunas	4,702	1.6%	289,185	293,887
Billfish				
Blue marlin	76	1.0	7,438	7,514
Spearfish	204	1.1	17,638	17,842
Striped marlin	123	0.9	12,996	13,119
Other marlin	5	0.8	596	601
Swordfish	298	5.5	5,090	5,388
Total billfish	706	1.6%	43,758	44,464
Other PMUS				
Mahimahi	854	1.4	59,465	60,319
Moonfish	396	1.4	28,666	29,062
Oilfish	2,094	7.0	28,011	30,105
Pomfret	407	0.4	96,937	97,344
Wahoo	74	0.3	24,795	24,869
Total other PMUS	3,825	1.6%	237,874	241,699
Non-PMUS fish	3,864	79.1	1,020	4,884
Total non-shark	13,097	2.2%	571,837	584,934
PMUS Sharks				
Blue shark	66,270	100.0	0	66,270
Mako shark	3,066	85.1	537	3,603
Thresher shark	14,905	99.5	69	14,974
Other PMUS sharks	1,178	99.9	1	1,179
Total PMUS sharks	85,419	99.3%	607	86,026
Non-PMUS sharks	423	50.0	423	846
Grand Total	98,939	14.7%	572,867	671,806

Table 26. Average weight (lbs) of the catch by the Hawai`i-permitted deep-set longline fishery, 2005-2015.

Year	Tunas					Billfish						Other PMUS					Sharks	
	Bigeye tuna	Yellowfin tuna	Albacore	Skipjack tuna	Bluefin Tuna	Swordfish	Striped marlin	Blue marlin	Spearfish	Sailfish	Black marlin	Mahimahi	Ono (Wahoo)	Moonfish	Pomfrets	Oilfish	Mako shark	Thresher shark
2005	88	58	51	16	184	148	72	170	31	43	189	13	29	83	13	16	177	197
2006	84	71	52	17	184	141	64	159	30	48	185	14	30	85	13	17	179	190
2007	82	73	56	16	184	159	74	170	33	47	189	12	31	86	14	15	190	180
2008	87	58	53	18	184	209	65	184	32	59	252	12	32	89	14	15	184	192
2009	86	78	48	18	184	180	71	184	28	45	189	12	33	90	15	15	186	189
2010	88	90	47	18	184	160	92	195	31	55	189	10	32	91	14	15	200	169
2011	81	66	47	18	184	169	47	182	33	58	189	12	34	92	12	15	182	164
2012	81	69	48	16	184	172	66	192	32	56	189	12	32	92	13	16	196	174
2013	75	81	47	16	241	176	69	215	32	61	229	11	33	89	13	17	197	170
2014	72	82	51	17	333	154	58	191	30	56	171	12	30	88	14	17	200	219
2015	84	73	53	18	228	163	82	172	33	59	219	12	31	90	13	17	191	238
Average	82.5	72.6	50.3	17.0	207.0	166.6	69.1	183.1	31.4	53.2	199.2	11.9	31.5	88.6	13.6	16.1	189.3	189.4
SD	5.2	9.9	3.0	1.0	46.5	18.3	11.9	15.4	1.5	6.3	23.8	0.9	1.6	3.0	0.9	0.8	8.4	22.4

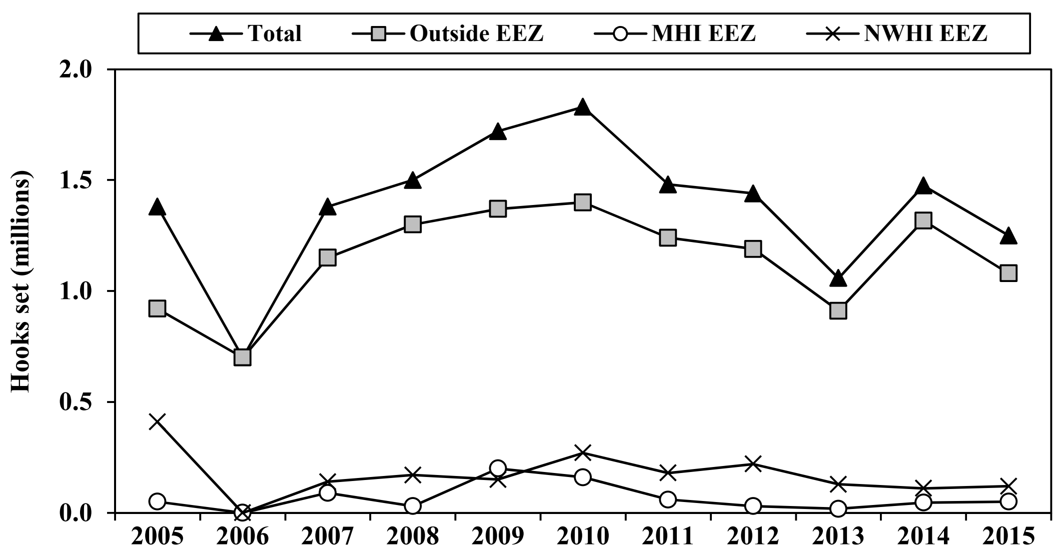
2.4.7 HAWAI`I SHALLOW-SET LONGLINE FISHERY EFFORT, LANDINGS. REVENUE AND CPUE

Figure 98. Number of Hawai`i-permitted shallow-set longline vessels, trips and sets, 2005-2015.



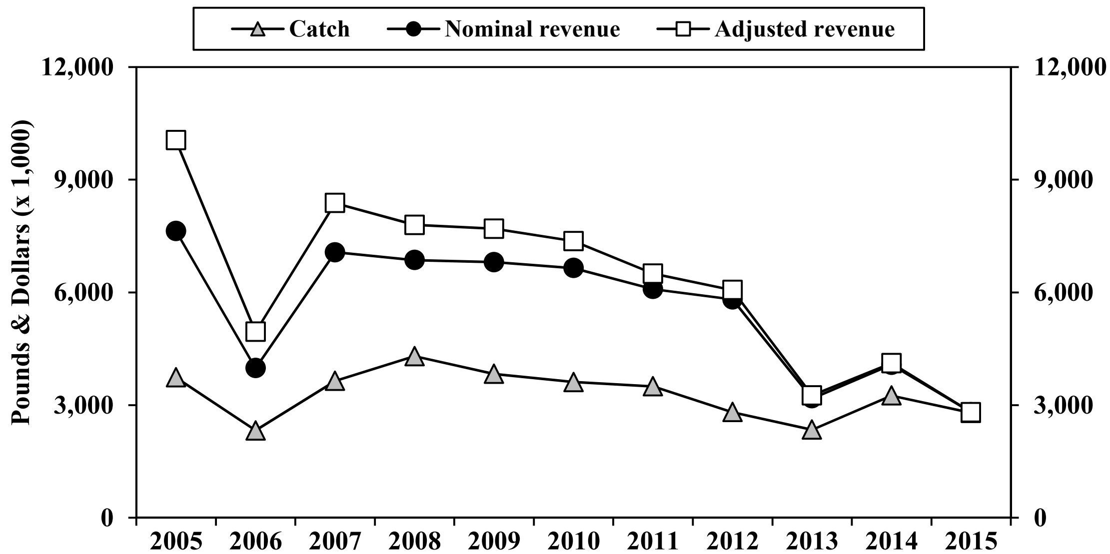
Supporting data shown in Table A-95.

Figure 99. Number of hooks set by the Hawai`i-permitted shallow-set longline fishery, 2005-2015.



Supporting data shown in Table A-96.

Figure 100. Catch and revenue for the Hawai`i-permitted shallow-set longline fishery, 2005-2015.



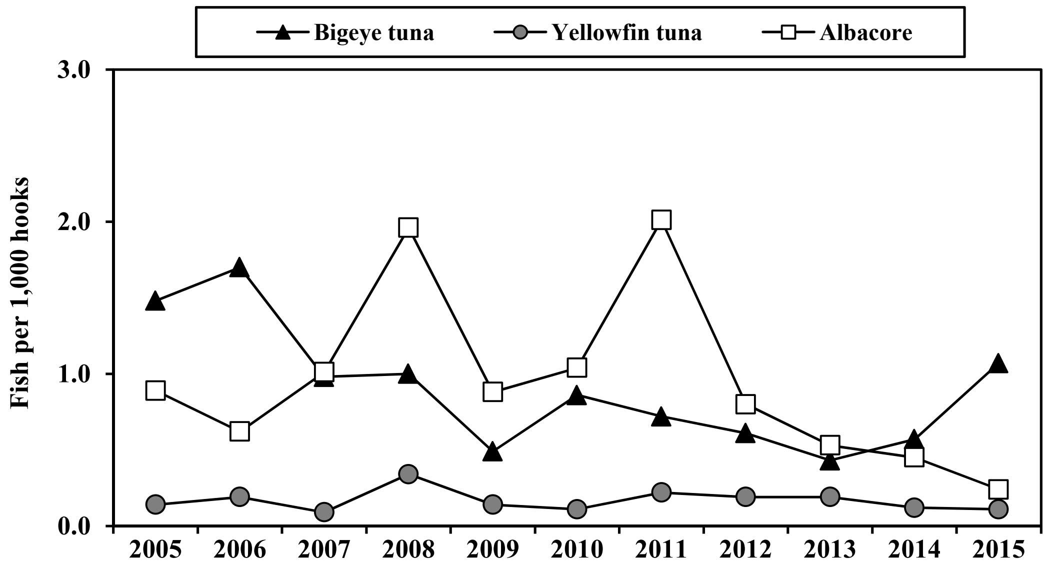
Supporting data shown in Table A-97.

Table 27. Hawai`i-permitted shallow-set longline catch (number of fish) by area, 2005-2015.

Year	Tunas			Billfish				Other PMUS				PMUS sharks
	Bigeye tuna	Yellowfin tuna	Albacore	Swordfish	Blue marlin	Striped marlin	Spearfish	Mahimahi	Ono (Wahoo)	Moonfish	Pomfrets	
MHI EEZ												
2005	52	37	2	776	42	94	19	226	18	0	16	390
2006												
2007	30	21	3	915	5	42	15	146	19	0	3	375
2008	11	21	0	290	22	66	5	63	8	0	2	172
2009	28	24	0	1,882	47	172	25	182	13	24	6	662
2010	25	62	3	925	18	33	12	408	14	0	6	869
2011	26	18	4	369	6	22	21	167	4	3	1	225
2012	3	10	0	196	4	8	2	128	2	0	0	141
2013	0	4	1	88	5	8	1	7	1	0	0	50
2014	3	19	0	348	14	28	25	43	6	0	0	335
2015	3	19	0	497	15	45	23	40	3	0	0	416
Northwestern Hawaiian EEZ												
2005	393	70	27	6,406	301	1,040	124	3,118	75	4	17	3,434
2006												
2007	76	11	1	2,421	24	79	9	293	11	1	11	697
2008	357	244	9	2,651	213	477	74	1,344	44	9	0	668
2009	58	31	2	1,994	56	106	12	219	4	1	8	453
2010	193	40	15	2,566	24	100	20	375	43	4	14	1,288
2011	183	73	14	1,728	79	245	56	1,339	6	1	3	906
2012	63	45	12	2,034	57	155	39	708	21	1	1	773
2013	93	72	4	1,419	38	290	31	1,672	7	0	3	769
2014	24	38	1	1,341	40	109	12	925	13	0	4	945
2015	37	17	1	1,504	8	66	17	764	2	0	3	1,121

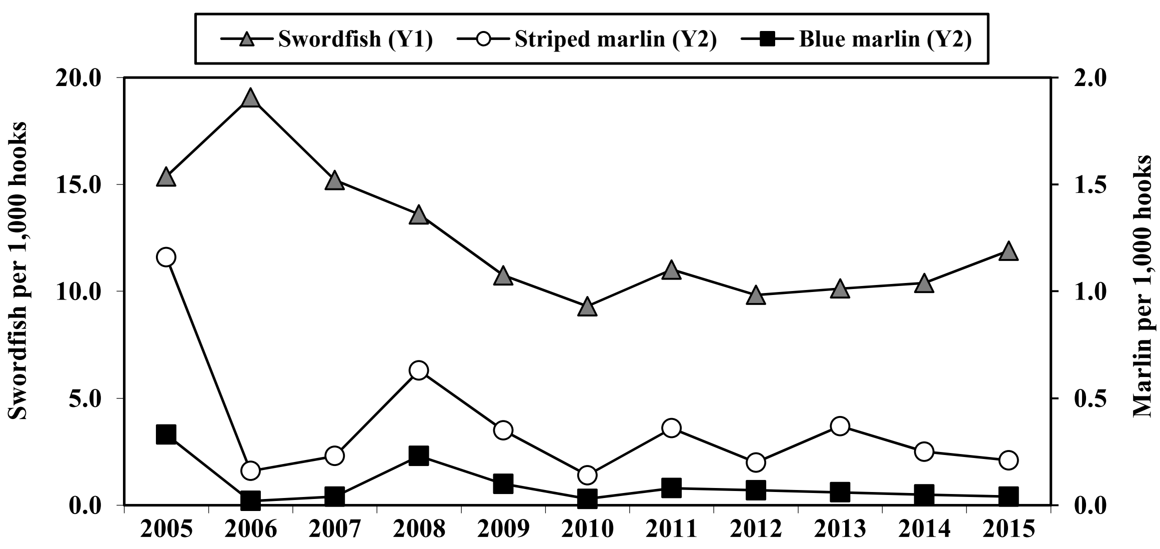
Year	Tunas			Billfish				Other PMUS				PMUS sharks
	Bigeye tuna	Yellowfin tuna	Albacore	Swordfish	Blue marlin	Striped marlin	Spearfish	Mahimahi	Ono (Wahoo)	Moonfish	Pomfrets	
Pacific Remote Islands Area EEZ												
	No fishing has occurred in the PRIA EEZ since 2005											
Outside EEZ												
2005	1,598	80	1,208	14,078	110	466	87	3,230	44	55	99	12,363
2006	1,200	135	434	13,435	13	110	4	465	6	49	149	10,075
2007	1,244	97	1,387	17,507	22	197	47	1,477	57	53	127	15,391
2008	1,122	239	2,921	17,401	116	394	90	3,386	82	96	75	12,863
2009	761	192	1,509	14,632	77	321	40	2,820	21	71	69	8,292
2010	1,367	103	1,902	13,636	22	122	38	1,819	15	213	57	16,800
2011	851	228	2,928	14,083	30	255	104	4,892	24	202	98	7,808
2012	811	227	1,142	12,011	41	122	102	3,623	17	284	352	6,066
2013	359	126	556	9,222	20	92	84	1,995	22	241	129	5,442
2014	810	124	662	13,646	21	231	134	3,321	25	515	228	10,173
2015	1,305	103	305	12,968	26	155	66	1,822	11	645	120	12,478
All areas												
2005	2,043	187	1,237	21,260	453	1,600	230	6,574	137	59	132	16,187
2006	1,200	135	434	13,435	13	110	4	465	6	49	149	10,075
2007	1,350	129	1,391	20,843	51	318	71	1,916	87	54	141	16,463
2008	1,490	504	2,930	20,342	351	937	169	4,793	134	105	77	13,703
2009	847	247	1,511	18,508	180	599	77	3,221	38	96	83	9,407
2010	1,585	205	1,920	17,127	64	255	70	2,602	72	217	77	18,957
2011	1,060	319	2,946	16,180	115	522	181	6,398	34	206	102	8,939
2012	877	282	1,154	14,241	102	285	143	4,459	40	285	353	6,980
2013	452	202	561	10,729	63	390	116	3,674	30	241	132	6,261
2014	837	181	663	15,335	75	368	171	4,289	44	515	232	11,453
2015	1,345	139	306	14,969	49	266	106	2,626	16	645	123	14,015

Figure 101. Tuna CPUE for the Hawai`i-permitted shallow-set longline fishery, 2005-2015.



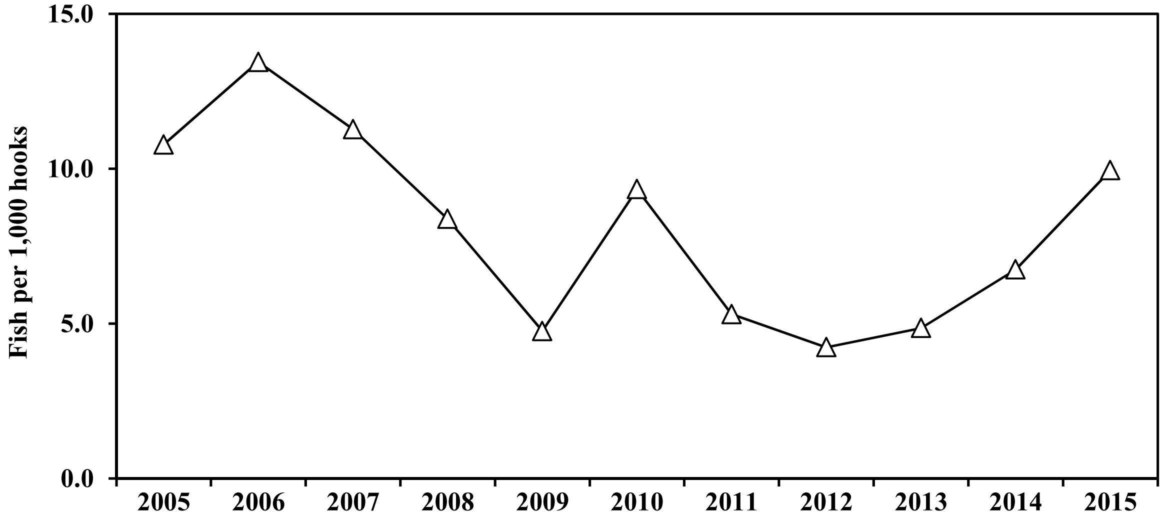
Supporting data shown in Table A-98.

Figure 102. Billfish CPUE for the Hawai`i-permitted shallow-set longline fishery, 2005-2015.



Supporting data shown in Table A-99.

Figure 103. Blue shark CPUE for the Hawai`i-permitted shallow-set longline fishery, 2005-2015.



Supporting data shown in Table A-100.

Table 28. Released catch, retained catch, and total catch for the Hawai`i-permitted shallow-set longline fishery, 2015.

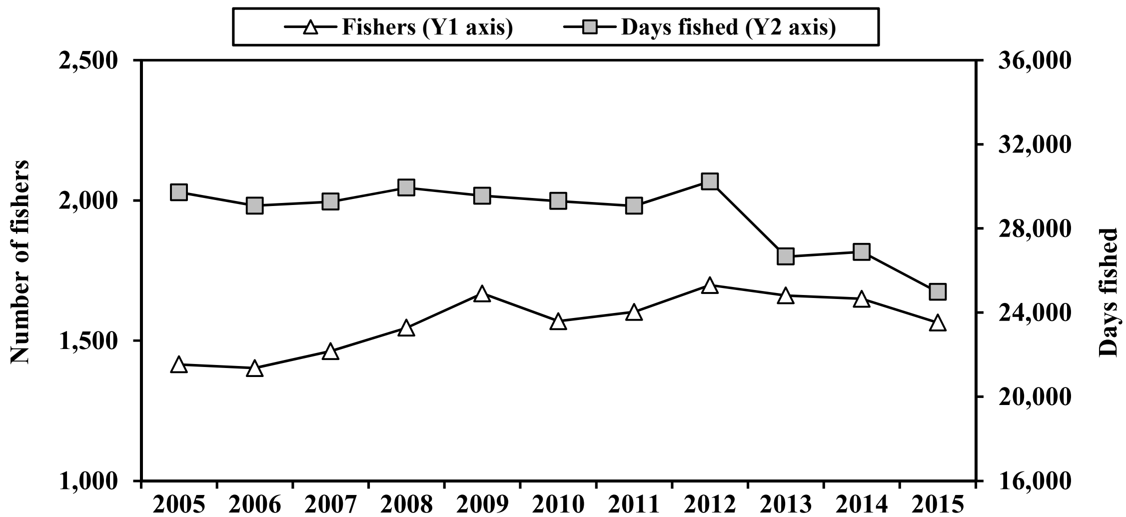
	Shallow-set longline fishery			
	Released catch	Percent released	Retained catch	Total Catch
Tuna				
Albacore	13	4.2	293	306
Bigeye tuna	93	6.9	1,249	1,342
Bluefin tuna	0	0.0	0	0
Skipjack tuna	2	4.4	43	45
Yellowfin tuna	6	4.3	133	139
Other tuna	0	0.0	0	0
Total tunas	114	6.2%	1,718	1,832
Billfish				
Blue marlin	9	18.4	40	49
Spearfish	18	17.0	88	106
Striped marlin	20	7.5	246	266
Other marlin	1	16.7	5	6
Swordfish	1,399	9.5	13,352	14,751
Total billfish	1,447	9.5%	13,731	15,178
Other PMUS				
Mahimahi	77	2.9	2,549	2,626
Moonfish	127	19.9	512	639
Oilfish	368	28.6	920	1,288
Pomfret	38	30.9	85	123
Wahoo	1	6.3	15	16
Total other PMUS	611	13.0%	4,081	4,692
Non-PMUS fish	1	100.0	0	1
Total non-shark	2,173	10.0%	19,530	21,703
PMUS Sharks				
Blue shark	12,187	100.0	0	12,187
Mako shark	1,255	88.7	160	1,415
Thresher shark	48	94.1	3	51
Other PMUS sharks	13	92.9	1	14
Total PMUS sharks	13,503	98.8%	164	13,667
Non-PMUS sharks	55	100.0	0	55
Grand Total	15,731	44.4%	19,694	35,425

Table 29. Average weight (lbs) of the catch by the Hawai`i-permitted shallow-set longline fisheries, 2005-2015.

	Tunas					Billfish						Other PMUS					Sharks	
Year	Bigeye tuna	Yellowfin tuna	Albacore	Skipjack tuna	Bluefin Tuna	Swordfish	Striped marlin	Blue marlin	Spearfish	Sailfish	Black marlin	Mahimahi	Ono (Wahoo)	Moonfish	Pomfrets	Oilfish	Mako shark	Thresher shark
2005	85	126	31	19	164	165	92	226	40	52	-	17	32	59	17	19	163	218
2006	110	77	30	19	164	170	130	204	34	52	-	14	35	54	17	21	124	-
2007	99	107	22	19	-	179	105	428	36	52	-	15	42	77	18	17	173	218
2008	121	117	25	19	164	202	86	185	35	52	189	14	36	77	17	18	207	218
2009	121	113	28	19	164	200	91	264	36	52	-	13	43	79	19	16	177	218
2010	95	116	24	19	164	202	106	299	37	52	-	12	42	74	18	18	155	218
2011	110	127	26	19	-	214	90	242	38	52	-	11	37	53	18	17	196	218
2012	92	109	25	19	164	193	95	259	36	52	-	11	34	74	18	17	180	218
2013	109	112	31	21	-	188	93	280	34	-	-	12	44	68	19	17	169	-
2014	98	129	24	18	228	196	91	270	36	-	196	12	41	72	16	20	221	-
2015	79	126	25	20	-	167	98	299	37	-	158	12	38	73	16	17	143	-
Average	101.7	114.5	26.6	19.4	173.3	188.7	97.8	268.8	36.3	51.6	180.9	12.9	38.4	69.1	17.5	17.8	173.4	218.0
SD	13.7	14.7	3.1	0.7	24.1	16.3	12.4	64.2	1.9	0.0	20.1	1.8	4.1	9.4	1.0	1.6	28.0	0.0

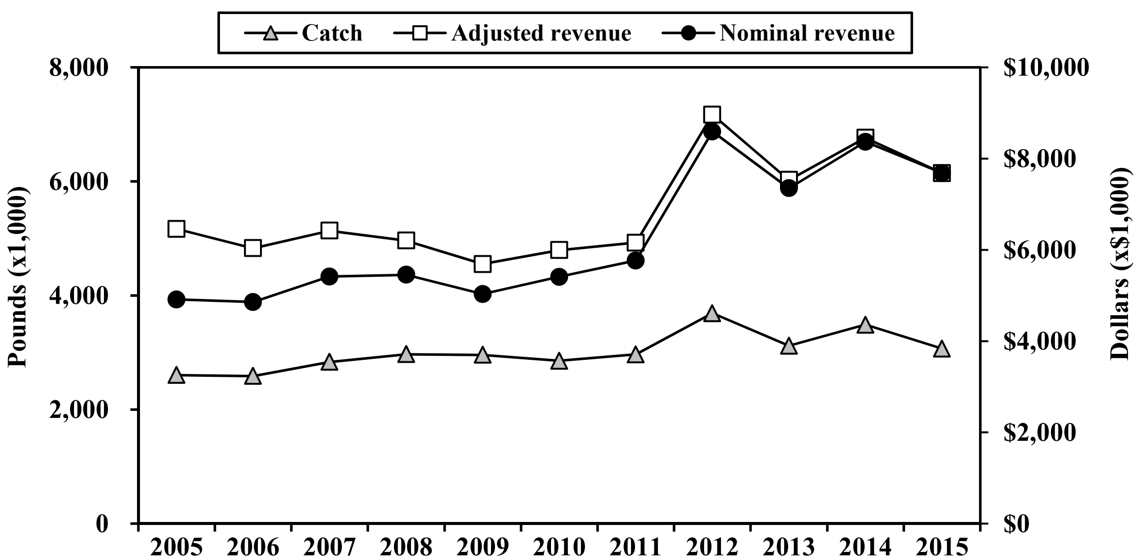
2.4.8 MHI TROLL FISHERY EFFORT, LANDINGS, REVENUE AND CPUE

Figure 104. Number of MHI troll fishers and days fished, 2005-2015.



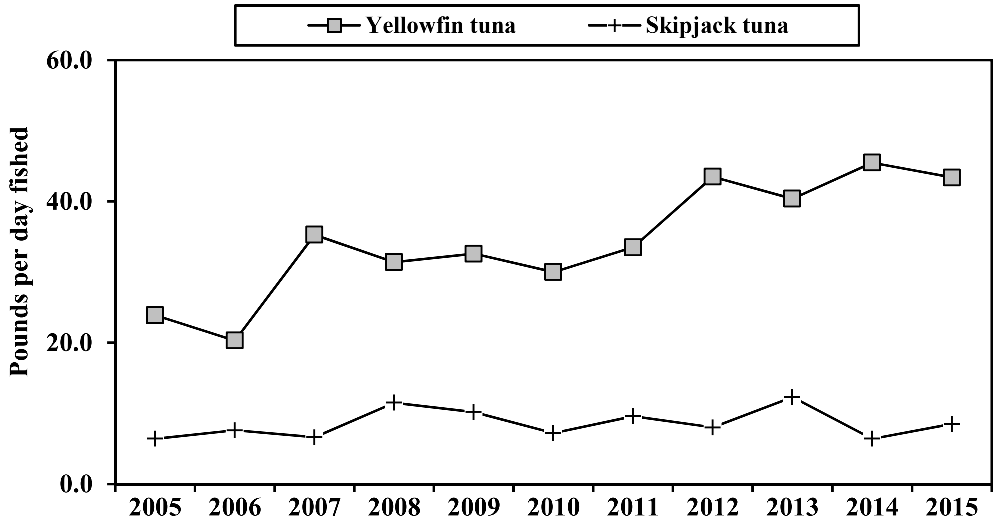
Supporting data shown in Table A-101.

Figure 105. Catch and revenue for the MHI troll fishery, 2005-2015.



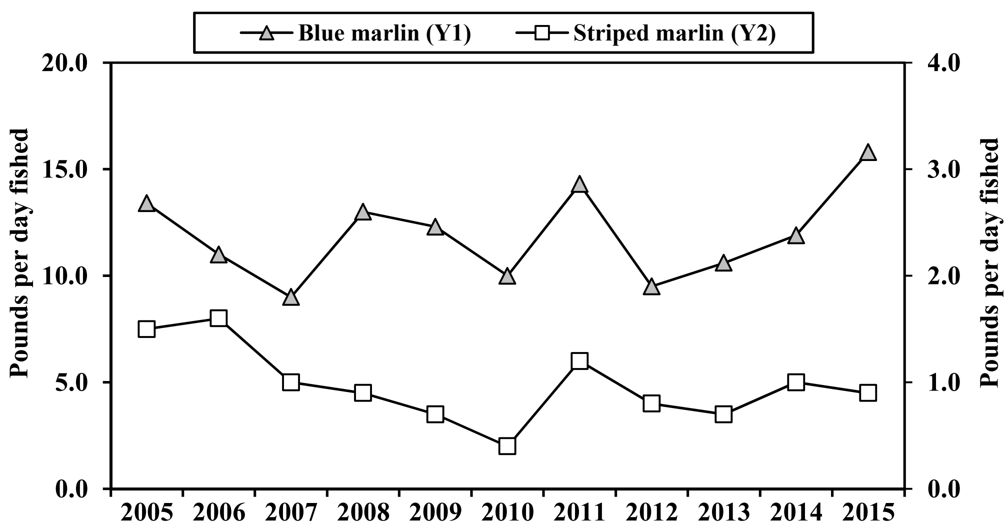
Supporting data shown in Table A-102.

Figure 106. Tuna CPUE for the MHI troll fishery, 2005-2015.



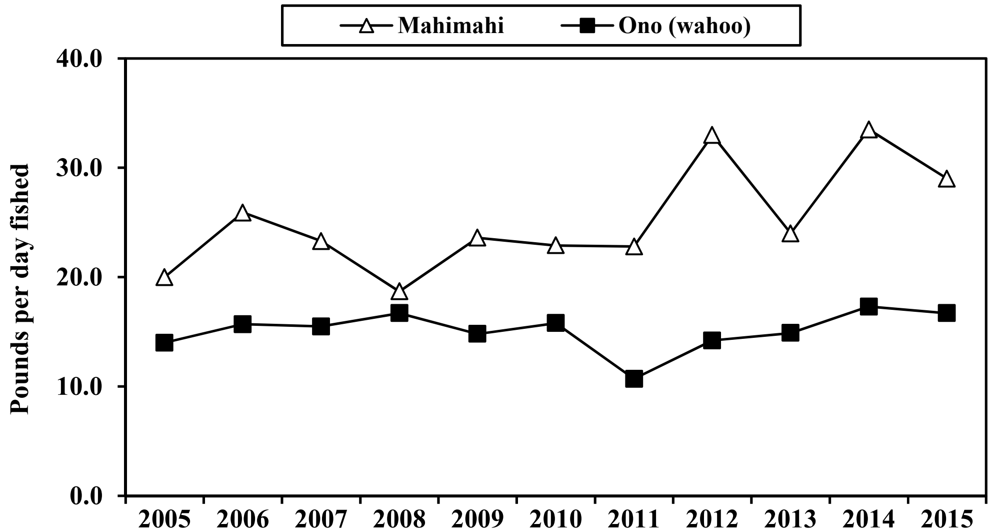
Supporting data shown in Table A-103.

Figure 107. Marlin CPUE for the MHI troll fishery, 2005-2015.



Supporting data shown in Table A-104.

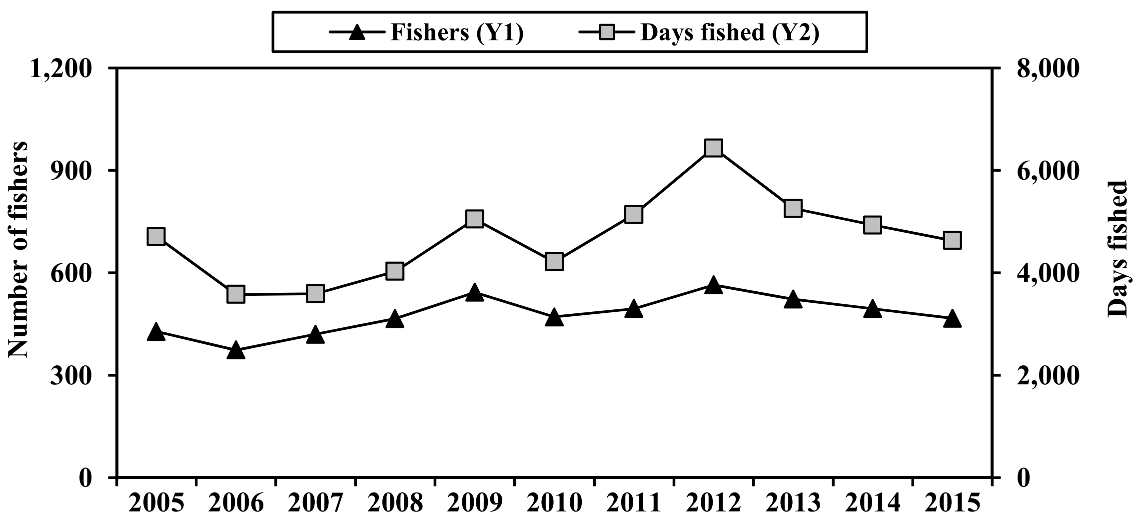
Figure 108. Mahimahi and Ono CPUE for the MHI troll fishery, 2005-2015.



Supporting data shown in Table A-105.

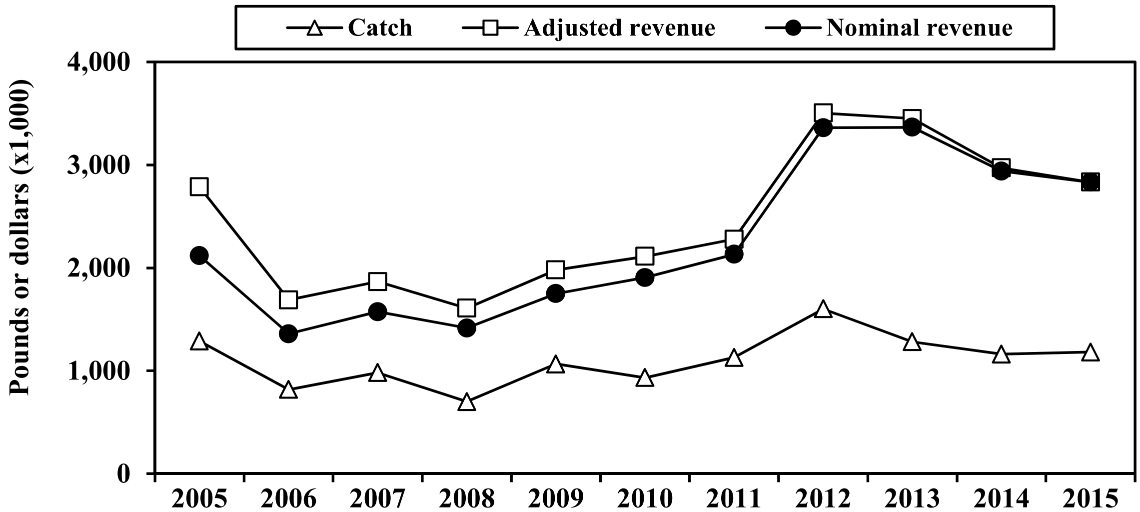
2.4.9 MHI HANDLINE FISHERY EFFORT, LANDINGS, REVENUE AND CPUE

Figure 109. Number of MHI handline fishers and days fished, 2005-2015.



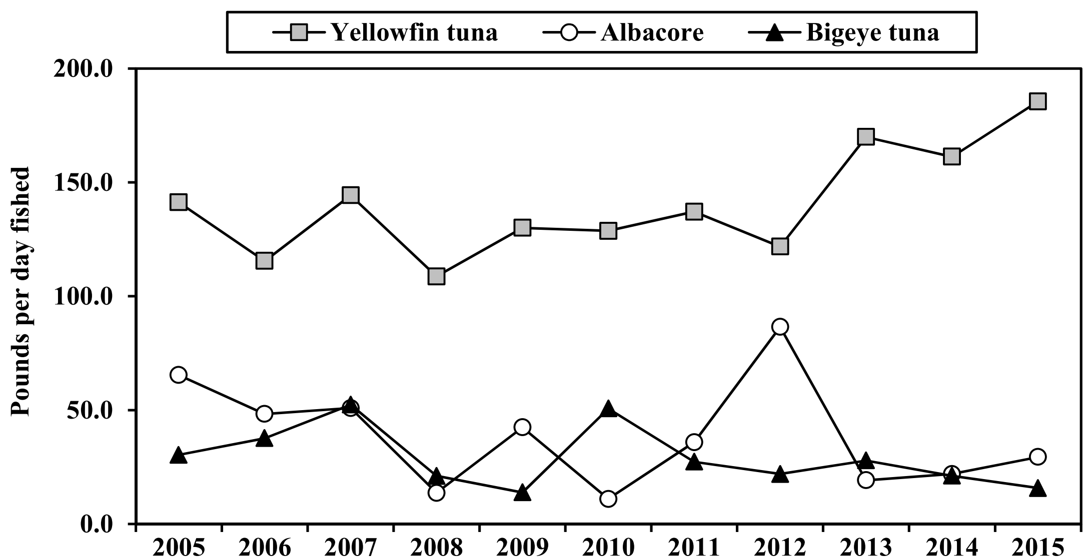
Supporting data shown in Table A-106.

Figure 110. Catch and revenue for the MHI handline fishery, 2005-2015.



Supporting data shown in Table A-107.

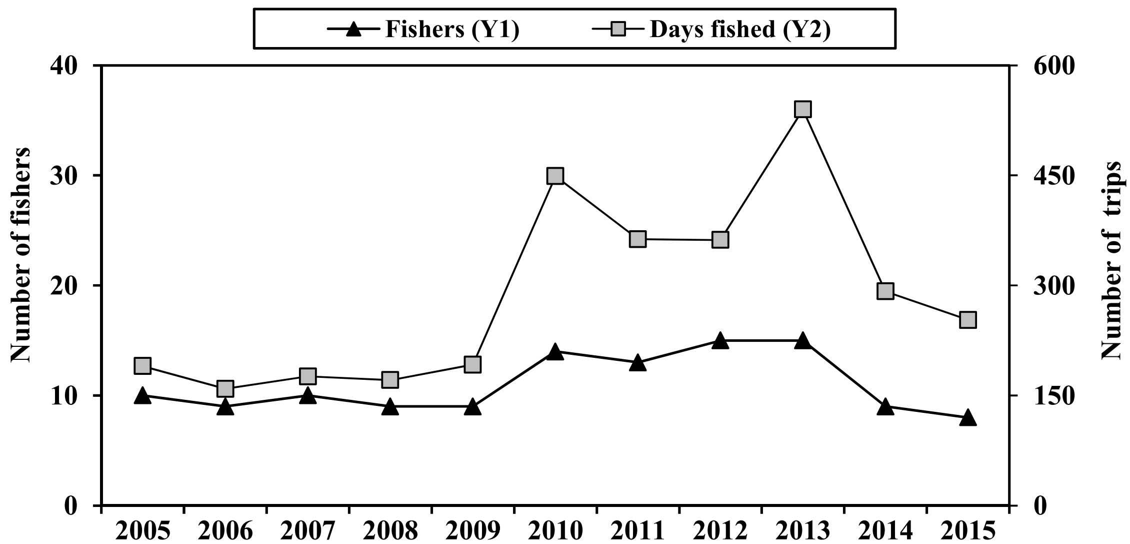
Figure 111. Tuna CPUE for the MHI handline fishery, 2005-2015.



Supporting data shown in Table A-108.

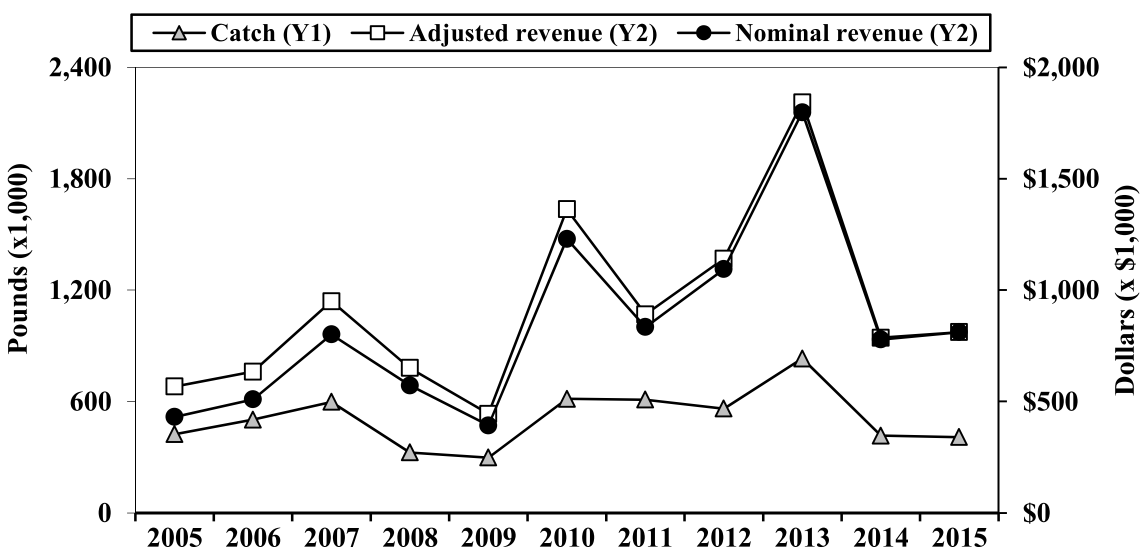
2.4.10 OFFSHORE HANDLINE FISHERY EFFORT, LANDINGS, REVENUE AND CPUE

Figure 112. Number of offshore handline fishers and days fished, 2005-2015.



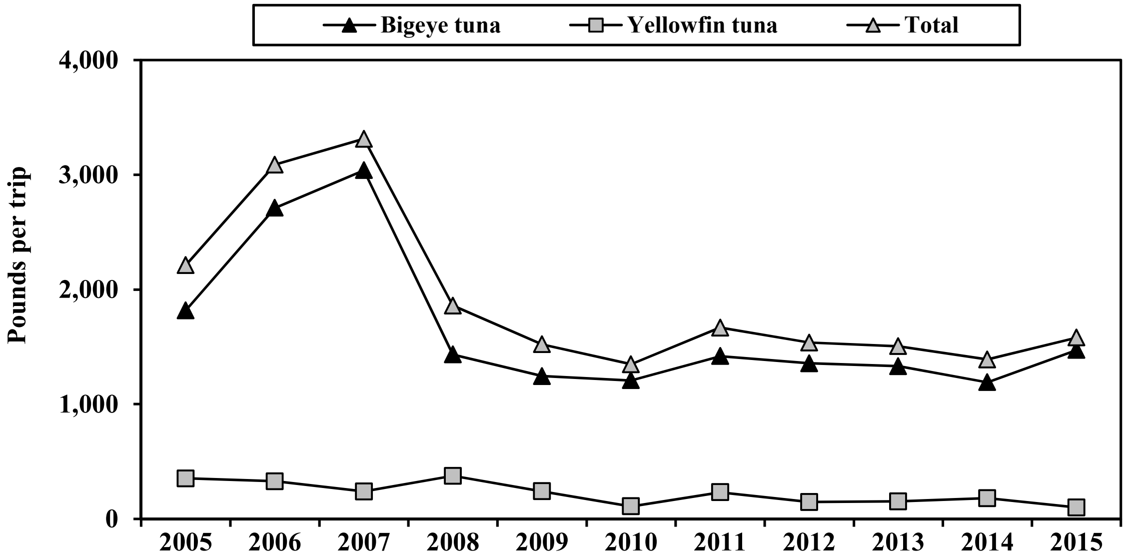
Supporting data shown in Table A-109.

Figure 113. Catch and revenue for the offshore tuna handline fishery, 2005-2015.



Supporting data shown in Table A-110.

Figure 114. Tuna CPUE for the offshore tuna handline fishery, 2005-2015.



Supporting data shown in Table A-111.

Table 30. Average weight (lbs) of the catch by the Hawai`i troll and handline fisheries, 2005-2015.

Year	Tunas				Billfish			Other PMUS	
	Albacore	Bigeye tuna	Skipjack tuna	Yellowfin tuna	Blue marlin	Striped marlin	Swordfish	Mahimahi	Ono (wahoo)
2005	48	29	5	23	183	74	102	15	23
2006	47	27	8	29	209	69	128	16	23
2007	49	31	4	35	267	89	133	16	24
2008	51	35	6	26	205	67	158	15	26
2009	46	30	7	30	231	84	184	14	24
2010	49	32	5	30	257	107	123	14	26
2011	45	27	8	32	222	50	132	13	27
2012	49	22	5	32	270	56	126	12	25
2013	46	24	9	36	266	63	157	12	24
2014	45	25	7	36	253	52	122	12	22
2015	45	22	8	35	176	76	96	13	22
Average	47.2	27.6	6.5	31.3	230.7	71.5	132.8	13.9	24.1
SD	2.1	4.2	1.6	4.3	34.2	17.1	25.4	1.4	1.6

2.5 RECREATIONAL

2.5.1 INTRODUCTION

Fishing, either for subsistence or recreation continues to be an important activity throughout the Western Pacific Region in the four major populated island areas of the Western Pacific Region, Hawai`i, American Samoa, Guam and CNMI. Fish consumption in Micronesia and Polynesia typically averages about 130 lb/per capita/yr (Dalzell et al 1996) and even in more culturally diverse Hawai`i, fish consumption is almost three times the U.S. national average at about 42 lb/ per capita/yr (Dalzell & Paty 1996).

2.5.2 RECREATIONAL FISHERIES IN THE WESTERN PACIFIC REGION

In Hawai`i, recreational shoreline fishing was more popular than boat fishing up to and after WWII. Boat fishing during this period referred primarily to fishing from traditional canoes (Glazier 1999). All fishing was greatly constrained during WWII through time and area restrictions, which effectively stopped commercial fishing and confined recreational fishing to inshore areas (Brock 1947). Following WWII, the advent of better fishing equipment and new small boat hulls and marine inboard and outboard engines led to a growth in small vessel-based recreational fishing.

A major period of expansion of small vessel recreational fishing occurred between the late 1950s and early 1970s, through the introduction of fiberglass technology to Hawai`i and the further refinement of marine inboard and outboard engines (Figure 115). By the early 1960s there were an estimated 5,300 small boats in the territory being used for recreational fishing. By the 1980s the number of recreational or pleasure craft had risen to almost 13,000 vessels and to about 15,000 vessels in the 1990s. There are presently about 30 fishing clubs in Hawai`i, and a variety of different recreational fishing tournaments organized both by clubs and independent tournament organizers. Hawai`i also hosts between 150 and 200 boat-based fishing tournaments, about 30 of which are considered major international competitions, with over 20 boats and entry fees of $100. This level of interest in recreational fishing is sufficient to support a local fishing magazine, Hawai`i Fishing News, which besides articles of interest to recreational fishermen, includes a monthly roundup of the fishing activity and conditions at the major small boat harbors in the State.

Figure 115. Annual number of small vessel fleet registrations in Hawai`i, 1966-2015.

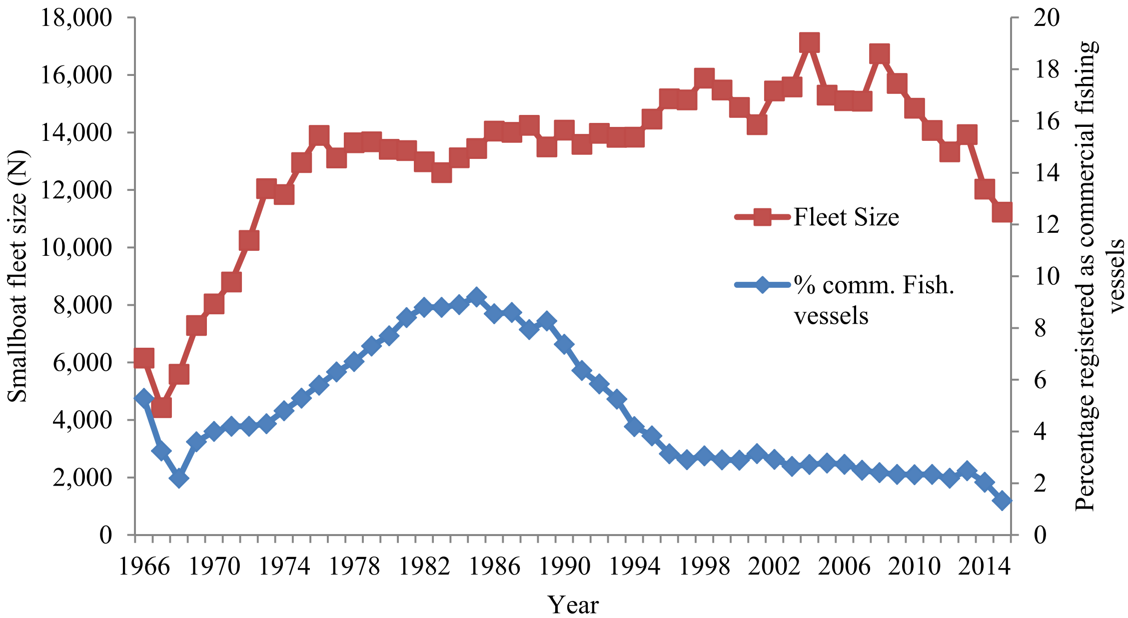


Figure shows total fleet size and percentage of vessels being registered for commercial fishing (Source: Hawai`i Division of Boating and Ocean Resources)

Elsewhere in the region, recreational fishing is less structured. In Guam fishing clubs have been founded along ethnic lines by Japanese and Korean residents. These clubs had memberships of 10-15 people, along with their families. Four such clubs were founded in Guam during the past 20 years, but none lasted for more than a 2-3 years (Gerry Davis, NMFS PIRO pers. comm.). There was also a Guam Boating Association comprising mostly fishermen, with several hundred members. This organization functioned as a fishing club for about 10 years and then disbanded. Some school groups and the boy scouts have formed fishing clubs focused on rod and reel fishing, and there is still one spear-fishing club that has only a handful of members, but appears to be still being active. There are also some limited fishing tournaments on Guam, including a fishing derby for children organized by the local Aquatic and Wildlife Resources Division. There are few fishing clubs in the in the Northern Mariana Islands. The Saipan Sports-fishing Association (SSA) has been in existence for at least 16 years, and is the sponsor of the annual Saipan International Fishing Tournament, which is usually held in August or September.

A recent innovation in the Mariana Island is the publication of a free quarterly magazine, Mariana Fishing Magazine, which covers recreational fishing in both Guam and the CNMI.

Levine and Allen (2009) provide an overview of fisheries in American Samoa, including subsistence and recreational fisheries. Citing a survey conducted in American Samoa by Kilarski *et al.* (2006), Levine and Allen noted that approximately half of the respondents stated that they fished for recreation, with 71 percent of these individuals fishing once a week or less. Fishermen also fished infrequently for cultural purposes, although cultural, subsistence, and recreational fishing categories were difficult to distinguish as one fishing outing could be motivated by all three reasons.

Boat-based recreational fishing in American Samoa has been influenced primarily by the fortunes of fishing clubs and fishing tournaments. Tournament fishing for pelagic species began in American Samoa in the 1970s, and between 1974 and 1998, a total of 64 fishing tournaments were held in American Samoa (Tulafono 2001). Most of the boats that participated were alia catamarans and small skiffs. Catches from tournaments were often sold, as most of the entrants are local small-scale commercial fishermen. In 1996, three days of tournament fishing contributed about one percent of the total domestic landings. Typically, 7 to 14 local boats carrying a total of 55 to 70 fishermen participated in each tournament, which were held two to five times per year (Craig et al. 1993).

The majority of tournament participants operated 28-foot alia, the same vessels that engage in the small-scale longline fishery. With more emphasis on commercial longline fishing since 1996, interest in the tournaments waned (Tulafono 2001) and pelagic fishing effort shifted markedly from trolling to longlining. Catch-and-release recreational fishing is virtually unknown in American Samoa. Landing fish to meet cultural obligations is so important that releasing fish would generally be considered a failure to meet these obligations (Tulafono 2001). Nevertheless, some pelagic fishermen who fish for subsistence release fish that are surplus to their subsistence needs.

More recently, recreational fishing has undergone a renaissance in American Samoa through the establishment of the PPGFA, which was founded by a group of recreational anglers in 2003[4]. The motivation to form the PPGFA was the desire to host regular fishing competitions. There are about 15 recreational fishing vessels ranging from 10 ft single engine dinghies to 35 ft twin diesel engine cabin cruisers. The PPGFA has annually hosted international tournaments in each of the past five years with fishermen from neighboring Samoa and Cook Islands attending. The recreational vessels use anchored FADs extensively, and on tournaments venture to the various outer banks which include the South Bank (35 miles), North East Bank (40 miles NE), South East bank (37 miles SE), Two Percent Bank (40 miles), and East Bank (24 miles East). The PPGFA plays host to the Steinlager I'a Lapo'a Game Fishing Tournament, which is a qualifying event for the International Game Fish Association’s Offshore World Championship.

There was no full-time regular charter fishery in American Samoa similar to those in Hawai`i or Guam. Pago Pago Marine Charters does offer fishing charters among other services it offers.

There is also some recreational fishing activity at some of the PRIAs, namely at Midway, Wake and Palmyra Islands. There are no resident populations at Howland & Baker, Johnston and Jarvis Islands and fishing activity at these locations is likely minimal. There was a tourist facility at Midway until 2002, which operated a charter boat fishery targeting primarily pelagic fish at Midway Atoll. The company operated five vessels for charter fishing at

4 http://ppgfa.com/page/about-ppgfa

Midway: three 22-26 ft catamarans for lagoon and nearshore fishing operations and two 38 ft sportfishing vessels used for blue water trolling. In addition, there were approximately seven small vessels maintained and used by Midway residents for recreational fishing. Of this total, three vessels engaged primarily in offshore trolling for PMUS including yellowfin tuna, whaoo and marlin. All vessels fishing at Midway were required to file a float plan prior to a fishing trip and complete the "Midway Sports Fishing Boat Trip Log" upon completion of each trip. The U.S. Fish and Wildlife Service was responsible for compiling these catch data.

At Palmyra Atoll, an island privately owned by The Nature Conservancy, a 22 ft catamaran is used for offshore trolling and four small boats operated within the lagoon used for bonefish angling. There are several craft used for recreational fishing at the military base on Wake Island including two landing craft and two small vessels.

2.5.3 RECREATIONAL CATCHES

Estimates of recreational pelagic fish catch for the Western Pacific in 2015 are given in Table 31. Data for Guam, Northern Mariana Islands and American Samoa are based on the proportion of troll catches landed for sale and catches retained and not sold, in all landings sampled by creel surveys in each area. The ratio of unsold to sold catch in the samples was used in conjunction with the total catch estimate expanded from the creel survey data. This was adjusted downwards based on the creel surveys by the ratio of landings by vessels retaining 100 % of their catch to the total unsold catch. This accounts for that fraction of the catch not sold by commercial fishing vessels. The volume of fish landed by vessels retaining all their catch was labeled the nominal recreational catch.

The estimates for American Samoa are almost certainly under-estimates due to the creel surveys not sampling the activities of sports-fishermen belonging to the Pago Pago Yacht Club. Most of their activities are conducted on the weekend, when the creel survey conducted by DMWR is inactive. A special survey is being undertaken by DMWR staff to capture this recreational fishing activity.

The recreational catch for Hawai`i is generated from the Hawai`i Marine Recreational Fisheries Statistical Survey, which is a collaborative effort between the State of Hawai`i's Division of Aquatic Resources and the NMFS Office of Science and Technology. This survey is part of the NMFS Marine Fisheries Recreational Statistical Survey (MRFSS) which has been modified following a review by the National Academy of Science in 2006, under the auspices of the Marine Recreational Improvement Program.

Table 31. Estimated boat-based recreational pelagic fish catches in the four principal island groups of the Western Pacific Region in 2015

Location	Total catch (lb)	Unsold catch (lb)	Nominal recreational catch (lb)	Recr. catch as % of total catch	Recr. fishing trips
American Samoa	4,772,758	747	663	0.01%	8
Guam	1,659,980	712,351	602,890	36.3%	5,766
Hawai`i	55,525,142	NA	15,831,142[a]	28.5%	273,190
CNMI	410,804	4,922	4,601	1.1%	352

[a] Hawaii recreational catch includes boat-based and shore based landings

2.5.4 CHARTER VESSEL SPORT-FISHING

Table 32 through Table 40 present summaries of the charter vessel sportsfishing in the Western Pacific in 2015. Charter fishing in Hawai`i is more focused on catching blue marlin, which in 2004 formed about 50 % of the total annual charter vessel catch by weight, but in 2015 only formed about a quarter of the charter vessel catch and was superseded by yellowfin. Although commercial troll vessels take blue marlin, this species only forms about 11% of their catch, with the majority of the target species being yellowfin, mahimahi, and wahoo (Table 33). Unlike other parts of the U.S., there is little recreational fishery interest in catching sharks in Hawai`i.

Guam has a charter fishing sector, which unlike Hawai`i caters for both pelagic and bottomfish fishing. Until recently the troll charter fishery was expanding, but, over the past few years the number of vessels involved, and level of fishing, has decreased in response to lower tourist volume from Japan. Comprising about 5 % of Guam's commercial troll fleet, the Guam troll charter industry accounts for about 7% of the troll catch and 39% and 30 % of the Guam blue marlin and mahimahi catch respectively. (See Guam module in this volume).

Charter fishing in NMI is limited, with about ten boats operating on Saipan, and a few vessels on Tinian conducting occasional fishing charters. No data were collected on charter vessel fishing in the NMI during 2015. Tourism is not a significant component of the American Samoa economy, and hence there is little charter fishing activity. As noted previously, there are few vessels suitable for charter-type operations (Tulafono 2001).

Table 32. Estimated catches by pelagic charter fishing vessels in Guam and Hawai`i in 2015

Location	Catch (lb)	Effort (trips)	CPUE (lb/trip	Principal species
Guam	60,999	1,223	50.00	Mahimahi, Blue marlin, Skipjack
Hawai`i	529,680	8,070	65.64	Yellowfin, Mahimahi, Blue marlin

Charter vessel fishing in the Western Pacific Region has elements of both recreational and commercial fishing. The primary motivation for charter patrons is recreational fishing, with the possibility of catching large game fish such as blue marlin. The charter vessel skipper and crew receive compensation in the form of the patron's fee, but are also able to dispose of fish on local markets, as is the case in Hawai`i. The catch composition of charter vessel catch versus conventional commercial trolling in Hawai`i reflects the different targeting in the two fisheries. Blue marlins are among the dominant feature of charter vessels in Hawai`i (Table 33), along with yellowfin and mahimahi. In Guam, blue marlin are also a dominant feature in charter catches, though the single largest catch is mahimahi (Table 34).

Table 33. Comparison of species composition of landings made by Hawai`i pelagic charter vessels versus commercial troll vessels, 2015

	Charter		Commercial	
Species	Landings (lb)	Percentage	Landings (lb)	Percentage
Yellowfin tuna	194,470	36.71%	792,668	35.36%
Blue marlin	131,077	24.75%	245,781	10.97%
Mahimahi	91,908	17.35%	532,008	23.73%
Wahoo	46,105	8.70%	354,640	15.82%
Aku	27,555	5.20%	161,878	7.22%
Short-nosed spearfish	14,975	2.83%	9,293	0.41%
Striped marlin	8,281	1.56%	14,488	0.65%
Kawakawa	6,060	1.14%	22,447	1.00%
Bigeye tuna	1,440	0.27%	78,260	3.49%
Uku	1,202	0.23%	6,754	0.30%
Sailfish	1,061	0.20%	3,363	0.15%
Kaku	279	0.05%	930	0.04%
Black marlin	248	0.05%	7,771	0.35%
Kamanu	126	0.02%	1,199	0.05%
Albacore		0.00%	2,506	0.11%
Swordfish		0.00%	1,120	0.05%
Others	4,894	0.92%	6,344	0.28%
Total	529,680	100.00%	2,241,450	100.00%

Table 34. Comparison of species composition of landings made by Guam pelagic charter vessels versus commercial troll vessels, 2015

	Charter		Commercial	
Species	Landings (lb)	Percentage	Landings (lb)	Percentage
Mahimahi	36,915	60.52%	122,231	13.79%
Blue Marlin	10,517	17.24%	27,129	3.06%
Wahoo	7,502	12.30%	23,995	2.71%
Skipjack Tuna	4,804	7.88%	596,912	67.32%
Yellowfin Tuna	787	1.29%	110,722	12.49%
Others	474	0.78%	5,641	0.64%
Total	60,999	100.00%	886,630	100.00%

In Hawai`i there is considerable variation in charter vessel catches between the various islands (Table 35), with the largest charter vessel fisheries based on the island of Hawai`i and Oahu, in terms of catch. The Hawai`i catch may be biased downwards due to the widespread practice of catch and release of billfish. Charter trips on Hawai`i and Oahu form over 70% of the total charter activity in the State of Hawai`i.

Table 35. Charter vessel catches in Hawai`i by island, 2015

Island	Catch (lb)	Percent	Trips	Percent	CPUE (lb/trip)
Hawai`i	185,379	35.00%	3,941	48.84%	47.04
Kauai	108,125	20.41%	1,112	13.78%	97.23
Maui County*	47,751	9.02%	1,037	12.85%	46.05
Oahu	188,424	35.57%	1,980	24.54%	95.16
Total	529,680	100.00%	8,070	100.00%	65.64

* DAR confidentiality protocols prevent reporting 2007 charter vessel activity for Molokai and Lanai separately, and these are aggregated with data for Maui, reported collectively as Maui County

Most charter vessel fishing on the island of Hawai`i is conducted from Kona's small boat harbor at Honokohau, and about 32% of the charter vessel catch comprises blue marlin (Table 36). Blue marlin used to amount to about two-thirds of the catch, but this number has fallen considerably with the spread of a stronger catch and release ethic for billfish by charter vessel operators at Honokohau. Elsewhere, yellowfin and mahimahi tend to dominate charter vessel landings.

Table 36. Composition of charter vessel catches in the MHI, 2015

Hawai`i	Landings (lb)	%	Kauai	Landings (lb)	%
Yellowfin tuna	69,122	37.29%	Yellowfin tuna	57,855	53.51%
Blue marlin	59,490	32.09%	Mahimahi	14,205	13.14%
Wahoo	18,188	9.81%	Aku	13,988	12.94%
Mahimahi	15,473	8.35%	Blue marlin	11,272	10.42%
Short-nosed spearfish	10,045	5.42%	Wahoo	8,018	7.42%
Striped marlin	4,051	2.19%	Short-nosed spearfish	768	0.71%
Aku	3,811	2.06%	Kawakawa	678	0.63%
Kawakawa	2,001	1.08%	Striped marlin	299	0.28%
Bigeye tuna	1,440	0.78%	Uku	123	0.11%
Sailfish	1,061	0.57%	Bigeye tuna		0.00%
Black marlin	248	0.13%	Sailfish		0.00%
Uku	104	0.06%	Black marlin		0.00%
Kaku	55	0.03%	Kaku		0.00%
Kamanu	53	0.03%	Kamanu		0.00%
Others	235	0.13%	Others	919	0.85%
Hawai`i Total	185,379	100.00%	Kauai Total	108,125	100.00%
Maui County	Landings (lb)	%	Oahu	Landings (lb)	%
Mahimahi	15,246	31.93%	Yellowfin tuna	57,363	30.44%
Yellowfin tuna	10,129	21.21%	Blue marlin	50,694	26.90%
Blue marlin	9,621	20.15%	Mahimahi	46,984	24.93%
Wahoo	7,514	15.74%	Wahoo	12,385	6.57%
Kawakawa	1,318	2.76%	Aku	9,257	4.91%
Uku	975	2.04%	Short-nosed spearfish	3,574	1.90%
Short-nosed spearfish	588	1.23%	Striped marlin	3,568	1.89%
Aku	498	1.04%	Kawakawa	2,063	1.09%
Striped marlin	363	0.76%	Kaku	212	0.11%
Kamanu	49	0.10%	Kamanu	24	0.01%
Kaku	12	0.03%	Bigeye tuna		0.00%
Bigeye tuna		0.00%	Sailfish		0.00%
Sailfish		0.00%	Black marlin		0.00%
Black marlin		0.00%	Uku		0.00%
Others	1,439	3.01%	Others	2,301	1.22%
Maui Total	47,752	100.00%	Oahu Total	188,425	100.00%

2.5.5 RECREATIONAL FISHING DATA COLLECTION IN HAWAI`I

Recreational fish catches in Hawai`i are monitored through the Hawai`i Marine Recreational Fishing Survey (HMRFS), a collaborative project of the NMFS Office of Science and Technology and the Hawai`i Division of Aquatic Resources. This project is a segment of the nationwide MRFSS, which has been used by NMFS to estimate recreational catches in most of the coastal states of the U.S.

The MRFSS program uses a triple survey approach that has been developed over the 20+ years of its history. For each two-month survey period (wave) a random sample of households is called by telephone to determine how many have conducted any fishing in the ocean, their mode of fishing (private boat, rental boat, charter boat, or shoreline), what methods were used, and how much effort (number of trips and hours) was expended. Concurrently, surveyors are sent out to boat launch ramps, small boat harbors, and shoreline fishing sites to interview fishermen to fill out intercept survey forms. The intercept survey collects data on fishing area, fishing methods, trip/effort, species caught, and lengths and weights of fish. The sites are randomly selected, but stratified by fishing pressure so that the sites with the highest pressures are likely to be surveyed more often. In addition the charter boat operators are surveyed by a separate survey. This additional survey of the charter fleet serves the same function as the random digit dialing household survey and is necessary because out of town fishers that charter vessels would not be covered by randomly calling the Hawaiian populace. The telephone and charter survey data are used to estimate total statewide fishing effort and the intercept surveys provide detailed catch and trip information. Data from the three surveys are combined and expanded to yield statewide estimates of total effort and catch by species, mode, and county.

NMFS and HDAR contributed joint funding for intercept surveys and charter boat surveys on the islands of Oahu, Hawai`i, and Maui. NMFS also funded the Random Digit Dialing household telephone survey via a national contractor beginning in January 2001. The HMRFS project commenced in July 2001 but took until 2003 until annual results were first reported from this initiative.

In 2006, the MRFSS survey was reviewed by the National Research Council of the National Academy of Sciences (NRC 2006). The reviewers were critical of the statistical methods employed to generate expansions of the survey data to annual recreational catch estimates for each state. Consequently, NMFS conducted an overhaul of the MRFSS survey to respond to the NRC criticisms. As such, readers of this report should understand that there is uncertainty surrounding the various expansions from the HMRFS survey and figures reported here may change as new methods are implemented to conduct the expansions from survey data.

Table 37 provides summaries of the recreational boat and shoreline fish catch between 2011 and 2015 for pelagic fish.

Table 37. Recreational boat-based pelagic fish catches in Hawai`i between 2011 and 2015.

Year	Shore catch (lb)	Vessel catch (lb)	Total (lb)
2011	14,216	10,574,696	10,588,912
2012	NA	12,330,638	12,330,638
2013	0	14,245,945	14,245,945
2014	0	10,833,018	10,833,018
2015	0	13,065,927	13,065,927

Source: HDAR HMFRS and NMFS PIFSC

Figure 116 through Figure 119 summarize aspects of the boat-based recreational fishery landings for six major pelagic fish species in Hawai`i (blue marlin, striped marlin, mahi mahi, skipjack, yellowfin and wahoo) between 2011 and 2015. Figure 120 shows the bimonthly distribution of boat-based fishing effort over the same time period. Skipjack tuna are the most commonly recreationally caught pelagic fish (Figure 116) followed by yellowfin tuna, mahimahi and wahoo. In terms of weight, however, yellowfin tuna dominates recreational pelagic fish catches (Figure 117).

Although blue marlin numbers in the catch are small compared to other species, the much greater average weight (Figure 118) means that it can comprise a significant fraction of the recreational catch by weight. Average weights for most species tended to be relatively similar between years for mahimahi, skipjack and wahoo, but may vary considerable between years for blue marlin, striped marlin and yellowfin tuna. This is also reflected in the nominal catch rate (lbs/trip) in Figure 119, where yellowfin catch rate was high in 2011, declined in 2012 and 2014, and then increased with peaks in 2015. The distribution of fishing recreational fishing effort shows that boat based activity tends to be highest in the summer and fall when the weather is at its most calm in Hawai`i.

Figure 116. Annual recreational fishery landings by number for six major pelagic species between 2011 and 2015

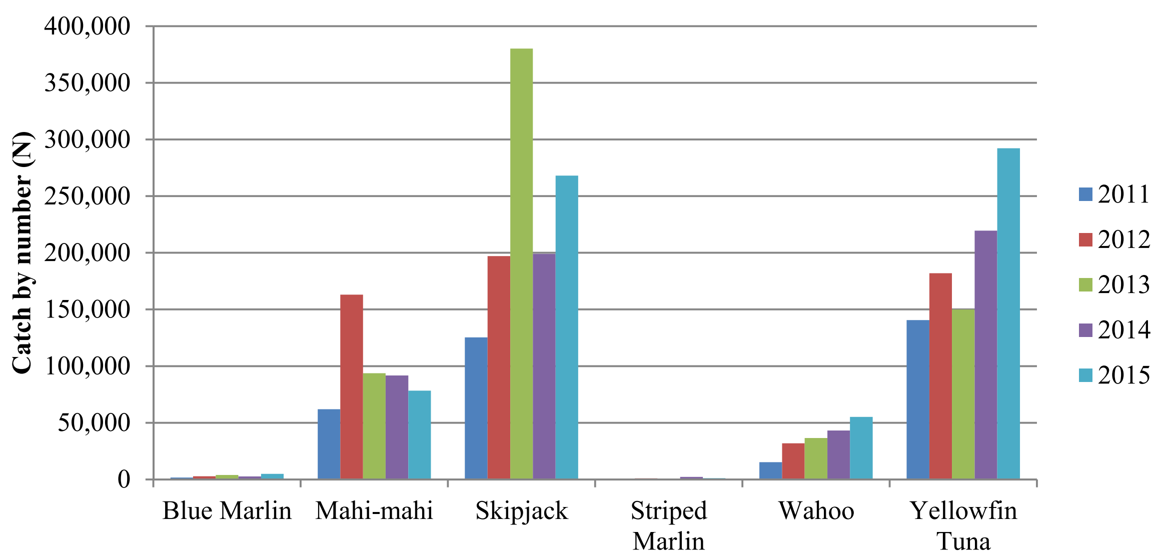


Figure 117. Annual recreational fishery landings by weight of six major pelagic fish species in Hawai`i between 2011 and 2015.

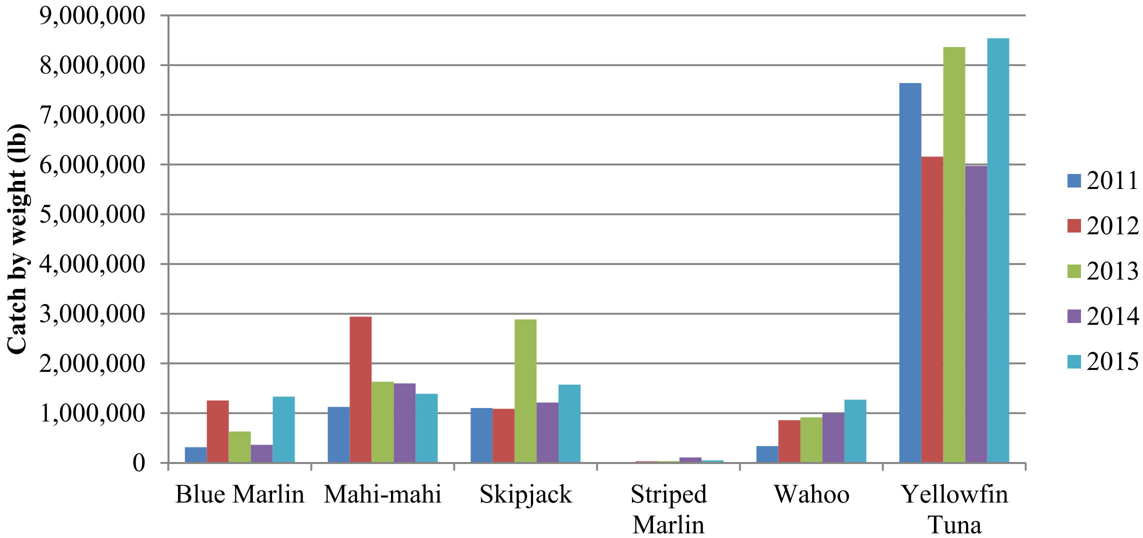


Figure 118. Average weight of six major pelagic fish species caught by recreational fishing in Hawai`i between 2011 and 2015.

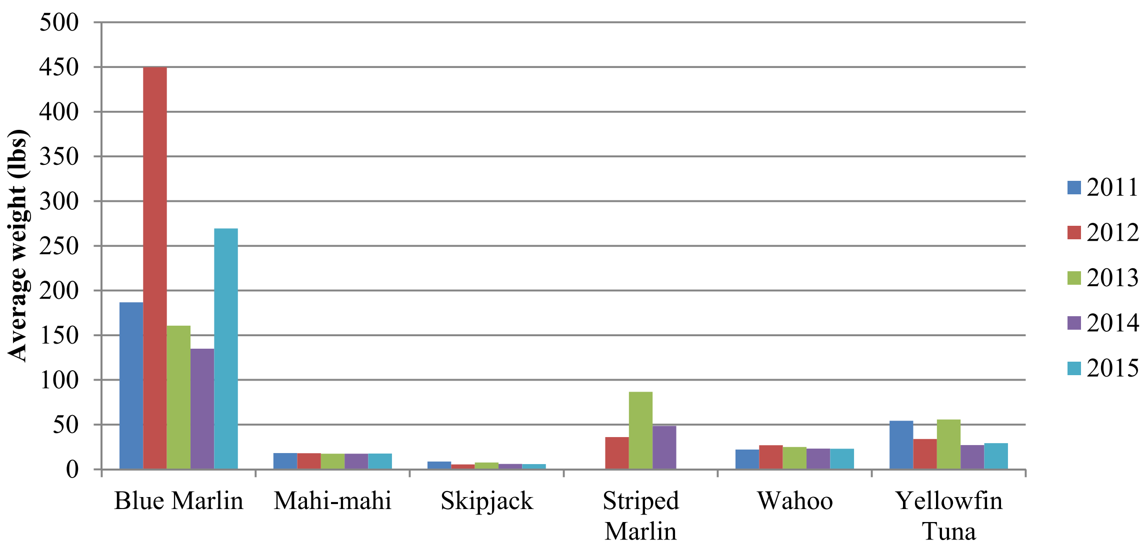


Figure 119. Annual recreational catch per unit effort (lbs per trip) for six major pelagic species in Hawai`i between 2011and 2015

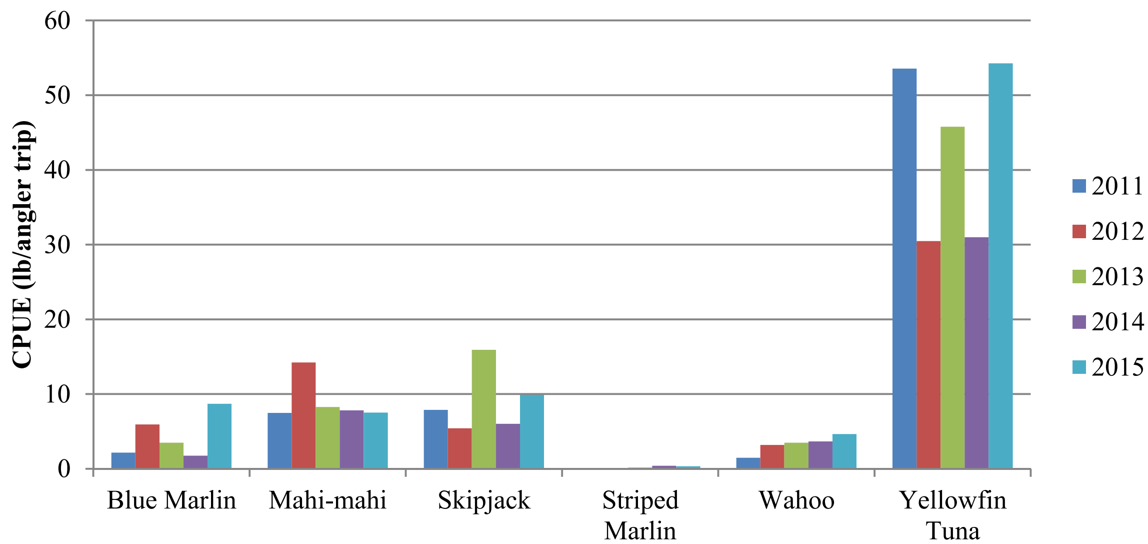
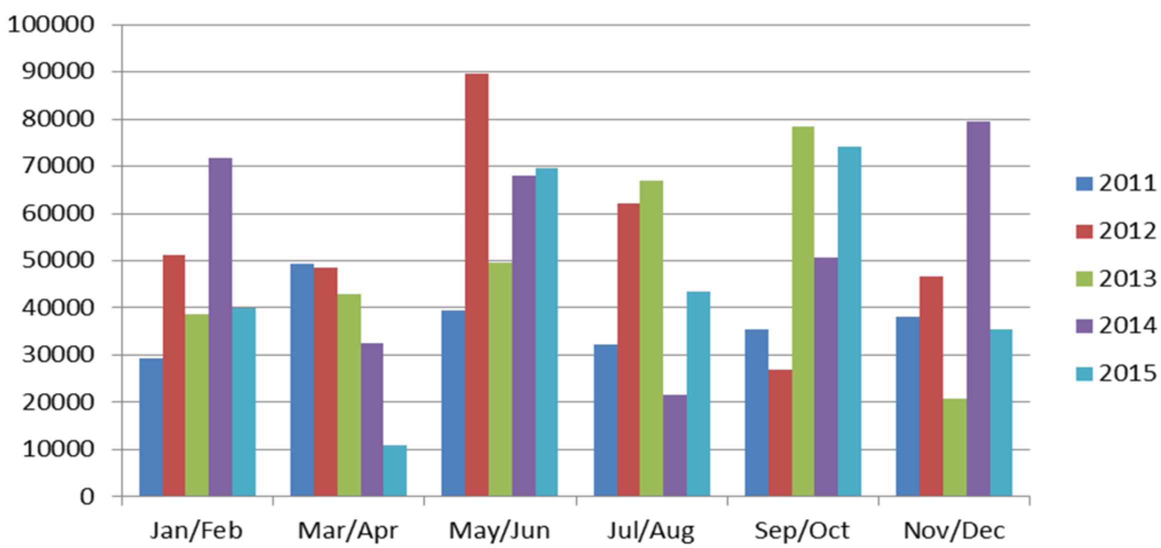


Figure 120. Boat fishing trip estimates (number of angler trips, 2011-2015



2.5.6 HAWAI`I SMALL BOAT SURVEY 2014

The National Marine Fisheries Pacific Islands Fisheries Science Center conducted a survey of 1,763 Hawai`i Commercial Marine License holders in 2014 (NMFS PIFSC pamphlet 2016). A total of 824 surveys were returned. Among the survey results were purely recreational fishermen, and recreational expense fishermen, as well as part time and full time commercial fishermen. The pure recreational and part time recreational are distinguished by the volumes of fish which they consume at home and give away. Pure recreational fishermen consume about 30% of their catch and give away about 37%. Even recreational expense fishermen who sell about half their catch consume 22% of their catch and give away 20%.

The survey also looked at ther expenses of fishing, with a mean cost per fishing trip of $269, with troll, pelagic handline and bottomfish handline being the most expensive at $292, $284 and $253 respectively. On average a small boat fishermen spends $5,557 per year on fixed costs, which include permit fees, gear, boat and trailer maintenance, vessel insurance, mooring fees, loan payments and financial services.

The total value of the catch, which includes pelagics, bottomfish and reef fish was $5.54 million, which reflects to mean income of $8,850 of fish. This includes pure recreational fishermen who sell about 28% of their catch. Trolling gear was the most deployed fishing gear used by 93% of those surveyed. The average vessel size was 23 ft, worth about $43,000, although some vessels in the survey were worth up to $600,000.

2.5.7 REFERENCES

Brock, V.E. Report of the Director, Division of Fish and Game. Report of the Board of Commissioners of Agriculture and Forestry of the Territory of Hawai`i. Honolulu.

Craig, P., B. Ponwith, F. Aitaoto, and D. Hamm. 1993. The commercial, subsistence, and recreational fisheries of American Samoa –Fisheries of Hawai`i and U.S. – associated pacific Islands. Marine Fisheries Review 55 (2), 109-116.

Dalzell, P., T. Adams,& N. Polunin, 1996. Coastal fisheries in the South Pacific. Oceanography and Marine Biology Annual Review 33, 395-531.

Dalzell, P. & W. Paty, 1996. The importance and uniqueness of fisheries in the Western Pacific Region. Paper presented at the 91st Western Pacific Fishery Council Meeting, 18-21 November 1996, Honolulu, 10 p.

Glazier, E.W. 1999. Social aspects of Hawai`i's small vessel troll fishery. Phase II of the Social Aspects of Pacific Pelagic Fisheries Program, Univ. Hawai`i, JIMAR, 287 pp.

Kilarski, S., D. Klaus, J. Lipscomb, K. Matsoukas, R. Newton, and A. Nugent. 2006. Decision Support for Coral Reef Fisheries Management: Community Input as a Means of Informing Policy in American Samoa. A Group Project submitted in partial satisfaction of the requirements of the degree of Master's in Environmental Science and Management for the Donald Bren School of Environmental Management. University of California, Santa Barbara.

Levine, A. and S. Allen. 2009. American Samoa as a fishing community. U.S. Dept. of Commerce, NOAA Tech. Memo., NOAA-TM-NMFS-PIFSC-19, 74 pp.

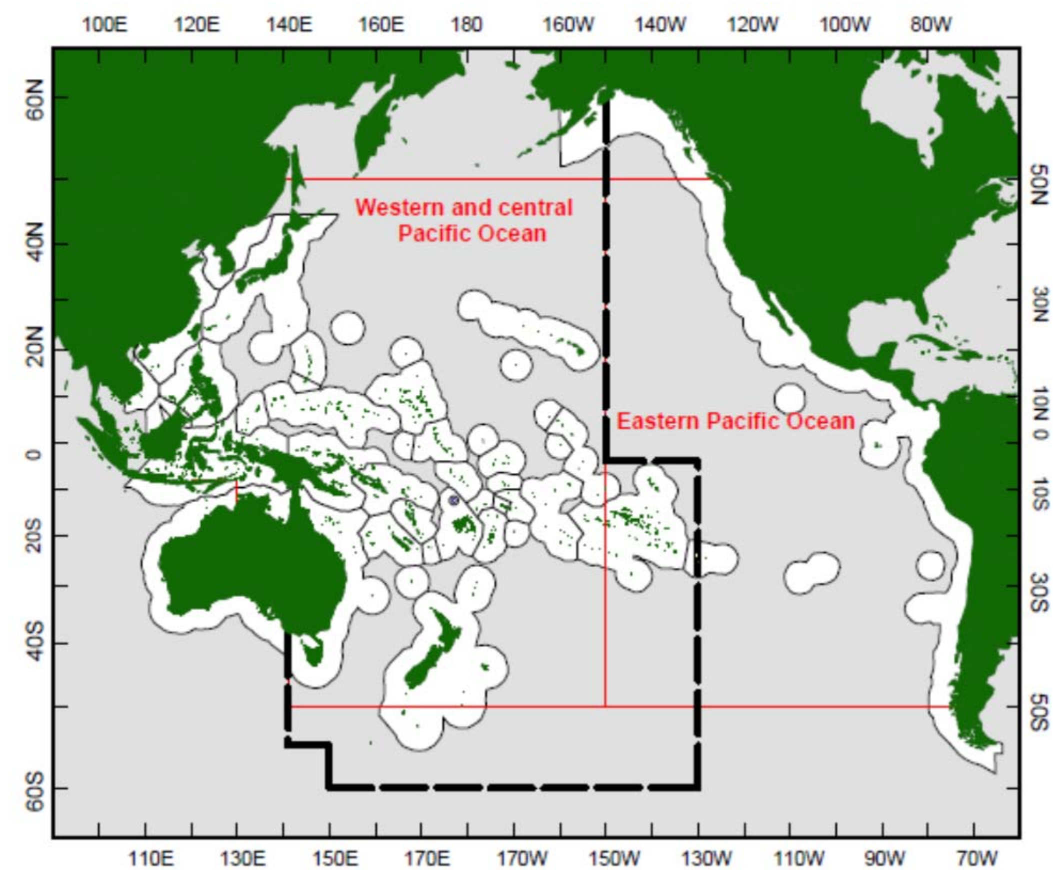
Tulafono, R. 2001. Gamefishing and tournaments in American Samoa. In, Proceedings of the 1998 Pacific Island Gamefish Symposium: Facing the Challenges of Resource Conservation, Sustainable Development, and the Sportfishing Ethic, 29 July-1 August, 1998, Kailua-Kona, Hawai`i, Western Pacific Regional Fishery Management Council.

2.6 INTERNATIONAL

2.6.1 INTRODUCTION

The U.S Pacific Island EEZs managed by the Council are surrounded by large and diverse fisheries targeting pelagic species. The International Module contains reported catches of pelagic species in the entire Pacific Ocean by fleets of Pacific Island nations and distant water fishing nations and information for a SAFE report that includes the most recent assessment information in relation to status determination criteria. Fishery trends in the entire Pacific Ocean are illustrated for the purse seine, longline and pole-and-line fisheries. Tables 44-46 provide the U.S. longline landings as submitted to the WCPFC and Inter-American Tropical Tuna Commission (IATTC).

Figure 121. The WCPO, EPO and the WCPFC Convention Area (WCP–CA) [in dashed lines]).



2.6.2 DATA SOURCES

The data sources for the international module of the SAFE Report are obtained from the various literature of the Western and Central Pacific Fisheries Commission (WCPFC), the IATTC, and the International Scientific Committee for Tuna and Tuna-like species (ISC). These can be found in the bibliography for this module. Additional sources of data include the US data submissions to the WCPFC and IATTC documented in this module

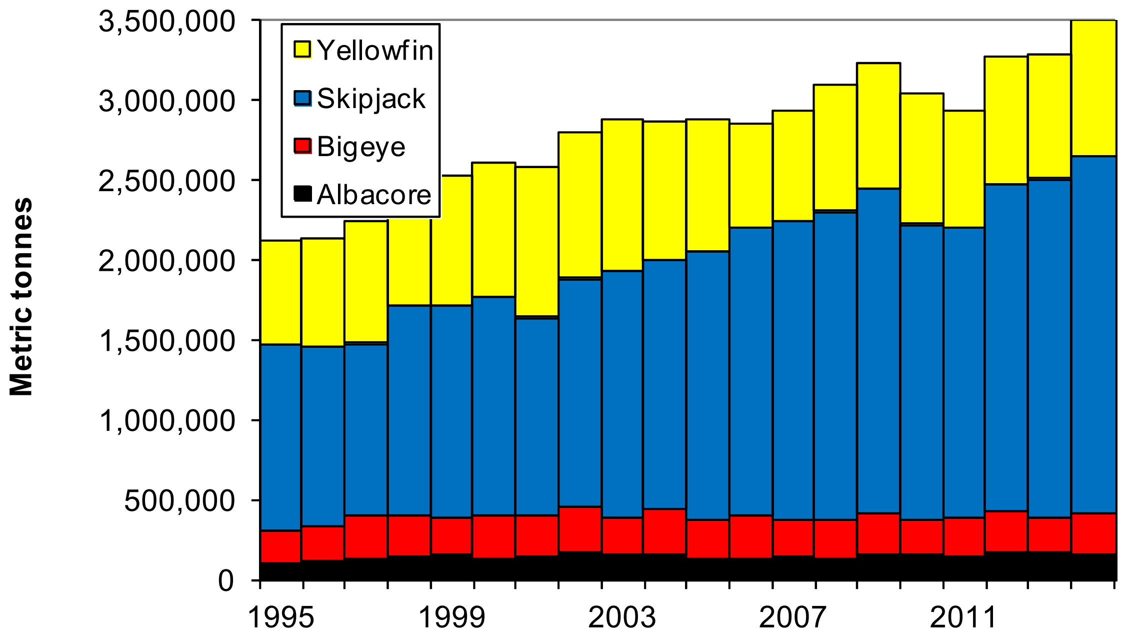
2.6.3 PLAN TEAM RECOMMENDATIONS

There were no recommendations by the Pelagics Plan Team in 2016 to be forwarded to the Council, only Action Items to Pelagic Plan Team members on improvements to modules

2.6.4 SUMMARY OF FISHERIES

This section presents the total catch of tuna species in the Pacific Ocean as reported to the Secretariat of the Pacific Commission (SPC) from all member countries. Figure 122 and Table 31 depict the combined catch of all fisheries, while the following subsections present fishery specific data for the three main fisheries: purse seine, longline, and pole-and-line.

Figure 122. Estimated total annual catch of tuna species in the Pacific Ocean.



Source: SPC 2014.

Table 38. Estimated annual catch (mt) of tuna species in the Pacific Ocean.

Year	Albacore	Bigeye	Skipjack	Yellowfin	Total
1995	104,959	210,812	1,153,935	644,532	2,114,238
1996	116,957	219,564	1,125,111	668,862	2,130,494
1997	141,576	269,708	1,066,862	767,102	2,245,248
1998	144,737	256,754	1,317,218	872,459	2,591,168
1999	161,818	235,658	1,319,051	807,979	2,524,506
2000	130,802	274,503	1,369,440	840,149	2,614,894
2001	145,397	263,537	1,234,720	939,446	2,583,100
2002	178,525	287,764	1,419,754	917,999	2,804,042
2003	157,013	241,277	1,538,901	942,191	2,879,382
2004	155,658	289,242	1,558,973	862,331	2,866,204
2005	130,043	250,259	1,670,844	826,689	2,877,835
2006	132,205	269,223	1,800,359	652,029	2,853,816
2007	153,235	230,412	1,864,399	687,089	2,935,135
2008	130,995	246,471	1,926,307	795,062	3,098,835
2009	167,015	252,649	2,024,606	781,211	3,225,481
2010	155,865	224,894	1,844,493	813,650	3,038,902
2011	146,220	242,471	1,817,824	731,382	2,937,897
2012	179,658	256,541	2,041,783	798,438	3,276,420
2013	173,010	225,850	2,111,867	777,216	3,287,943
2014	166,487	248,902	2,237,132	856,164	3,508,685
Average	148,609	249,825	1,622,179	799,099	2,819,711
STD deviation	20,145	21,781	359,419	89,188	381,889

Source: SPC 2014.

The above table provides the total tuna catch of all commercial fisheries in the Pacific as reported by the SPC.

2.6.4.1 PURSE SEINE FISHERY IN THE WCPFC

Vessels: The combined Pacific-Islands fleet has been clearly the highest producer in the tropical purse seine fishery since 2003. There was a hiatus in the Pacific-Islands fleet development in 2008 (when some vessels reflagged to the U.S. purse-seine fleet) but catch/effort has increased in recent years and catch by this component of the fishery was clearly at its highest level in 2014. The fleet sizes and effort by the Japanese and Korean purse seine fleets have been relatively stable for most of this time series. Several Chinese-Taipei vessels re-flagged in 2002, dropping the fleet from 41 to 34 vessels, with fleet numbers stable since. The increase in annual catch by the Pacific Islands fleet until 2005 corresponded to an increase in vessel numbers, and to some extent, mirrors the decline in U.S. purse seine catch, vessel numbers and effort over this period. However, the U.S. purse-seine fleet commenced a significant rebuilding phase in late 2007, with vessel numbers more than doubling in comparison to recent years, but still below the fleet size in the early-mid

1990s. The increase in vessel numbers in the U.S. purse seine fleet is reflected in the sharp increase in their catch and effort since 2007 (the U.S. catch has been on par with the Korea purse seine fleet over the past four years, although effort by the Korean purse seine fleet in the past three years was clearly lower than the U.S. effort, suggesting higher catch rates or potential issues with effort reporting by the Korean fleet). The total number of Pacific-island domestic vessels has gradually increased over the past two decades, attaining its highest level in 2014 (85 vessels).

Catch: The provisional **2014 purse-seine catch of 2,020,627 mt** was the highest catch on record and more than 120,000 mt higher than the previous record in 2013 (1,899,627 mt). The 2014 purse-seine skipjack catch (1,587,018 mt; 79% of total catch) was the highest on record (about 105,000 mt higher than the previous record in 2013) and the main contributor to the total purse seine catch record. This exceptional catch could be due to a strong year class in conjunction with environmental conditions resulting in a prolonged period where skipjack tuna were more available to the gear, but further investigation is warranted. The 2014 purse-seine catch estimate for yellowfin tuna (362,049 mt) was the third highest on record but at only 18% of the total catch, continuing the recent trend of a diminishing contribution in the overall catch. The provisional catch estimate for bigeye tuna for 2014 (67,367 mt) was the sixth highest on record and will be refined as further observer data for 2014 have been received and processed.

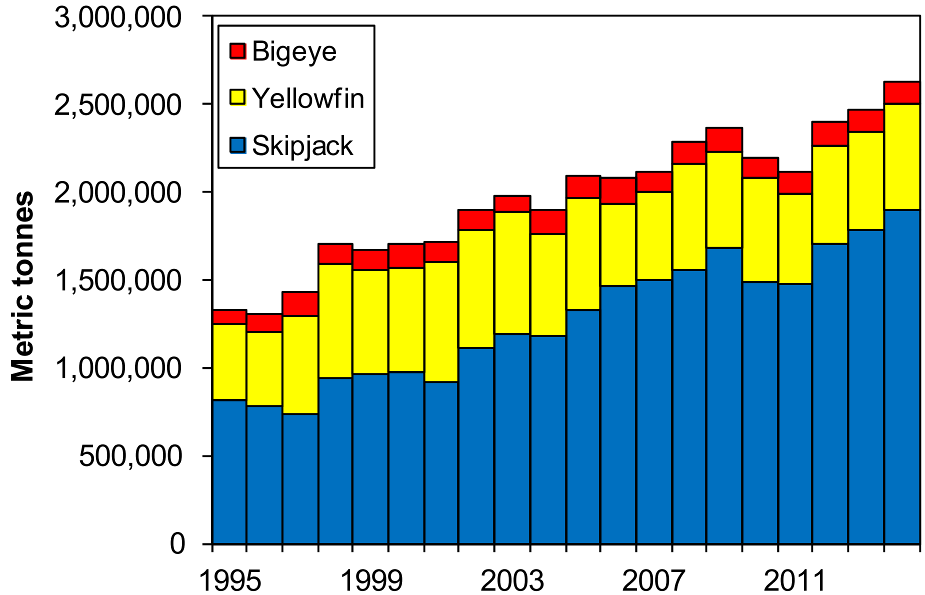
Fleet distribution: The purse-seine catch/effort distribution in tropical areas of the WCP–CA is strongly influenced by El Nino–Southern Oscillation Index (ENSO) events with fishing effort typically expanding further to the east during El Niño years and contracting to western areas during La Niña periods. Weak-moderate La Niña conditions were experienced during 2013, then neutral conditions into early 2014. El Niño conditions developed during 2014 and has persisted into early-mid 2015, with a forecast of more pronounced El Niño conditions in late 2015 to a level not experienced in the fishery for almost 20 years (i.e. since 1997/1998). In line with the prevailing ENSO conditions, fishing activity during 2014 (El Niño-type conditions) expanded into the eastern tropical areas compared to 2013 (La Niña conditions). For the first time in many years, purse seine effort during 2014 in the area to the east of longitude 160°E was more pronounced than in the area to the west of this longitude (i.e. PNG, FSM and Solomon Islands).

Table 39. Total reported purse seine catch (mt) of skipjack, yellowfin and bigeye tuna in the Pacific Ocean.

Year	Skipjack	Yellowfin	Bigeye	Total
1995	817,937	429,788	77,841	1,325,566
1996	779,340	428,125	103,754	1,311,219
1997	735,765	555,244	141,634	1,432,643
1998	942,426	645,119	117,732	1,705,277
1999	960,793	593,444	115,270	1,669,507
2000	979,592	585,021	143,913	1,708,526
2001	913,871	692,115	112,892	1,718,878
2002	1,109,297	673,606	115,199	1,898,102
2003	1,192,021	694,562	95,704	1,982,287
2004	1,176,378	589,503	137,563	1,903,444
2005	1,332,668	637,494	126,121	2,096,283
2006	1,462,861	470,872	142,867	2,076,600
2007	1,502,360	498,648	111,989	2,112,997
2008	1,552,049	609,614	131,011	2,292,674
2009	1,680,179	553,973	132,985	2,367,137
2010	1,483,620	595,731	113,553	2,192,904
2011	1,480,152	509,090	129,925	2,119,167
2012	1,705,680	563,729	130,347	2,399,756
2013	1,784,181	563,987	120,705	2,468,873
2014	1,895,009	607,098	126,160	2,628,267
Average	1,274,309	574,838	121,358	1,970,505
STD Deviation	360,003	77,670	16,613	376,130

Source: SPC 2014.

Figure 123. Total purse seine catch of skipjack and yellowfin tuna in the Pacific Ocean, 1994–2013.



Source: SPC 2014.

2.6.4.2 LONGLINE FISHERIES IN THE WCPFC

Vessels: The total number of vessels involved in the fishery has generally fluctuated between 3,000 and 6,000 for the last 30 years. The fishery involves two main types of operation:

- Large (typically >250 gross registered tonnes [GRT]) **distant-water** freezer vessels which undertake long voyages (months) and operate over large areas of the region. These vessels may target either tropical (yellowfin, bigeye tuna) or subtropical (albacore) species.
- Smaller (typically <100 GRT) **offshore** vessels which are usually **domestically based**, undertaking trips less than one month, with ice or chill capacity, and serving fresh or air-freight sashimi markets, or albacore canneries.

The following broad categories of longline fishery, based on type of operation, area fished and target species, are currently active in the WCP–CA.

South Pacific offshore albacore fishery comprises Pacific-Islands domestic "offshore" vessels, such as those from American Samoa, Cook Islands, Fiji, French Polynesia, Kiribati, New Caledonia, Samoa, Solomon Islands, Tonga and Vanuatu; these fleets mainly operate in subtropical waters, with albacore the main species taken. Two new entrants, Tuvalu and Wallis & Futuna, joined this category during 2011.

Tropical offshore bigeye/yellowfin-target fishery includes "offshore" sashimi longliners from Chinese-Taipei, based in Micronesia, Guam, Philippines and Chinese-Taipei, mainland Chinese vessels based in Micronesia, and domestic fleets based in Indonesia, Micronesian countries, Philippines, PNG, the Solomon Islands and Vietnam.

Tropical distant-water bigeye/yellowfin-target fishery comprises "distant-water" vessels from Japan, Korea, Chinese-Taipei, mainland China and Vanuatu. These vessels primarily operate in the eastern tropical waters of the WCP–CA (and into the EPO), targeting bigeye and yellowfin tuna for the frozen sashimi market. The Portuguese fleet (one vessel) started fishing in 2011.

South Pacific distant-water albacore fishery comprises "distant-water" vessels from Chinese-Taipei, mainland China and Vanuatu operating in the south Pacific, generally below 20°S, targeting albacore destined for canneries.

Domestic fisheries in the sub-tropical and temperate WCP–CA comprise vessels targeting different species within the same fleet depending on market, season and/or area. These fleets include the domestic fisheries of Australia, Japan, New Zealand and Hawai`i. For example, the Hawai`i longline fleet has a component that targets swordfish and another that targets bigeye tuna.

South Pacific distant-water swordfish fishery is a relatively new fishery and comprises "distant-water" vessels from Spain.

North Pacific distant-water albacore and swordfish fisheries mainly comprise "distant-water" vessels from Japan (swordfish and albacore), Chinese-Taipei (albacore only) and Vanuatu (albacore only).

Catch: The provisional WCP–CA longline catch (268,795 mt) for 2014 was slightly above the average for the past five years. The WCP–CA albacore longline catch (91,414 mt – 34%) for 2014 was the lowest for three years, 12,000 mt. lower that the record of 103,466 mt attained in 2010. The provisional bigeye catch (73,898 mt – 27%) for 2014 was higher than in 2013 but still amongst the lowest catches since 1996. In contrast, the yellowfin catch for 2014 (101,552 mt – 38%) was the highest for more than ten years, with increased catches by a number of fleets. A significant change in the WCP–CA longline fishery over the past 10 years has been the growth of the Pacific Islands domestic albacore fishery, which has risen from taking 33% of the total south Pacific albacore longline catch in 1998 to accounting for around 50-60% of the catch in recent years. The combined national fleets (including chartered vessels) mainly active in the Pacific Islands domestic albacore fishery have numbered more than 500 (mainly small "offshore") vessels in recent years and catches are now at a similar level as the distant-water longline vessels active in the WCP–CA.

The distant-water fleet dynamics continue to evolve in recent years, with catches down from record levels in the mid-2000s initially due to a reduction in vessel numbers, although vessel numbers for some fleets appear to be on the rise again in recent years, but with variations in areas fished and target species. The Japanese distant-water and offshore longline fleets have experienced a substantial decline in both bigeye catches (from 20,725 mt in 2004 to 8,812 mt in 2014) and vessel numbers (366 in 2004 to 111 in 2014). The Chinese-Taipei distant-water longline fleet bigeye catch declined from 16,888 mt in 2004 to 6,006 mt (in 2014), mainly related to a substantial drop in vessel numbers (137 vessels in 2004 reduced to 62 vessels in 2014). The Korean distant-water longline fleet also experienced declines in bigeye and yellowfin catches over the past decade in line with a reduction in vessel numbers – from 184 vessels active in 2002 reduced to 108 vessels in 2008, but back to 113 vessels in 2014.

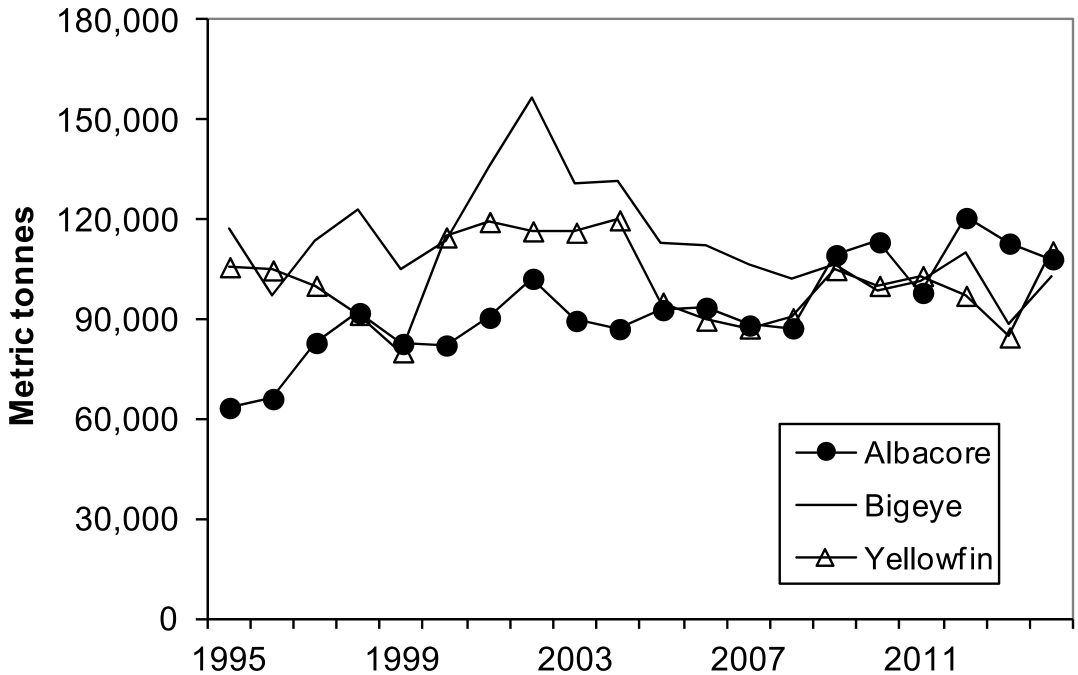
Fleet distribution: Effort by the **large vessel, distant-water fleets** of Japan, Korea and Chinese-Taipei account for most of the effort but there has been some reduction in vessel numbers in some fleets over the past decade. Effort is widespread as sectors of these fleets target bigeye and yellowfin for the frozen sashimi market in central and eastern tropical waters, and albacore for canning in the more temperate waters. Activity by **the foreign-offshore fleets** from Japan, mainland China and Chinese-Taipei is restricted to tropical waters, targeting bigeye and yellowfin for the fresh sashimi market; these fleets have limited overlap with the distant-water fleets. The substantial "**offshore**" effort in the west of the region is primarily by the Indonesian, Chinese-Taipei and Vietnamese **domestic fleets** targeting yellowfin and bigeye. The growth in **domestic fleets** in the South Pacific over the past decade has been noted; the most prominent fleets in this category are the Cook Islands, Samoan, Fijian, French Polynesian, Solomon Islands (when chartering arrangements are active) and Vanuatu fleets.

Table 40. Total reported longline catch (mt) of PMUS in the Pacific Ocean.

Year	Albacore	Yellowfin	Bigeye	Striped Marlin	Black Marlin	Blue Marlin	Swordfish	Total
1995	63,456	105,806	117,090	10,438	1,493	25,332	20,209	343,824
1996	66,146	104,862	96,894	9,052	1,045	18,122	22,248	318,369
1997	83,022	100,232	113,820	9,483	1,118	18,459	28,755	354,889
1998	92,020	91,466	122,799	10,638	1,713	21,305	29,099	369,040
1999	82,722	80,221	105,079	8,503	2,021	18,264	28,108	324,918
2000	82,257	114,771	113,557	6,153	1,401	17,431	30,144	365,714
2001	90,599	119,405	135,567	6,740	1,621	19,779	34,293	408,004
2002	102,322	116,629	156,895	6,533	1,873	19,007	36,487	439,746
2003	89,644	116,205	130,803	7,268	2,104	28,208	38,397	412,629
2004	87,199	119,918	131,444	6,502	2,334	25,630	37,437	410,464
2005	92,925	95,162	112,833	5,836	2,785	23,533	28,763	361,837
2006	93,613	89,749	112,228	5,655	2,473	20,246	31,854	355,818
2007	88,271	87,373	106,508	5,059	1,821	18,493	34,470	341,995
2008	87,435	90,483	101,938	4,928	1,868	18,028	34,746	339,426
2009	109,440	104,955	106,633	4,161	2,071	18,682	35,308	381,250
2010	113,324	100,201	98,404	4,977	2,251	21,082	35,734	375,973
2011	98,092	103,187	101,619	6,397	1,925	19,146	38,431	368,797
2012	120,612	97,215	109,817	6,425	2,003	20,176	42,991	399,239
2013	112,927	84,672	88,386	5,558	1,807	21,940	40,168	355,458
2014	108,236	110,586	103,107	5,328	2,000	21,960	41,087	392,304
Average	93,213	101,655	113,271	6,782	1,886	20,741	33,436	370,985
STD deviation	14,880	12,064	15,877	1,878	424	2,945	6,012	31,697

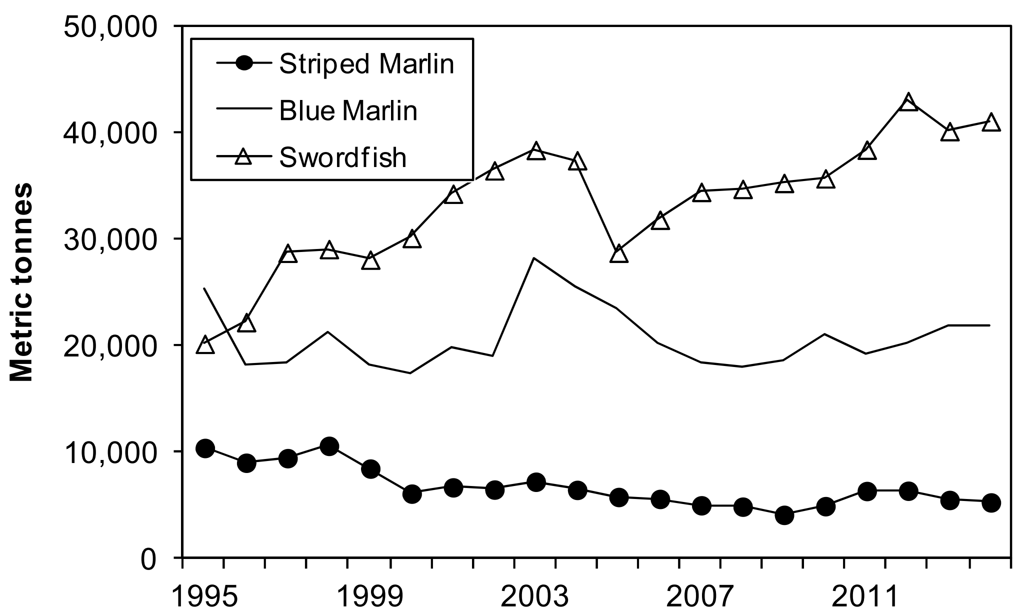
Source: SPC 2015 and I-ATTC 2015.

Figure 124. Reported longline tuna catches in the Pacific Ocean.



Source: SPC 2015 and I-ATTC 2015.

Figure 125. Reported longline billfish catches in the Pacific Ocean.



Source: SPC 2015 and I-ATTC 2015.

2.6.4.3 POLE-AND-LINE FISHERY IN THE WCPFC

Vessels: There are only five pole-and-line fleets active in the WCPO (French Polynesia, Japan, Indonesian, Kiribati and Solomon Islands). The pole-and-line fleet was composed of less than 200 vessels in the 2014 fishery which excludes vessels in the Indonesia domestic fishery.

Catch: The provisional 2014 pole-and-line catch (203,736 mt) was the lowest annual catch since the late-1960s and continuing the trend in declining catches for three decades. Skipjack tends to account for the majority of the catch (~70-83% in recent years, but typically more than 85% of the total catch in tropical areas) and albacore (8–20% in recent years) is taken by the Japanese coastal and offshore fleets in the temperate waters of the north Pacific. Yellowfin tuna (5–16%) and a small component of bigeye tuna (1–4%) make up the remainder of the catch.

Japanese distant-water and offshore fleets (100,347 mt in 2014), and the Indonesian fleets (102,093 mt in 2014), account for nearly all of the WCP–CA pole-and-line catch (99% in 2014). The catches by the Japanese distant-water and offshore fleets in recent years have been the lowest for several decades and this is no doubt related to the continued reduction in vessel numbers (in 2014 reduced to only 79 vessels, the lowest on record). The Solomon Islands fleet recovered from low catch levels experienced in the early 2000s (only 2,773 mt in 2000 due to civil unrest) to reach a level of 10,448 mt in 2003. This fleet ceased operating in 2009, but resumed fishing in 2011 with catches generally less than 1,000 mt (649 mt in 2014).

Fleet distribution: The WCP–CA pole-and-line fishery has several components:

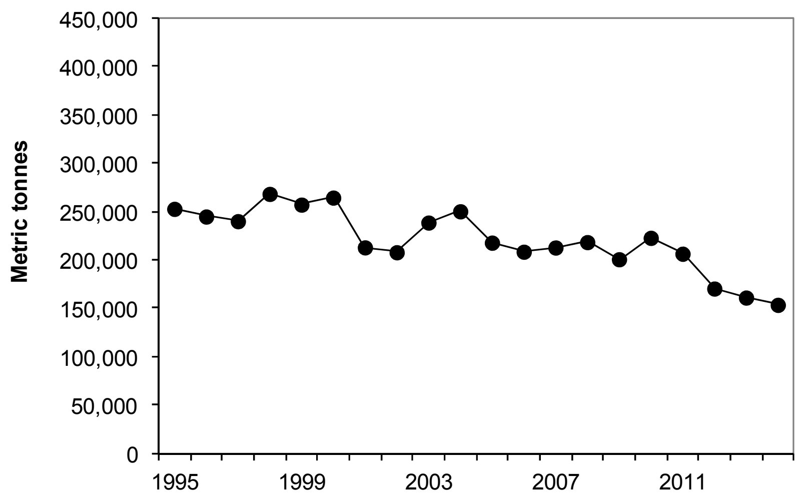
- the year-round tropical skipjack fishery, mainly involving the domestic fleets of Indonesia, Solomon Islands and French Polynesia, and the distant water fleet of Japan
- seasonal sub-tropical skipjack fisheries in the domestic (home) waters of Japan, Australia, Hawai`i and Fiji
- a seasonal albacore/skipjack fishery east of Japan (largely an extension of the Japan home-water fishery).

Table 41. Total reported pole-and-line catch (mt) of skipjack in the Pacific Ocean.

Year	Catch
1995	252,997
1996	245,041
1997	240,259
1998	268,456
1999	257,374
2000	264,638
2001	213,116
2002	208,104
2003	238,817
2004	250,464
2005	218,015
2006	208,655
2007	212,996
2008	218,571
2009	200,843
2010	222,995
2011	206,566
2012	170,537
2013	161,218
2014	153,677
Average	220,667
STD deviation	32,740

Source: SPC 2015.

Figure 126. Reported pole-and-line catch (mt) in the Pacific Ocean.



Source: SPC 2015.

2.6.5 STATUS OF THE STOCKS

National Standard 1 of the MSA requires that conservation and management measures prevent overfishing while achieving, on a continual basis, the optimum yield from each fishery for the U.S. fishing industry. NMFS advisory guidelines for National Standard 1 require the Council to evaluate and describe in their fishery management plans, the criteria for determining if a stock is subject to overfishing, and when a stock is overfished, or approaching a condition of becoming overfished. This section briefly summarizes the status determination criteria (SDC) for pelagic MUS described in the Pelagic FEP, the stock status relative to the SDC, and lists the stock assessments completed since the last SAFE report.

2.6.5.1 DESCRIPTION OF OVERFISHED STATUS DETERMINATION CRITERIA

For all pelagic MUS, the Council adopted a maximum sustainable yield (MSY) control rule shown in Figure 127. The Pelagic FEP uses minimum stock size threshold (MSST) as the SDC for an overfished determination, and a stock is considered overfished when its biomass (B) has declined below the MSST. The MSST is determined based on the natural mortality (M) of the stock and the biomass at MSY (B_{MSY}). Specifically, MSST = cB_{MSY}, where c is the greater of 0.5, or 1 minus the natural mortality rate (M). Expressed as a ratio, a stock is overfished when $B_{year}/B_{MSY} < 1\text{-M}$ or 0.50, whichever is greater. To illustrate these specifications of the MSST, for a stock with a natural mortality rate of 0.2, MSST would be set at $0.8B_{MSY}$, and the stock would be overfished if $B_{year}/B_{MSY} < 0.8$. For a stock with a natural mortality rate greater than 0.5, MSST cannot be set below $0.5B_{MSY}$, and the stock would be overfished if $B_{year}/B_{MSY} < 0.5$.

The Council has also adopted a warning reference point, B_{FLAG}, set equal to B_{MSY} to provide a trigger for consideration of management action before a stock's biomass reaches the MSST. A stock is approaching an overfished condition when there is more than a 50 percent chance that the biomass will decline below the MSST within two years.

It is important to note that NMFS National Standard 1 guidelines at 50 CFR 665.310(e)(1)(i)(C) defines B_{MSY} as the long-term average size of the stock measured in terms of spawning biomass (SB) or other appropriate measure of the stock's reproductive potential that would be achieved by fishing at B_{MSY}. Thus, whenever available, NMFS will use estimates of SB in determining the status of a stock. When estimates of SB are not available, NMFS may use estimates of total biomass (B), or other reasonable proxies for determining stock status.

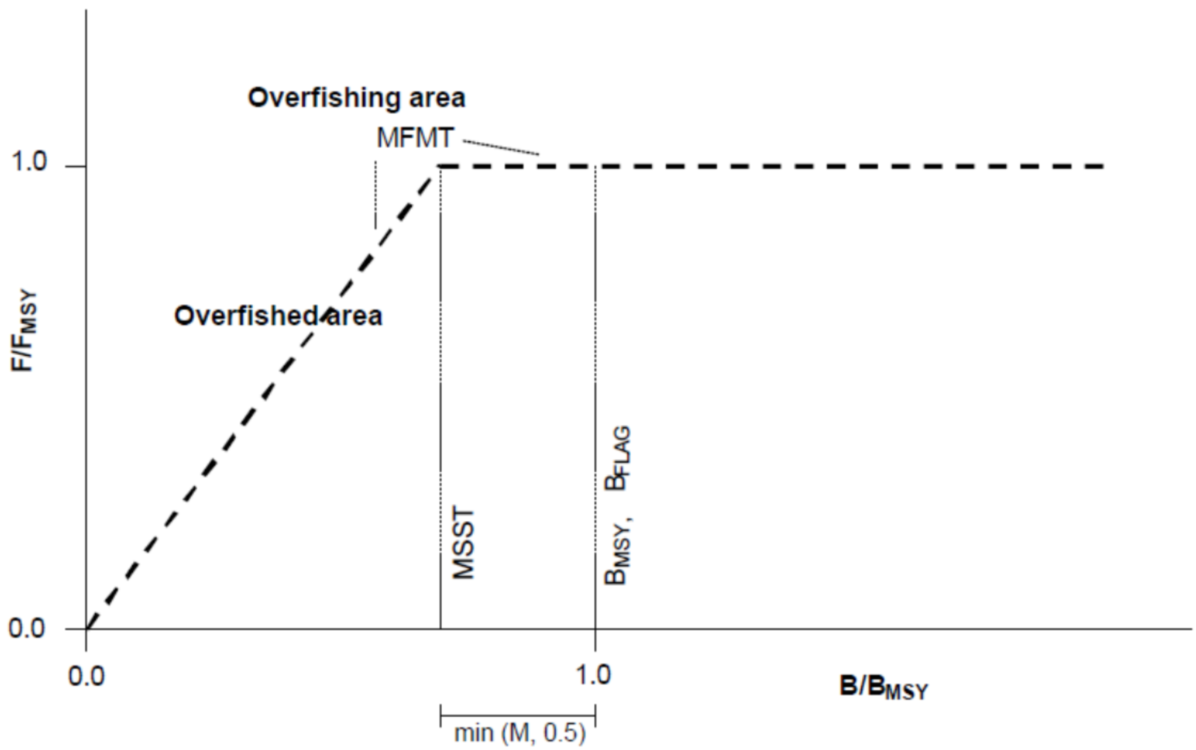
2.6.5.2 OVERFISHING SDC

The Pelagic FEP uses maximum fishing mortality threshold (MFMT) as the SDC for overfishing. Specifically, overfishing occurs when fishing mortality (F) is greater than the fishing mortality rate that results in MSY (F_{MSY}). Expressed as a ratio, the MFMT is exceeded and a stock is subject to overfishing when $F/F_{MSY} > 1.0$. However, for a stock where biomass has declined below MSST, the default MSY control rule requires the MFMT to be reduced linearly below F_{MSY} to allow for rebuilding of the stock.

It is also important to note that all finfish managed under the Pelagic FEP are also managed under the international agreements governing the WCPFC and/or the IATTC to which the

U.S. is a party. Additionally, both the WCPFC and IATTC have adopted criteria for overfishing and overfished for certain species that differ from those described above. Pursuant to Section 304(e)(1), for those fisheries managed under a fishery management plan or international agreement, NMFS shall determine the status of a stock using the criteria specified in the plan, or the agreement. For the purpose of stock status determinations, NMFS will determine stock status of Pelagic MUS using the SDC described in the Pelagic FEP.

Figure 127. MSY control rule and reference points for pelagic MUS.



2.6.6 INFORMATION ON OVERFISHING LIMIT, ACCEPTABLE BIOLOGICAL CATCH AND ANNUAL CATCH LIMITS

Because pelagic squid have an annual life cycle, and all pelagic finfish are subject to management under the international agreements governing the WCPFC and/or the IATTC, all pelagic MUS are excepted from annual catch limit (ACL) and accountability measure requirements of section 303(a)(15) of the MSA, and related reference points. However, this statutory exception does not preclude the Council from specifying ACLs and related reference points for pelagic MUS using the ACL process described in the Pelagic FEP, if the Council deems such specifications are necessary to meet the objectives of the plan.

2.6.7 STOCK ASSESSMENTS COMPLETED SINCE THE LAST PELAGIC SAFE REPORT

Stock status is most reliably determined from stock assessments that integrate fishery and life history information across the range of the stock. For Pelagic MUS, most stock assessments are conducted by several international organizations. In the EPO, IATTC staff conduct stock assessments mainly for tropical tunas (bigeye and yellowfin) and some billfish (striped marlin, swordfish). These assessments are presented to the Scientific Advisory Committee of the IATTC and then to the full IATTC plenary. Assessments for IATTC managed stocks may be accessed on the IATTC meeting webpage.

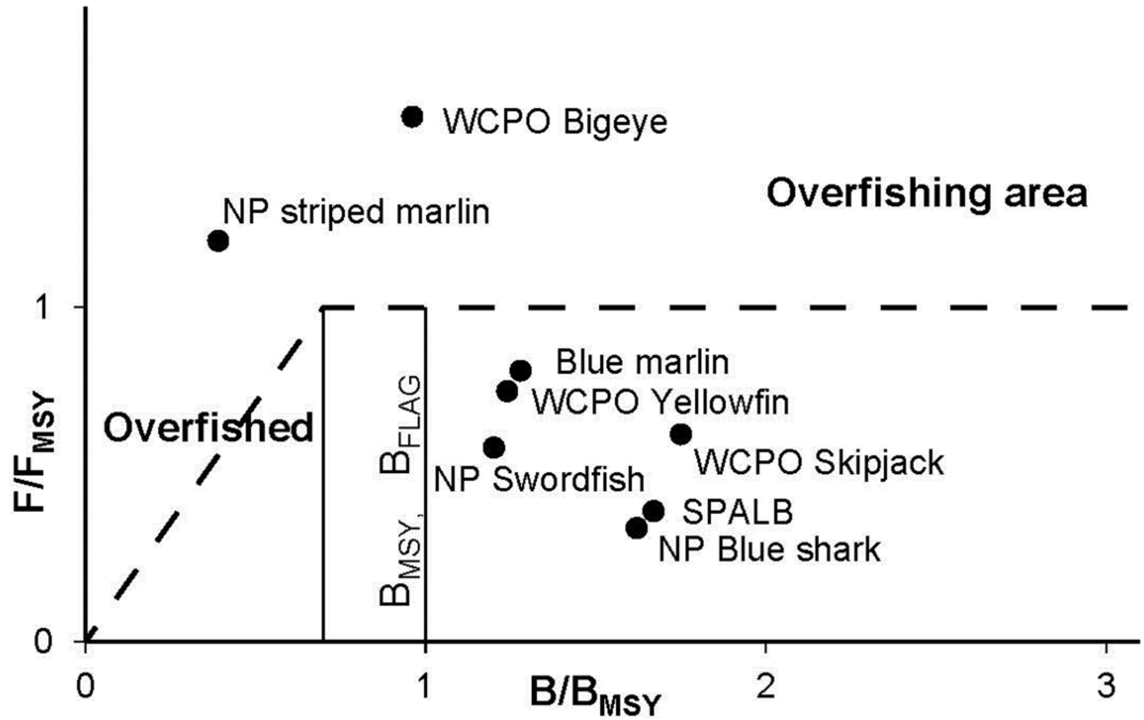
In the WCPO, the Secretariat of the Pacific Community's Oceanic Fisheries Program (OFP-SPC) conducts stock assessments as the science provider to the WCPFC. Like the IATTC, the OFP-SPC generally focuses on the tropical tunas, but also conduct stock assessments for South Pacific albacore and southwest Pacific swordfish and striped marlin.. In the North Pacific Ocean, the ISC for Tuna and Tuna-like Species in the North Pacific Ocean conducts stock assessments specifically for the WCPFC Northern Committee. These assessments are presented to the Scientific Committee of the WCPFC and then to the full WCPFC plenary. Assessments for WCPFC managed stocks may be accessed on the WCPFC meeting webpage.

Table 42 summarizes the stock assessments for pelagic MUS completed or scheduled for completion between 2012 and 2015. Figure 128 illustrates the overfishing and overfished status of pelagic MUS in relation to the overfishing and overfished SDC of the Pelagic FEP.

Table 42. Schedule of completed stock assessments for WPRFMC PMUS.

Management Unit Species	Year Completed		Management Unit Species	Year Completed
Albacore (S. Pacific)	2015		Swordfish (N. Pacific)	2014
Albacore (N. Pacific)	2014		Wahoo	
Other tuna relatives (*Auxis* sp.)			Yellowfin Tuna (WCPO)	2014
(*allothunnus* sp., *Scomber* sp.)			Kawakawa	
Bigeye Tuna (WCPO)	2014		Bluefin Tuna (Pacific)	2014
Black Marlin			Common Thresher Shark	
Blue Marlin	2013		Pelagic Thresher Shark	
Mahimahi			Bigeye Thresher Shark	
Oilfishes			Shortfin Mako Shark	
Opah			Longfin Mako Shark	
Pomfrets			Blue Shark (N. Pacific)	2014
Sailfish			Silky Shark	2013
Shortbill Spearfish			Oceanic Whitetip Shark	2012
Skipjack Tuna (WCPO)	2014		Salmon Shark	
Striped Marlin (N. Pacific)	2015		Squid	

Figure 128. Specification of fishing mortality and biomass reference points in the Pelagic FEP and current stock status in the WCPO and EPO.



The following pages include a description of the most recent stock assessments and assessment results completed in 2015. For more information on stock assessments and assessment results completed prior to 2015, please see the past Annual Pelagic SAFE Reports.

2.6.7.1 SOUTH PACIFIC ALBACORE

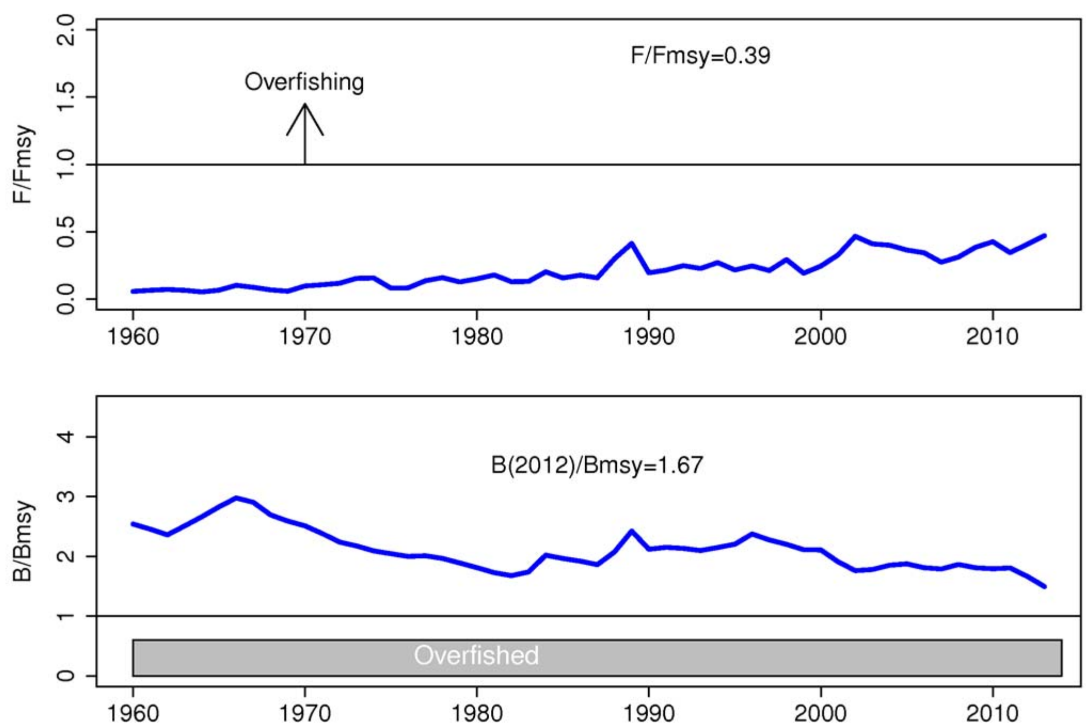
Stock assessment: Harley et al. 2015.

Stock status: The estimated MSY of 76,800 mt is lower than in the 2012 assessment (2012 MSY = 99,085 mt). Aside from general improvements to the stock assessment this was also influenced by 1) exclusion of catches from outside the southern part of the WCPFC Convention area; and 2) a reduction in the assumed value of natural mortality. Based on the range of MSY estimates (range: 62,260-129,814 mt), current catch is likely at or slightly less than the MSY. Fishing mortality has generally been increasing through time, with $F_{current}$ (2009-12 average) is estimated to be 0.39 times the fishing mortality that will support the *MSY*. Across the grid $F_{current}/F_{MSY}$ ranged from 0.13-0.62. This indicates that overfishing is not occurring, but fishing mortality on adults is approaching the assumed level of natural mortality. The fishery impact by sub-tropical longline fisheries has increased continuously since 2000. The latest (2013) estimates of spawning biomass are above both the level that will support the MSY (SB_{latest}/SB_{MSY} = 2.86 for the base case and range 1.74—7.03 across the grid) and the adopted LRP of $0.2SB_{F=0}$ ($SB_{latest}/SB_{F=0}$ = 0.40 for the base case and range

0.30-0.60 across the grid). It is important to note that SB_{MSY} is lower than the limit reference point (0.14 $SB_{F=0}$) due to the combination of the selectivity of the fisheries and maturity of the species.

Management advice and implications: The South Pacific albacore spawning stock is currently above both the level that will support the MSY and the adopted spawning biomass limit reference point, and overfishing is not occurring (F less than F_{MSY}, Figure 129, Table 43). While overfishing is not occurring, further increases in effort will yield little or no increase in long-term catches and result in further reduced catch rates. Decline in abundance of albacore is a key driver in the reduced economic conditions experienced by many PICT domestic longline fleets. Further, reductions in prices are also impacting some distant water fleets. For several years, the WCPFC Standing Committee (SC) has noted that any increases in catch or effort in sub-tropical longline fisheries are likely to lead to declines in catch rates in some regions (10ºS-30ºS), especially for longline catches of adult albacore, with associated impacts on vessel profitability. Despite the fact that the stock is not overfished and overfishing is not occurring, SC11 reiterates the advice of SC10 recommending that longline fishing mortality and longline catch be reduced to avoid further decline in the vulnerable biomass so that economically viable catch rates can be maintained.

Figure 129. Ratios of F/FMSY (top) and SB/SBMSY (bottom) for South Pacific albacore.



The horizontal line at 1.0 in the F/FMSY figure indicates an overfishing reference point. The shaded area in the SB/SBMSY figure indicates an overfished reference point.

2.6.7.2 WESTERN AND CENTRAL PACIFIC STRIPED MARLIN IN THE NORTH PACIFIC (WCNPSTR)

Stock assessment: ISC Billfish Working Group. 2015.

Stock status: Estimates of population biomass of the Western and Central North Pacific (WCNPO) striped marlin stock (Kajikia audax) exhibit a long-term decline. Population biomass (age-1 and older) averaged roughly 20,513 mt, or 46% of unfished biomass during 1975-1979, the first 5 years of the assessment time frame, and declined to 6,819 mt, or 15% of unfished biomass in 2013. Spawning stock biomass is estimated to be 1,094 mt in 2013 (39% of SSB_{MSY}, the spawning stock biomass to produce MSY. Fishing mortality on the stock (average F on ages 3 and older) is currently high and averaged roughly F = 0.94 during 2010-2012, or 49% above F_{MSY}. The predicted value of the spawning potential ratio (SPR, the predicted spawning output at current F as a fraction of unfished spawning output) is currently SPR2010-2012 = 12% which is 33% below the level of SPR required to produce MSY. Recruitment averaged about 308 thousand recruits during 1994-2011, which was 25% below the 1975-2013 average. No target or limit reference points have been established for the WCNPO striped marlin stock under the auspices of the WCPFC.

The WCNPO striped marlin stock is expected to be highly productive due to its rapid growth and high resilience to reductions in spawning potential. The status of the stock is highly dependent on the magnitude of recruitment, which has been below its long-term average since 2007, with the exception of 2010. Changes in recent size composition data in comparison to the previous assessment resulted in changes in fishery selectivity estimates and also affected recruitment estimates. This, in turn, affected the scaling of biomass and fishing mortality to reference levels.

When the status of striped marlin is evaluated relative to MSY-based reference points, the 2013 spawning stock biomass is 61% below SSB_{MSY} (2,819 t) and the 2010-2012 fishing mortality exceeds FMSY by 49%. Therefore, overfishing is occurring relative to MSY-based reference points and the WCNPO striped marlin stock is overfished.

Management advice and implications: The updated stock status of WCNPO striped marlin was noted that the stock was overfished (SSB_{2013} at 61% below SSB_{MSY}) and that overfishing was occurring ($F_{2010\text{-}2012}$ exceeds F_{MSY} by 49%). Although a LRP for billfish species has not been adopted by the WCPFC, SC11 noted that $SSB_{current}/SSB_{current,F=0} = 0.12$ and is below the LRP adopted for tunas. Projections indicate that $Prob(SSB_{2020}>SSB_{2015})<50\%$ for all constant catch scenarios over 2,850 mt (under the three recruitment hypotheses modelled), which means that in order to allow the spawning biomass to rebuild then catches need to be reduced to less than 2,850mt.

nates of stock status in relation to overfishing and overfished reference points for WPRFMC PMUS.

Overfishing reference point	Is overfishing occurring?	Approaching Overfishing (2 yr)	Overfished reference point	Is the stock overfished?	Approaching Overfished (2 yr)	Assessment results
F/F_{MSY} =0.62	No	No	SB_{2011}/SB_{MSY} =1.81, $SB_{2011}/SB_{F=0}$=0.48	No	No	Harley et al. 2014
			B_{2011}/B_{MSY} =1.73			
F/F_{MSY} =0.72	No	No	SB_{2012}/SB_{MSY} =1.24, $SB_{2012}/SB_{F=0}$=0.38	No	No	Davies et al. 2014
			B_{2012}/B_{MSY} =1.21			
F/F_{MSY} =0.39	No	No	SB_{2012}/SB_{MSY} =2.56, $SB_{2012}/SB_{F=0}$=0.42	No	No	Harley et al. 2015
			B_{2012}/B_{MSY} =1.67			
F/F_{MSY} =0.52	No	No	$SB_{2012}/SB_{F=0}$=0.36	No	No	ISC 2014
F/F_{MSY} =1.57	Yes	Not Applicable	SB_{2012}/SB_{MSY} =0.77, $SB_{2012}/SB_{F=0}$=0.16	No	No	Rice et al. 2014
			B_{2012}/B_{MSY} =0.89			
	Yes	Not Applicable		Yes	Not Applicable	ISC 2014
F/F_{MSY}=0.81	No	Unknown	SB/SB_{MSY} =1.28	No	Unknown	ISC 2013
F/F_{MSY}=0.58	No	Unknown	SB/SB_{MSY} =1.20	No	Unknown	ISC 2014
F/F_{MSY}=1.49	Yes	Not Applicable	SB/SB_{MSY} =0.39	Yes	Not Applicable	ISC 2015
F/F_{MSY}=0.34	No	Unknown	SB_{2011}/SB_{MSY} =1.62	No	Unknown	Rice et al. 2014
F/F_{MSY}=6.69	Yes	Not Applicable	SB/SB_{MSY} =0.15	Yes	Not Applicable	Rice and Harley 2012
F/F_{MSY}=4.32	Yes	Not Applicable	SB/SB_{MSY} =0.72	Yes	Not Applicable	Rice and Harley 2013
Unknown			Unknown			
Unknown			Unknown			
Unknown			Unknown			

2.6.8 U.S. LONGLINE LANDINGS REPORTED TO WCPFC AND IATTC FOR 2014.

The tables of this section show the preliminary catches of pelagic MUS by U.S. Hawai`i and U.S. territorial longline fisheries in the WCP-CA from 2010-2014, as reported to the WCPFC (NMFS PIFSC, unpublished data)."

Table 44. U.S. and Territorial longline catch (mt) by species in the WCPFC Statistical Area, 2010–2014.

	U.S. in North Pacific Ocean					CNMI in North Pacific Ocean					American Samoa in North Pacific Ocean					American Samoa in South Pacific Ocean					Total				
	2014	2013	2012	2011	2010	2014	2013	2012	2011	2010	2014	2013	2012	2011	2010	2014	2013	2012	2011	2010	2014	2013	2012	2011	2010
Vessels	140	135	127	128	123	109	113				18	17	115	114	11	22	22	25	24	26	162	157	153	152	146
Species																									
Albacore, North Pacific	177	265	480	497	324		23				9	11	115	113	48						186	298	595	610	371
Albacore, South Pacific																1,448	2,128	3,147	2,291	3,943	1,448	2,128	3,147	2,291	3,943
Bigeye tuna	3,815	3,654	3,660	3,565	3,577	1,000	492				245	305	1,338	1,086	507	82	84	164	178	178	5,143	4,534	5,162	4,829	4,261
Pacific bluefin tuna	0	0	0	0	0											3	2	7	2	3	3	3	7	2	3
Skipjack tuna	167	188	115	158	114		25				9	9	123	34	18	112	66	251	108	110	288	288	490	300	242
Yellowfin tuna	565	568	576	738	462		93				31	32	272	144	53	426	390	348	555	445	1,023	1,083	1,196	1,437	960
Other tuna	0	0	0	0	0		0								0						0	0	0	0	0
TOTAL TUNA	4,725	4,674	4,831	4,958	4,477	1,000	633				294	357	1,849	1,376	625	2,071	2,671	3,916	3,135	4,679	8,090	8,335	10,596	9,469	9,781
Black marlin	1	1	1	1	0						0	0	0	0	0		0	2	1	0	1	1	3	2	1
Blue marlin	427	305	226	290	238		20				32	22	50	45	23	27	31	36	40	45	486	378	313	375	306
Sailfish	15	7	5	10	9		3				0	1	3	2	1	2	2	1	4	2	17	12	9	15	11
Spearfish	162	133	111	169	79		34				12	9	35	35	9	1	1	1	5	2	175	177	147	209	89
Striped marlin, North Pacific	342	262	209	263	124		42				14	23	54	68	13						357	328	263	331	137
Striped marlin, South Pacific																7	4	7	3	2	7	4	7	3	2
Other marlins	0	1	1	1	1		0						0			0					1	1	1	1	1

	U.S. in North Pacific Ocean					CNMI in North Pacific Ocean					American Samoa in North Pacific Ocean					American Samoa in South Pacific Ocean					Total				
	2014	2013	2012	2011	2010	2014	2013	2012	2011	2010	2014	2013	2012	2011	2010	2014	2013	2012	2011	2010	2014	2013	2012	2011	2010
Swordfish, North Pacific	865	558	862	837	1,013		8				15	17	38	22	20						880	583	900	859	1,033
Swordfish, South Pacific																10	11	14	12	11	10	11	14	12	11
TOTAL BILLFISH	1,812	1,266	1,414	1,570	1,464		107				73	72	180	171	66	47	48	62	64	62	1,932	1,493	1,656	1,805	1,592
Blue shark	0	1	12	9	6								2	2	0	1	1	3	2	1	1	2	18	14	7
Mako shark	35	31	42	43	63		3				1	4	8	8	5	0		0	0	0	37	39	50	51	68
Thresher	5	5	9	15	16		0				1	0	3	3	0			0	0		6	5	13	18	16
Other sharks	0	0	0	2	3								0	0	0				1	1	0	0	1	3	3
Oceanic whitetip shark		0	1													0	0	0			0	0	1		
Silky shark	0	0														0	0	0			0	0	0		
Hammerhead shark																									
Tiger shark																									
Porbeagle																									
TOTAL SHARKS	41	37	65	69	87		3				2	5	14	14	6	1	1	4	4	2	44	46	83	87	95
Mahimahi	236	238	288	291	230		9				15	27	52	52	23	12	19	11	11	9	263	293	351	353	262
Moonfish	385	377	356	309	356		37				22	35	86	84	42	1	2	3	3	2	408	450	445	396	400
Oilfish	169	171	169	178	164		28				13	17	59	55	20	0	1	0	1	0	182	216	228	233	185
Pomfret	372	315	215	115	169		26				19	18	56	33	19						391	359	270	148	188
Wahoo	242	154	117	124	101		17				19	15	39	23	11	58	87	85	123	133	319	274	241	270	246
Other fish	6	9	8	20	10		0				0	0	1	0	0	0	0	0	1	1	6	10	9	21	11
TOTAL OTHER	1,410	1,263	1,154	1,036	1,031		117				88	113	292	248	115	72	109	99	137	145	1,570	1,602	1,545	1,421	1,291
GEAR TOTAL	7,988	7,241	7,464	7,632	7,058	1,000	860				457	546	2,335	1,809	812	2,191	2,829	4,081	3,341	4,888	11,636	11,476	13,880	12,782	12,758

Table 45. U.S. longline catch (mt) by species in the North Pacific Ocean, 2010-2014.

	U.S. (ISC)				
	2014	2013	2012	2011	2010
Vessels	141	136	129	129	125
Species					
Albacore, North Pacific	209	317	660	708	421
Albacore, South Pacific					
Bigeye tuna	7,161	6,504	5,873	5,701	5,440
Pacific bluefin tuna	0	1	0	0	0
Skipjack tuna	187	233	245	207	153
Yellowfin tuna	656	736	887	937	568
Other tuna	0	0	0	0	0
TOTAL TUNA	8,213	7,792	7,667	7,552	6,582
Black marlin	1	1	1	1	1
Blue marlin	535	406	298	373	306
Sailfish	19	12	9	13	11
Spearfish	218	213	163	234	118
Striped marlin, North Pacific	426	398	282	362	165
Striped marlin, South Pacific					
Other marlins	1	1	1	1	1
Swordfish, North Pacific	1,663	1,270	1,395	1,623	1,676
Swordfish, South Pacific					
TOTAL BILLFISH	2,861	2,300	2,148	2,608	2,278
Blue shark	0	1	16	13	7
Mako shark	53	52	68	68	94
Thresher	7	6	14	19	18
Other sharks	0	0	1	2	3
Oceanic whitetip shark					
Silky shark	0				
Hammerhead shark					
Tiger shark					
Porbeagle					
TOTAL SHARKS	60	59	98	103	122
Mahimahi	389	403	427	418	439
Moonfish	1,037	952	741	757	824
Oilfish	234	262	257	272	237
Pomfret	509	466	312	181	239
Wahoo	312	213	168	161	128
Other fish	7	10	9	21	12
TOTAL OTHER	2,487	2,307	1,914	1,810	1,878
GEAR TOTAL	13,620	12,458	11,827	12,073	10,861

Table 46. U.S. longline catch (mt) by species in the Eastern Pacific Ocean, 2010-2014.

All U.S. vessels					U.S. vessels GT 24 m					U.S. vessels LE 24 m				
2014	2013	2012	2011	2010	2014	2013	2012	2011	2010	2014	2013	2012	2011	2010
126	120	102	112	118	34	30	29	28	30	92	90	73	84	88
23	19	65	98	49	17	6	19	46	21	6	13	46	53	28
2,100	2,054	875	1,050	1,356	536	598	309	337	407	1,564	1,457	565	713	950
0	0				0	0					0			
11	11	7	15	21	2	3	2	6	6	9	8	5	9	15
60	43	39	55	54	16	23	23	26	25	43	20	16	29	29
0		0	0	0	0		0	0	0	0				
2,194	2,127	986	1,218	1,481	571	630	353	414	459	1,623	1,498	633	804	1,022
		0	0	0							0	0	0	0
76	59	21	38	45	17	14	4	13	12	59	45	17	25	33
4	1	1	2	1	1	0	0	1	0	2	1	1	2	1
44	38	17	31	31	9	9	5	9	7	35	29	12	22	24
69	70	19	31	28	13	19	6	11	7	55	51	14	20	21
0	0	0	0	0	0	0	0			0	0		0	0
783	687	495	764	642	386	279	217	330	314	397	408	279	435	328
976	855	554	867	747	428	321	232	364	341	548	534	322	503	406

	All U.S. vessels					U.S. vessels GT 24 m					U.S. vessels LE 24 m				
	2014	2013	2012	2011	2010	2014	2013	2012	2011	2010	2014	2013	2012	2011	2010
Blue shark			1	2	1			0	1	0			1	1	1
Mako shark	16	14	19	18	26	10	7	11	8	10	6	6	7	10	16
Thresher	1	1	1	1	1	0	0	1	0	1	1	1	1	1	1
Other sharks					1					0					1
Oceanic whitetip shark															
Silky shark															
Hammerhead shark															
Tiger shark															
Porbeagle															
TOTAL SHARKS	17	14	21	20	30	11	7	12	9	11	7	7	9	11	19
Mahimahi	138	129	86	76	186	35	35	30	25	40	103	94	57	50	145
Moonfish	630	504	299	364	426	158	145	99	104	112	472	359	200	261	313
Oilfish	52	47	29	40	53	15	14	10	16	18	37	33	19	24	35
Pomfret	117	108	42	33	51	30	30	10	7	13	87	78	31	26	37
Wahoo	51	27	11	14	15	12	8	4	4	4	39	18	8	9	11
Other fish	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
TOTAL OTHER	989	814	468	527	733	250	231	153	156	188	739	583	315	371	544
GEAR TOTAL	4,176	3,811	2,029	2,632	2,990	1,259	1,189	750	943	1,000	2,916	2,622	1,279	1,689	1,991

2.6.9 LITERATURE CITED

Davies, N., Harley, S., Hampton, J. and S. McKechnie 2014. Stock assessment of yellowfin tuna in the western and central Pacific Ocean. WCPFC-SC10-2014/SA-WP-04, Majuro, Republic of the Marshall Islands, 6–14 August 2014.

Harley, S., Davies, N., Hampton, J. and S. McKechnie 2014. Stock assessment of bigeye tuna in the western and central Pacific Ocean. WCPFC-SC10-2014/SA-WP-01, Majuro, Republic of the Marshall Islands, 6–14 August 2014.

Harley, S., Davies, N., Tremblay-Boyer, L., Hampton, J. and S. McKechnie 2015. Stock assessment for South Pacific albacore tuna WCPFC-SC11-2015/SA-WP-06, Pohnpei, Federated States of Micronesia, 5–13 August 2015.

ISC Albacore Working Group. 2014. Stock assessment of albacore tuna in the north Pacific Ocean in 2014. International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean. 132 p.

ISC Billfish Working Group. 2014. North Pacific Swordfish (Xipiaus gladius) Stock Assessment in 2014. International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean. 89 p.

ISC Billfish Working Group. 2013. Stock assessment of blue marlin in the Pacific Ocean. International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean. 125 p.

ISC Billfish Working Group. 2015. Annex 11: Stock Assessment update for striped marlin (Kajikia audax) in the western and central North Pacific Ocean through 2013. 97 p.

ISC Pacific Bluefin Tuna Working Group. 2014. Stock assessment of Pacific bluefin tuna. International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean. 110 p.

Kahaulelio, D. 2006. Ka Oihana Lawaia, Hawaiian Fishing Traditions. Translated by Mary Kawena Pukui; edited by M. Puakea Nogelmeirer. Bishop Museum Press. ISBN 1-58178-038-9.Rice, J., Harley, S., Davies, N. and J. Hampton 2014. . Stock assessment of skipjack tuna in the western and central Pacific Ocean. WCPFC- SC10-2014/SA-WP-05, Majuro, Republic of the Marshall Islands, 6–14 August 2014.

Rice, J. and S. Harley. 2012. Stock assessment of oceanic whitetip sharks in the western and central Pacific Ocean. WCPFC-SC8-2012/SA-WP-06, Busan, South Korea, 7-15 August 2012.

Rice, J. and S. Harley. 2013. Updated stock assessment of silky sharks in the western and central Pacific Ocean. WCPFC-SC9-2013/SA-WP-03, Pohnpei, Federated States of Micronesia, 6-14 August 2013.

Rice, J. Harley, S. and K. Mikihiko Kai 2014. Stock assessment of Blue Shark in the North Pacific Ocean using Stock Synthesis. WCPFC- SC10-2014/SA-WP-05, Majuro, Republic of the Marshall Islands, 6–14 August 2014.

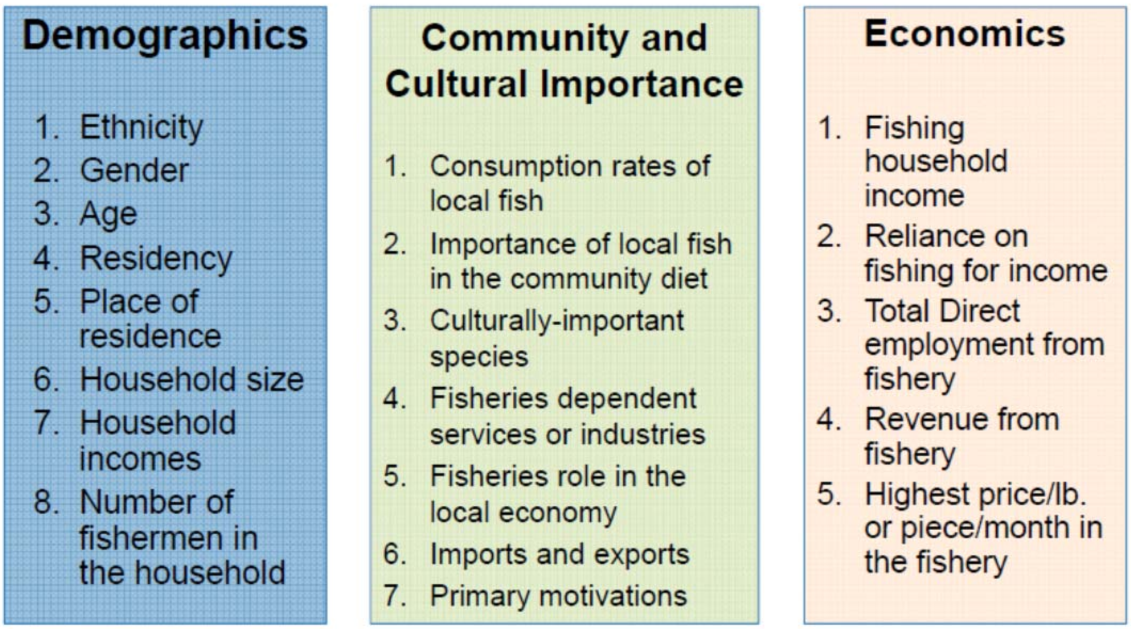
Secretariat of the Pacific Community 2014. Western and Central Pacific Fisheries Commission – Tuna Fishery Yearbook. 149 p.

3 FISHERY ECOSYSTEMS

3.1 SOCIOECONOMIC AND HUMAN DIMENSIONS

Socioeconomic and human dimensions related to fisheries encompass a broad category of information, including objective data on demographics and economics, to subjective and qualitative information on community desires, perceptions and cultural values.

Figure 130. Monitoring Parameters



The above figure presents the elements approved by the Council for consideration in the Economics and Human Dimensions section of this inaugural SAFE Report. Many of the parameters listed above are not available for specific fisheries or regions. This section presents the available information appropriate for publication at the time this report was prepared. In some cases, information outside of these parameters in provided.

3.1.1 AMERICAN SAMOA

3.1.1.1 INTRODUCTION

The small economy in American Samoa continues to develop. Its two most important sectors are the American Samoa Government (ASG), which receives income and capital subsidies from the federal government, and tuna canning (Bank of Hawai`i [BOH] 1997; American Samoa economic report. Bank of Hawai`i, Honolulu). In 2013, domestic exports from American Samoa amounted to $393,145,824 of which $383,730,000 or 98% comprised canned tuna (American Samoa Statistical Yearbook 2013). Private businesses and commerce comprise a smaller third sector. Unlike some of its South Pacific neighbors, American Samoa has never had a robust tourist industry.

The excellent harbor at Pago Pago, 390,000 km^2 of EEZ, and certain special provisions of U.S. law form the basis of American Samoa's decades-old fish processing industry (BOH 1997). The territory is exempt from the Nicholson Act, which prohibits foreign ships from landing their catches in U.S. ports. American Samoan products with less than 50 percent market value from foreign sources enter the U.S. duty free (Headnote 3(a) of the U.S. Tariff Schedule). In 1997, tuna processing directly and indirectly generated about 15% of current money wages, 10-12% of aggregate household income, and 7% of government receipts in the territory (BOH 1997). These numbers are thought to be fairly reliable up until Chicken-of-the-Sea (COS) closed in 2009. Prior to the COS tuna cannery closure, canning provided 8,118 jobs (5,538 direct 2,580 indirect) in American Samoa – 45.6 percent of total employment (McPhee and Associates 2008). The COS closure resulted in the loss of approximately 2,000 of those jobs. Although the private sector gross domestic product declined in 2012, it was offset by an increase in the tuna canning industry (BEA 2013). Cannery exports accounted for the majority of total exports of goods and services (DOC SD 2013); the value of canned tuna exports was approximately $383.7 million (DOC SD 2013) out of the total $393.1 million for total exports.

In 2013, the ASG employed 6,198 people (38 percent of total employment; DOC Statistical Yearbook, pg. 118, 2013), and the private sector employed 7,783 people. Canneries employed 2,108 people, which is 13% of the people employed. As of 2010, there were 34,767 people 16 years and older in the labor force (statistic is updated every 5 years).

Harsh working conditions, low wages and long fishing trips have discouraged American Samoans from working on foreign longline vessels delivering tuna to the canneries. American Samoans prefer employment on the U.S. purse seine vessels, but the capital-intensive nature of purse seine operations limits the number of job opportunities for locals in that sector as well. However, the presence of the industrial tuna fishing fleet has had a positive economic effect on the local economy as a whole. Ancillary businesses involved in re-provisioning the fishing fleet generate a significant number of jobs and amount of income for local residents.

The tuna processing industry has had a mixed effect on the commercial fishing activities undertaken by American Samoans. The canneries used to buy fish from the small-scale domestic longline fleet based in American Samoa, although the quantity of this fish was insignificant compared to cannery deliveries by the U.S. purse seine, U.S. albacore and foreign longline fleets. Moreover, the small-scale alia fleet has been reduced to one vessel that still operates.

Local fishermen have indicated an interest in participating in the far more lucrative overseas market for fresh fish. To date however, inadequate shore-side ice and cold storage facilities in American Samoa and infrequent and expensive air transportation links have been restrictive factors.

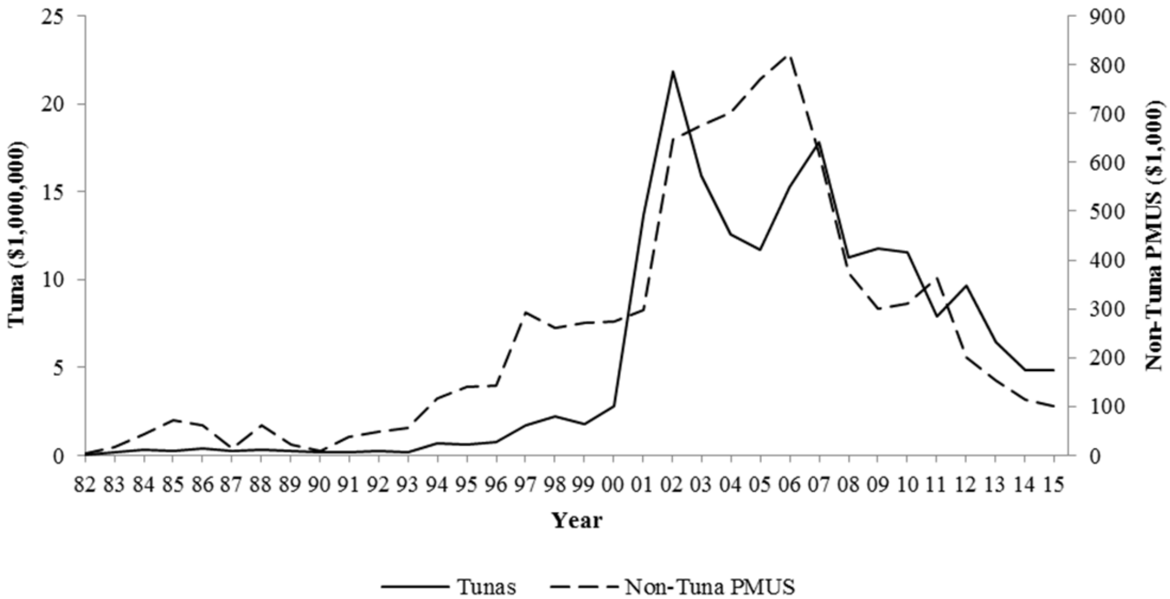
American Samoa's position in the industry is being eroded by forces at work in the world economy and in the tuna canning industry itself. Whereas wage levels in American Samoa are the U.S. minimum wage, they are considerably higher than in other canned tuna production centers around the world. To remain competitive, U.S. tuna producers are purchasing more raw materials, especially pre-cooked loins, from foreign manufacturers. Tax benefits to U.S. canneries operating in American Samoa have also been tempered by the removal of a provision in the U.S. tax code that previously permitted the tax-free repatriation of corporate income in U.S. territories. Trends in world trade, specifically reductions in tariffs, are reducing the competitive advantage of American Samoa's duty-free access to the U.S. canned tuna market.

3.1.1.1.1 Economic impact/contribution for commercial fisheries

Table 47. American Samoa 2015 estimated commercial landings, value and average price for pelagic species

	Longline			Troll/Non-Longline		
Species	Lbs	Value($)	Price/LB	Lbs	Value($)	Price/LB
Skipjack tuna	192,494	$83,123	$0.43	7,090	$23,870	$3.37
Albacore tuna	3,475,497	$4,284,864	$1.23	0	$0	
Yellowfin tuna	699,262	$378,969	$0.54	3,652	$11,870	$3.25
Bigeye tuna	151,073	$67,354	$0.45	0	$0	
TUNAS SUBTOTALS	4,518,327	$4,814,310	$1.07	10,742	$35,740	$3.33
Mahimahi	1,518	$4,438	$2.92	883	$2,612	$2.96
Blue marlin	152	$380	$2.50	1,488	$3,721	$2.50
Wahoo	138,319	$68,511	$0.50	586	$1,759	$3.00
Swordfish	3,717	$13,010	$3.50	0	$0	
Sailfish	811	$2,310	$2.85	1,391	$3,965	$2.85
Moonfish	0	$0		99	$296	$3.00
Oilfish	26	$71	$2.75	15	$40	$2.75
NON-TUNA PMUS SUBTOTALS	144,542	$88,721	$0.61	4,462	$12,392	$2.78
TOTAL PELAGICS	4,662,869	$4,903,031	$1.05	15,204	$48,133	$3.17

Figure 131. American Samoa 2014 annual estimated inflation-adjusted revenue in dollars for Tuna and non-Tuna PMUS



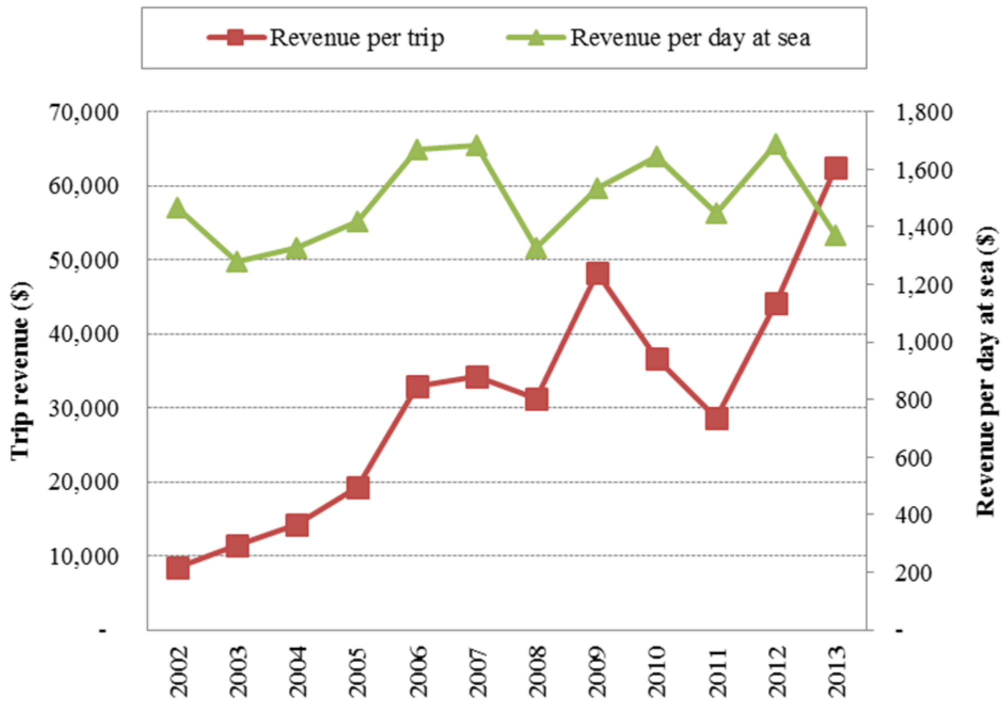
Revenue adjusted for inflation by multiplying a given year's revenue by the 2000 consumer price index (CPI) divided by the CPI for that year.

Supporting data shown in Table A-112.

Inflation-adjusted revenue for tunas and non-tuna PMUS both decreased in 2015. Adjusted revenue for tunas in 2015 showed the lowest earnings since 2000. Non-tuna adjusted revenue in 2015 also decreased and it was the lowest seen since 1996.

3.1.1.1.2 American Samoa Longline Revenue and Costs

Figure 132 Average revenue per trip and per day at sea for American Samoa Longliners



Supporting data shown in Table A-113.

Figure 133 Gini Coefficient for American Samoa Longliners

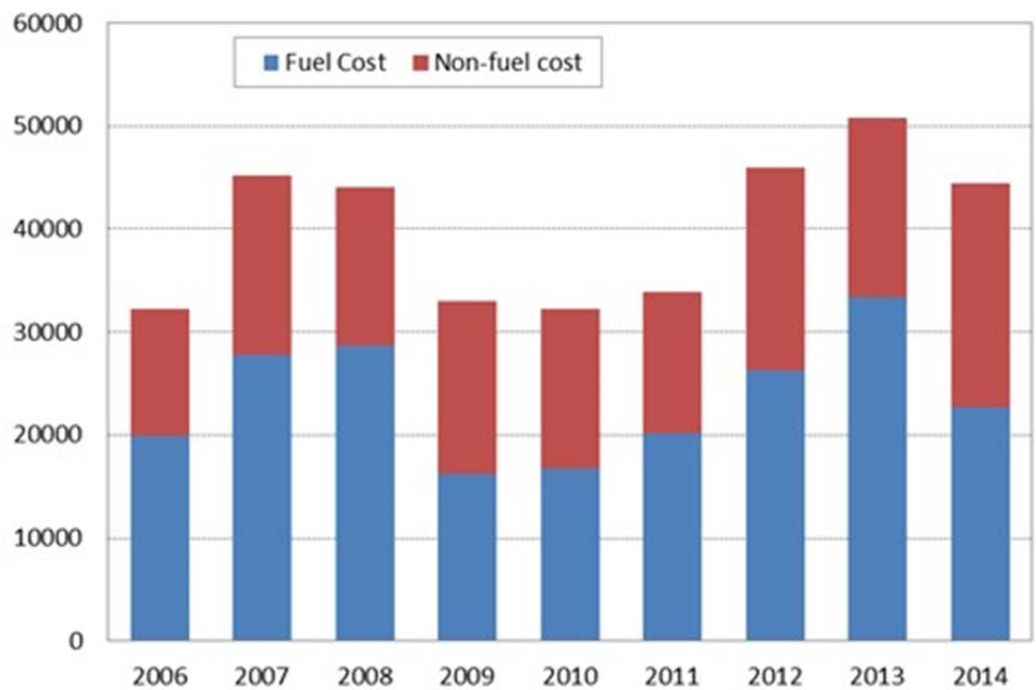
Supporting data shown in Table A-113.

The average revenue per day at sea for American Samoa longline is stable over the period of 2002-2013. The change of the trip revenue and Gini coefficient[5] may reflect the fleet structure changes over the period, when the Alia vessels, small sized longline vessels that usually took one-day trips, gradually left the fishery.

---

[5] The Gini coefficient is a statistical measure of the degree of variation or inequality represented in a set of values, used especially in analyzing income inequality.

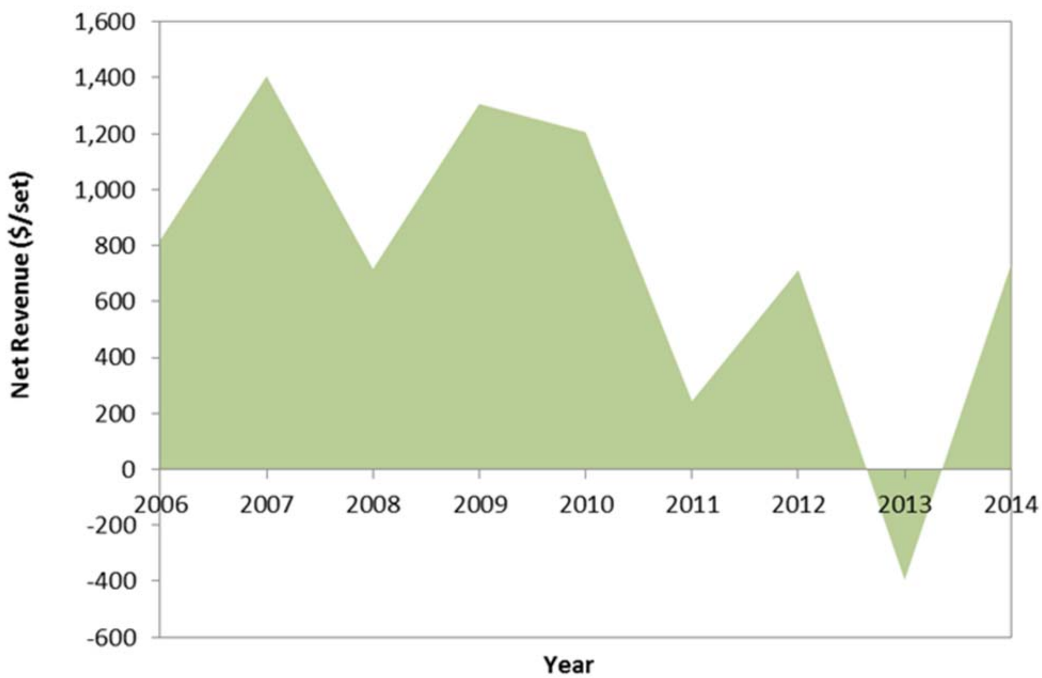
Figure 134. American Samoa Longline Fishery Trip Expenditure (2006 to present)



Supporting data shown in Table A-114.

Fuel cost composes a large percentage, approximately 58%, of total trip cost. As trip length varies across years and vessels, significantly impacting trip cost, using the metric cost per set may be a better indicator to measure changes in variable costs over time.

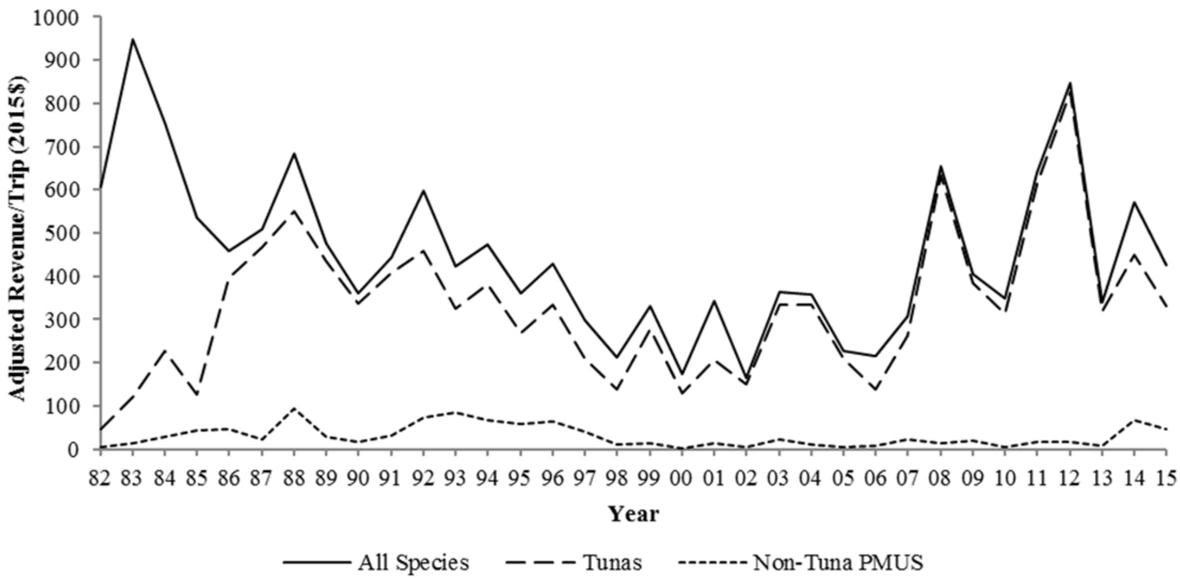
Figure 135 American Samoa Longline Net Revenue per set



Supporting data shown in Table A-115.

3.1.1.1.3 American Samoa Trolling Revenue and Costs

Figure 136. American Samoa average estimated inflation-adjusted revenue per trolling trip landing pelagic species



Revenue per trip was adjusted for inflation by multiplying the given year's revenue/trip by the 2003 CPI divided by the CPI for that year.

Supporting data shown in Table A-116.

The unadjusted revenue/trip for Tunas and Non-Tuna PMUS is calculated by first summing the value of the species in these pelagic subgroups caught and sold by purely trolling methods and then dividing this by the number of pure trolling trips. The unadjusted revenue/trip for all species is the sum of the value of all species caught by the purely trolling trips that sold all or part of their catch divided by the number of such trips.

The PIFSC Economics Program implemented continuous economic data collections of American Samoa small boat-based fisheries through a collaboration with WPacFIN in August 2009. The economic data collection gathers fishing expenditure data for boat-based pelagic fishing trips on a continuous basis. The survey form was designed to collect the primary expenses and costs including fuel, ice, bait and chum, lost fishing gear, and vessel engine type. These economic data are collected from same subset of fishing trips as the boat-based creel survey carried out by the local fisheries management agencies and WPacFIN.

The annual average trolling trip cost in American Samoa was approximately \$85 in 2011, \$83 in 2012, and \$88 in 2013. The sample sizes in 2009 and 2010 were minimal and should be interpreted with caution. Fuel cost dropped from \$81 in 2011 to \$69 in 2012 due to lower fuel usage. Fuel cost contributed approximately 80% of total trip costs in 2012 and 2013. Ice costs have been collected since August 2012.

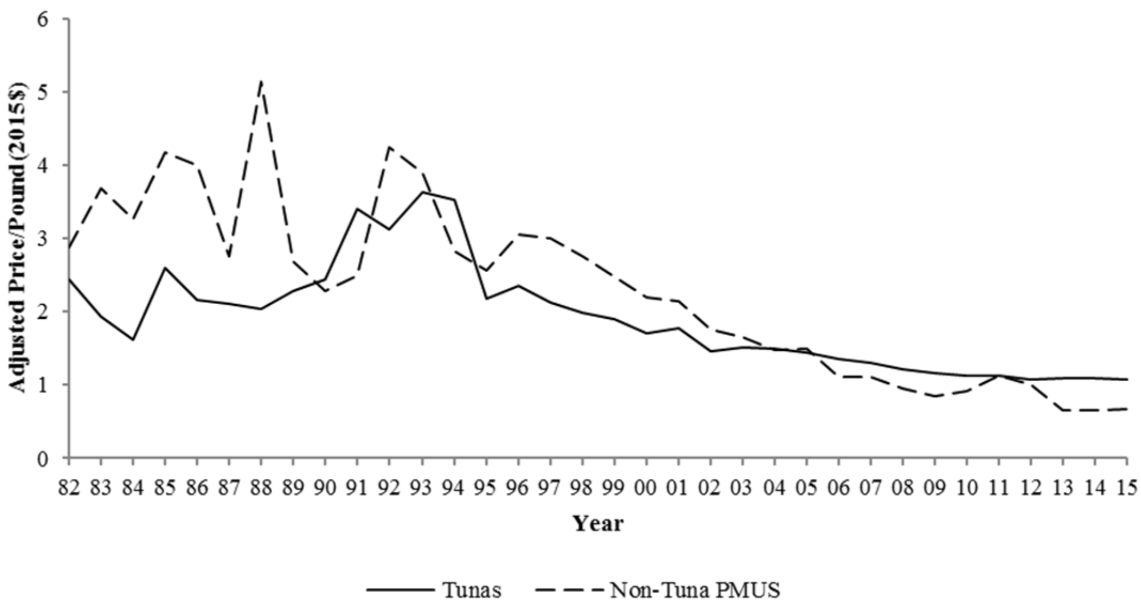
Table 48. American Samoa Troll Trip Costs

Year	2009	2010	2011	2012	2013
Fuel cost	30.80	87.40	80.99	68.88	67.88
Non-fuel cost	0.00	0.00	4.38	13.95	19.97
Ice	-	-	-	11.43	14.52
Bait & chum	0.00	0.00	0.00	0.00	0.00
Gear lost	0.00	0.00	4.38	9.74	5.88
Total cost	30.80	87.40	85.36	82.83	87.85
Sample size (n)	1	2	32	19	34

Source: Pan, Minling, 2016: CNMI, American Samoa, and Guam Small Boat Fishery Trip Expenditure (2009 to present). Pacific Islands Fisheries Science Center, https://inport.nmfs.noaa.gov/inport/item/20627

3.1.1.1.4 Fish prices

Figure 137. American Samoa average estimated inflation-adjusted price per pound of Tunas and Non-Tuna PMUS



Price per pound adjusted for inflation by multiplying a given year's revenue by the 2000 CPI divided by the CPI for that year.

Supporting data shown in Table A-117.

The average inflation-adjusted price-per-pound for tunas and non-tunas showed a declining trend since 1996. In the past ten years the average price ranged from $0.98 to $1.10. The 2015 average price was lower than the overall average, a contributing factor to the low effort in 2015. The average price for non-tuna ranged from $0.65 to $1.08 between 2005 and 2014.

Average price in 2014 was $0.66. Tuna price-per-pound peaked at $3.45 in 1993; and for non- tuna average peaked in 1988 at $5.16.

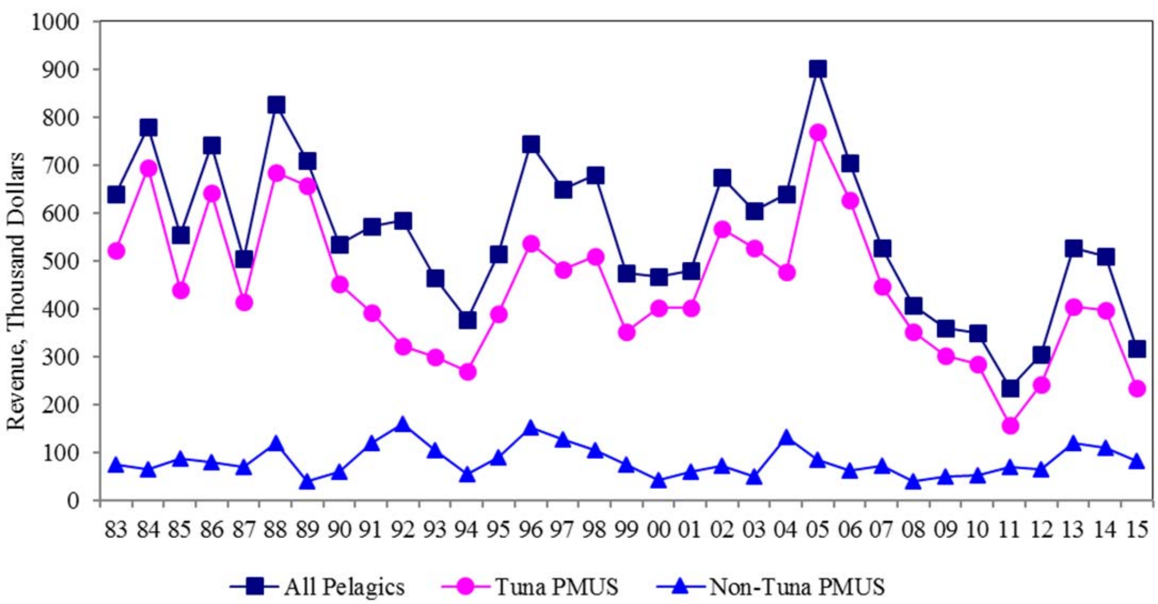
3.1.2 CNMI

3.1.2.1 INTRODUCTION

In the early 1980s, U.S. purse seine vessels established a transshipment operation at Tinian Harbor. The CNMI is exempt from the Jones Act, which requires the use of U.S.-flag and U.S.-built vessels to carry cargo between U.S. ports. The U.S. purse seiners took advantage of this exemption by offloading their catch at Tinian onto foreign vessels for shipment to tuna canneries in American Samoa; however this operation closed in the 1990s. A small 2-4 vessel longline fishing operation operated in the CNMI for about ten years, but ceased in 2012.

3.1.2.1.1 Economic impact/contribution for commercial fisheries

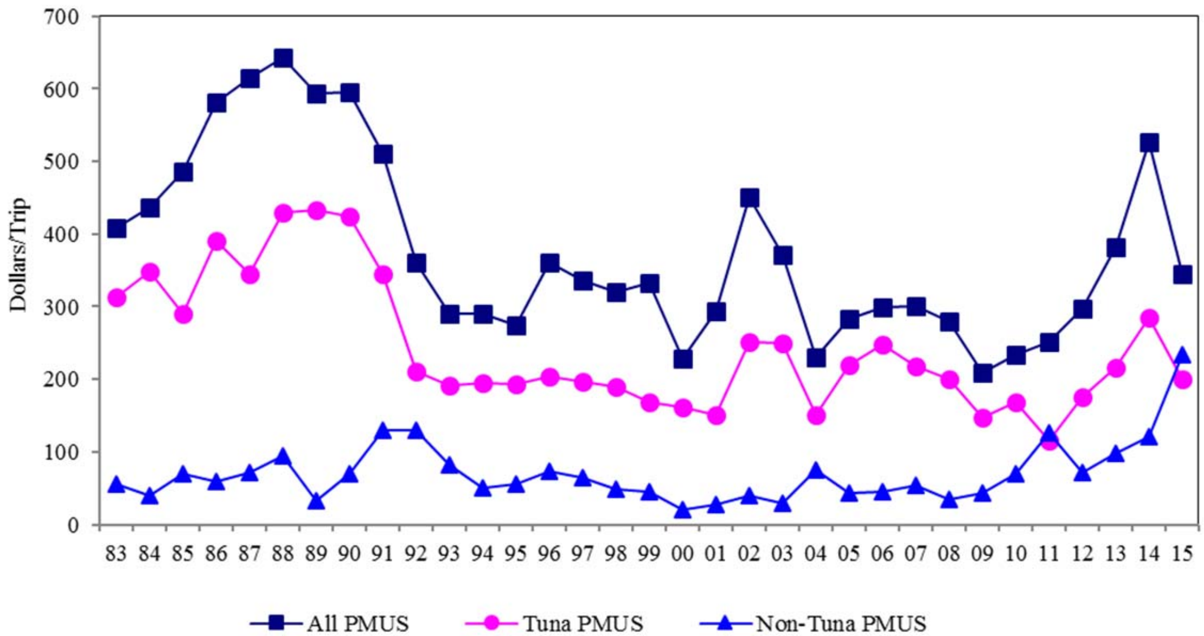
Figure 138. CNMI Annual Commercial Inflation-Adjusted Revenues for All Pelagics



Supporting data shown in Table A-119.

3.1.2.1.2 Revenue and Cost for all CNMI Fisheries

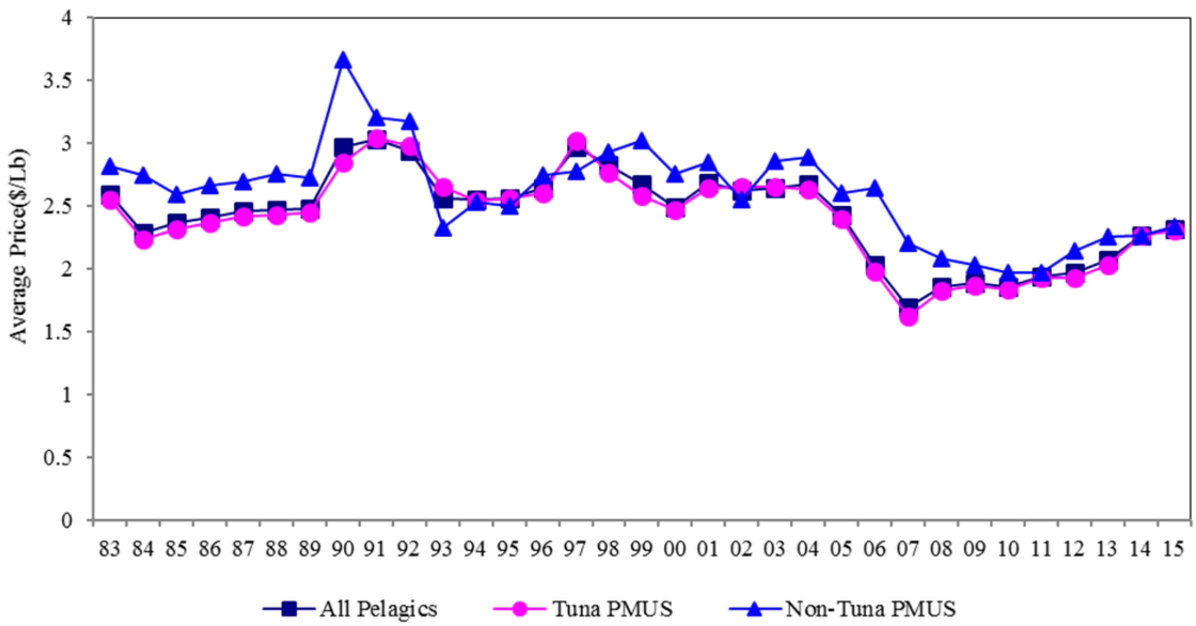
Figure 139. CNMI Annual Inflation-Adjusted Revenue Per Trip for PMUS Trips



Supporting data shown in Table A-120.

3.1.2.1.3 Fish Prices

Figure 140. CNMI Average Inflation-Adjusted Price of All Pelagics



Supporting data shown in Table A-121.

3.1.3 GUAM

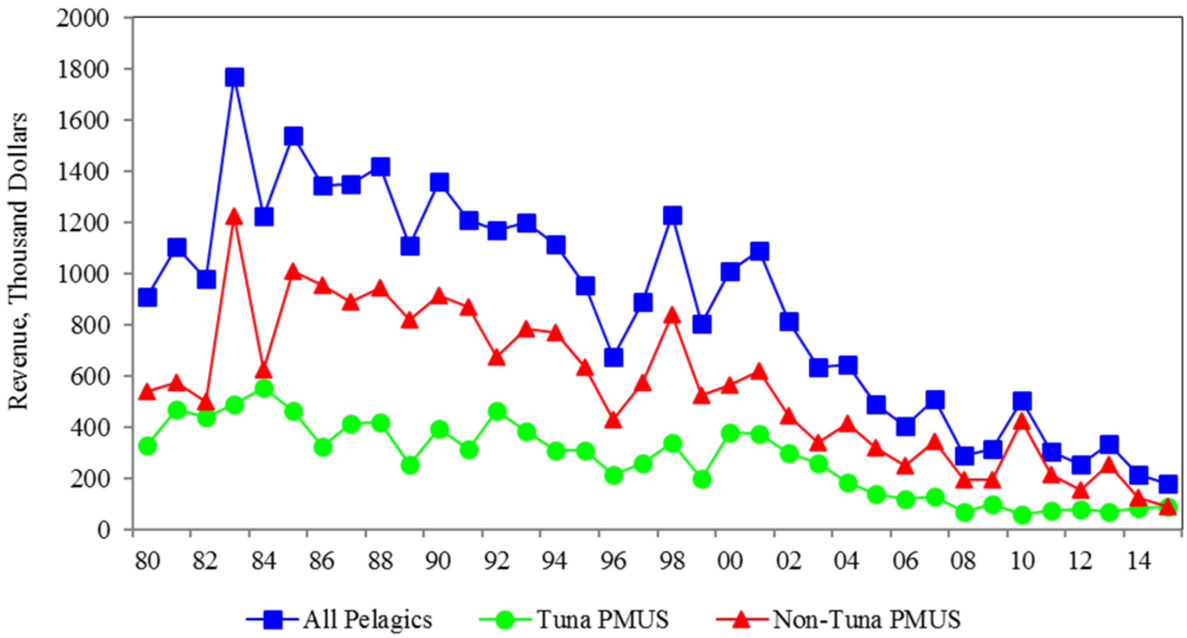
3.1.3.1 INTRODUCTION

The importance of commercial fishing in Guam lies mainly in the territory's status as a major regional fish transshipment center and re-supply base for domestic and foreign tuna fishing fleets. Among Guam's advantages as a home port are well-developed and highly efficient port facilities in Apra Harbor; an availability of relatively low-cost vessel fuel; a well-established marine supply/repair industry; and recreational amenities for crew shore leave. In addition, the territory is exempt from the Nicholson Act, which prohibits foreign ships from landing their catches in U.S. ports. Initially, the majority of vessels calling in Apra Harbor to discharge frozen tuna for transshipment were Japanese purse seine boats and carrier vessels. In the late 1980s, Guam became an important port for Japanese and Taiwanese longline fleets, but port calls have steadily declined and the transshipment volume has also declined accordingly.

By the early 1990s, an air transshipment operation was also established on Guam. Fresh tuna was flown into Guam from the Federated States of Micronesia and elsewhere on air cargo planes and out of Guam to the Japanese market on wide-body passenger planes. Further, vessels from Japan and Taiwan also landed directly into Guam where their fish was packed and transshipped by air to Japan. A second air transshipment operation began in the mid-1990s; it was transporting to Europe fish that did not meet Japanese sashimi market standards, but this has since ceased operations. Moreover, the entire transshipment industry has contracted markedly with only a few operators still making transshipments to Japan. Annual volumes of tuna transshipped of between 2007 and 2011 averages about 3,400 mt, with a 2012 estimate of 2,222 mt, compared to over 12,000 mt at the peak of operations between 1995 and 2001.

3.1.3.1.1 Economic impact/contribution for commercial fisheries

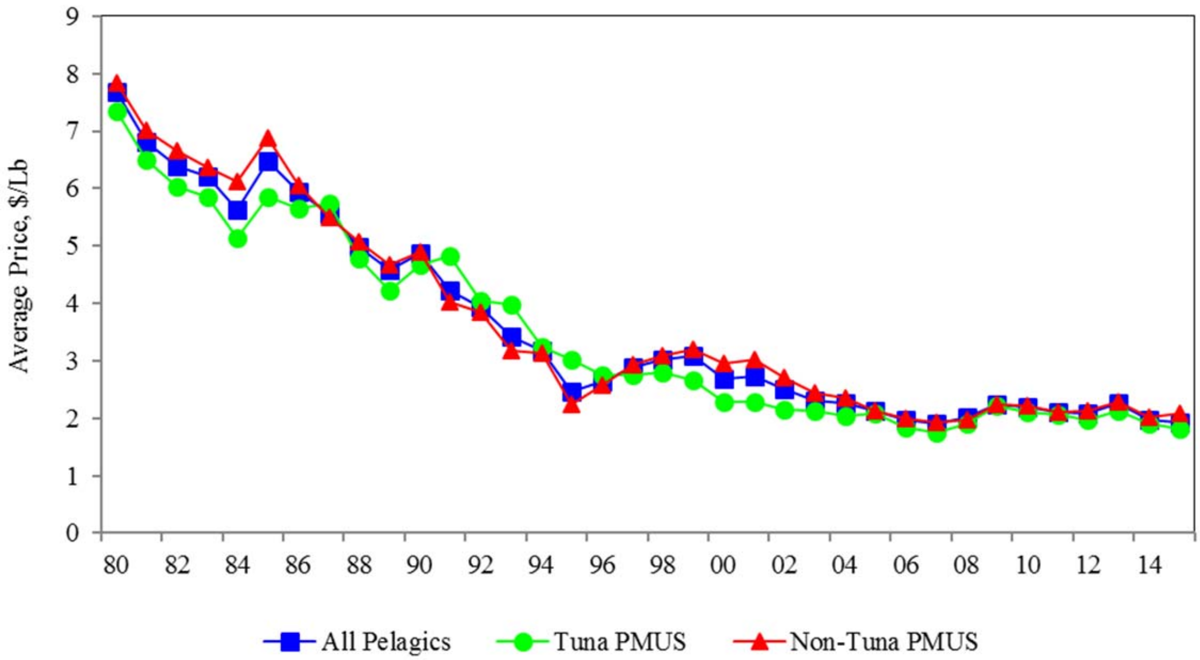
Figure 141. Guam Annual Estimated Inflation-Adjusted Commercial Revenues: All Pelagics, Tuna PMUS, and Non-Tuna PMUS



Supporting data shown in Table A-123.

3.1.3.1.2 Fish Prices

Figure 142. Guam Annual Estimated Inflation-Adjusted Average Price of: All Pelagics, Tuna PMUS, and Non-tuna PMUS



Supporting data shown in Table A-124.

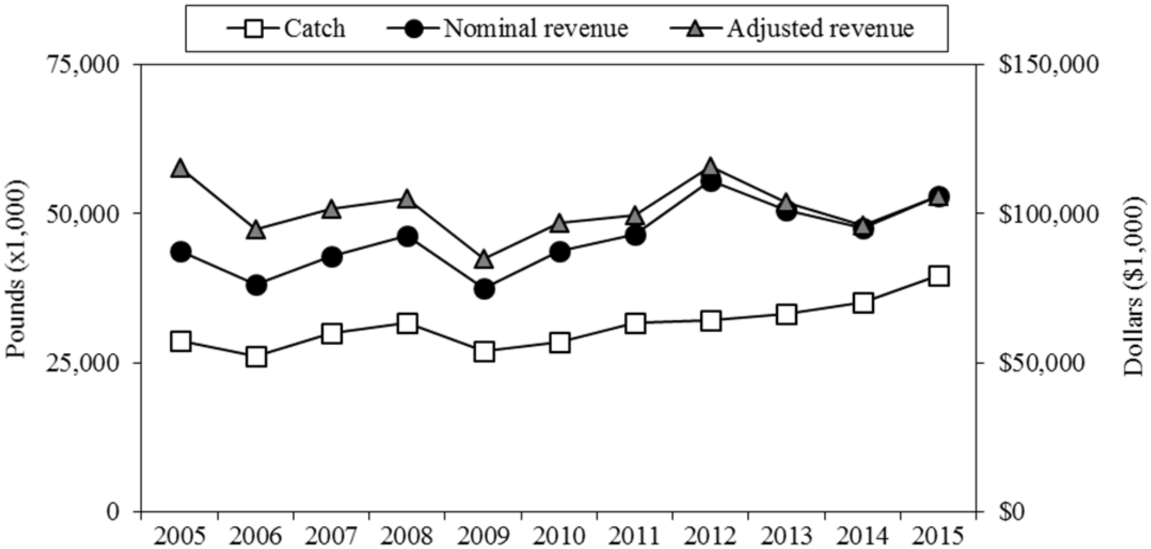
3.1.4 HAWAI`I

3.1.4.1 INTRODUCTION

3.1.4.1.1 Economic impact/contribution for commercial fisheries

Information for this section was obtained from NOAA Fisheries longline logbooks and HDAR Commercial Fish Catch and Marine Dealer data. The catch and nominal revenue values are obtained by adding the catch and revenue values for all species and all fisheries for each year. The inflation-adjusted revenue for each year is calculated by multiplying the nominal value by the Honolulu CPI for the current year and then dividing by the Honolulu CPI for that year.

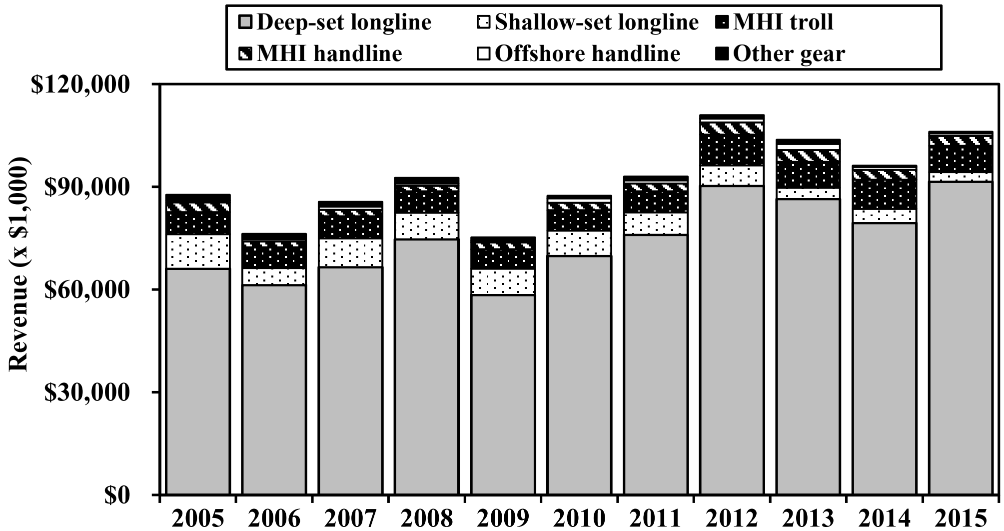
Figure 143. Hawai`i total commercial catch and revenue, 2005-2015.



Supporting data shown in Table A-125.

Catch of all fisheries combined reached a record high of 39.7 million lbs while revenue increased to $106.1 million in 2015. The trend for catch was increasing while the inflation-adjusted revenue varied with no trend during 2005 through 2015. Gear and species specific changes over the 11-year period are explained in greater detail in the following figures and tables.

Figure 144. Total commercial pelagic ex-vessel revenue by gear type, 2005-2015.



Supporting data shown in Table A-126.

Ex-vessel revenue from Hawai`i's pelagic fisheries varied during the 11-year period with a somewhat upward trend from 2009. Revenue peaked at $111 million in 2012 and was slightly lower at $106 million in 2015. The highest grossing fishery in Hawai`i was the deep-set longline which reached a record $91 million and accounted for 86 % of the total revenue in 2015. The next three largest revenue generating gear types were the MHI troll, MHI handline and shallow-set longline fisheries, respectively. Revenue by both the MHI troll and MHI handline fisheries peaked in 2012 at $9.0 million and $3.5 million in 2012, respectively. These two fisheries were higher in the latter part of the time series. In contrast, shallow-set longline revenue was highest in 2005 at $10 million then decreased gradually to a low of $2.8 million in 2015. Many shallow-set vessels fish out of California early in the swordfish season then migrate to Hawai`i later. Revenue from fish landed in California is not included in this figure. The offshore handline fishery and other gear category generated $1.3 million in 2015.

Table 49. Hawai`i commercial pelagic catch, revenue, and average price by species for the Hawai`i-permitted deep-set longline fishery, 2014-2015.

	2014			2015		
Species	Catch (1,000 lbs)	Ex-vessel value ($1,000)	Avg. Price ($/lb)	Catch (1,000 lbs)	Ex-vessel value ($1,000)	Avg. Price ($/lb)
Tuna PMUS						
Albacore	423	$817	$2.12	528	$874	$1.66
Bigeye tuna	15,657	$59,077	$3.92	19,194	$69,583	$3.83
Bluefin tuna	0	$3	$9.27	0	$4	$8.70
Skipjack tuna	411	$334	$1.02	466	$288	$0.89
Yellowfin tuna	1,407	$5,472	$3.82	1,989	$5,803	$3.01
Other tunas	0	$0	$0.00	0	$0	$0.00
Tuna PMUS Subtotal	17,898	$65,704	$3.82	22,178	$76,552	$3.66
Billfish PMUS						
Swordfish	694	$1,722	$2.57	852	$2,117	$2.54
Blue marlin	1,160	$1,204	$1.31	1,365	$1,155	$1.02
Spearfish	477	$504	$1.04	575	$524	$0.89
Striped marlin	908	$1,474	$1.45	1,066	$1,314	$1.16
Other marlins	43	$60	$1.17	33	$39	$0.90
Billfish PMUS Subtotal	3,282	$4,965	$1.58	3,891	$5,149	$1.38
Other PMUS						
Mahimahi	810	$1,625	$1.95	692	$1,837	$2.62
Ono (wahoo)	684	$1,458	$2.15	781	$1,602	$2.08
Opah (moonfish)	2,213	$2,915	$1.47	2,619	$3,157	$1.53
Oilfish	491	$400	$0.77	504	$272	$0.57
Pomfrets (monchong)	1,118	$2,259	$1.92	1,238	$2,822	$2.13
PMUS sharks	106	$104	$1.11	120	$88	$0.97
Other PMUS Subtotal	5,421	$8,761	$1.66	5,954	$9,778	$1.80
Non-PMUS pelagics	14	$13	$0.81	17	$11	$0.56
Total pelagics	26,615	$79,442	$3.10	32,039	$91,490	$3.04

Deep-set longline catch and revenue was 20% and 15% higher in 2015. The average price for the deep-set longline fishery in 2015 was slightly lower from the price in 2014. Bigeye tuna is the largest component of the catch and the most valuable species for the deep-set longline fishery and experienced the largest gains in 2015.

Table 50. Hawai`i commercial pelagic catch, revenue, and average price by species for the Hawai`i-permitted shallow-set longline fishery, 2014-2015.

	2014			2015		
Species	Catch (1,000 lbs)	Ex-vessel value ($1,000)	Avg. Price ($/lb)	Catch (1,000 lbs)	Ex-vessel value ($1,000)	Avg. Price ($/lb)
Tuna PMUS						
Albacore	12	$3	$0.84	7	$3	$1.42
Bigeye tuna	65	$170	$5.38	106	$162	$3.24
Bluefin tuna	1	$5	$7.20	0	$0	$0.00
Skipjack tuna	0	$0	$0.67	1	$0	$0.78
Yellowfin tuna	24	$106	$4.58	17	$62	$4.16
Other tunas	0	$0	$0.00	0	$0	$0.00
Tuna PMUS Subtotal	101	$283	$4.84	130	$226	$3.38
Billfish PMUS						
Swordfish	2,978	$3,677	$2.06	2,507	$2,472	$2.07
Blue marlin	19	$15	$0.78	12	$7	$0.61
Spearfish	4	$2	$1.28	3	$2	$0.69
Striped marlin	31	$43	$1.49	24	$23	$1.01
Other marlins	1	$1	$1.38	0	$0	$0.92
Billfish PMUS Subtotal	3,033	$3,738	$2.04	2,546	$2,504	$2.03
Other PMUS						
Mahimahi	45	$78	$2.25	30	$67	$2.61
Ono (wahoo)	2	$2	$1.89	1	$1	$1.31
Opah (moonfish)	28	$3	$1.17	39	$3	$1.25
Oilfish	23	$6	$0.76	20	$3	$0.39
Pomfrets (monchong)	2	$1	$1.51	1	$0	$1.52
PMUS sharks	20	$6	$1.01	24	$6	$0.69
Other PMUS Subtotal	121	$96	$1.83	115	$80	$1.79
Non-PMUS pelagics	0	$0	$0.00	0	$0	$0.00
Total pelagics	3,255	$4,117	$2.12	2,791	$2,810	$2.09

Shallow-set longline catch and revenue decreased by 14% and 32%, respectively in 2015. The average price for the shallow-set longline fisheries in 2015 was slightly lower from the price in 2014. Swordfish was the most important species in terms of catch and revenue for the shallow-set longline fishery.

The weight of catch kept is the product of the number fish kept from the NOAA Fisheries longline logbook data and the average weight calculated from the HDAR Commercial

Marine Dealer data (Amount paid/Lbs bought). The longline ex-vessel revenue was calculated by summing longline records in the HDAR Commercial Marine Dealer data for each species. The HDAR Dealer data was used to calculate average price by dividing the "Amount Paid" for longline fish sales by the "Lbs Bought". Ex-vessel revenue and average price was adjusted for inflation by dividing the current year Honolulu CPI (H-CPI) by the previous year H-CPI then multiplying the nominal revenue for that respective year.

3.2 PROTECTED SPECIES

This section of the report summarizes information on protected species interactions in fisheries managed under the Pelagic FEP. Protected species covered in this report include sea turtles, seabirds, marine mammals, sharks and corals.

Lists of species protected under the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA) that occur in the Western Pacific region and their listing status can be found online at:

- Hawai`i: http://www.fpir.noaa.gov/Library/PRD/ESA%20Consultation/Marianas_Species_List_Jan_2015.pdf

- Mariana Islands: http://www.fpir.noaa.gov/Library/PRD/ESA%20Consultation/Marianas_Species_List_Jan_2015.pdf

- American Samoa: http://www.fpir.noaa.gov/Library/PRD/ESA%20Consultation/American_Samoa_Species_List_Jan_2015.pdf

3.2.1 HAWAI`I SHALLOW-SET LONGLINE FISHERY

3.2.1.1 INDICATORS FOR MONITORING PROTECTED SPECIES INTERACTIONS AND EFFECTIVENESS OF MANAGEMENT MEASURES IN THE HAWAI`I SHALLOW-SET LONGLINE FISHERY

In this annual report, the Council monitors protected species interactions in the Hawai`i shallow-set longline fishery using the following indicators:

- General interaction trends over time

- Effectiveness of FEP conservation measures

- Take levels compared to authorized take levels under the ESA

- Take levels compared to marine mammal Potential Biological Removals (PBRs), where applicable

Details of these indicators are discussed below.

3.2.1.2 CONSERVATION MEASURES

The Pelagic FEP includes a number of conservation measures to mitigate seabird and sea turtle interactions in the shallow-set longline fishery. These measures include the following:

- Longline vessel owners/operators are required to adhere to regulations for safe handling and release of sea turtles and seabirds.

- Longline vessel owners/operators must have on board the vessel all required turtle handling/dehooking gear specified in regulations.

- Longline vessel owners/operators can choose between side-setting or stern-setting longline gear with additional regulatory specifications to reduce seabird interactions (e.g., blue-dyed bait, weighted branch lines, strategic offal discards, using a "bird curtain").

- When shallow-set longline fishing north of the Equator:

    - Use 18/0 or larger circle hooks with no more than 10° offset.

    - Use mackerel-type bait.

    - 100 percent observer coverage

    - vessel owners and operators required to annually attend protected species workshop

    - closure for remainder of year when fishery reaches annual interaction limits ("hard caps") of 26 leatherback and 34 loggerhead turtles

3.2.1.2.1 ESA Consultations

The Hawai`i shallow-set longline fishery is covered under a NMFS Biological Opinion dated January 30, 2012 and modified on May 22, 2012 (NMFS 2012). NMFS concluded that the fishery is not likely to jeopardize four sea turtle species (loggerhead, leatherback, olive ridley and green turtles) and humpback whales, and not likely to adversely affect hawksbill turtles. A USFWS Biological Opinion dated January 6, 2012 (USFWS 2012a), also concluded that the fishery is not likely to jeopardize short-tailed albatrosses. Several informal consultations conducted by NMFS have determined that the fishery is not likely to adversely affect other ESA-listed marine mammals, the Eastern Pacific distinct population segment (DPS) of scalloped hammerhead shark or Hawaiian monk seal critical habitat (Table 51).

NMFS and USFWS have issued incidental take statements (ITS) for species included in the Biological Opinions and determined that the fishery, as currently managed, does not jeopardize the ESA-listed species (Table 52). The 1-year ITSs for loggerhead and leatherback turtles is 34 and 26 (half of the 2-year ITS), respectively, and are equivalent to the hard caps and trigger closures for this fishery. Exceedance of the 2-year or 5-year ITSs requires reconsultation of the fishery under the ESA.

Table 51. Summary of ESA consultations for the Hawai`i shallow-set longline fishery.

Species	Consultation Date	Consultation Type[a]	Outcome[b]
Loggerhead turtle, North Pacific DPS	2012-01-30	BiOp	LAA, non-jeopardy
Leatherback turtle	2012-01-30	BiOp	LAA, non-jeopardy
Olive ridley turtle	2012-01-30	BiOp	LAA, non-jeopardy
Green turtle	2012-01-30	BiOp	LAA, non-jeopardy
Hawksbill turtle	2012-01-30	BiOp	NLAA
Humpback whale	2012-01-30, with corrections dated 2012-05-22	BiOp	LAA, non-jeopardy
False killer whale, MHI insular DPS	2015-03-02	LOC	NLAA
Fin whale	2015-09-16	LOC	NLAA
Blue whale	2008-08-27	LOC	NLAA
North Pacific right whale	2008-08-27	LOC	NLAA
Sei whale	2008-08-27	LOC	NLAA
Sperm whale	2008-08-27	LOC	NLAA
Hawaiian monk seal	2008-08-27	LOC	NLAA
Scalloped hammerhead shark, Eastern Pacific DPS	2015-03-02	LOC	NLAA
Short-tailed albatross	2012-01-06	BiOp (FWS)	LAA, non-jeopardy
Critical Habitat: Hawaiian monk seal	2015-09-16	LOC	NLAA

[a] BiOp = Biological Opinion; LOC = Letter of Concurrence.

[b] LAA = likely to adversely affect; NLAA = not likely to adversely affect.

Table 52. Summary of Incidental Take Statements (ITS) for the Hawai`i shallow-set longline fishery.

Species	ITS Time Period	Takes	Mortalities	Source BiOp
Loggerhead turtle (North Pacific DPS)	2-year	68	14	NMFS 2012
Leatherback turtle	2-year	52	12	NMFS 2012
Olive Ridley turtle	2-year	4	2	NMFS 2012
Green turtle	2-year	6	2	NMFS 2012
Humpback whale	2-year	4	0.80	NMFS 2012, with corrections
Short-tailed albatross	5-year	1 injury or death		USFWS 2012a

3.2.1.2.2 Non-ESA Marine Mammals

Fishery impacts to marine mammal stocks are primarily assessed and monitored through the Stock Assessment Reports (SARs) prepared pursuant to the MMPA. The SARs include detailed information on these species' geographic range, abundance, PBR estimates, bycatch estimates, and status. The most recent SARs are available online at: http://www.nmfs.noaa.gov/pr/sars/.

The Hawai`i shallow-set longline fishery is a Category II under the MMPA 2016 List of Fisheries (LOF) (81 FR 20550, April 8, 2016), meaning that this fishery has occasional incidental mortality and serious injuries of marine mammals. The 2016 LOF lists the following marine mammal stocks that are incidentally killed or injured in this fishery:

- Blainville's beaked whale, HI stock
- Bottlenose dolphin, HI Pelagic stock
- False killer whale, HI Pelagic stock
- Humpback whale, Central North Pacific stock
- Kogia spp. whale (Pygmy or dwarf sperm whale), HI stock
- Risso's dolphin, HI stock
- Short-finned pilot whale, HI stock
- Striped dolphin, HI stock

Most bycatch estimates in the SARs are based on the most recently available 5-year period, but there is a data lag of approximately 2 years due to the SAR review process. This annual report focuses on available long-term interaction trends and summarizes relevant information from the most recent SAR.

3.2.1.3 DATA SOURCE FOR MONITORING PROTECTED SPECIES INTERACTIONS IN THE HAWAI`I SHALLOW-SET LONGLINE FISHERY

Protected species interactions in the Hawai`i longline fishery have been monitored through mandatory observer coverage since 1994. Observer coverage in the Hawai`i longline fishery was between 3 and 5 percent from 1994 through 1999 and increased to 10 percent in 2000. Since 2004, the shallow-set component of the Hawai`i longline fishery has had 100 percent observer coverage. Annual observed interactions are tallied based on vessel arrival date (rather than interaction date) for the purposes of this report for consistency with the Observer Program reports.

3.2.1.4 SEA TURTLE INTERACTIONS IN THE HAWAI`I SHALLOW-SET LONGLINE FISHERY

Table 53 summarizes the incidental take data of sea turtles from 2004 to 2015 in the Hawai`i shallow-set longline fishery. Since there is full observer coverage for this fishery, all sea turtle interactions have been documented. The incidental take data in this section were compiled from the PIRO Observer Program Annual Status Reports and are for monitoring purposes. Many of these interactions have been examined further, and updated information necessary for any data analyses can be requested from the PIFSC. The incidental take data for the fourth quarter of 2007 are combined with 2008 data due to vessel confidentiality rules.

All sea turtles observed in the Hawai`i shallow-set longline fishery from 2004 to 2015 were released alive. One loggerhead in 2013 was entangled in marine debris that became entangled with fishing gear and was not counted towards the annual shallow-set interaction limit. One unidentified hard shell in 2013 was classified as a loggerhead per protocol and was counted towards the annual shallow-set interaction limit. The highest interaction rates involved both leatherback and loggerhead turtles (average takes/1,000 Hooks = 0.0063 and 0.0081, respectively), whereas interactions with greens, olive ridleys, and unidentified hard shell turtles were much more infrequent (0.0004, 0.0003, and 0.004 respectively).

There are no obvious temporal trends evident in the annual take data for sea turtles for the Hawai`i shallow-set fishery during this time range. Observed number of sea turtle takes per year was variable, ranging between 0-4 greens, 0-2 olive ridleys, 1-19 leatherbacks, 0-17 loggerheads, and 0-2 unidentified hard shell turtles. Furthermore, there have been multiple years where no interactions were observed with greens, olive ridleys, and unidentified sea turtles.

Table 53. Observed takes and takes per fishing effort (1,000 Hooks) for sea turtles in the Hawai`i shallow-set longline fishery, 2004-2015[g]

Year	Observer Coverage (%)	Sets	Hooks	Green		Leatherback		Loggerhead		Olive ridley		Unidentified hard shell	
				Takes	Takes/ 1,000 Hooks	Takes	Takes/ 1,000 Hooks	Takes	Takes/ 1,000 Hooks	Takes	Takes/ 1,000 Hooks	Takes	Takes/ 1,000 Hooks
2004	100	88	76,750	0	0.000	1	0.013	1	0.013	0	0.000	0	0.000
2005	100	1,604	1,328,806	0	0.000	8	0.006	10	0.008	0	0.000	0	0.000
2006	100	939	745,125	0	0.000	2	0.003	17c	0.023	0	0.000	2e	0.003
2007a	100	1,496	1,292,036	0	0.000	5	0.004	15	0.012	1	0.001	0	0.000
2008	100	1,487	1,350,127	1	0.001	2	0.001	0	0.000	2	0.001	0	0.000
2009	100	1,833	1,767,128	1	0.001	9	0.005	3	0.002	0	0.000	0	0.000
2010	100	1,879	1,828,529	0	0.000	7	0.004	5	0.003	0	0.000	0	0.000
2011	100	1,579	1,611,395	4	0.002	17	0.011	14	0.009	0	0.000	0	0.000
2012	100	1,307	1,418,843	0	0.000	7b	0.005	5	0.004	0	0.000	0	0.000
2013	100	912	1,000,084	0	0.000	7	0.007	5d	0.005	0	0.000	1f	0.001
2014	100	1,349	1,509,727	1	0.001	19	0.013	13	0.009	1	0.001	1	0.001
2015	100	1,178	1,286,628	0	0.000	6	0.005	15	0.012	1	0.001	0	0.000

[a] Due to vessel confidentiality rules, data for the fourth quarter in 2007 are combined with data for 2008. Take data for 2007 reflect those from first, second and third quarters.

[b] The released condition of one leatherback was unknown.

[c] The released conditions of two loggerheads were unknown.

[d] One injured loggerhead was entangled in marine debris, which became entangled with fishing gear. This loggerhead will not count toward the annual shallow-set interaction limit, but is included in this table.

[e] The released condition of one unidentified hard shell turtle was unknown.

[f] One turtle listed as an unidentified hard shell sea turtle in the Observer Program Status Report is being classified as a loggerhead per protocol for the shallow-set interaction limit and will count toward the annual shallow-set limit.

[g] Take data are based on vessel arrival dates

Sources: 2004-2015 PIRO Observer Program Annual and Quarterly Status Reports

Comparison of Interactions with ITS

The Hawai`i shallow-set longline fishery operates under ITSs in the 2012 Biological Opinion (NMFS 2012). The 1-year ITSs for leatherback and loggerhead turtle interactions in this fishery are used as a "hard cap" of interactions in a given year, in that the fishery will be closed for the remainder of the year if these numbers are reached. The 2-year ITSs are used for purposes of reinitiating consultation if these numbers are reached in any given two year time period.

NMFS began monitoring the ITS for the Hawai`i shallow-set longline fishery in Quarter 1 of 2012 and uses a rolling 2-year period to track incidental take. NMFS always uses the date of the interaction for tracking sea turtle interactions against the ITS, regardless of when the vessel returns to port. In the PIRO Observer Program Quarterly and Annual Reports, NMFS bases the percent observer coverage on vessel departures and bases sea turtle interactions on vessel arrivals. For this reason, the number of quarterly or annual sea turtle interactions counted against an ITS may vary from those reported on the Observer Program's quarterly and annual reports. NMFS uses post-hooking mortality criteria (Ryder et al. 2006) to calculate sea turtle mortality rates. Since the 2012 Biological Opinion through the end of 2015, the fishery did not exceeded the 2-year ITS for any of the species (Table 54).

Table 54. Observed interactions and estimated total mortality (using Ryder et al. 2006) of sea turtles in the Hawai`i shallow-set longline fishery compared to the 2-year ITS in the 2012 Biological Opinion

Species	2-year ITS	2-year Monitoring Period		
		2012-2013	2013-2014	2014-2015
Green				
Interactions	6	0	1	1
Total Mortalities	2	0	0.25	0.25
Leatherback				
Interactions	52	18	27	21
Total Mortalities	12	3.05	4.27	4.07
Loggerhead				
Interactions	68	12	21	28
Total Mortalities	14	0.95	2.31	2.95
Olive Ridley				
Interactions	4	0	1	2
Total Mortalities	2	0	0.05	0.15

[a] Interactions are counted based on capture date

Effectiveness of FEP Conservation Measures

As of the end of 2015, the fishery has not reached the current hard cap (26 leatherback and 34 loggerhead turtles) for either species since they were revised based on the 2012 Biological Opinion ITSs. From 2004-2012, the shallow-set fishery operated under hard caps of 17 loggerhead turtles and 16 leatherback turtles (except in 2010 when the loggerhead hard cap was 46 under Pelagic FEP Amendment 18; later returned to 17 loggerheads due to litigation). The fishery reached the loggerhead hard cap in 2006 and leatherback hard cap in 2011.

Management measures in the Hawai`i shallow-set longline fishery have been effective in reducing the number of sea turtle interactions. The introduction of sea turtle bycatch-reduction measures for the fishery in 2004, such as switching from J-hooks to circle hooks and squid bait to mackerel bait, resulted in an 89% decrease in sea turtle interactions in 2004-2006 compared to interactions observed in 1994-2002 (Gilman et al. 2007). The rate of deeply hooked sea turtles, which is thought to result in higher mortality levels, also declined after these measures were implemented (Gilman et al. 2007).

3.2.1.5 MARINE MAMMAL INTERACTIONS IN THE HAWAI`I SHALLOW-SET LONGLINE FISHERY

Table 55 through Table 59 summarize the incidental take data of marine mammals from 2004 to 2015 in the Hawai`i shallow-set longline fishery. Since there is full observer coverage for this fishery, all marine mammal interactions have been documented. The incidental take data in this section were compiled from the PIRO Observer Program Annual Status Reports and are for monitoring purposes. Reported interactions listed in these tables reflect all observed interactions, including mortalities, serious injuries, and non-serious injuries. Refer to the most recent SARs for mortality and serious injury estimates and stock-specific estimates of interactions. Many of these interactions have been examined further, and updated information necessary for any data analyses can be requested from the PIFSC. The incidental take data for the fourth quarter of 2007 are combined with 2008 data due to vessel confidentiality rules.

The majority of observed interactions and all mortalities during this time period involved smaller dolphin species (Table 55). Of these species, Risso's dolphins had the highest rate of interactions (average takes/1,000 Hooks = 0.0022), followed by bottlenose dolphins (0.0011), striped dolphins (0.0003), common dolphins (0.0001) and only one take of a rough-toothed dolphin. Marine mammals grouped as small whales (Table 56) and large whales (Table 57) had comparatively lower rates of interactions than most smaller dolphin species. For small whales, false killer whales had the highest interaction rate (0.0003), and there was only one take each of a Blainville's beaked whale in 2011, a pygmy sperm whale in 2008 and a ginkgo-tooth beaked whale in 2015. In the large whale group, humpback whales had the highest rate of interactions (0.0002) and there was only one take each of a Bryde's whale in 2005 and a fin whale in 2015. Observed interactions with unidentified cetacean groups are shown in Table 58.

Interactions with Northern elephant seals, unidentified pinnipeds and unidentified sea lions have been observed since 2013 (Table 59). A total of five interactions with unidentified pinnipeds and sea lions were observed in 2015, all of which were taken outside of the EEZ offshore of California.

There are no obvious temporal trends evident in the annual take data of each species of marine mammal for the Hawai`i shallow-set fishery during this time range. For most species, interactions were relatively infrequent and thus, appeared random. However, interactions with Risso's dolphins and bottlenose dolphins were more frequent, but fluctuations in the number of interactions from year to year do not suggest a clear trend for either species over time.

takes, mortalities (M), and takes per fishing effort (1,000 Hooks) for dolphins in the Hawai`i shallow-set longline fishery, 2004-2015

Sets	Hooks	Bottlenose dolphin		Risso's dolphin		Rough-toothed dolphin		Short-beaked common dolphin		Striped dolphin	
		Takes (M)	Takes/ 1,000 Hooks	Takes (M)	Takes/ 1,000 Hooks	Takes (M)	Takes/ 1,000 Hooks	Takes (M)	Takes/ 1,000 Hooks	Takes (M)	Takes/ 1,000 Hooks
88	76,750	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
1,604	1,328,806	0	0.000	1	0.001	0	0.000	0	0.000	0	0.000
939	745,125	1	0.001	2(1)	0.003	0	0.000	0	0.000	0	0.000
1,496	1,292,036	3	0.002	3	0.002	0	0.000	0	0.000	0	0.000
1,487	1,350,127	0	0.000	4(1)	0.003	0	0.000	0	0.000	1	0.001
1,833	1,767,128	0	0.000	3	0.002	0	0.000	0	0.000	0	0.000
1,879	1,828,529	2	0.001	7(1)	0.004	0	0.000	0	0.000	2(1)	0.001
1,579	1,611,395	2	0.001	4	0.002	0	0.000	1[b]	0.001	0	0.000
1,307	1,418,843	1	0.001	0	0.000	0	0.000	0	0.000	1	0.001
912	1,000,084	2(1)	0.002	3	0.003	1(1)	0.001	0	0.000	0	0.000
1,349	1,509,727	4	0.003	6(2)	0.004	0	0.000	1	0.001	2	0.001
1,178	1,286,628	2	0.002	3(2)	0.002	0	0.000	0	0.000	0	0.000

lity rules, data for the fourth quarter in 2007 are combined with data for 2008. Take data for 2007 reflect those from first, second and

ly a common dolphin in the Observer Program Status Report.

ssel arrival dates.

Observer Program Annual and Quarterly Status Reports

Table 56. Observed takes, mortalities (M), and takes per fishing effort (1,000 Hooks) small whales in the Hawai`i shallow-set longline fishery, 2004-2015

Year	Observer Coverage (%)	Sets	Hooks	Blainville's beaked whale		False killer whale		Pygmy sperm whale		Ginkgo-too beaked wh	
				Takes (M)	Takes/ 1,000 Hooks	Takes (M)	Takes/ 1,000 Hooks	Takes (M)	Takes/ 1,000 Hooks	Takes (M)	Ta 1 H
2004	100	88	76,750	0	0.000	0	0.000	0	0.000	0	0
2005	100	1,604	1,328,806	0	0.000	0	0.000	0	0.000	0	0
2006	100	939	745,125	0	0.000	0	0.000	0	0.000	0	0
2007[a]	100	1,496	1,292,036	0	0.000	0	0.000	0	0.000	0	0
2008	100	1,487	1,350,127	0	0.000	1	0.001	1	0.001	0	0
2009	100	1,833	1,767,128	0	0.000	1	0.001	0	0.000	0	0
2010	100	1,879	1,828,529	0	0.000	0	0.000	0	0.000	0	0
2011	100	1,579	1,611,395	1	0.001	1	0.001	0	0.000	0	0
2012	100	1,307	1,418,843	0	0.000	1	0.001	0	0.000	0	0
2013	100	912	1,000,084	0	0.000	0	0.000	0	0.000	0	0
2014	100	1,349	1,509,727	0	0.000	1	0.001	0	0.000	0	0
2015	100	1,178	1,286,628	0	0.000	0	0.000	0	0.000	1	0

[a] Due to vessel confidentiality rules, data for the fourth quarter in 2007 are combined with data for 2008. Ta data for 2007 reflect those from first, second and third quarters.

[b] Take data are based on vessel arrival dates.

Sources: 2004-2015 PIRO Observer Program Annual and Quarterly Status Reports

Table 57. Observed takes, mortalities (M), and takes per fishing effort (1,000 Hooks) for large whales in the Hawai`i shallow-set longline fishery, 2004-2015.

Year	Observer Coverage (%)	Sets	Hooks	Bryde's whale		Humpback whale		Fin whale	
				Takes (M)	Takes/1,000 Hooks	Takes (M)	Takes/1,000 Hooks	Takes (M)	Takes/1,000 Hooks
2004	100	88	76,750	0	0.000	0	0.000	0	0.000
2005	100	1,604	1,328,806	1	0.001	0	0.000	0	0.000
2006	100	939	745,125	0	0.000	1	0.001	0	0.000
2007[a]	100	1,496	1,292,036	0	0.000	0	0.000	0	0.000
2008	100	1,487	1,350,127	0	0.000	1	0.001	0	0.000
2009	100	1,833	1,767,128	0	0.000	0	0.000	0	0.000
2010	100	1,879	1,828,529	0	0.000	0	0.000	0	0.000
2011	100	1,579	1,611,395	0	0.000	1	0.001	0	0.000
2012	100	1,307	1,418,843	0	0.000	0	0.000	0	0.000
2013	100	912	1,000,084	0	0.000	0	0.000	0	0.000
2014	100	1,349	1,509,727	0	0.000	0	0.000	0	0.000
2015	100	1,178	1,286,628	0	0.000	1	0.001	1	0.001

[a] Due to vessel confidentiality rules, data for the fourth quarter in 2007 are combined with data for 2008. Take data for 2007 reflect those from first, second and third quarters.

[b] Take data are based on vessel arrival dates.

Source: 2004-2015 PIRO Observer Program Annual and Quarterly Status Reports

Table 58. Observed takes, mortalities (M), and takes per fishing effort (1,000 Hooks) for unidentified dolphins, beaked whales, whales, and cetaceans in the Hawai`i shallow-set longline fishery, 2004-2015

Year	Observer Coverage (%)	Sets	Hooks	Unidentified dolphin[b]		Unidentified beaked whale		Unidentified whale[b]		Unidentified cetacean[b]	
				Takes (M)	Takes/ 1,000 Hooks	Takes (M)	Takes/ 1,000 Hooks	Takes (M)	Takes/ 1,000 Hooks	Takes (M)	Takes/ 1,000 Hooks
2004	100	88	76,750	0	0.000	0	0.000	0	0.000	0	0.000
2005	100	1,604	1,328,806	0	0.000	0	0.000	1	0.001	0	0.000
2006	100	939	745,125	0	0.000	0	0.000	0	0.000	0	0.000
2007[a]	100	1,496	1,292,036	0	0.000	0	0.000	0	0.000	0	0.000
2008	100	1,487	1,350,127	0	0.000	0	0.000	1	0.001	0	0.000
2009	100	1,833	1,767,128	0	0.000	0	0.000	1	0.001	0	0.000
2010	100	1,879	1,828,529	1	0.001	0	0.000	0	0.000	0	0.000
2011	100	1,579	1,611,395	0	0.000	1	0.001	0	0.000	2	0.001
2012	100	1,307	1,418,843	0	0.000	0	0.000	0	0.000	1	0.001
2013	100	912	1,000,084	0	0.000	2	0.002	0	0.000	0	0.000
2014	100	1,349	1,509,727	0	0.000	0	0.000	0	0.000	0	0.000
2015	100	1,178	1,286,628	0	0.000	0	0.000	0	0.000	0	0.000

[a] Due to vessel confidentiality rules, data for the fourth quarter in 2007 are combined with data for 2008. Take data for 2007 reflect those from first, second and third quarters.

[b] Unidentified species identification based on PIRO Observer Program classifications. Unidentified cetacean refers to a marine mammal not including pinnipeds (seal or sea lion); unidentified whale refers to a large whale; unidentified dolphin refers to a small cetacean with a visible beak; and unidentified beaked whale refers to an animal in the Ziphiidae family. Further classifications based on observer description, sketches, photos and videos may be available from the PIFSC.

[c] Take data are based on vessel arrival dates.

Source: 2004-2015 PIRO Observer Program Annual and Quarterly Status Reports

Table 59. Observed takes, mortalities (M), and takes per fishing effort (1,000 Hooks) for pinnipeds in the Hawai`i shallow-set longline fishery, 2004-2015.

Year	Observer Coverage (%)	Sets	Hooks	Northern elephant seal		Unidentified pinniped		Unidentified sea lion	
				Takes (M)	Takes/1,000 Hooks	Takes (M)	Takes/1,000 Hooks	Takes (M)	Takes/1,000 Hooks
2004	100	88	76,750	0	0.000	0	0.000	0	0.000
2005	100	1,604	1,328,806	0	0.000	0	0.000	0	0.000
2006	100	939	745,125	0	0.000	0	0.000	0	0.000
2007[a]	100	1,496	1,292,036	0	0.000	0	0.000	0	0.000
2008	100	1,487	1,350,127	0	0.000	0	0.000	0	0.000
2009	100	1,833	1,767,128	0	0.000	0	0.000	0	0.000
2010	100	1,879	1,828,529	0	0.000	0	0.000	0	0.000
2011	100	1,579	1,611,395	0	0.000	0	0.000	0	0.000
2012	100	1,307	1,418,843	0	0.000	0	0.000	0	0.000
2013	100	912	1,000,084	1	0.001	0	0.000	0	0.000
2014	100	1,349	1,509,727	1	0.001	0	0.000	1	0.001
2015	100	1,178	1,286,628	0	0.000	3[b]	0.002	2[b]	0.002

[a] Due to vessel confidentiality rules, data for the fourth quarter in 2007 are combined with data for 2008. Take data for 2007 reflect those from first, second and third quarters.

[b] The interactions with these pinnipeds and sea lions occurred off the California coast, outside the EEZ, while fishing under the Hawai`i Longline Permit.

[c] Take data are based on vessel arrival dates.

Source: 2004-2015 PIRO Observer Program Annual and Quarterly Status Reports

Comparison of Interactions with ITS

The Hawai`i shallow-set longline fishery operates under the ITS in the 2012 Biological Opinion in regards to humpback whale interactions. The 1-year ITS for humpback whales is 2 interactions and 0.40 mortalities, and the 2-year ITS is 4 interactions and 0.80 mortalities.

NMFS began monitoring the ITS for the Hawai`i shallow-set longline fishery in Quarter 1 of 2012 and uses a rolling 2-year period to track incidental take. NMFS always uses the date of the interaction for tracking marine mammal interactions against the ITS, regardless of when the vessel returns to port. In the PIRO Observer Program Quarterly and Annual Reports, NMFS bases the percent observer coverage on vessel departures and bases marine mammal interactions on vessel arrivals. For this reason, the number of quarterly or annual marine mammal interactions counted against an ITS may vary from those reported on the Observer Program's quarterly and annual reports. NMFS uses M&SI determinations under the MMPA to calculate marine mammal mortality rates. Since the 2012 Biological Opinion through the end of 2015, the fishery did not exceed the 2-year ITS for humpback whales (Table 60).

Table 60. Observed interactions and estimated total mortality of humpback whales in the Hawai`i shallow-set longline fishery compared to the 2-year ITS in the 2012 Biological Opinion. Interactions are counted based on capture date.

Species	2-year ITS	2-year Monitoring Period		
		2012-2013	2013-2014	2014-2015
Humpback whale				
Interactions	4	0	0	1
Total Mortalities	0.8	0	0	TBD[b]

[a] Interactions are counted based on capture date.

[b] TBD: To Be Determined. M&SI estimate is pending

Comparison of Interactions with PBR under the MMPA

Marine mammal takes against the PBR are monitored through the SARs. A summary of the current mean annual M&SI and the PBR for stocks relevant to the Hawai`i shallow-set longline fishery is presented in Table 61. The PBR of a stock reflects only marine mammals of that stock observed within the EEZ around Hawai`i, with the exception of the Central North Pacific stock of humpback whales for which PBR applies to the entire stock. The mean annual M&SI specified in the SARs includes only interactions determined as mortalities and serious injuries; it does not include interactions classified as non-serious injuries. The shallow-set longline fishery has not had an observed interaction with a short-finned pilot whale, but a mean annual M&SI is estimated for the Hawai`i stock based on a proration of unidentified blackfish interactions.

For marine mammal stocks where the PBR is available, the mean annual M&SI for the shallow-set longline fishery inside the EEZ around Hawai`i is well below the corresponding PBR in the time period covered by the current SAR (Table 61).

Table 61. Summary of mean annual mortality and serious injury (M&SI) and potential biological removal (PBR) by marine mammal stocks with observed interactions in the Hawai`i shallow-set longline fishery

Stock	Years Included in 2015 SAR	Outside EEZ[a]	Inside EEZ	
		Mean Annual M&SI	Mean Annual M&SI	PBR (Inside EEZ only)[c]
Bottlenose dolphin, HI Pelagic	2007-2011	1.2	0.2	38
Risso's dolphin, HI	2007-2011	3.6	0	42
Rough-toothed dolphin, HI	2007-2011	0	0	46
Striped dolphin, HI	2007-2011	0.6	0	154
Blainville's beaked whale, HI	2007-2011	0	0	11
False killer whale, HI Pelagic	2009-2013	0.14	0.27	9.43
Short-finned pilot whale, HI	2007-2011	0.1	0	70
Kogia spp. whale (Pygmy or dwarf sperm whale), HI	2007-2011	Pygmy = 0 Dwarf = 0	Pygmy = 0 Dwarf = 0	undetermined
Humpback whale, Central North Pacific	2009-2013	0.2[b]		83[b]
Fin whale, HI	2007-2011	0	0	0.1

[a] PBR estimates are not available for portions of the stock outside of the U.S EEZ around Hawai`i, except for the Central North Pacific stock of humpback whales for which PBR applies to the entire stock.

[b] PBR for the Central North Pacific stock for humpback whales apply to the entire stock.

[c] PBR estimates for Hawai`i stocks are only available for portions of the stock within the U.S. EEZ around Hawai`i.

Source: SARs 2015.

3.2.1.6 SEABIRD INTERACTIONS IN THE HAWAI`I SHALLOW-SET LONGLINE FISHERY

Table 62 summarizes the incidental take data of seabirds from 2004 to 2015 in the Hawai`i shallow-set longline fishery. Since there is full observer coverage for this fishery, all seabird interactions have been documented. The incidental take data in this section were compiled from the PIRO Observer Program Annual Status Reports and are for monitoring purposes. Many of these interactions have been examined further, and updated information necessary for any data analyses can be requested from the PIFSC. The incidental take data for the fourth quarter of 2007 are combined with 2008 data due to vessel confidentiality rules.

Interaction data provided here may vary slightly from other sources depending on how interactions were reported (date of trip departure or arrival, set date, or haul date in a given year). NMFS annually publishes the report Seabird Interactions and Mitigation Efforts in Hawai`i Longline Fisheries (Seabird Annual Report), which includes verified numbers of seabird interactions and information on fishing regulations and effort, interaction rates, and band recovery data for seabirds caught in the shallow-set and deep-set fisheries. Refer to the Seabird Annual Reports for more detailed information on seabird interactions in the Hawai`i longline fishery. The reports are available at: http://www.fpir.noaa.gov/SFD/SFD_seabirds.html.

The large majority of observed interactions and all mortalities during this time period involved Laysan albatross (average takes/1,000 hooks = 0.0309) and black-footed albatross (0.0146). There were also four interactions with unidentified shearwaters (0.0003) and one northern fulmar, all of which were released injured. The unidentified shearwaters have been identified as sooty shearwaters (NMFS 2016). There were no observed takes of short-tailed albatross by this fishery. The table suggests a marginal increase in takes of black-footed albatross after 2008, however no such trend is apparent for Laysan albatross.

Table 62. Observed takes, mortalities (M), and takes per fishing effort (1,000 Hooks) for seabirds in the Hawai`i shallow-set longline fishery, 2004-2015.

Year	Observer Coverage (%)	Sets	Hooks	Laysan Albatross		Black-footed Albatross		Northern fulmar		Unidentified shearwater		Short-tailed Albatross
				Takes (M)	Takes/ 1,000 Hooks	Takes (M)	Takes/ 1,000 Hooks	Takes (M)	Takes/ 1,000 Hooks	Takes (M)	Takes/ 1,000 Hooks	Takes (M)
2004	100	88	76,750	1	0.013	0	0.000	0	0.000	0	0.000	0
2005	100	1,604	1,328,806	62(18)	0.047	7(4)	0.005	0	0.000	0	0.000	0
2006	100	939	745,125	8(3)	0.011	3(3)	0.004	0	0.000	0	0.000	0
2007[a]	100	1,496	1,292,036	39(6)	0.030	8(2)	0.006	0	0.000	0	0.000	0
2008	100	1,487	1,350,127	33(11)	0.024	6(4)	0.004	0	0.000	0	0.000	0
2009	100	1,833	1,767,128	81(17)	0.046	29(7)	0.016	0	0.000	1[b]	0.001	0
2010	100	1,879	1,828,529	40(7)	0.022	39(11)	0.021	1	0.001	0	0.000	0
2011	100	1,579	1,611,395	49(10)	0.030	19(5)	0.012	0	0.000	0	0.000	0
2012	100	1,307	1,418,843	61(11)	0.043	37(10)	0.026	0	0.000	0	0.000	0
2013	100	912	1,000,084	46(10)	0.046	28(17)	0.028	0	0.000	2[b]	0.002	0
2014	100	1,349	1,509,727	36(2)	0.024	29(14)	0.019	0	0.000	1[b]	0.001	0
2015	100	1,178	1,286,628	45(6)	0.035	41(10)	0.032	0	0.000	0	0.000	0

[a] Due to vessel confidentiality rules, data for the fourth quarter in 2007 are combined with data for 2008. Take data for 2007 reflect those from first, second and third quarters.

[b] Identified as sooty shearwaters in the 2014 Seabird Annual Report.

[c] Take data are based on vessel arrival dates.

Sources: 2004-2015 PIRO Observer Program Annual and Quarterly Status Reports

Comparison of Interactions with ITS

The short-tailed albatross ITS in the USFWS 2012 Biological Opinion for the Hawai`i longline fishery is 1 incidental take every 5 years in the shallow-set fishery. Exceeding this number will lead to reinitiating consultation of the impact of this fishery on the species. Since there have been no observed takes of short-tailed albatross in the fishery, the ITS has not been exceeded as of the end of 2015.

3.2.1.7 SCALLOPED HAMMERHEAD SHARK INTERACTIONS IN THE HAWAI`I SHALLOW-SET LONGLINE FISHERY

There have been no recorded or observed take of scalloped hammerhead sharks in the range of the Eastern Pacific DPS in the shallow-set fishery. Based on the known range and likely occurrence for the Eastern Pacific DPS, it is unlikely that these sharks occur in the area where shallow-set fishing occurs.

3.2.2 HAWAI`I DEEP-SET LONGLINE FISHERY

3.2.2.1 INDICATORS FOR MONITORING PROTECTED SPECIES INTERACTIONS AND EFFECTIVENESS OF MANAGEMENT MEASURES IN THE HAWAI`I DEEP-SET LONGLINE FISHERY

In this annual report, the Council monitors protected species interactions in the Hawai`i deep-set longline fishery using the following indicators:

- General interaction trends over time
- Effectiveness of FEP conservation measures
- Take levels compared to authorized take levels under ESA
- Take levels compared to marine mammal PBRs, where applicable

Details of these indicators are discussed below.

3.2.2.1.1 Conservation Measures

The Pelagic FEP includes a number of conservation measures to mitigate seabird and sea turtle interactions in the deep-set longline fishery. These measures include the following:

- Longline vessel owners/operators are required to adhere to regulations for safe handling and release of sea turtles and seabirds.
- Longline vessel owners/operators must have on board the vessel all required turtle handling/dehooking gear specified in regulations.
- Deep-set fishing operations north of 23º N latitude are required to comply with seabird mitigation regulations, which include choosing between side-setting or stern-setting longline gear with additional regulatory specifications (e.g., blue-dyed bait, weighted branch lines, strategic offal discards, using a “bird curtain”).
- The fishery is observed at a minimum of 20 percent coverage.
- Vessel owners and operators are required to annually attend a protected species workshop.

3.2.2.1.2 ESA Consultations

The Hawai`i deep-set longline fishery is covered under a NMFS Biological Opinion dated September 19, 2014 (NMFS 2014). NMFS concluded that the fishery is not likely to jeopardize four sea turtle species (North Pacific DPS loggerhead, leatherback, olive ridley and green turtles), three marine mammal species (humpback whale, sperm whale and MHI insular DPS false killer whale) and the Indo-West Pacific DPS of scalloped hammerhead sharks, and not likely to adversely affect hawksbill turtles, four marine mammal species (blue, North Pacific right and sei whale, and Hawaiian monk seal) and the Eastern Pacific DPS of scalloped hammerhead sharks (Table 63). A USFWS Biological Opinion dated January 6, 2012, also concluded that the fishery is not likely to jeopardize short-tailed albatrosses (USFWS 2012a). An additional informal consultation dated September 16, 2015 concluded that the fishery is not likely to adversely affect fin whales or Hawaiian monk seal critical habitat.

NMFS and USFWS have issued ITSs for species included in the Biological Opinions and determined not to jeopardize the species (Table 64). Exceedance of the 3-year or 5-year ITSs requires reconsultation of the fishery under the ESA. The ITSs for green turtle and loggerhead turtles were exceeded in 2015 and the ITS for olive ridley turtle was exceeded during the first quarter of 2016, and NMFS will reinitiate consultation.

Table 63. Summary of ESA consultations for the Hawai`i deep-set longline fishery.

Species	Consultation Date	Consultation Type[a]	Outcome[b]
Loggerhead turtle, North Pacific DPS	2014-09-19	BiOp	LAA, non-jeopardy
Leatherback turtle	2014-09-19	BiOp	LAA, non-jeopardy
Olive ridley turtle	2014-09-19	BiOp	LAA, non-jeopardy
Green turtle	2014-09-19	BiOp	LAA, non-jeopardy
Hawksbill turtle	2014-09-19	BiOp	NLAA
Humpback whale	2014-09-19	BiOp	LAA, non-jeopardy
False killer whale, MHI insular DPS	2014-09-19	BiOp	LAA, non-jeopardy
Fin whale	2015-09-16	LOC	NLAA
Blue whale	2014-09-19	BiOp	NLAA
North Pacific right whale	2014-09-19	BiOp	NLAA
Sei whale	2014-09-19	BiOp	NLAA
Sperm whale	2014-09-19	BiOp	LAA, non-jeopardy
Hawaiian monk seal	2014-09-19	BiOp	NLAA
Scalloped hammerhead shark, Eastern Pacific DPS	2014-09-19	BiOp	NLAA
Scalloped hammerhead shark, Indo-West Pacific DPS	2014-09-19	BiOp	LAA, non-jeopardy
Short-tailed albatross	2012-01-06	BiOp (FWS)	LAA, non-jeopardy
Critical Habitat: Hawaiian monk seal	2015-09-16	LOC	NLAA

[a] BiOp = Biological Opinion; LOC = Letter of Concurrence.

[b] LAA = likely to adversely affect; NLAA = not likely to adversely affect.

Table 64. Summary of ITSs for the Hawai`i deep-set longline fishery.

Species	ITS Time Period	Takes	Mortalities	Source BiOp
Loggerhead turtle (North Pacific DPS)	3-year	9	9	NMFS 2014
Leatherback turtle	3-year	72	27	NMFS 2014
Olive Ridley turtle	3-year	99	96	NMFS 2014
Green turtle	3-year	9	9	NMFS 2014
Humpback whale	3-year	6	3	NMFS 2014
Sperm whale	3-year	9	6	NMFS 2014
False killer whale (MHI insular DPS)	3-year	1	0.74	NMFS 2014
Scalloped hammerhead shark (Indo-West Pacific DPS)[a]	3-year	6	3	NMFS 2014
Short-tailed albatross	5-year	2 injury or death		FWS 2012

[a] An ITS is not required for the Indo-West Pacific DPS of scalloped hammerhead sharks due to the lack of take prohibition under ESA section 4(d), but NMFS included an ITS to serve as a check on the no-jeopardy conclusion by providing a reinitiation trigger.

3.2.2.1.3 Non-ESA Marine Mammals

Fishery impacts to marine mammal stocks are primarily assessed and monitored through the SARs prepared pursuant to the MMPA. The SARs include detailed information on these species' geographic range, abundance, PBR estimates, bycatch estimates, and status. The most SARs are available online at: http://www.nmfs.noaa.gov/pr/sars/.

The Hawai`i deep-set longline fishery is a Category I under the MMPA 2016 List of Fisheries (LOF) (81 FR 20550, April 8, 2016), meaning that NMFS has determined that this fishery has frequent incidental mortality and serious injuries of marine mammals. The 2016 LOF lists the following marine mammal stocks that are incidentally killed or injured in this fishery:

- Bottlenose dolphin, HI Pelagic stock
- False killer whale, MHI Insular stock (also ESA-listed)
- False killer whale, HI Pelagic stock
- False killer whale, NWHI stock
- Pantropical spotted dolphin, HI stock
- Risso's dolphin, HI stock
- Short-finned pilot whale, HI stock
- Sperm whale, HI stock (also ESA-listed)
- Striped dolphin, HI stock

Most bycatch estimates in the SARs are based on the most recently available 5-year period, but there is a data lag of approximately 2 years due to the SAR review process. This annual report focuses on available long-term interaction trends and summarizes relevant information from the most recent SAR.

3.2.2.2 DATA SOURCE FOR MONITORING PROTECTED SPECIES INTERACTIONS IN THE HAWAI`I DEEP-SET LONGLINE FISHERY

Protected species interactions in the Hawai`i longline fishery have been monitored through mandatory observer coverage since 1994. Observer coverage in the Hawai`i longline fishery was between 3 and 5 percent from 1994 through 1999, increased to 10 percent in 2000, then to 20 percent in 2001. This report summarizes protected species interactions in the Hawai`i deep-set longline fishery since 2002, when separate reporting by deep-set and shallow-set components of the longline fishery began. Annual observed interactions are tallied based on vessel arrival date (rather than interaction date) for the purposes of this report for consistency with the Observer Program reports.

3.2.2.3 SEA TURTLE INTERACTIONS IN THE HAWAI`I DEEP-SET LONGLINE FISHERY

Table 65 summarizes the incidental take data of sea turtles from 2002 to 2015 in the Hawai`i deep-set longline fishery. Observer coverage on vessels operating in this fishery ranged from 20.3% to 26.1%. The incidental take data in this section were compiled from the PIRO Observer Program Annual Status Reports and are for monitoring purposes. Many of these interactions have been examined further, and updated information necessary for any data analyses can be requested from the PIFSC. Observed take data are expanded to represent the estimated number of incidental takes for the entire fishery by PIFSC (referred to in this document as "McCracken estimates (ME)." When ME were not available, a standard expansion factor estimate was used (EF Est. = 100/% observer coverage * # takes).

Using the expanded estimates, the average annual numbers of incidental takes during this time period were 3 greens, 11 leatherbacks, 4 loggerheads, and 33 olive ridleys. The highest interaction rates involved olive ridley sea turtles (2002-2015 average takes/1,000 Hooks = 0.0009), whereas interactions with leatherbacks, greens, and loggerheads were much more infrequent (0.0003, <0.0001, and <0.0001 respectively).

Observed sea turtle takes year to year were variable, ranging between 0-3 greens (0-15 expanded estimates), 1-7 leatherbacks (4-38), 0-4 loggerheads (0-17), and 3-13 olive ridleys (10-63). Furthermore, there have been multiple years where no interactions were observed with greens and loggerheads.

Preliminary results from an analysis conducted by PIFSC and presented to the Scientific and Statistical Committee at its 122nd Meeting in March 2016 showed that leatherback interactions in 2014 were significantly higher than levels expected from previous years (2007-2013). The higher level of interactions in 2014 was considered in the 2014 Biological Opinion, which concluded that the fishery is not likely to jeopardize leatherback turtles. Leatherback interactions since the 2014 Biological Opinion remain below the ITS of 72 interactions over three years. The Council at its 165th Meeting in March 2016 recommended continued monitoring of the interactions and further analysis to evaluate patterns of leatherback interactions in the Hawai`i deep-set longline fishery.

takes, mortalities (M), takes per fishing effort (1,000 Hooks), and estimated annual takes using expansion EF Est. = 100/% observer coverage * # of takes) and ME for sea turtles in the Hawai`i deep-set longline fishery, 2002-2015.

	Green				Leatherback				Loggerhead				Olive ridley			
	Observed				Observed				Observed				Observed			
oks	Takes (M)	Takes/1,000 Hooks	EF Est.	ME	Takes (M)	Takes/1,000 Hooks	EF Est.	ME	Takes (M)	Takes/1,000 Hooks	EF Est.	ME	Takes (M)	Takes/1,000 Hooks	EF Est.	ME
,303	1(1)	0.0001	-	3	2	0.0003	-	5	4(1)	0.0006	-	17	7(7)	0.0010	-	31
,221	0	0.0000	-	0	1(1)	0.0002	-	4	0	0.0000	-	0	3(3)	0.0005	-	14
,681	1(1)	0.0001	-	5	3	0.0004	-	15	0	0.0000	-	0	13(13)	0.0016	-	46
,671	0	0.0000	-	0	1	0.0001	-	4	0	0.0000	-	0	4(4)	0.0004	-	16
,286	2(2)	0.0003	-	6	2(2)	0.0003	-	9	0	0.0000	-	0	11(10)	0.0015	-	54
,083	0	0.0000	-	0	2	0.0003	-	4	1(1)	0.0001	-	7	7(7)	0.0009	-	26
,951	0	0.0000	-	0	1	0.0001	-	11	0	0.0000	-	0	3(3)	0.0003	-	18
,861	0	0.0000	-	0	1(1)	0.0001	-	4	0	0.0000	-	0	4(4)	0.0005	-	18
,127	1(1)	0.0001	-	1	1(1)	0.0001	-	6	1(1)	0.0001	-	6	4(3)[a]	0.0005	-	10
,092	1(1)	0.0001	-	5	3	0.0004	-	14	0	0.0000	-	0	7(6)	0.0008	-	36
,728	0	0.0000	-	0	1(1)	0.0001	-	6	0	0.0000	-	0	6(6)	0.0007	-	34
,133	1(1)	0.0001	-	5	3	0.0001	-	15	2(2)	0.0002	-	11	9(9)	0.0010	-	42
,244	3(3)	0.0003	-	15	7(2)	0.0007	-	38	0	0.0000	-	0	8(7)	0.0008	-	49
,234	1(1)	0.0003	5	-	4(2)	0.0004	19	-	2(2)	0.0002	10	-	13(12)	0.0014	63	-

eraction (released injured) occurred inside the American Samoa EEZ. This interaction was included in the Observer Program Annual p-set fishery because the vessel departed Honolulu under the Hawai`i longline permit.

essel arrival dates.

-2015 PIRO Observer Program Annual and Quarterly Status Reports

02-2003 — NMFS, 2005.

IcCracken, 2006; McCracken, 2007; McCracken, 2008; McCracken, 2009; McCracken, 2010; McCracken, 2011b; McCracken, 2012; ken, 2014; McCracken, 2016

Comparison of Interactions with ITS

The Hawai`i deep-set longline fishery operates under the 3-year ITS in the 2014 Biological Opinion in regards to all species of sea turtles (Table 66). NMFS began monitoring the Hawai`i deep-set longline ITS in Quarter 3 of 2014 and uses a rolling 3-year period to track incidental take. NMFS always uses the date of the interaction for tracking sea turtle interactions against the ITS, regardless of when the vessel returns to port. In the PIRO Observer Program Quarterly and Annual Reports, NMFS bases the percent observer coverage on vessel departures and bases sea turtle interactions on vessel arrivals. For this reason, the number of quarterly or annual sea turtle interactions counted against an ITS may vary from those reported on the Observer Program's quarterly and annual reports. NMFS uses post-hooking mortality criteria (Ryder et al. 2006) to calculate sea turtle mortality rates.

Unlike the shallow-set fishery, the deep-set fishery does not have hard caps and the ITS is used to reinitiate consultation when exceeded. The ITSs for loggerhead and green turtles were exceeded during the fourth quarter of 2015 and the ITS for olive ridley turtle was exceed during the first quarter of 2016. Reconsultation for these species is underway.

Table 66. Estimated total interactions (extrapolated using quarterly observer coverage) and total mortalities (using Ryder et al. 2006) of sea turtles in the Hawai`i deep-set longline fishery from 2014 third quarter to 2015 fourth quarter compared to the 3-year ITS in the 2014 Biological Opinion.

Species	3-year ITS	Estimated Total Interactions and Mortalities from Q3 2014 to Q4 2015
Green		
Interactions	9	10.3
Total Mortalities	9	9.7
Leatherback		
Interactions	72	24.2
Total Mortalities	27	8.6
Loggerhead		
Interactions	9	10.3
Total Mortalities	9	8.0
Olive Ridley		
Interactions	99	85.5
Total Mortalities	96	81.0

[a] Interactions are counted based on capture date.

3.2.2.4 MARINE MAMMAL INTERACTIONS IN THE HAWAI`I DEEP-SET LONGLINE FISHERY

Table 67 through Table 70 summarize the incidental take data of marine mammals from 2002 to 2015 in the Hawai`i deep-set longline fishery. Observer coverage on vessels operating in this fishery ranged from 20.3% to 26.1%. The incidental take data in this section were compiled from the PIRO Observer Program Annual Status Reports and are for monitoring purposes. Reported interactions listed in these tables reflect all observed interactions, including mortalities, serious injuries, and non-serious injuries. Refer to the most recent SARs for mortality and serious injury estimates and stock-specific abundance estimates and geographic range. Many of these interactions have been examined further, and updated information necessary for any data analyses can be requested from the PIFSC. Observed take data are expanded to represent the estimated number of annual incidental takes for the entire fishery by PIFSC (referred to in this document as "ME"). When ME were not available, a standard expansion factor estimate was listed in the table (EF Est. = 100/% observer coverage * # takes).

The majority of observed interactions and all observed mortalities during this time period involved dolphin and small whale species (Table 67, Table 68). False killer whales had the highest interaction rate over the 2002-2015 period (average takes/1,000 Hooks = 0.0006), followed by short-finned pilot whales (<0.0001), bottlenose dolphins (<0.0001) and Risso's dolphins (<0.0001). Very few interactions were observed with striped dolphins, pantropical spotted dolphins, rough-toothed dolphins, Blainville's beaked whales, pygmy killer whale, and *Kogia* species whale. Interactions with marine mammals grouped as large whales were also rare, with observed interactions recorded with humpback whales and a sperm whale (Table 69). Observed interactions with unidentified cetacean groups are shown in Table 70.

There are no obvious temporal trends evident in the observed annual take data of each species of marine mammal for the Hawai`i deep-set fishery during this time range. For most species, interactions were rare, only being observed once or twice during the 2002-2015 period. Observed interactions with false killer whales were more frequent, but fluctuations in the number of interactions (ranging between 6 and 55 expanded annual estimated takes) do not suggest a clear trend for this species over time. There was also variability in expanded annual estimated takes of bottlenose dolphins (0-11 takes), Risso's dolphins (0-10 takes), and short-finned pilot whales (0-6 takes).

Table 67. Observed takes, mortalities (M), takes per fishing effort (1,000 Hooks), and estimated annual takes using expansion factor estimates (EFE = 100/% observer coverage * # of takes) and ME for dolphins in the Hawai`i deep-set longline fishery, 2002-2015.

				Bottlenose dolphin				Pantropical spotted dolphin				Rough-toothed dolphin				Risso's dolphin				Striped dolphin			
				Observed				Observed				Observed				Observed				Observed			
Year	Obs. Cov. (%)	Sets	Hooks	Takes (M)	Takes/ 1,000 Hooks	EF Est.	ME	Takes (M)	Takes/ 1,000 Hooks	EF Est.	ME	Takes (M)	Takes/ 1,000 Hooks	EF Est.	ME	Takes (M)	Takes/ 1,000 Hooks	EF Est.	ME	Takes (M)	Takes/ 1,000 Hooks	EF Est.	ME
2002	24.6	3,523	6,786,303	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-
2003	22.2	3,204	6,442,221	1(1)	0.0002	5	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-
2004	24.6	3,958	7,900,681	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	0	-	0	0.0000	-	0	0	0.0000	0	-
2005	26.1	4,602	9,360,671	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	0	-	1	0.0001	-	3	0	0.0000	0	-
2006	21.2	3,605	7,540,286	1	0.0001	-	1	0	0.0000	-	0	0	0.0000	0	-	2	0.0003	-	5	1(1)	0.0001	-	6
2007	20.1	3,506	7,620,083	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	0	-	1(1)	0.0001	-	3	0	0.0000	-	0
2008	21.7	3,915	8,775,951	0	0.0000	-	0	1(1)	0.0001	-	3	0	0.0000	0	-	1	0.0001	-	2	0	0.0000	-	0
2009	20.6	3,520	7,877,861	1	0.0001	-	5	0	0.0000	-	0	0	0.0000	0	-	0	0.0000	-	0	0	0.0000	-	0
2010	21.1	3,580	8,184,127	1	0.0001	-	4	0	0.0000	-	0	0	0.0000	-	0	1	0.0001	-	3	0	0.0000	-	0
2011	20.3	3,540	8,260,092	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0	1(1)	0.0001	-	4
2012	20.4	3,659	8,768,728	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0
2013	20.4	3,830	9,278,133	2(1)	0.0002	-	11	0	0.0000	-	0	1(1)	0.0001	-	5	0	0.0000	-	0	0	0.0000	-	0
2014	20.8	3,831	9,608,244	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0
2015	20.6	3,728	9,393,234	0	0.0000	0	-	0	0.0000	-	-	0	0.0000	0	-	2(1)	0.0002	10	-	0	0.0000	0	-

[a] Take data are based on vessel arrival dates.

Sources: Take data—2002-2015 PIRO Observer Program Annual and Quarterly Status Reports

ME—McCracken, 2005; McCracken, 2006; McCracken, 2011a; McCracken, 2016.

Table 68. Observed takes, mortalities (M), takes per fishing effort (1,000 Hooks), and estimated annual takes using expansion factor estimates (EFE = 100/% observer coverage * # of takes) and ME for small whales in the Hawai`i deep-set longline fishery, 2002-2015.

				Blainville's beaked whale				False killer whale				*Kogia* species				Pygmy killer whale				Short-finned pilot whale			
				Observed				Observed				Observed				Observed				Observed			
Year	Obs. Cov. (%)	Sets	Hooks	Takes (M)	Takes/ 1,000 Hooks	EF Est.	ME	Takes (M)	Takes/ 1,000 Hooks	EF Est.	ME	Takes (M)	Takes/ 1,000 Hooks	EF Est.	ME	Takes (M)	Takes/ 1,000 Hooks	EF Est.	ME	Takes (M)	Takes/ 1,000 Hooks	EF Est.	ME
2002	24.6	3,523	6,786,303	1(1)	0.0001	4	-	5	0.0007	20	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-
2003	22.2	3,204	6,442,221	0	0.0000	0	-	2	0.0003	9	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-
2004	24.6	3,958	7,900,681	0	0.0000	-	0	6(1)	0.0008	-	28	0	0.0000	0	-	0	0.0000	0	-	1	0.0001	-	3
2005	26.1	4,602	9,360,671	1	0.0001	-	6	2(1)	0.0002	-	6	0	0.0000	0	-	0	0.0000	0	-	1	0.0001	-	6
2006	21.2	3,605	7,540,286	0	0.0000	-	0	4	0.0005	-	17	0	0.0000	0	-	0	0.0000	0	-	2	0.0003	-	6
2007	20.1	3,506	7,620,083	0	0.0000	-	0	4	0.0005	-	15	0	0.0000	0	-	0	0.0000	0	-	1	0.0001	-	2
2008	21.7	3,915	8,775,951	0	0.0000	-	0	3	0.0003	-	11	0	0.0000	0	-	0	0.0000	0	-	3	0.0003	-	5
2009	20.6	3,520	7,877,861	0	0.0000	-	0	10(1)	0.0013	-	55	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	-	0
2010	21.1	3,580	8,184,127	0	0.0000	-	0	4	0.0005	-	19	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0
2011	20.3	3,540	8,260,092	0	0.0000	-	0	3	0.0004	-	10	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0
2012	20.4	3,659	8,768,728	0	0.0000	-	0	3	0.0003	-	15	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0
2013	20.4	3,830	9,278,133	0	0.0000	-	0	4	0.0004	-	22	0	0.0000	-	0	1(1)	0.0001	-	5	1(1)	0.0001	-	4
2014	20.8	3,831	9,608,244	0	0.0000	-	0	11	0.0011	-	53	1	0.0001	-	10	0	0.0000	-	0	0	0.0000	-	0
2015	20.6	3,728	9,393,234	0	0.0000	0	-	5(1)	0.0005	24	-	0	0.0000	0	-	0	0.0000	0	-	1	0.0001	5	-

[a] Take data are based on vessel arrival dates.

Sources: Take data—2002-2015 PIRO Observer Program Annual and Quarterly Status Reports

ME—McCracken, 2005; McCracken, 2006; McCracken, 2011a; McCracken, 2016.

Table 69. Observed takes, takes per fishing effort (1,000 Hooks), and estimated annual takes using expansion factor estimates (EF Est. = 100/% observer coverage * # of takes) and ME for large whales in the Hawai`i deep-set longline fishery, 2002-2015.

Year	Obs. Cov. (%)	Sets	Hooks	Humpback whale				Sperm whale			
				Observed		EF Est.	ME	Observed		EF Est.	ME
				Takes	Takes/1,000 Hooks			Takes	Takes/1,000 Hooks		
2002	24.6	3,523	6,786,303	1	0.0001	4	-	0	0.0000	0	-
2003	22.2	3,204	6,442,221	0	0.0000	0	-	0	0.0000	0	-
2004	24.6	3,958	7,900,681	1	0.0001	-	6	0	0.0000	-	0
2005	26.1	4,602	9,360,671	0	0.0000	-	0	0	0.0000	-	0
2006	21.2	3,605	7,540,286	0	0.0000	-	0	0	0.0000	0	-
2007	20.1	3,506	7,620,083	0	0.0000	-	0	0	0.0000	0	-
2008	21.7	3,915	8,775,951	0	0.0000	-	0	0	0.0000	0	-
2009	20.6	3,520	7,877,861	0	0.0000	-	0	0	0.0000	0	-
2010	21.1	3,580	8,184,127	0	0.0000	-	0	0	0.0000	-	0
2011	20.3	3,540	8,260,092	0	0.0000	-	0	1	0.0001	-	6
2012	20.4	3,659	8,768,728	0	0.0000	-	0	0	0.0000	-	0
2013	20.4	3,830	9,278,133	0	0.0000	-	0	0	0.0000	-	0
2014	20.8	3,831	9,608,244	1	0.0001	-	5	0	0.0000	-	0
2015	20.6	3,728	9,393,234	0	0.0000	0	-	0	0.0000	0	-

[a] Take data are based on vessel arrival dates.

Sources: Take data—2002-2015 PIRO Observer Program Annual and Quarterly Status Reports

ME—McCracken, 2005; McCracken, 2006; McCracken, 2011a; McCracken, 2016.

Table 70. Observed takes, takes per fishing effort (1,000 Hooks), and estimated annual takes using expansion factor estimates (EF Est. = 100/% observer coverage * # of takes) for unidentified species of cetaceans in the Hawai`i deep-set longline fishery, 2002-2015.

Year	Obs. Cov. (%)	Sets	Hooks	Unidentified cetacean[a]			Unidentified whale[a]			Unidentified dolphin[a]		
				Observed			Observed			Observed		
				Takes	Takes/ 1,000 Hooks	EF Est.	Takes	Takes/ 1,000 Hooks	EF Est.	Takes	Takes/ 1,000 Hooks	EF Est.
2002	24.6	3,523	6,786,303	2	0.0003	8	0	0.0000	0	0	0.0000	0
2003	22.2	3,204	6,442,221	1	0.0002	5	1	0.0002	5	0	0.0000	0
2004	24.6	3,958	7,900,681	0	0.0000	0	0	0.0000	0	0	0.0000	0
2005	26.1	4,602	9,360,671	1	0.0001	4	0	0.0000	0	0	0.0000	0
2006	21.2	3,605	7,540,286	0	0.0000	0	2	0.0003	9	2	0.0003	9
2007	20.1	3,506	7,620,083	1	0.0001	5	0	0.0000	0	1	0.0001	5
2008	21.7	3,915	8,775,951	2	0.0002	9	2	0.0002	9	0	0.0000	0
2009	20.6	3,520	7,877,861	0	0.0000	0	3	0.0004	15	0	0.0000	0
2010	21.1	3,580	8,184,127	0	0.0000	0	3	0.0004	14	0	0.0000	0
2011	20.3	3,540	8,260,092	2	0.0002	10	0	0.0000	0	0	0.0000	0
2012	20.4	3,659	8,768,728	2	0.0002	10	0	0.0000	0	0	0.0000	0
2013	20.4	3,830	9,278,133	2	0.0002	10	0	0.0000	0	0	0.0000	0
2014	20.8	3,831	9,608,244	2	0.0002	10	0	0.0000	0	0	0.0000	0
2015	20.6	3,728	9,393,234	1	0.0001	5	0	0.0000	0	1	0.0001	5

[a] Unidentified species identification based on PIRO Observer Program classifications. Unidentified cetacean refers to a marine mammal not including pinnipeds (seal or sea lion); unidentified whale refers to a large whale; and unidentified dolphin refers to a small cetacean with a visible beak. Further classifications based on observer description, sketches, photos and videos may be available from the Pacific Islands Fisheries Science Center.

[b] Take data are based on vessel arrival dates.

Sources: Take data—2002-2015 PIRO Observer Program Annual and Quarterly Status Reports

Comparison of Interactions with ITS

The Hawai`i deep-set longline fishery operates under the 3-year ITS in the 2014 Biological Opinion in regards to all marine mammals protected under the ESA, which includes humpback whales, sperm whales, and the MHI insular DPS of false killer whales (Table 71). NMFS began monitoring the Hawai`i deep-set longline fishery ITS in Quarter 3 of 2014 and uses a rolling 3-year period to track incidental take. NMFS always uses the date of the interaction for tracking marine mammal interactions against the ITS, regardless of when the vessel returns to port. In the PIRO Observer Program Quarterly and Annual Reports, NMFS bases the percent observer coverage on vessel departures and bases the marine mammal interactions on vessel arrivals. For this reason, the number of quarterly or annual marine mammal interactions counted against an ITS may vary from those reported on the Observer Program's quarterly and annual reports. NMFS uses M&SI determinations under the MMPA to calculate marine mammal mortality rates. Take for these three species are still under the 3-year ITS at this time.

Table 71. Estimated total interactions (extrapolated using quarterly observer coverage) and total mortalities of cetaceans in the Hawai`i deep-set longline fishery compared to the 3-year ITS in the 2014 Biological Opinion

Species	3-year ITS	Estimated Total Interactions and Mortalities from Q3 2014 to Q4 2015[a]
Humpback whale		
Interactions	6	5
Total Mortalities	3	TBD[b]
Sperm whale		
Interactions	9	0
Total Mortalities	3	0
MHI insular false killer whale		
Interactions	1	0
Total Mortalities	0.74	0

[a] Interactions are counted based on capture date.

[b] TBD: To Be Determined. M&SI estimate is pending

Comparison of Interactions with PBR under the MMPA

Marine mammal takes against the PBR are monitored through the SARs. A summary of the current mean estimated annual M&SI and the PBR for stocks relevant to the Hawai`i shallow-set longline fishery is presented in Table 72 and Table 73. The PBR of a stock reflects only marine mammals of that stock observed within the EEZ around Hawai`i, with the exception of the Central North Pacific stock of humpback whales for which PBR applies to the entire stock. The mean estimated annual M&SI specified in the SARs includes only interactions determined as mortalities and serious injuries; it does not include interactions classified as non-serious injuries.

For most marine mammal stocks where the PBR is available, the number of observed takes of marine mammal species in the deep-set longline fishery inside the EEZ around Hawai`i is well below the PBR in the time period covered by the most current SAR (Table 72).

The M&SI interactions inside the Hawai`i EEZ for the MHI Insular and HI Pelagic stocks of false killer whales in 2009-2013 exceeded the PBR for these stocks (Table 73). A False Killer Whale Take Reduction Team was formed in 2010 pursuant to the MMPA to address incidental takes of false killer whales in the Hawai`i-permitted longline fisheries. NMFS implemented the False Killer Whale Take Reduction Plan in 2012. The objective of the plan is to reduce mortality and serious injury of false killer whales in the Hawai`i-permitted longline fisheries. Monitoring of false killer whale interactions in the MHI Insular and HI Pelagic stocks is ongoing under the False Killer Whale Take Reduction Plan.

Table 72. Summary of mean estimated annual mortality and serious injury (M&SI) and PBR by marine mammal stocks with observed interactions in the Hawai`i deep-set longline fishery.

Stock	Years Included in 2015 SAR	Outside EEZ[a]	Inside EEZ[c]	
		Mean Estimated Annual M&SI	Mean Estimated Annual M&SI	PBR (Inside EEZ only)
Bottlenose dolphin, HI Pelagic	2007-2011	1.9	0	38
Pantropical spotted dolphin, HI Pelagic	2007-2011	0.6	0	115
Rough-toothed dolphin, HI	2007-2011	0	0	46
Risso's dolphin, HI	2007-2011	0.9	0.6	42
Striped dolphin, HI	2007-2011	0.8	0	154
Blainville's beaked whale, HI	2007-2011	0	0	11
Kogia spp. whale (Pygmy or dwarf sperm whale), HI	2007-2011	Pygmy = 0 Dwarf = 0	Pygmy = 0 Dwarf = 0	undetermined
Short-finned pilot whale, HI	2007-2011	1.0	0.1	70
Humpback whale, Central North Pacific	2009-2013	0		83[b]
Sperm whale, HI	2007-2011	0	0.7	10.2

[a] PBR estimates are not available for portions of the stock outside of the U.S EEZ around Hawai`i, except for the Central North Pacific stock of humpback whales for which PBR applies to the entire stock.

[b] PBR for the Central North Pacific stock for humpback whales apply to the entire stock.

[c] PBR estimates are only available for portions of the stock within the U.S. EEZ around Hawai`i

Source: SARs 2015

Table 73. Summary of mean estimated annual M&SI and PBR for false killer whale stocks with observed or prorated interactions in the Hawai`i deep-set longline fishery.

False Killer Whale Stock	Years Included in 2015 SAR	Outside EEZ[a]	Inside EEZ	
		Mean Estimated Annual M&SI	Mean Estimated Annual M&SI	PBR (Inside EEZ only)
MHI Insular	2009-2013	-	0.15	0.18
HI Pelagic	2009-2013	11.29	10.85	9.3
NWHI	2009-2013	-	0.49	2.3
Palmyra Atoll	2006-2010	-	0.3	6.4

[a] PBR estimates are not available for portions of the stock outside of the U.S EEZ around Hawai`i and Palmyra Atoll.

[b] PBR estimates are only available for portions of the stock within the U.S. EEZ around Hawai`i and Palmyra Atoll.

Source: SARs 2015

3.2.2.5 SEABIRD INTERACTIONS IN THE HAWAI`I DEEP-SET LONGLINE FISHERY

The incidental take data in this section were compiled from the PIRO Observer Program Annual Status Reports and are for monitoring purposes. Many of these interactions have been examined further, and updated information necessary for any data analyses can be requested from the PIFSC. Observed take data are expanded to represent the estimated number of annual incidental takes for the entire fishery by PIFSC (referred to in this document as "ME"). When ME were not available, a standard expansion factor estimate was listed in the table (EF Est. = 100/% observer coverage * # takes).

Interaction data provided here may vary slightly from other sources depending on how interactions were reported (date of trip departure or arrival, set date, or haul date in a given year). NMFS annually publishes the report *Seabird Interactions and Mitigation Efforts in Hawai`i Longline Fisheries* (Seabird Annual Report), which includes verified numbers of seabird interactions and information on fishing regulations and effort, interaction rates, and band recovery data for seabirds caught in the shallow-set and deep-set fisheries. Refer to the Seabird Annual Reports for more detailed information on seabird interactions in the Hawai`i longline fishery. The reports are available at: http://www.fpir.noaa.gov/SFD/SFD_seabirds.html.

Table 74 summarizes the incidental take data of seabirds from 2002 to 2015 in the Hawai`i deep-set longline fishery. Observer coverage on vessels operating in this fishery ranged from 20.3% to 26.1%. The large majority of observed interactions during this time period involved Laysan albatross (average takes/1,000 Hooks = 0.0026) and black-footed albatross (0.0033). Additional seabird takes were observed with unidentified shearwaters (0.0003), sooty shearwaters (<0.0001), brown booby (<0.0001) and red-footed booby (<0.0001). Most of the unidentified shearwaters have been identified as sooty shearwater (NMFS 2016). There were no observed takes of short-tailed albatross by this fishery.

Expanded annual estimated takes suggested a high degree of variability from year to year, ranging between 7 and 236 for Laysan albatross, 16 and 519 for black-footed albatross, and 0 and 62 for unidentified shearwaters. Interactions with black-footed albatross in 2015 were substantially higher compared to previous years. Interactions with sooty shearwaters and boobies were relatively infrequent.

Results from an analysis of seabird interaction rates in the Hawai`i deep-set longline fishery (Gilman et al. 2016) was presented to the Protected Species Advisory Committee and Pelagic Plan Team. The analysis included data from October 2004 to May 2014. Results indicate that seabird interaction rates significantly increased as annual mean multivariate ENSO index values increased, meaning that decreasing ocean productivity may have contributed to the increasing trend in seabird catch rates. The analysis also showed a significant increasing trend in the number of albatrosses attending vessels, which may also be contributing to the increasing seabird catch rates. Both side setting and blue-dyed bait significantly reduced the seabird catch rate compared to stern setting and untreated bait, respectively. Of two options for meeting regulatory requirements, side setting had a significantly lower seabird catch rate than blue-dyed bait.

Table 74. Observed takes, mortalities (M), takes per fishing effort (sets and 1,000 Hooks), and estimated annual takes using expansion factor estimates (EF Est. = 100/% observer coverage * # of takes) and ME for seabirds in the Hawai`i deep-set longline fishery, 2002-2015.

				Laysan albatross				Black-footed albatross				Booby species				Sooty shearwater			Unidentified shearwater				Short-tailed albatross
				Observed				Observed				Observed				Observed			Observed				Observed
Year	Obs. Cov. (%)	Sets	Hooks	Takes (M)	Takes/ 1,000 Hooks	EF Est.	ME	Takes (M)	Takes/ 1,000 Hooks	EF Est.	ME	Takes (M)	Takes/ 1,000 Hooks	EF Est.	ME	Takes (M)	Takes/ 1,000 Hooks	EF Est.	Takes (M)	Takes/ 1,000 Hooks	EF Est.	ME	Takes (M)
2002	24.6	3,523	6,786,303	16(13)	0.002	65	-	18(17)	0.003	73	-	0	0.000	0	-	0	0.000	0	0	0.000	0	-	0
2003	22.2	3,204	6,442,221	44(44)	0.007	198	-	24(23)	0.004	108	-	0	0.000	0	-	0	0.000	0	0	0.000	0	-	0
2004	24.6	3,958	7,900,681	2(2)	0.000	-	10	4(4)	0.001	-	16	0	0.000	0	-	0	0.000	0	2(2)	0.000	8	-	0
2005	26.1	4,602	9,360,671	6(6)	0.001	-	43	12(12)	0.001	-	82	1(1)[b]	0.000	4	-	0	0.000	0	0	0.000	0	-	0
2006	21.2	3,605	7,540,286	1(1)	0.000	-	7	17(17)	0.002	-	70	0	0.000	0	-	3(3)	0.000	14	2(2)	0.000	9	-	0
2007	20.1	3,506	7,620,083	7(7)	0.001	-	44	14(14)	0.002	-	77	0	0.000	0	-	0	0.000	0	0	0.000	0	-	0
2008	21.7	3,915	8,775,951	14(13)	0.002	-	55	34(33)	0.004	-	118	1[c]	0.000	-	4	0	0.000	0	14(14)	0.002	-	62	0
2009	20.6	3,520	7,877,861	18(18)	0.002	-	60	23(23)	0.003	-	110	0	0.000	-	0	0	0.000	0	4(4)	0.001	-	24	0
2010	21.1	3,580	8,184,127	39(38)	0.005	-	155	17(17)	0.002	-	65	0	0.000	-	0	0	0.000	0	1(1)	0.000	-	0	0
2011	20.3	3,540	8,260,092	32(31)	0.004	-	187	13(12)	0.002	-	73	0	0.000	-	0	0	0.000	0	3(3)	0.000	-	19	0
2012	20.4	3,659	8,768,728	30(25)	0.003	-	136	35(35)	0.004	-	167	0	0.000	-	0	1(1)	0.000	5	6(6)	0.001	-	36	0
2013	20.4	3,830	9,278,133	48(46)	0.005	-	236	50(47)	0.005	-	257	0	0.000	-	0	0	0.000	0	8(8)	0.001	-	43	0
2014	20.8	3,831	9,608,244	13(10)	0.001	-	73	32(29)	0.003	-	177	0	0.000	-	0	0	0.000	0	1(1)	0.000	-	7	0
2015	20.6	3,728	9,393,234	24(22)	0.003	117	-	107(92)	0.011	519	-	1(1)[c]	0.000	5	-	5(4)	0.001	5	0	0.000	0	-	0

[a] One *unidentified seabird* was released injured in the second quarter of 2008 (takes/1,000 Hooks = 0.000, ME = 2).

[b] This animal was identified as a brown booby on the 2005 PIRO Observer Program Annual and Quarterly Status reports.

[c] This animal was identified as a red-footed booby on the 2008 PIRO Observer Program Annual and Quarterly Status reports.

[d] Take data are based on vessel arrival dates.

Sources: Take data—2002-2015 PIRO Observer Program Annual and Quarterly Status Reports

ME—McCracken, 2005; McCracken, 2006; McCracken, 2007; McCracken, 2008; McCracken, 2009; McCracken, 2010; McCracken, 2011b; McCracken, 2012; McCracken, 2013; McCracken, 2014

Comparison of Interactions with ITS

The short-tailed albatross ITS in the USFWS 2012 Biological Opinion for the Hawai`i longline fishery is two incidental take every five years in the deep-set fishery. Exceeding this number will lead to reinitiating consultation of the impact of this fishery on the species. Since there have been no observed takes of short-tailed albatross in the fishery, the ITS has not been exceeded as of the end of 2015.

3.2.2.6 SCALLOPED HAMMERHEAD SHARK INTERACTIONS IN THE HAWAI`I DEEP-SET LONGLINE FISHERY

Table 75 summarizes the incidental take data for the Indo-west Pacific DPS of scalloped hammerhead shark in the Hawai`i deep-set longline fishery. The data only include interactions that occurred within the range of the Indo-west Pacific DPS, and do not include interactions occurred within the range of the Central Pacific DPS, which is not listed under the ESA.

Three observed interactions with the Indo-west Pacific DPS of scalloped hammerhead shark have been recorded since 2004. Estimates of total interaction for the fleet are only available using the expansion factor calculations.

The 2014 Biological Opinion includes a three-year ITS of 6 takes from the Indo-west Pacific DPS of scalloped hammerhead shark. NMFS began monitoring the Hawai`i deep-set longline fishery ITS in Quarter 3 of 2014 and uses a rolling three-year period to track incidental take. NMFS counts takes for the Indo-west Pacific DPS of scalloped hammerhead shark based on the end of haul incidental take date. NMFS uses data from condition at time of release to calculate shark mortality rates. Interactions since the third quarter of 2014 are monitored against this ITS, and there has been no observed interaction with this DPS through the end of 2015.

Table 75. Observed and estimated interactions with Indo-west Pacific DPS of scalloped hammerhead sharks in the Hawai`i deep-set longline fishery, 2004-2015.

Year	Observed	Observer coverage (%)	Expansion factor[a]	Estimated interactions[b]
2004	2	24.6	4.07	9
2005	0	26.1	3.83	0
2006	0	21.2	4.72	0
2007	1	20.1	4.98	5
2008	0	21.7	4.61	0
2009	0	20.6	4.85	0
2010	0	21.1	4.74	0
2011	0	20.3	4.93	0
2012	0	20.4	4.9	0
2013	0	20.4	4.9	0
2014	0	20.8	4.81	0
2015	0	20.6	4.85	0

[a] 100 ÷ observer coverage. E.g., for 2008, 100/21.70 = 4.61.

[b] (Observed interactions) x (Expansion factor). E.g., for 2010, 1(4.74) = 5.

Source: NMFS 2014 (2004-2013 data), NMFS unpublished (2014-2015 data)

3.2.3 AMERICAN SAMOA LONGLINE FISHERY

3.2.3.1 INDICATORS FOR MONITORING PROTECTED SPECIES INTERACTIONS AND EFFECTIVENESS OF MANAGEMENT MEASURES IN THE AMERICAN SAMOA LONGLINE FISHERY

In this annual report, the Council monitors protected species interactions in the Hawai`i deep-set longline fishery using the following indicators:

- General interaction trends over time
- Effectiveness of FEP conservation measures
- Take levels compared to authorized take levels under ESA

Take levels compared to marine mammal PBRs, where applicable

Details of these indicators are discussed below.

3.2.3.1.1 FEP Conservation Measures

The Pelagic FEP includes conservation measures to mitigate sea turtle interactions in the American Samoa longline fishery. These measures include the following:

- Longline vessel owners/operators are required to adhere to regulations for safe handling and release of sea turtles and seabirds.

- Longline vessel owners/operators must have on board the vessel all required turtle handling/dehooking gear specified in regulations.
- Owners and operators of vessels longer than 40 ft (12.2 m) must use longline gear that is configured according to the following requirements:
    - Each float line must be at least 30 m long.
    - At least 15 branch lines must be attached to the mainline between any two float lines attached to the mainline.
    - Each branch line must be at least 10 m long.
    - No branch line may be attached to the mainline closer than 70 m to any float line.
    - No more than 10 swordfish may be possessed or landed during a single fishing trip.

Additionally, the American Samoa longline fishery has had observer coverage since 2006, with coverage rate of approximately 20 percent or higher since 2010. Longline vessel owners and operators are also required to annually attend a protected species workshop.

3.2.3.1.2 ESA Consultations

The American Samoa longline fishery is covered under a NMFS Biological Opinion dated October 30, 2015 (NMFS 2015). NMFS concluded that the fishery is not likely to jeopardize five sea turtle species (South Pacific DPS loggerhead, leatherback, olive ridley, green and hawksbill turtles) and the Indo-West Pacific DPS of scalloped hammerhead sharks, and not likely to adversely affect six species of reef-building corals (Table 76). Several informal consultations conducted by NMFS and FWS have concluded that the fishery is not likely to adversely affect two marine mammal species or the Newell’s shearwater. NMFS has also determined that the fishery has no effect on three marine mammal species or three petrel species.

NMFS and USFWS have issued ITS for species included in the Biological Opinions and determined not to jeopardize the species (Table 77). Exceeding the three-year ITSs requires reconsultation of the fishery under the ESA.

Table 76. Summary of ESA consultations for the American Samoa longline fishery.

Species	Consultation Date	Consultation Type[a]	Outcome[b]
Loggerhead turtle, South Pacific DPS	2015-10-30	BiOp	LAA, non-jeopardy
Leatherback turtle	2015-10-30	BiOp	LAA, non-jeopardy
Olive ridley turtle	2015-10-30	BiOp	LAA, non-jeopardy
Green turtle	2015-10-30	BiOp	LAA, non-jeopardy
Hawksbill turtle	2015-10-30	BiOp	LAA, non-jeopardy
Humpback whale	2010-07-27	LOC	NLAA
Fin whale	2010-05-12	No Effects Memo	No effect
Blue whale	2010-05-12	No Effects Memo	No effect
Sei whale	2010-05-12	No Effects Memo	No effect
Sperm whale	2010-07-27	LOC	NLAA
Scalloped hammerhead shark, Indo-West Pacific DPS	2015-10-30	BiOp	LAA, non-jeopardy
Reef-building corals	2015-10-30	BiOp	NLAA
Newell's shearwater	2011-05-19	LOC (FWS)	NLAA
Chatham petrel	2011-07-29	No Effects Memo	No effect
Fiji petrel	2011-07-29	No Effects Memo	No effect
Magenta petrel	2011-07-29	No Effects Memo	No effect

[a] BiOp = Biological Opinion; LOC = Letter of Concurrence.

[b] LAA = likely to adversely affect; NLAA = not likely to adversely affect.

Table 77. Summary of ITS for the American Samoa longline fishery.

Species	ITS Time Period	Takes	Mortalities	Source BiOp
Loggerhead turtle (South Pacific DPS)	3-year	6	3	NMFS 2015
Leatherback turtle	3-year	69	49	NMFS 2015
Olive Ridley turtle	3-year	33	10	NMFS 2015
Green turtle	3-year	60	54	NMFS 2015
Hawksbill turtle	3-year	6	3	NMFS 2015
Scalloped hammerhead shark (Indo-West Pacific DPS)[a]	3-year	36	12	NMFS 2015

[a] An ITS is not required for the Indo-West Pacific DPS of scalloped hammerhead sharks due to the lack of take prohibition under ESA section 4(d), but NMFS included an ITS to serve as a check on the no-jeopardy conclusion by providing a re-initiation trigger.

3.2.3.1.3 Non-ESA Marine Mammals

Fishery impacts to marine mammal stocks are primarily assessed and monitored through the SARs prepared pursuant to the MMPA. The SARs include detailed information on these species' geographic range, abundance, PBR estimates, bycatch estimates, and status. The most recent SARs are available online at: http://www.nmfs.noaa.gov/pr/sars/.

The American Samoa longline fishery is a Category II under the MMPA 2016 LOF (81 FR 20550, April 8, 2016), meaning that this fishery has occasional incidental mortality and serious injuries of marine mammals. The 2016 LOF lists the following marine mammal stocks that are incidentally killed or injured in this fishery:

- Bottlenose dolphin, unknown stock
- Cuvier's beaked whale, unknown stock
- False killer whale, American Samoa stock
- Rough-toothed dolphin, American Samoa stock
- Short-finned pilot whale, unknown stock

Most bycatch estimates in the SARs are based on the most recently available 5-year period, but there is a data lag of approximately two years due to the SAR review process. This annual report focuses on available long-term interaction trends and summarizes relevant information from the most recent SAR.

3.2.3.2 DATA SOURCE FOR MONITORING PROTECTED SPECIES INTERACTIONS IN THE AMERICAN SAMOA LONGLINE FISHERY

Protected species interactions in the American longline fishery have been monitored through mandatory observer coverage since 2006. Observer coverage in the fishery ranged between 6 and 8 percent from 2006-2009, increased to 25 percent in 2010 and 33 percent in 2011. Coverage has been consistently around 20 percent since 2012. This report summarizes protected species interactions in the American Samoa longline fishery since 2006. Annual observed interactions are tallied based on vessel arrival date (rather than interaction date) for the purpose of this report for consistency with the Observer Program reports.

3.2.3.3 SEA TURTLE INTERACTIONS IN THE AMERICAN SAMOA LONGLINE FISHERY

Table 78 summarizes the incidental take data of sea turtles from 2006 to 2015 in the American Samoa longline fishery. Observer coverage on vessels operating in this fishery ranged from 6.4% to 33.3%, with higher coverage starting in 2010 and becoming consistent around 20% since 2012. The incidental take data in this section were compiled from the PIRO Observer Program Annual Status Reports and are for monitoring purposes. Many of these interactions have been examined further, and updated information necessary for any data analyses can be requested from the PIFSC. Observed take data were expanded to represent the estimated number of incidental takes for the entire fishery using a standard expansion factor estimate (EF Est. = 100/% observer coverage * # takes) except for years for which ME are available.

Between 2006 and 2015, the PIRO Observer Program reported interactions with green, leatherback and olive ridley sea turtles, but no observed interactions were reported with loggerhead sea turtles. The highest interaction rates involved green sea turtles (2006-2015 average takes/1,000 Hooks = 0.0018), whereas interactions with leatherbacks and olive ridleys were more infrequent (0.0005 and 0.0004 respectively).

Green sea turtle takes were variable year to year, ranging between 0-11 observed takes and 0-39 expanded annual estimated takes. While a formal evaluation of the effects of the sea turtle conservation measure implemented under the FEP in 2011 have yet to be conducted, green turtle interactions appear to be less frequent based on the estimated total number of interactions.

All leatherback and olive ridley sea turtle interactions were observed after 2010. Observer coverage was relatively low in 2006-2010 when interactions with these species were not observed (average observer coverage = 10.8%) compared to 2011-2014 when all interactions were observed (23.0%). Since leatherback and olive ridley interactions with this fishery are relatively uncommon, it is likely the recent occurrence of interactions is due to higher observer coverage as opposed to a temporal increase.

Table 78. Observed takes, mortalities (M), takes per fishing effort (1,000 Hooks), estimated annual takes using expansion factor estimates (EF Est. = 100/observer coverage * # of takes), and ME for sea turtles in the American Samoa longline fishery, 2006-2015.

				Green				Leatherback				Olive ridley			
				Observed				Observed				Observed			
Year	Obs. Cov. (%)	Sets	Hooks	Takes (M)	Takes/ 1,000 Hooks	EF Est.	ME	Takes (M)	Takes/ 1,000 Hooks	EF Est.	ME	Takes (M)	Takes/ 1,000 Hooks	EF Est.	ME
2006	8.1	287	797,221	3(3)	0.004	37	-	0	0.000	0	-	0	0.000	0	-
2007	7.1	410	1,255,329	1(1)	0.001	14	-	0	0.000	0	-	0	0.000	0	-
2008	6.4	379	1,194,096	1(1)	0.001	16	-	0	0.000	0	-	0	0.000	0	-
2009	7.7	306	880,612	3(3)	0.003	39	-	0	0.000	0	-	0	0.000	0	-
2010	25.0	798	2,301,396	6(5)	0.003	-	50	0	0.000	-	0	0	0.000	-	0
2011	33.3	1,257	3,605,897	11(10)	0.003	-	32	2(1)	0.001	-	4	1	0.000	-	4
2012	19.8	662	1,880,525	0	0.000	-	0	1	0.001	-	6	1(1)	0.001	-	6
2013	19.4	585	1,690,962	2(2)	0.001	-	19	2(1)	0.001	-	13	1	0.001	-	4
2014	19.4	565	1,490,416	2(2)	0.001	10	-	0	0.000	0	-	2	0.001	10	-
2015	22.0	504	1,441,706	0	0.000	0	-	3(3)	0.006	14	-	1	0.002	5	-

[a] Take data are based on vessel arrival dates.

Source: Take data—2006-2015 PIRO Observer Program Annual and Quarterly Status Reports

ME—McCracken, 2015

Comparison of Interactions with ITS

NMFS completed a Biological Opinion for the American Samoa longline fishery on October 30, 2015. The Biological Opinion includes data through June 30, 2015. NMFS began monitoring the American Samoa longline fishery ITS in the second third quarter of 2015 and uses a rolling three-year period to track incidental take (Table 79). NMFS always uses the date of the interaction for tracking sea turtle interactions against the ITS, regardless of when the vessel returns to port. In the PIRO Observer Program Quarterly and Annual Reports, NMFS bases the percent observer coverage on vessel departures and bases sea turtle interactions on vessel arrivals. For this reason, the number of quarterly or annual interactions counted against an ITS may vary from those reported on the Observer Program's quarterly and annual reports. NMFS uses post-hooking mortality criteria (Ryder et al. 2006) to calculate sea turtle mortality rates.

Table 79. Estimated total interactions (extrapolated using quarterly observer coverage) and total mortality (using Ryder et al. 2006) of sea turtles in the American Samoa longline fishery compared to the 3-year Incidental Take Statement (ITS) in the 2015 Biological Opinion.

Species	3-year ITS	Estimated total Interactions and Mortalities for Q3-Q4 2015
Green		
Interactions	60	0
Total Mortalities	54	0
Leatherback		
Interactions	69	0
Total Mortalities	49	0
Olive Ridley		
Interactions	33	3.9
Total Mortalities	10	1.1
Loggerhead		
Interactions	6	0
Total Mortalities	3	0
Hawksbill		
Interactions	6	0
Total Mortalities	3	0

[a] Interactions are counted based on capture date.

3.2.3.4 MARINE MAMMAL INTERACTIONS IN THE AMERICAN SAMOA LONGLINE FISHERY

Table 80 summarizes the incidental take data of marine mammals from 2006 to 2015 in the American Samoa longline fishery. Observer coverage on vessels operating in this fishery ranged from 6.4% to 33.3%. The incidental take data in this section were compiled from the PIRO Observer Program Annual Status Reports and are for monitoring purposes. Reported interactions listed in these tables reflect all observed interactions, including mortalities, serious injuries, and non-serious injuries. Refer to the most recent SARs for mortality and serious injury estimates and stock-specific abundance estimates and geographic range. Many of these interactions have been examined further, and updated information necessary for any data analyses can be requested from the PIFSC. Observed take data were expanded to represent the estimated number of incidental takes for the entire fishery using a standard expansion factor estimate (EF Est. = 100/% observer coverage * # takes).

Observed marine mammal interactions with the American Samoa longline fishery between 2006 and 2014 were relatively infrequent. False killer whales had the highest interaction rate over this period (average takes/1,000 Hooks = 0.0004), followed by rough-toothed dolphins (0.0003), 1 Cuvier's beaked whale (<0.0001), 1 short-finned pilot whale (<0.0001), and 2 unidentified cetaceans (<0.0001). Between 2006 and 2015, there were 5 years of no observed marine mammal interactions with this fishery (2006, 2007, 2009, 2010, and 2012).

Table 80. Observed takes, mortalities (M), takes per fishing effort (1,000 Hooks), and estimated annual takes using expansion factor estimates (EF Est. = 100/observer coverage * # of takes) for marine mammals in the American Samoa longline fishery, 2006-2015.

				Cuvier's beaked whale			False killer whale			Rough-toothed dolphin			Short-finned pilot whale			Unidentified cetacean		
				Observed			Observed			Observed			Observed			Observed		
Year	Obs. Cov. (%)	Sets	Hooks	Takes (M)	Takes/ 1,000 Hooks	EF Est.	Takes (M)	Takes/ 1,000 Hooks	EF Est.	Takes(M)	Takes/ 1,000 Hooks	EF Est.	Takes (M)	Takes/ 1,000 Hooks	EF Est.	Takes (M)	Takes/ 1,000 Hooks	EF Est.
2006	8.1	287	797,221	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0
2007	7.1	410	1,255,329	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0
2008	6.4	379	1,194,096	0	0.000	0	2(1)	0.002	31	1	0.001	16	0	0.000	0	0	0.000	0
2009	7.7	306	880,612	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0
2010	25.0	798	2,301,396	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0
2011	33.3	1,257	3,605,897	1(1)	0.000	3	3	0.001	9	5	0.001	15	0	0.000	0	2	0.001	6
2012	19.8	662	1,880,525	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0
2013	19.4	585	1,690,962	0	0.000	0	1	0.001	5	1(1)	0.001	5	0	0.000	0	0	0.000	0
2014	19.4	565	1,490,416	0	0.000	0	0	0.000	0	0	0.000	0	1	0.001	5	0	0.000	0
2015	22.0	504	1,441,706	0	0.000	0	2(1)	0.001	9	0	0.000	0	0	0.000	0	0	0.000	0

[a] Take data are based on vessel arrival dates.

Source: 2006-2015 PIRO Observer Program Annual and Quarterly Status Reports

Note: McCracken (2015) produced annual estimates for cetaceans for 2010-2013, but they are not shown in this table. The ME did not include interactions classified as non-serious injury, thus do not correspond to the observed takes included in this table.

Comparison of Interactions with PBR under the MMPA

SARs are only available for four species of marine mammals for which stocks have been identified around American Samoa (humpback whale, false killer whale, rough-toothed dolphin and spinner dolphin). PBR comparisons with estimates of mortality and serious injury are not available for American Samoa stocks of marine mammals due to the lack of abundance estimates.

3.2.3.5 SEABIRD INTERACTIONS IN THE AMERICAN SAMOA LONGLINE FISHERY

Table 81 summarizes the incidental take data of seabirds from 2006 to 2015 in the American Samoa longline fishery. Observer coverage on vessels operating in this fishery ranged from 6.4% to 33.3%. The incidental take data in this section were compiled from the PIRO Observer Program Annual Status Reports and are for monitoring purposes. Many of these interactions have been examined further, and updated information necessary for any data analyses can be requested from the PIFSC. Observed take data were expanded to represent the estimated number of incidental takes for the entire fishery using a standard expansion factor estimate (EF Est. = 100/% observer coverage * # takes).

Observed seabird interactions with the American Samoa longline fishery between 2006 and 2015 were uncommon with a total of three observed unidentified shearwater and frigate bird interactions (all released dead). The observer program report for 2015 also included 13 observed interactions with black-footed albatross that occurred in the North Pacific by vessels departing American Samoa and landing in California.

Table 81. Observed takes, mortalities (M), takes per fishing effort (1,000 Hooks), and estimated annual takes using expansion factor estimates (EF Est. = 100/observer coverage * # of takes) and ME for seabirds in the American Samoa longline fishery, 2006-2015.

Year	Obs. Cov. (%)	Sets	Hooks	Black-footed Albatross			Unidentified shearwater				Unidentified frigatebird			
				Observed			Observed				Observed			
				Takes (M)	Takes/ 1,000 Hooks	EF Est.	Takes (M)	Takes/ 1,000 Hooks	EF Est.	ME	Takes (M)	Takes/ 1,000 Hooks	EF Est.	ME
2006	8.1	287	797,221	0	0.000	0	0	0.000	0	-	0	0.000	0	-
2007	7.1	410	1,255,329	0	0.000	0	1(1)	0.001	14	-	0	0.000	0	-
2008	6.4	379	1,194,096	0	0.000	0	0	0.000	0	-	0	0.000	0	-
2009	7.7	306	880,612	0	0.000	0	0	0.000	0	-	0	0.000	0	-
2010	25.0	798	2,301,396	0	0.000	0	0	0.000	-	0	0	0.000	-	0
2011	33.3	1,257	3,605,897	0	0.000	0	1(1)	0.000	-	2	0	0.000	-	0
2012	19.8	662	1,880,525	0	0.000	0	0	0.000	-	0	0	0.000	-	0
2013	19.4	585	1,690,962	0	0.000	0	0	0.000	-	0	1(1)	0.001	-	5
2014	19.4	565	1,490,416	0	0.000	0	0	0.000	0	-	0	0.000	0	-
2015	22.0	504	1,441,706	13(13)[a]	0.026	59	0	0.000	0	-	0	0.000	0	-

[a] These seabird interactions occurred in the North Pacific by vessels departing American Samoa and landing in California.

[b] Take data are based on vessel arrival dates.

Source: 2006-2015 PIRO Observer Program Annual and Quarterly Status Reports; McCracken (2015)

3.2.3.6 SCALLOPED HAMMERHEAD SHARK INTERACTIONS IN THE AMERICAN SAMOA LONGLINE FISHERY

Table 82 summarizes the incidental take data for the Indo-west Pacific DPS scalloped hammerhead shark in the American Samoa longline fishery. Observed interactions range 0-4 per year, with expanded total ranging between 0-17 per year.

The 2015 Biological Opinion includes a three-year ITS of 36 takes from the Indo-west Pacific DPS of scalloped hammerhead sharks. NMFS began monitoring the American Samoa longline fishery ITS in the third quarter of 2015 and uses a rolling three-year period to track incidental take. NMFS counts takes for the Indo-west Pacific DPS of scalloped hammerhead sharks based on the end of haul incidental take date. The observed scalloped hammerhead interaction in 2015 occurred in the first two quarters of the year, and no interactions were observed during the third and fourth quarters.

Table 82. Observed and estimated total scalloped hammerhead interactions with the American Samoa longline fishery for 2006–2015.

Year	Observed	Observer Coverage (%)	Expansion Factor [a]	Expansion Factor Estimates[b]	ME
2006	1	8.1	12.35	13	-
2007	1	7.1	14.08	15	-
2008	0	6.4	15.63	0	-
2009	0	7.7	12.99	0	-
2010	4	25	-	-	17
2011	2	33.3	-	-	7
2012	0	19.8	-	-	0
2013	0	19.4	-	-	0
2014	1	19.4	5.15	5.15	-
2015	1	22.0	4.55	4.55	-

[a] 100 ÷ observer coverage. E.g., for 2014, 100/19.4 = 5.15.

[b] (Observed interactions) x (Expansion factor). E.g., for 2014, 1(5.15) = 5.15.

[c] Total caught estimated by McCracken where available (McCracken 2015), otherwise estimated using expansion factor.

Source: NMFS American Samoa Longline Observer Program Annual Reports 2006–2011 (NMFS 2006b, 2007, 2008b, 2009, 2010b, 2011, 2012, 2013, 2014d) and unpublished data; 2010–2015, McCracken 2015.

3.2.4 HAWAI`I TROLL FISHERY

3.2.4.1 INDICATORS FOR MONITORING PROTECTED SPECIES INTERACTIONS IN THE HAWAI`I TROLL FISHERY

In this report, the Council monitors protected species interactions in the Hawai`i troll fishery using proxy indicators such as fishing effort and changes in gear types as this fishery does not have observer coverage.

3.2.4.1.1 FEP Conservation Measures

The Hawai`i troll fishery has not had reported interactions with protected species, and no specific regulations are in place to mitigate protected species interactions. The Pacific Pelagic FEP prohibits the use of drift gillnets in the U.S. EEZ of the Western Pacific, and this measure provides benefits to protected species by preventing potential interactions with non-selective fishing gear. The Pacific Pelagic FEP also requires any vessel fishing under the FEP to comply with sea turtle handling and release regulations.

3.2.4.1.2 ESA Consultations

In a BiOp completed on September 1, 2009 for the troll and handline fisheries in the western Pacific region, NMFS concluded that these fisheries are not likely to jeopardize the continued existence of green turtles and included an ITS of four animals killed per year from collisions with troll and handling fishing vessels (NMFS 2009). The BiOp also concluded that the fisheries are not likely to adversely affect all other protected species in the region. NMFS also determined on October 6, 2014 that fisheries managed under the Pelagic FEP have no effects on ESA-listed reef-building corals.

3.2.4.1.3 Non-ESA Marine Mammals

The MMPA requires NMFS to annually publish a List of Fisheries (LOF) that classifies commercial fisheries in one of three categories based on the level of mortality and serious injury of marine mammals associated with that fishery. According to the 2016 LOF (81 FR 20550, April 8, 2016), the Hawai`i troll fishery (HI troll) is classified as a Category III fishery (i.e. a remote likelihood of or no known incidental mortality and serious injury of marine mammals).

3.2.4.2 STATUS OF PROTECTED SPECIES INTERACTIONS IN THE HAWAI`I TROLL FISHERY

NMFS has determined that the Hawai`i troll fishery operating under the Pacific Pelagic FEP is not likely to jeopardize green sea turtles and not likely to adversely affect other ESA-listed sea turtles, marine mammals, seabirds, and scalloped hammerhead shark, non ESA-listed marine mammals, and have no effects on ESA-listed reef-building corals. The Hawai`i troll fishery has minimal interactions with these protected species.

The ITS in the 2009 BiOp estimates four green turtle mortalities annually in the troll and handline fisheries in the western Pacific region. There have not been any reported or observed collisions of troll and handline vessels with green turtles, and data are not available to attribute stranded turtle mortality source to troll and handline vessels.

Based on fishing effort and other characteristics described in Section 2.4.9, no notable changes have been observed in the fishery. There is no other information to indicate that impacts to protected species from this fishery have changed in recent years.

3.2.5 MHI HANDLINE FISHERY

3.2.5.1 INDICATORS FOR MONITORING PROTECTED SPECIES INTERACTIONS IN THE MHI HANDLINE FISHERY

In this report, the Council monitors protected species interactions in the MHI handline fishery using proxy indicators such as fishing effort and changes in gear types as this fishery does not have observer coverage.

3.2.5.1.1 FEP Conservation Measures

The MHI handline fishery has not had reported interactions with protected species, and no specific regulations are in place to mitigate protected species interactions. The Pacific Pelagic FEP prohibits the use of drift gillnets in the U.S. EEZ of the Western Pacific, and this measure provides benefits to protected species by preventing potential interactions with non-selective fishing gear. The Pacific Pelagic FEP also requires any vessel fishing under the FEP to comply with sea turtle handling and release regulations.

3.2.5.1.2 ESA Consultations

In a BiOp completed on September 1, 2009 for the troll and handline fisheries in the western Pacific region, NMFS concluded that these fisheries are not likely to jeopardize the continued existence of green turtles and included an ITS of four animals killed per year from collisions with troll and handling fishing vessels (NMFS 2009). The BiOp also concluded that the fisheries are not likely to adversely affect all other protected species in the region. NMFS also determined on October 16, 2014 that fisheries managed under the Pelagic FEP have no effects on ESA-listed reef-building corals.

3.2.5.1.3 Non-ESA Marine Mammals

The MMPA requires NMFS to annually publish an LOF that classifies commercial fisheries in one of three categories based on the level of mortality and serious injury of marine mammals associated with that fishery. According to the 2016 LOF (81 FR 20550, April 8, 2016), the MHI handline (HI pelagic handline) fishery is classified as a Category III fishery (i.e. a remote likelihood of or no known incidental mortality and serious injury of marine mammals).

3.2.5.2 STATUS OF PROTECTED SPECIES INTERACTIONS IN THE MHI HANDLINE FISHERY

NMFS has determined that the MHI handline fishery operating under the Pacific Pelagic FEP is not likely to jeopardize green sea turtles and not likely to adversely affect other ESA-listed sea turtles, marine mammals, seabirds, and scalloped hammerhead shark, non ESA-listed marine mammals, and have no effects on ESA-listed reef-building corals. The MHI handline fishery has minimal interactions with these protected species.

The ITS in the 2009 BiOp estimates four green turtle mortalities annually in the troll and handline fisheries in the western Pacific region. There have not been any reported or observed collisions of troll and handline vessels with green turtles, and data are not available to attribute stranded turtle mortality source to troll and handline vessels.

Based on fishing effort and other characteristics described in Section 2.4.10, no notable changes have been observed in the fishery. There is no other information to indicate that impacts to protected species from this fishery have changed in recent years.

3.2.6 HAWAI`I OFFSHORE HANDLINE FISHERY

3.2.6.1 INDICATORS FOR MONITORING PROTECTED SPECIES INTERACTIONS IN THE HAWAI`I OFFSHORE HANDLINE FISHERY

In this report, the Council monitors protected species interactions in the Hawai`i offshore handline fishery using proxy indicators such as fishing effort and changes in gear types as this fishery does not have observer coverage.

3.2.6.1.1 FEP Conservation Measures

The Hawai`i offshore handline fishery has not had reported interactions with protected species, and no specific regulations are in place to mitigate protected species interactions.

The Pacific Pelagic FEP prohibits the use of drift gillnets in the U.S. EEZ of the Western Pacific, and this measure provides benefits to protected species by preventing potential interactions with non-selective fishing gear. The Pacific Pelagic FEP also requires any vessel fishing under the FEP to comply with sea turtle handling and release regulations.

3.2.6.1.2 ESA Consultations

In a BiOp completed on September 1, 2009 for the troll and handline fisheries in the Western Pacific region, NMFS concluded that these fisheries are not likely to jeopardize the continued existence of green turtles and included an ITS of four animals killed per year from collisions with troll and handling fishing vessels. The BiOp also concluded that the fisheries are not likely to adversely affect all other protected species in the region. NMFS also determined on October 16, 2014 that fisheries managed under the Pelagic FEP have no effects on ESA-listed reef-building corals.

3.2.6.1.3 Non-ESA Marine Mammals

The MMPA requires NMFS to annually publish an LOF that classifies commercial fisheries in one of three categories based on the level of mortality and serious injury of marine mammals associated with that fishery. According to the 2016 (81 FR 20550, April 8, 2016), the Hawai`i offshore handline (HI pelagic handline) fishery is classified as a Category III fishery (i.e. a remote likelihood of or no known incidental mortality and serious injury of marine mammals).

3.2.6.2 STATUS OF PROTECTED SPECIES INTERACTIONS IN THE HAWAI`I OFFSHORE HANDLINE FISHERY

NMFS has determined that the Hawai`i offshore handline fishery operating under the Pacific Pelagic FEP is not likely to jeopardize green sea turtles and not likely to adversely affect other ESA-listed sea turtles, marine mammals, seabirds, and scalloped hammerhead shark, non ESA-listed marine mammals, and have no effects on ESA-listed reef-building corals. The Hawai`i offshore handline fishery has minimal interactions with these protected species.

The ITS in the 2009 BiOp estimates four green turtle mortalities annually in the troll and handline fisheries in the western Pacific region. There have not been any reported or observed collisions of troll and handline vessels with green turtles, and data are not available to attribute stranded turtle mortality source to troll and handline vessels.

Based on fishing effort and other characteristics described in Section 4.10.11, no notable changes have been observed in the fishery. There is no other information to indicate that impacts to protected species from this fishery have changed in recent years.

3.2.7 AMERICAN SAMOA, GUAM AND CNMI TROLL FISHERY

3.2.7.1 INDICATORS FOR MONITORING PROTECTED SPECIES INTERACTIONS IN THE AMERICAN SAMOA, GUAM AND CNMI TROLL FISHERY

In this report, the Council monitors protected species interactions in the American Samoa, Guam, and CNMI troll fisheries using proxy indicators such as fishing effort and changes in gear types as these fisheries do not have observer coverage.

Details of these indicators are discussed in the sections below.

3.2.7.1.1 FEP Conservation Measures

The American Samoa, Guam, and CNMI fisheries have not had reported interactions with protected species, and no specific regulations are in place to mitigate protected species interactions. The Pacific Pelagic FEP prohibits the use of drift gillnets in the U.S. EEZ of the Western Pacific, and this measure provides benefits to protected species by preventing potential interactions with non-selective fishing gear. The Pacific Pelagic FEP also requires any vessel fishing under the FEP to comply with sea turtle handling and release regulations.

3.2.7.1.2 ESA Consultations

In a BiOp completed on September 1, 2009 for the troll and handline fisheries in the Western Pacific region, NMFS concluded that these fisheries are not likely to jeopardize the continued existence of green turtles and included an ITS of four animals killed per year from collisions with troll and handling fishing vessels. The BiOp also concluded that the fisheries are not likely to adversely affect all other protected species in the region. NMFS also determined on October 16, 2014 that fisheries managed under the Pelagic FEP have no effects on ESA-listed reef-building corals.

3.2.7.1.3 Non-ESA Marine Mammals

The MMPA requires NMFS to annually publish an LOF that classifies commercial fisheries in one of three categories based on the level of mortality and serious injury of marine mammals associated with that fishery. According to the 2016 LOF (81 FR 20550, April 8, 2016), troll fisheries in American Samoa, Guam and CNMI are classified as Category III fisheries (i.e. a remote likelihood of or no known incidental mortality and serious injury of marine mammals).

3.2.7.2 STATUS OF PROTECTED SPECIES INTERACTIONS IN THE AMERICAN SAMOA, GUAM AND CNMI TROLL FISHERY

NMFS has determined that the American Samoa, Guam, and CNMI fisheries operating under the Pacific Pelagic FEP are not likely to jeopardize green sea turtles and not likely to adversely affect other ESA-listed sea turtles, marine mammals, seabirds, and scalloped hammerhead shark, non ESA-listed marine mammals, and have no effects on ESA-listed reef-building corals. The American Samoa, Guam, and CNMI fisheries have minimal interactions with these protected species.

The ITS in the 2009 BiOp estimates four green turtle mortalities annually in the troll and handline fisheries in the western Pacific region. There have not been any reported or observed collisions of troll and handline vessels with green turtles, and data are not available to attribute stranded turtle mortality source to troll and handline vessels.

Based on fishing effort and other characteristics described in 2.1.9, 2.2.4, and 2.3.7, no notable changes have been observed in the fishery. There is no other information to indicate that impacts to protected species from this fishery have changed in recent years.

3.2.8 IDENTIFICATION OF RESEARCH, DATA AND ASSESSMENT NEEDS

The following research, data and assessment needs for pelagic fisheries were identified by the Council's Protected Species Advisory Committee and Plan Team:

- Research on at-sea foraging behavior of albatross species to improve understanding of interaction rates in the Hawai`i longline fisheries;

- Identify zones to develop a regional look at environmental and oceanographic factors for area outside of the EEZ that may focus on areas of high-interactions. Develop metrics to characterize environmental data, effort, and bycatch rates at these regional scales (e.g. leatherback, albatrosses);

- Ecosystem-considerations on catch and bycatch in the DSLL fishery (e.g., bigeye tuna, albatross, leatherback turtle) as they relate to the environmental and ecological drivers of changing species distribution and aggregation; and

- Evaluation of spatial and temporal representation of observer coverage compared to the non-observed effort. While vessel behavior may be motivated by various factors, an assessment of sampling bias may be warranted.

3.2.9 REFERENCES:

Carretta, J.V., E.M. Oleson, J. Baker, D.W. Weller, A.R. Lang, K.A. Forney, M.M. Muto, B. Hanson, A.J. Orr, H. Huber, M.S. Lowry, J. Barlow, J.E. Moore, D. Lynch, L. Carswell, and R.L. Brownell Jr. 2016. U.S. Pacific Marine Mammal Stock Assessments: 2015. U.S. Department of Commerce, NOAA Technical Memorandum, NOAA-TMNMFS-SWFSC-561. 419 p.

Endangered and Threatened Species: Final Rulemaking To Revise Critical Habitat for Hawaiian Monk Seals, 50 C.F.R. §226.201 (August 21, 2015).

Gilman, E., Kobayashi, D., Swenarton, T., Brothers, N., Dalzell, P., & Kinan-Kelly, I. 2007. Reducing sea turtle interactions in the Hawai`i-based longline swordfish fishery. Biological Conservation, 139(1), 19-28.

Gilman, E., Chaloupka, M., Peschon, J., & Ellgen, S. 2016. Risk factors for seabird bycatch in a pelagic longline tuna fishery. PLoS ONE, 11(5), e0155477.

Kobayashi, D., and K. Kawamoto. 1995. Evaluation of shark, dolphin, and monk seal interactions with Northwestern Hawaiian Island bottomfishing activity: A comparison of two time periods and an estimate of economic impacts. Fisheries Research. 23:11–22.

McCracken, M.L. 2005. Estimation of Year 2004 Incidental Takes of Sea Turtles, Seabirds, and Marine Mammals in the Hawai`i Longline Deep Set Fishery. Pacific Islands Fisheries Science Center, PIFSC Internal Report, IR-05-001, 3p. March 21, 2005.

McCracken, M.L. 2006. Estimation of Incidental Interactions with Sea Turtles, Seabirds, and Marine Mammals in the 2005 Hawai`i Longline Deep Set Fishery. Pacific Islands Fisheries Science Center, PIFSC Internal Report, IR-06-006, 3p. April 19, 2006.

McCracken, M.L. 2007. Estimation of Incidental Interactions with Sea Turtles, Seabirds, and Marine Mammals in the 2006 Hawai`i Longline Deep Set Fishery. Pacific Islands Fisheries Science Center, PIFSC Internal Report, IR-07-006, 4p. April 20, 2007.

McCracken, M.L. 2008. Estimation of Incidental Interactions with Sea Turtles and Seabirds in the 2007 Hawai`i Longline Deep Set Fishery. Pacific Islands Fisheries Science Center, PIFSC Internal Report, IR-08-007, 3p. April 24, 2008.

McCracken, M.L. 2009. Estimation of Incidental Interactions with Sea Turtles and Seabirds in the 2008 Hawai`i Longline Deep Set Fishery. Pacific Islands Fisheries Science Center, PIFSC Internal Report, IR-09-011, 4p. April 10, 2009.

McCracken, M.L. 2010. Estimation of Incidental Interactions with Sea Turtles and Seabirds in the 2009 Hawai`i Longline Deep Set Fishery. Pacific Islands Fisheries Science Center, PIFSC Internal Report, IR-10-009, 3p. April 16, 2010

McCracken, M.L. 2011a. Assessment of incidental interactions with marine mammals in the Hawai`i longline deep and shallow set fisheries from 2006 through 2010. Pacific Islands Fisheries Science Center, PIFSC Working Paper, WP-11-012, 30 p.

McCracken, M.L. 2011b. Estimation of Incidental Interactions with Sea Turtles and Seabirds in the 2010 Hawai`i Deep-set Longline Fishery. Pacific Islands Fisheries Science Center, PIFSC Internal Report, IR-11-005, 3p. April 19, 2011.

McCracken, M.L. 2012. Estimation of Incidental Interactions with Sea Turtles and Seabirds in the 2011 Hawai`i Deep-set Longline Fishery. Pacific Islands Fisheries Science Center, PIFSC Internal Report, IR-12-012, 3p. April 13, 2012.

McCracken, M.L. 2013. Estimation of Incidental Interactions with Sea Turtles and Seabirds in the 2012 Hawai`i Deep-set Longline Fishery. Pacific Islands Fisheries Science Center, PIFSC Internal Report, IR-13-014, 6p. June 5, 2013.

McCracken, M.L. 2014. Estimation of Incidental Interactions with Sea Turtles and Seabirds in the 2013 Hawai`i Deep-set Longline Fishery. Pacific Islands Fisheries Science Center, PIFSC Internal Report, IR-14-022, 4p. June 24, 2014.

McCracken, M.L. 2015. American Samoa Longline Fishery Protected Species Takes and Cetaceans Takes Resulting in a Classification of Dead or Serious Injury for Years 2010 through 2013. Pacific Islands Fisheries Science Center, PIFSC Internal Report, IR-15-10. February 13, 2015

McCracken, M.L. 2015. Estimation of Incidental Interactions with seabirds in the 2014 Hawai`i Deep Set Longline Fishery. Pacific Islands Fisheries Science Center, PIFSC Internal Report, IR-15-042, 3p. December 4, 2015.

McCracken, M.L. 2016. Assessment of Incidental Interactions with Marine Mammals in the Hawai`i Longline Deep and Shallow-set Fisheries from 2010 through 2014. Pacific Islands Fisheries Science Center, PIFSC Internal Report, IR-16-008, 2p., May 10, 2016.

McCracken, M.L. 2016. Estimation of Incidental Interactions with Sea Turtles in the 2014 Hawai`i Deep Set Longline Fishery. Pacific Islands Fisheries Science Center, PIFSC Internal Report, IR-16-007, 3p. April 12, 2016.

Muto, M. M., V. T. Helker, R. P. Angliss, B. A. Allen, P. L. Boveng, J. M. Breiwick, M. F. Cameron, P. J. Clapham, S. P. Dahle, M. E. Dahlheim, B. S. Fadely, M. C. Ferguson, L. W. Fritz, R. C. Hobbs, Y. V. Ivashchenko, A. S. Kennedy, J. M. London, S. A. Mizroch, R. R. Ream, E. L. Richmond, K. E. W. Shelden, R. G. Towell, P. R. Wade, J. M. Waite, and A. R. Zerbini. 2016. Alaska marine mammal stock assessments, 2015. U.S. Dep. Commer., NOAA Tech. Memo. NMFSAFSC-323, 300 p. doi:10.7289/V5/TM-AFSC-323.

Nitta, E. 1999. Draft: Summary report: Bottomfish observer trips in the Northwestern Hawaiian Islands, October 1990 to December 1993. Honolulu, HI: NMFS Pacific Islands Area Office, Pacific Islands Protected Species Program.

NMFS (National Marine Fishery Service). 1978. Biological Opinion on the Fishery Management Plan for Precious Corals Fisheries of the Western Pacific Region. October 4, 1978.

NMFS (National Marine Fishery Service). 2002. Endangered Species Act Section 7 Consultation on the Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries in the Western Pacific Region. Sustainable Fisheries Division, Southwest Region, Pacific Islands Area Office. March 8, 2002.

NMFS (National Marine Fishery Service). 2005. Biological Opinion: Continued authorization of the Hawai`i-based pelagic, deep-set, tuna longline fishery based on the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region. Pacific Islands Region, Protected Resources Division. October 4, 2005.

NMFS (National Marine Fishery Service). 2008. Biological Opinion and Incidental Take Statement: Implementation of Bottomfish Fishing Regulations within Federal Waters of the Main Hawaiian Islands. Pacific Islands Region, Protected Resources Division. March 18, 2008.

NMFS (National Marine Fishery Service). 2009. Biological Opinion: Continued Authorization of Pelagic Troll and Handline Fisheries, as Managed under the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region. September, 1, 2009.

NMFS (National Marine Fishery Service). 2012. Biological Opinion: Continued operation of the Hawai`i-based Shallow-set Longline Swordfish Fishery – under Amendment 18 to the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region (modified May 29, 2012 for technical corrections). Pacific Islands Region, Protected Resources Division. January 30, 2012.

NMFS (National Marine Fishery Service). 2014. Biological Opinion: Continued operation of the Hawai`i-based deep-set pelagic longline fishery. Pacific Islands Region, Protected Resources Division. September 19, 2014.

NMFS (National Marine Fishery Service). 2015. Biological Opinion: Continued operation of the American Samoa longline fishery. Pacific Islands Region, Protected Resources Division. October 30, 2015.

NMFS (National Marine Fisheries Service). 2016. Annual Report on Seabird Interactions and Mitigation Efforts in the Hawai`i Longline Fisheries for 2014. NMFS Pacific Islands Regional Office. Honolulu, HI. 16 p. January 2016 (revised February 2016).

Ryder C.E., Conant T.A., and Schroeder B.A. 2006. Report of the Workshop on Marine Turtle Longline Post-Interaction Mortality. U.S. Dep. Commerce, NOAA Technical Memorandum NMFS-F/OPR-29, 36 p.

Taking of Marine Mammals Incidental to Commercial Fishing Operations; False Killer Whale Take Reduction Plan, 50 C.F.R. §229.3 and §665.806 (November 29, 2012).

USFWS (United States Fish and Wildlife Service). 2012a. Biological Opinion of the U.S. Fish and Wildlife Service for the Operation of Hawai`i-based Pelagic Longline Fisheries, Shallow Set and Deep Set, Hawai`i. Pacific Islands Fish and Wildlife Office. January 6, 2012. 2011-F-0436.

WPRFMC (Western Pacific Regional Fishery Management Council). 2008. Amendment 18 to the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region – Management Modifications for the Hawai`i-based Shallow-set Longline Swordfish Fishery that Would Remove Effort Limits, Eliminate the Set Certificate Program, and Implement New Sea Turtle Interaction Caps. August 12, 2008.

WPRFMC (Western Pacific Regional Fishery Management Council). 2009. Fishery Ecosystem Plan for the Hawai`i Archipelago. September 24, 2009.

3.3 CLIMATE AND OCEANIC INDICATORS

3.3.1 INTRODUCTION

Over the past few years, the Council has incorporated climate change into the overall management of its managed fisheries. This 2015 Annual Report includes an inaugural chapter on indicators of current and changing climate and related oceanic conditions in the Western Pacific Region.

The Council's decision to provide and maintain an evolving discussion of climate conditions as an integral and continuous consideration in their deliberations, decisions and reports are numerous:

- Emerging scientific and community understanding of the impacts of changing climate conditions on fishery resources, the ecosystems that sustain those resources and the communities that depend upon them;

- Recent Federal Directives including the 2010 implementation of a National Ocean Policy that identified Resiliency and Adaptation to Climate Change and Ocean Acidification as one of nine National priorities; the development of a Climate Science Strategy by NMFS in 2015 and the development of Pacific Islands Regional Action Plan for the Climate Science Strategy; and

- The Council's own engagement with NOAA as well as jurisdictional fishery management agencies in American Samoa, CNMI, Guam and Hawai`i as well as fishing industry representatives and local communities in those jurisdictions

In 2013, the Council began restructuring its Marine Protected Area Committee / Coastal and Marine Spatial Planning Committee to include a focus on climate change and renamed the committee as the Marine Planning and Climate Change (MPCC) Committee. In 2015, based on recommendations from the committee, the Council adopted its Marine Planning and Climate Change Policy and Action Plan, which provide guidance to the Council on implementing climate change measures, including climate change research and data needs. The revised Pelagic FEP (February 2016) includes a discussion on climate change data and research and a new objective (Objective 9) that states the Council should consider the implications of climate change in decision-making, with the following sub-objectives:

a) Identify and prioritize research that examines the effects of climate change on Council-managed fisheries and fishing communities.

b) Ensure climate change considerations are incorporated into the analysis of management alternatives.

c) Monitor climate-change related variables via the Council's Annual Reports.

d) Engage in climate change outreach with U.S. Pacific islands communities.

Beginning with the 2015 Report, the Council and its partners will provide continuing descriptions of changes in a series of climate and oceanic indicators.

Future Annual Reports will include additional indicators as the information becomes available and their relevance to the development, evaluation and revision of ecosystem-fishery plans becomes clearer. Working with national and jurisdictional partners, the Council will make all datasets used in the preparation of this and future reports available and easily accessible.

3.3.2 RESPONSE TO PREVIOUS COUNCIL RECOMMENDATIONS

In 2013, at its 157th meeting in June, the Council adopted a dozen climate-change related recommendations from its Hawaiʻi Regional Ecosystem Advisory Committee. Letters were sent to NMFS and the State of Hawaiʻi about these. The Council also approved converting the Marine Protected Area/Coastal and Marine Spatial Planning Committee into the MPCC Committee and to adjust the membership of the committee accordingly.

In 2014, at its 159th meeting in March, the Council approved membership of the MPCC Committee. It directed staff to work with the CNMI and American Samoa on their climate change matters. At its 160th meeting in June, the Council agreed to a definition of climate change that includes natural variability and directed staff to work with other organizations on climate change and to write to the Administration about funding for climate change-related efforts. The MPCC Committee subsequently reviewed, revised, categorized and prioritized the various climate change related recommendations from the Council since 2013. At its 161st meeting in October 2014, the Council approved the prioritization and directed the staff to work with the committee on a MPCC policy and action plan. The Council also approved the Statement of Organization, Practices, and Procedures for the MPCC Committee and directed staff to write to NMFS that critical habitat will not aid in curtailing the threat posed by climate change impacts to ESA listed coral species in the Western Pacific Region.

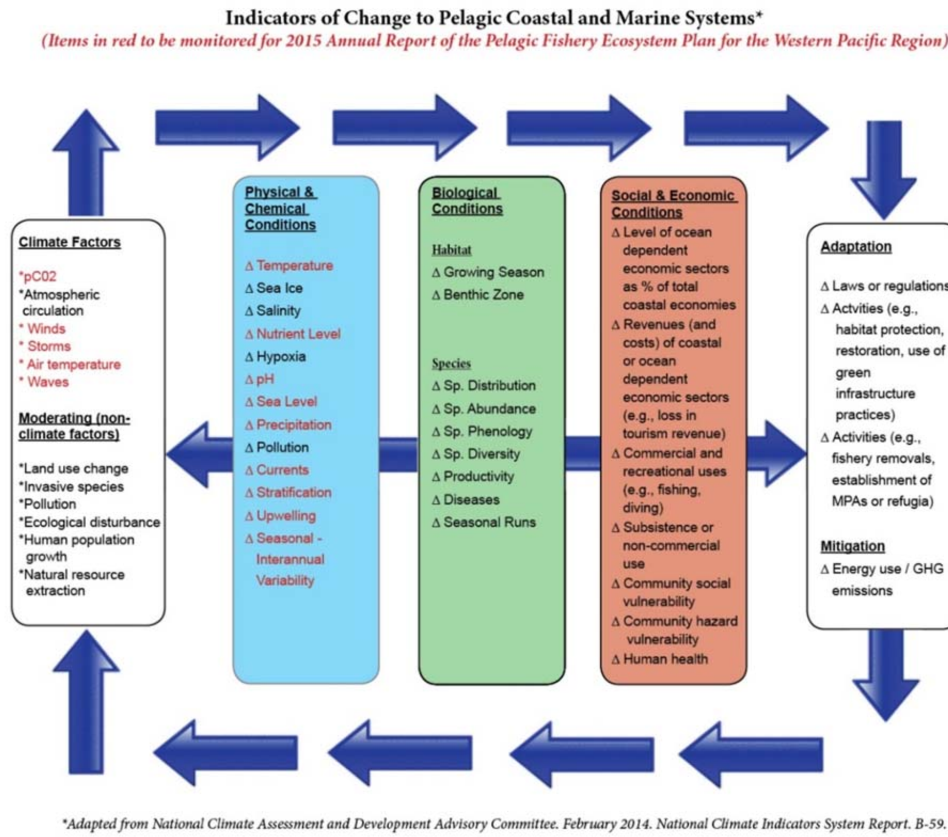
In 2015, at its 162nd meeting in March, the Council approved the MPCC policy drafted by the MPCC Committee and directed staff to provide comments on the draft NOAA Fisheries Draft Climate Science Strategy. The comments were submitted on March 30. At its 163rd meeting in June, the Council revised the makeup of its Plan Team to include marine planning expertise as well as other ecosystem-related scientists. At both the 163rd meeting and the 164th meeting in October, the Council approved the draft objectives of the Council's revised FEPs, including climate change-related objectives; and, in 2016, at its 165th meeting in March, the Council approved slightly revised versions of the FEP objectives, based on NMFS recommendations.

3.3.3 CONCEPTUAL MODEL

In developing this chapter, the Council relied on a number of recent reports conducted in the context of the U.S. National Climate Assessment including, most notably, the 2012 Pacific Islands Regional Climate Assessment and the Ocean and Coasts chapter of the 2014 report on a Pilot Indicator System prepared by the National Climate Assessment and Development Advisory Committee (NCADAC).

The Advisory Committee Report presented a possible conceptual framework designed to illustrate how climate factors can connect to and interact with other ecosystem components to ocean and coastal ecosystems and human communities. The Council adapted this model with considerations relevant to the fishery resources of the Western Pacific Region:

Figure 145. Indicators of Change to Pelagic Coastal and Marine Systems



As described in the 2014 NCADAC report, the conceptual model represents a "simplified representation of climate and non-climate stressors in coastal and marine ecosystems." For the purposes of this Annual Report, the modified Conceptual Model allows the Council and its partners to identify indicators of interest to be monitored on a continuing basis in coming years. The indicators shown in red were considered for inclusion in the 2015 Annual Report; the specific indicators used in the Report are listed in Section 2.3. Other indicators will be added over time as datasets become available and understanding of the nature of the causal chain from stressors to impacts emerges.

The Council also hopes that this Conceptual Model can provide a guide for future monitoring and research that will enable the Council and its partners to move from observations and correlations to understanding the specific nature of interactions and developing capabilities to predict future changes of importance in developing, evaluating and adapting ecosystem-fishery plans in the Western Pacific Region.

3.3.4 SELECTED INDICATORS

The primary goal for selecting the Indicators used in this (and future reports) is to provide fisheries-related communities, resource managers and businesses with a climate-related situational awareness. In this context, Indicators were selected to:

- Be fisheries relevant and informative;
- Build intuition about current conditions in light of changing climate;
- Provide historical context; and
- Recognize patterns and trends.

In this context, the Council has included the following climate and oceanic indicators:

- Atmospheric Concentration of Carbon Dioxide;
- Oceanic pH (at Station ALOHA);
- Sea Surface Temperature;
- Oceanic Niño Index (ONI);
- Pacific Decadal Oscillation (PDO);
- Tropical Cyclones;
- Oligotrophic Area (North Pacific);
- Ocean Color (Chlorophyll-a concentration);
- Subtropical Front/Transition Zone Chlorophyll Front; and
- Fish Community Size Structure.

Table 83 provides a description of these Indicators and a summary of the key findings detailed in the following sections of the report.

Table 83. Pelagic Climate and Ocean Indicator Summary

Indicator	Definition and Rationale	Indicator Status
Atmospheric Concentration of Carbon Dioxide (CO_2)	Atmospheric concentration CO_2 at Mauna Loa Observatory. Increasing atmospheric CO_2 is a primary measure of anthropogenic climate change.	Trend: increasing exponentially 2015: time series maximum 400.83 parts per million (ppm)
Oceanic pH	Ocean surface pH at Station ALOHA. Ocean pH provides a measure of ocean acidification. Increasing ocean acidification limits the ability of marine organisms to build shells and other hard structures.	Trend: pH is decreasing at a rate of 0.039 pH units per year, equivalent to 0.4% increase in acidity per year
ONI	Sea surface temperature anomaly from Niño 3.4 region (5°N - 5°S, 120° - 170°W). This index is used to determine the phase of the ENSO, which has implications across the region, affecting migratory patterns of key commercial fish stocks which in turn affect the location, safety, and costs of commercial fishing.	2015: Strong El Niño
PDO	A measure of Sea Surface Temperature (SST) anomalies north of 20°. The PDO can be thought of as a long-lived, multi-decadal ENSO cycle and has well-documented fishery implications related to ocean temperature and productivity.	2015: Positive (warm) PDO
Tropical Cyclones	Measures of tropical cyclone occurrence, strength, and energy. Tropical cyclones have the potential to significantly impact fishing operations.	Eastern Pacific, 2015: 18 named storms, time series maximum 9 major hurricanes
		Central Pacific, 2015: 14 named storms, time series maximum 5 major hurricanes
		Western Pacific, 2015: 27 named storms
Oligotrophic Area[6]	Area with ≤ 0.07 mg chlorophyll-a per m^3. A measure of the size of the region's least productive waters, projected to expand as a result of climate change	2015: VIIRS sensor maximum 18 million km^2
SST[7]	Satellite remotely-sensed sea surface temperature. SST is projected to rise, and impacts phenomena ranging from winds to fish distribution.	Trend: increasing at a rate of 0.01°C per year (1985 – 2015) 2015: 2nd warmest year in time series (1985 – 2015), 22.91°C
Ocean Color[8]	Satellite remotely-sensed ocean color. A measure of ocean productivity.	2015: VIIRS sensor minimum 0.12 mg chl-a m^{-3} (2012–2015)
North Pacific Subtropical Fontal Zone (STF) & Transition Zone Chlorophyll Front (TZCF)	The STF is marked by the 18°C isotherm, the TZCF by the 0.2 mg chl-a m^{-3} isopleth. These fronts are target by swordfish fishery.	STF, 2015: farther north than average TZCF, 2015: farther south than average west of 150°W, farther north east of 150°W
Fish Community Size Structure[9]	Fish lengths as recorded by longline observers. Fish size is impacted by several factors, including climate.	Full Fishery: median fish length declined by 1.9 cm per year over 2007 – 2013
		Bigeye Tuna: no trend in median fish length
		Swordfish: no trend in median fish length

3.3.4.1 ATMOSPHERIC CONCENTRATION OF CARBON DIOXIDE (CO_2) AT MAUNA LOA

Description: Monthly mean atmospheric carbon dioxide at Mauna Loa Observatory, Hawai`i in ppm from March 1958 to present. The carbon dioxide data are measured as the mole fraction in dry air, on Mauna Loa, A dry mole fraction is defined as the number of molecules of carbon dioxide divided by the number of molecules of dry air multiplied by one million

62015 data are incomplete.

7 2015 data are incomplete.

8 2015 data are incomplete.

9 2014 and 2015 data are incomplete.

(ppm). This constitutes the longest record of direct measurements of CO_2 in the atmosphere. The measurements were started by C. David Keeling of the Scripps Institution of Oceanography in March of 1958 at a facility of the National Oceanic and Atmospheric Administration (Keeling, 1976). NOAA started its own CO_2 measurements in May of 1974, and they have run in parallel with those made by Scripps since then (Thoning, 1989).

The observed increase in monthly average carbon dioxide concentration is due primarily to CO_2 emissions from fossil fuel burning. Carbon dioxide remains in the atmosphere for a very long time, and emissions from any location mix throughout the atmosphere in about one year. The annual oscillations at Mauna Loa, Hawai`i are due to the seasonal imbalance between the photosynthesis and respiration of plants on land. During the summer photosynthesis exceeds respiration and CO_2 is removed from the atmosphere, whereas outside the growing season respiration exceeds photosynthesis and CO_2 is returned to the atmosphere. The seasonal cycle is strongest in the northern hemisphere because of the presence of the continents. The difference between Mauna Loa and the South Pole has increased over time as the global rate of fossil fuel burning, most of which takes place in the northern hemisphere, has accelerated.

Timeframe: Annual Time Series

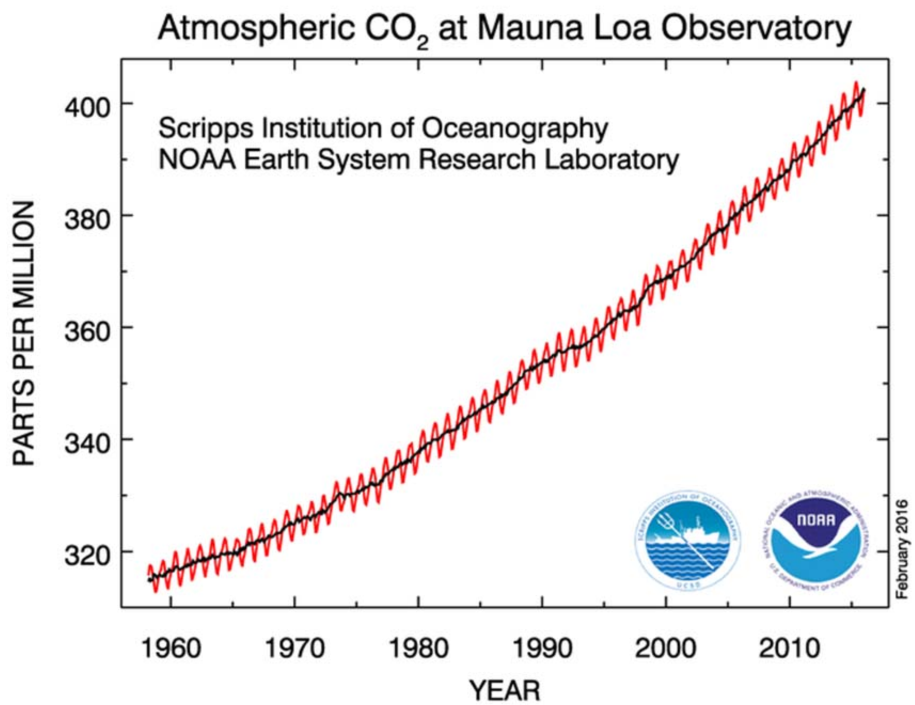
Region/Location: Hawai`i but representative of global concentration of carbon dioxide.

Data Source: "Full Mauna Loa CO_2 record" at http://www.esrl.noaa.gov/gmd/ccgg/trends/ , NOAA ESRL Global Monitoring Division. The NOAA Global Monitoring Division provides high-precision measurements of the abundance and distribution of long-lived greenhouse gases that are used to calculate global average concentrations.

Measurement Platform: *In-situ* Station

Rationale: Atmospheric carbon dioxide is a measure of what human activity has already done to affect the climate system through greenhouse gas emissions. It provides quantitative information in a simplified, standardized format that decision makers can easily understand. This indicator demonstrates that the concentration (and, in turn, the warming influence) of greenhouse gases in the atmosphere has increased substantially over the last several decades. In 2015, the annual mean concentration of $C0_2$ was 400.83 ppm. In 1959, the onset year it was 315.97ppm. It passed 350ppm in 1988.

Figure 146. Monthly mean atmospheric carbon dioxide at Mauna Loa Observatory, Hawai`i.



Note: The carbon dioxide data (red curve), measured as the mole fraction (ppm), in dry air, on Mauna Loa. The black curve represents the seasonally corrected data.

3.3.4.2 OCEANIC PH

Description: Trends in surface (0-10 m) pH and pCO_2 at Station ALOHA, North of Oahu (22° 45' N, 158° W), collected by the Hawai'i Ocean Time-series (HOT). Green dots represent directly measured pH, blue dots represent pH calculated from total alkalinity (TA) and dissolved inorganic carbon (DIC). The 25+ year time-series at Station ALOHA represents the best available documentation of the significant downward trend of ocean pH since 1989. Actual ocean pH varies in both time and space, but over last 25 years, the HOTS Station ALOHA time series has shown a significant linear decrease of -0.0386 pH units, or roughly a 9% increase in acidity ([H+]) over that period.

Timeframe: Updated Monthly

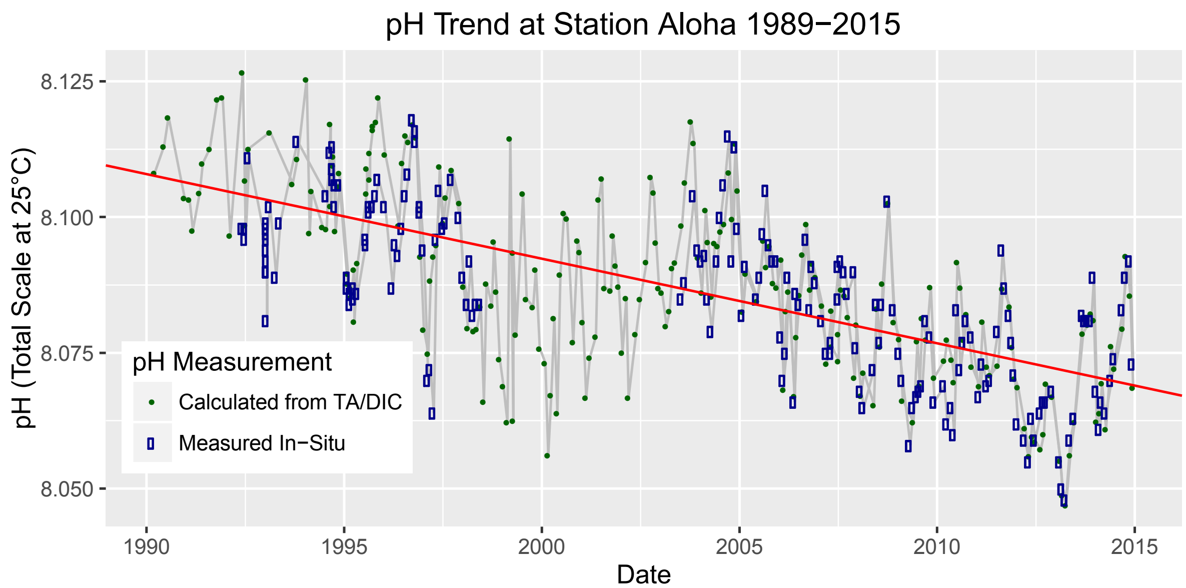
Region/Location: North Oahu.

Data Source/Responsible Party: Hawai'i Ocean Time Series. (http://hahana.soest.Hawai`i.edu/hot/)

Measurement Platform: Oceanographic research station, shipboard collection.

Rationale: Increasing ocean acidification affects coral reef growth and health which in turn affects the health of coral reef ecosystems and the ecosystems and resources that they sustain. Monitoring pH on a continuous provides a foundational basis for documenting, understanding and, ultimately, predicting the effects of ocean acidification.

Figure 147. pH Trend at Station Aloha 1989–2015



3.3.4.3 SEA SURFACE TEMPERATURE

Description: Monthly sea surface temperature from 2003-2015 from the Advanced Very High Resolution Radiometer (AVHRR) instrument aboard the NOAA Polar Operational Environmental Satellite (POES). These data take us back to 2003, if we were to blend this record with Pathfinder, we could reach back to 1981.

Background Below Below Inserted From [CoastWatch West Coast Node.](#) We would like to acknowledge the NOAA CoastWatch Program and the NOAA NWS Monterey Regional Forecast Office.***:***

> **Short Description:** The global area coverage (GAC) data stream from NOAA | NESDIS | OSDPD provides a high-quality sea surface temperature product with very little cloud contamination. These data are used for a variety of fisheries management projects, including the El Niño Watch Report, which stress data quality over high spatial resolution.
>
> **Technical Summary:** CoastWatch offers global SST data from the Advanced Very High Resolution Radiometer (AVHRR) instrument aboard NOAA's Polar Operational Environmental Satellites (POES). Two satellites are currently in use, NOAA-17 and NOAA-18. The AVHRR sensor is a five channel sensor comprised of two visible radiance channels and three infrared radiance channels. During daytime satellite passes, all five radiance channels are used. During nighttime passes, only the infrared radiance channels are used.

The POES satellite stores a sub-sample of the AVHRR radiance measurements onboard, generating a global data set. The satellite downloads this dataset once it is within range of a receiving station. The sub-sampling reduces the resolution of the original data from 1.47km for the HRPT SST product to 11km for the global data product.

AVHRR radiance measurements are processed to SST by NOAA's National Environmental Satellite, Data, and Information Service (NESDIS), Office of Satellite Data Processing and Distribution (OSDPD) using the non-linear sea surface temperature (NLSST) algorithm detailed in *Walton et al., 1998*. SST values are accurate to within 0.5 degrees Celsius. Ongoing calibration and validation efforts by NOAA satellites and information provide for continuity of quality assessment and algorithm integrity (e.g., *Li et al., 2001a and Li et al., 2001b*). In addition, the CoastWatch West Coast Regional Node runs monthly validation tests for all SST data streams using data from the NOAA National Weather Service and National Data Buoy Center .

The data are cloud screened using the CLAVR-x method developed and maintained by NOAA Satellites and Information (e.g., *Stowe et al., 1999*). The data are mapped to an equal angle grid (0.1 degrees latitude by 0.1 degrees longitude) using a simple arithmetic mean to produce individual and composite images of various durations (e.g., 1, 3, 8, 14-day).

Timeframe: 2003-2015, Daily data available, Monthly means shown.

Region/Location: Global.

Data Source: "SST, POES AVHRR, GAC, Global, Day and Night (Monthly Composite)" http://coastwatch.pfeg.noaa.gov/erddap/griddap/erdAGsstamday.html.

Measurement Platform: *AVHRR, POES Satellite*

Rationale: Sea surface temperature is one of the most directly observable measures we have for tracking increasing ocean temperature.

References:

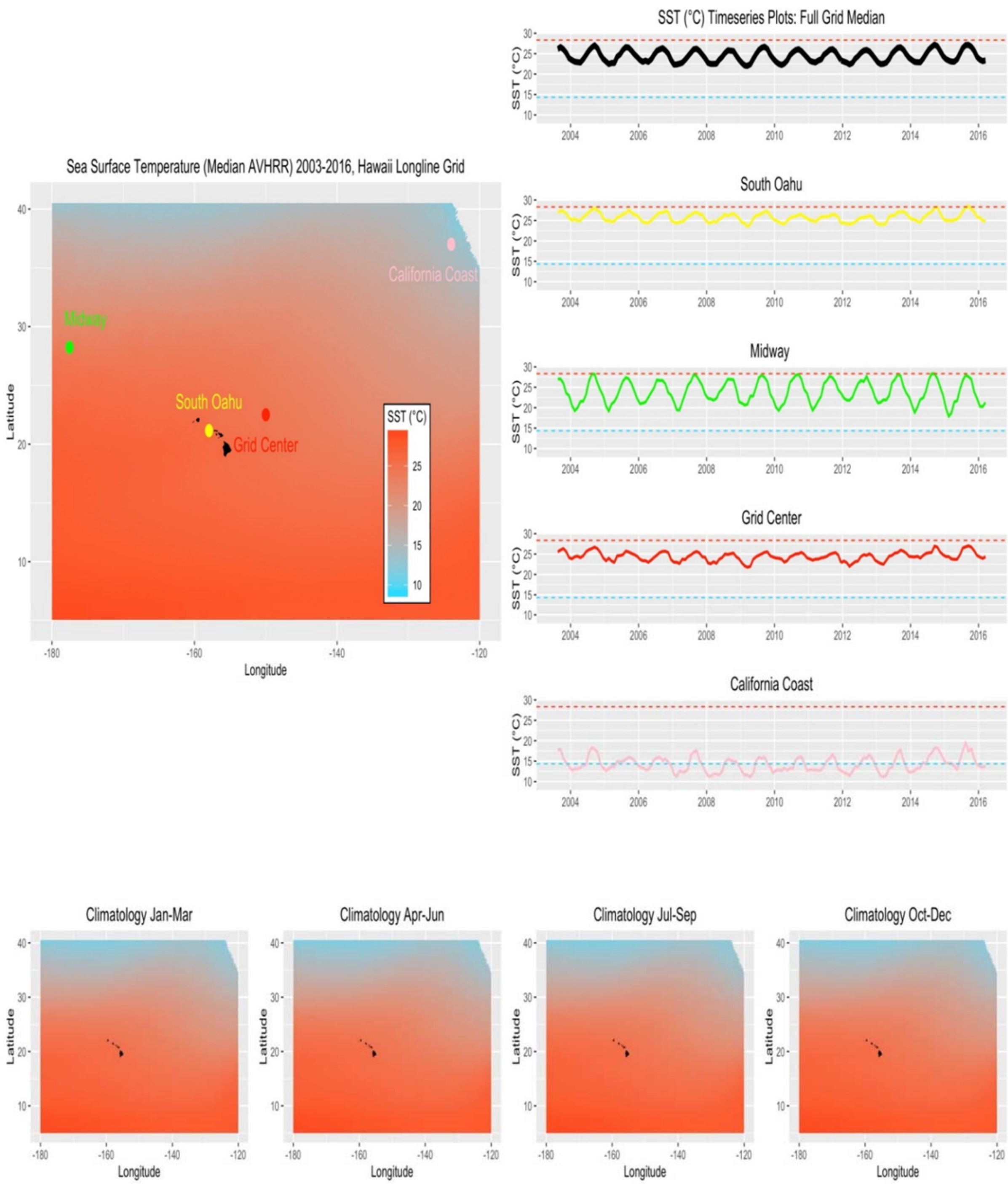
Li, X., W. Pichel, E. Maturi, P. Clemente-Colón, and J. Sapper, 2001a. Deriving the operational nonlinear multi-channel sea surface temperature algorithm coefficients for NOAA-15 AVHRR/3, Int. J. Remote Sens., Volume 22, No. 4, 699 - 704.

Li, X, W. Pichel, P. Clemente-Colón, V. Krasnopolsky, and J. Sapper, 2001b. Validation of coastal sea and lake surface temperature measurements derived from NOAA/AVHRR Data, Int. J. Remote Sens., Vol. 22, No. 7, 1285-1303.

Stowe, L. L., P. A. Davis, and E. P. McClain, 1999. Scientific basis and initial evaluation of the CLAVR-1 global clear/cloud classification algorithm for the advanced very high resolution radiometer. J. Atmos. Oceanic Technol., 16, 656-681.

Walton C. C., W. G. Pichel, J. F. Sapper, D. A. May, 1998. The development and operational application of nonlinear algorithms for the measurement of sea surface temperatures with the NOAA polar-orbiting environmental satellites, J. Geophys. Res., 103: (C12) 27999-28012.

Figure 148. Quarterly Sea Surface Temperature around Hawai`i (Year)



3.3.4.4 OCEANIC NIÑO INDEX (ONI)

Description: "Warm (red) and cold (blue) periods based on a threshold of +/- 0.5°C for the ONI [three-month running mean of ERSST.v4 SST anomalies in the Niño 3.4 region (5°N-5°S, 120°-170°W)], based on centered 30-year base periods updated every 5 years.

For historical purposes, periods of below and above normal sSSTs are colored in blue and red when the threshold is met for a minimum of five consecutive overlapping seasons. The ONI is one measure of the ENSO, and other indices can confirm whether features consistent with a coupled ocean-atmosphere phenomenon accompanied these periods."

Description inserted from:
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ensoyears.shtml

Timeframe: Every three months.

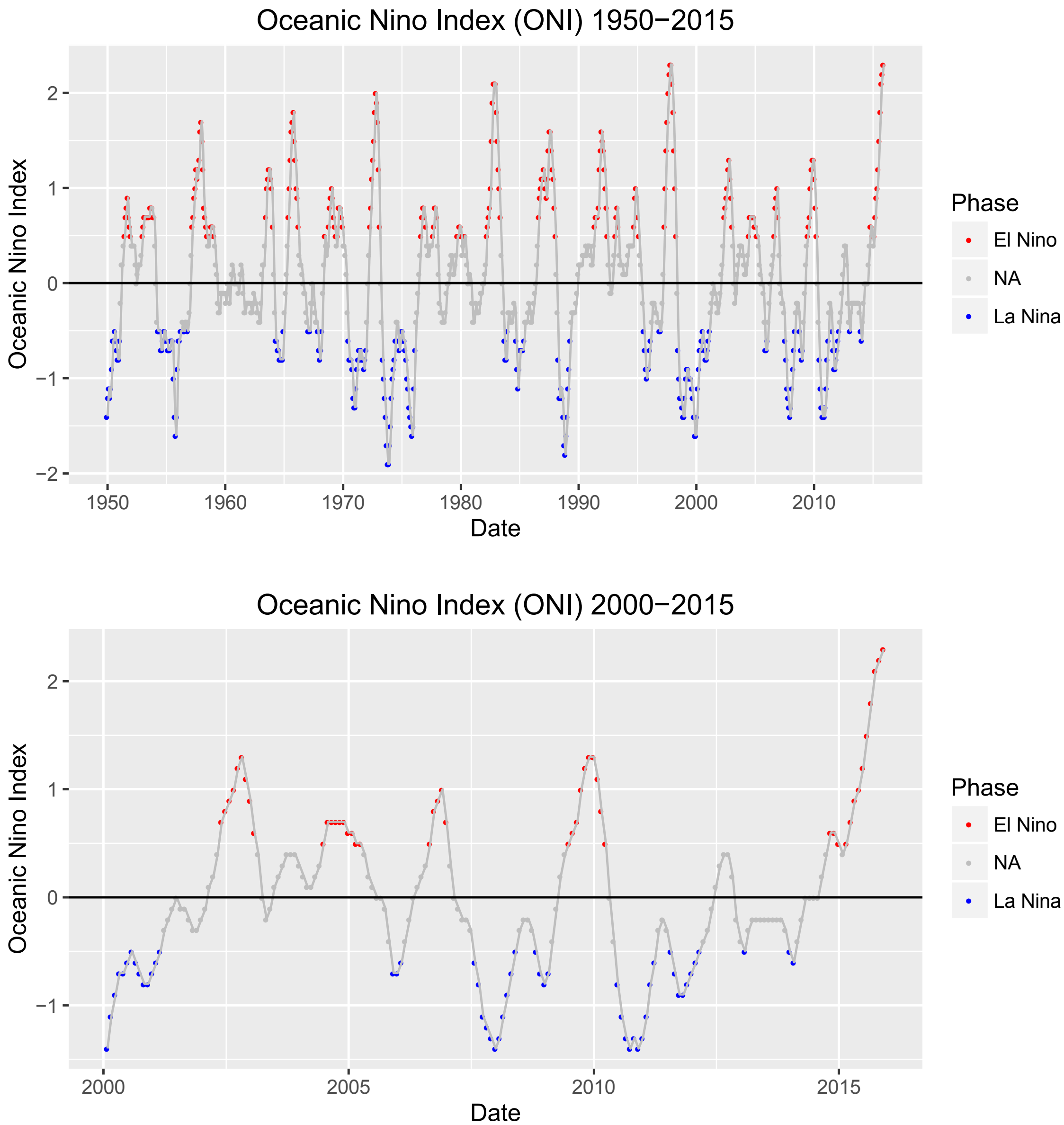
Region/Location: Niño3.4 Region: 5°S - 5°N, 120°-170°W

Data Source/Responsible Party: NOAA NCEI Equatorial Pacific Sea Surface Temperatures (www.ncdc.noaa.gov/teleconnections/enso/indicators/sst.php)

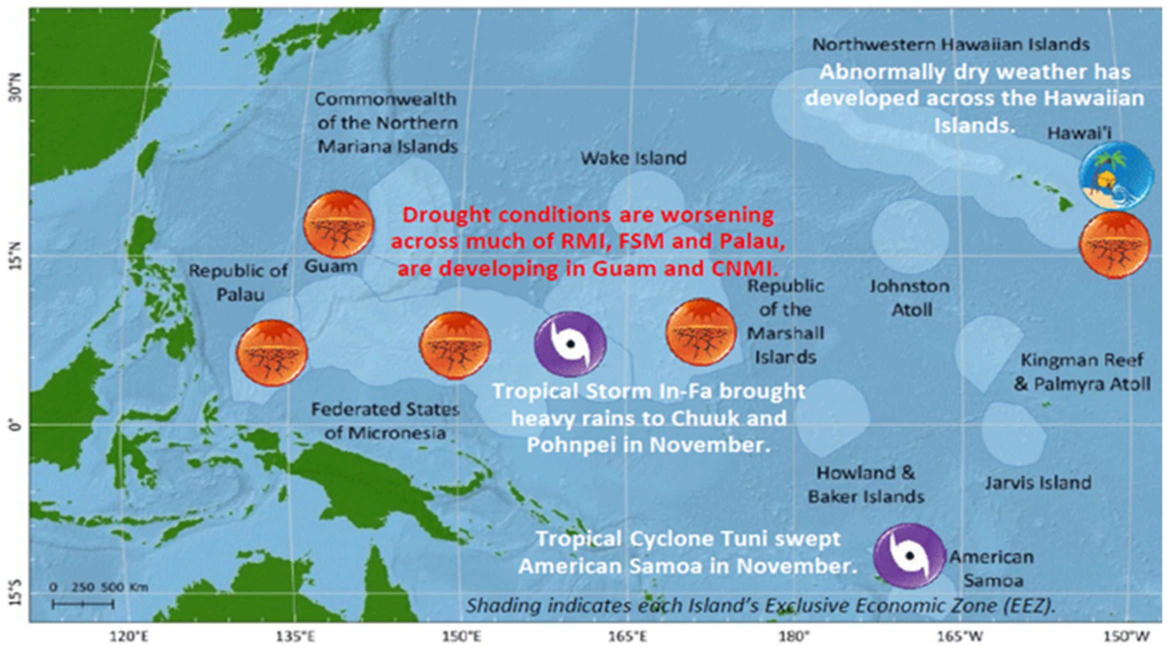
Measurement Platform: In-situ Station, Satellite, Model, Other

Rationale: The ENSO cycle is known to have impacts on Pacific fisheries including but not limited to tuna. The ONI focuses on ocean temperature which has the most direct effect on those fisheries. The atmospheric half of this Pacific basin oscillation is measured using the Southern Oscillation Index.

Figure 149. Oceanic Nino Index 1950 – 2015 and 2000-2015



The 2015-2016 El Niño From: http://www.pacificcis.org/dashboard



El Niño Continues

Below normal rainfall fell over most of Hawaii, the Federated States of Micronesia, the Marshall Islands, Guam and the Commonwealth of the Northern Marianas.

Very wet weather was reported in American Samoa in November and December.

There have been an above normal number of giant wave events in Hawaii

In 2015, there were a total of 31 tropical cyclones in the western North Pacific.

Fisheries scientists are investigating how high catches in 2015 might be related to oceanographic conditions like those associated with the 2015-2016 El Niño. Research is underway to understand HOW the 2015 longline catch was impacted by this El Niño.

***Natural Resources* – Coral bleaching HotSpots are concentrated on the central equatorial Pacific Ocean but have diminished throughout most of the northeastern Pacific Ocean. Taimasa (low stands) conditions have been reported in American Samoa.**

Regional Overview—End of Fourth Quarter 2-15

The current El Niño has reached its peak and a slow decline towards neutral conditions is expected to begin in the 1st quarter 2016. However, many islands will continue to feel the effects of El Niño throughout much of 2016. The SST anomaly outlook for the 1st quarter indicates near-normal values in American Samoa, with slightly below normal values across CNMI, FSM, and Palau. Above-normal SST anomalies are forecast to continue across the Hawaiian Islands. The 4-month coral bleaching outlook projects continued thermal stress to last through at least the end of May across the central equatorial Pacific. Alert Level 2 is expected to be widespread in the Eastern Pacific while the southwestern Pacific around the Great Barrier Reef, Vanuatu, and Fiji, reaches Alert Level 1. The forecast values for sea level in the 1st quarter indicate that most of the USAPI stations are likely to be much closer to normal. American Samoa is expected to be marginally below normal, with further falls expected as the year continues. In Hawaii, both Honolulu and Hilo are likely to be slightly elevated. Severe drought is expected to develop and/or continue across nearly all of the USAPI, including Palau, Yap, Chuuk, Pohnpei, and Kosrae, as well as all islands in the RMI, Guam and CNMI, and the Hawaiian Islands. Below-normal rainfall is projected for American Samoa. Tropical cyclone (TC) activity in the western north Pacific is expected to be quiet in the 1st quarter. During the last major El Niño event in 1998, Feb-Apr saw zero typhoons or tropical storms. In the southwest Pacific, due to strong El Niño conditions, the chances for TC activity remains elevated for a majority of the Pacific Island countries, and particularly in the eastern portion of the basin, including American Samoa.

3.3.4.5 PACIFIC DECADAL OSCILLATION (PDO):

Description: The PDO is often described as a long-lived El Niño-like pattern of Pacific climate variability. As seen with the better-known ENSO, extremes in the PDO pattern are marked by widespread variations in the Pacific Basin and the North American climate. In parallel with the ENSO phenomenon, the extreme phases of the PDO have been classified as being either warm or cool, as defined by ocean temperature anomalies in the northeast and tropical Pacific Ocean. When SSTs are anomalously cool in the interior North Pacific and warm along the Pacific Coast, and when sea level pressures are below average over the North Pacific, the PDO has a positive value. When the climate anomaly patterns are reversed, with warm SST anomalies in the interior and cool SST anomalies along the North American coast, or above average sea level pressures over the North Pacific, the PDO has a negative value.

The NCEI PDO index is based on NOAA's extended reconstruction of SSTs (ERSST Version 4). It is constructed by regressing the ERSST anomalies against the Mantua PDO index for their overlap period, to compute a PDO regression map for the North Pacific ERSST anomalies. The ERSST anomalies are then projected onto that map to compute the NCEI index.:

Description inserted from www.ncdc.noaa.gov/teleconnections/pdo/

Timeframe: Yearly, Quarterly/Monthly

Region/Location: Pacific Basin

Data Source/Responsible Party: NOAA NCEI Pacific Decadal Oscillation

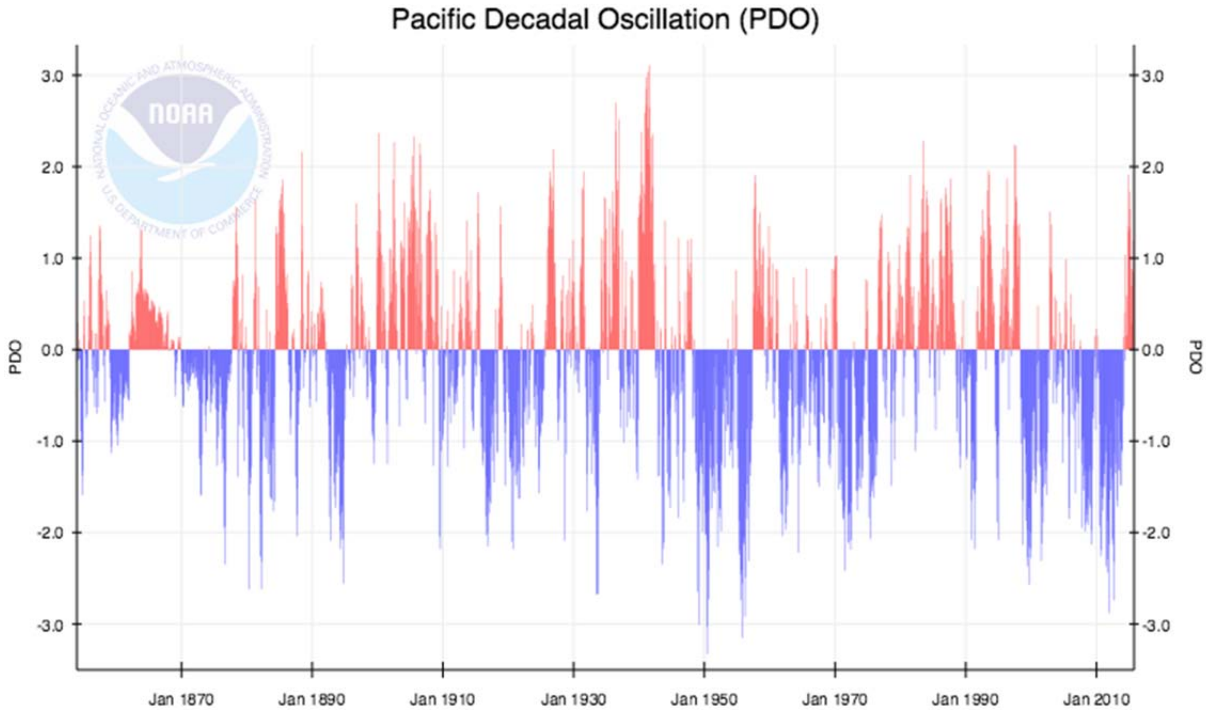
(www.ncdc.noaa.gov/teleconnections/pdo/) and

NOAA State of the Ocean (http://stateoftheocean.osmc.noaa.gov/atm/pdo.php)

Measurement Platform: Satellite

Rationale: The PDO was initially named by a fisheries scientist, Steven Hare, in 1996 while researching connections between Alaska salmon production cycles and Pacific climate. Like ENSO, PDO reflects changes between periods of persistently warm or persistently cool ocean temperatures but over a period of 20-30 years versus an El Niño event that typically persists for 6 to 18 months. The climatic fingerprints of the PDO are most visible in the North Pacific/North American sector but has secondary signatures exist in the tropics (http://research.jisao.washington.edu/pdo/). Understanding the links between PDO and fisheries in the Pacific is an active area of research.

Figure 150. Pacific Decadal Oscillation



3.3.4.6 TROPICAL CYCLONES

Description: This indicator uses historical data from NOAA National Climatic Data Center (NCDC) International Best Track Archive for Climate Stewardship to track the number of tropical cyclones in the western, central, and south Pacific basins. This indicator also monitors the Accumulated Cyclone Energy (ACE) Index and the Power Dissipation Index which are two ways of monitoring the frequency, strength, and duration of tropical cyclones based on wind speed measurements.

The annual frequency of storms passing through the western North Pacific basin is tracked and a stacked time series plot will show the representative breakdown of the Saffir-Simpson hurricane categories. Three solid lines across the graph will also be plotted representing a) the annual long-term average number of named storms, b) the annual average number of typhoons, and c) the annual average number of major typhoons (Cat 3 and above). Three more lines will also be shown (in light gray) representing the annual average number of named-storms for ENSO a) neutral, b) warm, and c) cool.

Every cyclone has an ACE Index value, which is a number based on the maximum wind speed measured at six-hourly intervals over the entire time that the cyclone is classified as at least a tropical storm (wind speed of at least 34 knot; 39 mph). Therefore, a storm’s ACE Index value accounts for both strength and duration. This plot will show the historical ACE values for each typhoon season and will have a solid line representing the annual average

ACE value. Three more lines will also be shown (in light gray) representing the annual average ACE values for ENSO a) neutral, b) warm, and c) cool.

Timeframe: Yearly

Region/Location: Hawai`i and U.S. Affiliated Pacific Islands

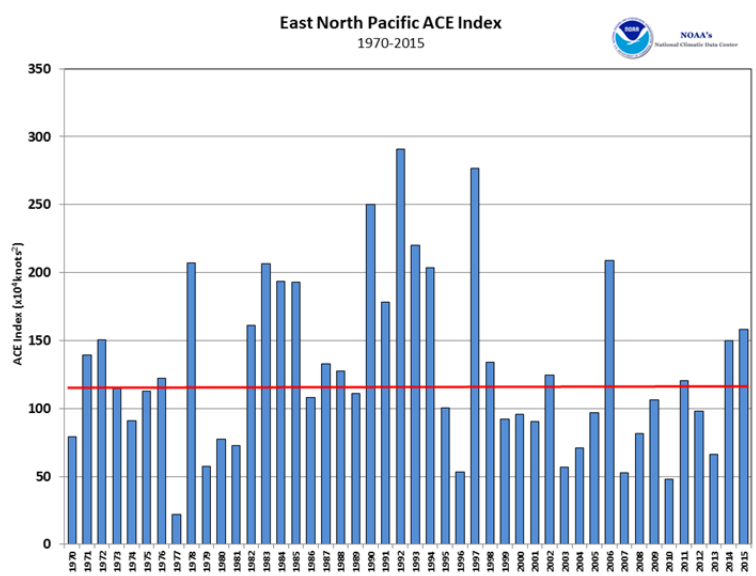
Data Source/Responsible Party: NCDC's International Best Track Archive for Climate Stewardship.

Measurement Platform: Satellite

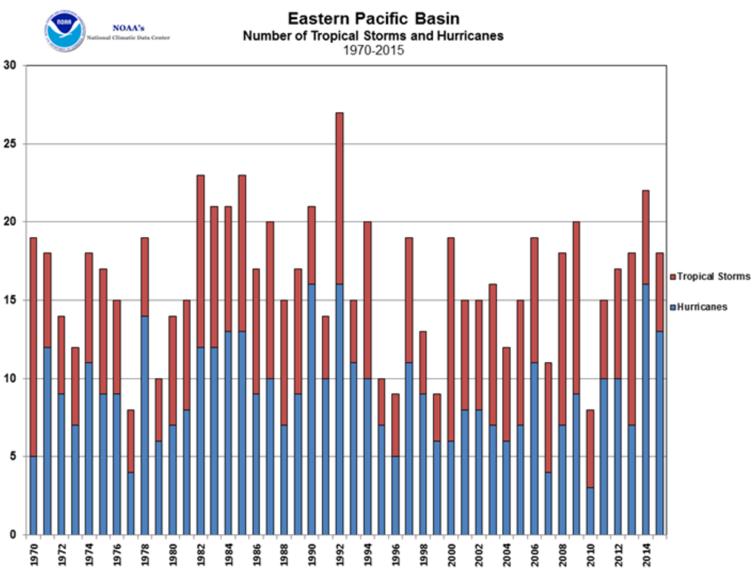
Rationale: The effects of tropical cyclones are numerous and well-known. At sea, storms disrupt and endanger shipping traffic as well as fishing effort and safety. The Hawai`i longline fishery, for example, had serious problems between August and November 2015 with vessels dodging storms at sea, delayed departures and inability to make it safely back to Honolulu because of bad weather. When cyclones encounter land, their intense rains and high winds can cause severe property damage, loss of life, soil erosion, and flooding. The associated storm surge, the large volume of ocean water pushed toward shore by the cyclone's strong winds, can cause severe flooding and destruction.

Annual Climatology of Tropical Cyclones in the Pacific

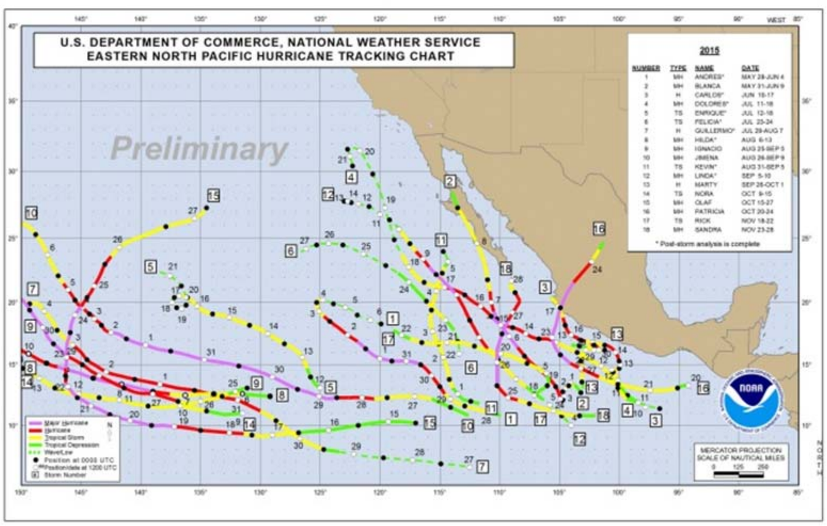
East Pacific Basin 2015 Season Summary:



2015 East Pacific Tropical Cyclone ACE 1970-2015. Source: NOAA's National Hurricane Center



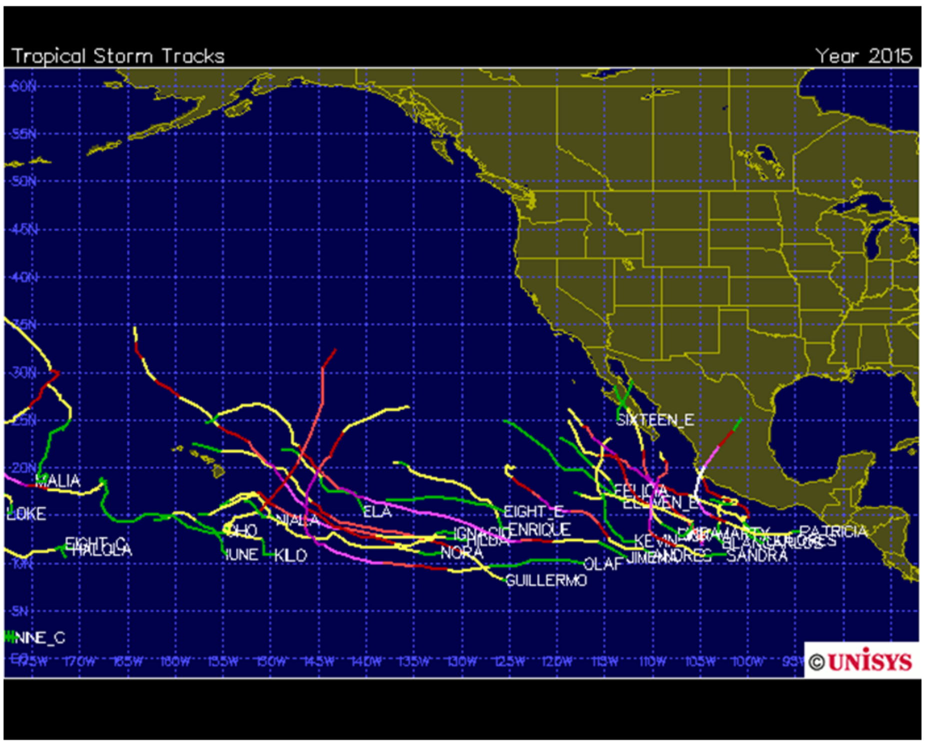
East Pacific Tropical Cyclone Count 1970-2015. Source: NOAA’s National Hurricane Center



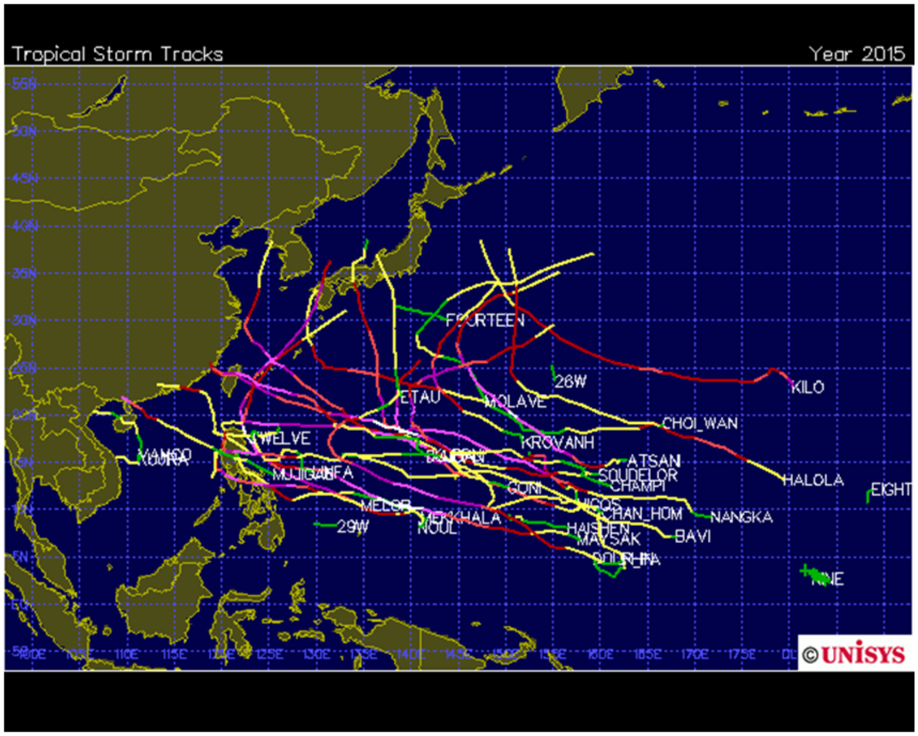
2015 Eastern Pacific Tropical Cyclones Tracks. Source: NOAA's National Hurricane Center

The NOAA National Centers for Environmental Information, State of the Climate: Hurricanes and Tropical Storms for Annual 2015, published online January 2016, notes that “the 2015 East Pacific hurricane season had 18 named storms, including 13 hurricanes, nine of which became major. The 1981-2010 average number of named storms in the East Pacific is 16.5, with 8.9 hurricanes, and 4.3 major hurricanes. This is the first year since reliable record keeping began in 1971 that the eastern Pacific saw nine major hurricanes. The Central Pacific also saw an above-average tropical cyclone season, with 14 named storms, eight hurricanes, and five major hurricanes, the most active season since reliable record-keeping began in 1971. Three major hurricanes (Ignacio, Kilo and Jimena) were active across the two adjacent basins at the same time, the first time this occurrence has been observed. The ACE index for the East Pacific basin during 2015 was 158 (x104 knots2), which is above the 1981-2010 average of 132 (x104 knots2) and the highest since 2006. The Central Pacific basin ACE during 2015 was 124 (x104 knots2).” Inserted from http://www.ncdc.noaa.gov/sotc/tropical-cyclones/201513).

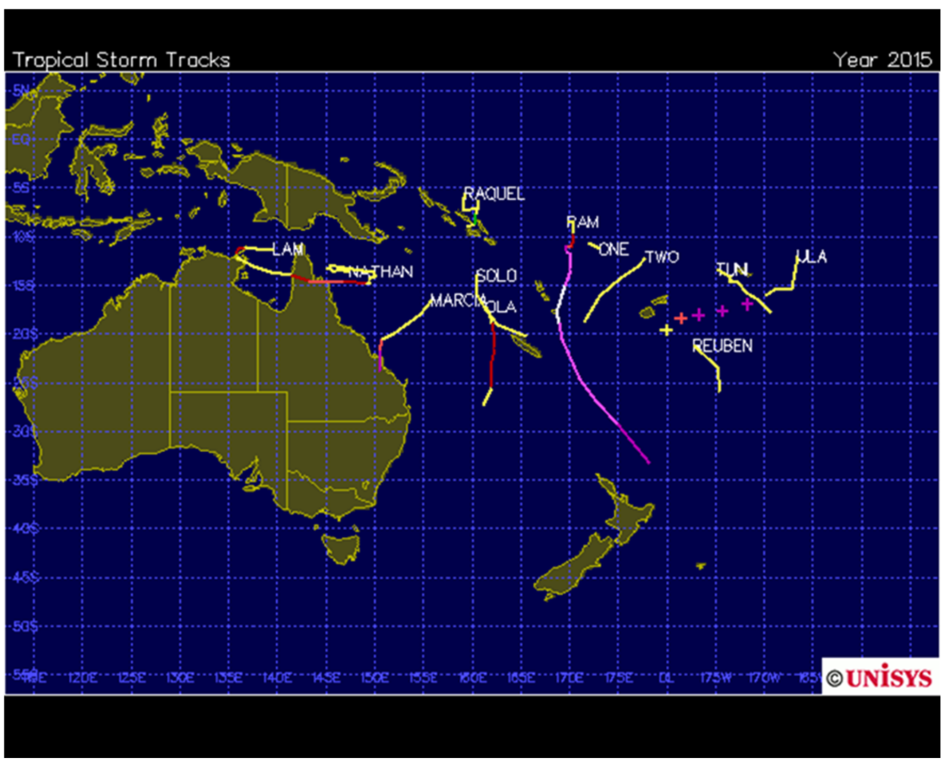
Cyclone Tracks 2015 (http://weather.unisys.com/hurricane)



Eastern Pacific Cyclone Tracks in 2015. Source: (http://weather.unisys.com/hurricane/e_pacific/2015)



Western Pacific Cyclone Tracks in 2015. Source:
http://weather.unisys.com/hurricane/w_pacific/2015



Southern Pacific Cyclones in 2015. Source: http://weather.unisys.com/hurricane/w_pacific

References:

NOAA National Centers for Environmental Information, State of the Climate: Hurricanes and Tropical Storms for Annual 2015, published online January 2016, retrieved on August 5, 2016 from http://www.ncdc.noaa.gov/sotc/tropical-cyclones/201513.

3.3.4.7 OLIGOTROPHIC AREA (NORTH PACIFIC)

Description: A time series of total monthly area in the central North Pacific with surface waters having ≤ 0.07 mg chl-*a* m^{-3} from October 1997 through present is presented. Chlorophyll concentration is determined via satellite remotely-sensed observations of ocean color. Waters below the 0.07 mg chl-*a* m^{-3} threshold are considered oligotrophic, or to be of low productivity. Work by Polovina et al. (2008) showed that these waters may be expanding in the North Pacific.

Timeframe: Monthly

Region/Location: Pelagic North Pacific (5 – 45°N, 120°E – 100°W)

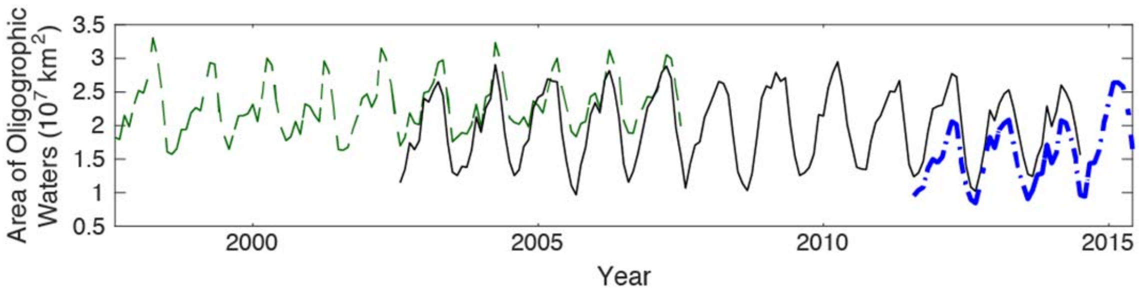
Data Source/Responsible Party: NOAA OceanWatch ocean color data. SeaWiFS, MODIS, and NASA VIIRS (http://oceanwatch.pifsc.noaa.gov/)

Measurement Platform: Satellite

Rationale: Trends in the area of oligotrophic waters are influenced by both natural climate variability and anthropogenic climate change. This area is of interest as lower productivity waters are not able to support as large a food web as higher productivity waters. This indicator provides information on ocean productivity.

Given the changes in sensors over time, it is difficult to place 2015 in the context of the full time series. However, oligotrophic area in 2015 was greater than in previous years in the VIIRS record. This indicates that low-productivity waters covered a larger area in 2015. It remains to be seen whether this is related to above-average ocean temperatures in 2015 and how longline fishery catch was impacted or may be impacted in subsequent years. Understanding these relationships is an area of active research.

Figure 151. Monthly total area of oligotrophic waters from SeaWiFS (green dashed), MODIS (black solid) and NASA VIIRS (blue dot-dash).



Note: The difference in total oligotrophic area between time series is due in part to the different sensors used.

References:

Polovina, J. J., E. A. Howell, and M. Abecassis (2008), Ocean's least productive waters are expanding, Geophys. Res. Lett., 35, L03618, doi:10.1029/2007GL031745.

3.3.4.8 OCEAN COLOR (CHLOROPHYLL-A CONCENTRATION)

Description: Satellite remotely-sensed ocean color is used to determine chlorophyll concentrations in the pelagic surface ocean. These data can be used as a proxy for phytoplankton abundance. Time series of median monthly chlorophyll-a concentrations averaged over four areas of interest is presented. Additionally, a spatial climatology and quarterly anomalies are shown for each area.

Timeframe: Monthly

Region/Location:

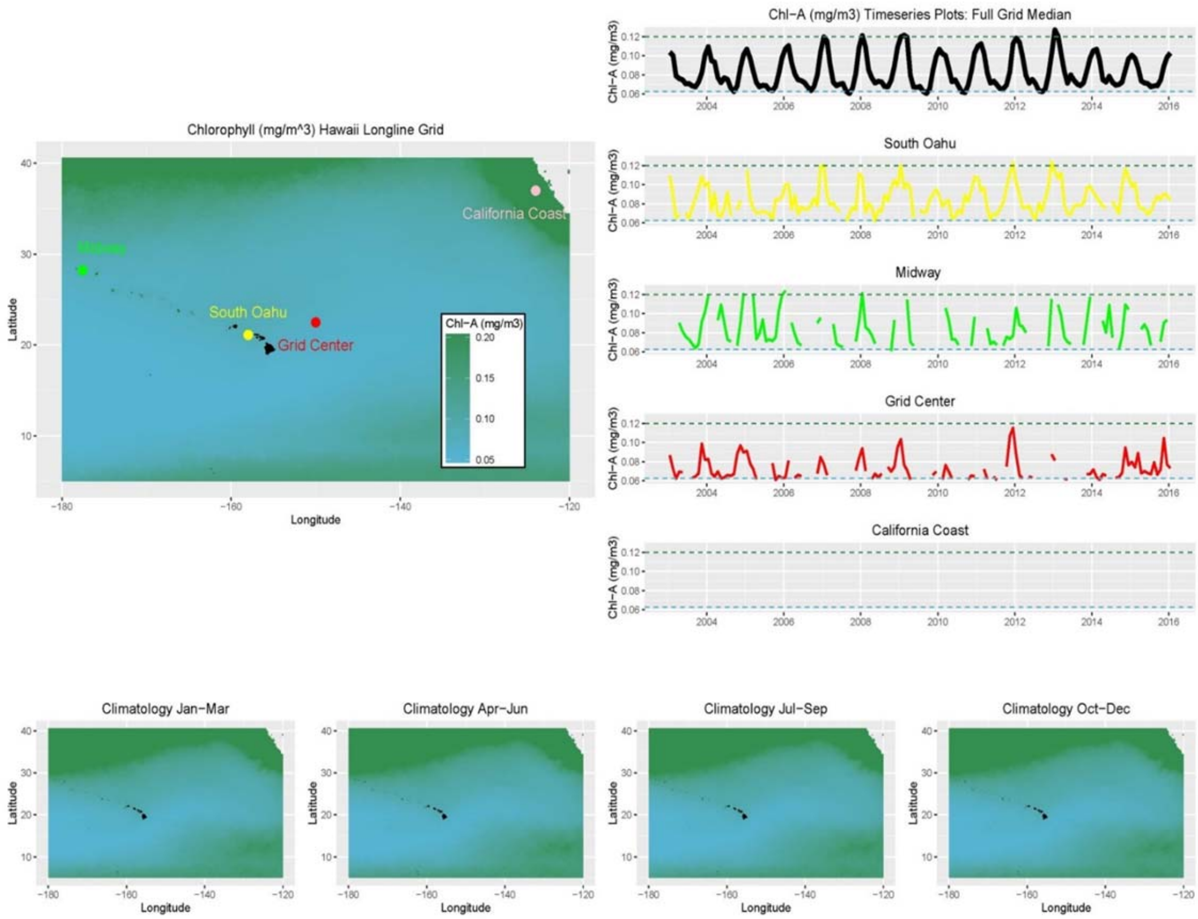
Hawai`i longline region: 5 – 45 °N, 180 – 120 °W

Data Source: NOAA OceanWatch ocean color data. SeaWiFS, MODIS, and NASA VIIRS (http://oceanwatch.pifsc.noaa.gov/)

Measurement Platform: Satellite

Rationale: Phytoplankton is the foundational food source for the fishery. Changes in phytoplankton abundance have been linked to both natural climate variability and anthropogenic climate change. These changes have the potential to impact fish abundance and catch.

Figure 152. Ocean Color (Chl-A) from the MODIS sensor.



3.3.4.9 NORTH PACIFIC SUBTROPICAL FRONT AND TRANSITION ZONE CHLOROPHYLL FRONT:

Description: The STF is marked by the 18°C SST isotherm and the TZCF by the 0.2 mg chl m^{-3} isopleth. They roughly mark the northern boundary of the North Pacific Subtropical Gyre as well as the northern extent of the Hawai`i-permitted longline fishery. The STF is targeted by the swordfish fishery. Additionally, both the STF and TZCF are used as migration and foraging corridors by both commercially-valuable and protected species. Both fronts migrate meridionally seasonally and their positions are impacted by the phase of ESNO. Due to significant seasonal variation, the climatology (SST: 1985 – 2014, Chl: 2012 – 2014) and anomaly (2015) are presented for the first quarter of the year only.

Timeframe: Yearly or seasonally

Region/Location: Hawai`i longline region: 5 – 45 °N, 180 – 120 °W

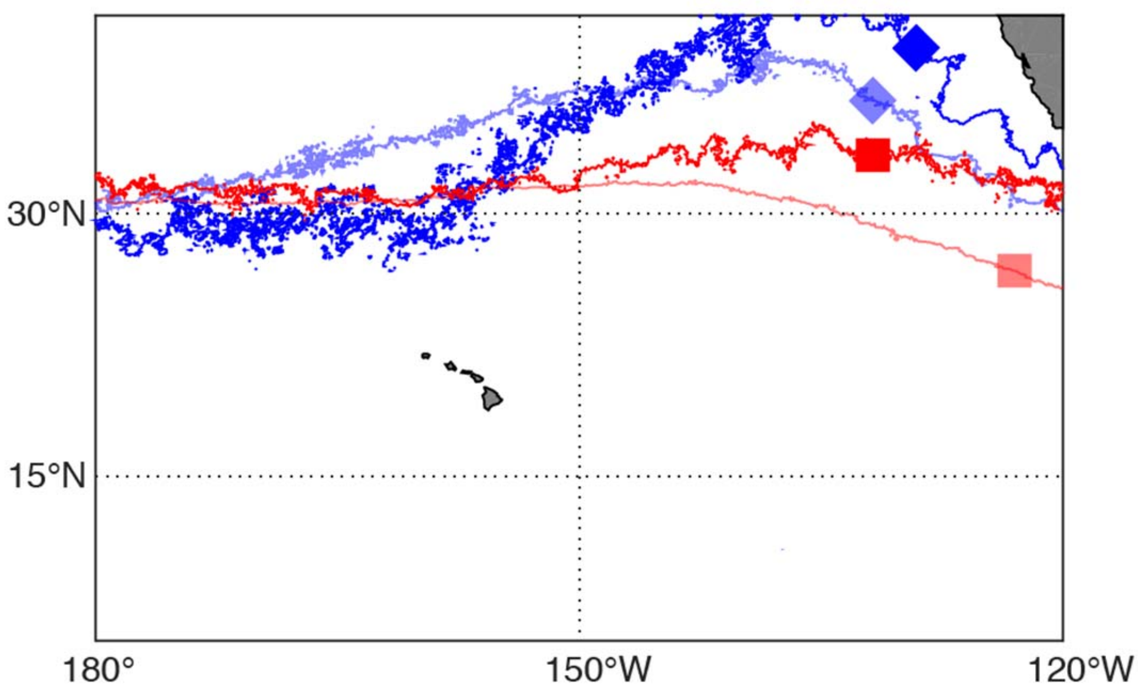
Data Source/Responsible Party: NOAA OceanWatch ocean color data. NASA VIIRS and Pathfinder/GAC (http://oceanwatch.pifsc.noaa.gov/)

Measurement Platform: Satellite

Rationale: Northward displacement of the frontal zone can increase the distance fishing vessels must travel to set their gear. This can, in turn, increase operational expenses. The positions of the fronts vary in response to natural climate variations. Long-term northward displacement of the frontal zone may also result from anthropogenic climate change

In the first quarter of 2015, the STF was farther north than average east of 150° W. This may be due to above average ocean temperatures in 2015. The TZCF was farther south than average conditions west of 150° W and farther north than average east of 150° W. This may be due to El Niño conditions as well as other factors.

Figure 153. First-quarter climatological STF (light red, square marker) and TZCF (light blue, diamond marker) and 2015 STF (bold red, square marker) and TZCF (bold blue, diamond marker).



3.3.4.10 FISH COMMUNITY SIZE STRUCTURE

Description: Since February 2006, longline observers have measured the length of every third fish caught. Using these lengths, community size structure is presented. A standardized pooled climatological distribution is presented with quarterly anomalies for 2015. Similar distributions for target species (bigeye tuna and swordfish) are also presented. Annual time series of pooled and target species lengths are presented as box plots. Bigeye lengths are from deep sets (≥ 15 hooks per float) only. Swordfish lengths are from shallow sets (< 10 hooks per float) only.

Timeframe: Yearly

Region/Location: Hawai`i-permitted longline fishing grounds

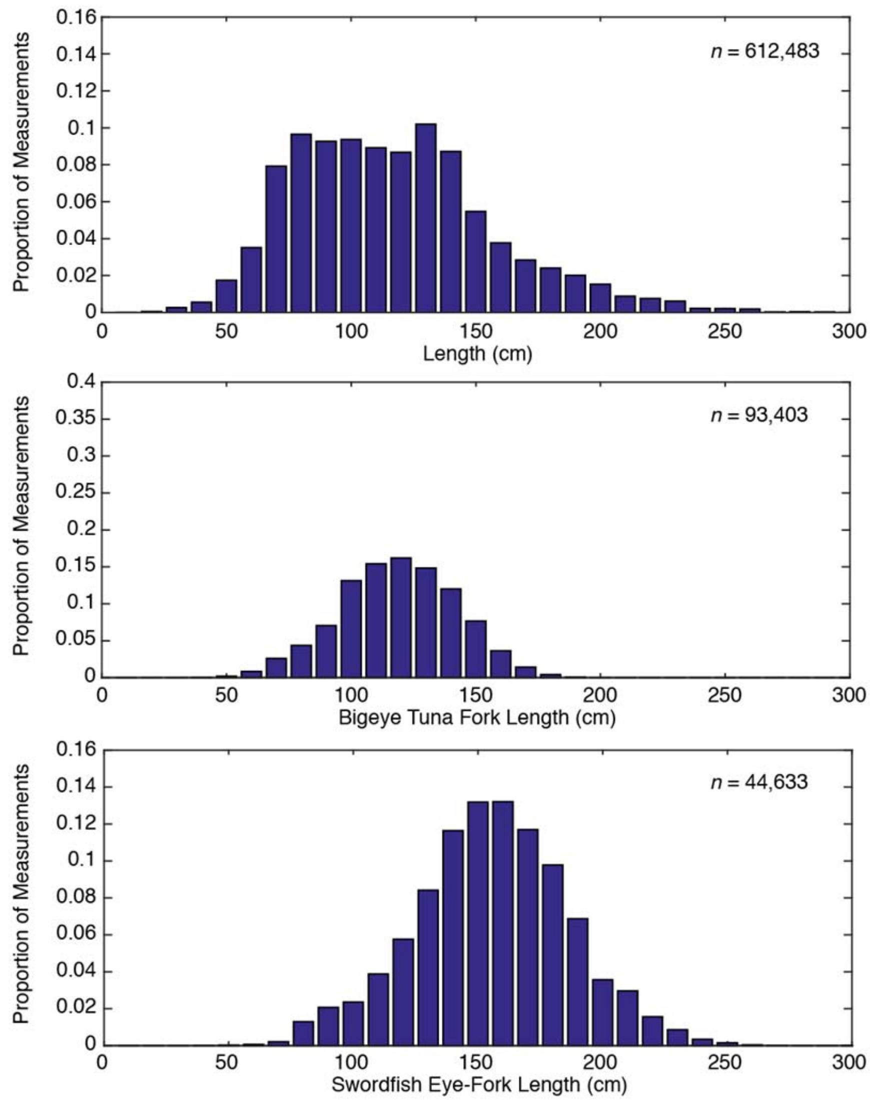
Data Source/Responsible Party: Longline observer records

Measurement Platform*: In-situ*

Rationale: Fish size can be impacted by a number of factors, including climate. Currently, the degree to which the fishery's target species are impacted by climate, and the scales at which these impacts may occur, is largely unknown. Ongoing collection of size structure data is necessary for detecting trends in community size structure and attributing causes of these trends.

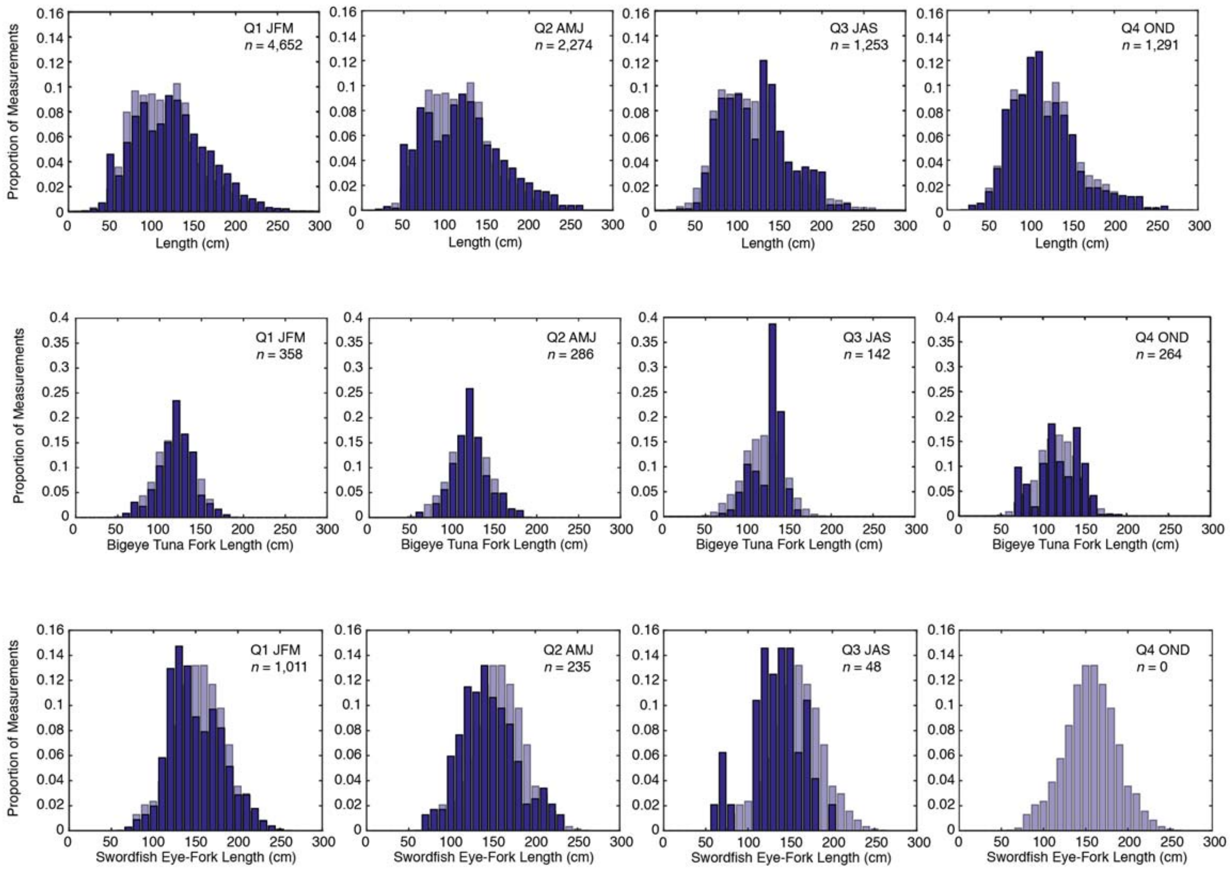
Data from 2015 are incomplete, making it challenging to place the year in context with previous years at this time. Understanding trends in fish size structure and how oceanographic conditions influence these trends is an area of active research.

Figure 154. Climatological (Feb 2006 – Dec 2014) size distribution of observed catch from the Hawai`i-permitted longline fleet for the full fishery (top), deep-set target (middle), and shallow-set target (bottom).



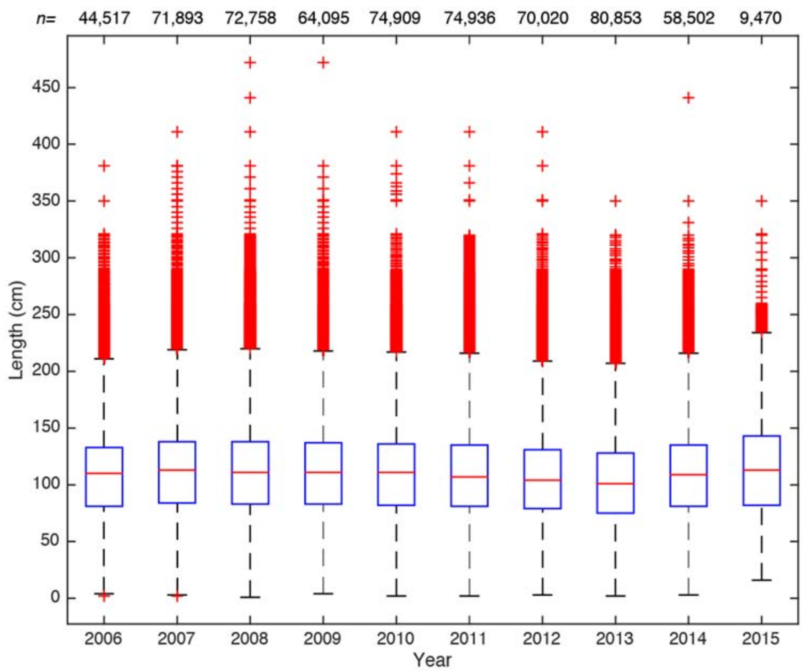
Note: 2014 data are incomplete.

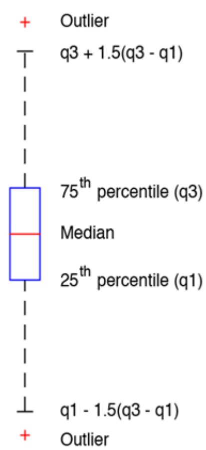
Figure 155. Quarterly 2015 anomalies for the full fishery (top), bigeye (middle), and swordfish (bottom). The climatological distribution is shaded lightly for reference.



Note: 2015 data are incomplete.

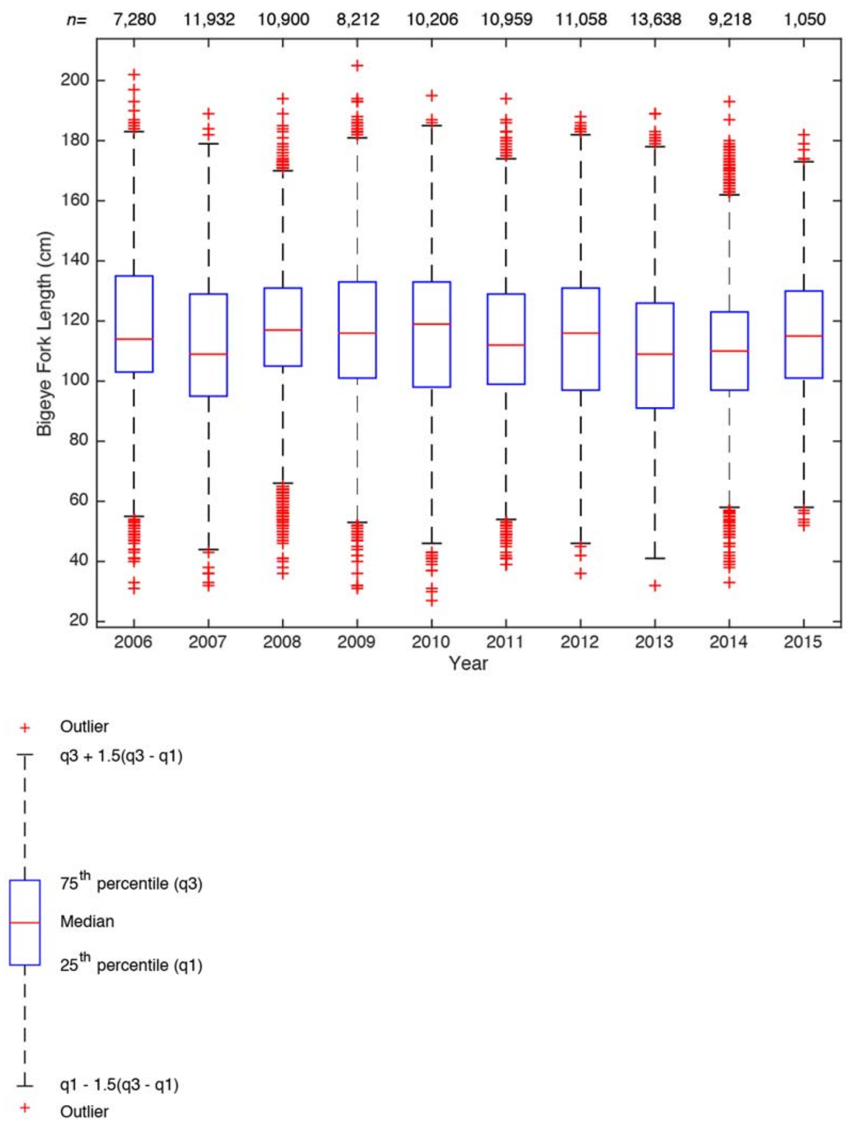
Figure 156. Annual distribution of observed fish lengths for the full fishery.





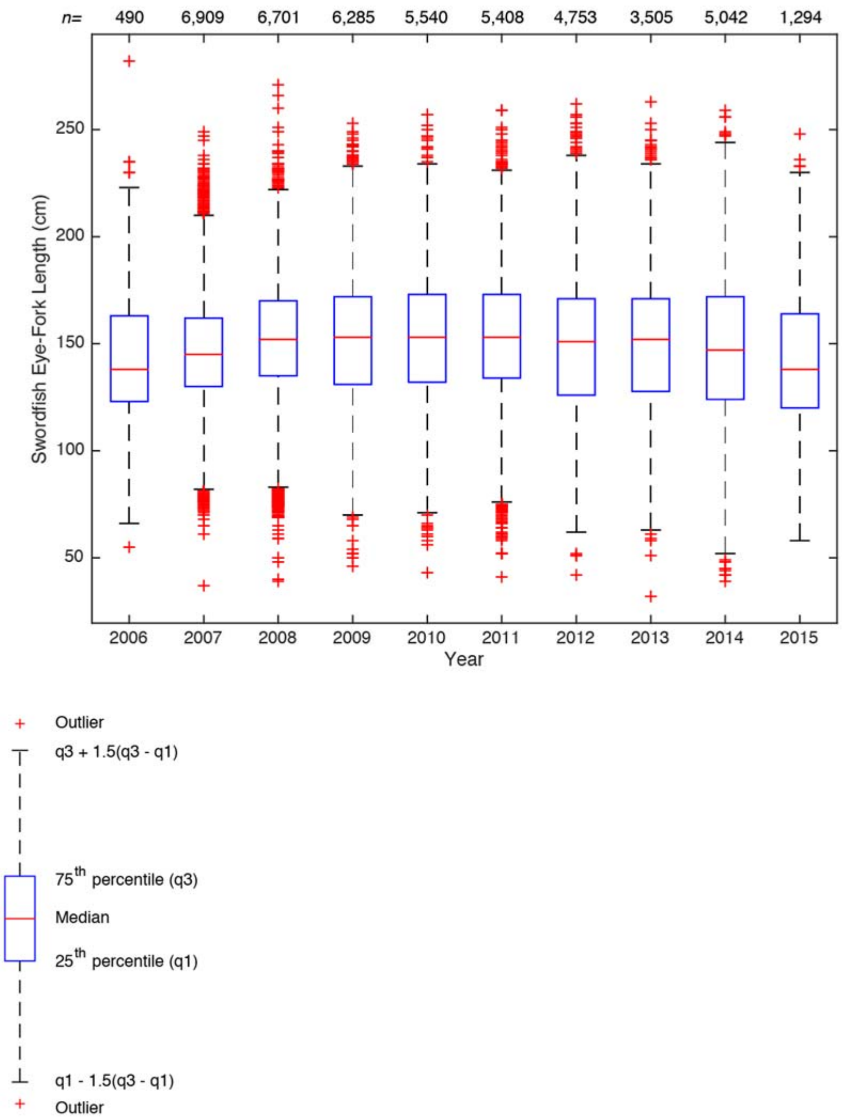
Note: 2014 and 2015 data are incomplete.

Figure 157. Annual distributions of observed bigeye lengths from deep sets (≥ 15 hooks per float).



Note: 2014 and 2015 data are incomplete

Figure 158. Annual distributions of observed swordfish lengths from shallow sets (< 15 hooks per float).



Note: 2014 and 2015 data are incomplete.

3.3.5 OBSERVATIONAL AND RESEARCH NEEDS

Through preparation of the 2015 Annual Pelagic Report, the Council has identified a number of observational and research needs that, if addressed, would improve the information content of future Climate and Ocean Indicators chapters. This information would provide fishery managers, fishing industry and community stakeholders with better understanding and predictive capacity that is vital to sustaining resilient and vibrant fishery in the Western Pacific

- Emphasize the importance of continuing the climate and ocean indicators used in this report so that a consistent, long-term record can be maintained and interpreted;

- Develop agreements among stakeholders and research partners to ensure the sustainability, availability and accessibility of climate and ocean indicators, associated datasets and analytical methods used in this and future reports;

- Improve monitoring and understanding of the impacts of changes in ocean temperature, pH and ocean acidity, ocean oxygen content and hypoxia, and sea level rise through active collaboration by all fishery stakeholders and research partners;

- Develop, test and provide access to additional climate and ocean indicators that can improve the Pelagic Conceptual Model;

- Investigate the connections between climate variables and other indicators in the Pelagic Conceptual Model to improve understand of changes physical, biochemical, biologic and socio-economic processes and their interactions in the regional ecosystem;

- Develop predictive models that can be used for scenario planning to account for unexpected changes and uncertainties in the regional ecosystem and fisheries;

- Foster applied research in ecosystem modeling to better describe current conditions and to better anticipate the future under alternative models of climate and ocean change including changes in expected human benefits and their variability;

- Improve understanding of the connections between PDO and fisheries ecosystems beyond the North Pacific;

- Improve understanding of mahi and swordfish size in relation to the orientation of the TZCF;

- Explore the connections among sea surface conditions, stratification and mixing;

- Identify the biological implications of tropical cyclones;

- Explore the additional and/or alternative climate and ocean that may have important effects on pelagic fisheries systems including:

    - Ocean currents and anomalies;

    - Near-surface wind velocity, direction and anomalies;

    - Wave forcing and anomalies;

    - Storm frequency;

    - South Pacific Oligotrophic Area;

- Nutrients;
- Standardize fish community size structure data for gear types;
- Estimates of phytoplankton abundance and size from satellite remotely-sensed SST and chlorophyll measurements;
- Eddy kinetic energy which can be derived from satellite and remotely-sensed sea surface height data and can be indicative of productivity-enhancing eddies;
- Time series of species richness and diversity from catch data which could potentially provide insight into how the ecosystem is responding to physical climate influences;
- Identifying and monitoring key socio-economic indicators of effects of changing climate on fishing communities and businesses;
- Cultural knowledge and practices for adapting to changing climate in the past and how they might contribute to future climate adaptation.

3.4 ESSENTIAL FISH HABITAT

3.4.1 INTRODUCTION

Per requirements of the MSA (50 CFR § 600.815), EFH information for all PMUS is found in the Pelagic FEP. NS2 requires that the Council review and revise EFH provisions periodically and report on this review as part of the annual SAFE report, with a complete review conducted as recommended by the Secretary, but at least once every 5 years.

The habitat objective of the FEP is to refine EFH and minimize impacts to EFH, with the following sub-objectives:

a. Review EFH and Habitat Areas of Particular Concern (HAPC) designations every 5 years and update such designations based on the best available scientific information, when available.
b. Identify and prioritize research to: assess adverse impacts to EFH and HAPC from fishing (including aquaculture) and non-fishing activities, including, but not limited to, activities that introduce land-based pollution into the coastal environment.

The pelagic EFH information was not reviewed during preparation of 2015 SAFE report, as the precious corals fishery was prioritized for the EFH review. The Council's support of non-fishing activities research is monitored through the program plan and five-year research priorities, not the annual report.

3.4.2 RESPONSE TO PREVIOUS COUNCIL RECOMMENDATIONS

At its 163rd meeting in Honolulu, HI, the Council endorsed a plan team working group to explore HAPC designation options for the Western Pacific region. The working group met twice in 2015 and recommended that the Council staff develop an HAPC policy that includes terms of reference for proposals from guiding documents, working group discussions and additional input from other relevant sources including Council bodies. The process should include criteria for 1) proposal development, 2) proposal review, and 3) HAPC weighting and interpretation considerations. This recommendation was chosen in favor of amending the FEPs with an HAPC update procedure, to increase management flexibility.

There are no other standing Council recommendations relevant to this annual report.

3.4.3 HABITAT USE BY MUS AND TRENDS IN HABITAT CONDITION

The geographic extent of essential fish habitat for pelagic management unit species is the shoreline to the edge of the exclusive economic zone. Egg/larval PMUS EFH is the water column to a depth of 200 m, while juvenile/adult PMUS EFH is designated to 1000 m. HAPC is designated to a depth of 1,000 m above seamounts and banks with summits shallower than 2000 m.

Because the habitat is the water column, the Climate Change Indicators (Section 4.3) provides data and trends relevant to pelagic EFH, including oceanic pH, the Oceanic Nino Index, Pacific Decadal Oscillation, tropical cyclones, North Pacific oligotrophic area, ocean color, and subtropical front/transition zone chlorophyll front indicators. Future SAFE reports may provide further interpretation of these indicators as they relate to EFH.

3.4.4 REPORT ON REVIEW OF EFH INFORMATION

The pelagics biological components of the EFH section in the pelagic FEP will be scheduled for review by Council, PIFSC, and PIRO leadership pending finalization of the EFH Agreement, an attachment to the Regional Operating Agreement. The non-fishing impact and cumulative impacts components are scheduled for review in 2016.

3.4.5 RESEARCH AND INFORMATION NEEDS

The Council identified scientific data needs to more effectively address the EFH provisions in the FEP. In subsequent SAFE reports, this section will include active research and data collection to address these needs as well as a list of revised and focused critical research needs for specific management concerns.

3.4.6 REFERENCES

Western Pacific Fishery Management Council. Amendment 8 to the Pelagic Fishery Management Plan. 64 FR 19067, April 19, 1999.

3.5 MARINE PLANNING

3.5.1 INTRODUCTION

Marine planning is a science-based tool being utilized regionally, nationally and globally to identify and address issues of multiple human uses, ecosystem health and cumulative impacts in the coastal and ocean environment. The Council's efforts to incorporate marine planning in its actions began in response to Executive Order 13547, Stewardship of the Ocean, Our Coasts, and the Great Lakes.

At its 165th meeting in March 2016, in Honolulu, Hawai`i, the Council approved the following objective for the FEPs: Consider the Implications of Spatial Management Arrangements in Council Decision-making. The following sub-objectives apply:

a. Identify and prioritize research that examines the positive and negative consequences of areas that restrict or prohibit fishing to fisheries, fishery ecosystems, and fishermen, such as the Bottomfish Fishing Restricted Areas, military installations, NWHI restrictions, and Marine Life Conservation Districts.

b. Establish effective spatially-based fishing zones.

c. Consider modifying or removing spatial-based fishing restrictions that are no longer necessary or effective in meeting their management objectives.

d. As needed, periodically evaluate the management effectiveness of existing spatial-based fishing zones in Federal waters.

In order to monitor implementation of this objective, this annual report includes the Council's spatially-based fishing restrictions or marine managed areas (MMAs), the goals associated with those, and the most recent evaluation. Council research needs are identified and prioritized through the 5 Year Research Priorities and other processes, and are not tracked in this report.

In order to meet the EFH and National Environmental Policy Act (NEPA) mandates, this annual report tracks activities that occur in the ocean that are of interest to the Council and incidents that may contribute to cumulative impact. While the Council is not responsible for NEPA compliance, monitoring the environmental effects of ocean activities for the FEP's EFH cumulative impacts section is duplicative of the agency's NEPA requirement, and therefore, this report can provide material or suggest resources to meet both mandates.

3.5.2 RESPONSE TO COUNCIL PREVIOUS RECOMMENDATIONS

At its 147th meeting, the Council recommended a no-take area from 0-12 nautical miles around Rose Atoll with the Council to review the no-take regulations after three years. The Council will hear a report of the Rose Atoll Marine National Monument from NMFS and the U.S. Fish and Wildlife Service at its 168th meeting.

At its 162nd meeting, the Council recommended a regulatory amendment for the temporary exemption to the Large Vessel Protected Area (LVPA) by American Samoa longline limited entry permitted vessels greater than 50ft in length. The Council will review the LVPA exemption on an annual basis with regards, but not limited to, catch rates of fishery participants; small vessel participation; and fisheries development initiatives. At its 165th meeting, the Council requested NMFS PIFSC provide pelagic catch rates and other fishery statistics for the newly opened sections of the LVPA, which the Council will hear at its 168th meeting.

3.5.3 MMAS

3.5.3.1 MMAS ESTABLISHED UNDER FMPS

Council-established MMAs are shown in Figure 159, and are compiled in Table 84.

Figure 159. Spatial Management Areas Established under FMPs

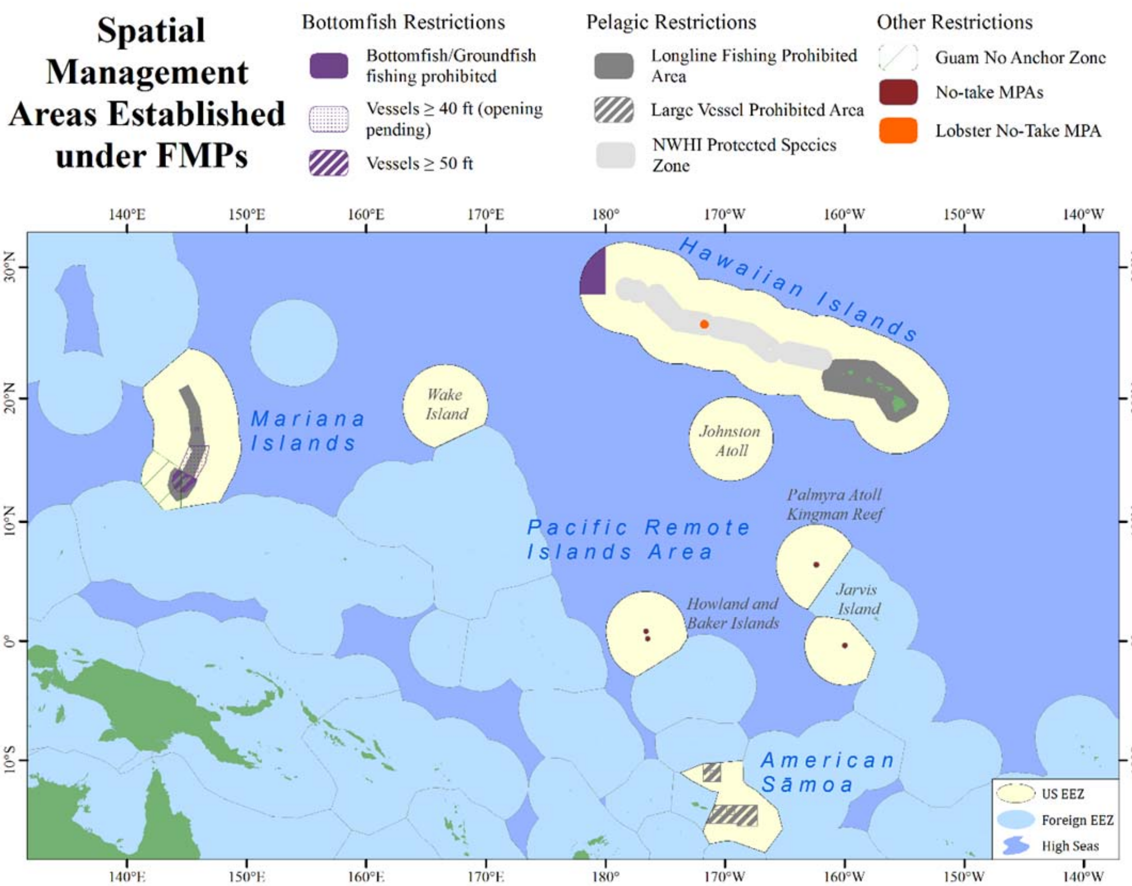


Table 84. MMAs established under FEPs from 50 CFR § 665.

	Island	50 CFR /FR /Amendment Reference	Marine Area (km²)	Fishing Restriction	Goals	Most Recent Evaluation	Review Deadline
Pelagic Restrictions							
'i)	NWHI	665.806(a)(1) 56 FR 52214 Pelagic FEP Am. 3	351,514.00	Longline fishing prohibited	Prevent longline interaction with monk seals	1991	-
'i)	MHI	665.806(a)(2) 57 FR 7661 Pelagic FEP Am. 5	248,682.38	Longline fishing prohibited	Prevent gear conflicts between longline vessels and troll/handline vessels	1992	-
	Guam	665.806(a)(3) 57 FR 7661 Pelagic FEP Am. 5	50,192.88	Longline fishing prohibited	Prevent gear conflicts between longline vessels and troll/handline vessels	1992	-
		665.806(a)(4) 76 FR 37287	88,112.68	Longline fishing prohibited	Reduce potential for nearshore localized fish depletion from longline fishing, and to limit catch competition and gear conflicts between the CNMI-based longline and trolling fleets	2011	-
can	Tutuila, Manu'a, and Rose Atoll	665.806 (b)(1) 81 FR 5619	74,857.32	Vessels ≥ 50 ft prohibited	Prevent gear conflict with smaller alia vessels; longline vessels >50 ft exempted from 12 to 50 nm to improve the viability of the American Samoa longline fishery and achieve optimum yield from the fishery while preventing overfishing	Jan 29, 2016	Jan 29, 2017 (March meeting)

Name	FEP	Island	50 CFR /FR /Amendment Reference	Marine Area (km^2)	Fishing Restriction	Goals	Most Recent Evaluation	Review Deadline
Large Vessel Prohibited Area	Pelagic (American Samoa)	Swains Island	665.806 (b)(2) 81 FR 5619 Pelagic FEP	28,352.17	Vessels ≥ 50 ft prohibited	Prevent gear conflict with smaller alia vessels; longline vessels over 50 ft exempted between 12 and 50 nm due to improve the viability of the American Samoa longline fishery and achieve optimum yield from the fishery while preventing overfishing	Jan 29, 2016	Jan 29, 2017 (March meeting)
Other Restrictions								
Howland Island No-Take Marine Protected Area (MPA)/PRI Marine National Monument	PRIA/ Pelagic	Howland Island	665.599 and 665.799(a)(1) 69 FR 8336 Coral Reef Ecosystem FEP 78 FR 32996 PRIA FEP Am. 2	-	All Take Prohibited	Minimize adverse human impacts on coral reef resources; commercial fishing prohibited within 12 nautical miles (nmi)	2013	-
Jarvis Island No-Take MPA/PRI Marine National Monument	PRIA/ Pelagic	Jarvis Island	665.599 and 665.799(a)(1) 69 FR 8336 Coral Reef Ecosystem FEP 78 FR 32996 PRIA FEP Am. 2	-	All Take Prohibited	Minimize adverse human impacts on coral reef resources; commercial fishing prohibited within 12 nmi	2013	-
Baker Island No-Take MPA/PRI Marine National Monument	PRIA/ Pelagic	Baker Island	665.599 and 665.799(a)(1) 69 FR 8336 Coral Reef Ecosystem FEP 78 FR 32996 PRIA FEP Am. 2	-	All Take Prohibited	Minimize adverse human impacts on coral reef resources; commercial fishing prohibited within 12 nmi	2013	-

Name	FEP	Island	50 CFR /FR /Amendment Reference	Marine Area (km²)	Fishing Restriction	Goals	Most Recent Evaluation	Review Deadline
Rose Atoll No-Take MPA/Rose Atoll Marine National Monument	American Samoa Archipelago/ Pelagic	Rose Atoll	665.99 and 665.799(a)(2) 69 FR 8336 Coral Reef Ecosystem FEP 78 FR 32996 American Samoa FEP Am. 3	-	All Take Prohibited	Minimize adverse human impacts on coral reef resources; commercial fishing prohibited within 12 nmi	June 3, 2013	June 3, 2016 (Council to review no-take regulations after 3 years)
Kingman Reef No-Take MPA/PRI Marine National Monument	PRIA/Pelagic	Kingman Reef	665.599 and 665.799(a)(1) 69 FR 8336 Coral Reef Ecosystem FEP 78 FR 32996 PRIA FEP Am. 2	-	All Take Prohibited	Minimize adverse human impacts on coral reef resources; all fishing prohibited within 12 nmi	2013	-
Guam No Anchor Zone	Mariana Archipelago	Guam	665.399 69 FR 8336 Coral Reef Ecosystem FEP	138,992.51	Anchoring by all fishing vessels ≥ 50 ft prohibited on the offshore southern banks located in the U.S. EEZ off Guam	Minimize adverse human impacts on coral reef resources	2004	-
Johnston Atoll Low-Use MPA/PRI Marine National Monument	PRIA/ Pelagic	Johnston Atoll	69 FR 8336 Coral Reef Ecosystem FEP 78 FR 32996 PRIA FEP Am. 2	-	Special Permit Only	Minimize adverse human impacts on coral reef resources; superseded by prohibiting fishing within 12 nmi in Am. 2	2013	-

Name	FEP	Island	50 CFR /FR /Amendment Reference	Marine Area (km^2)	Fishing Restriction	Goals	Most Recent Evaluation	Review Deadline
Palmyra Atoll Low-Use MPAs/PRI Marine National Monument	PRIA/ Pelagic	Palmyra Atoll	69 FR 8336 Coral Reef Ecosystem FEP 78 FR 32996 PRIA FEP Am. 2	-	Special Permit Only	Minimize adverse human impacts on coral reef resources; superseded by prohibiting fishing within 12 nmi in Am. 2	2013	-
Wake Island Low-Use MPA/PRI Marine National Monument	PRIA/Pelagic	Wake Island	69 FR 8336 Coral Reef Ecosystem FEP 78 FR 32996 PRIA FEP Am. 2	-	Special Permit Only	Minimize adverse human impacts on coral reef resources; superseded by prohibiting fishing within 12 nmi in Am. 2	2013	-

3.5.3.2 OTHER MPAS IN THE REGION

MPA data were downloaded from the NOAA Marine Protected Areas Center Data Inventory. Data are current through 2014.

The Excel MPA Inventory was filtered to retain only those records without GIS data for the following management agencies: American Samoa, Bureau of Ocean Energy Management, Guam, Hawai`i, Mariana Islands, Marine National Monuments, National Estuarine Research Reserve System, National Marine Fisheries Service, National Park Service, or National Wildlife Refuge System.

MPAs within the 200 nmi limit around Hawai`i, American Samoa, Guam, the CNMI, Wake Island, Johnston Atoll, Palmyra Atoll and Kingman Reef, Jarvis Island, and Howland and Baker Islands were selected from the MPA GIS inventory and their attributes were exported to a spreadsheet. Fields that matched the Excel inventory were retained.

Type, size, location, and fishery measures are shown in Figure 160 and summarized in Table 85.

Figure 160. Large Regulated Commercial Fishing Areas of the U.S. EEZ, Western Pacific Region

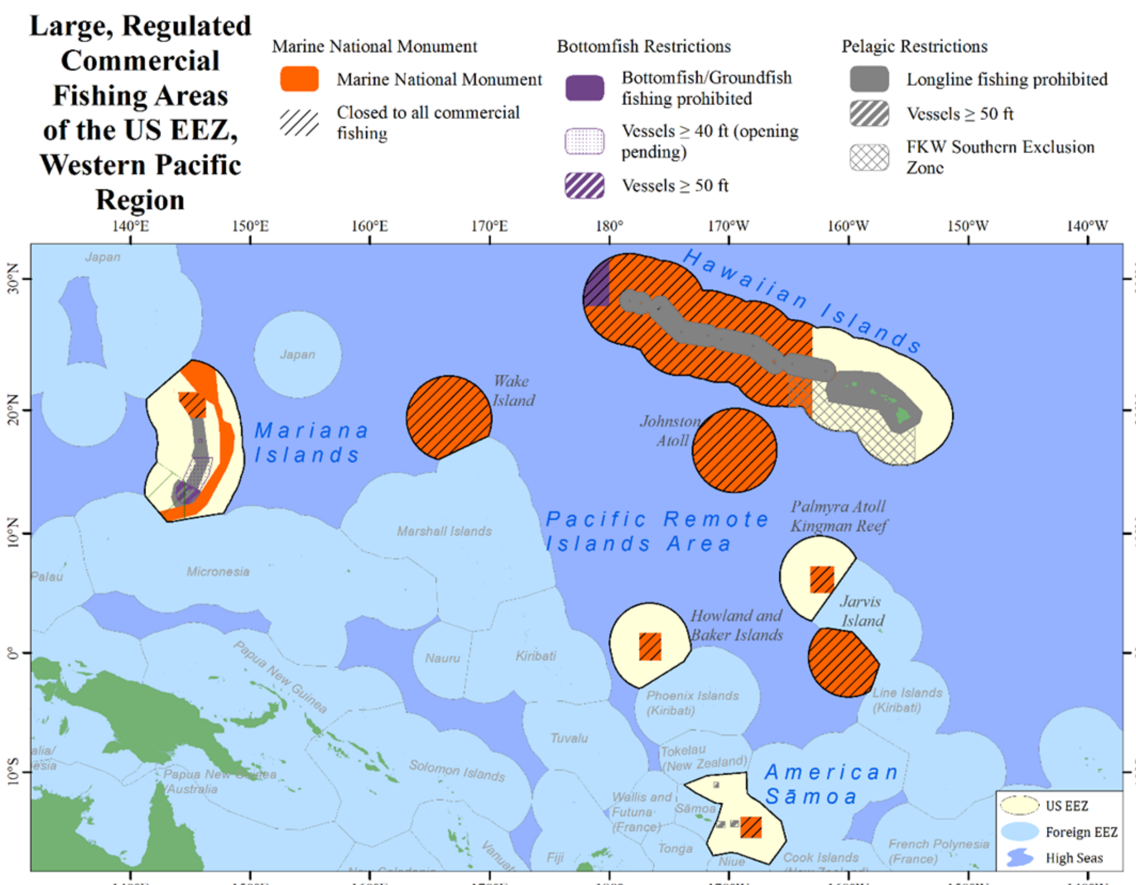


Table 85. Marine Protected Areas in the Western Pacific Region from the MPA Inventory unless otherwise noted

Site ID	Name	State	Marine Area (km^2)	Fishing Restrictions
MNM8	Pacific Remote Islands Marine National Monument	Marine National Monuments	1,267,750.00	Commercial Fishing Prohibited, Recreational Fishing Restricted
MNM1	Papahanaumokuakea Marine National Monument	Marine National Monuments	363,687.00	Commercial and Recreational Fishing Prohibited
MNM7	Marianas Trench Marine National Monument	Marine National Monuments	248,455.00	Commercial Fishing Prohibited, Recreational Fishing Restricted
NWR189	Mariana Trench National Wildlife Refuge	National Wildlife Refuge System	205,499.00	No Site Restrictions
NMS3	National Marine Sanctuary of American Samoa	National Marine Sanctuaries	35,373.70	Commercial and Recreational Fishing Restricted
MNM6	Rose Atoll Marine National Monument	Marine National Monuments	35,004.60	Commercial Fishing Prohibited, Recreational Fishing Restricted
NMS9	Hawaiian Islands Humpback Whale National Marine Sanctuary	National Marine Sanctuaries	3,554.97	No Restrictions on Fishing
NWR71	Midway Atoll National Wildlife Refuge	National Wildlife Refuge System	2,365.30	Commercial and Recreational Fishing Prohibited
NWR143	Johnston Island National Wildlife Refuge	National Wildlife Refuge System	2,202.78	Commercial and Recreational Fishing Prohibited
NWR157	Palmyra Atoll National Wildlife Refuge	National Wildlife Refuge System	2,051.73	Commercial Fishing Prohibited, Recreational Fishing Restricted
NWR190	Wake Atoll National Wildlife Refuge	National Wildlife Refuge System	2,027.38	Commercial Fishing Prohibited, Recreational Fishing Restricted
NWR145	Kingman Reef National Wildlife Refuge	National Wildlife Refuge System	1,968.05	Commercial and Recreational Fishing Prohibited
NWR59	Jarvis Island National Wildlife Refuge	National Wildlife Refuge System	1,756.62	Commercial and Recreational Fishing Prohibited
NWR53	Howland Island National Wildlife Refuge	National Wildlife Refuge System	1,688.47	Commercial and Recreational Fishing Prohibited
NWR10	Baker Island National Wildlife Refuge	National Wildlife Refuge System	1,663.16	Commercial and Recreational Fishing Prohibited
NWR188	Mariana Arc Of Fire National Wildlife Refuge	National Wildlife Refuge System	222.57	No Site Restrictions
HI34	Kaho'olawe Island Reserve	Hawai`i	202.94	Commercial Fishing Prohibited, Recreational Fishing Restricted
NWR95	Rose Atoll National Wildlife Refuge	National Wildlife Refuge System	158.62	Commercial and Recreational Fishing Prohibited
-	False Killer Whale Longline Exclusion Zone	National Marine Fisheries Service	-	Fishing Prohibited

3.5.4 FISHING ACTIVITIES AND FACILITIES OCCURRING IN THE PIR

Guam. The small-boat trolling fishery in Guam relies on boat ramp access and Fish Aggregating Devices to access fishing grounds and improve catch. The following is recent activities to support this fishery.

The makeshift ramp at Ylig Bay was eliminated in 2010. Widening of the main road on the southeast coast of Guam will cause removal of the ramp. In December, 2006, a new launch ramp and facility was opened in Acfayan Bay, located in the village on Inarajan on the southeast coast of Guam. Monitoring of this ramp for pelagic fishing activity began at the start of 2007. In early 2007, this facility was damaged by heavy surf, and has yet to be repaired. Monitoring of this ramp is currently on hold until the ramp is repaired. The current financial situation in Guam makes it unlikely this ramp will be repaired in the near future. DAWR staff are meeting with land owners and Department of Public Works officials to develop a new boat launching facility on the east side of Guam.

No FADs were deployed in 2015. Issues with procurement delayed awarding of a FAD deployment contract. DAWR currently has five systems on hand, and is awaiting the awarding of a deployment contract. If these five systems are deployed, this should bring the number of FADS on station to eleven, of the fourteen considered to be a full complement.

3.5.5 NON-FISHING ACTIVITIES AND FACILITIES OCCURRING IN THE PIR

In the Western Pacific Region, fisheries compete with other activities for access to and use of fishing grounds. These activities include, but are not limited to, military bases and training activities, commercial shipping, recreational activities and off-shore energy projects. Between the Bureau of Ocean Energy Management (BOEM), the U.S. Army Corps of Engineers (USACE), and NMFS, most permits for offshore energy and aquaculture development, dredging or mooring projects that occur in the waters of the U.S., are captured. Department of Defense activities are assessed in environmental impact statements (EISs) on a five-year cycle and are available through the Federal Register. Due to the sheer volume of ocean activities and the annual frequency of this report, only major activities on multi-year planning cycles or those permitted by NMFS Sustainable Fisheries Division are tracked in this report.

3.5.5.1 AQUACULTURE FACILITIES

There are no offshore aquaculture projects in federal waters, proposed or existing, in American Samoa, Guam, CNMI, or the PRIA. Hawai`i has one permitted offshore aquaculture facility. The information in Table 86 was transferred from the Joint NMFS and USACE EFH Assessment for the Proposed Issuance of a Permit to Authorize the Use of a Net Pen and Feed Barge Moored in Federal Waters West of the Island of Hawai`i to Fish for a Coral Reef Ecosystem Management Unit Species, *Seriola rivoliana* (RIN 0648-XD961).

Table 86. Aquaculture facilities.

Name	Size	Location	Species	Stage
Kampachi Farms	Shape: Cylindrical Height: 33 ft Diameter: 39 ft Volume: 36,600 ft^3	5.5 nautical miles (nm) west of Keauhou Bay and 7 nm south-southwest of Kailua Bay, off the west coast of Hawai`i Island 19 deg 33 min N 156 deg 04 min W. mooring scope is 10,400 foot radius.	*Seriola rivoliana*	Draft EA public comment period closed February 16, 2016 (81 FR 4021)

3.5.5.2 ALTERNATIVE ENERGY FACILITIES

There are no alternative energy facilities in Federal waters, proposed or existing, in American Samoa, Guam, CNMI, or the PRIA. There is some renewable energy development interest in the Northern Islands, which the Mayors may discuss in their meeting on Pagan (pers. comm., MPCCC meeting, March 30, 2016).

Hawai`i has three proposed wind energy facilities in federal waters and several existing alternative energy facilities. The information in Table 87 is from various sources.

Table 87. Alternative Energy Facilities and Development

Name	Type	Location	Impact to Fisheries	Stage of Development	Source
AWH O'ahu Northwest Project	408 MW Wind	12 miles W of Ka'ena Pt, O'ahu	Hazard to navigation; benthic impacts from cables	Request for Interest as a Federal Register notice to determine if competitive interest exists is pending	BOEM Hawai`i
AWH O'ahu South Project	408 MW Wind	17 miles S of Waikiki, O'ahu	Hazard to navigation; benthic impacts from cables; close to Penguin Bank	Request for Interest as a Federal Register notice to determine if competitive interest exists is pending	BOEM Hawai`i
Progression Hawai`i Offshore Wind, Inc.	400 MW Wind	SSE of Barber's Pt and SW of Waikiki, O'ahu	Hazard to navigation; in popular trolling area; benthic impacts from cables	Lease application processed - state task force meeting pending	Progression Energy BOEM Lease Application, BOEM, Hawai`i
Natural Energy Laboratory of Hawai`i	120 kW OTEC Test Site/ 1 MW Test Site	West Hawai`i	Intake	120 kW operational; Between DEA and FEA/FONSI for 1 MW Test Site using existing infrastructure	http://nelha.Hawai`i.gov/energy-portfolio/ Draft Environmental Assessment, NELHA, July 2012
Honolulu Sea Water Air Conditioning	SWAC	4 miles S of Kaka'ako, O'ahu	Benthic impacts; intake	USACE Record of Decision (ROD) signed; completion in early 2017.	http://honoluluswac.com/pressroom.html
Marine Corps Base Hawai`i Wave Energy Test Site	Shallow- and Deep-Water Wave Energy	1, 2 and 2.5 km N of Mokapu, O'ahu	Hazard to navigation	Shallow is operational; deep is under construction	Final Environmental Assessment, NAVFACPAC, January 2014
Hawai`i Interisland Energy Transmission Cable	Transmission	Maui to O'ahu	Benthic impacts	Planning is stalled and dependent on NextEra/HECO merger outcome	IEEE Spectrum article

3.5.5.3 MILITARY TRAINING AND TESTING ACTIVITIES AND IMPACTS

The Department of Defense major planning activities in the region are summarized in Table 88. Maps of the Mariana Islands Range Complex from the Mariana Islands Training and Testing (MITT) FEIS are included in the maps section.

Table 88. Department of Defense (DOD) major planning activities

Action	Description	Phase	Impacts
Guam and CNMI Military Relocation SEIS	Relocate Marines to Guam and build a cantonment/family housing unit on Finegayan/AAFB, a live-fire individual training range complex at the Ritidian Unit of the Guam National Wildlife Refuge	ROD published August 29, 2015	Surface danger zone established at Ritidian – access restricted during training. Access will be negotiated between the Navy and USFWS Northern District Wastewater Treatment Plant is non-compliant with NPDES permit; until plant is upgraded, increased wastewater discharge associated with buildup will significantly impact nearshore water quality. DOD to fund plant upgrades – see Economic Adjustment Committee Implementation Plan.
Mariana Islands Training and Testing	Continue Navy testing and training activities; include use of active sonar and explosives within the Mariana Islands Range Complex; pier-side sonar maintenance and testing in Apra Harbor	ROD Published August 4, 2015	Surface danger zones established – access restricted during training and testing Explosives and anchoring may damage shallow reef systems or hard bottom habitat.
Hawai`i-Southern California Training and Testing	Increase naval testing and training activities	DEIS Expected Spring 2017	Likely access and habitat impacts similar to MITT
CNMI Joint Military Training	Establish unit and combined level training ranges on Tinian and Pagan	Supplemental Draft EIS expected in March 2017	Significant access and habitat impacts
Divert Activities and Exercises, Air Force, Marianas	Improve airports in CNMI for expanding mission requirements in Western Pacific	Final EIS In Prep	Land-based construction impacts will be mitigated in stormwater management plan (standard); access near fuel transfer
Garapan Anchorage *June 2015 CNMI Advisory Panel Meeting Report*	Military Pre-Positioned Ships anchor and transit	Expired Memorandum of Understanding with the CNMI government. After transfer of submerged lands to CNMI, CNMI may be able to charge anchorage fees to the DOD. As of June 2015, MOU had not been signed.	Access, invasive species, unmitigated damage to reefs

3.5.6 INCIDENTS CONTRIBUTING TO CUMULATIVE IMPACT

The Coast Guard and NOAA Office of Response and Restoration respond to marine pollution events related to vessels. The following table of incidents since 2011 is from selected oil spills off U.S. coastal waters and other incidents where NOAA's Office of Response and Restoration (OR&R) provided scientific support for the spill response (NOAA OR&R). These incidents are included in the overview maps of the map section.

3.5.6.1 INTERPRETATION

The algal bloom in Pago Pago Harbor, American Samoa, was not the first algal bloom. DMWR investigated the algal blooms and determined phosphate levels to be one of the cause (Pers. Comm., MPCCC, March 30, 2016).

There is a grounded longline vessel in the lagoon on Saipan from Soudelor. The vessel owners filed for bankruptcy; it is unknown how the vessel will be removed (Pers. Comm., MPCCC, March 30, 2016.)

There is also a vessel grounded in American Samoa that was not reported in the NOAA OR&R dataset (pers. comm., MPCCC, March 30, 2016.)

Table 89. NOAA OR&R Incident Response since 2011

Name	Location	Date	Commodity	Cause	Other Cause/Notes
Algal Bloom Pago Pago harbor	American Samoa	10/23/2013	Hazardous algal bloom	Other / Unknown	Reason for bloom unknown
Barge YON268	Apra Harbor, Guam	2/12/2013	Heavy (waste) oil	Other / Unknown	Derelict vessel
Mystery Sheen	Sasa Bay, Apra Harbor, Guam	5/15/2015	diesel	Sunken Vessel	
F/V DAIKI MARU 7 grounding	Apra Harbor, Guam	2/13/2014	Diesel	Grounding	
Piti Power Plant generator fire	Piti, Guam	8/31/2015	#6 Fuel Oil	Fire / Explosion	
Sunken NPS work boat	Adelup, Guam	7/29/2012		Capsized Vessel	
F/V IL SIN HO	Tinian Island, CNMI	9/13/2013	Diesel	Grounding	
M/V PAUL RUSS	Tanapag Harbor, Saipan	9/8/2014	IFO 380	Grounding	
NOAA SHIP HI'IALAKAI	Maug Islands, CNMI	5/2/2014	Gasoline	Leaking Tank	
TUG NALANI	Off Barbers Point, HI	1/22/2015	Diesel	Sunken Vessel	
Molasses Spill	Honolulu Harbor, HI	9/10/2013	molasses	Pipe breach	
Downed Military Aircraft	North Shore, Oahu	1/15/2016	JP5 fuel	Collision	
Mystery Sheen	Oahu, HI	3/27/2013	Sheen	Other / Unknown	
Hurricane Iselle	Hawai`i	8/6/2014		Landfall	

3.5.7 PACIFIC ISLANDS REGIONAL PLANNING BODY (RPB) REPORT

The Council is a member of the Pacific Islands RPB and as such, the interests of the Council will be incorporated into the CMS plan. It is through the Council member that the Council may submit recommendations to the Pacific Islands RPB.

The Pacific Islands RPB will meet on March 30-31, 2016, to discuss several items. The Pacific Islands RPB will be brought up to date on the planning activities in American Samoa and then will discuss how much participation the Pacific Islands RPB would like to have in the development of the American Samoa Ocean Plan, given cross membership. The Pacific Islands RPB will discuss its operations in the bigger context of efforts associated with climate change, planning efforts, and GIS efforts, as well as discuss a capacity assessment to inform the needs of the Pacific Islands RPB. Pacific Islands RPB members will then discuss their data and tools needs, as well as their stakeholder engagement progress.

The American Samoa Ocean Planning Team is meeting on March 28, 29, and April 1, 2016, to finalize their vision for the ocean in American Samoa and develop draft goals and objectives for their ocean plan.

3.5.8 REFERENCES

Bureau of Ocean Energy Management. Hawai`i Activities. Accessed March 1, 2016. http://www.boem.gov/Hawai`i/

CNMI Joint Military Training EIS/OEIS. DOD to Issue Revise Draft EIS on CJMT. Accessed March 17, 2016. http://www.cnmijointmilitarytrainingeis.com/announcements/25.

DeMello, Joshua. Report of the CNMI Advisory Panel to the Western Pacific Regional Fishery Management Council, June 2015.

Department of Defense; Department of the Navy. Final EIS/OEIS Hawai`i Range Complex. Kauai, Honolulu, Maui, and Hawai`i Counties. May 2008.

Department of Defense; Department of the Navy. Hawai`i-Southern California Training and Testing EIS/OEIS. Schedule. Accessed March 17, 2016. http://hstteis.com/Schedule.aspx.

Department of Defense; Department of the Navy; Naval Facilities Engineering Command, Pacific; Naval Facilities Engineering and Expeditionary Warfare Center; Marine Corps Base Hawai`i. Wave Energy Test Site Final Environmental Assessment. January 2014.

Department of Defense; Department of the Navy. Record of Decision for the Final Supplemental Environmental Impact Statement for Guam and Commonwealth of the Northern Mariana Islands Military Relocation. 28 August 2015.

Department of Defense; Department of the Navy. Record of Decision for the Mariana Islands Training and Testing Final Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS). 23 July 2015.

Emergency Response Division, Office of Response and Restoration, National Ocean Service, National Oceanic and Atmospheric Administration 2016. Raw Incident Data. Dataset. March 1, 2016. Downloaded from http://incidentnews.noaa.gov/raw/index.

Environmental Impact Statement for Divert Activities and Exercises, Commonwealth of the Northern Mariana Islands. Home page. Accessed March 17, 2016. http://www.pacafdivertmarianaseis.com/index.html.

Fairley. Does Hawai`i Need a Unified Grid? IEEE Spectrum 6 February 2015. Accessed March 16, 2016. http://spectrum.ieee.org/energywise/energy/the-smarter-grid/proponent-of-interisland-cables-seeks-control-of-Hawai`is-power-sector.

"Fisheries in the Western Pacific; Bottomfish and Seamount Groundfish Fisheries; Management Measures for the Northern Mariana Islands, Final Rule." *Federal Register* 73 (12 December 2008): 75615-75622. Downloaded from http://www.wpcouncil.org/bottomfish/Documents/FMP/Bottomfish%20A10%20Final%20Rule%202008.pdf.

"Fisheries in the Western Pacific; Hawai`i Bottomfish and Seamount Groundfish Fisheries; Management Measures for Hancock Seamounts to Rebuild Overfished Armorhead, Proposed Rule." *Federal Register* 75 (30 August 2010): 52921-52923. Downloaded from https://www.gpo.gov/fdsys/pkg/FR-2010-08-30/pdf/2010-21537.pdf.

"Fisheries in the Western Pacific; Precious Coral Fisheries; Black Coral Quota and Gold Coral Moratorium, Final Rule." *Federal Register* 73 (13 August 2008): 47098-47100. Downloaded from http://www.wpcouncil.org/precious/Documents/FMP/Coral%20Reef%20A7%20Final%20Rule%2008-2008.pdf.

"Fisheries in the Western Pacific." Title 50 *Code of Federal Regulations,* Pt. 665. Electronic Code of Federal Regulations data current as of March 16, 2016. Viewed at http://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=b28abb7da3229173411daf43959fcbd1&n=50y13.0.1.1.2&r=PART&ty=HTML#_top.

"Fisheries in the Western Pacific; Western Pacific Bottomfish and Seamount Groundfish Fisheries; Guam Bottomfish Management Measures, Final Rule." *Federal Register* 71 (2 November 2006): 64474-64477. Downloaded from http://www.wpcouncil.org/bottomfish/Documents/FMP/Bottomfish%20A9%20Final%20Rule%202006.pdf.

"Fisheries Off West Coast States and in the Western Pacific; Coral Reef Ecosystems Fishery Management Plan for the Western Pacific, Final Rule." *Federal Register* 69 (24 February 2004): 8336-8349. Downloaded from http://www.wpcouncil.org/precious/Documents/FMP/Amendment5-FR-FinalRule.pdf.

Hawai`i Ocean Science & Technology Park, Administered by the Natural Energy Laboratory of Hawai`i Authority. Energy Portfolio. Accessed March 1, 2016. http://nelha.Hawai`i.gov/energy-portfolio/.

Honolulu Seawater Air Conditioning. Press Room Articles. Accessed March 1, 2016. http://honoluluswac.com/pressroom.html.

Letter sent from K. Simonds to R. Seman, CNMI DLNR on May 5, 2015.

National Marine Protected Areas Center; National Oceanic and Atmospheric Administration 2014. Marine Protected Areas Inventory. Dataset. January 15, 2016. Downloaded from http://marineprotectedareas.noaa.gov/dataanalysis/mpainventory/.

National Marine Protected Areas Center; National Oceanic and Atmospheric Administration 2014. Marine Protected Areas Inventory GIS Spatial Data. Dataset. January 15, 2016. Downloaded from http://marineprotectedareas.noaa.gov/dataanalysis/mpainventory/.

"Pacific Island Pelagic Fisheries; Exemption for Large U.S. Longline Vessels to Fish in Portions of the American Samoa Large Vessel Prohibited Area, Final Rule." *Federal Register* 81 (3 February 2016): 5619-5626. Downloaded from https://www.gpo.gov/fdsys/pkg/FR-2016-02-03/pdf/2016-01891.pdf.

"Pelagic Fisheries of the Western Pacific Region, Final Rule." *Federal Register* 56 (18 October 1991): 52214-52217. Downloaded from http://www.wpcouncil.org/pelagic/Documents/FMP/Amendment3-FR-FinalRule.pdf.

"Pelagic Fisheries of the Western Pacific Region, Final Rule." *Federal Register* 57 (4 March 1992): 7661-7665. Downloaded from http://www.wpcouncil.org/pelagic/Documents/FMP/Amendment5-FR-FinalRule.pdf.

Progression Hawai`i Offshore Wind, Inc. Unsolicited Application for a Section 585 Commercial Wind Lease on the Outer Continental Shelf Offshore of the South Coast of Oahu. October 8, 2015. http://www.boem.gov/Progression-Hawai`i-OCS-Lease-Application/.

Robichaux, David M. Draft Environmental Assessment for the Ocean Thermal Energy Conversion Technology Research, Development and Demonstration Facility, Keahole, North Kona, Hawai`i. July 11, 2012.

Van Fossen, Lewis, and Wunderlich, Mary. Joint National Marine Fisheries Service and U.S. Army Corps of Engineers Essential Fish Habitat Assessment. Project Name: Proposed Issuance of a Permit to Authorize the Use of a Net Pen and Feed Barge Moored in Federal Waters West of the Island of Hawai`i to Fish for Coral Reef Ecosystem Management Unit Species, *Seriola rivoliana* (RIN 0648-XD961). Honolulu, HI. 16 October 2015.

"Western Pacific Fisheries; Fishing in the Marianas Trench, Pacific Remote Islands, and Rose Atoll Marine National Monuments, Final Rule." *Federal Register* 78 (3 June 2013): 32996-33007. Downloaded from http://www.wpcouncil.org/precious/Documents/FMP/Amendment5-FR-FinalRule.pdf.

"Western Pacific Pelagic Fisheries; Prohibiting Longline Fishing Within 30 nm of the Northern Mariana Islands, Final Rule." *Federal Register* 76 (27 June 2011): 37287-37289. Downloaded from https://www.gpo.gov/fdsys/pkg/FR-2011-06-27/pdf/2011-16039.pdf.

Western Pacific Regional Fishery Management Council. Fishery Management Plan and Fishery Ecosystem Plan Amendments available from http://www.wpcouncil.org/.

APPENDIX A: SUPPORTING DATA TABLES FOR FIGURES IN CHAPTER 2 – DATA MODULES AND SECTION 3.1 – HUMAN DIMENSIONS

Table **Page**

TABLES FOR SECTION 2.1: AMERICAN SAMOA

Table A-1. Supporting Data for Figure 2. Number of American Samoa boats landing any pelagic species, tunas and non-tuna PMUS

Year	Number of Boats Landing		
	Any Pelagics	Tuna	Non-Tuna PMUS
1982	22	17	12
1983	35	31	22
1984	50	42	38
1985	47	43	36
1986	55	54	40
1987	34	32	20
1988	44	42	33
1989	47	45	29
1990	41	38	28
1991	32	28	21
1992	26	26	20
1993	38	34	29
1994	41	40	28
1995	43	43	39
1996	44	43	37
1997	48	45	43
1998	42	38	36
1999	57	56	49
2000	54	52	43
2001	78	75	68
2002	67	66	61
2003	67	65	64
2004	60	58	53
2005	47	45	44
2006	46	39	37
2007	59	50	44
2008	53	44	38
2009	44	39	34
2010	40	38	35
2011	39	37	32
2012	38	38	33
2013	42	37	36
2014	47	44	39
2015	36	33	31
Average	**46**	**43**	**37**
Std. Dev	**11**	**12**	**12**

Table A-2. Supporting Data for Figure 3. Number of American Samoa boats landing any pelagic species by longlining, trolling and all methods

Year	Number of Boats Using		
	Any Method	Longlining	Trolling
1982	22	0	22
1983	35	0	35
1984	50	0	50
1985	47	0	47
1986	55	0	49
1987	34	0	32
1988	44	4	42
1989	47	1	44
1990	41	0	37
1991	32	2	27
1992	26	0	26
1993	38	4	33
1994	41	5	40
1995	43	5	41
1996	44	12	37
1997	48	21	32
1998	42	26	24
1999	57	29	36
2000	54	37	19
2001	78	61	18
2002	67	57	16
2003	67	49	20
2004	60	40	18
2005	47	36	9
2006	46	31	9
2007	59	29	19
2008	53	28	16
2009	44	26	10
2010	40	26	7
2011	39	24	10
2012	38	22	9
2013	42	23	13
2014	47	21	22
2015	36	19	11
Average	**46**	**23**	**26**
Std. Dev.	**11**	**16**	**13**

Table A-3. Supporting Data for Figure 4. Number of American Samoa fishing trips or sets for all pelagic species by method

Year	Troll Trips	Longline Sets
1982	177	0
1983	406	0
1984	853	0
1985	464	0
1986	1,234	0
1987	751	0
1988	875	31
1989	1,269	3
1990	615	0
1991	699	21
1992	513	0
1993	481	16
1994	1,355	20
1995	1,548	187
1996	847	653
1997	656	1,529
1998	316	1,754
1999	429	2,108
2000	292	2,814
2001	330	4,801
2002	288	6,872
2003	310	6,221
2004	276	4,853
2005	211	4,359
2006	193	5,069
2007	145	5,920
2008	143	4,754
2009	81	4,916
2010	53	4,540
2011	141	3,894
2012	84	4,211
2013	132	3,411
2014	157	2,570
2015	167	2,452
Average	**485**	**4,055**
Std. Dev.	**395**	**1,489**

Table A-4. Supporting Data for Figure 5. American Samoa annual estimated total landings of Tuna and Non-Tuna PMUS

	Pounds Landed	
Year	Tuna	Non Tuna PMUS
1982	23,042	2,106
1983	90,057	4,806
1984	198,961	15,121
1985	107,659	19,686
1986	190,967	23,899
1987	144,037	10,894
1988	207,095	23,462
1989	171,809	20,534
1990	81,736	10,494
1991	72,645	28,092
1992	94,060	12,328
1993	47,815	21,736
1994	190,262	48,146
1995	288,667	64,329
1996	317,601	64,473
1997	802,140	119,960
1998	1,160,724	163,726
1999	1,004,615	178,648
2000	1,685,591	175,061
2001	7,870,925	292,699
2002	15,169,356	606,670
2003	10,617,519	621,523
2004	8,489,580	575,669
2005	8,204,994	639,043
2006	11,244,079	868,788
2007	13,734,213	601,352
2008	9,252,262	433,255
2009	10,225,834	498,002
2010	10,336,610	453,486
2011	7,024,522	464,856
2012	8,924,345	366,327
2013	5,967,980	357,821
2014	4,434,854	288,892
2015	4,531,226	241,436
Average	**4,203,170**	**244,627**
Std. Dev.	**4,748,609**	**245,021**

Table A-5. Supporting Data for Figure 6. American Samoa annual commercial landings of Tunas and Non-Tuna PMUS

Year	Pounds Landed	
	Tuna	Non Tuna PMUS
1982	22,065	1,515
1983	85,069	4,441
1984	196,100	13,458
1985	99,987	17,515
1986	170,150	15,291
1987	132,238	4,841
1988	172,803	12,111
1989	113,545	8,164
1990	56,622	3,627
1991	58,027	15,027
1992	90,575	11,088
1993	44,407	14,479
1994	188,980	41,330
1995	281,804	55,056
1996	311,348	46,254
1997	799,973	97,956
1998	1,115,310	95,011
1999	946,855	109,638
2000	1,646,902	124,833
2001	7,746,689	138,967
2002	14,989,385	367,251
2003	10,554,312	410,305
2004	8,449,678	473,258
2005	8,159,461	518,561
2006	11,229,688	744,572
2007	13,730,465	558,695
2008	9,248,516	389,997
2009	10,155,355	357,274
2010	10,321,550	335,982
2011	7,015,245	320,185
2012	8,922,045	198,971
2013	5,899,494	230,132
2014	4,430,084	176,829
2015	4,529,069	149,004
Average	**4,173,935**	**178,283**
Std. Dev.	**4,731,556**	**195,319**

Table A-6. Supporting Data for Figure 7. American Samoa annual estimated total landings of Yellowfin Tuna by gear

Year	Pounds Landed	
	Longline	Trolling
1982	0	7,038
1983	0	19,789
1984	0	58,704
1985	0	38,586
1986	0	51,439
1987	0	27,451
1988	1,775	48,319
1989	127	51,873
1990	0	25,188
1991	262	28,046
1992	0	23,916
1993	2,632	18,180
1994	1,716	49,415
1995	4,052	54,139
1996	25,662	37,051
1997	48,589	21,679
1998	92,528	6,762
1999	139,496	11,566
2000	190,564	4,827
2001	413,999	6,116
2002	1,060,315	12,353
2003	1,096,218	6,953
2004	1,959,674	5,939
2005	1,151,375	7,501
2006	1,096,061	9,106
2007	1,396,468	9,023
2008	749,825	20,089
2009	866,631	2,785
2010	975,802	2,052
2011	1,204,700	12,379
2012	828,483	8,479
2013	931,281	7,137
2014	932,544	6,617
2015	699,660	4,011
Average	**566,801**	**20,721**
Std. Dev.	**551,505**	**17,313**

Table A-7. Supporting Data for Figure 8. American Samoa annual estimated total landings of Skipjack Tuna by gear

	Pounds Landed	
Year	Longline	Trolling
1982	0	15,877
1983	0	58,997
1984	0	117,693
1985	0	38,902
1986	0	139,421
1987	0	116,436
1988	0	153,903
1989	0	118,948
1990	0	53,423
1991	345	42,137
1992	0	69,901
1993	533	25,356
1994	103	136,762
1995	160	168,389
1996	438	53,149
1997	2,546	30,430
1998	40,625	14,822
1999	56,014	35,171
2000	32,153	16,211
2001	149,565	15,086
2002	538,700	11,376
2003	264,414	19,464
2004	519,129	20,728
2005	312,055	10,845
2006	470,412	13,040
2007	365,281	12,255
2008	359,568	16,294
2009	343,714	2,775
2010	251,511	2,043
2011	246,602	19,862
2012	637,502	9,703
2013	144,285	8,459
2014	241,996	12,941
2015	192,494	6,881
Average	**206,806**	**46,696**
Std. Dev.	**193,394**	**48,849**

Table A-8. Supporting Data for Figure 9. American Samoa annual estimated total landings of Wahoo by gear

	Pounds Landed	
Year	Longline	Trolling
1982	0	114
1983	0	632
1984	0	1,777
1985	0	2,678
1986	0	2,282
1987	0	1,395
1988	84	1,962
1989	0	1,476
1990	0	1,333
1991	0	16,081
1992	0	3,904
1993	1,227	5,977
1994	0	7,261
1995	1,642	12,625
1996	3,570	4,399
1997	15,807	2,074
1998	40,439	487
1999	48,181	685
2000	47,330	140
2001	114,219	587
2002	362,689	351
2003	431,531	612
2004	475,032	537
2005	487,394	828
2006	630,488	696
2007	436,981	889
2008	299,481	165
2009	305,920	0
2010	289,524	64
2011	282,893	55
2012	187,851	597
2013	197,667	1,109
2014	157,021	1,072
2015	138,319	505
Average	**176,975**	**2,216**
Std. Dev.	**186,821**	**3,476**

Table A-9. Supporting Data for Figure 10. American Samoa annual estimated total landings of Mahimahi by gear

Year	Pounds Landed: Longline	Pounds Landed: Trolling
1982	0	777
1983	0	1,443
1984	0	1,844
1985	0	8,011
1986	0	10,542
1987	0	3,049
1988	0	6,736
1989	0	3,170
1990	0	3,169
1991	61	2,090
1992	0	2,325
1993	212	4,000
1994	101	9,086
1995	2,373	8,393
1996	5,395	5,022
1997	33,410	3,623
1998	33,484	843
1999	35,779	2,193
2000	42,857	66
2001	87,037	782
2002	84,603	720
2003	81,022	1,434
2004	42,718	469
2005	53,078	161
2006	48,705	1,164
2007	31,415	684
2008	28,027	931
2009	36,844	113
2010	18,049	0
2011	21,389	611
2012	22,645	157
2013	42,748	300
2014	21,759	2,077
2015	11,050	883
Average	**31,390**	**2,555**
Std. Dev.	**25,232**	**2,811**

Table A-10. Supporting Data for Figure 11. American Samoa annual estimated total landings of Blue Marlin by gear

Year	Pounds Landed: Longline	Pounds Landed: Trolling
1982	0	315
1983	0	1,083
1984	0	6,097
1985	0	2,574
1986	0	4,327
1987	0	265
1988	0	10,217
1989	0	10,590
1990	0	4,339
1991	0	6,669
1992	0	4,807
1993	2,168	6,545
1994	0	18,661
1995	5,338	21,272
1996	21,576	7,867
1997	32,434	5,379
1998	45,475	1,592
1999	34,883	590
2000	59,505	623
2001	36,792	0
2002	89,825	0
2003	26,994	1,344
2004	12,314	0
2005	50,584	300
2006	60,533	0
2007	84,970	204
2008	76,297	0
2009	91,753	0
2010	98,141	0
2011	86,587	0
2012	80,606	0
2013	67,557	0
2014	57,498	2,007
2015	49,766	1,767
Average	**50,939**	**3,513**
Std. Dev.	**29,967**	**5,128**

Table A-11. Supporting Data for Figure 12. American Samoa annual estimated total landings of Sailfish by gear

Year	Pounds Landed	
	Longline	Trolling
1982	0	127
1983	0	74
1984	0	989
1985	0	2,744
1986	0	294
1987	0	1,187
1988	0	394
1989	0	757
1990	0	0
1991	0	0
1992	0	0
1993	618	218
1994	0	1,561
1995	3,078	2,751
1996	3,130	1,444
1997	6,921	0
1998	7,191	314
1999	7,391	184
2000	2,257	0
2001	5,498	0
2002	6,932	0
2003	6,268	0
2004	4,598	32
2005	4,959	248
2006	12,933	0
2007	2,167	0
2008	1,931	148
2009	4,184	0
2010	3,404	0
2011	8,226	73
2012	3,333	0
2013	3,924	0
2014	3,370	195
2015	3,517	1,391
Average	**4,601**	**445**
Std. Dev.	**2,782**	**735**

Table A-12. Supporting Data for Figure 17. Thousands of American Samoa longline hooks set (Federal Logbook Data)

Year	1000's of Hooks From Logbook Data
1988	0
1989	0
1990	0
1991	0
1992	0
1993	0
1994	0
1995	0
1996	99
1997	419
1998	771
1999	915
2000	1,335
2001	5,795
2002	13,096
2003	14,165
2004	11,742
2005	11,129
2006	14,264
2007	17,555
2008	14,444
2009	15,086
2010	13,185
2011	11,075
2012	12,112
2013	10,184
2014	7,187
2015	6,922
Average	**6,481**
Std. Dev.	**6,236**

Table A-13. Supporting Data for Figure 18. American Samoa annual estimated total landings of Bigeye Tuna by longlining

Year	Pounds
1988	0
1989	0
1990	0
1991	0
1992	0
1993	708
1994	0
1995	2,191
1996	8,701
1997	8,808
1998	22,291
1999	19,211
2000	47,710
2001	165,755
2002	436,280
2003	534,903
2004	502,541
2005	293,605
2006	442,965
2007	509,563
2008	274,482
2009	353,779
2010	387,431
2011	392,198
2012	383,023
2013	187,646
2014	172,597
2015	151,073
Average	**189,195**
Std. Dev.	**192,591**

Table A-14. Supporting Data for Figure 19. American Samoa annual estimated total landings of Albacore by longlining

Year	Pounds
1988	1,875
1989	241
1990	0
1991	1,730
1992	0
1993	315
1994	1,609
1995	58,949
1996	190,269
1997	689,460
1998	983,560
1999	743,038
2000	1,394,011
2001	7,120,245
2002	13,109,695
2003	8,693,212
2004	5,480,841
2005	6,429,023
2006	9,211,813
2007	11,440,920
2008	7,831,590
2009	8,655,948
2010	8,716,712
2011	5,146,519
2012	7,055,591
2013	4,688,559
2014	3,067,631
2015	3,475,631
Average	**4,078,178**
Std. Dev.	**4,033,494**

Table A-15. Supporting Data for Figure 20. American Samoa annual estimated total landings of Swordfish by longlining

Year	Pounds
1996	893
1997	701
1998	3,716
1999	2,259
2000	2,056
2001	13,091
2002	32,710
2003	32,231
2004	20,195
2005	16,491
2006	82,625
2007	28,287
2008	14,889
2009	27,615
2010	24,816
2011	28,379
2012	31,179
2013	23,818
2014	20,998
2015	16,324
Average	**21,164**
Std. Dev.	**17,756**

Table A-16. Supporting Data for Figure 21. Number of Fish Released by American Samoa Longline Vessels

	Number of Fish Released			
Year	Tunas	Non-Tuna PMUS	Other Pelagics	Sharks
1996	0	0	0	37
1997	50	36	1	19
1998	71	29	0	28
1999	492	438	43	37
2000	371	815	0	386
2001	7,888	4,457	239	3,648
2002	24,601	18,100	4,183	10,459
2003	14,679	16,826	3,125	10,831
2004	11,323	15,481	1,521	9,918
2005	7,830	8,039	1,057	7,318
2006	12,609	16,508	842	7,489
2007	14,418	19,354	3,308	6,672
2008	5,542	13,039	2,274	5,833
2009	9,733	19,034	3,291	5,933
2010	16,703	17,957	4,576	5,108
2011	5,575	12,175	4,035	4,836
2012	6,924	16,062	3,572	6,932
2013	1,095	11,838	1,771	3,879
2014	845	6,587	770	4,946
2015	1,667	7,387	1,192	5,634

Table A-17. Supporting Data for Figure 22. American Samoa Albacore catch per 1,000 Hooks by Alias and Monohull Vessels from Longline Logbook Data

Year	Number of Fish Per 1000 Hooks: Alias	Number of Fish Per 1000 Hooks: Monohulls
1996	40.6	--
1997	32.8	--
1998	26.6	--
1999	18.8	14.8
2000	19.8	28
2001	27.3	32.9
2002	17.2	25.8
2003	17.3	16.4
2004	13.7	12.9
2005	10.3	17.4
2006	--	18.4
2007	--	18.3
2008	--	14.2
2009	--	14.8
2010	--	17.4
2011	--	12.1
2012	--	14.8
2013	--	11.7
2014	--	11
2015	--	13.1

Table A-18. Supporting Data for Figure 23. American Samoa pelagic catch per hour of trolling and number of trolling hours

Year	CPUE	Hours
1982	25.91	1,019
1983	27.41	3,513
1984	30.97	7,785
1985	32.59	4,394
1986	19.36	11,294
1987	25.34	6,179
1988	38.01	6,125
1989	23.79	8,370
1990	21.86	4,362
1991	20.64	4,884
1992	28.97	3,809
1993	20.09	3,216
1994	21.23	11,448
1995	22.94	12,143
1996	27.38	4,442
1997	22.31	3,144
1998	19.93	1,405
1999	26.81	1,981
2000	22.01	1,149
2001	18.09	1,655
2002	20.62	1,362
2003	31.78	1,044
2004	25.7	1,204
2005	25.44	862
2006	36.02	883
2007	35.15	723
2008	50.44	808
2009	26.38	424
2010	20.32	308
2011	51.56	711
2012	52.03	389
2013	27.4	673
2014	25.31	1,063
2015	15.8	1,144
Average	**27.64**	**3,350**
Std. Dev.	**8.98**	**3,350**

Table A-19. Supporting Data for Figure 24. American Samoa trolling catch rates for Skipjack and Yellowfin Tuna

Year	Pounds Caught Per Trolling Hour	
	Skipjack	Yellowfin
1982	15.9	7.8
1983	21	5.04
1984	18.1	7.2
1985	13.8	8.9
1986	12.9	4.31
1987	19.3	3.88
1988	26	7.3
1989	15.2	5.9
1990	12.8	5.51
1991	10.7	7.06
1992	18.7	6.4
1993	8.89	6.06
1994	12.6	4.49
1995	14.1	4.57
1996	12.7	8.98
1997	10.1	7.19
1998	10.8	4.89
1999	18.4	5.62
2000	14.9	4.61
2001	11.4	4.44
2002	9.03	9.83
2003	19.8	7.1
2004	18.2	5.1
2005	13.3	9.25
2006	15.4	10.8
2007	18.2	13.4
2008	21.5	26.9
2009	11.7	14
2010	8.78	9.23
2011	30.5	19.1
2012	25.9	23.2
2013	13.1	11.4
2014	13.9	6.95
2015	7.01	5.03
Average	**15.43**	**8.57**
Std. Dev.	**5.26**	**5.24**

Table A-20. Supporting Data for Figure 25. American Samoa trolling catch rates for Blue Marlin, Mahimahi, and Wahoo

Year	Pounds Caught Per Trolling Hour		
	Blue Marlin	Mahimahi	Wahoo
1982	0.00	0.92	0.14
1983	0.43	0.43	0.15
1984	0.91	0.28	0.09
1985	0.41	2.06	0.36
1986	0.39	0.90	0.15
1987	0.00	0.52	0.23
1988	1.79	1.13	0.22
1989	1.40	0.36	0.15
1990	1.05	0.70	0.30
1991	1.70	0.57	4.39
1992	1.29	0.62	1.04
1993	2.25	1.38	1.84
1994	1.74	0.80	0.64
1995	1.74	0.69	1.00
1996	1.99	1.27	1.05
1997	1.86	1.18	0.63
1998	0.99	0.65	0.35
1999	0.13	1.21	0.37
2000	0.60	0.06	0.14
2001	0.00	0.60	0.37
2002	0.00	0.59	0.28
2003	1.39	1.49	0.59
2004	0.00	0.43	0.48
2005	0.00	0.21	0.94
2006	0.00	1.40	0.79
2007	0.31	0.98	1.29
2008	0.00	0.90	0.22
2009	0.00	0.58	0.00
2010	0.00	0.00	0.29
2011	0.00	1.02	0.04
2012	0.00	0.44	1.67
2013	0.00	0.46	1.78
2014	2.34	2.37	0.86
2015	2.49	1.24	0.38
Average	**0.80**	**0.84**	**0.68**
Std. Dev.	**0.84**	**0.51**	**0.81**

TABLES FOR SECTION 2.2: COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS

Table A-21. Boat-based Survey Statistics (raw data), CNMI

Year	Survey Days	Total Trips (Boat Log)	Non-Charter Trips (Boat Log)	Charter Trips (Boat Log)	Total Interviews Conducted	Non-charter Interviews	Charter Interviews
2000	66	130	115	15	123	104	19
2001	67	221	202	19	215	196	19
2002	75	149	138	11	163	137	26
2003	91	248	224	24	278	223	55
2004	77	211	191	20	211	187	24
2005	78	293	259	34	294	247	47
2006	71	212	198	14	222	193	29
2007	63	199	193	6	194	187	7
2008	56	164	160	4	160	155	5
2009	66	140	137	3	137	132	5
2010	70	123	119	4	115	112	3
2011	73	111	106	5	105	100	5
2012	73	134	127	7	126	119	7
2013	71	163	161	2	149	147	2
2014	74	156	154	2	141	140	1
2015	67	107	106	1	97	96	1

Table A-22. Supporting Data for Figure 26. Number of CNMI Fishermen (Boats) Making Commercial Pelagic Landings

Year	Number of Fishermen
1983	92
1984	99
1985	82
1986	96
1987	62
1988	78
1989	77
1990	79
1991	76
1992	104
1993	55
1994	65
1995	89
1996	114
1997	111
1998	92
1999	106
2000	113
2001	113
2002	90
2003	73
2004	71
2005	77
2006	65
2007	52
2008	52
2009	47
2010	40
2011	48
2012	35
2013	28
2014	20
2015	14
Average	**73**
Standard Deviation	**27**

Table A-23. Supporting Data for Figure 27. CNMI Numbers of Trips Catching Any Pelagic Fish from Commercial Receipt Invoices

Year	Number of Trips
1983	1,408
1984	1,621
1985	1,240
1986	1,356
1987	992
1988	1,298
1989	1,242
1990	888
1991	999
1992	1,419
1993	1,372
1994	1,218
1995	1,721
1996	2,249
1997	2,042
1998	2,223
1999	1,759
2000	2,095
2001	2,178
2002	1,835
2003	1,715
2004	1,801
2005	1,990
2006	1,436
2007	1,366
2008	1,192
2009	1,148
2010	791
2011	549
2012	895
2013	1,218
2014	908
2015	352
Average	**1,410**
Standard Deviation	**477**

Table A-24. Supporting Data for Figure 28. CNMI Boat-based Creel Estimated Number of Trolling Trips

Year	Total Trolling Trips	Non-Charter	Charter
2000	6,755	5,528	1,227
2001	5,709	5,039	671
2002	4,001	3,683	318
2003	5,181	4,804	377
2004	4,810	4,412	398
2005	4,616	4,064	553
2006	4,235	3,896	340
2007	4,504	4,261	242
2008	4,921	4,717	204
2009	4,141	3,951	190
2010	4,312	4,154	158
2011	3,339	3,064	275
2012	3,423	3,238	185
2013	3,522		
2014	3,595	3,568	27
2015	2,640		
Average	**4,356.50**	**4,169.93**	**368.93**
Standard Deviation	**1,006.45**	**690.22**	**296.80**

Table A-25. Supporting Data for Figure 29. CNMI Boat-based Creel Estimated Number of Trolling Hours

Year	Total Trolling Hours	Non-Charter	Charter
2000	28,425	25,349	3,077
2001	26,166	24,370	1,796
2002	18,870	17,940	930
2003	25,266	24,078	1,188
2004	23,623	22,375	1,248
2005	21,619	19,915	1,705
2006	20,299	19,160	1,140
2007	21,232	20,499	733
2008	26,642	25,969	673
2009	21,027	20,443	584
2010	24,473	24,000	473
2011	18,061	17,318	743
2012	17,659	17,144	516
2013	17,880		
2014	19,634	19,522	112
2015	14,302		
Average	**21,573.63**	**21,291.57**	**1,065.57**
Standard Deviation	**3,892.35**	**3,028.51**	**745.43**

Table A-26. Supporting Data for Figure 30. CNMI Boat-Based Creel Average Trip Length – Hours per Trip

Year	Avg Hrs/Trip	Non-Charter	Charter
2000	4.2	4.6	2.5
2001	4.6	4.8	2.7
2002	4.7	4.9	2.9
2003	4.9	5	3.2
2004	4.9	5.1	3.1
2005	4.7	4.9	3.1
2006	4.8	4.9	3.4
2007	4.7	4.8	3
2008	5.4	5.5	3.3
2009	5.1	5.2	3.1
2010	5.7	5.8	3
2011	5.4	5.7	2.7
2012	5.2	5.3	2.8
2013	5.1		
2014	5.5	5.5	4.1
2015	5.4		
Average	**5.02**	**5.14**	**3.06**
Standard Deviation	**0.40**	**0.37**	**0.39**

Table A-27. Supporting Data for Figure 31. CNMI Annual Estimated Total Landings: All Pelagics, Tunas PMUS, and Non-Tuna PMUS

Year	All Pelagics	Tuna PMUS	Non-Tuna PMUS
2000	627,277	535,741	91,536
2001	689,372	611,209	78,164
2002	454,126	403,062	51,064
2003	703,326	660,587	42,584
2004	599,469	516,500	82,773
2005	557,828	492,725	64,661
2006	598,611	531,855	66,757
2007	610,609	485,613	124,996
2008	602,371	470,059	132,312
2009	378,203	301,895	76,308
2010	516,663	425,969	90,694
2011	335,472	263,340	72,131
2012	478,910	408,157	70,753
2013	476,955	389,640	87,315
2014	395,701	262,059	133,642
2015	411,118	309,485	101,633
Average	**527,251**	**441,744**	**85,458**
Standard Deviation	**109,327**	**114,900**	**25,922**

Table A-28. Supporting Data for Figure 32. CNMI Annual Estimated Total Pelagic Landings: Total, Non-Charter, and Charter

Year	Total Pelagics	Non-Charter	Charter
2000	627,277	603,262	24,015
2001	689,372	671,490	17,882
2002	454,126	442,094	12,033
2003	703,326	694,952	8,374
2004	599,469	588,394	11,075
2005	557,828	537,791	20,037
2006	598,611	587,487	11,125
2007	610,609	600,499	10,110
2008	602,371	599,505	2,866
2009	378,203	374,509	3,694
2010	516,663	512,621	4,043
2011	335,472	325,937	9,535
2012	478,910	473,795	5,116
2013	476,955		
2014	395,701	394,366	1,335
2015	411,118		
Average	**527,250.69**	**529,050.14**	**10,088.57**
Standard Deviation	**112,912.27**	**112,511.15**	**6,757.82**

Table A-29. Supporting Data for Figure 33. CNMI Annual Estimated Total Tuna PMUS Landings: Total, Non-Charter, and Charter

Year	Total Tuna PMUS	Non-Charter	Charter
2000	535,741	523,233	12,507
2001	611,209	605,798	5,410
2002	403,062	400,848	2,214
2003	660,587	657,971	2,616
2004	516,500	513,783	2,718
2005	492,725	484,451	8,275
2006	531,855	528,264	3,591
2007	485,613	484,638	975
2008	470,059	468,651	1,408
2009	301,895	299,580	2,315
2010	425,969	421,927	4,043
2011	263,340	257,823	5,518
2012	408,157	406,654	1,503
2013	389,640		
2014	262,059	262,059	0
2015	309,485		
Average	**441,743.50**	**451,120.00**	**3,792.36**
Standard Deviation	**118,668.38**	**119,538.02**	**3,307.27**

Table A-30. Supporting Data for Figure 34. CNMI Annual Estimated Total Non-Tuna PMUS Landings: Total, Non-Charter, and Charter

Year	Total Non-Tuna PMUS	Non-Charter	Charter
2000	91,536	80,029	11,507
2001	78,164	65,692	12,472
2002	51,064	41,246	9,819
2003	42,584	36,827	5,758
2004	82,773	74,416	8,357
2005	64,661	52,898	11,762
2006	66,757	59,223	7,533
2007	124,996	115,861	9,135
2008	132,312	130,854	1,458
2009	76,308	74,929	1,379
2010	90,694	90,694	0
2011	72,131	68,114	4,017
2012	70,753	67,141	3,612
2013	87,315		
2014	133,642	132,307	1,335
2015	101,633		
Average	**85,457.69**	**77,873.64**	**6,296.00**
Standard Deviation	**26,771.92**	**30,076.13**	**4,349.58**

Table A-31. Supporting Data for Figure 35. CNMI Annual Estimated Total Skipjack Landings: Total, Non-Charter, and Charter

Year	Total Skipjack	Non-Charter	Charter
2000	514,027	510,678	3,350
2001	573,996	569,041	4,955
2002	381,612	380,062	1,550
2003	621,204	619,130	2,073
2004	460,626	457,966	2,660
2005	424,597	418,340	6,258
2006	494,927	491,520	3,407
2007	444,493	443,600	893
2008	419,311	417,903	1,408
2009	270,439	268,484	1,955
2010	365,636	365,192	444
2011	220,077	214,669	5,408
2012	304,529	303,281	1,247
2013	353,954	353,954	0
2014	233,472	233,472	0
2015	292,951	292,951	0
Average	**398,491**	**396,265**	**2,226**
Standard Deviation	**114,269**	**113,697**	**1,915**

Table A-32. Supporting Data for Figure 36. CNMI Annual Estimated Total Yellowfin Landings: Total, Non-Charter, and Charter

Year	Total Yellowfin	Non-Charter	Charter
2000	18,123	10,195	7,928
2001	35,265	35,265	0
2002	16,714	16,494	220
2003	34,953	34,568	384
2004	49,674	49,674	0
2005	57,829	56,656	1,173
2006	27,658	27,599	59
2007	35,958	35,958	0
2008	33,906	33,906	0
2009	26,602	26,602	0
2010	29,730	26,289	3,441
2011	41,159	41,159	0
2012	77,604	77,454	150
2013	34,002		
2014	23,149	23,149	0
2015	16,220		
Average	**34,909.13**	**35,354.86**	**953.93**
Standard Deviation	**16,035.64**	**17,152.22**	**2,211.02**

Table A-33. Supporting Data for Figure 37. CNMI Annual Estimated Total Mahimahi Landings: Total, Non-Charter, and Charter

Year	Total Mahimahi	Non-Charter	Charter
2000	66,230	56,719	9,512
2001	58,548	50,219	8,328
2002	43,149	36,774	6,375
2003	34,128	31,338	2,790
2004	68,302	62,433	5,869
2005	48,960	41,122	7,839
2006	48,666	42,729	5,937
2007	110,351	101,792	8,559
2008	81,912	81,025	887
2009	63,559	62,568	991
2010	73,965	73,965	0
2011	55,291	52,374	2,917
2012	41,390	40,102	1,289
2013	75,298		
2014	117,466	116,131	1,335
2015	97,928		
Average	**67,821.44**	**60,663.64**	**4,473.43**
Standard Deviation	**24,360.02**	**24,987.42**	**3,353.73**

Table A-34. Supporting Data for Figure 38. CNMI Annual Estimated Total Wahoo Landings: Total, Non-Charter, and Charter

Year	Total Wahoo	Non-Charter	Charter
2000	13,282	11,287	1,996
2001	16,653	12,509	4,144
2002	7,060	4,471	2,589
2003	5,528	3,417	2,110
2004	10,537	9,924	613
2005	10,956	7,033	3,924
2006	6,225	5,141	1,085
2007	11,023	10,447	576
2008	6,525	5,954	571
2009	12,750	12,362	388
2010	13,494	13,494	0
2011	11,853	10,753	1,101
2012	19,073	16,749	2,324
2013	10,225		
2014	10,615	10,615	0
2015	3,705		
Average	**10,594.00**	**9,582.57**	**1,530.07**
Standard Deviation	**4,100.29**	**3,849.95**	**1,356.14**

Table A-35. Supporting Data for Figure 39. CNMI Annual Estimated Total Blue Marlin Landings: Total, Non-Charter, and Charter

Year	Total Blue Marlin	Non-Charter	Charter
2000	12,024	12,024	0
2001	2,963	2,963	0
2002	855	0	855
2003	2,928	2,071	857
2004	1,876	0	1,876
2005	4,248	4,248	0
2006	10,161	10,161	0
2007	3,623	3,623	0
2008	42,586	42,586	0
2009	0	0	0
2010	0	0	0
2011	4,987	4,987	0
2012	10,290	10,290	0
2013	1,793		
2014	5,561	5,561	0
2015	0		
Average	**6,493.44**	**7,036.71**	**256.29**
Standard Deviation	**10,342.22**	**11,003.82**	**559.21**

Table A-36. Supporting Data for Figure 40. CNMI Annual Commercial Landings: All Pelagics, Tuna PMUS, and Non-Tuna PMUS

Year	All Pelagics	Tuna PMUS	Non-Tuna PMUS
1983	245,985	204,692	26,544
1984	341,136	310,424	23,244
1985	234,178	189,809	33,143
1986	307,459	271,279	29,626
1987	205,068	171,957	25,450
1988	334,523	281,872	43,805
1989	286,784	267,811	14,595
1990	180,450	158,430	15,936
1991	188,561	128,848	36,975
1992	199,228	108,314	50,159
1993	181,328	113,207	44,518
1994	147,329	105,942	21,657
1995	200,180	152,756	35,759
1996	281,277	206,247	55,712
1997	218,873	159,626	46,049
1998	240,263	184,450	35,979
1999	177,031	136,907	24,768
2000	187,295	162,747	15,551
2001	179,181	152,144	21,198
2002	256,982	213,565	27,876
2003	228,416	198,843	17,346
2004	239,007	181,331	45,737
2005	372,375	321,089	32,136
2006	346,885	316,446	23,080
2007	312,554	275,614	32,755
2008	219,187	192,598	18,454
2009	190,796	161,778	24,284
2010	188,351	154,871	26,978
2011	121,118	81,269	34,757
2012	155,273	125,356	29,917
2013	254,114	200,213	52,950
2014	224,797	175,513	48,259
2015	136,483	101,496	34,943
Average	**229,772**	**186,892**	**31,822**
Standard Deviation	**62,865**	**64,006**	**11,276**

Table A-37. Supporting Data for Figure 41. CNMI Annual Commercial Landings: Skipjack and Yellowfin

Year	Skipjack	Yellowfin
1983	183411	21281
1984	290843	19580
1985	177344	12466
1986	254362	16917
1987	161504	10454
1988	266497	15375
1989	257703	10109
1990	147962	10468
1991	115802	13042
1992	82280	25687
1993	97268	14898
1994	92212	13445
1995	131377	20918
1996	165037	38043
1997	133446	21352
1998	167114	14570
1999	106297	24419
2000	140389	17673
2001	133769	14543
2002	179966	30017
2003	171574	26042
2004	148328	27548
2005	260614	52014
2006	265753	41996
2007	238972	34894
2008	170059	18695
2009	133794	26463
2010	124096	30507
2011	60431	19059
2012	99187	19392
2013	166969	31278
2014	158671	15029
2015	90838	10576
Average	**162,845**	**21,780**
Standard Deviation	**59,913**	**9,766**

Table A-38. Supporting Data for Figure 42. CNMI Annual Commercial Landings: Mahimahi, Wahoo, and Blue Marlin

Year	Mahimahi	Wahoo	Blue Marlin
1983	13939	8760	3787
1984	7614	14087	1544
1985	12955	18251	1860
1986	17796	9062	2654
1987	9502	13404	2460
1988	30799	11697	1309
1989	7320	1571	5704
1990	10439	3462	2034
1991	33756	1521	1568
1992	26257	17172	6603
1993	37545	2779	3687
1994	15063	3863	2635
1995	23321	5722	6619
1996	35655	10783	8593
1997	31277	7580	7068
1998	25375	6299	4201
1999	12882	8063	3541
2000	7324	4097	3608
2001	14229	4550	1924
2002	18042	8212	1261
2003	7357	7950	1130
2004	35808	6936	2001
2005	26891	3349	1595
2006	17181	3116	1402
2007	26410	2504	76
2008	13187	1669	2027
2009	20030	3500	82
2010	23157	2887	73
2011	21821	9606	175
2012	18712	8677	2010
2013	44889	5345	2091
2014	38048	7232	2416
2015	34582	361	0
Average	**21,793**	**6,790**	**2,659**
Standard Deviation	**10,393**	**4,426**	**2,127**

Table A-39. Supporting Data for Figure 43. CNMI Boat-based Creel Trolling Catch Rates (lbs per hour)

Year	Average CPH	Non-Charter	Charter
2000	22.4	24.1	8.2
2001	26.6	27.8	10.1
2002	24.4	25	13.4
2003	28.3	29.3	7.5
2004	25.9	26.9	9.3
2005	26.6	27.8	12.4
2006	29.9	31.1	9.9
2007	29	29.5	14.2
2008	22.8	23.3	4.4
2009	18	18.3	6.3
2010	21.6	21.9	8.5
2011	19.2	19.5	13.1
2012	27.4	27.9	10.2
2013	26.8		
2014	20.4	20.5	11.9
2015	28.7		
Average	**24.88**	**25.21**	**9.96**
Standard Deviation	**3.71**	**4.04**	**2.85**

Table A-40. Supporting Data for Figure 44. CNMI Boat-based Creel Trolling Catch Rates (lbs/hr): Skipjack

Year	Combined	Non-Charter	Charter
2000	18.1	20.1	1.1
2001	21.9	23.4	2.8
2002	20.2	21.2	1.7
2003	24.6	25.7	1.7
2004	19.5	20.5	2.1
2005	19.6	21	3.7
2006	24.4	25.7	3
2007	20.9	21.6	1.2
2008	15.7	16.1	2.1
2009	12.9	13.1	3.3
2010	14.9	15.2	0.9
2011	12.2	12.4	7.3
2012	17.2	17.7	2.4
2013	19.8		
2014	11.9	12	0
2015	20.5		
Average	**18.39**	**18.98**	**2.38**
Standard Deviation	**3.98**	**4.64**	**1.74**

Table A-41. Supporting Data for Figure 45. CNMI Boat-based Creel Trolling Catch Rates (lbs/hr): Yellowfin

Year	Combined	Non-Charter	Charter
2000	0.6	0.4	2.6
2001	1.3	1.4	0
2002	0.9	0.9	0.2
2003	1.4	1.4	0.3
2004	2.1	2.2	0
2005	2.7	2.8	0.7
2006	1.4	1.4	0.1
2007	1.7	1.8	0
2008	1.3	1.3	0
2009	1.2	1.2	0
2010	1.2	1.1	7.3
2011	2.3	2.4	0
2012	4.4	4.5	0.3
2013	1.9		
2014	1.2	1.2	0
2015	1.1		
Average	**1.67**	**1.71**	**0.82**
Standard Deviation	**0.91**	**1.02**	**1.99**

Table A-42. Supporting Data for Figure 46. CNMI Boat-based Creel Trolling Catch Rates (lbs/hr): Mahimahi

Year	Combined	Non-Charter	Charter
2000	2.3	2.2	3.1
2001	2.2	2.1	4.6
2002	2.3	2	6.9
2003	1.4	1.3	2.3
2004	2.9	2.8	4.7
2005	2.3	2.1	4.6
2006	2.4	2.2	5.2
2007	5.2	5	11.7
2008	3.1	3.1	1.3
2009	3	3.1	1.7
2010	3	3.1	0
2011	3.1	3	3.8
2012	2.3	2.3	2.5
2013	4.2		
2014	6	5.9	11.9
2015	6.7		
Average	**3.28**	**2.87**	**4.59**
Standard Deviation	**1.49**	**1.23**	**3.53**

Table A-43. Supporting Data for Figure 47. CNMI Boat-based Creel Trolling Catch Rates (lbs/hr): Wahoo

Year	Combined	Non-Charter	Charter
2000	0.5	0.4	0.6
2001	0.6	0.5	2.3
2002	0.4	0.2	2.8
2003	0.2	0.1	1.8
2004	0.4	0.4	0.5
2005	0.5	0.4	2.3
2006	0.3	0.3	1
2007	0.5	0.5	0.8
2008	0.2	0.2	0.8
2009	0.6	0.6	0.7
2010	0.6	0.6	0
2011	0.7	0.6	1.5
2012	1.1	1	4.5
2013	0.6		
2014	0.5	0.5	0
2015	0.3		
Average	**0.50**	**0.45**	**1.40**
Standard Deviation	**0.22**	**0.22**	**1.24**

Table A-44. Supporting Data for Figure 48. CNMI Boat-based Creel Trolling Catch Rates (lbs/hr): Blue Marlin

Year	Combined	Non-Charter	Charter
2000	0.4	0.5	0
2001	0.1	0.1	0
2002	0	0	0.9
2003	0.1	0.1	0.7
2004	0.1	0	1.5
2005	0.2	0.2	0
2006	0.5	0.5	0
2007	0.2	0.2	0
2008	1.6	1.6	0
2009	0	0	0
2010	0	0	0
2011	0.3	0.3	0
2012	0.6	0.6	0
2013	0.1		
2014	0.3	0.3	0
2015	0		
Average	**0.28**	**0.31**	**0.22**
Standard Deviation	**0.40**	**0.42**	**0.47**

Table A-45. Supporting Data for Figure 49. CNMI Trolling Catch Rates of Skipjack and Yellowfin Tuna (lbs/trip)

Year	Skipjack	Yellowfin	Skipjack Creel
1983	104	12	0
1984	144	10	0
1985	114	8	0
1986	150	10	0
1987	130	8	0
1988	164	9	49
1989	166	7	112
1990	133	9	104
1991	93	10	51
1992	46	14	60
1993	57	9	106
1994	61	9	110
1995	61	10	62
1996	59	14	68
1997	52	8	0
1998	60	5	0
1999	48	11	0
2000	54	7	94
2001	49	5	122
2002	78	13	104
2003	80	12	133
2004	45	8	104
2005	72	14	99
2006	102	16	119
2007	114	17	108
2008	93	10	88
2009	64	13	72
2010	71	17	95
2011	44	14	66
2012	72	14	95
2013	89	17	101
2014	114	11	74
2015	77	9	114
Average	**87**	**11**	**70**
Standard Deviation	**36**	**3**	**44**

Table A-46. Supporting Data for Figure 50. CNMI Trolling Catch Rate of Mahimahi, Wahoo, and Blue Marlin (lbs/trip)

Year	Mahimahi	Wahoo	Blue Marlin
1983	7.92	4.98	2.15
1984	3.76	6.95	0.76
1985	8.36	11.77	1.2
1986	10.5	5.35	1.57
1987	7.66	10.81	1.98
1988	18.98	7.21	0.81
1989	4.71	1.01	3.67
1990	9.4	3.12	1.83
1991	27.03	1.22	1.26
1992	14.8	9.68	3.72
1993	21.89	1.62	2.15
1994	9.89	2.54	1.73
1995	10.84	2.66	3.08
1996	12.68	3.84	3.06
1997	12.25	2.97	2.77
1998	9.13	2.27	1.51
1999	5.86	3.67	1.61
2000	2.8	1.56	1.38
2001	5.23	1.67	0.71
2002	7.87	3.58	0.55
2003	3.43	3.71	0.53
2004	10.94	2.12	0.61
2005	7.43	0.93	0.44
2006	6.58	1.19	0.54
2007	12.57	1.19	0.04
2008	7.19	0.91	1.11
2009	9.6	1.68	0.04
2010	13.17	1.64	0.04
2011	15.9	7	0.13
2012	13.59	6.3	1.46
2013	23.96	2.85	1.12
2014	27.24	5.18	1.73
2015	29.47	0.31	0
Average	**11.9**	**3.74**	**1.37**
Standard Deviation	**6.99**	**2.92**	**1.02**

TABLES FOR SECTION 2.3: GUAM

Table A-47. Numbers of Trips and Interviews for Creel Trolling Method, Guam

Year	Survey Days	Trips in Boat Log	Interviews
1982	46	392	363
1983	47	362	351
1984	54	485	366
1985	66	736	503
1986	49	627	382
1987	48	610	431
1988	51	1,031	698
1989	60	1,052	642
1990	60	1,097	804
1991	60	1,097	774
1992	60	1,169	843
1993	61	1,149	844
1994	69	1,222	878
1995	96	1,540	1,110
1996	96	1,543	1,146
1997	96	1,378	950
1998	96	1,477	1,052
1999	96	1,434	917
2000	96	1,337	854
2001	96	1,076	620
2002	84	730	396
2003	79	531	289
2004	96	715	366
2005	97	695	377
2006	96	763	413
2007	96	753	391
2008	96	784	406
2009	96	1,014	605
2010	96	1,134	684
2011	96	877	496
2012	96	498	274
2013	96	799	456
2014	90	964	511
2015	95	903	539

Table A-48. Supporting Data for Figure 51. Guam Estimated Number of Trolling Boats

Year	Estimated Boat	Upper 95%	Lower 95%
1982	199	280	165
1983	193	242	168
1984	219	267	193
1985	276	323	249
1986	246	284	226
1987	219	244	201
1988	320	353	297
1989	329	374	303
1990	352	467	299
1991	349	422	309
1992	332	405	294
1993	346	401	316
1994	369	439	329
1995	427	476	393
1996	466	572	415
1997	449	572	393
1998	469	537	430
1999	449	510	415
2000	416	470	385
2001	375	429	345
2002	375	464	330
2003	371	492	312
2004	401	568	326
2005	358	498	293
2006	386	527	321
2007	370	485	315
2008	385	523	322
2009	368	468	316
2010	432	508	390
2011	454	563	396
2012	351	457	298
2013	496	588	446
2014	447	537	395
2015	372	460	326

Table A-49. Supporting Data for Figure 52. Guam Annual Estimated Total Landings: All Pelagics, Tuna PMUS, and Non-Tuna PMUS

Year	All Pelagic	Tuna PMUS	Non-Tuna PMUS
1982	426,837	234,815	191,401
1983	440,183	164,338	275,844
1984	417,546	290,824	126,721
1985	458,175	206,354	251,752
1986	365,891	133,989	230,254
1987	323,019	103,649	219,371
1988	806,093	303,375	502,718
1989	481,110	170,559	310,551
1990	539,575	227,509	312,065
1991	728,057	163,729	564,328
1992	515,410	260,516	254,893
1993	529,117	171,329	357,789
1994	532,665	260,115	272,550
1995	763,798	274,043	489,755
1996	890,036	351,293	538,743
1997	747,847	312,874	420,769
1998	828,485	343,276	470,482
1999	597,825	263,448	319,745
2000	591,983	348,941	242,489
2001	726,324	389,757	336,568
2002	524,690	222,011	302,678
2003	483,054	265,486	217,568
2004	642,413	285,224	357,190
2005	283,640	124,790	158,850
2006	481,497	178,224	303,272
2007	541,482	207,887	333,595
2008	542,521	320,033	222,488
2009	707,268	382,745	310,567
2010	721,804	364,390	357,414
2011	579,027	433,271	145,756
2012	394,500	271,787	122,713
2013	789,311	553,790	235,522
2014	746,376	437,841	307,554
2015	947,627	713,780	228,993
Average	**591,035**	**286,353**	**302,734**
Standard Deviation	**164,608**	**123,049**	**111,132**

Table A-50. Supporting Data for Figure 53. Guam Annual Estimated Total Landings by Method

Year	Total Pelagics	Non-Charter	Charter
1982	426,837	418,059	8,778
1983	440,183	434,544	5,638
1984	417,546	394,934	22,612
1985	458,175	414,057	44,118
1986	365,891	343,579	22,312
1987	323,019	292,709	30,311
1988	806,093	722,740	83,353
1989	481,110	410,618	70,492
1990	539,575	415,115	124,460
1991	728,057	577,547	150,510
1992	515,410	397,919	117,491
1993	529,117	397,724	131,393
1994	532,665	425,696	106,969
1995	763,798	601,167	162,631
1996	890,036	657,892	232,144
1997	747,847	578,312	169,535
1998	828,485	707,241	121,244
1999	597,825	520,592	77,234
2000	591,983	497,622	94,361
2001	726,324	653,045	73,280
2002	524,690	477,026	47,664
2003	483,054	427,788	55,266
2004	642,413	537,080	105,333
2005	283,640	225,690	57,950
2006	481,497	414,720	66,777
2007	541,482	463,673	77,809
2008	542,521	491,903	50,618
2009	707,268	654,203	53,064
2010	721,804	660,906	60,898
2011	579,027	553,768	25,260
2012	394,500	366,056	28,444
2013	789,311	740,115	49,197
2014	746,376	690,022	56,355
2015	947,627	886,628	60,999
Average	**591,035**	**513,256**	**77,779**
Standard Deviation	**164,608**	**143,586**	**50,009**

Table A-51. Supporting Data for Figure 54. Guam Annual Estimated Tuna PMUS Landings by Method

Year	Total Tunas	Non-Charter	Charter
1982	234,815	230,825	3,990
1983	164,338	162,678	1,660
1984	290,824	289,268	1,556
1985	206,354	196,915	9,439
1986	133,989	128,595	5,394
1987	103,649	97,522	6,127
1988	303,375	288,947	14,428
1989	170,559	153,314	17,245
1990	227,509	198,153	29,356
1991	163,729	144,629	19,100
1992	260,516	233,399	27,117
1993	171,329	152,583	18,745
1994	260,115	231,178	28,937
1995	274,043	245,833	28,210
1996	351,293	303,207	48,086
1997	312,874	274,711	38,163
1998	343,276	309,647	33,628
1999	263,448	239,444	24,003
2000	348,941	315,275	33,666
2001	389,757	366,232	23,524
2002	222,011	207,131	14,880
2003	265,486	243,993	21,493
2004	285,224	257,065	28,159
2005	124,790	108,340	16,450
2006	178,224	154,766	23,459
2007	207,887	190,003	17,885
2008	320,033	304,863	15,170
2009	382,745	372,733	10,013
2010	364,390	354,187	10,203
2011	433,271	422,796	10,475
2012	271,787	264,733	7,054
2013	553,790	547,157	6,633
2014	437,841	427,628	10,213
2015	713,780	708,189	5,591
Average	**286,353**	**268,410**	**17,943**
Standard Deviation	**123,049**	**123,901**	**11,162**

Table A-52. Supporting Data for Figure 55. Guam Annual Estimated Landings of Skipjack Tuna by Fishing by Method

Year	Total Skipjack	Non-Charter	Charter
1982	126,486	124,310	2,176
1983	97,361	95,700	1,660
1984	223,926	222,771	1,155
1985	109,842	104,898	4,944
1986	78,074	73,669	4,405
1987	60,964	58,139	2,825
1988	214,312	201,570	12,742
1989	128,101	112,256	15,845
1990	150,023	129,479	20,544
1991	118,245	102,383	15,862
1992	123,055	103,798	19,257
1993	109,344	94,842	14,502
1994	188,233	163,738	24,496
1995	179,036	160,771	18,265
1996	237,878	198,857	39,021
1997	218,895	188,929	29,966
1998	201,837	174,041	27,796
1999	123,384	109,595	13,789
2000	266,741	237,373	29,368
2001	328,047	308,280	19,767
2002	178,480	165,627	12,852
2003	185,613	170,390	15,223
2004	168,955	147,605	21,350
2005	99,012	84,383	14,629
2006	146,658	126,042	20,616
2007	157,533	143,004	14,529
2008	296,162	282,739	13,423
2009	334,273	326,013	8,260
2010	338,649	329,362	9,286
2011	360,360	351,101	9,259
2012	245,883	240,558	5,325
2013	501,211	494,578	6,633
2014	403,121	393,253	9,868
2015	601,716	596,912	4,804
Average	**214,747**	**200,499**	**14,248**
Standard Deviation	**120,464**	**121,534**	**8,932**

Table A-53. Supporting Data for Figure 56. Guam Annual Estimated Total Yellowfin Landings by Method

Year	Total Yellowfin	Non-Charter	Charter
1982	107,553	105,739	1,813
1983	65,686	65,686	0
1984	65,837	65,571	266
1985	94,878	90,382	4,495
1986	55,915	54,926	989
1987	40,883	38,036	2,847
1988	86,254	85,687	568
1989	40,432	39,428	1,004
1990	72,471	65,043	7,429
1991	43,850	41,639	2,212
1992	132,581	126,722	5,859
1993	50,351	46,444	3,906
1994	71,020	66,820	4,199
1995	93,495	83,913	9,582
1996	106,877	98,979	7,898
1997	90,092	82,333	7,759
1998	137,689	132,238	5,451
1999	127,820	122,005	5,815
2000	77,434	73,750	3,684
2001	57,928	54,667	3,261
2002	42,900	41,147	1,753
2003	71,656	68,603	3,053
2004	104,969	98,283	6,686
2005	24,792	23,038	1,754
2006	28,049	25,419	2,630
2007	48,049	44,866	3,184
2008	19,611	18,624	987
2009	45,283	44,095	1,188
2010	24,456	23,613	843
2011	72,261	71,210	1,051
2012	25,904	24,176	1,729
2013	52,165	52,165	0
2014	34,480	34,136	345
2015	111,509	110,722	787
Average	**68,386**	**65,297**	**3,282**
Standard Deviation	**32,683**	**31,304**	**2,524**

Table A-54. Supporting Data for Figure 57. Guam Annual Estimated non-Tuna PMUS Landings by Method

Year	Total Non_Tuna PMUS	Non-Charter	Charter
1982	191,401	186,612	4,788
1983	275,844	271,867	3,978
1984	126,721	105,666	21,056
1985	251,752	217,074	34,678
1986	230,254	213,337	16,917
1987	219,371	195,187	24,184
1988	502,718	433,793	68,925
1989	310,551	257,303	53,247
1990	312,065	216,962	95,104
1991	564,328	432,918	131,410
1992	254,893	164,519	90,374
1993	357,789	245,141	112,648
1994	272,550	194,518	78,032
1995	489,755	355,335	134,421
1996	538,743	354,685	184,058
1997	420,769	289,398	131,371
1998	470,482	382,866	87,616
1999	319,745	266,514	53,230
2000	242,489	181,795	60,695
2001	336,568	286,812	49,756
2002	302,678	269,894	32,784
2003	217,568	183,795	33,773
2004	357,190	280,016	77,174
2005	158,850	117,350	41,500
2006	303,272	259,954	43,318
2007	333,595	273,670	59,924
2008	222,488	187,039	35,449
2009	310,567	267,516	43,051
2010	357,414	306,719	50,695
2011	145,756	130,972	14,784
2012	122,713	101,322	21,391
2013	235,522	192,958	42,564
2014	307,554	261,413	46,142
2015	228,993	174,058	54,935
Average	**302,734**	**242,911**	**59,823**
Standard Deviation	**111,132**	**82,646**	**40,683**

Table A-55. Supporting Data for Figure 58. Guam Annual Estimated Total Mahimahi Landings by Method

Year	Total Mahimahi	Non-Charter	Charter
1982	111,947	107,246	4,701
1983	155,605	152,423	3,183
1984	25,660	16,714	8,946
1985	72,082	65,163	6,919
1986	100,916	92,429	8,488
1987	78,347	71,200	7,147
1988	337,718	300,534	37,183
1989	95,985	84,733	11,253
1990	140,682	108,517	32,166
1991	414,455	339,650	74,805
1992	87,779	62,111	25,668
1993	234,979	169,663	65,317
1994	137,685	103,319	34,367
1995	326,979	250,910	76,069
1996	327,328	235,066	92,262
1997	265,058	198,244	66,813
1998	264,673	206,882	57,790
1999	161,529	137,486	24,043
2000	85,541	66,556	18,986
2001	183,277	157,292	25,986
2002	173,235	156,278	16,958
2003	84,794	74,821	9,973
2004	195,693	160,425	35,267
2005	104,908	77,124	27,784
2006	162,512	139,365	23,147
2007	259,482	218,175	41,307
2008	110,778	98,298	12,480
2009	146,379	124,312	22,067
2010	279,488	242,899	36,589
2011	88,537	79,291	9,245
2012	77,924	64,491	13,433
2013	164,506	133,333	31,173
2014	189,909	158,800	31,110
2015	159,145	122,231	36,915
Average	**170,750**	**140,470**	**30,281**
Standard Deviation	**90,768**	**72,671**	**22,534**

Table A-56. Supporting Data for Figure 59. Guam Annual Estimated Total Wahoo Landings by Method

Year	Total Wahoo	Non-Charter	Charter
1982	55,598	55,511	87
1983	86,099	85,303	795
1984	52,371	44,466	7,905
1985	123,191	110,651	12,540
1986	70,084	67,657	2,428
1987	85,282	81,333	3,949
1988	98,653	85,012	13,642
1989	127,246	113,478	13,768
1990	75,232	60,886	14,347
1991	55,775	42,482	13,293
1992	82,249	59,805	22,444
1993	62,551	46,533	16,018
1994	50,331	37,640	12,691
1995	77,391	62,365	15,026
1996	145,591	94,845	50,746
1997	64,983	47,642	17,341
1998	158,443	145,920	12,523
1999	76,098	66,472	9,625
2000	70,411	58,135	12,277
2001	119,764	107,149	12,616
2002	72,846	61,590	11,257
2003	64,314	53,553	10,761
2004	120,600	100,207	20,393
2005	43,730	32,026	11,704
2006	105,878	91,713	14,166
2007	44,492	31,129	13,362
2008	98,544	78,474	20,071
2009	130,426	121,464	8,962
2010	44,392	41,490	2,902
2011	37,122	32,577	4,545
2012	37,159	33,798	3,361
2013	54,190	49,634	4,556
2014	88,392	80,072	8,320
2015	31,497	23,995	7,502
Average	**79,733**	**67,794**	**11,939**
Standard Deviation	**32,652**	**29,407**	**8,712**

Table A-57. Supporting Data for Figure 60. Guam Annual Estimated Total Blue Marlin Landings by Method

Year	Total Blue Marlin	Non-Charter	Charter
1982	21,764	21,764	-
1983	30,252	30,252	-
1984	48,094	43,889	4,205
1985	55,766	40,547	15,219
1986	56,960	50,958	6,002
1987	48,623	35,536	13,087
1988	61,421	44,244	17,177
1989	85,451	58,413	27,038
1990	94,749	46,423	48,325
1991	87,633	44,663	42,970
1992	84,281	42,593	41,688
1993	57,993	27,280	30,713
1994	76,489	45,913	30,576
1995	76,569	33,535	43,034
1996	63,268	22,594	40,673
1997	90,728	43,511	47,217
1998	44,028	27,038	16,990
1999	80,400	60,960	19,440
2000	86,398	56,965	29,432
2001	33,302	22,148	11,154
2002	53,790	49,221	4,569
2003	68,235	55,196	13,039
2004	38,794	18,036	20,758
2005	9,213	7,201	2,012
2006	29,222	23,217	6,005
2007	18,946	14,100	4,846
2008	9,635	6,737	2,898
2009	32,344	20,350	11,994
2010	32,007	20,803	11,204
2011	18,858	17,864	994
2012	5,460	864	4,597
2013	15,038	8,204	6,834
2014	29,240	22,528	6,712
2015	37,646	27,129	10,517
Average	**49,488**	**32,079**	**17,409**
Standard Deviation	**26,387**	**16,120**	**14,908**

Table A-58. Supporting Data for Figure 61. Guam Annual Estimated Commercial Landings: All Pelagics, Tuna PMUS, and Non-tuna PMUS

Year	All Pelagic	Tuna PMUS	Non-Tuna PMUS
1980	118,251	45,043	69,062
1981	162,186	72,229	81,808
1982	153,577	72,347	74,832
1983	285,118	83,764	191,676
1984	218,028	107,568	102,398
1985	237,695	79,028	146,477
1986	226,138	57,689	157,377
1987	242,444	72,004	161,657
1988	284,408	88,093	185,451
1989	242,554	59,825	175,667
1990	279,121	84,176	185,934
1991	285,696	64,694	216,611
1992	296,809	114,765	175,751
1993	351,201	96,289	248,070
1994	351,187	95,321	246,860
1995	389,849	102,236	282,468
1996	255,281	78,636	166,702
1997	307,764	93,825	196,335
1998	405,666	120,186	272,882
1999	260,669	75,346	164,082
2000	376,192	165,898	190,761
2001	399,471	163,369	205,648
2002	325,299	139,009	164,853
2003	272,633	121,326	138,160
2004	285,545	89,479	175,777
2005	228,936	66,804	150,770
2006	203,139	63,579	125,847
2007	266,964	72,271	178,660
2008	144,110	36,009	98,207
2009	138,854	43,760	86,040
2010	228,620	27,935	191,275
2011	145,750	36,939	100,868
2012	120,210	41,004	72,849
2013	147,084	33,456	110,388
2014	106,952	43,507	62,049
2015	93,063	50,130	42,120
Average	**245,457**	**79,376**	**155,455**
Standard Deviation	**85,961**	**33,853**	**59,521**

Table A-59. Supporting Data for Figure 62. Guam Estimated Number of Trolling Trips

Year	Estimated Trips	Non-Charter	Charter
1982	5,271	5,210	62
1983	5,312	5,160	151
1984	5,770	5,411	359
1985	7,422	6,751	671
1986	6,980	6,209	772
1987	6,686	5,738	948
1988	11,976	9,727	2,249
1989	10,653	8,041	2,612
1990	10,530	6,582	3,949
1991	9,868	6,317	3,550
1992	10,153	5,602	4,551
1993	10,295	6,971	3,324
1994	11,103	7,493	3,610
1995	15,562	10,030	5,532
1996	16,060	10,274	5,787
1997	14,313	9,555	4,758
1998	14,958	11,317	3,641
1999	14,832	11,604	3,228
2000	13,198	10,148	3,049
2001	11,977	9,522	2,456
2002	8,921	7,501	1,420
2003	6,994	5,625	1,368
2004	7,301	5,749	1,553
2005	6,197	4,455	1,743
2006	6,414	4,440	1,973
2007	6,384	4,509	1,875
2008	6,920	5,029	1,891
2009	9,975	8,471	1,504
2010	10,930	9,188	1,743
2011	8,309	7,240	1,068
2012	5,060	4,241	819
2013	8,094	7,177	918
2014	9,804	8,495	1,308
2015	9,223	8,000	1,223
Average	**9,513**	**7,288**	**2,225**
Standard Deviation	**3,139**	**2,081**	**1,493**

Table A-60. Supporting Data for Figure 63. Guam Estimated Number of Trolling Hours

Year	Estimated Hours	Non-Charter	Charter
1982	29,602	29,149	453
1983	30,211	29,651	560
1984	28,527	26,743	1,783
1985	36,813	33,476	3,337
1986	38,519	35,387	3,132
1987	34,630	31,005	3,625
1988	59,027	50,974	8,053
1989	50,182	40,647	9,535
1990	47,881	33,621	14,259
1991	44,064	30,909	13,155
1992	43,793	27,008	16,785
1993	43,354	31,465	11,889
1994	45,916	32,803	13,113
1995	57,767	39,409	18,359
1996	64,452	44,748	19,704
1997	57,082	42,925	14,157
1998	62,643	51,028	11,614
1999	57,477	47,947	9,530
2000	53,046	43,718	9,329
2001	57,572	50,232	7,341
2002	40,968	35,805	5,162
2003	31,988	27,525	4,463
2004	34,623	29,008	5,615
2005	25,744	19,958	5,786
2006	29,250	22,987	6,263
2007	27,593	21,904	5,689
2008	32,365	26,278	6,087
2009	50,955	45,778	5,176
2010	53,587	48,215	5,372
2011	44,871	41,763	3,108
2012	27,805	24,852	2,953
2013	42,411	39,527	2,885
2014	48,891	44,503	4,388
2015	62,568	55,600	6,968
Average	**44,005**	**36,369**	**7,636**
Standard Deviation	**11,676**	**9,499**	**4,986**

Table A-61. Supporting Data for Figure 64. Guam Estimated Number of Trip Length

Year	Estimated Trips	Non-Charter	Charter
1982	5.6	5.6	7.3
1983	5.7	5.7	3.7
1984	4.9	4.9	5
1985	5	5	5
1986	5.5	5.7	4.1
1987	5.2	5.4	3.8
1988	4.9	5.2	3.6
1989	4.7	5.1	3.7
1990	4.5	5.1	3.6
1991	4.5	4.9	3.7
1992	4.3	4.8	3.7
1993	4.2	4.5	3.6
1994	4.1	4.4	3.6
1995	3.7	3.9	3.3
1996	4	4.4	3.4
1997	4	4.5	3
1998	4.2	4.5	3.2
1999	3.9	4.1	3
2000	4	4.3	3.1
2001	4.8	5.3	3
2002	4.6	4.8	3.6
2003	4.6	4.9	3.3
2004	4.7	5	3.6
2005	4.2	4.5	3.3
2006	4.6	5.2	3.2
2007	4.3	4.9	3
2008	4.7	5.2	3.2
2009	5.1	5.4	3.4
2010	4.9	5.2	3.1
2011	5.4	5.8	2.9
2012	5.5	5.9	3.6
2013	5.2	5.5	3.1
2014	5	5.2	3.4
2015	6.8	7	5.7
Average	**4.7**	**5.1**	**3.7**
Standard Deviation	**0.6**	**0.6**	**0.9**

Table A-62. Supporting Data for Figure 65. Guam Trolling Catch Rates (lbs per hour)

Year	Catch Rate	Non-Charter	Charter
1982	14.9	14.8	20.2
1983	14.7	14.8	10.2
1984	14.9	15	12.7
1985	13	12.9	13.4
1986	9.9	10.1	7.5
1987	9.7	9.8	8.4
1988	14	14.6	10.4
1989	9.9	10.5	7.4
1990	11.5	12.6	8.8
1991	16.9	19.2	11.5
1992	12	15	7.1
1993	12.3	12.8	11.1
1994	11.8	13.2	8.2
1995	13.4	15.5	8.9
1996	14.3	15.3	11.8
1997	13.4	13.8	12
1998	13.5	14.2	10.4
1999	10.9	11.5	8.1
2000	11.5	11.8	10.1
2001	12.9	13.3	10
2002	13	13.6	9.2
2003	16	16.6	12.6
2004	20.1	20.3	18.9
2005	11.5	11.8	10.2
2006	16.8	18.5	10.6
2007	19.8	21.3	13.7
2008	16.8	18.8	8.3
2009	14.1	14.5	10.4
2010	13.7	14	11.4
2011	13	13.4	8.1
2012	14.2	14.8	9.6
2013	19.2	19.4	17.1
2014	15.7	16	12.8
2015	15.4	16.3	8.8
Average	**14**	**14.7**	**10.9**
Standard Deviation	**2.6**	**2.8**	**3**

Table A-63. Supporting Data for Figure 66. Guam Trolling Catch Rates (lbs per hour): Skipjack

Year	Total Skipjack	Non-Charter	Charter
1982	4.3	4.3	4.8
1983	3.1	3.1	3
1984	7.8	8.3	0.6
1985	3	3.1	1.5
1986	2	2.1	1.4
1987	1.8	1.9	0.8
1988	3.6	4	1.6
1989	2.6	2.8	1.7
1990	3.1	3.9	1.4
1991	2.7	3.3	1.2
1992	2.8	3.8	1.1
1993	2.5	3	1.2
1994	4.1	5	1.9
1995	3.1	4.1	1
1996	3.7	4.4	2
1997	3.8	4.4	2.1
1998	3.2	3.4	2.4
1999	2.1	2.3	1.4
2000	5	5.4	3.1
2001	5.7	6.1	2.7
2002	4.4	4.6	2.5
2003	5.8	6.2	3.4
2004	4.9	5.1	3.8
2005	3.8	4.2	2.5
2006	5	5.5	3.3
2007	5.7	6.5	2.6
2008	9.2	10.8	2.2
2009	6.6	7.1	1.6
2010	6.3	6.8	1.7
2011	8	8.4	3
2012	8.8	9.7	1.8
2013	11.8	12.5	2.3
2014	8.2	8.8	2.2
2015	9.6	10.7	0.7
Average	**4.9**	**5.5**	**2.1**
Standard Deviation	**2.5**	**2.7**	**0.9**

Table A-64. Supporting Data for Figure 67. Guam Trolling Catch Rates (lbs per hour): Yellowfin

Year	Total Yellowfin	Non-Charter	Charter
1982	3.6	3.6	4
1983	2.2	2.2	0
1984	2.3	2.5	0.1
1985	2.6	2.7	1.3
1986	1.5	1.6	0.3
1987	1.2	1.2	0.8
1988	1.5	1.7	0.1
1989	0.8	1	0.1
1990	1.5	1.9	0.5
1991	1	1.3	0.2
1992	3	4.7	0.3
1993	1.2	1.5	0.3
1994	1.5	2	0.3
1995	1.6	2.1	0.5
1996	1.7	2.2	0.4
1997	1.6	1.9	0.5
1998	2.2	2.6	0.4
1999	2.2	2.5	0.6
2000	1.4	1.7	0.4
2001	1	1.1	0.4
2002	1	1.1	0.3
2003	2.2	2.5	0.7
2004	3	3.4	1.2
2005	1	1.2	0.3
2006	0.9	1.1	0.4
2007	1.7	2	0.5
2008	0.6	0.7	0.2
2009	0.9	1	0.2
2010	0.5	0.5	0.2
2011	1.6	1.7	0.3
2012	0.9	1	0.6
2013	1.2	1.3	0
2014	0.7	0.8	0.1
2015	1.8	2	0.1
Average	**1.6**	**1.8**	**0.5**
Standard Deviation	**0.7**	**0.9**	**0.7**

Table A-65. Supporting Data for Figure 68. Guam Trolling Catch Rates (lbs per hour): Mahimahi

Year	Total Mahimahi	Non-Charter	Charter
1982	3.8	3.7	10.4
1983	4.9	4.9	5.7
1984	0.9	0.6	5
1985	2	1.9	2.1
1986	2.6	2.6	2.7
1987	2.3	2.3	2
1988	5.7	5.9	4.6
1989	1.9	2.1	1.2
1990	2.9	3.2	2.3
1991	9.4	11	5.7
1992	2	2.3	1.5
1993	5.4	5.4	5.5
1994	3	3.1	2.6
1995	5.7	6.4	4.1
1996	5	5.2	4.7
1997	4.6	4.6	4.7
1998	4.2	4.1	5
1999	2.8	2.9	2.5
2000	1.6	1.5	2
2001	3.2	3.1	3.5
2002	4.2	4.4	3.3
2003	2.7	2.7	2.2
2004	5.7	5.5	6.3
2005	4.1	3.9	4.8
2006	5.6	6.1	3.7
2007	9.4	10	7.3
2008	3.4	3.7	2.1
2009	2.9	2.7	4.3
2010	5.2	5	6.8
2011	2	1.9	3
2012	2.8	2.6	4.5
2013	3.9	3.4	10.8
2014	3.9	3.6	7
2015	2.5	2.2	5.3
Average	**3.9**	**4**	**4.4**
Standard Deviation	**1.9**	**2.2**	**2.3**

Table A-66. Supporting Data for Figure 69. Guam Trolling Catch Rates (lbs per hour): Wahoo

Year	Wahoo	Non-Charter	Charter
1982	1.9	1.9	0.2
1983	2.8	2.9	1.4
1984	1.8	1.7	4.4
1985	3.3	3.3	3.8
1986	1.8	1.9	0.8
1987	2.5	2.6	1.1
1988	1.7	1.7	1.7
1989	2.5	2.8	1.4
1990	1.6	1.8	1
1991	1.3	1.4	1
1992	1.9	2.2	1.3
1993	1.4	1.5	1.3
1994	1.1	1.1	1
1995	1.3	1.6	0.8
1996	2.3	2.1	2.6
1997	1.1	1.1	1.2
1998	2.5	2.9	1.1
1999	1.3	1.4	1
2000	1.3	1.3	1.3
2001	2.1	2.1	1.7
2002	1.8	1.7	2.2
2003	2	1.9	2.4
2004	3.5	3.5	3.6
2005	1.7	1.6	2
2006	3.6	4	2.3
2007	1.6	1.4	2.3
2008	3	3	3.3
2009	2.6	2.7	1.7
2010	0.8	0.9	0.5
2011	0.8	0.8	1.4
2012	1.3	1.4	1.1
2013	1.3	1.3	1.6
2014	1.8	1.8	1.9
2015	0.5	0.4	1.1
Average	**1.9**	**1.9**	**1.7**
Standard Deviation	**0.8**	**0.8**	**0.9**

Table A-67. Supporting Data for Figure 70. Guam Trolling Catch Rates (lbs per hour): Blue Marlin

Year	Total Blue Marlin	Non-Charter	Charter
1982	0.7	0.7	0
1983	1	1	0
1984	1.7	1.6	2.4
1985	1.5	1.2	4.6
1986	1.5	1.4	1.9
1987	1.4	1.1	3.6
1988	1	0.9	2.1
1989	1.7	1.4	2.8
1990	2	1.4	3.4
1991	2	1.4	3.3
1992	1.9	1.6	2.5
1993	1.3	0.9	2.6
1994	1.7	1.4	2.3
1995	1.3	0.9	2.3
1996	1	0.5	2.1
1997	1.6	1	3.3
1998	0.7	0.5	1.5
1999	1.4	1.3	2
2000	1.6	1.3	3.2
2001	0.6	0.4	1.5
2002	1.3	1.4	0.9
2003	2.1	2	2.9
2004	1.1	0.6	3.7
2005	0.4	0.4	0.3
2006	1	1	1
2007	0.7	0.6	0.9
2008	0.3	0.3	0.5
2009	0.6	0.4	2.3
2010	0.6	0.4	2.1
2011	0.4	0.4	0.3
2012	0.2	0	1.6
2013	0.4	0.2	2.4
2014	0.6	0.5	1.5
2015	0.6	0.5	1.5
Average	**1.1**	**0.9**	**2.2**
Standard Deviation	**0.5**	**0.5**	**1**

Table A-68. Supporting Data for Figure 71. Guam Foreign Longline Transshipment Landings: Longliners Fishing Outside the Guam EEZ

Year	Total	Bigeye	Yellowfin
1990	12,198	6,793	5,011
1991	10,707	4,824	5,505
1992	8,157	3,754	4,104
1993	8,981	4,178	4,379
1994	11,023	4,400	5,878
1995	12,366	3,560	7,635
1996	10,356	2,280	7,214
1997	5,093	2,395	2,392
1998	9,032	3,533	4,379
1999	9,865	5,328	3,404
2000	11,664	5,725	4,795
2001	12,716	5,996	5,711
2002	7,691	3,904	3,011
2003	7,010	3,418	2,788
2004	6,190	3,375	2,287
2005	5,660	2,618	2,574
2006	6,315	3,455	2,377
2007	5,991	3,439	2,134
2008	4,215	2,926	1,014
2009	2,874	1,813	934
2010	1,779	935	656
2011	2,016	1,343	532
2012	2,342	1,637	492
2013	2,047	1,379	436
2014	2,290	1,855	291
2015	2,043	1,321	588
Average	**6,947**	**3,315**	**3,097**
Standard Deviation	**3,653**	**1,533**	**2,161**

TABLES FOR SECTION 2.4: HAWAI`I

Table A-69. Supporting Data for Figure 72. Hawai`i commercial tuna, billfish, other PMUS and PMUS shark catch, 2005-2015.

	Hawaii pelagic catch (1,000 pounds)					
Year	Tunas	Billfish	Other PMUS	PMUS Sharks	non-PMUS	Total
2005	17,262	6,367	4,645	311	46	28,631
2006	15,696	5,559	4,589	285	49	26,178
2007	19,058	5,689	4,814	396	23	29,980
2008	19,306	7,136	4,892	390	36	31,760
2009	15,257	6,059	5,226	332	20	26,894
2010	17,450	5,363	5,343	244	33	28,433
2011	20,235	6,234	4,936	190	51	31,646
2012	21,104	5,109	5,682	181	26	32,102
2013	21,321	5,440	6,215	131	25	33,133
2014	21,317	6,721	6,932	129	18	35,116
2015	25,426	6,925	7,176	146	22	39,695
Average	**19,403.0**	**6,054.7**	**5,495.4**	**248.6**	**31.8**	**31,233.4**
SD	**2,943.9**	**680.4**	**906.7**	**100.3**	**12.1**	**3,899.4**

Table A-70. Supporting Data for Figure 73. Total commercial pelagic catch by gear type, 2005-2015.

	Hawaii pelagic total catch (1,000 pounds)						
Year	Deep-set longline	Shallow-set longline	MHI troll	MHI handline	Offshore handline	Other gear	Total
2005	19,452	3,739	2,606	1,288	424	1,122	28,631
2006	19,008	2,328	2,590	818	502	932	26,178
2007	20,967	3,644	2,835	982	598	954	29,980
2008	22,456	4,301	2,971	701	326	1,005	31,760
2009	18,071	3,833	2,958	1,067	298	667	26,894
2010	20,075	3,614	2,855	933	614	342	28,433
2011	22,796	3,500	2,966	1,129	610	645	31,646
2012	22,975	2,814	3,690	1,602	562	459	32,102
2013	25,006	2,345	3,117	1,282	831	550	33,133
2014	26,615	3,255	3,486	1,161	416	182	35,116
2015	32,039	2,791	3,067	1,182	408	207	39,695
Average	**22,678.3**	**3,287.7**	**3,012.9**	**1,104.1**	**508.2**	**642.3**	**31,233.4**
SD	**4,043.7**	**639.3**	**332.3**	**247.6**	**154.9**	**328.1**	**3,899.4**

Table A-71. Supporting Data for Figure 74. Hawai`i commercial tuna catch by gear type, 2005-2015.

	Hawaii tuna catch by gear type (1,000 pounds)						
Year	Deep-set longline	Shallow-set longline	MHI troll	MHI handline	Offshore handline	Other gear	Total
2005	13,243	209	1,116	1,204	413	1,077	17,262
2006	12,454	147	979	749	485	882	15,696
2007	15,130	148	1,382	930	579	889	19,058
2008	15,723	270	1,462	607	311	933	19,306
2009	11,794	156	1,417	970	286	634	15,257
2010	14,140	200	1,381	818	597	314	17,450
2011	16,250	209	1,509	1,061	602	604	20,235
2012	16,590	131	1,926	1,496	548	413	21,104
2013	17,019	82	1,745	1,166	810	499	21,321
2014	17,898	101	1,743	1,026	403	145	21,317
2015	22,178	130	1,463	1,081	399	175	25,426
Average	**15,674.5**	**162.1**	**1,465.7**	**1,009.9**	**494.0**	**596.9**	**19,403.0**
SD	**2,901.9**	**54.8**	**272.8**	**241.2**	**152.6**	**318.9**	**2,943.9**

Table A-72. Supporting Data for Figure 75. Species composition of the tuna catch, 2005-2015.

	Hawaii tuna catch (1,000 pounds)						
Year	Bigeye tuna	Yellowfin tuna	Skipjack tuna	Albacore	Bluefin tuna	Other tunas	Total
2005	11,816	3,186	1,193	1,038	1	28	17,262
2006	10,606	3,211	1,090	769	0	20	15,696
2007	13,729	3,541	1,015	758	0	15	19,058
2008	13,689	3,479	1,281	843	0	14	19,306
2009	10,683	2,788	1,099	667	0	20	15,257
2010	13,052	2,747	662	963	0	26	17,450
2011	13,496	3,877	1,105	1,734	0	23	20,235
2012	14,022	4,098	907	2,009	1	67	21,104
2013	15,699	3,698	1,109	803	1	11	21,321
2014	16,564	3,522	648	552	1	30	21,317
2015	19,962	4,030	721	676	0	37	25,426
Average	**13,937.9**	**3,470.7**	**984.6**	**983.0**	**0.4**	**26.4**	**19,403.0**
SD	**2,712.4**	**454.9**	**218.8**	**463.5**	**0.5**	**15.5**	**2,943.9**

Table A-73. Supporting Data for Figure 76. Hawai`i bigeye tuna catch by gear type, 2005-2015.

	Hawaii bigeye tuna catch (1,000 pounds)						
Year	Deep-set longline	Shallow-set longline	MHI troll	MHI handline	Offshore handline	Other gear	Total
2005	10,873	160	188	143	345	107	11,816
2006	9,597	126	154	135	431	163	10,606
2007	12,567	115	140	188	535	184	13,729
2008	12,858	167	166	86	245	167	13,689
2009	10,067	96	130	70	239	81	10,683
2010	11,736	143	261	212	542	158	13,052
2011	12,315	106	243	140	515	177	13,496
2012	12,741	75	341	131	491	243	14,022
2013	14,240	45	326	147	719	222	15,699
2014	15,657	65	315	105	348	75	16,564
2015	19,194	106	130	73	372	87	19,962
Average	**12,895.0**	**109.4**	**217.6**	**130.0**	**434.7**	**151.3**	**13,937.9**
SD	**2,718.4**	**38.6**	**82.5**	**44.8**	**143.5**	**57.0**	**2,712.4**

Table A-74. Supporting Data for Figure 77. Hawai`i yellowfin tuna catch by gear type, 2005-2015.

	Hawaii yellowfin tuna catch (1,000 pounds)						
Year	Deep-set longline	Shallow-set longline	MHI troll	MHI handline	Offshore handline	Other gear	Total
2005	1,541	22	708	665	67	183	3,186
2006	2,082	10	590	414	52	63	3,211
2007	1,835	13	1,032	517	42	102	3,541
2008	1,869	56	941	437	64	112	3,479
2009	1,014	28	964	656	46	80	2,788
2010	1,202	23	881	542	49	50	2,747
2011	2,009	38	970	704	84	72	3,877
2012	1,886	29	1,304	759	53	67	4,098
2013	1,582	22	1,078	894	82	40	3,698
2014	1,407	24	1,224	795	53	21	3,522
2015	1,989	17	1,084	859	25	57	4,030
Average	**1,674.1**	**25.6**	**979.6**	**658.3**	**56.1**	**77.0**	**3,470.7**
SD	**352.5**	**12.7**	**206.2**	**164.0**	**17.3**	**43.7**	**454.9**

Table A-75. Supporting Data for Figure 78. Hawai`i skipjack tuna catch by gear type, 2005-2015.

	Hawaii skipjack tuna catch (1,000 pounds)					
Year	Deep-set longline	Shallow-set longline	MHI troll	MHI handline	Other gear	Total
2005	200	1	191	21	780	1,193
2006	206	0	221	11	652	1,090
2007	204	1	192	15	603	1,015
2008	264	2	344	20	651	1,281
2009	298	1	303	24	473	1,099
2010	332	1	211	14	104	662
2011	453	1	279	17	355	1,105
2012	541	1	240	20	105	907
2013	515	0	328	22	243	1,109
2014	411	0	172	15	51	648
2015	466	1	212	9	32	721
Average	**353.7**	**0.9**	**244.8**	**17.1**	**368.1**	**984.6**
SD	**129.0**	**0.5**	**59.3**	**4.7**	**276.5**	**218.8**

Table A-76. Supporting Data for Figure 79. Hawai`i albacore catch by gear type, 2005-2015.

	Hawaii albacore catch (1,000 pounds)					
Year	Deep-set longline	Shallow-set longline	MHI troll	MHI handline	Other gear	Total
2005	628	26	14	370	0	1,038
2006	569	11	2	187	0	769
2007	524	19	7	208	0	758
2008	732	45	3	62	1	843
2009	415	31	7	214	0	667
2010	870	33	4	48	8	963
2011	1,473	64	8	186	3	1,734
2012	1,421	26	7	554	1	2,009
2013	682	14	4	101	3	803
2014	423	12	7	108	2	552
2015	528	7	4	136	1	676
Average	**751.3**	**26.2**	**6.1**	**197.7**	**1.7**	**983.0**
SD	**368.7**	**16.9**	**3.3**	**148.1**	**2.4**	**463.5**

Table A-77. Supporting Data for Figure 80. Hawai`i commercial billfish catch by gear type, 2005-2015.

	Hawaii billfish catch (1,000 lbs)						
Year	Deep-set longline	Shallow-set longline	MHI troll	MHI handline	Offshore handline	Other gear	Total
2005	2,506	3,365	476	16	1	3	6,367
2006	2,987	2,158	397	12	3	2	5,559
2007	1,948	3,409	315	14	1	2	5,689
2008	2,776	3,892	445	17	0	6	7,136
2009	2,087	3,552	404	14	0	2	6,059
2010	1,710	3,305	335	11	1	1	5,363
2011	2,549	3,176	486	15	1	7	6,234
2012	2,167	2,564	346	22	1	9	5,109
2013	2,895	2,177	334	18	5	10	5,440
2014	3,282	3,033	373	21	6	6	6,721
2015	3,891	2,546	458	16	4	10	6,925
Average	**2,618.0**	**3,016.1**	**397.2**	**16.0**	**2.1**	**5.4**	**6,054.7**
SD	**638.4**	**574.9**	**61.5**	**3.4**	**2.0**	**3.5**	**680.4**

Table A-78. Supporting Data for Figure 81. Species composition of the billfish catch, 2005-2015.

	Hawaii billfish catch (1,000 lbs)					
Year	Swordfish	Blue marlin	Striped marlin	Spearfish	Other marlins	Total
2005	3,543	1,147	1,171	481	25	6,367
2006	2,552	1,223	1,382	375	27	5,559
2007	3,846	834	638	339	32	5,689
2008	4,455	1,165	969	518	29	7,136
2009	4,019	1,159	591	261	29	6,059
2010	3,700	975	376	280	32	5,363
2011	3,569	1,247	835	543	40	6,234
2012	3,094	951	648	386	30	5,109
2013	2,816	1,190	898	497	39	5,440
2014	3,690	1,511	967	501	52	6,721
2015	3,372	1,786	1,115	604	47	6,925
Average	**3,514.2**	**1,199.0**	**871.8**	**435.0**	**34.7**	**6,054.7**
SD	**541.3**	**263.8**	**293.1**	**112.7**	**8.7**	**680.4**

Table A-79. Supporting Data for Figure 82. Hawai`i swordfish catch by gear type, 2005-2015.

	Swordfish catch (1,000 lbs)						
Year	Deep-set longline	Shallow-set longline	MHI troll	MHI handline	Offshore handline	Other gear	Total
2005	388	3,144	1	10	0	0	3,543
2006	399	2,144	1	8	0	0	2,552
2007	476	3,357	1	12	0	0	3,846
2008	689	3,749	1	14	0	2	4,455
2009	554	3,451	1	12	0	1	4,019
2010	432	3,258	1	9	0	0	3,700
2011	456	3,100	1	11	0	1	3,569
2012	566	2,508	1	18	0	1	3,094
2013	677	2,120	1	14	1	2	2,816
2014	694	2,978	2	15	0	1	3,690
2015	852	2,507	2	11	0	1	3,372
Average	**562.1**	**2,937.8**	**1.2**	**12.1**	**0.1**	**0.9**	**3,514.2**
SD	**149.4**	**542.1**	**0.4**	**2.9**	**0.2**	**0.8**	**541.3**

Table A-80. Supporting Data for Figure 83. Hawai`i blue marlin catch by gear type, 2005-2015.

	Blue marlin catch (1,000 lbs)						
Year	Deep-set longline	Shallow-set longline	MHI troll	MHI handline	Offshore handline	Other gear	Total
2005	652	90	396	6	1	2	1,147
2006	895	0	320	4	3	1	1,223
2007	545	21	263	2	1	2	834
2008	708	62	388	3	0	4	1,165
2009	749	45	362	2	0	1	1,159
2010	657	18	296	2	1	1	975
2011	797	27	414	4	1	4	1,247
2012	630	26	285	4	1	5	951
2013	879	17	282	4	3	6	1,190
2014	1,160	19	318	4	5	4	1,511
2015	1,365	12	394	5	3	8	1,786
Average	**821.5**	**30.7**	**338.0**	**3.6**	**1.7**	**3.4**	**1,199.0**
SD	**246.3**	**25.7**	**54.3**	**1.3**	**1.6**	**2.2**	**263.8**

Table A-81. Supporting Data for Figure 84. Hawai`i striped marlin catch by gear type, 2005-2015.

Year	Striped marlin catch (1,000 lbs) Deep-set longline	Shallow-set longline	MHI troll	MHI handline	Offshore handline	Other gear	Total
2005	1,002	125	44	0	0	0	1,171
2006	1,320	14	47	0	0	1	1,382
2007	581	29	28	0	0	0	638
2008	866	76	27	0	0	0	969
2009	516	53	22	0	0	0	591
2010	338	26	12	0	0	0	376
2011	756	43	35	0	0	1	835
2012	596	25	25	0	0	2	648
2013	843	35	18	0	0	1	898
2014	908	31	27	1	0	0	967
2015	1,066	24	23	0	0	1	1,115
Average	**799.3**	**43.7**	**28.0**	**0.1**	**0.1**	**0.6**	**871.8**
SD	**280.3**	**31.9**	**10.5**	**0.3**	**0.2**	**0.7**	**293.1**

Table A-82. Supporting Data for Figure 85. Hawai`i commercial catch of other PMUS by gear type, 2005-2015.

Year	Catch of other PMUS by gear type (1,000 lbs) Deep-set longline	Shallow-set longline	MHI troll	MHI handline	Offshore handline	Other gear	Total
2005	3,663	163	1,012	67	10	41	4,956
2006	3,520	23	1,212	57	14	48	4,874
2007	3,870	87	1,136	37	18	62	5,210
2008	3,924	139	1,061	77	15	66	5,282
2009	4,173	125	1,135	82	12	31	5,558
2010	4,199	109	1,135	102	16	26	5,587
2011	3,952	115	967	52	7	33	5,126
2012	4,198	119	1,413	83	13	37	5,863
2013	5,071	86	1,036	97	16	40	6,346
2014	5,421	121	1,367	114	7	30	7,061
2015	5,954	115	1,143	84	4	22	7,322
Average	**4,358.7**	**109.3**	**1,147.0**	**77.5**	**12.1**	**39.6**	**5,744.0**
SD	**777.6**	**35.7**	**139.4**	**22.8**	**4.3**	**14.1**	**831.7**

Table A-83. Supporting Data for Figure 86. Species composition of other PMUS catch, 2005-2015.

	Catch of other PMUS by species (1,000 lbs)						
Year	Mahimahi	Oilfish	Ono	Moonfish	Pomfret	PMUS shark	Total
2005	1,630	365	897	1,096	657	311	4,956
2006	1,531	391	1,002	1,080	585	285	4,874
2007	1,692	425	857	1,225	615	396	5,210
2008	1,443	455	975	1,338	681	390	5,282
2009	1,473	498	748	1,897	610	332	5,558
2010	1,703	521	758	1,781	580	244	5,587
2011	1,628	589	675	1,622	422	190	5,126
2012	2,007	563	809	1,593	710	181	5,863
2013	1,588	580	883	2,073	1,091	131	6,346
2014	1,819	516	1,176	2,242	1,179	129	7,061
2015	1,486	525	1,221	2,659	1,285	146	7,322
Average	**1,636.4**	**493.4**	**909.2**	**1,691.4**	**765.0**	**248.6**	**5,744.0**
SD	**166.9**	**75.4**	**172.8**	**501.9**	**282.9**	**100.3**	**831.7**

Table A-84. Supporting Data for Figure 87. Hawai`i moonfish catch by gear type, 2005-2015.

	Moonfish catch (1,000 lbs)			
Year	Deep-set longline	Shallow-set longline	Other gear	Total
2005	1,093	3	0	1,096
2006	1,078	2	0	1,080
2007	1,222	3	0	1,225
2008	1,332	6	0	1,338
2009	1,891	6	0	1,897
2010	1,772	9	0	1,781
2011	1,616	6	0	1,622
2012	1,574	17	2	1,593
2013	2,063	10	0	2,073
2014	2,213	28	0	2,242
2015	2,619	39	1	2,659
Average	**1,679.4**	**11.7**	**0.2**	**1,691.4**
SD	**491.9**	**11.7**	**0.6**	**501.9**

Table A-85. Supporting Data for Figure 88. Hawai`i mahimahi catch by gear type, 2005-2015.

	Mahimahi catch (1,000 lbs)						
Year	Deep-set longline	Shallow-set longline	MHI troll	MHI handline	Offshore handline	Other gear	Total
2005	881	91	595	47	8	8	1,630
2006	714	6	754	38	8	11	1,531
2007	951	26	681	21	6	7	1,692
2008	765	62	560	32	9	15	1,443
2009	686	40	696	35	7	9	1,473
2010	934	31	671	41	14	12	1,703
2011	860	60	656	30	6	16	1,628
2012	889	46	988	53	12	19	2,007
2013	846	43	639	37	12	11	1,588
2014	810	45	901	52	5	7	1,819
2015	692	30	725	26	2	10	1,486
Average	**820.7**	**43.6**	**715.0**	**37.5**	**8.2**	**11.4**	**1,636.4**
SD	**94.7**	**22.2**	**127.2**	**10.2**	**3.4**	**3.9**	**166.9**

Table A-86. Supporting Data for Figure 89. Hawai`i ono (wahoo) catch by gear type, 2005-2015.

	Ono catch (1,000 lbs)						
Year	Deep-set longline	Shallow-set longline	MHI troll	MHI handline	Offshore handline	Other gear	Total
2005	455	4	416	10	1	11	897
2006	512	0	457	10	2	21	1,002
2007	380	3	454	7	1	12	857
2008	448	5	500	11	1	10	975
2009	292	2	438	12	1	3	748
2010	277	3	463	11	1	3	758
2011	352	1	309	9	1	3	675
2012	366	1	424	15	1	2	809
2013	464	1	396	16	2	4	883
2014	684	2	465	20	1	5	1,176
2015	781	1	417	17	1	5	1,221
Average	**455.5**	**2.0**	**430.8**	**12.5**	**1.2**	**7.2**	**909.2**
SD	**156.3**	**1.6**	**49.7**	**3.8**	**0.4**	**5.8**	**172.8**

Table A-87. Supporting Data for Figure 90. Hawai`i pomfret catch by gear type, 2005-2015.

Year	Pomfret catch (1,000 lbs) Deep-set longline	Shallow-set longline	MHI handline	Offshore handline	Other gear	Total
2005	629	2	9	1	16	657
2006	558	2	8	3	14	585
2007	568	2	6	10	29	615
2008	616	1	31	3	30	681
2009	559	1	32	4	14	610
2010	525	1	43	1	10	580
2011	398	1	11	0	12	422
2012	682	5	11	0	12	710
2013	1,027	1	41	2	20	1,091
2014	1,118	2	41	1	18	1,179
2015	1,238	1	40	0	4	1,285
Average	**719.8**	**1.8**	**24.9**	**2.3**	**16.3**	**765.0**
SD	**275.3**	**1.2**	**15.7**	**2.9**	**7.7**	**282.9**

Table A-88. Supporting Data for Figure 91. Hawai`i PMUS shark catch by gear type, 2005-2015.

Year	PMUS shark catch (1,000 lbs) Deep-set longline	Shallow-set longline	Non-longline	Total
2005	282	26	3	311
2006	276	6	3	285
2007	368	20	8	396
2008	356	28	6	390
2009	294	33	5	332
2010	210	28	6	244
2011	171	14	5	190
2012	150	26	5	181
2013	112	15	4	131
2014	106	20	3	129
2015	120	24	2	146
Average	**222.2**	**21.9**	**4.5**	**248.6**
SD	**97.5**	**7.8**	**1.8**	**100.3**

Table A-89. Supporting Data for Figure 92. Number of Hawai`i-permitted deep-set longline vessels, trips and sets 2005-2015.

	Deep-set longline		
Year	Vessels	Trips	Sets
2005	125	1,445	16,535
2006	128	1,392	16,450
2007	130	1,430	17,796
2008	128	1,384	17,839
2009	128	1,257	16,762
2010	123	1,211	16,065
2011	130	1,311	17,166
2012	129	1,364	18,101
2013	136	1,386	18,732
2014	140	1,355	17,756
2015	143	1,452	18,519
Average	**130.9**	**1,362.5**	**17,429.2**
SD	**6.2**	**76.2**	**887.7**

Table A-90. Supporting Data for Figure 93. Number of hooks set by the Hawai`i-permitted deep-set longline fishery, 2005-2015.

	Number of deep-set hooks by area (milions)				
Year	Outside EEZ	MHI EEZ	NWHI EEZ	PRIA EEZ	Total
2005	16.4	14.3	2.4	0.5	33.7
2006	17.5	10.7	4.6	1.7	34.6
2007	22.6	11.0	2.9	2.4	38.8
2008	23.1	10.2	5.4	1.3	40.0
2009	24.3	8.5	3.7	1.1	37.7
2010	28.0	5.4	2.4	1.4	37.2
2011	26.3	8.2	5.4	0.9	40.8
2012	28.3	8.9	5.1	1.9	44.1
2013	32.8	8.7	4.1	1.2	46.8
2014	34.1	7.9	2.9	0.8	45.7
2015	33.0	11.2	3.1	0.3	47.6
Average	**26.03**	**9.55**	**3.83**	**1.22**	**40.63**
SD	**5.97**	**2.31**	**1.17**	**0.60**	**4.84**

Table A-91. Supporting Data for Figure 94. Catch and revenue for the Hawai`i-permitted deep-set longline fishery, 2005-2015.

Year	Catch (1,000 lbs)	Adjusted revenue ($1,000)	Nominal revenue ($1,000)	Honolulu CPI
2005	19,452	$66,084	$50,236	197.8
2006	19,008	$61,327	$49,354	209.4
2007	20,967	$66,574	$56,161	219.5
2008	22,456	$74,662	$65,681	228.9
2009	18,071	$58,369	$51,594	230.0
2010	20,075	$69,817	$63,028	234.9
2011	22,796	$75,996	$71,147	243.6
2012	22,975	$90,231	$86,520	249.5
2013	25,006	$86,470	$84,376	253.9
2014	26,615	$79,442	$78,617	257.5
2015	32,039	$91,490	$91,490	260.2
Average	**22,678.3**	**74,587.4**	**68,018.7**	
SD	**4,043.7**	**11,381.2**	**15,454.0**	

Table A-92. Supporting Data for Figure 95. Tuna CPUE for the Hawai`i-permitted deep-set longline fishery, 2005-2015.

	Deep-set longline CPUE (fish per 1,000 hooks)		
Year	Bigeye tuna	Yellowfin tuna	Albacore
2005	3.8	0.9	0.4
2006	3.4	0.9	0.4
2007	4.1	0.7	0.3
2008	3.8	0.9	0.4
2009	3.2	0.4	0.2
2010	3.7	0.4	0.5
2011	3.9	0.8	0.8
2012	3.7	0.6	0.7
2013	4.1	0.4	0.3
2014	4.8	0.4	0.2
2015	4.8	0.6	0.2
Average	**3.93**	**0.62**	**0.39**
SD	**0.51**	**0.21**	**0.20**

Table A-93. Supporting Data for Figure 96. Billfish CPUE for the Hawai`i-permitted deep-set longline fishery, 2005-2015.

	Deep-set longline CPUE (fish per 1,000 hooks)		
Year	Swordfish	Striped marlin	Blue marlin
2005	0.1	0.4	0.1
2006	0.1	0.6	0.2
2007	0.1	0.2	0.1
2008	0.1	0.3	0.1
2009	0.1	0.2	0.1
2010	0.1	0.1	0.1
2011	0.1	0.4	0.1
2012	0.1	0.2	0.1
2013	0.1	0.3	0.1
2014	0.1	0.3	0.1
2015	0.1	0.3	0.2
Average	**0.09**	**0.30**	**0.11**
SD	**0.01**	**0.14**	**0.03**

Table A-94. Supporting Data for Figure 97. Blue shark CPUE for the Hawai`i-permitted deep-set longline fishery, 2005-2015.

	Deep-set CPUE (fish per 1000 hooks)
Year	Blue shark
2005	1.6
2006	1.4
2007	1.3
2008	1.0
2009	1.1
2010	1.1
2011	1.2
2012	1.0
2013	1.0
2014	1.2
2015	1.4
Average	**1.21**
SD	**0.19**

Table A-95. Supporting Data for Figure 98. Number of Hawai`i-permitted shallow-set longline vessels, trips and sets, 2005-2015.

Year	Vessels	Trips	Sets
2005	33	109	1,640
2006	35	57	848
2007	28	88	1,569
2008	27	92	1,595
2009	28	112	1,762
2010	28	114	1,871
2011	20	82	1,447
2012	18	83	1,352
2013	15	58	961
2014	20	81	1,329
2015	22	68	1,129
Average	**24.9**	**85.8**	**1,409.4**
SD	**6.3**	**20.1**	**325.0**

Table A-96. Supporting Data for Figure 99. Number of hooks set by the Hawai`i-permitted shallow-set longline fishery, 2005-2015.

	Number of hooks set by area (milions)				
Year	Outside EEZ	MHI EEZ	NWHI EEZ	PRIA EEZ	Total
2005	0.9	0.1	0.4	0.0	1.4
2006	0.7	0.0	0.0	0.0	0.7
2007	1.1	0.1	0.1	0.0	1.3
2008	1.3	0.1	0.1	0.0	1.5
2009	1.4	0.2	0.1	0.0	1.7
2010	1.4	0.2	0.3	0.0	1.9
2011	1.2	0.1	0.2	0.0	1.5
2012	1.2	0.1	0.2	0.0	1.5
2013	0.9	0.0	0.1	0.0	1.1
2014	1.3	0.1	0.1	0.0	1.5
2015	1.1	0.1	0.1	0.0	1.2
Average	**1.14**	**0.09**	**0.16**	**0.00**	**1.39**
SD	**0.23**	**0.06**	**0.11**	**0.00**	**0.32**

Table A-97. Supporting Data for Figure 100. Catch and revenue for the Hawai`i-permitted shallow-set longline fishery, 2005-2015.

Year	Catch (1,000 lbs)	Adjusted revenue ($1,000)	Nominal revenue ($1,000)	Honolulu CPI
2005	3,739	$10,047	$7,637	197.8
2006	2,328	$4,952	$3,985	209.4
2007	3,644	$8,379	$7,069	219.5
2008	4,301	$7,798	$6,860	228.9
2009	3,833	$7,696	$6,803	230.0
2010	3,614	$7,365	$6,649	234.9
2011	3,500	$6,501	$6,086	243.6
2012	2,814	$6,063	$5,814	249.5
2013	2,345	$3,258	$3,180	253.9
2014	3,255	$4,117	$4,074	257.5
2015	2,791	$2,810	$2,810	260.2
Average	**3,287.7**	**6,271.5**	**5,542.4**	
SD	**639.3**	**2,275.8**	**1,710.8**	

Table A-98. Supporting Data for Figure 101. Tuna CPUE for the Hawai`i-permitted shallow-set longline fishery, 2005-2015.

	Shallow-set longline CPUE (fish per 1,000 hooks)		
Year	Bigeye tuna	Yellowfin tuna	Albacore
2005	1.5	0.1	0.9
2006	1.7	0.2	0.6
2007	1.0	0.1	1.0
2008	1.0	0.3	2.0
2009	0.5	0.1	0.9
2010	0.9	0.1	1.0
2011	0.7	0.2	2.0
2012	0.6	0.2	0.8
2013	0.4	0.2	0.5
2014	0.6	0.1	0.5
2015	1.1	0.1	0.2
Average	**0.90**	**0.17**	**0.95**
SD	**0.40**	**0.07**	**0.57**

Table A-99. Supporting Data for Figure 102. Billfish CPUE for the Hawai`i-permitted shallow-set longline fishery, 2005-2015.

	Shallow-set longline CPUE (fish per 1,000 hooks)		
Year	Swordfish	Striped marlin	Blue marlin
2005	15.4	1.2	0.3
2006	19.1	0.2	0.0
2007	15.2	0.2	0.0
2008	13.6	0.6	0.2
2009	10.8	0.4	0.1
2010	9.3	0.1	0.0
2011	11.0	0.4	0.1
2012	9.8	0.2	0.1
2013	10.1	0.4	0.1
2014	10.4	0.3	0.1
2015	11.9	0.2	0.0
Average	**12.41**	**0.37**	**0.10**
SD	**3.05**	**0.30**	**0.10**

Table A-100. Supporting Data for Figure 103. Blue shark CPUE for the Hawai`i-permitted shallow-set longline fishery, 2005-2015.

	Shallow-set CPUE (fish per 1000 hooks)
Year	Blue shark
2005	10.8
2006	13.5
2007	11.3
2008	8.4
2009	4.8
2010	9.3
2011	5.3
2012	4.2
2013	4.9
2014	6.8
2015	10.0
Average	**8.10**
SD	**3.12**

Table A-101. Supporting Data for Figure 104. Number of MHI troll fishers and days fished, 2005-2015.

Year	Fishers	Days fished
2005	1,415	29,714
2006	1,402	29,080
2007	1,462	29,271
2008	1,546	29,938
2009	1,668	29,553
2010	1,569	29,298
2011	1,602	29,073
2012	1,698	30,232
2013	1,661	26,658
2014	1,649	26,884
2015	1,564	24,974
Average	**1,566.9**	**28,606.8**
SD	**102.9**	**1,669.1**

Table A-102. Supporting Data for Figure 105. Catch and revenue for the MHI troll fishery, 2005-2015.

Year	Catch (1,000 lbs)	Adjusted revenue ($1,000)	Nominal revenue ($1,000)	Honolulu CPI
2005	2,606	$6,460	$4,911	197.8
2006	2,590	$6,037	$4,858	209.4
2007	2,835	$6,419	$5,415	219.5
2008	2,971	$6,202	$5,456	228.9
2009	2,958	$5,690	$5,030	230.0
2010	2,855	$5,993	$5,410	234.9
2011	2,966	$6,159	$5,766	243.6
2012	3,690	$8,963	$8,594	249.5
2013	3,117	$7,532	$7,350	253.9
2014	3,486	$8,456	$8,368	257.5
2015	3,067	$7,684	$7,684	260.2
Average	**3,012.9**	**$6,872.3**	**$6,258.4**	
SD	**332.3**	**$1,103.4**	**$1,439.9**	

Table A-103. Supporting Data for Figure 106. Tuna CPUE for the MHI troll fishery, 2005-2015.

MHI troll tuna CPUE (pounds per day fished)		
Year	Yellowfin tuna	Skipjack tuna
2005	23.9	6.4
2006	20.3	7.6
2007	35.3	6.6
2008	31.4	11.5
2009	32.6	10.2
2010	30.0	7.2
2011	33.5	9.6
2012	43.5	8.0
2013	40.4	12.3
2014	45.5	6.4
2015	43.4	8.5
Average	34.53	8.57
SD	8.16	2.07

MHI troll tuna CPUE (pounds per hour fished)		
Year	Yellowfin tuna	Skipjack tuna
2005	4.1	1.1
2006	3.5	1.3
2007	5.9	1.1
2008	5.4	2.0
2009	5.5	1.7
2010	5.0	1.2
2011	5.5	1.6
2012	7.0	1.3
2013	6.4	2.0
2014	7.2	1.0
2015	7.0	1.4
Average	5.68	1.42
SD	1.20	0.35

Table A-104. Supporting Data for Figure 107. Marlin CPUE for the MHI troll fishery, 2005-2015.

MHI troll marlin CPUE (pounds per day fished)		
Year	Blue marlin	Striped marlin
2005	13.4	1.5
2006	11.0	1.6
2007	9.0	1.0
2008	13.0	0.9
2009	12.3	0.7
2010	10.0	0.4
2011	14.3	1.2
2012	9.5	0.8
2013	10.6	0.7
2014	11.9	1.0
2015	15.8	0.9
Average	11.89	0.97
SD	2.12	0.35

MHI troll marlin CPUE (pounds per hour fished)		
Year	Blue marlin	Striped marlin
2005	2.3	0.3
2006	1.9	0.3
2007	1.5	0.2
2008	2.2	0.2
2009	2.1	0.1
2010	1.7	0.1
2011	2.4	0.2
2012	1.5	0.1
2013	1.7	0.1
2014	1.9	0.2
2015	2.5	0.2
Average	1.96	0.17
SD	0.34	0.06

Table A-105. Supporting Data for Figure 108. Mahimahi and Ono CPUE for the MHI troll fishery, 2005-2015.

MHI troll mahimahi and ono CPUE (pounds per day fished)		
Year	Mahimahi	Ono (wahoo)
2005	20.0	14.0
2006	25.9	15.7
2007	23.3	15.5
2008	18.7	16.7
2009	23.6	14.8
2010	22.9	15.8
2011	22.8	10.7
2012	33.0	14.2
2013	24.0	14.9
2014	33.5	17.3
2015	29.0	16.7
Average	**25.15**	**15.12**
SD	**4.82**	**1.80**

MHI troll mahimahi and ono CPUE (pounds per hour fished)		
Year	Mahimahi	Ono (wahoo)
2005	3.4	2.4
2006	4.4	2.7
2007	3.9	2.6
2008	3.2	2.9
2009	4.0	2.5
2010	3.8	2.7
2011	3.8	1.8
2012	5.3	2.3
2013	3.8	2.4
2014	5.3	2.7
2015	4.7	2.7
Average	**4.14**	**2.50**
SD	**0.70**	**0.30**

Table A-106. Supporting Data for Figure 109. Number of MHI handline fishers and days fished, 2005-2015.

Year	Fishers	Days fished
2005	428	4,710
2006	374	3,579
2007	420	3,592
2008	466	4,030
2009	543	5,049
2010	471	4,215
2011	495	5,141
2012	565	6,437
2013	523	5,258
2014	495	4,933
2015	467	4,632
Average	**477.0**	**4,688.7**
SD	**56.0**	**828.9**

Table A-107. Supporting Data for Figure 110. Catch and revenue for the MHI handline fishery, 2005-2015.

Year	Catch (1,000 lbs)	Adjusted revenue ($1,000)	Nominal revenue ($1,000)	Honolulu CPI
2005	1,288	$2,787	$2,119	197.8
2006	818	$1,689	$1,359	209.4
2007	982	$1,866	$1,574	219.5
2008	701	$1,608	$1,415	228.9
2009	1,067	$1,980	$1,750	230.0
2010	933	$2,111	$1,906	234.9
2011	1,129	$2,277	$2,132	243.6
2012	1,602	$3,505	$3,361	249.5
2013	1,282	$3,450	$3,366	253.9
2014	1,161	$2,971	$2,940	257.5
2015	1,182	$2,832	$2,832	260.2
Average	**1,104.1**	**$2,461.5**	**$2,250.4**	
SD	**247.6**	**$681.0**	**$751.2**	

Table A-108. Supporting Data for Figure 111. Tuna CPUE for the MHI handline fishery, 2005-2015.

	MHI handline CPUE (pounds per day fished)			
Year	Yellowfin tuna	Albacore	Bigeye tuna	Total
2005	141.2	65.4	30.3	236.9
2006	115.5	48.3	37.7	201.5
2007	144.3	50.9	52.4	247.6
2008	108.7	13.7	21.1	143.5
2009	130.0	42.4	13.9	186.3
2010	128.7	11.0	50.7	190.4
2011	137.1	35.9	27.3	200.3
2012	121.8	86.5	21.9	230.2
2013	169.9	19.2	27.9	217.0
2014	161.2	21.9	21.2	204.3
2015	185.5	29.4	15.8	230.7
Average	**140.35**	**38.60**	**29.11**	**208.06**
SD	**23.62**	**23.24**	**12.94**	**29.24**

	MHI handline CPUE (pounds per hour fished)			
Year	Yellowfin tuna	Albacore	Bigeye tuna	Total
2005	20.3	9.4	4.3	34.0
2006	17.3	7.2	5.6	30.1
2007	22.5	7.9	8.2	38.6
2008	17.1	2.2	3.3	22.6
2009	19.7	6.4	2.1	28.2
2010	19.1	1.6	7.5	28.2
2011	19.8	5.2	4.0	29.0
2012	17.4	12.3	3.1	32.8
2013	24.0	2.7	3.9	30.6
2014	22.8	3.1	3.0	28.9
2015	29.0	4.4	2.4	35.8
Average	**20.82**	**5.67**	**4.31**	**30.80**
SD	**3.57**	**3.34**	**2.00**	**4.34**

Table A-109. Supporting Data for Figure 112. Number of offshore handline fishers and days fished, 2005-2015.

Year	Fishers	Days fished
2005	10	190
2006	9	159
2007	10	176
2008	9	171
2009	9	192
2010	14	449
2011	13	363
2012	15	362
2013	15	540
2014	9	292
2015	8	253
Average	**11.0**	**286.1**
SD	**2.7**	**127.8**

Table A-110. Supporting Data for Figure 113. Catch and revenue for the offshore tuna handline fishery, 2005-2015.

Year	Catch (1,000 lbs)	Adjusted revenue ($1,000)	Nominal revenue ($1,000)	Honolulu CPI
2005	424	$567	$431	197.8
2006	502	$634	$510	209.4
2007	598	$950	$801	219.5
2008	326	$650	$572	228.9
2009	298	$445	$393	230.0
2010	614	$1,362	$1,230	234.9
2011	610	$891	$834	243.6
2012	562	$1,141	$1,094	249.5
2013	831	$1,843	$1,798	253.9
2014	416	$786	$778	257.5
2015	408	$811	$811	260.2
Average	**508.2**	**$916.3**	**$841.1**	
SD	**154.9**	**$404.0**	**$410.9**	

Table A-111. Supporting Data for Figure 114. Tuna CPUE for the offshore tuna handline fishery, 2005-2015.

Year	Offshore handline CPUE (pounds per trip)			
	Bigeye tuna	Yellowfin tuna	Mahimahi	Total
2005	1,816	353	42	2,211
2006	2,711	327	50	3,088
2007	3,040	239	34	3,313
2008	1,433	374	53	1,860
2009	1,245	240	36	1,521
2010	1,207	109	31	1,347
2011	1,419	231	17	1,667
2012	1,356	146	33	1,536
2013	1,331	152	22	1,505
2014	1,191	180	19	1,389
2015	1,471	99	10	1,580
Average	**1,656.2**	**222.8**	**31.5**	**1,910.5**
SD	**630.5**	**96.0**	**13.8**	**682.6**

TABLES FOR SECTION 3.1: HUMAN DIMENSIONS

AMERICAN SAMOA

Table A-112. Supporting Data for Figure 131. American Samoa 2014 annual estimated inflation-adjusted revenue in dollars for Tuna and non-Tuna PMUS

		Revenue ($)			
		Tunas		Non-Tuna PMUS	
Year	CPI	Unadjust	Adjusted	Unadjust.	Adjusted
1982	100.0	$18,990	$53,742	$1,534	$4,341
1983	100.8	$58,561	$164,381	$5,828	$16,359
1984	102.7	$114,981	$316,773	$15,938	$43,909
1985	103.7	$95,157	$259,682	$26,800	$73,138
1986	107.1	$139,021	$367,293	$23,117	$61,076
1987	111.8	$110,012	$278,440	$5,267	$13,331
1988	115.3	$143,623	$352,451	$25,384	$62,293
1989	120.3	$110,343	$259,527	$9,338	$21,962
1990	129.6	$63,285	$138,151	$3,813	$8,324
1991	135.3	$94,344	$197,274	$17,923	$37,476
1992	140.9	$141,106	$283,340	$23,451	$47,090
1993	141.1	$80,250	$160,980	$28,181	$56,530
1994	143.8	$337,977	$665,139	$59,266	$116,635
1995	147.0	$319,213	$614,484	$73,194	$140,897
1996	152.5	$393,770	$730,837	$76,234	$141,489
1997	156.4	$941,091	$1,702,434	$162,262	$293,532
1998	158.4	$1,241,313	$2,216,985	$146,754	$262,102
1999	159.9	$1,016,156	$1,798,595	$153,286	$271,317
2000	166.7	$1,656,449	$2,812,650	$161,748	$274,649
2001	169.9	$8,226,280	$13,704,982	$178,111	$296,733
2002	172.1	$13,284,647	$21,839,959	$393,751	$647,326
2003	176.0	$9,905,705	$15,918,468	$420,253	$675,346
2004	188.5	$8,384,420	$12,585,014	$467,170	$701,222
2005	198.3	$8,206,541	$11,710,734	$539,924	$770,471
2006	204.3	$11,048,198	$15,301,754	$594,241	$823,024
2007	215.5	$13,586,140	$17,838,601	$471,582	$619,188
2008	231.5	$9,196,349	$11,237,938	$306,141	$374,104
2009	240.7	$10,007,107	$11,758,351	$255,313	$299,993
2010	249.4	$10,211,540	$11,579,887	$273,152	$309,755
2011	269.4	$7,541,841	$7,918,933	$345,046	$362,299
2012	279.1	$9,514,282	$9,647,482	$196,475	$199,225
2013	284.7	$6,487,865	$6,448,937	$153,326	$152,406
2014	283.8	$4,857,988	$4,843,414	$114,461	$114,117
2015	283.0	$4,720,690	$4,720,690	$92,619	$92,619
Average	**174.7**	**$4,183,977**	**$5,600,832**	**$171,202**	**$246,596**
Std. Dev.	**58.74**	**$4,609,606**	**$6,330,071**	**$171,898**	**$240,313**

Table A-113. Supporting Data for Figure 132 Average revenue per trip and per day at sea for American Samoa Longliners and Figure 133 Gini Coefficient for American Samoa Longliners

Year	Revenue per trip	Revenue per day at sea	Gini Coefficient
2002	8,504	1,467	0.58
2003	11,492	1,279	0.49
2004	14,270	1,326	0.51
2005	19,230	1,420	0.47
2006	32,940	1,668	0.28
2007	34,164	1,682	0.23
2008	31,222	1,329	0.34
2009	48,263	1,535	0.26
2010	36,623	1,646	0.28
2011	28,571	1,447	0.29
2012	44,183	1,687	0.34
2013	62,573	1,369	0.27

Table A-114. Supporting Data for Figure 134. American Samoa Longline Fishery Trip Expenditure

Year	Trip Cost	Fuel Cost	Other costs
2006	32,219	19,938	12,281
2007	45,253	27,820	17,433
2008	44,010	28,628	15,382
2009	32,941	16,182	16,759
2010	32,210	16,771	15,439
2011	33,826	20,141	13,685
2012	46,017	26,294	19,723
2013	50,737	33,381	17,356
2014	44,461	22,758	21,703

Source: https://inport.nmfs.noaa.gov/inport/item/10373

Table A-115. Supporting Data for Figure 135 American Samoa Longline Net Revenue per set

Year	Revenue per set	Cost per set	Net Revenue per set
2006	2.313	1,492	821
2007	2,369	963	1,406
2008	2,009	1,293	716
2009	2,137	830	1,307
2010	2,348	1,142	1,206
2011	2,246	2,002	244
2012	2,357	1,645	712
2013	1,740	2,137	-397
2014	1,902	1,170	732

Sources: Revenue data: https://inport.nmfs.noaa.gov/inport/item/1775

Cost data: https://inport.nmfs.noaa.gov/inport/item/10373

Table A-116. Supporting Data for Figure 136. American Samoa average estimated inflation-adjusted revenue per trolling trip landing pelagic species

	All Species		Tunas		Non-Tuna PMUS	
Year	**Adj.**	**Unadj.**	**Adj.**	**Unadj.**	**Adj.**	**Unadj.**
1982	$607	$214	$45	$16	$3.7	$1.3
1983	$948	$338	$121	$43	$14.6	$5.2
1984	$754	$274	$226	$82	$28.9	$10.5
1985	$535	$196	$127	$47	$43.1	$15.8
1986	$458	$173	$396	$150	$46.0	$17.4
1987	$509	$201	$468	$185	$23.0	$9.1
1988	$683	$278	$552	$225	$94.7	$38.6
1989	$475	$202	$436	$185	$29.4	$12.5
1990	$362	$166	$336	$154	$17.0	$7.8
1991	$444	$212	$408	$195	$32.2	$15.4
1992	$598	$298	$458	$228	$73.9	$36.8
1993	$423	$211	$325	$162	$83.7	$41.7
1994	$473	$241	$381	$194	$66.3	$33.7
1995	$360	$187	$268	$139	$57.2	$29.7
1996	$428	$230	$333	$180	$65.5	$35.3
1997	$299	$165	$210	$116	$41.8	$23.1
1998	$213	$119	$139	$78	$10.9	$6.1
1999	$331	$187	$279	$158	$13.1	$7.4
2000	$173	$102	$130	$76	$1.4	$0.8
2001	$344	$206	$206	$124	$14.3	$8.6
2002	$165	$101	$150	$91	$6.2	$3.8
2003	$364	$226	$335	$208	$22.5	$14.0
2004	$359	$239	$335	$223	$9.6	$6.4
2005	$226	$158	$211	$148	$6.0	$4.2
2006	$215	$155	$139	$100	$7.9	$5.7
2007	$306	$233	$264	$201	$23.4	$17.8
2008	$654	$535	$633	$518	$13.9	$11.4
2009	$405	$345	$386	$328	$18.7	$15.9
2010	$348	$307	$315	$277	$4.1	$3.6
2011	$639	$608	$613	$584	$15.5	$14.8
2012	$847	$835	$828	$816	$16.7	$16.5
2013	$340	$342	$321	$323	$8.3	$8.3
2014	$570	$572	$451	$452	$66.7	$66.9
2015	$333	$333	$263	$263	$28.1	$28.1
Average	**$447**	**$270**	**$326**	**$214**	**$29.7**	**$16.9**
Std. Dev.	**$185**	**$154**	**$165**	**$163**	**$24.9**	**$14.3**

Table A-117. Supporting Data for Figure 137. American Samoa average estimated inflation-adjusted price per pound of Tunas and Non-Tuna PMUS

	Average Price/Pound ($)			
	Tunas		Non-Tuna PMUS	
Year	Unadjust.	Adjusted	Unadjust.	Adjusted
1982	$0.86	$2.44	$1.01	$2.87
1983	$0.69	$1.93	$1.31	$3.68
1984	$0.59	$1.62	$1.18	$3.26
1985	$0.95	$2.60	$1.53	$4.18
1986	$0.82	$2.16	$1.51	$3.99
1987	$0.83	$2.11	$1.09	$2.75
1988	$0.83	$2.04	$2.10	$5.14
1989	$0.97	$2.29	$1.14	$2.69
1990	$1.12	$2.44	$1.05	$2.29
1991	$1.63	$3.40	$1.19	$2.49
1992	$1.56	$3.13	$2.12	$4.25
1993	$1.81	$3.63	$1.95	$3.90
1994	$1.79	$3.52	$1.43	$2.82
1995	$1.13	$2.18	$1.33	$2.56
1996	$1.26	$2.35	$1.65	$3.06
1997	$1.18	$2.13	$1.66	$3.00
1998	$1.11	$1.99	$1.54	$2.76
1999	$1.07	$1.90	$1.40	$2.47
2000	$1.01	$1.71	$1.30	$2.20
2001	$1.06	$1.77	$1.28	$2.14
2002	$0.89	$1.46	$1.07	$1.76
2003	$0.94	$1.51	$1.02	$1.65
2004	$0.99	$1.49	$0.99	$1.48
2005	$1.01	$1.44	$1.04	$1.49
2006	$0.98	$1.36	$0.80	$1.11
2007	$0.99	$1.30	$0.84	$1.11
2008	$0.99	$1.22	$0.79	$0.96
2009	$0.99	$1.16	$0.71	$0.84
2010	$0.99	$1.12	$0.81	$0.92
2011	$1.08	$1.13	$1.08	$1.13
2012	$1.07	$1.08	$0.99	$1.00
2013	$1.10	$1.09	$0.67	$0.66
2014	$1.10	$1.09	$0.65	$0.65
2015	$1.06	$1.06	$0.65	$0.65
Average	**$1.07**	**$1.91**	**$1.20**	**$2.29**
Std. Dev.	**$0.27**	**$0.72**	**$0.39**	**$1.19**

COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS

Table A- 118. CNMI Consumer Price Indices (Supporting Data for Figure 138 through Figure 140)

Year	CPI	CPI Adjusted Factor	Data Coverage %
1983	140.90	2.57	80.00
1984	153.20	2.36	80.00
1985	159.30	2.27	80.00
1986	163.50	2.22	80.00
1987	170.70	2.12	80.00
1988	179.60	2.02	80.00
1989	190.20	1.90	80.00
1990	199.33	1.82	80.00
1991	214.93	1.69	80.00
1992	232.90	1.56	80.00
1993	243.18	1.49	80.00
1994	250.00	1.45	80.00
1995	254.48	1.42	80.00
1996	261.98	1.38	80.00
1997	264.95	1.37	80.00
1998	264.18	1.37	80.00
1999	267.80	1.35	80.00
2000	273.23	1.33	80.00
2001	271.01	1.34	80.00
2002	271.55	1.33	80.00
2003	268.92	1.35	80.00
2004	271.28	1.34	55.00
2005	271.90	1.33	55.00
2006	285.96	1.27	55.00
2007	301.72	1.20	65.00
2008	320.39	1.13	65.00
2009	325.20	1.11	55.00
2010	351.05	1.03	45.00
2011	363.90	1.00	40.00
2012	369.10	0.98	65.00
2013	367.47	0.99	65.00
2014	368.61	0.98	65.00
2015	362.27	1.00	30.00

Table A-119. Supporting Data for Figure 138. CNMI Annual Commercial Inflation-Adjusted Revenues for All Pelagics

Year	All Pelagics		Tuna PMUS		Non-Tuna PMUS	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
1983	248,387	638,355	202,800	521,196	29,059	74,682
1984	330,254	779,399	294,077	694,022	27,044	63,824
1985	244,171	554,268	193,920	440,198	37,882	85,992
1986	333,766	740,961	289,681	643,092	35,488	78,783
1987	237,687	503,896	195,793	415,081	32,344	68,569
1988	409,075	826,332	338,348	683,463	59,701	120,596
1989	373,927	710,461	345,839	657,094	20,917	39,742
1990	293,993	535,067	248,144	451,622	32,102	58,426
1991	338,643	572,307	232,077	392,210	70,235	118,697
1992	374,977	584,964	206,950	322,842	102,133	159,327
1993	311,342	463,900	201,350	300,012	69,592	103,692
1994	259,470	376,232	185,381	268,802	37,818	54,836
1995	361,511	513,346	275,080	390,614	62,920	89,346
1996	539,628	744,687	388,691	536,394	110,939	153,096
1997	474,509	650,077	351,492	481,544	93,306	127,829
1998	496,652	680,413	372,142	509,835	77,011	105,505
1999	351,062	473,934	261,394	352,882	55,404	74,795
2000	350,468	466,122	302,473	402,289	32,186	42,807
2001	358,656	480,599	300,154	402,206	44,987	60,283
2002	506,302	673,382	425,961	566,528	53,468	71,112
2003	447,647	604,323	390,100	526,635	36,764	49,631
2004	476,543	638,568	356,110	477,187	98,417	131,879
2005	678,773	902,768	578,914	769,956	62,759	83,469
2006	554,373	704,054	492,762	625,808	48,026	60,993
2007	439,953	527,944	372,573	447,088	60,137	72,164
2008	359,427	406,153	310,855	351,266	33,954	38,368
2009	324,637	360,347	271,832	301,734	44,309	49,183
2010	339,846	350,041	276,286	284,575	51,525	53,071
2011	234,249	234,249	156,557	156,557	68,250	68,250
2012	311,441	305,212	245,899	240,981	65,542	64,231
2013	532,620	527,294	409,623	405,527	120,787	119,579
2014	520,275	509,870	405,919	397,801	111,576	109,344
2015	315,765	315,765	233,986	233,986	81,649	81,649
Average	385,758	556,221	306,459	443,970	59,643	82,841
Standard Deviation	105,970	156,792	93,822	145,388	26,864	31,829

Table A-120. Supporting Data for Figure 139. CNMI Annual Inflation-Adjusted Revenue Per Trip for PMUS Trips

Year	All Pelagics		Tuna PMUS		Non-Tuna PMUS	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
1983	159.00	408.63	122.00	313.54	22.00	56.54
1984	185.00	436.60	148.00	349.28	17.00	40.12
1985	214.00	485.78	128.00	290.56	31.00	70.37
1986	262.00	581.64	176.00	390.72	27.00	59.94
1987	290.00	614.80	163.00	345.56	34.00	72.08
1988	318.00	642.36	213.00	430.26	47.00	94.94
1989	312.00	592.80	228.00	433.20	17.00	32.30
1990	327.00	595.14	233.00	424.06	38.00	69.16
1991	302.00	510.38	204.00	344.76	77.00	130.13
1992	231.00	360.36	135.00	210.60	83.00	129.48
1993	195.00	290.55	128.00	190.72	55.00	81.95
1994	200.00	290.00	135.00	195.75	35.00	50.75
1995	193.00	274.06	136.00	193.12	39.00	55.38
1996	261.00	360.18	148.00	204.24	53.00	73.14
1997	245.00	335.65	143.00	195.91	47.00	64.39
1998	234.00	320.58	138.00	189.06	36.00	49.32
1999	246.00	332.10	125.00	168.75	33.00	44.55
2000	172.00	228.76	121.00	160.93	16.00	21.28
2001	219.00	293.46	113.00	151.42	21.00	28.14
2002	339.00	450.87	189.00	251.37	30.00	39.90
2003	275.00	371.25	185.00	249.75	22.00	29.70
2004	172.00	230.48	112.00	150.08	56.00	75.04
2005	213.00	283.29	165.00	219.45	32.00	42.56
2006	236.00	299.72	195.00	247.65	35.00	44.45
2007	251.00	301.20	182.00	218.40	45.00	54.00
2008	248.00	280.24	177.00	200.01	30.00	33.90
2009	189.00	209.79	133.00	147.63	39.00	43.29
2010	227.00	233.81	164.00	168.92	68.00	70.04
2011	251.00	251.00	116.00	116.00	127.00	127.00
2012	304.00	297.92	179.00	175.42	73.00	71.54
2013	385.00	381.15	219.00	216.81	99.00	98.01
2014	538.00	527.24	291.00	285.18	123.00	120.54
2015	345.00	345.00	200.00	200.00	233.00	233.00
Average	258.73	376.27	164.97	243.31	52.73	69.91
Standard Deviation	73.91	124.35	41.40	87.45	42.29	41.10

Table A-121. Supporting Data for Figure 140. CNMI Average Inflation-Adjusted Price of All Pelagics

Year	All Pelagics		Tuna PMUS		Non-Tuna PMUS	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
1983	1.01	2.60	0.99	2.55	1.09	2.81
1984	0.97	2.28	0.95	2.24	1.16	2.75
1985	1.04	2.37	1.02	2.32	1.14	2.59
1986	1.09	2.41	1.07	2.37	1.20	2.66
1987	1.16	2.46	1.14	2.41	1.27	2.69
1988	1.22	2.47	1.20	2.42	1.36	2.75
1989	1.30	2.48	1.29	2.45	1.43	2.72
1990	1.63	2.97	1.57	2.85	2.01	3.67
1991	1.80	3.04	1.80	3.04	1.90	3.21
1992	1.88	2.94	1.91	2.98	2.04	3.18
1993	1.72	2.56	1.78	2.65	1.56	2.33
1994	1.76	2.55	1.75	2.54	1.75	2.53
1995	1.81	2.56	1.80	2.56	1.76	2.50
1996	1.92	2.65	1.88	2.60	1.99	2.75
1997	2.17	2.97	2.20	3.02	2.03	2.78
1998	2.07	2.83	2.02	2.76	2.14	2.93
1999	1.98	2.68	1.91	2.58	2.24	3.02
2000	1.87	2.49	1.86	2.47	2.07	2.75
2001	2.00	2.68	1.97	2.64	2.12	2.84
2002	1.97	2.62	1.99	2.65	1.92	2.55
2003	1.96	2.65	1.96	2.65	2.12	2.86
2004	1.99	2.67	1.96	2.63	2.15	2.88
2005	1.82	2.42	1.80	2.40	1.95	2.60
2006	1.60	2.03	1.56	1.98	2.08	2.64
2007	1.41	1.69	1.35	1.62	1.84	2.20
2008	1.64	1.85	1.61	1.82	1.84	2.08
2009	1.70	1.89	1.68	1.87	1.82	2.03
2010	1.80	1.86	1.78	1.84	1.91	1.97
2011	1.93	1.93	1.93	1.93	1.96	1.96
2012	2.01	1.97	1.96	1.92	2.19	2.15
2013	2.10	2.08	2.05	2.03	2.28	2.26
2014	2.31	2.27	2.31	2.27	2.31	2.27
2015	2.31	2.31	2.31	2.31	2.34	2.34
Average	1.73	2.43	1.71	2.40	1.85	2.61
Standard Deviation	0.37	0.35	0.38	0.36	0.36	0.38

GUAM

Table A- 122. Annual Consumer Price Indexes and CPI adjustment Factor (Supporting Data for Figure 141 and Figure 142)

Year	Consumer Price Index	CPI Adjust Factor
1980	134.0	6.09
1981	161.4	5.06
1982	169.7	4.81
1983	175.6	4.65
1984	190.9	4.28
1985	198.3	4.12
1986	203.7	4.01
1987	212.7	3.84
1988	223.8	3.65
1989	248.2	3.29
1990	283.5	2.88
1991	312.5	2.61
1992	344.2	2.37
1993	372.9	2.19
1994	436.0	1.87
1995	459.2	1.78
1996	482.0	1.69
1997	491.3	1.66
1998	488.2	1.67
1999	497.2	1.64
2000	507.1	1.61
2001	500.0	1.63
2002	503.2	1.62
2003	517.0	1.58
2004	548.5	1.49
2005	590.5	1.38
2006	658.9	1.24
2007	703.5	1.16
2008	733.7	1.11
2009	749.2	1.09
2010	768.5	1.06
2011	793.5	1.03
2012	818.1	1.00
2013	818.0	1.00
2014	824.1	0.99
2015	816.6	1.00

Table A-123. Supporting Data for Figure 141. Guam Annual Estimated Inflation-Adjusted Commercial Revenues: All Pelagics, Tuna PMUS, and Non-Tuna PMUS

	All Pelagics		Tuna PMUS		Non-Tuna PMUS	
Year	**Unadjusted**	**Adjusted**	**Unadjusted**	**Adjusted**	**Unadjusted**	**Adjusted**
1980	149124	908761	54353	331224	88775	540997
1981	218384	1104806	92914	470054	113212	572741
1982	203847	980913	90719	436540	103459	497844
1983	380231	1768072	105308	489683	262817	1222099
1984	286490	1225318	129389	553398	146339	625894
1985	373796	1539290	112286	462392	244423	1006535
1986	334955	1342835	81299	325929	237826	953445
1987	350828	1346828	107642	413238	231451	888539
1988	388630	1418109	115243	420523	258203	942184
1989	337586	1110658	76865	252887	249421	820593
1990	471241	1357175	136321	392604	316491	911494
1991	462191	1207704	119640	312620	333096	870380
1992	492707	1168702	195547	463836	284546	674944
1993	547835	1199759	175360	384039	358592	785316
1994	593838	1112259	165296	309599	411832	771361
1995	537889	956367	173629	308713	356256	633423
1996	398375	674848	127375	215773	254063	430383
1997	534352	888094	154819	257309	344972	573343
1998	733101	1226478	201639	337341	502801	841187
1999	489605	803931	122023	200362	319342	524360
2000	626803	1009152	234735	377924	349312	562393
2001	667648	1090269	228652	373388	379174	619191
2002	500777	812760	184705	299777	274929	446210
2003	399989	631582	163423	258045	214143	338132
2004	432735	644342	122098	181804	277544	413264
2005	353131	488380	100720	139296	232336	321321
2006	324686	402286	94040	116516	202560	250972
2007	437861	508356	109201	126782	296385	344103
2008	260474	289907	61360	68294	174973	194745
2009	286514	312300	88918	96921	176071	191917
2010	474481	504373	55183	58660	397710	422766
2011	297294	305916	73945	76089	206185	212165
2012	252145	251640	81441	81278	154924	154614
2013	332185	331520	71501	71358	252391	251886
2014	213813	211889	83372	82622	126865	125723
2015	179943	179943	90762	90762	88072	88072
Average	**397930**	**869876**	**121715**	**273266**	**256153**	**556237**
Standard Deviation	**138794**	**421618**	**47307**	**144703**	**96473**	**284777**

Table A-124. Supporting Data for Figure 142. Guam Annual Estimated Inflation-Adjusted Average Price of: All Pelagics, Tuna PMUS, and Non-tuna PMUS

	All Pelagics		Tuna PMUS		Non-Tuna PMUS	
Year	**Unadjusted**	**Adjusted**	**Unadjusted**	**Adjusted**	**Unadjusted**	**Adjusted**
1980	1.26	7.69	1.21	7.35	1.29	7.83
1981	1.35	6.81	1.29	6.51	1.38	7.00
1982	1.33	6.39	1.25	6.03	1.38	6.65
1983	1.33	6.20	1.26	5.85	1.37	6.38
1984	1.31	5.62	1.20	5.14	1.43	6.11
1985	1.57	6.48	1.42	5.85	1.67	6.87
1986	1.48	5.94	1.41	5.65	1.51	6.06
1987	1.45	5.56	1.49	5.74	1.43	5.50
1988	1.37	4.99	1.31	4.77	1.39	5.08
1989	1.39	4.58	1.28	4.23	1.42	4.67
1990	1.69	4.86	1.62	4.66	1.70	4.90
1991	1.62	4.23	1.85	4.83	1.54	4.02
1992	1.66	3.94	1.70	4.04	1.62	3.84
1993	1.56	3.42	1.82	3.99	1.45	3.17
1994	1.69	3.17	1.73	3.25	1.67	3.12
1995	1.38	2.45	1.70	3.02	1.26	2.24
1996	1.56	2.64	1.62	2.74	1.52	2.58
1997	1.74	2.89	1.65	2.74	1.76	2.92
1998	1.81	3.02	1.68	2.81	1.84	3.08
1999	1.88	3.08	1.62	2.66	1.95	3.20
2000	1.67	2.68	1.41	2.28	1.83	2.95
2001	1.67	2.73	1.40	2.29	1.84	3.01
2002	1.54	2.50	1.33	2.16	1.67	2.71
2003	1.47	2.32	1.35	2.13	1.55	2.45
2004	1.52	2.26	1.36	2.03	1.58	2.35
2005	1.54	2.13	1.51	2.09	1.54	2.13
2006	1.60	1.98	1.48	1.83	1.61	1.99
2007	1.64	1.90	1.51	1.75	1.66	1.93
2008	1.81	2.01	1.70	1.90	1.78	1.98
2009	2.06	2.25	2.03	2.21	2.05	2.23
2010	2.08	2.21	1.98	2.10	2.08	2.21
2011	2.04	2.10	2.00	2.06	2.04	2.10
2012	2.10	2.09	1.99	1.98	2.13	2.12
2013	2.26	2.25	2.14	2.13	2.29	2.28
2014	2.00	1.98	1.92	1.90	2.04	2.03
2015	1.93	1.93	1.81	1.81	2.09	2.09
Average	**1.65**	**3.59**	**1.58**	**3.46**	**1.68**	**3.66**
Standard Deviation	**0.26**	**1.70**	**0.26**	**1.64**	**0.26**	**1.76**

HAWAI`I

Table A-125. Supporting Data for Figure 143. Hawai`i total commercial catch and revenue, 2005-2015.

	Hawaii pelagic catch and revenue			
Year	Catch (1,000 lbs)	Nominal revenue ($1,000)	Adjusted revenue ($1,000)	Honolulu CPI
2005	28,631	$87,678	$115,338	197.8
2006	26,178	$76,233	$94,726	209.4
2007	29,980	$85,583	$101,452	219.5
2008	31,760	$92,643	$105,311	228.9
2009	26,894	$75,200	$85,074	230.0
2010	28,433	$87,423	$96,839	234.9
2011	31,646	$92,984	$99,320	243.6
2012	32,102	$110,923	$115,680	249.5
2013	33,133	$101,249	$103,761	253.9
2014	35,116	$95,169	$96,167	257.5
2015	39,695	$106,089	$106,089	260.2
Average	**31,233.4**	**91,924.8**	**$101,796.1**	
SD	**3,899.4**	**11,247.9**	**$8,960.5**	

Table A-126. Supporting Data for Figure 144. Total commercial pelagic ex-vessel revenue by gear type, 2005-2015.

	Hawaii pelagic total revenue ($1,000)							
Year	Deep-set longline	Shallow-set longline	MHI troll	MHI handline	Offshore handline	Other gear	Total	Honolulu CPI
2005	$66,084	$10,047	$6,460	$2,787	$567	$1,732	$87,678	197.8
2006	$61,327	$4,952	$6,037	$1,689	$634	$1,594	$76,233	209.4
2007	$66,574	$8,379	$6,419	$1,866	$950	$1,395	$85,583	219.5
2008	$74,662	$7,798	$6,202	$1,608	$650	$1,722	$92,643	228.9
2009	$58,369	$7,696	$5,690	$1,980	$445	$1,020	$75,200	230.0
2010	$69,817	$7,365	$5,993	$2,111	$1,362	$774	$87,423	234.9
2011	$75,996	$6,501	$6,159	$2,277	$891	$1,160	$92,984	243.6
2012	$90,231	$6,063	$8,963	$3,505	$1,141	$1,021	$110,923	249.5
2013	$86,470	$3,258	$7,532	$3,449	$1,843	$1,209	$103,761	253.9
2014	$79,442	$4,117	$8,456	$2,971	$786	$395	$96,167	257.5
2015	$91,490	$2,810	$7,684	$2,832	$811	$461	$106,089	260.2
Average	**$74,587.4**	**$6,271.5**	**$6,872.3**	**$2,461.5**	**$916.3**	**$1,134.9**	**$92,243.9**	
SD	**$11,381.2**	**$2,275.8**	**$1,103.4**	**$680.9**	**$404.0**	**$463.1**	**$11,509.4**	

APPENDIX B: 2015 PELAGIC PLAN TEAM MEMBERS

Member	Team Role
Christofer Boggs; NMFS PIFSC Fisheries Research and Monitoring Division	Marine Ecology Pelagics
Paul Bartram; Akala Products Inc.	Pelagics
Keith Bigelow; NMFS PIFSC Fisheries Research and Monitoring Division	Chair, Pelagics
Michael Fujimoto; Hawai`i Division of Aquatic Resources	Pelagics
Tom Graham; NMFS PIRO	Pelagics
Justin Hospital; NMFS PIFSC Economics Program	Economics
Russell Ito; PIFSC Fisheries Research and Monitoring Division	Pelagics
Reginald Kokubun; Hawai`i Division of Aquatic Resources	Ex-Officio
Eileen Shea	Ex-Officio
Tepora Lavatai; A.S. Dept. of Marine & Wildlife Resources	Pelagics
Michael Quach; PIFSC Fisheries Research and Monitoring Division	Ex-Officio
Ray Roberto; CNMI Division of Fish & Wildlife	Marianas
Brent Tibbatts; Guam Division of Aquatic & Wildlife Resources	Archipelagic Pelagics