Annual Stock Assessment and Fishery Evaluation Report for U.S. Pacific Island Pelagic Fisheries Ecosystem Plan 2023

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Cover Photo: Longline F/V *Flora* at the Malaloa Marina Dock. WPFMC.

A report of the Western Pacific Regional Fishery Management Council
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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 bottomfish fishing.
American Samoa	A U.S. territory in the South Pacific Ocean, southeast of Samoa.
Bycatch	Fish harvested in a fishery that are not sold or kept for personal use, including economic discards and regulatory discards, except in a recreational fishery catch and release fishery management program.
Commercial	Commercial fishing, where the catch is intended to be sold, bartered, or traded.
CNMI	A U.S. territory in the Marianas Archipelago. North of and adjacent to Guam.
Council	The Western Pacific Regional Fishery Management Council, one of eight regional fishery management councils established by Congress in 1976. Under the Magnuson-Stevens Fishery Conservation and Management Act, it has authority over fisheries seaward of state/territorial waters of Hawaii and the U.S. Pacific Islands.
Guam	A U.S. territory in the Marianas Archipelago. South of and adjacent to the Commonwealth of the Northern Marianas Islands.
Hawaii	U.S. state. See MHI, NWHI. Composed of the islands, atolls, and reefs of the Hawaiian Archipelago from Hawaii 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: sea turtles, marine mammals, seabirds.
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.
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.

Term	Definition
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 (Hawaii).
PRIA	A group of U.S. island territories in the Central Pacific Ocean.
Protected Species	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, sea turtles, dolphins.
Purse Seine	Fishing for tuna by surrounding schools of fish with a 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. Also, non-commercial.
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. Classified as ecosystem component species in the FEP and 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
B	Biomass
B_{FLAG}	Warning Reference Point. Set equal to B_{MSY}
B_{MSY}	Biomass at MSY
BET	Bigeye Tuna
BiOp	Biological Opinion
BOEM	Bureau of Ocean Energy Management
BSIA	Best Scientific Information Available
C	Recent Average Catch
CFEAI	Commercial Fishing Economic Assessment Index
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
CMM	Conservation and Management Measures
CPC	Climate Prediction Center, NOAA
CPDF	Catch-Per-Day-Fished
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
CV	Coefficient of Variation
DAR	Division of Aquatic Resources, State of Hawaii
DAWR	Division of Aquatic and Wildlife Resources, Guam
DEIS	Draft Environmental Impact Statement
DFW	Division of Fish and Wildlife, Northern Mariana Islands
DIC	Dissolved Inorganic Carbon
DMWR	Department of Marine and Wildlife Resources, American Samoa
DOD	Department of Defense
DOJ	Department of Justice
DPS	Distinct Population Segment
DWFN	Distant Water Fishing Nation
E-A	Euro-American

Acronym	Meaning
EEZ	Exclusive Economic Zone, refers to waters of a nation, recognized internationally under the United Nations Convention on the Law of the Sea as extending 200 nautical miles from shore. Within the U.S., the EEZ is typically between three and 200 nautical miles from shore
EF	Expansion Factor
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ELAPS	Effort Limit Area for Purse Seine
ENSO	El Niño-Southern Oscillation Index
EO	Executive Order
EPO	East Pacific Ocean
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.
ESD	Equivalent Spherical Diameter
ESRL	Earth System Research Laboratory, NOAA
F	Fishing Mortality
F_{MSY}	Fishing Mortality at MSY
FAD	Fish Aggregating Device; a raft or buoy, drifting or anchored to the sea floor, and under which, pelagic fish will concentrate
FDM	Farallon de Medinilla, CNMI
FEP	Fisheries Ecosystem Plan
FMP	Fishery Management Plan
FR	Federal Register
FWS	Fish and Wildlife Service
GAC	Global Area Coverage
GAM	General Additive Models
GOES	Geostationary Operational Environmental Satellites
GFCA	Guam Fishermen's Cooperative Association
GODAS	Global Ocean Data Assimilation System
GRT	Gross Registered Tonnes
HAPC	Habitat Areas of Particular Concern
HDAR	Hawaii Division of Aquatic Resources. Also, DAR
HLF	Hawaii Longline Fishery
HMRFS	Hawaii Marine Recreational Fishing Survey
HOT	Hawaii Ocean Time Series
HP	Horsepower
HSTT	Hawaii-Southern California Training and Testing
IATTC	Inter-American Tropical Tuna Commission
IFA	Interjurisdictional Fisheries Act
IFP	International Fisheries Program

Acronym	Meaning
ISC	International Scientific Committee
ITS	Incidental Take Statement
K-A	Korean-American
LAA	Likely to adversely affect
LOC	Letter of Concurrence
LOF	List of Fisheries
LRP	Limit Reference Point
LVPA	Large Vessel Protected Area
M	Natural Mortality
M&SI	Mortality and Serious Injury
MSA	Magnuson-Stevens Fishery Conservation and Management Act
ME	McCracken Estimates
MEI	Multivariate ENSO Index
MFMT	Maximum Fishing Mortality Threshold
MHI	Main Hawaiian Islands
MITT	Mariana Islands Training and Testing
MMA	Marine Managed Area
MMPA	Marine Mammal Protection Act
MODIS	Moderate Resolution Imaging Spectroradiometer
MOU	Memorandum of Understanding
MPA	Marine Protected Area
MPCC	Marine Planning and Climate Change
MPCCC	Marine Planning and Climate Change Committee
MRFSS	Marine Recreational Fishing Statistical Survey
MSST	Minimum Stock Size Threshold
MSY	Maximum Sustainable Yield
MUS	Management Unit Species
MW	Megawatt
NA	Not applicable
NCADAC	National Climate Assessment and Development Advisory Committee
NCDC	National Climatic Data Center
NCEI	National Centers for Environmental Information, NOAA
NCRMP	National Coral Reef Monitoring Program
NELHA	Natural Energy Laboratory of Hawaii Authority
NEPA	National Environmental Policy Act
NESDIS	National Environmental Satellite, Data, and Information Service
NLAA	Not likely to adversely affect
NMFS	National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce. Also, NOAA Fisheries
NMSAS	National Marine Sanctuary of American Samoa
NOAA	National Oceanic and Atmospheric Administration, U.S. Department of Commerce

Acronym	Meaning
NOI	Notice of Intent
NS2	National Standard 2
NS8	National Standard 8
NWHI	Northwestern Hawaiian Islands. All islands in the Hawaiian Archipelago, other than the Main Hawaiian Islands (MHI)
NWR	National Wildlife Refuge
OC-CCI	Ocean Color Climate Change Initiative
OEIS	Overseas Environmental Impact Statement
OFP-SPC	Oceanic Fisheries Program of the Secretariat of the Pacific Community
OFL	Overfishing Limit
OLE	Office of Law Enforcement, NOAA
ONI	Oceanic Niño Index
OTEC	Ocean Thermal Energy Conversion
OY	Optimum Yield
PBF	Pacific Bluefin Tuna
PBR	Potential Biological Removal
PDO	Pacific Decadal Oscillation
PICTs	Pacific Island Countries and Territories
PIFSC	Pacific Islands Fisheries Science Center
PIRO	Pacific Islands Regional Office, National Marine Fisheries Service. Also, NMFS PIRO
PMUS	Pacific Pelagic Management Unit Species. Species managed under the Pelagic FEP
POES	Polar Operational Environmental Satellites
PPGFA	Pago Pago Game Fishing Association
ppm	Parts per Million
PPT	Pelagic Fishery Ecosystem Plan Team
PRIA	Pacific Remote Island Areas
RFMA	Regional Fishery Management Agreements
RFMO	Regional Fishery Management Organization
RIMPAC	Rim of the Pacific
RPB	Regional Planning Body
ROD	Record of Decision
SA	Spawning Abundance
SA_{MSY}	Spawning Abundance at MSY
SAFE	Stock Assessment and Fishery Evaluation
SAR	Stock Assessment Report
SB	Spawning Biomass
SB_{MSY}	Spawning Biomass at MSY
SC	Standing Committee of the Western and Central Pacific Fisheries Commission
SDC	Status Determination Criteria

Acronym	Meaning
SEIS	Supplemental Environmental Impact Statement
SEZ	Southern Exclusion Zone, Hawaii
SFA	Saipan Fishermen’s Association
SFD	Sustainable Fisheries Division, NMFS PIRO
SFM	Shortfin Mako shark
SHARKWG	Shark Working Group, ISC
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; now Pacific Community
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%.
SSB	Spawning Stock Biomass
SSB_{MSY}	Spawning Stock Biomass at MSY
SSC	Scientific and Statistical Committee, an advisory body to the Council comprising experts in fisheries, marine biology, oceanography, etc.
SST	Sea Surface Temperature
STD	Standard Deviation
STF	Subtropical Front
SWAC	Seawater Air Conditioning
SWG	Spatial Working Group
SWO	Swordfish
TA	Total Alkalinity
TRP	Target Reference Point
TZCF	Transition Zone Chlorophyll Front
US	United States
USAF	United States Air Force
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service, Department of Interior
V-A	Vietnamese-American
WCNPO	Western and Central North Pacific Ocean
WCP–CA	Western and Central Pacific Fisheries Commission Convention Area
WCPFC	Western and Central Pacific Fisheries Commission
WCPO	Western and Central Pacific Ocean
WETS	Wave Energy Test Site
WPacFIN	Western Pacific Fishery Information Network, NMFS
WPFMC	Western Pacific Regional Fishery Management Council
WPUE	Weight per Unit Effort
WSEP	Weapon Systems Evaluation Program
XBT	Expendable Bathythermographs

CONTENTS

Section **Page**

Table	Page

Figure **Page**

EXECUTIVE SUMMARY

The Western Pacific Regional Fishery Management Council (WPFMC; the Council) manages the pelagic resources specified in 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, Hawaii, and the U.S. possessions in the Western Pacific Region (Johnston Atoll, Kingman Reef and Palmyra, Jarvis, Howland, Baker, Midway, and Wake Islands) known as the Pacific Remote Island Area (PRIA). The Council developed and the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) implemented the Fishery Management Plan (FMP) for Pelagic Fisheries of the Western Pacific Region in 1987, which has since been replaced by the Fishery Ecosystem Plan (FEP) implemented in 2010. 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.

In July 2013, NMFS issued a final rule (78 FR 43066, July 19, 2013) that revised National Standard 2 (NS2) guidelines and clarified the content and purpose of the Stock Assessment and Fishery Evaluation (SAFE) report to manage fisheries using of the best scientific information available (BSIA) (see Title 50 Code of Federal Regulations [CFR] Part 600.315). In 2015, the Council, in partnership with NMFS Pacific Islands Fisheries Science Center (PIFSC), 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 (EFH) review, and marine planning activities. SAFE reports provide regional fishery management councils and NMFS with information for determining the annual catch limits (ACLs) for each stock in the fishery, documenting significant trends or changes in the resource, marine ecosystems, and fishery over time, implementing required EFH provisions, and assessing the relative success of existing relevant state and federal fishery management programs. The annual SAFE report is intended to serve as a source document for developing the FEPs, amendments, and other analytical documents needed for management decisions.

Table ES-1 was developed from a review of NS2 guidelines and the 2013 revisions under the Final Rule for Provisions on Scientific Information for NS2 (78 FR 43066).

Table ES-1. Fulfillment of National Standard 2 requirements within the 2023 annual SAFE report for the U.S. Pacific Island Pelagic Fisheries Ecosystem Plan

Requirement	Data Needs	Citation for Additional Guidance	Section
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 (ACLs)	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	NA[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[2] on biological condition of stocks		NA
Condition of ecosystems	BSIA to assess success of FEP		3.4 + Ch. 4
Condition of EFH	Report on review of available information; full review every five years	600.815(a)(10)	3.5
Socioeconomic conditions of fishery	BSIA to assess success of FEP		3.2
Socioeconomic conditions of fishing communities	BSIA to assess success of FEP		3.2
Socioeconomic conditions of processing industry	BSIA to assess success of FEP		NA
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

NA = 'Not Applicable'

[1] A numeric 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 FR 43067, July 19, 2013).

SUMMARY OF SAFE STOCK ASSESSMENT REQUIREMENTS

Many of the fish managed under the Pacific Island Pelagic Fisheries Ecosystem Plan (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’ designations for certain species that differ from those under the Pelagic FEP. For the purposes of stock status determinations, NMFS will determine stock status of pelagic management unit species (MUS) using the Status Determination Criteria (SDC) described in the Pelagic FEP.

For all pelagic MUS (PMUS) the Council adopted a maximum sustainable yield (MSY) control rule (see Section 2.6.5). 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 minimum stock size threshold (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 Eastern Pacific Ocean bigeye, yellowfin, striped marlin, and swordfish.

In the western and central Pacific Ocean (WCPO), the Secretariat of the Pacific Community Oceanic Fisheries Program (SPC) 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 for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) conducts similar stock assessments.

In 2022, stock assessments were completed for Western and Central Pacific Ocean skipjack tuna (Castillo-Jordan et al. 2022), Pacific bluefin tuna, (ISC 2022a), and North Pacific blue shark (ISC 2022b). Details of these stock assessments can be found in Section 2.6.7. This section also provides an overview of stock status in relation to overfishing and overfished reference points for species managed under this Pelagic FEP. This section has yet to be updated for the 2023 report.

Figure ES-1 provides the current stock status for all species in the Pelagic FEP for which stock assessments have been completed as of last year’s report.

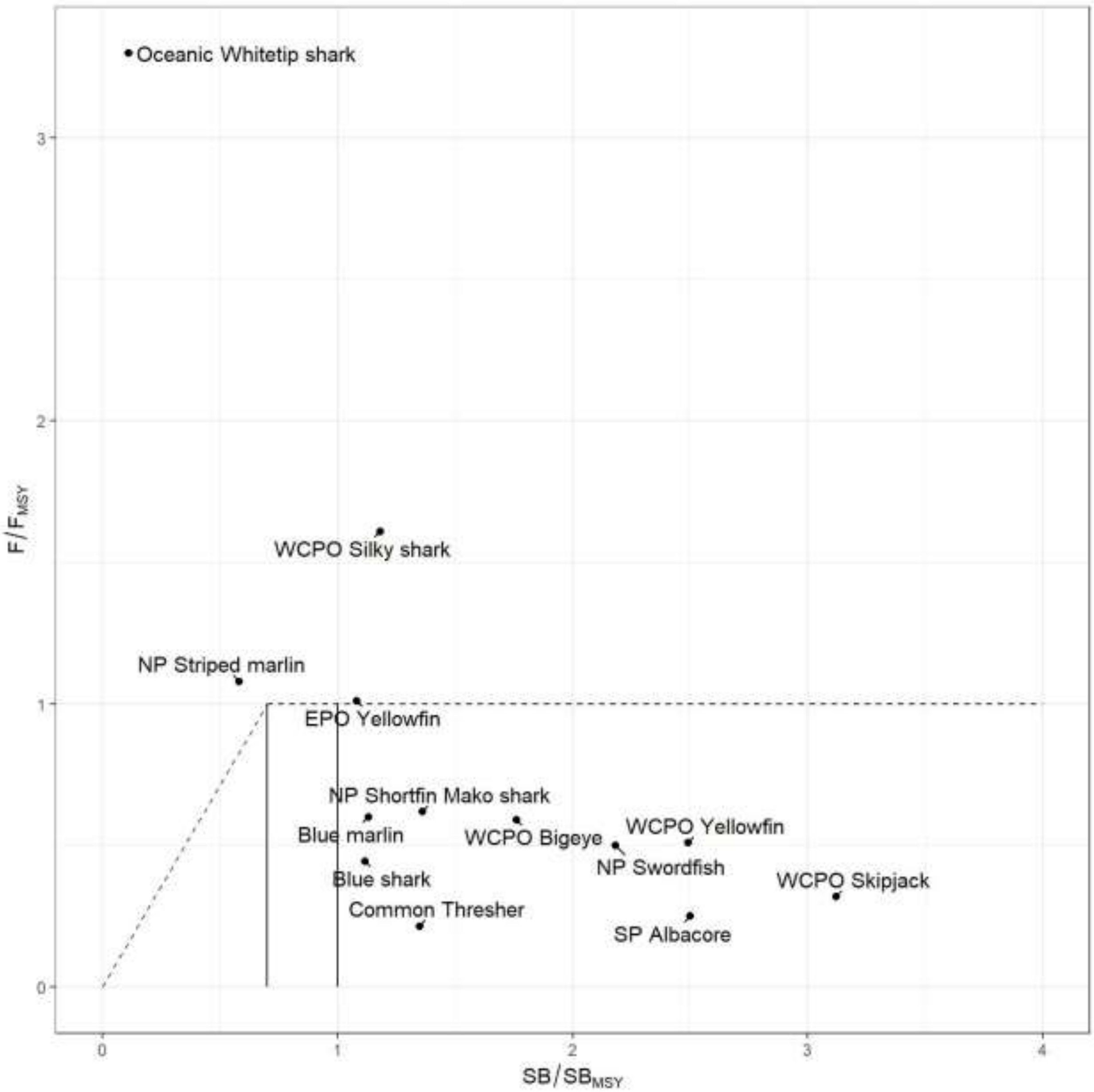


Figure ES-1. Specification of fishing mortality and biomass reference points in the Pelegic FEP and current stock status in the WCPO and EPO. North Pacific albacore is not represented due to the use of different status determination criteria

SUMMARY OF FISHERY DATA IN THE PACIFIC ISLAND REGION

Table ES-2. Summary of the total pelagic landings during 2023 in the Western Pacific and the percentage change between 2022 and 2023

Species	American Samoa		CNMI		Guam		Hawaii	
	Landings (lb)	% Change	Landings (lb)	% Change	Landings (lb)	% Change	Landings (lb)	% Change
Swordfish	6,965	-1.4	-	-	0	-	1,892,044	-7.7
Blue marlin	86,555	-26.3	0	-	14,199	63.0	948,684	-23.7
Striped marlin	3,715	-6.9	-	-	0	-	445,442	-30.9
Other billfish*	4,668	10.3	0	-	2,077	100.5	482,644	49.5
Mahimahi	3,079	-77.0	11,427	-80.3	52,698	-44.6	895,092	14.5
Wahoo	25,557	0.2	13,875	-33.3	45,682	-20.5	899,647	34.6
Opah (moonfish)	296	-76.0	-	-	-	-	492,093	-6.5
Sharks (whole wt.)	90	-	0	-	786	-	8,260	-16.3
Albacore	1,913,266	-23.8	-	-	0	-	1,125,002	146.3
Bigeye tuna	81,664	70.4	-	-	0	-	14,520,258	-1.9
Bluefin tuna	238	-	-	-	-	-	4,411	33.7
Skipjack tuna	104,153	0.8	76,217	-42.2	491,671	16.1	393,000	-14.6
Yellowfin tuna	460,279	35.1	19,368	36.5	97,424	188.0	7,350,841	2.4
Other pelagics**	2,210	21.0	5,606	-37.0	13,805	16.3	503,356	-16.2
Total	**2,692,735**	**-15.3**	**126,493**	**-46.7**	**718,342**	**13.7**	**29,960,774**	**0.7**

Note: Total pelagic landings are based on commercial reports and/or creel surveys; % change based on 2022 landings relative to 2023 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 PMUS. 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 transshipment and processing of tuna taken by domestic fleets from other South Pacific nations, the distant-water longline fleets, and purse seine fleets. As the 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 feet (ft), are required to fish beyond 50 nautical miles (nm) from shore, and sell the majority of their catch, primarily albacore, to the Pago Pago canneries. In 2023, there were 10 active longline vessels, all large (> 60 feet). Smaller longline vessels called *alias* (i.e., locally built, twin-hulled vessels about 30 ft long, powered by 40 horsepower gasoline outboard engines) can fish within 50 nm from shore, but due to the low participation in recent years, these data are confidential and can be reported only in combination with the large vessel fishery. Trolling is the next largest fishery with nine boats that landed pelagic species in 2023, identical to 2022. Non-commercial pelagic fisheries in American Samoa are less common.

Landings. The estimated annual pelagic landings have varied from 2.0 to 5.6 million lb between 2014 and 2023. The 2023 landings were approximately 2.69 million lb, which is lower than the 3.18 million lb landings in 2022. There also has been a steady increase since 2020 only to drop in 2023 (Figure 4). 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 75% of the tuna species in 2023. Blue marlin, wahoo, swordfish, sailfish, striped marlin and mahimahi make up most of the non-tuna species landings. Sailfish and striped marlin were up in 2023.

Bycatch. There was no recorded bycatch for the troll fishery in 2023 (Table 14). In the longline fishery, around 3.9% of the tuna catch was released. Yellowfin and bigeye were the most released bycatch tuna species at 8.9 and 5.9%, respectively. These are much higher release rates compared to 2022. Conversely, sharks, oilfish, and pomfret had the highest release numbers of non-tunas, from 93 to 100% of each species released (Table 6). In total, 9.8% of all pelagic species caught by the longline fishery were released in 2023, up from 3.8% in 2022. Fish are released for various reasons including quality, handling and storage difficulties, and marketing problems.

Effort. In 2023, there were 19 vessels known to be fishing in the waters of American Samoa according to federal logbooks collected. The 10 longline vessels that fished in 2023 deployed 1,224 sets (122 sets/vessel) using 3.79 million hooks (Table 5). The troll fishery conducted 277 trips that landed pelagic species, representing a huge increase from recent years.

Catch Rate. The total pelagic catch rate by all longline vessels in 2023 was similar to 2022 at 19.1 fish/1,000 hooks in 2022. The tuna catch rate by longliners decreased by 0.4 fish/1,000 hooks in 2023 to 17.4 fish/1,000 hooks and is one of the highest catch rates since 2013 (17.9 fish/1,000 hooks in 2015 and 17.8 fish/1,000 hooks in 2022). The catch rate for albacore decreased by 2.0 fish/1,000 hooks in 2023 to 12.6 fish/1,000 hooks. The average catch per troll hour for all pelagic species decreased in 2023 to 4 lb/hour from 22 lb/hour in 2022.

Revenues. In 2023, the total longline fleet revenue (estimated landed value) was $2.82 million, and albacore composed a majority of the total landed value. Other main species included yellowfin tuna, bigeye tuna, skipjack tuna, and wahoo. The overall average fish price was $1.05 per pound in 2023. Albacore price was $1.39 per pound in 2023, a decrease $0.11from 2022.

Protected Species Interactions. Protected species interactions are monitored in the American Samoa longline fishery with mandatory observer coverage targeting approximately 20% of all trips, however, coverage for 2020 was at 2.13% and for 2021 was at 4.65% due to impacts from the COVID-19 pandemic. In 2022, observer coverage was 8.7% and data were no longer confidential. Coverage remained relatively consistent in 2023 at 8.8%. However, there were still very few protected species interactions observed (i.e., only two with green sea turtles).

CNMI

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

Participation. The number of fishers involved in CNMI's pelagic fishery has decreased since 2001, when there were 113 reporting commercial pelagic landings. In 2023, 77 fishers reported landing pelagic species, representing a decrease of nearly 19% from the 95 fishers in 2022.

Landings. Skipjack tuna is the principal species landed, comprising over 60% of the total estimated pelagic landings in 2023 based on expanded creel survey data. Skipjack estimated landings decreased by over 51% in 2023 to 83,413 lb, while total estimated landings also decreased by nearly 47% to 126,493 lb. Landings of yellowfin tuna and wahoo ranked second and third by weight of pelagic species landings in 2023, respectively, at 19,368 lb and 13,875 lb. The amount of mahimahi landed in 2023 decreased substantially from 2022 levels to 11,427 lb.

Effort. Estimated trolling trips decreased from 2,974 trips in 2022 to 2,369 trips in 2023 representing a decrease of over 20%. From commercial invoices, there were 1,087 trips that caught pelagic species from 77 fishers. There were 38% fewer trips according to commercial invoices, and 19% fewer fishers. The exact number of vessels registered for non-commercial and commercial fishing is currently unknown.

Catch Rate. In 2023, trolling catch rates decreased from 15.9 lb per trolling hour to 10.3 lb per trolling hour, a decrease compared to the 10-year average (20.0 lb/hr). The skipjack catch rate decreased to 6.2 lb per hour fished. This catch rate is 7.9 lb less than the 10-year average (14.1 lb/hr). Yellowfin catch rate increased from 1.0 lb per hour in 2022 to 1.5 lb per hour in 2023. The mahimahi catch rate increased to 0.9 lb/hr in 2022, which is 2.6 lb/hr less than the 10-year average.

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 two fish were caught as bycatch in the trolling fisheries in 2020, both mahimahi. No bycatch was observed during boat-based creel surveys in 2023.

Revenue. The total value of the pelagic fishery in 2023 was $365,865.20. The average price for all pelagic species was $3.08/lb.

Protected Species Interactions. There have not been any reported or observed interactions with protected species in the CNMI pelagic 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. The number of boats involved in Guam's pelagic fishery gradually increased from 193 in 1983 to a high of 546 in 2021. There were 464 boats involved in Guam's pelagic fishery in 2023, an increase of 3.34% from 2022. The majority of the fishing boats are less than 10 m (33 ft) in length and are usually owner-operated by fishers who earn a living outside of fishing. Most fishers sell a portion of their catch, and it is difficult to make a distinction between recreational, subsistence, and commercial fishers. A small but economically significant segment (~5%) of the pelagic fishery is made up of marina-berthed charter boats that are operated primarily by full-time captains and crews. Data and figures for non-charter fishing, charter operations, and bycatch are represented in this report.

Landings. The estimated annual pelagic landings vary widely in the 43-year time series, ranging between 383,000 and 958,000 lb. The average total catch has shown a slowly increasing trend over the reporting period. The 2023 total expanded pelagic landings were 718,342 lb, an increase of 14.1% when compared with the catch from 2023. Tuna PMUS landings in 2023 were 589,551 lb, an increase of 29.9%, while non-tuna PMUS decreased 30.3% to 115,442 lb in 2023. Landings consisted primarily of five major species: mahimahi, wahoo, bonita or skipjack tuna, yellowfin tuna, and Pacific blue marlin, with skipjack comprising over 68.44% of total landings. Other minor species caught include rainbow runner, barracudas, and pomfrets. Sharks were also caught during 2023, with sharks noted in specific fishermen interviews conducted in 2023 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. 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 in 2023 from the previous year's levels. Skipjack increased by 17.2%, and yellowfin increased by 186%. Wahoo catch decreased 19.9%, mahimahi catch decreased by 44.2%, and blue marlin increased by 63.2%.

Effort. In 2023, the number of trolling trips decreased by 15.6% from 2022 levels to 8,347, and hours spent trolling similarly decreased by 20.7%.

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 1995 to 2009, DAWR surveys recorded an annual average of 13.5 weekday trips to the south, and 31 weekend trips to the south, for a total of 44.5 trips per year. Since 2010, DAWR surveys have recorded an annual average of 6.7 weekday trips to the south, and 19.8 weekend trips to the south, for an average of 26.5 trips per year, a decrease of 40.5% per year. As the majority of NTMs for W-517 cover weekdays, the decrease in weekday trips is greater at 50.4%.

The small-boat bottomfish and trolling fishery in Guam relies on boat ramp access and FADs. Recent activities to support the Guam fishery follow.

Catch Rate. Trolling catch rates (lb/per hour fished) for 2023 were 16.8 lb/hr, an increase from 2022. Total CPUE increased by 43% in 2023. Skipjack tuna showed a decrease in CPUE, while yellowfin tuna showed an increase in CPUE from 2022 to 2023. Marlin showed an increase in CPUE from 2022 to 2023. Mahi showed a decrease in CPUE and wahoo CPUE increased from 2022 to 2023. The fluctuations in CPUE are possibly due to variability in the year-to-year abundance and availability of the stocks.

Bycatch. There is low bycatch in the charter fishery. In 2023, interview data indicated there was again a low bycatch rate; there were 94 fish reported as bycatch in 6,607 tallied fish caught, for a 1.42% rate. Bycatch occasionally occurs in the troll fishery including sharks, shark-bitten and undersized fish.

In 2023, fishers were asked if they experienced a shark interaction. There was a total of 457 interviews for boat-based fishing in 2023, with 120 of these inappropriate for determining shark interaction. Of the remaining 337 interviews, 167 reported interactions with sharks and 170 reported no interactions with sharks for a 49.6% positive rate for interviews where fishers were asked about shark interactions.

Revenues. Commercial data for Guam pelagic fisheries are non-disclosed due to confidentiality rules that prevent data derived from fewer than three sources to be reported. Because there were fewer than three vendors that reported sales of pelagic fish on Guam in 2023, the data are not able to be presented in this report.

A majority of troll fishers 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.

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

HAWAII

Compared to the other regions, Hawaii has a diverse fishery sector which includes shallow- and deep-set longline, Main Hawaiian Islands (MHI) troll and handline, offshore handline, and the aku boat (pole and line) fisheries. With COVID-19 recovery into its third year, catches and revenue were below the 10-year average in 2023. With La Niña in early 2023, weather and ocean patterns rapidly transitioned into El Niño by the summer and into 2024. Seasonality of certain species may have been affected by El Niño such as high yellowfin tuna catches and low bigeye tuna catches at the end of the year. There were 10 hurricanes in the Pacific Ocean, most which dissipated in the eastern Pacific Ocean, four which crossed into the western central Pacific one which was a major hurricane that passed far south of the Hawaiian Islands and another which passed closer but was downgraded into a tropical storm by the time it came to Hawaii. The Pacific Missile Range Facility (PMRF) issued only 3 Notice of Hazardous Operation in 2023, each which cover a period of time and area boundaries which could possibly affect fishing area for longline vessels.

Participation. A total of 3,132 fishermen were licensed in 2023 by the HDAR, including 1,829 (58%) who indicated that their primary fishing method and gear were intended to catch pelagic fish. This is an 2% decrease in fishing licenses from the previous year. Most licenses that indicated pelagic fishing as their primary method were issued to longline fishermen (50%) and trollers (31%). The remainder was issued to ika-shibi and palu-ahi (handline) (19%).

Landings. Hawaii commercial fisheries caught and landed 30.0 million pounds of pelagic species in 2023, slightly higher from the previous year. Although each fishery targets or intends to catch a particular pelagic species, a variety of other species were also caught. The deep-set longline fishery targeted bigeye and yellowfin tuna. This was the largest of all pelagic fisheries and its total catch comprised 86% (25.7 million pounds) of all pelagic fisheries. The shallow-set longline fishery targeted swordfish and its catch was 1.6 million pounds, or 5% of the total catch. The MHI troll fishery targeted tunas, marlins and other PMUS caught 1.8 million pounds or 5% of the total. The MHI handline fishery targeted yellowfin tuna while the offshore handline fishery targeted bigeye tuna. The MHI handline fishery accounted for 940,000 pounds (2% of the total). The offshore handline fishery was responsible for 454,000 pounds or less than 1% of the total catch.

The largest component of the pelagic catch was tunas, which comprised 78% of the total in 2023. Bigeye tuna alone accounted for 62% of the tunas and 48% of all the pelagic catch. Billfish catch made up 13% of the total catch in 2023. Swordfish was the largest of these, at 50% of the billfish and 6% of the total catch. Catches of other PMUS represented 9% of the total catch in 2023 with ono being the largest component at 32% of the other PMUS and 3% of the total catch.

Bycatch. A total of 98,897 fish were released by the deep-set longline fishery in 2023 of which PMUS sharks accounted for 84% of the deep-set longline bycatch. There is almost no market demand for sharks in Hawai'i. Of all shark species combined, 99.9% of the deep-set longline shark catch was released. Conversely, bycatch rate for the deep-set longline fishery was only 4% for targeted and incidentally caught pelagic species in 2023. A total of 8,270 fish were released by the shallow-set longline fishery in 2023. PMUS sharks accounted for 91% of the shallow-set longline bycatch. Of all shark species combined, 100% of the shallow-set longline shark catch were released. Conversely, bycatch rate for the shallow-set longline fishery was 5% for targeted and incidentally caught pelagic species in 2023. Since shallow-set longline trips are often longer than deep-set trips, the shallow-set sector conserves space for swordfish, which they target, and foregoes keeping other pelagic species due to their short shelf life.

Effort. There was a record 150 active Hawai`i-permitted deep-set longline vessels in 2023, three more than the previous year. The number of deep-set trips was 1,594 along with 22,105 sets made in 2023. The number of hooks set by the deep-set longline fishery was a record 66.3 million hooks in 2023. The Hawai`i-permitted shallow-set longline fishery operates mainly in the first half of the year. In 2023, 23 vessels made 71 trips and 853 sets, which was 1 more vessel, 2 more trips and 4 less sets than the previous year. The number of hooks set by this fishery was 1.1 million in 2023, the same as the previous year. The number of days fished by MHI troll fishers has been trending lower from its peak in 2014, with 1,151 fishers logging 14,500 days fished around the MHI in 2023. There were 370 MHI handline fishers that fished 2,837 days in 2023 and was the lowest participation and effort through the ten-year period. The offshore handline fishery only had 6 fishers and 252 days fished in 2023.

CPUE. The deep-set longline fishery targets bigeye tuna and nominal CPUE for this species trended down to its lowest level (2.5 fish per 1,000 hooks) in 2023. Yellowfin tuna CPUE peaked in 2017 and was above the 10-year average for the past 3 years. Albacore CPUE was the lowest of the large tunas but peaked at 0.5 in 2023. Blue marlin and striped marlin CPUEs were at their respective the ten-year average. In contrast, blue shark had the second highest CPUE even though all fish logged were released. The Hawai`i-permitted shallow-set longline fishery targets swordfish and had a CPUE of 7.9 fish in 2023, down from 12.7 fish in 2017. Blue shark, a bycatch species for this fishery too, had a CPUE of 6.3 fish, almost the same as the previous two years. The MHI troll fishery CPUE for yellowfin tuna and blue marlin were both down in 2023. MHI troll CPUE for skipjack tuna reached a ten-year high in 2023 while mahimahi and ono CPUE varied with no clear trend. MHI handline CPUE for yellowfin showed a strong, consistent upward pattern from 2019 through 2022 but dropped in 2023. Albacore and bigeye tuna CPUE were not only much lower than yellowfin tuna but below their respective long-term CPUEs. Bigeye tuna and yellowfin tuna CPUE varied significantly over the ten-year period.

Fish Size. With the exception of bigeye tuna and moonfish the average weight for the remaining pelagic species were close to or below their respective long-term average weight in the deep-set longline fishery. Bigeye tuna caught in the deep-set fishery was 85 pounds in 2023, 4 pounds above the long-term average. All billfish species caught by this fishery were below their 10-year average weight while other PMUS species were close to long-term mean weights. The mean size of swordfish was 131 pounds in 2023, much lower from the 10-year average weight. The pattern of average weight for tunas, billfish and other PMUS in by the shallow-set longline fishery was similar to fish size in the deep-set longline fishery. Swordfish caught by the shallow-set longline fishery was 168 pounds, below the 10-year average weight. In general, the average weight of most fish caught by the shallow-set longline fishery is higher than fish caught by the deep-set longline fishery. The average weight for bigeye tuna, yellowfin tuna, blue marlin and swordfish caught by the troll and handline fisheries were above their long-term averages in 2023.

Revenue. The total revenue from Hawai'i's pelagic fisheries was $118.1 million in 2023. This was a decrease of $15.8 million, or down 12% from the previous year. Although the recovery from the COVID pandemic continued, the market was weaker with lower fish prices in 2023. Revenue of tunas represented $97.0 million or 82% of the total pelagic revenue with bigeye tuna ($66.9 million) and yellowfin tuna ($28.4 million) representing 57% and 24%, respectively in 2023. Billfish contributed $12.0 million or 10% of the total revenue with swordfish accounting for 7% of the total revenue. The deep-set longline revenue was $100.5 million in 2023, representing 85% of the total revenue for pelagic fish in Hawai'i. The shallow-set longline fishery revenue was $6.8 million, a decrease of $3.2 million in 2023 accounting for 6% of the revenue. Most of shallow-set trips land their catch in Hawaii rather than off-loading in California. Revenue from all small boat fisheries decreased in 2023. The MHI troll revenue was $6.0 million or 5% of the total in 2023. The MHI handline fishery decreased to $2.6 million (3% of total revenue). The offshore handline fishery was $1.3 million in 2023.

Protected Species Interactions. Protected species interactions are monitored in the Hawaii-based longline fishery with mandatory observer coverage at 100% for shallow-set vessels and a target of a minimum of 20% for deep-set vessels; however, observer coverage in the deep-set longline fishery in 2020 and 2021 was 15.25% and 17.84%, respectively, due to impacts related to pandemic restrictions. While coverage increased to 20.22% in 2022, it again decreased to 17.41% in 2023. In the shallow-set longline fishery, annual monitoring of turtle interactions now occurs via trip limits. In 2023, two trips reached the leatherback limit (2 interactions) and returned to port; one trip reached the loggerhead limit (5). In response to a recommendation from the previous year, the Pelagic Plan Team received and endorsed a review of the turtle trip interaction limit at its meeting in May 2024. The Plan Team concurred that revisions to the trip limits are not warranted at this time and recommended the next review of the trip limit measure to be conducted in two to three years, pending update of the loggerhead turtle population model. Further, in the shallow-set fishery, trends of interactions with the black-footed albatross had been increasing over time but decreased in 2023. An analysis of oceanographic factors and fishery distribution has been identified as a need to better understand this trend. A recent study on the potential use of tori lines to improve mitigation measures for the fishery concluded that the approach is not effective. In the deep-set longline fishery, olive ridley and black-footed albatross interactions have decreased over the last three to four years after four to five years of higher interactions. Prior analyses showed that higher interactions were likely driven by oceanographic factors.

OCEANIC AND CLIMATE 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, this 2022 report provides information on the following list of climate and oceanic indicators being tracked:

- Atmospheric Concentration of Carbon Dioxide (CO_2)
- Oceanic pH (at Station ALOHA)
- Oceanic Niño Index (ONI)
- Pacific Decadal Oscillation (PDO)
- Tropical Cyclones
- Sea Surface Temperature
- Temperature at 200 – 300 m Depth
- Ocean Color (Chlorophyll-*a* concentration)
- North Pacific Subtropical Front (STF)/Transition Zone Chlorophyll Front (TZCF)
- Estimated Median Phytoplankton Size
- Fish Community Size Structure
- Bigeye Tuna Weight-Per-Unit-Effort
- Bigeye Tuna Recruitment Index
- Bigeye Tuna Catch Rate Forecast

Section 3.4.2 provides a description of each of these indicators, a 2023 snapshot of the current conditions accompanied by time series data, and a rationale for how these data may progress ecosystem-based fishery management.

ESSENTIAL FISH HABITAT

NS2 requires that the Council review and revise EFH provisions periodically and to report on this review as part of the annual SAFE report process, with a complete review conducted as recommended by the Secretary at least once every five years. No pelagic EFH reviews were completed in 2023. Non-fishing and cumulative impact components were reviewed from 2016 through 2017 (Minton 2017), and a habitat review for crustaceans in Guam and Hawaii was completed in 2019. The Council expects to amend the EFH for Hawaii precious corals in 2025.

MARINE PLANNING

In 2016, the Council approved a new FEP objective to “consider the implications of spatial management arrangements in Council decision-making”. To monitor implementation of this objective, the 2023 annual SAFE report includes the Council’s spatially based fishing restrictions (or marine managed areas, MMAs), the goals associated with them, and the most recent evaluation. In addition, to meet EFH and National Environmental Policy Act (NEPA) mandates, this annual SAFE report monitors activities of interest to the Council that may contribute to cumulative impact. This includes observing fishing and non-fishing activities and facilities, including aquaculture operations, alternative energy facilities, and military training and testing activities.

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 (NOAA) National Marine Fisheries Service (NMFS) on March 23, 1987. The Western Pacific Regional Fishery Management Council (WPFMC; the Council) developed the FMP to manage the pelagic resources under the authority of the Magnuson 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, Hawaii, and the U.S. possessions in the Western Pacific Region (i.e., Johnston Atoll, Kingman Reef, Palmyra Atoll, and Jarvis, Howland, Baker, Midway, and Wake Islands). In 2010, the Council and NMFS implemented the Fishery Ecosystem Plan (FEP) for the U.S. Pacific Island Pelagic Fisheries (Pelagic FEP), which includes management measures and strives to integrate 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 FEP's objectives, past amendments, and other information, refer to the Pelagic FEP found on Council website and regulations at 50 CFR 665.

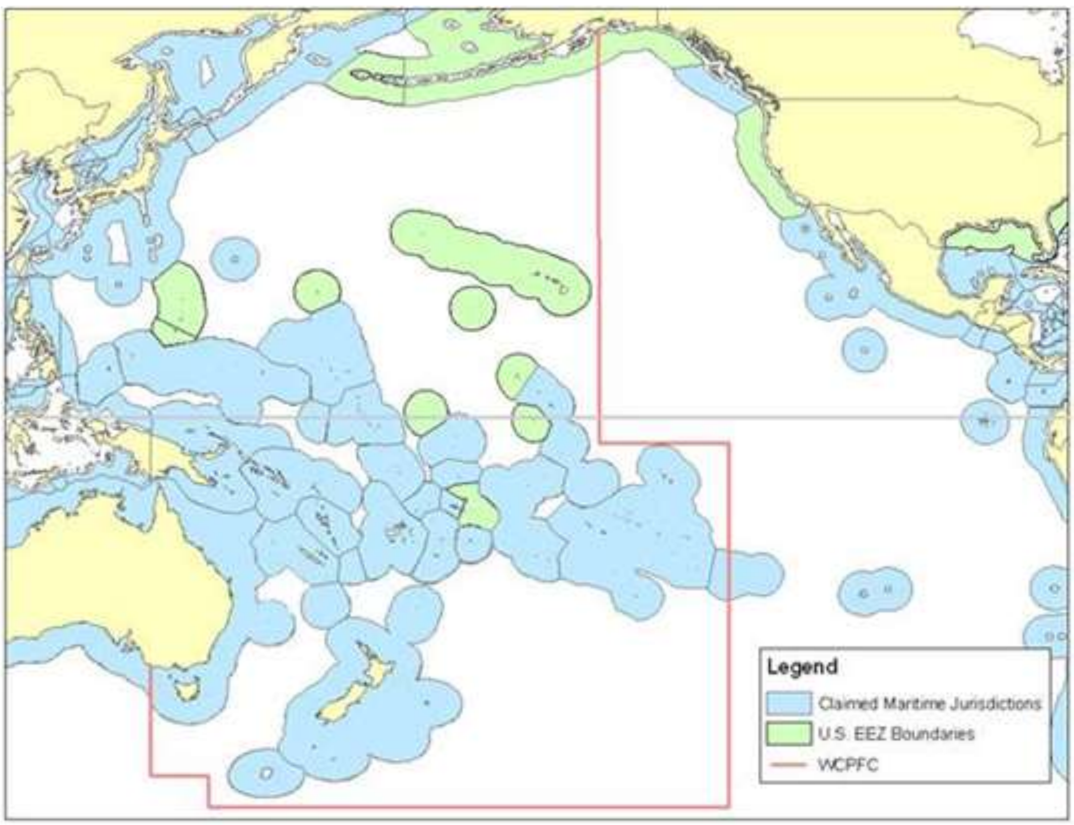
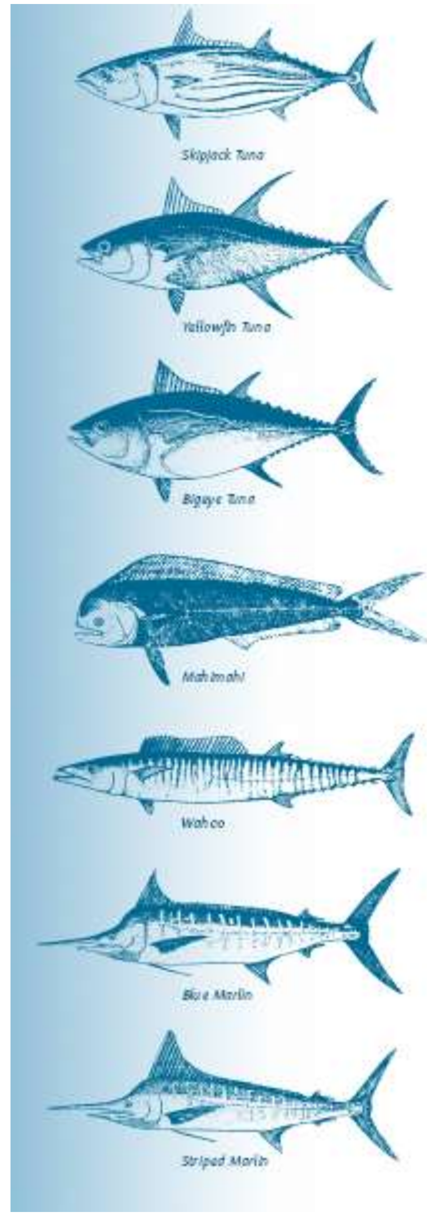


Figure 1. Map of the Western Pacific region

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 (78 FR 43066) that revised National Standard 2 (NS2) guidelines to manage fisheries using of the best scientific information available (BSIA) 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 (PIFSC), 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 seventh 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

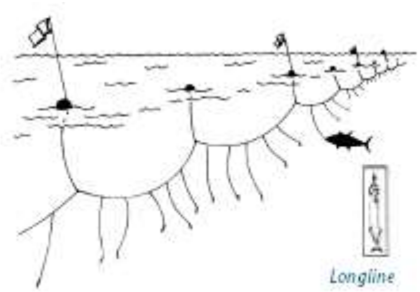
The management unit species (MUS) managed under the Pelagic FEP include large pelagic species such as tunas (tribe Thunnini), billfishes (Istiophoridae and Xiphiidae), and other harvested species with distribution straddling domestic and international waters. The MUS excludes some scombrids found predominantly near land, such as little 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 exclude all jacks (Carangidae, e.g., rainbow runner, *Elagatis bipinnulata*), all barracudas (Sphyraenidae), 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 (class Cephalopoda) except those listed in Table 1. Although caught frequently, most shark MUS are discarded alive and with fins attached in U.S. fisheries managed under the FEP. Shark finning is illegal in U.S. fisheries.

Table 1. Names of U.S. Pacific Island 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* *Makaira indica*	Sa'ula	A'u, Kajiki	Batto'	Taghalaar	Taghalaar
Striped marlin	*Tetrapturus audax*		Nairagi			
Shortbill spearfish	*Tetrapturus 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	*Thunnus obesus*	Asiasi, To'uo	'Ahi po'onui, Mabachi	Bigeye tuna	Toghu, Sangir	Toghu, Sangir
Yellowfin tuna	*Thunnus albacares*	Asiasi, To'uo	'Ahi shibi	'Ahi, Shibi	Yellowfin tuna	Toghu
Northern bluefin tuna	*Thunnus 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	*Auxis* spp, *Scomber* spp; *Allothunus* spp	(various)	Ke'o ke'o, saba (various)	(various)	(various)	(various)
Neon flying squid Diamondback squid Purple flying squid	*Ommastrephes bartamii* *Thysanoteuthis rhombus* *Sthenoteuthis oualaniensis*		Squid, ika Squid, ika Squid, ika			

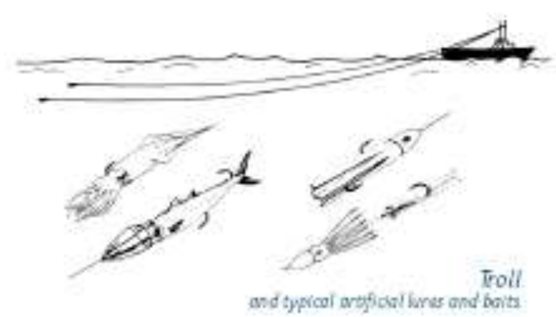
1.3 SUMMARY OF PELAGIC FISHERIES AND GEAR TYPES MANAGED UNDER THE FEP

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 Council, and is also not described in this report.



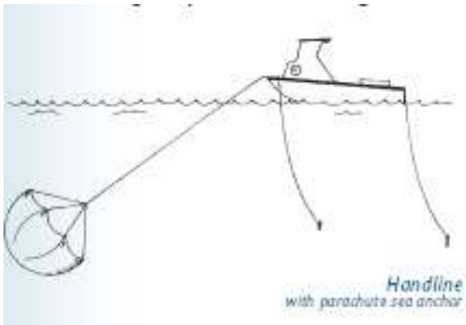
U.S. longline vessels in the Western Pacific Region are based primarily in Hawaii and American Samoa, although Hawaii-based vessels targeting swordfish and bigeye tuna have also fished seasonally out of California. The Hawaii fishery, with 150 active vessels, targets a range of species, with vessels setting shallow longlines to catch swordfish or fishing deep to maximize catches of bigeye tuna. Catches by the Hawaii fleet also include yellowfin tuna, mahimahi, wahoo, blue and striped marlins, opah (moonfish) and monchong (pomfret). The Hawaii fishery does not freeze its catch, which is sold to the fresh fish and sashimi markets in Hawaii, Japan, and the U.S. mainland.

The American Samoa longline fleet fishes almost exclusively for albacore, which is landed at the cannery in American Samoa. Pelagic landings consist primarily of four tuna species: albacore, yellowfin, bigeye, and skipjack. The pelagic species wahoo, blue marlin, and mahimahi comprise most of the non-tuna landings.



Trolling and, to lesser extent, handline fishing for pelagic species are the largest commercial fisheries in terms of participation, although they catch a relatively modest volume of fish annually compared to longline and purse seine gears. Troll and handline catches are dominated by yellowfin tuna in Hawaii, skipjack tuna in Guam and the CNMI, and skipjack and yellowfin tuna in American Samoa. Other commonly caught troll catches include mahimahi, wahoo, and blue marlin. Most of the troll and handline landings are made by Hawaii vessels.

Troll fishing for pelagic species is the most common recreational (i.e., non-commercial) 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.



The Western and Central Pacific Ocean (WCPO) supports the world's largest tuna fishery, with a total tuna catch of around 3.3 million mt of fish annually. Most of the catch is taken by fleets of longliners and purse seiners from countries such as Japan, Taiwan, United States (including the U.S. purse seine fleet), Korea and China; however, around a third of purse seine vessels operating in the WCPO are flagged to Pacific Island countries and these fleets are growing. Small scale artisanal longlining is also conducted in Pacific Island countries like Samoa.

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 surrounding environment.

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 from June to October and the eastward-flowing South Equatorial Counter Current from November to April. Surface temperatures vary between 27° and 29° C and are highest from January to April. The upper limit of the thermocline in ocean areas is relatively shallow (27° C isotherm at 100 m depth, approximately 328 ft) but the thermocline itself is diffuse (lower boundary at 300 m depth, approximately 984 ft).

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 Island 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 is conducted primarily in the American Samoa EEZ and comprises the second-largest of the U.S. longline fisheries in the FEP (after Hawaii). 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 Western and Central Pacific Fisheries

Commission (WCPFC) establishes conservation and management measures that NMFS implements under its authorities, including the MSA.

Prior to the mid-1990s, 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 with less effort and use less gasoline for trips. Initially the vessels used for longlining were “alias”, locally built, twin-hulled (wood with fiberglass or aluminum) vessels about 30 ft. long, powered by 40 horsepower 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 nm of Tutuila, Manu‘a, Swains Island and Rose Atoll (see Section 3.6 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 transshipment and processing of tuna taken by domestic fleets from other South Pacific nations, distant-water longline fleets, and purse seine fleets. Purse seine vessels land skipjack, yellowfin and other tunas, and a small portion of albacore.

1.3.1.2 CURRENT PELAGIC FISHERIES

The small-scale longline fishery is nearly defunct. Most participants in the small-scale domestic longline fishery were indigenous American Samoans with vessels under 50 ft in length, of which the remaining vessels are *alia* boats under 40 ft in length. The motivation 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. 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 has been albacore, which is marketed to the local tuna canneries.

American Samoa’s domestic longline fishery expanded rapidly in 2001. Much of the growth was 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 2023, there were 10 active longline vessels. Poor economic conditions have plagued the large vessel fleet for several years. All other fishing effort indicators from 2023 indicate a declining longline fishery: the number of active vessels was at an all-time low, the number hooks set have decreased since 2021 and was just slightly higher in 2023 than the all-time low of 3.65 million in 2020; and the number of longline sets was at an all-time low.

While the smallest (≤40 ft) vessels average 350 hooks per set, vessels over 50 ft can set five to six times more hooks and have a greater fishing ranges and capacity for storing fish (from eight to 40 mt on a larger vessel as compared to less than two mt on a small-scale vessel). Larger vessels are also outfitted with hydraulically-powered reels to set and haul mainline, as well as modern electronic equipment for navigation, communications and fish finding. Most are presently being operated to freeze albacore onboard, rather than to land chilled fish.

From October 1985 to the present, catch and effort data in American Samoa troll and handline fisheries have been collected through a creel survey that includes subsistence and recreational fishing, as well as commercial fishing. However, differentiating commercial fishing from non-commercial activity has been difficult, and there have been recent focuses on non-target longline catches that are sold to the local community instead of the cannery.

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. Recreational fishing vessels range 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 fish aggregating devices (FADs) extensively, and, during tournaments, venture to the various outer banks which include the South Bank (35 miles south), North East Bank (35 miles northeast), South East bank (37 miles southeast), 2% bank (29 miles east-southeast), and East Bank (24 miles east).

There was no full-time regular charter fishery in American Samoa similar to those in Hawaii or Guam prior to 2015, however, Pago Pago Marine Charters began operating a full-time charter fishery since then.

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 the American Samoa Department of Marine and Wildlife Resources (DMWR) and provided to NMFS PIFSC Fisheries Research and Monitoring Division (FRMD). While boat-based recreational catches were as high as over 46,000 lb in the 2000s, total non-commercial catch was estimated to be over 97,000 lb in 2019. It is likely that non-commercial fishing data in recent years have been affected by impacts associated with the COVID-19 pandemic.

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

1.3.2 COMMONWEALTH OF THE NORTHERN MARIANAS ISLANDS

Generally, the major surface current affecting the Mariana Archipelago is the North Equatorial Current, which flows westward through the archipelago. However, the Subtropical Counter Current affects the 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.

1.3.2.1 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.

1.3.2.2 CURRENT PELAGIC FISHERIES

The CNMI's pelagic fisheries occur mainly from the island of Farallon de Medinilla (FDM) south to the island of Rota. Trolling is the primary fishing method utilized in the pelagic fishery. The pelagic fishing fleet consists mostly of vessels less than 24 ft in length, which usually have a limited 20-mile travel radius from Saipan. There were an estimated 1,087 trolling trips in 2023, representing a decrease of nearly 39% from the 1,780 trips in 2022.

The primary target and most marketable species for the pelagic fleet is skipjack tuna (approximately 45% of 2023 landings). Schools of skipjack tuna have historically been common in nearshore 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, but seasonal, species. During their seasonal 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 nearshore 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 found it difficult to market their catch and did not perform well. By 2014, there were no active longliners in the CNMI, although a few of the original vessels were experimenting with other types of fishing with limited success.

1.3.3 GUAM

1.3.3.1 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.

1.3.3.2 CURRENT PELAGIC FISHERIES

Pelagic fishing vessels based in Guam are classified into two general groups: (1) distant-water purse seiners and longliners that fish outside Guam's EEZ and transship through the island; and (2) small, primarily recreational, trolling boats that are either towed to boat launch sites or berthed in marinas and fish only within local waters within Guam's EEZ or on some occasions in the adjacent EEZ of the Northern Mariana Islands. This annual report primarily covers the local, Guam-based, small-boat pelagic fishery.

Landings from Guam fisheries primarily consist 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 has gradually increased from about 200 vessels in 1982. There were 446 boats active in Guam's domestic pelagic fishery in 2023. 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.

1.3.4 HAWAII

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 counterclockwise, have important biological impacts. For example, eddies create vertical fluxes, with regions of divergence (i.e., upwelling) where the thermocline shoals and deep nutrients are pumped into surface waters enhancing phytoplankton production, and also regions of convergence (i.e., 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 colder waters occurring more often in the NWHI.

A significant source of inter-annual physical and biological variation around Hawaii 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 1980s, 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.

1.3.4.1 TRADITIONAL AND HISTORICAL PELAGIC FISHERIES

In old Hawaii, 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 nearly a 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 pelagics.

1.3.4.2 CURRENT PELAGIC FISHERIES

Hawaii’s pelagic fisheries, which include longlining, 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 harvested approximately 30 million lb of commercial landings with a total ex-vessel value of $118.2 million in 2023. The deep-set longline fishery was the largest of all commercial pelagic fisheries in Hawaii and represented 86% of the total commercial pelagic catch and ex-vessel revenue. The shallow-set longline fishery was the second largest fishery in Hawaii and accounted for 5% of the catch and revenue. The MHI troll, MHI handline, aku boat, offshore handline fisheries, and other gear types made up the remainder.

The largest component of the pelagic catch was tunas, which comprised 78% of the total in 2023. Bigeye tuna alone accounted for 62% of the tunas and 48% of all the pelagic catch. Billfish catch made up 13% of the total catch in 2023. Swordfish was the largest of these, at 50% of the billfish and 6% of the total catch. Catches of other PMUS represented 9% of the total catch in 2023 with ono being the largest component at 32% of the other PMUS and 3% of the total catch.

The Hawaii longline fishery is by far the most important economically, with the deep-set fishery sector accounting for about 85% percent of the estimated ex-vessel value of the total commercial fish landings in the State in 2023. In 2017, it is estimated that the commercial fishing and seafood industries in Hawaii generated $900.6 million in sales, $262 million in income, and $402.2 million in value-added impacts while supporting 9,827 full- and part-time jobs (NMFS 2021a). In 2018, these industries supported 8,086 full- and part-time jobs and generated $776.2 million in sales, $233.4 million in income, and $343.6 million in value-added impacts (NMFS 2021b). More recently, in 2019, 7,693 jobs were supported by the industries, which generated $786 million in sales, $229.5 million in income, and $340.9 million in value-added impacts (NMFS 2022).

Recreational fisheries are also extremely important in the State of Hawaii economically, socially, and culturally. The total estimated pelagic recreational fisheries production in 2020 was nearly 14.5 million lb. The number of small vessels in Hawaii declined to approximately 11,000 in 2018 since a peak of over 16,000 vessels in 2008. Boat-based anglers took 632,088 fishing trips in 2019, with only 7,744 designated charter vessel trips. Although unsold or not entering the typical commercial channels for fish sales, the total estimated value of the recreational catch was approximately $20 million in 2018 based on an average of $3.00/lb provided by PIFSC FRMD.

1.3.5 PACIFIC REMOTE ISLAND AREA

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, the 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, the 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, the 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, the 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, the 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, the 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 Hawaii longline fleet does seasonally fish in those areas. For example, the EEZ around Palmyra is visited by Hawaii-based longline vessels targeting yellowfin tuna, whereas at Johnston Atoll, albacore is often caught in greater numbers than yellowfin or bigeye tuna. Similarly, the U.S. purse seine fleet also targets pelagic species (primarily skipjack tuna) in the EEZs around some Pacific Remote Island Area (PRIA), 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 and Wildlife Service (USFWS) prohibits fishing within the Howland Island, Jarvis Island, and Baker Island National Wildlife Refuge 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 ADMINISTRATIVE AND REGULATORY ACTIONS

This section describes NMFS management actions for the pelagic fisheries in the Pacific Islands Region over the course of 2023.

On October 3, 2023, NMFS announced a valid specified fishing agreement between the CNMI and the HLA (88 FR 67984). The agreement allocated up to 1,500 metric tons of the CNMI’s 2023 bigeye tuna limit to U.S. longline fishing vessels identified in the agreement. The agreement supports the long-term sustainability of fishery resources of the U.S. Pacific Islands and fisheries development in the CNMI. The specified agreement was valid as of February 2, 2023. The start date for attributing 2023 bigeye tuna catch to the CNMI under the agreement was October 8, 2023.

On October 6, 2023, NMFS announced that 25 American Samoa pelagic longline limited entry permits in 2 permit size classes were available for 2023 (88 FR 69621). Seventeen permits were available in the Small permit size class, and eight permits were available in the Large vessel size class. Complete permit applications were due to NMFS by February 5, 2024.

1.5 TOTAL PELAGIC LANDINGS IN THE WESTERN PACIFIC REGION FOR ALL FISHERIES

A summary of the 2023 total pelagic landings in the Western Pacific and the change between 2022 and 2023 are shown in Table 2.

Table 2. Total pelagic landings (lb) in the Western Pacific Region in 2023 and percent change from the previous year

Species	American Samoa			CNMI			Guam			Hawaii		
	2022 lb	2023 lb	% Change	2022 lb	2023 lb	% Change	2022 lb	2023 lb	% Change	2022 lb	2023 lb	% Change
Swordfish	7,062	6,965	-1.4	-	-	-	0	0	-	2,048,997	1,892,044	-7.7
Blue marlin	117,517	86,555	-26.3	0	0	-	8,713	14,199	63.0	1,242,998	948,684	-23.7
Striped marlin	3,990	3,715	-6.9	-	-	-	0	0	-	645,096	445,442	-30.9
Other billfish*	4,233	4,668	10.3	3,447	0	-	1,036	2,077	100.5	322,816	482,644	49.5
Mahimahi	13,393	3,079	-77.0	57,973	11,427	-80.3	95,115	52,698	-44.6	782,056	895,092	14.5
Wahoo	25,506	25,557	0.2	20,805	13,875	-33.3	57,466	45,682	-20.5	668,553	899,647	34.6
Opah (moonfish)	1,235	296	-76.0	-	-	-	-	-	-	526,242	492,093	-6.5
Sharks (whole wt.)	0	90	-	0	0	-	0	786	-	9,873	8,260	-16.3
Albacore	2,511,041	1,913,266	-23.8	-	-	-	0	0	-	456,692	1,125,002	146.3
Bigeye tuna	47,916	81,664	70.4	-	-	-	0	0	-	14,798,540	14,520,258	-1.9
Bluefin tuna	0	238	-	-	-	-	-	-	-	3,299	4,411	33.7
Skipjack tuna	103,284	104,153	0.8	131,833	76,217	-42.2	423,646	491,671	16.1	460,214	393,000	-14.6
Yellowfin tuna	340,737	460,279	35.1	14,186	19,368	36.5	33,830	97,424	188.0	7,175,216	7,350,841	2.4
Other pelagics**	1,826	2,210	21.0	8,896	5,606	-37.0	11,867	13,805	16.3	600,603	503,356	-16.2
Total	**3,177,740**	**2,692,735**	**-15.3**	**237,140**	**126,493**	**-46.7**	**631,673**	**718,342**	**13.7**	**29,741,195**	**29,960,774**	**0.7**

Note: Total Pelagic Landings based on commercial reports and/or creel surveys. % change based on 2022 landings relative to 2023 landings. Hawaii data reflect commercial reports only.

*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 kawakawa, unknown tunas, 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.

1.6 PLAN TEAM RECOMMENDATIONS

At its May 2024 meeting, the Pelagic Plan Team made several recommendations:

Regarding the Shallow-Set Longline Turtle Trip Interaction Limit Review, the Pelagic Plan Team:

- Endorses the Working Group report for review by the SSC, Council, and any other applicable Council advisory Groups.
- Concurs with the Working Group that revisions to the trip limits are not warranted at this time and recommends the next review of the trip limit measure to be conducted in 2-3 years, pending update of the loggerhead turtle population model.

Regarding Biological Opinion (BiOp) Reasonable and Prudent Measure (RPM) Implementation Working Group Report, the Pelagic Plan Team:

- Recommends the Council initiate the process for developing a regulatory requirement for Hawaii and American Samoa longline crew training consistent with the BiOp RPM Terms and Conditions (T&C). The Pelagic Plan Team further recommends that the Council consider methods for monitoring and evaluating effectiveness of the crew training program as part of the regulatory requirement development.
- Recommends the Council further explore the use of EM to address the BiOp RPM T&C to provide observer coverage for the insular false killer whale overlap area, considering the increasing cost of observer coverage, reduction in the deep-set longline (DSLL) observer coverage for the foreseeable future, and unintended consequences to characterizing the DSLL fishery as a whole if human observers are used to fulfill this T&C. The Pelagic Plan Team acknowledges that EM implementation will likely not meet the observer coverage implementation timeline specified in the T&C, and recommends Council and NMFS, through the Working Group, explore interim approaches, including continued monitoring of available observer and logbook data.

Regarding Electronic Monitoring, the Pelagic Plan Team:

- Recommends that the Council initiate exploration of regulatory processes for electronic monitoring (EM), including consideration of the pre-implementation plan and the phase-in period toward a fully implemented program. The Plan Team notes that regional fishery management organizations are developing standards for EM.
- Notes that current EM efforts are funded through temporary funding through Request for Proposal (RFP) responses and that future work is contingent on available funding.

Regarding Cookie Cutter Shark Depredation, the Pelagic Plan Team:

- Recommends that the Council request PIFSC compile information presented on cookie cutter shark depredation in Hawaii longline fisheries into a technical memorandum or report to share with Council advisory groups and stakeholders and to solicit feedback on what additional details would be useful to inform fishery operations.
- Recommends that PIFSC explore alternative approaches to continuing data collection on this issue, noting cessation in data collection through the Pacific Islands Region Observer Program (PIROP).

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 National Marine Fisheries Service (NMFS) Pacific Islands Fisheries Science Center (PIFSC) and supported in part through funding from the Interjurisdictional Fisheries Act (IFA). Purse seine and non-U.S. vessel landings are not included in this module but are discussed in general in the International module (see 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 creel survey program to include subsistence, recreational, as well as commercial fishing. Surveyors have noted that fishermen may not accurately report the number of fish released at sea, although the troll fishery in American Samoa has not been known to release fish. However, the Pago Pago Gamefishing Association, a recreational troll fishery, catches and releases blue marlin.

In September 1990, a commercial purchase system (i.e., 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 catch or effort from alia and monohull longline vessels in recent years. 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 2020, except that the number of vendors participating in the commercial purchase system decreased.

Participation (i.e., number of boats) is determined through both logbook entries and creel interviews. Effort (i.e., number of trips, hooks) is determined by direct reporting for longline trips, but is indirectly calculated for trolling trips, based on total pounds landed (reported), and average hourly catch rate and duration for trip (from 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 to include information from alia longline vessels that did not frequent the canneries and exclude alias that exclusively conducted bottomfish fishing and/or trolling.

DMWR implemented a fuel subsidy program from 2015 to 2018 that required DMWR to meet fishers at a designated time and location for mandatory surveys in order to receive fuel subsidies. This extended the creel survey schedule and detracted from the random sampling design at other times of the day. The fuel was dispensed to vessel owners, including those who rent their vessels to fishermen. The new program caused changes in fishing behavior that may have impacted catch estimates. Generally, more fuel was used and there were longer and more frequent trips, but otherwise, catch per unit effort (CPUE) and species composition were not affected. There was an increase in the number of trolling trips and trip length that may have affected the relative amount of pelagic species in the catch.

Average weight (pounds) per fish is calculated directly from creel-weighed fish sampled over the year. In the past, cannery fish weight was determined based on a length to weight conversion from cannery sampling data, since longline boats have been landing their catches gilled and gutted since 1999. However, the cannery sampling program was discontinued in 2015, so those average weight data are no longer available. There is no cannery sampling data available since 2016. Therefore, PIFSC used proxies to estimate the weight and value of fish landings for the longline fishery in American Samoa.

For estimated weights, the current summaries are based on the best available average weight data for 2020, which is from DMWR's creel surveys. It should be noted that the weight of fish from the small boats is somewhat smaller than fish caught on the larger oceangoing vessels, contributing to a somewhat lower weight estimate for the fishery. Over the course of 2016, the PIFSC Fisheries Research and Monitoring Division (FRMD) International Fisheries Program (IFP) began estimating the average weight of fish kept for the longline fishery from observer data. This alternative source provides trip-level average weights for vessels with observers. These weights will be more representative of the longline fishery, but they will not be available for trips that do not carry observers. The protocol for handling unobserved trips is being developed by IFP, which will provide the data for this report in future years, but the information is not yet available. The information will be provided in the Regional Fishery Management Organization (RFMO) report for US Pacific longline fisheries.

Another item lost with the discontinuation of the longline cannery sampling program by the Pacific Islands Regional Office (PIRO) in Pago Pago was data on the proportion of longline fish (by species) sold to the cannery versus local market and village/take home (given, not sold). While the cannery buys a much higher volume of fish, their prices are low. The lesser amount of fish sold to the markets and local restaurants garners a higher price. Another portion of the catch is given away or taken home. In the absence of a cannery sampling program in 2016, PIFSC had to apply a number of estimates. For the top five cannery species (albacore, skipjack, yellowfin and big eye tuna and wahoo) the assumption of 100% sold to the cannery was applied. For other species also previously sampled at the cannery, for which a large percentage are not sold, proxy values from previous years were applied. The net result of using lower average weights (from creel surveys) and lower percentages sold to the market (or sold period) is likely to be responsible in part for a decrease in estimated weight and value of the catch sold.

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 assumed to be the recreational/subsistence component of the fishery.

This module was prepared by DMWR and PIFSC FRMD and was reviewed by the WPFMC, its Scientific and Statistical Committee (SSC), and its Pelagic FEP Team (PPT).

2.1.2 SUMMARY OF AMERICAN SAMOAN PELAGIC FISHERY

Landings. The estimated annual pelagic landings have varied from 2.0 to 5.6 million lb between 2014 and 2023. The 2023 landings were approximately 2.69 million lb, lower than the 3.18 million lb landings in 2022. There had been a steady increase in landings since 2020 before the drop in 2023 (Figure 4). 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 75% of the tuna species in 2023. Blue marlin, wahoo, swordfish, sailfish, striped marlin and mahimahi make up most of the non-tuna species landings. Landings of sailfish and striped marlin increased in 2023.

Longline Effort. There were 10 vessels known to be fishing in the waters of American Samoa in 2023, one less than in 2022 according to the PIRO Sustainable Fisheries Division permit program. The vessel size classes were recently changed from four to two: small (< 40 feet) and large vessels (> 60 feet). There were 10 active large vessels and no active small vessels in 2023; there have been no active small longline vessels since 2021. The 10 vessels that fished in 2023 made 37 trips (averaging 3.7 trips/vessel), deployed 1,224 sets, (122 sets/vessel) using 3.79 million hooks and zero lightsticks (Table 5). All other fishing effort indicators indicate a declining longline fishery: the number of boats is an all-time low; the number hooks set have decreased since 2021 and just slightly higher than the all-time low of 3.65 million in 2020; and the number of longline sets is an all-time low. On the other hand, fishing effort in troll fishery in 2023 dramatically increased, seemingly a reverse after years of decline. The number of boats weas nine in 2023 and 2022, up from five in 2021 at the end of a long-term decline since 2014. The number of troll trips precipitously increased from 49 in 2022 to 277 in 2023, the highest since 2014. There were 1,209 effective trolling hours in 2023, increased from 201 hours in 2022 and the second highest since 2014. However, the catch rate at 4 lb/hr in 2023, the lowest since 2014 with 16 lb/hr as the lowest recorded until last year. These values are being reviewed by PIFSC and the Council.

Longline CPUE. The total pelagic catch rate by all longline vessels in 2023 was similar to 2022 at 19.1 fish/1,000 hooks in 2022. The tuna catch rate by longliners decreased by 0.4 fish/1,000 hooks in 2023 to 17.4 fish/1,000 hooks and is one of the highest catch rates since 2013 (alongside 17.9 fish/1,000 hooks in 2015 and 17.8 fish/1,000 hooks in 2022). The catch rate for albacore decreased by 2.0 fish/1,000 hooks in 2023 to 12.6 fish/1,000 hooks. However, it is still one of the highest catch rates since 2012, lower by 2.2 fish/1,000 hooks relative to 2012. The highest albacore catch rate on record is 32.9 fish/1,000 hooks in 2001.

Lb-Per-Hour Trolling. Trolling catch rates dramatically decreased to 4 lb/hr in 2023 from 22 lb/hr in 2022, continuing decreasing trend since 2021 (Figure 19). Trolling catch rates have fluctuated with peak in 2016 of 45 lb/hr. The dramatic decline in catch rates could be attributed to the increase in effort and decline of skipjack catch rates. The catch rates for skipjack decreased to 0.49 lb/hr in 2023 from 25.39 lb/hr in 2021 and 18.14 lb/hr in 2022. The catch rates for yellowfin dramatically increased to 1.55 lb/hr in 2023 from to 0.09 lb/hr in 2022, However, it is still one of the lowest since 2014 with the highest catch rate of 17.8 lb/hr in 2016 (Figure 20).

Fish Size. Since the last year of available data from the cannery sampling program was 2015 average weight-per-fish are no longer presented in this report. Average albacore weight ranged from 38 to 40 lb from 2010 to 2015. However, the boat-based creel surveys recorded a size range of 35 to 38 lb from 2013 to 2020. Yellowfin and bigeye tuna weight per fish from the cannery sampling program seemed to decline from 2011 to 2015, at 57 to 39 lb and 54 to 38 lb, respectively.

Revenues. In 2023, the total longline fleet revenue (estimated landed value) was $2.82 million, and albacore composed a majority of the total landed value. Other main species included yellowfin tuna, bigeye tuna, skipjack tuna, and wahoo. The overall average fish price was $1.05/lb in 2023. Albacore price was $1.39/lb in 2023, a decrease $0.11from 2022. See the Socioeconomics (Section 3.2) module for additional data on American Samoa pelagic fisheries.

Bycatch. There was no recorded bycatch for the troll fishery in 2023 (Table 14). In the longline fishery, around 3.9% of the tuna catch was released. Yellowfin and bigeye were the most released bycatch tuna species at 8.9 and 5.9%, respectively. These are much higher release rates compared to 2022. Conversely, sharks, oilfish, and pomfret had the highest release numbers of non-tunas, from 93 to 100% of each species released (Table 6). In total, 9.8% of all pelagic species caught by the longline fishery were released in 2023, up from 3.8% in 2022. Fish are released for various reasons including quality, handling and storage difficulties, and marketing problems.

2.1.3 PLAN TEAM RECOMMENDATIONS

While there were no Plan Team recommendations to the Council relevant to the American Samoa pelagic fisheries data module, the Pelagic Plan Team developed several associated work items, including:

- American Samoa DMWR to communicate with longline fishers to better understand the increase in releases of tuna species in recent years.
- American Samoa DMWR to work with PIFSC FRMD to perform an exploration of small boat pelagic fishing in American Samoa, focusing on understanding available data from the FAD Program and how those data can be evaluated alongside creel survey estimates to develop more accurate depictions of troll catch and effort, also noting that there is additional ongoing work to assess data collection for the troll fishery.
- Supplement the Archipelagic Plan Team working group to develop a non-commercial module for territorial pelagic MUS similar to the one recently developed for territorial archipelagic BMUS and ECS.

2.1.4 OVERVIEW OF PARTICIPATION – ALL FISHERIES

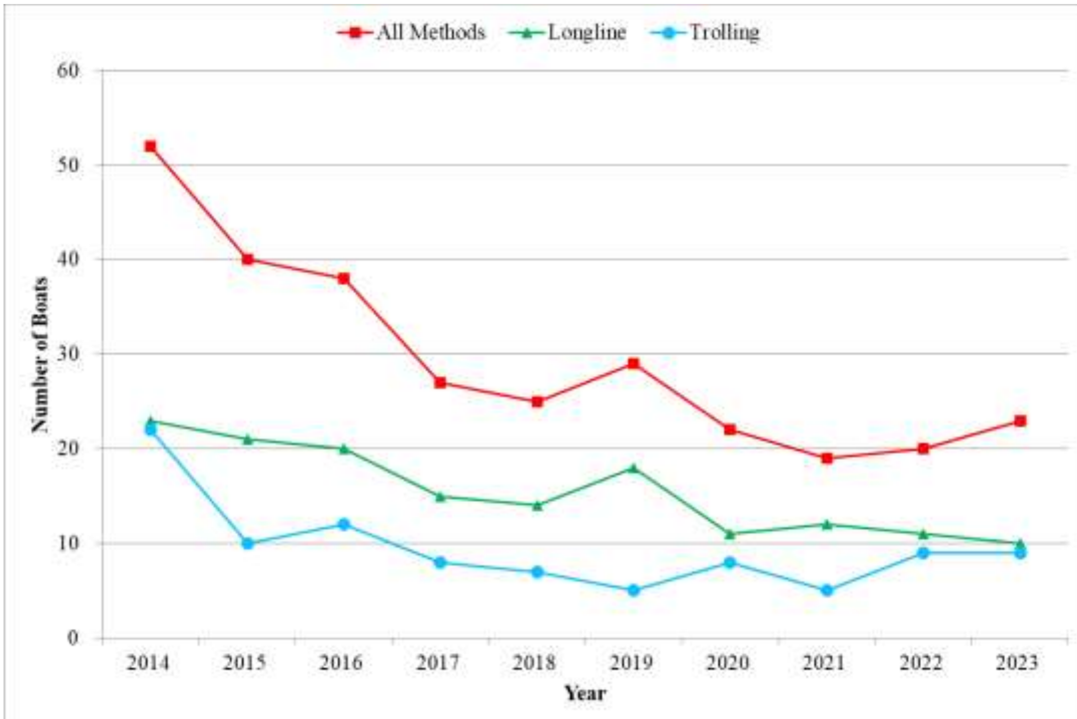


Figure 2. Number of boats landing any pelagic species in American Samoa by longlining, trolling, and all methods

Supporting data shown in Table A-2.

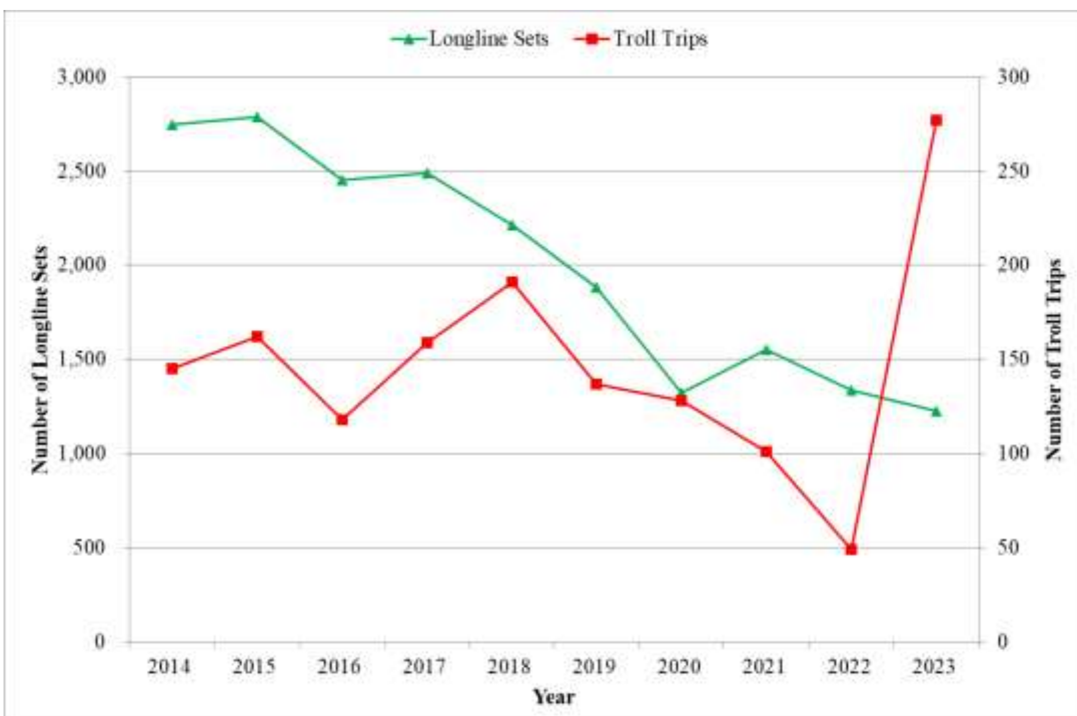


Figure 3. Number of fishing trips and sets for pelagic species in American Samoa

Supporting data shown in Table A-3.

2.1.5 OVERVIEW OF LANDINGS – ALL FISHERIES

Table 3. Estimated total landings (lb) of pelagic species in American Samoa by gear in 2023

Species	Longline Pounds	Troll Pounds	Other Pounds	Total Pounds
Skipjack tuna	100,759	3,394	0	104,153
Albacore tuna	1,913,266	0	0	1,913,266
Yellowfin tuna	460,134	145	0	460,279
Kawakawa	0	72	0	72
Bigeye tuna	81,664	0	0	81,664
Bluefin tuna	238	0	0	238
Tunas (unknown)	0	0	0	0
TUNAS TOTAL	**2,556,061**	**3,611**	**0**	**2,559,672**
Mahimahi	3,023	56	0	3,079
Black marlin	225	0	0	225
Blue marlin	86,555	0	0	86,555
Striped marlin	3,715	0	0	3,715
Wahoo	25,414	143	0	25,557
Swordfish	6,965	0	0	6,965
Sailfish	3,049	290	0	3,339
Spearfish	1,104	0	0	1,104
Moonfish	296	0	0	296
Oilfish	114	0	0	114
Pomfret	229	0	0	229
Pelagic thresher shark	0	0	0	0
Thresher shark	0	0	0	0
Shark (unknown pelagic)	0	0	0	0
Snake mackerel	0	0	0	0
Bigeye thresher shark	0	0	0	0
Silky shark	0	0	0	0
White tip oceanic shark	0	0	0	0
Blue shark	0	0	0	0
Shortfin mako shark	90	0	0	90
Longfin mako shark	0	0	0	0
Billfishes (unknown)	0	0	0	0
NON-TUNA PMUS TOTAL	**130,779**	**489**	**0**	**131,268**
Pelagic fishes (unknown)	0	0	0	0
Double-lined mackerel	0	77	7	84
Mackerel	0	0	0	0

Species	Longline Pounds	Troll Pounds	Other Pounds	Total Pounds
Long-jawed mackerel	0	0	0	0
Barracudas	1,227	0	0	1,227
Great barracuda	0	130	0	130
Small barracudas	0	0	0	0
Rainbow runner	42	245	33	320
Dogtooth tuna	0	34	0	34
OTHER PELAGICS TOTAL	**1,269**	**486**	**40**	**1,795**
TOTAL PELAGICS	**2,688,109**	**4,586**	**40**	**2,692,735**

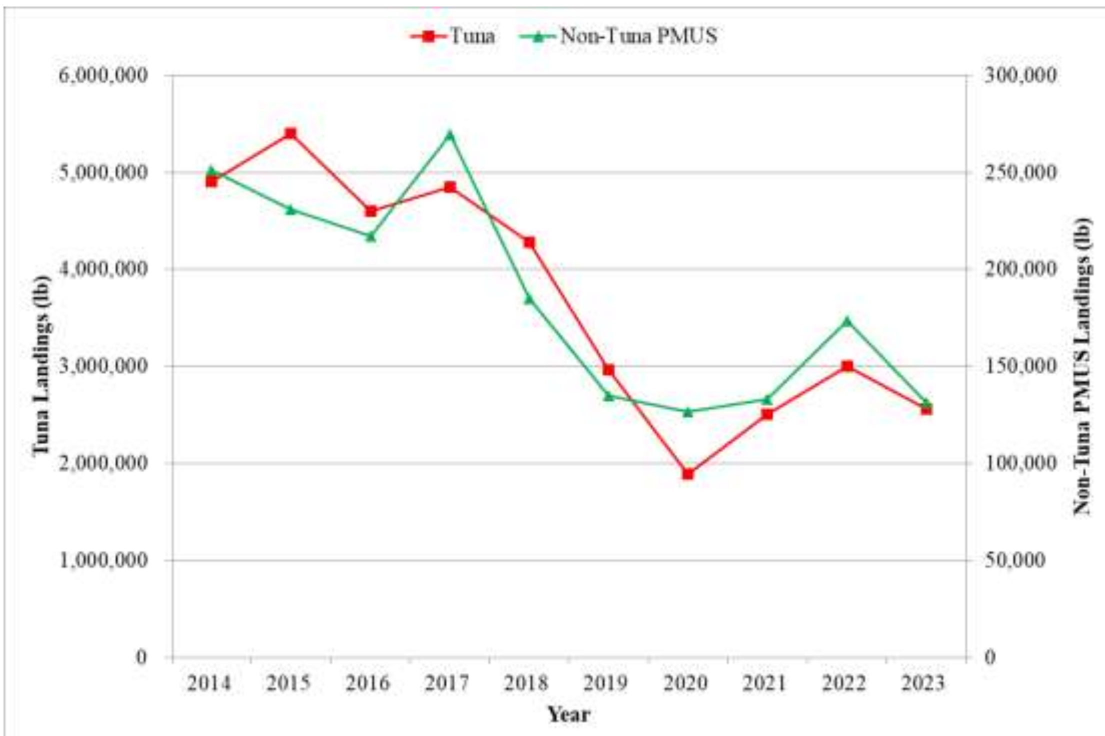


Figure 4. Total estimated landings of tuna and non-tuna PMUS in American Samoa
Supporting data shown in Table A-4.

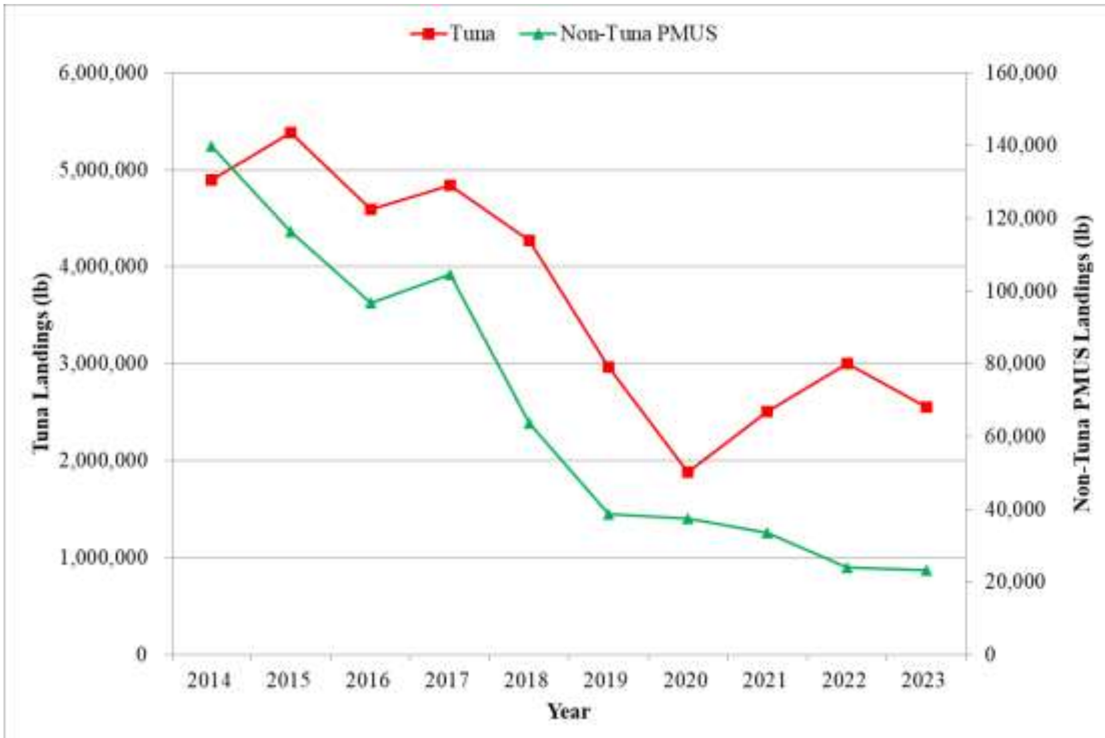


Figure 5. Commercial landings of tuna and non-tuna PMUS in American Samoa

Supporting data shown in Table A-5.

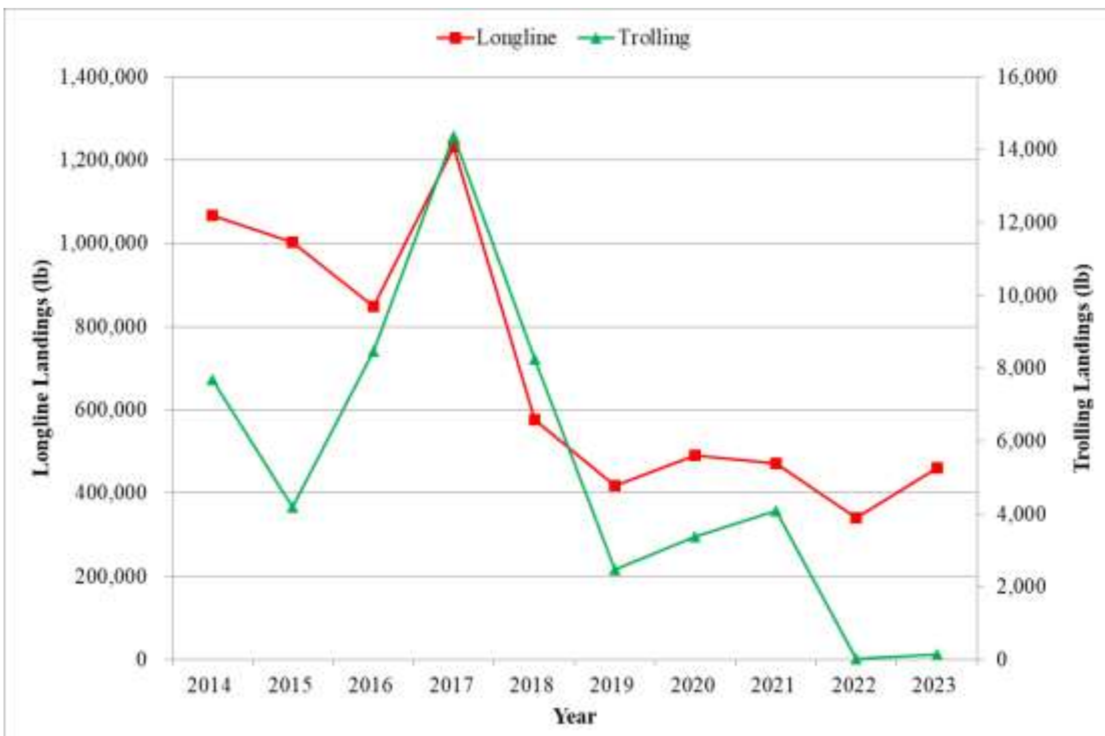


Figure 6. Total estimated landings of yellowfin tuna in American Samoa

Supporting data shown in Table A-6.

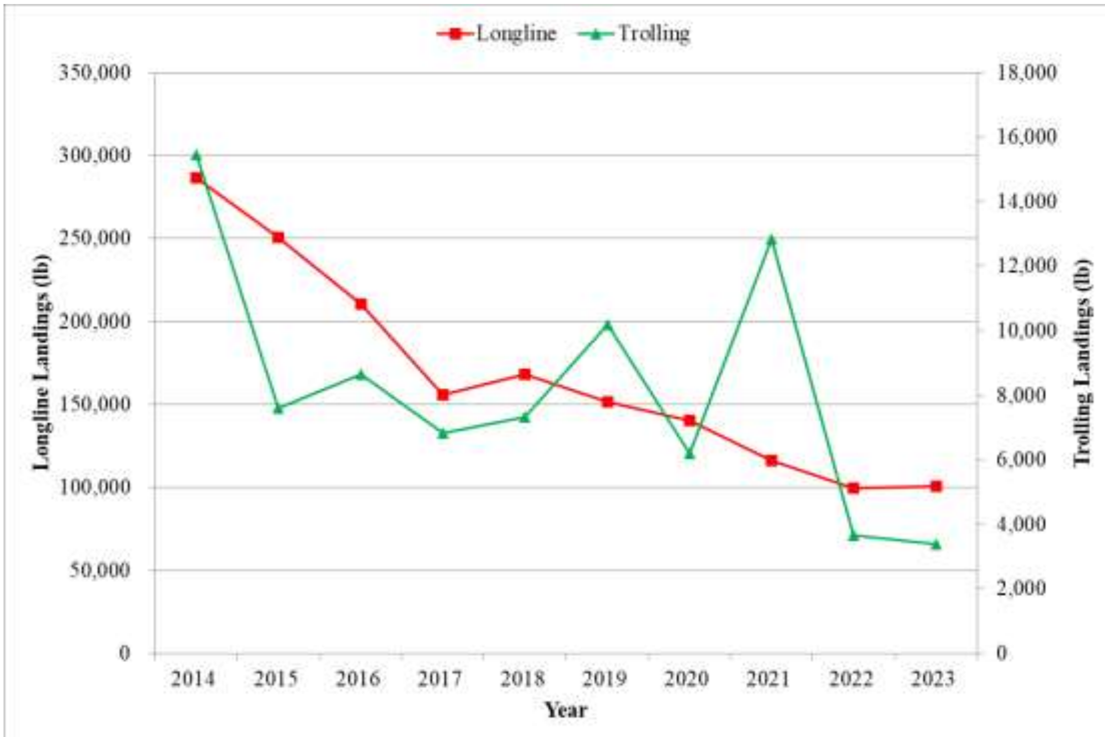


Figure 7. Total estimated landings of skipjack tuna in American Samoa

Supporting data shown in Table A-7.

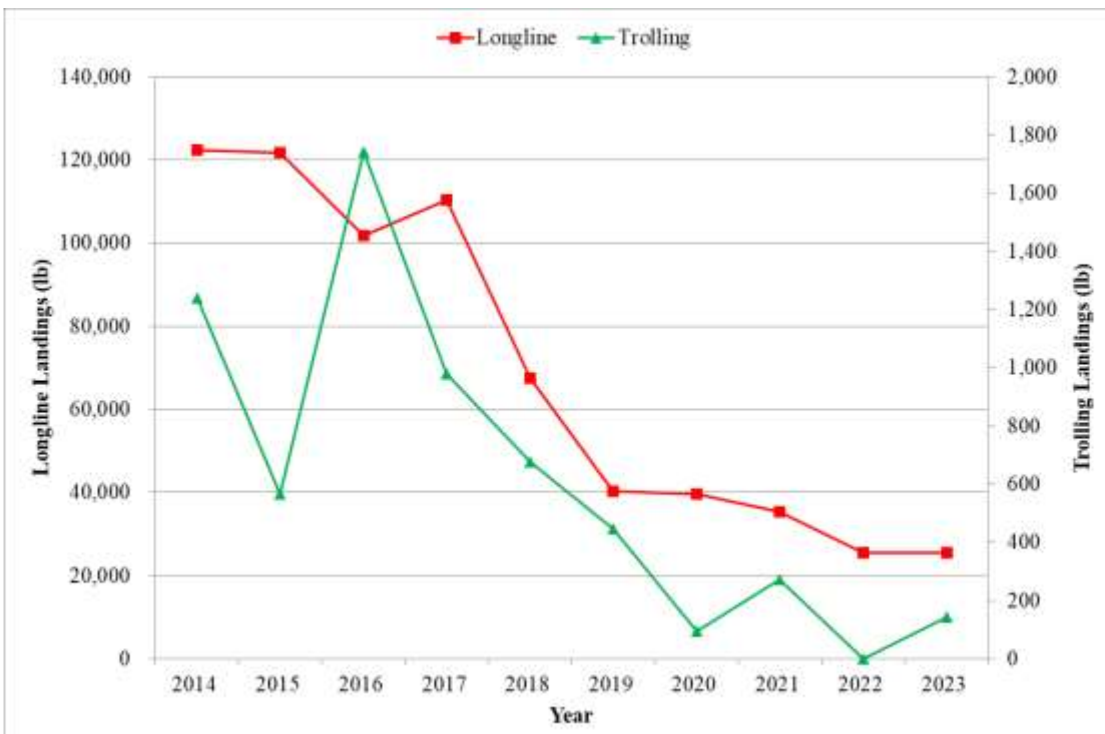


Figure 8. Total estimated landings of wahoo in American Samoa

Note: An unrepresentative amount of wahoo was caught by trolling one day in 2016. Supporting data shown in Table A-8.

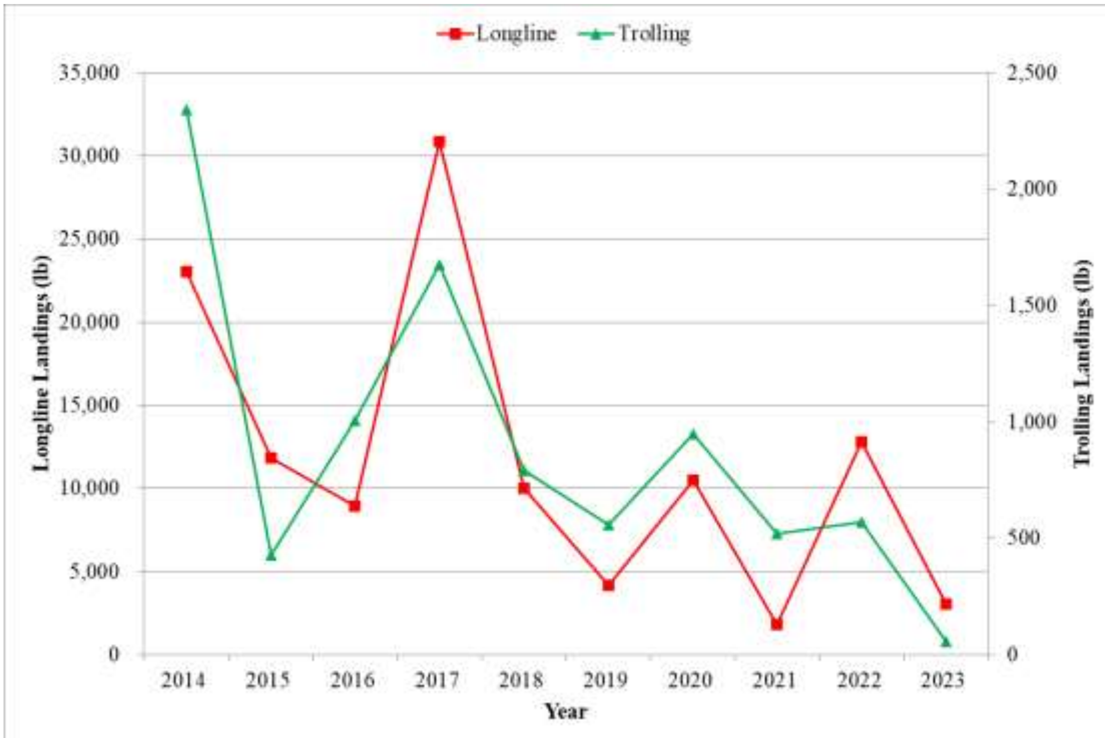


Figure 9. Total estimated landings of mahimahi in American Samoa
Supporting data shown in Table A-9.

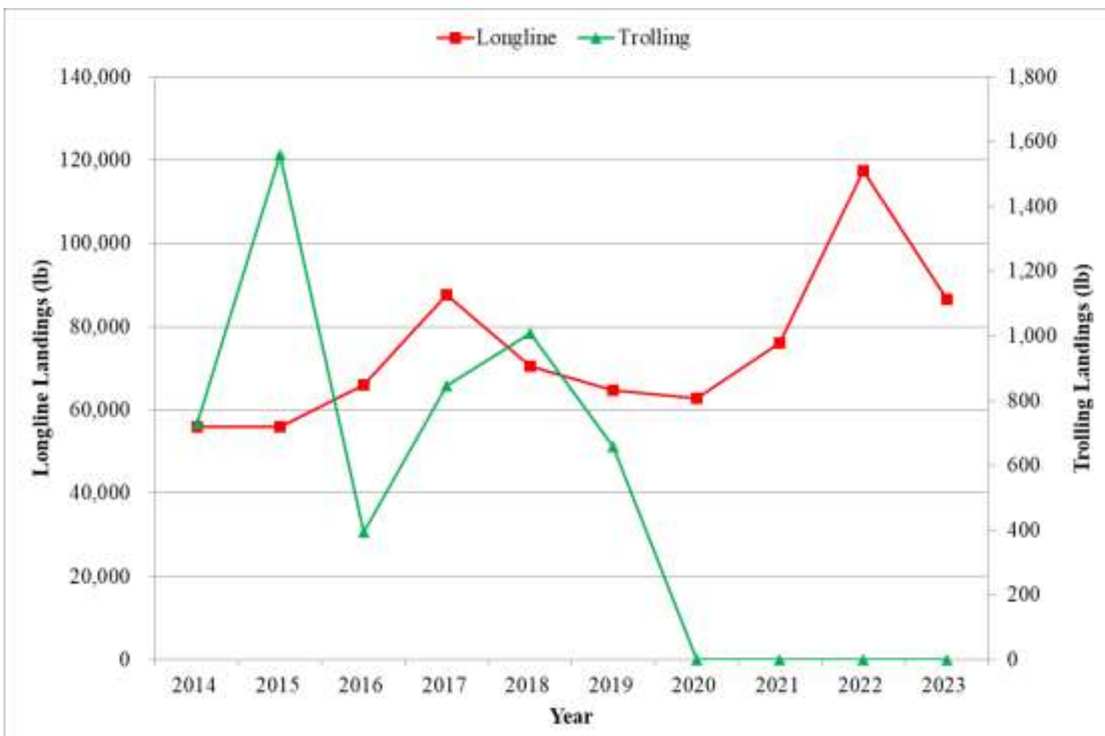


Figure 10. Total estimated landings of blue marlin in American Samoa
Supporting data shown in Table A-10.

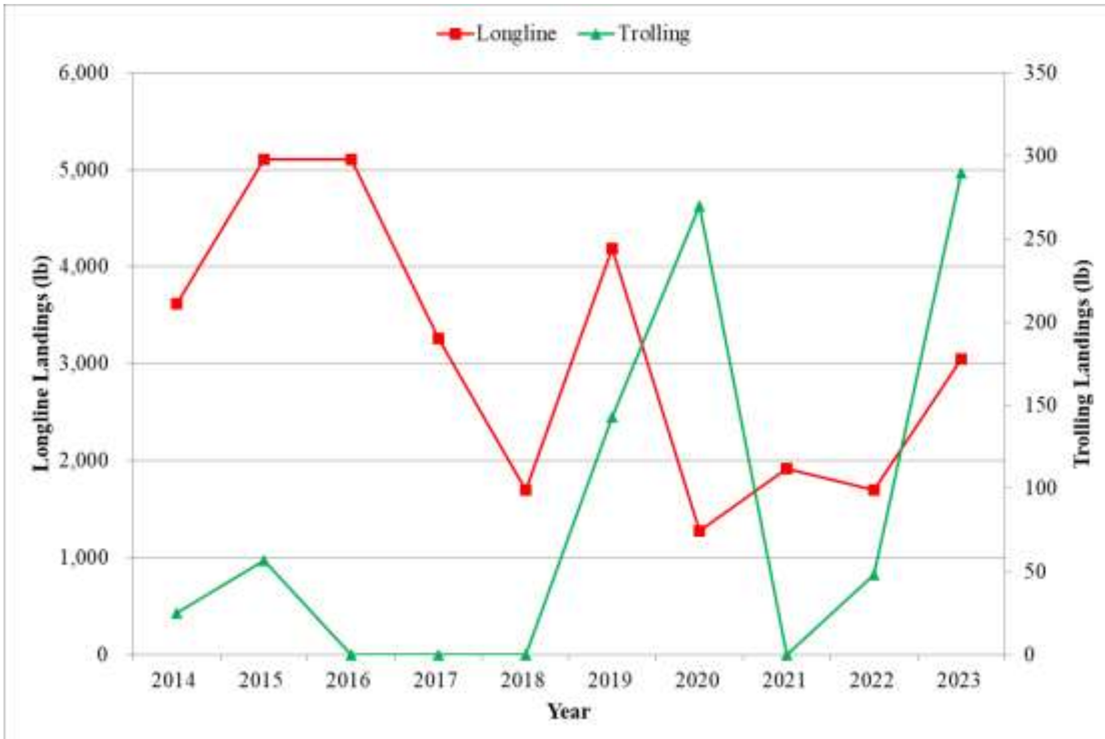


Figure 11. Total estimated landings of sailfish in American Samoa

Supporting data shown in Table A-11.

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

Table 4. Number of permitted and active longline fishing vessels by size class in American Samoa

Year	Small Vessel Permits	Small Vessel Active	Large Vessel Permits	Large Vessel Active
2014	18	2	44	21
2015	12	3	46	18
2016	11	2	39	18
2017	10	1	38	14
2018	13	1	43	13
2019	8	3	42	15
2020	7	1	40	10
2021	5	0	39	11
2022	5	0	39	11
2023	5	0	46	10

Notes: These data are used for Figure 12 that follows. The "small" size class includes alia vessels, whereas the "large" size class typically includes larger monohull vessels fishing in the Southern Pacific Ocean. Dual-permitted vessels are included. These designations shifted from Classes A through D to Small and Large due to Amendment 9 to the Pelagic FEP (86 FR 55743, October 7, 2021) that reduced the original four size classes to the two presented here.

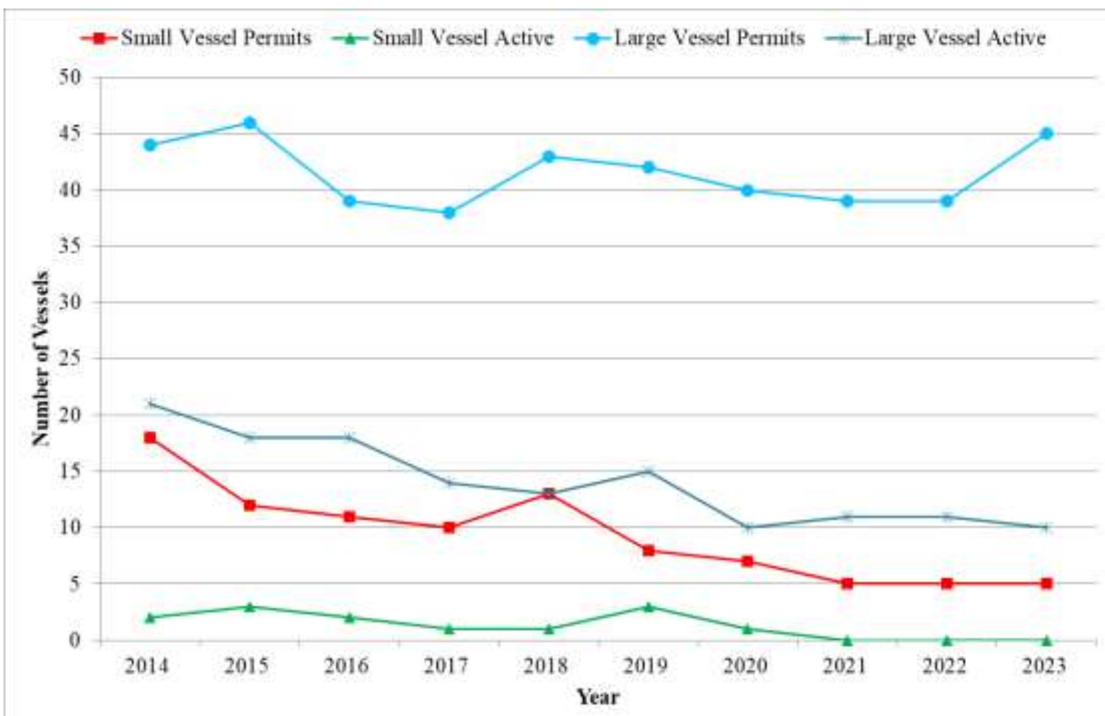


Figure 12. Number of active longline fishing vessels in American Samoa by size classes: Small (0-50 ft) and Large (> 51 ft)

Table 5. Longline effort by American Samoa vessels in 2023

Effort Type	Amount
Boats	10
Trips	37
Sets	1,224
Hooks (Thousands)	3,793
Lightsticks	0

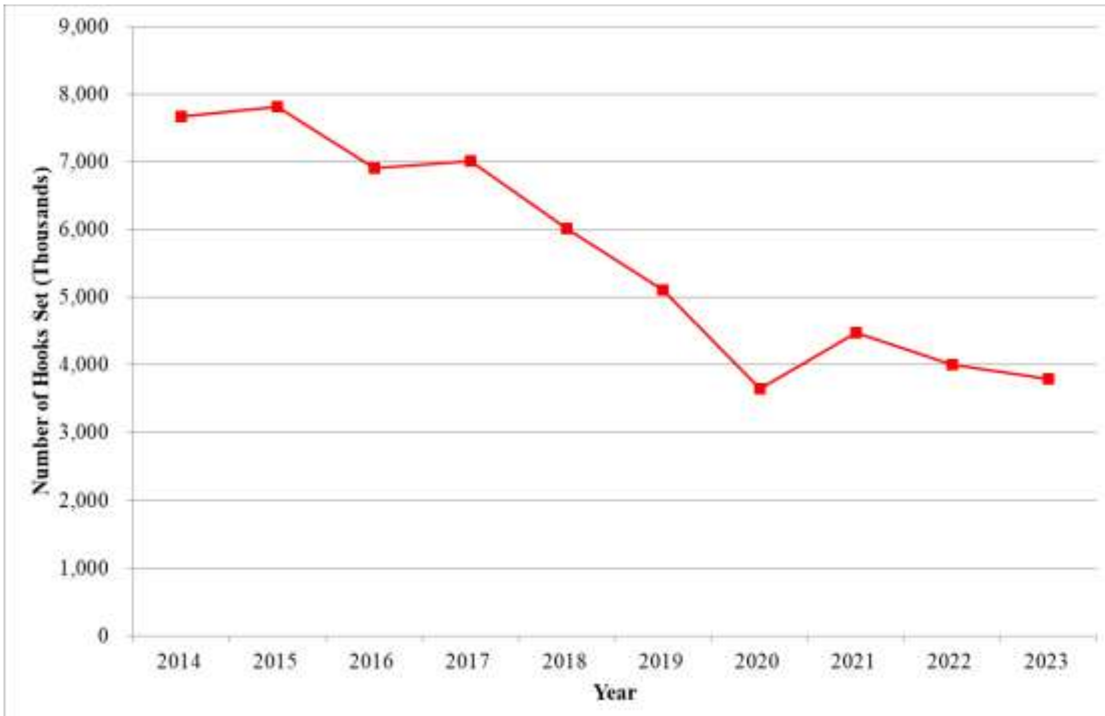


Figure 13. Number of longline hooks set from federal logbook data in American Samoa
Supporting data shown in Table A-12.

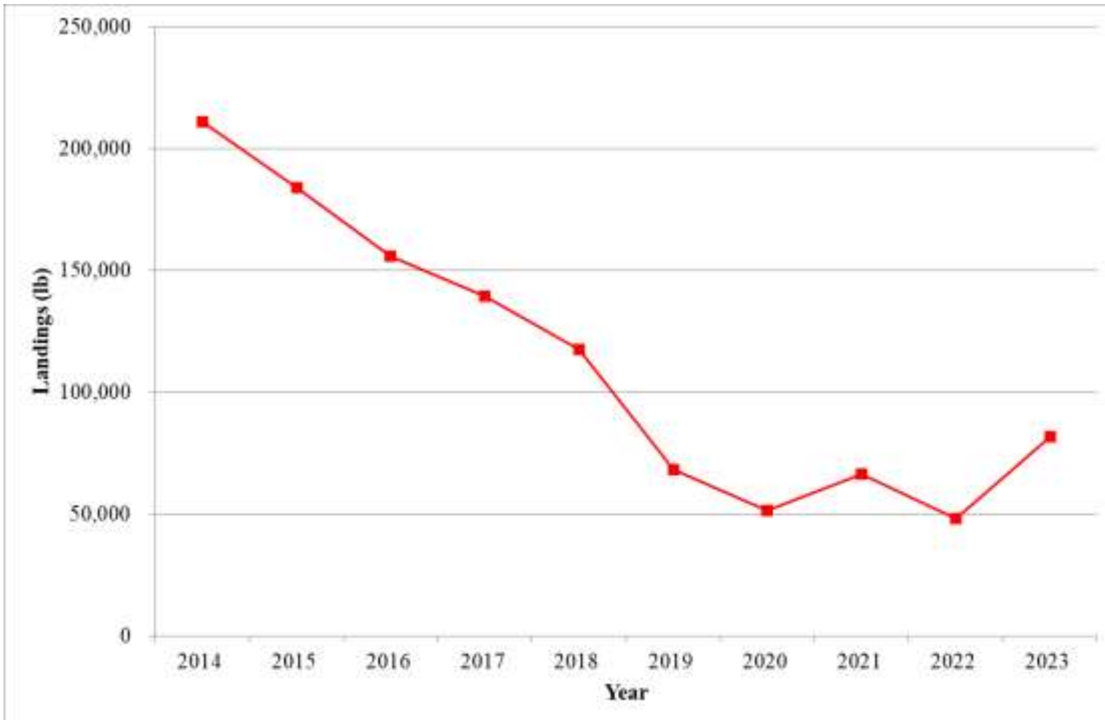


Figure 14. Total estimated landings of bigeye tuna by longlining in American Samoa
Supporting data shown in Table A-13.

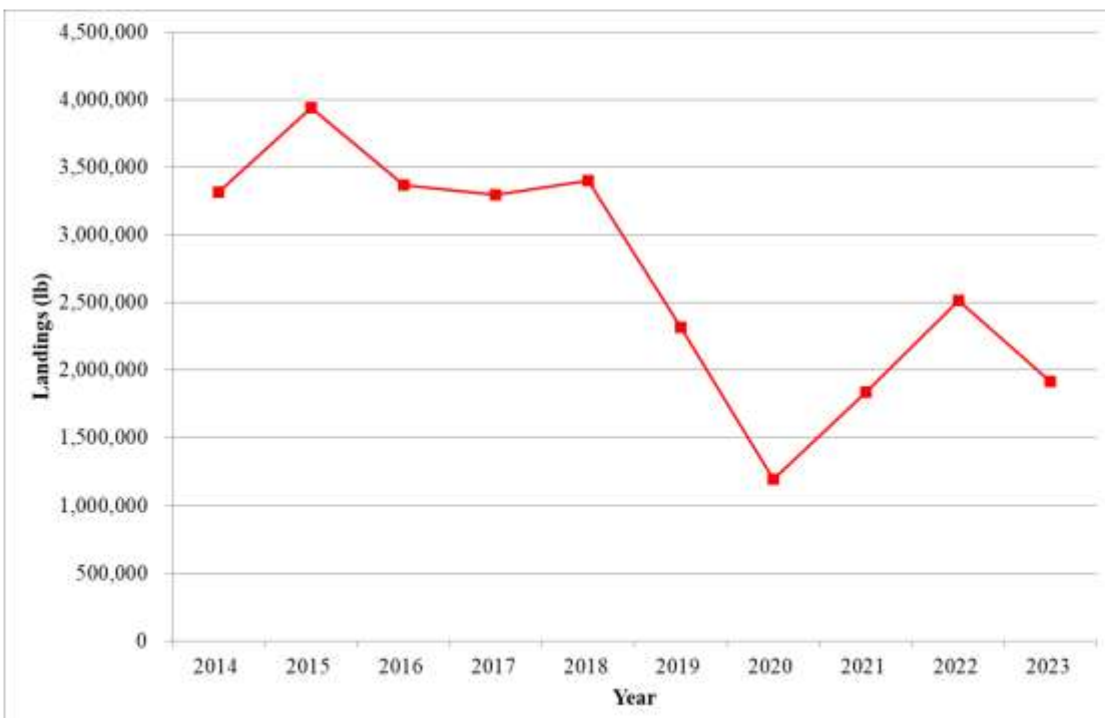


Figure 15. Total estimated landings of albacore by longlining in American Samoa
Supporting data shown in Table A-14.

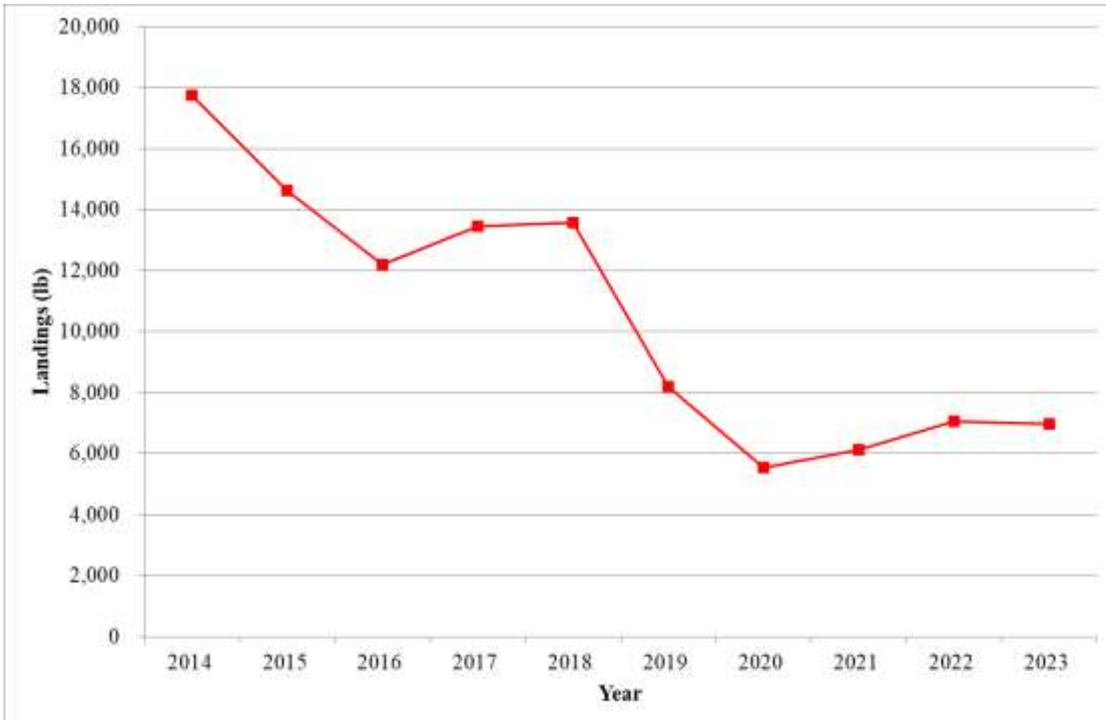


Figure 16. Total estimated landings of swordfish by longlining in American Samoa
Supporting data shown in Table A-15.

Table 6. Number of fish kept, released, and percent released for all American Samoa longline vessels from federal logbook data in 2023

Species	Number Kept	Number Released	Total Caught	Percent Released
Skipjack tuna	5,887	288	6,175	4.7
Albacore tuna	46,470	1,259	47,729	2.6
Yellowfin tuna	9,381	917	10,298	8.9
Kawakawa	0	0	0	0.0
Bigeye tuna	1,636	103	1,739	5.9
Bluefin tuna	1	0	1	0.0
Tunas (unknown)	0	0	0	0.0
TUNAS TOTAL	**63,375**	**2,567**	**65,942**	**3.9**
Mahimahi	141	9	150	6.0
Black marlin	2	0	2	0.0
Blue marlin	693	43	736	5.8
Striped marlin	54	3	57	5.3
Wahoo	1,115	72	1,187	6.1
Swordfish	65	84	149	56.4
Sailfish	43	19	62	30.6
Spearfish	24	117	141	83.0

Species	Number Kept	Number Released	Total Caught	Percent Released
Moonfish	6	16	22	72.7
Oilfish	6	1,424	1,430	99.6
Pomfret	26	364	390	93.3
Pelagic thresher shark	0	0	0	0.0
Thresher shark	0	79	79	100.0
Shark (unknown pelagic)	0	0	0	0.0
Snake mackerel	0	187	187	100.0
Bigeye thresher shark	0	0	0	0.0
Silky shark	0	716	716	100.0
White tip oceanic shark	0	319	319	100.0
Blue shark	0	951	951	100.0
Shortfin mako shark	1	47	48	97.9
Longfin mako shark	0	0	0	0.0
Billfishes (unknown)	0	0	0	0.0
NON-TUNA PMUS TOTAL	**2,176**	**4,450**	**6,626**	**67.2**
Pelagic fishes (unknown)	0	2	2	100.0
Double-lined mackerel	0	0	0	0.0
Mackerel	0	0	0	0.0
Long-jawed Mackerel	0	0	0	0.0
Barracudas	114	81	195	41.5
Great barracuda	0	0	0	0.0
Small barracudas	0	0	0	0.0
Rainbow runner	7	0	7	0.0
Dogtooth tuna	0	0	0	0.0
OTHER PELAGICS TOTAL	**121**	**83**	**204**	**40.7**
TOTAL PELAGICS	**65,672**	**7,100**	**72,772**	**9.8**

Table 7. Total estimated bycatch in number of fish for the top 10 bycatch species from the Pacific Islands Region Observer Program for the American Samoa longline fishery

Species	2016	2017	2018	2019	2020	2021	2022	Average	SD
Stingray, Pelagic	19,459	16,306	8,156	11,908	8,395	8,259	6,487	11,282	4,877.5
Escolar, Longfin	8,820	9,652	5,605	6,609	5,037	4,788	3,706	6,317	2,189.9
Escolar	7,756	7,773	5,567	5,094	5,540	5,517	3,111	5,765	1,614.7
Lancetfish, Longnose	6,228	5,881	5,482	4,991	4,063	3,913	2,749	4,758	1,240.5
Tuna, Yellowfin	1,873	1,702	1,345	1,180	1,476	1,363	1,755	1,528	253.5
Shark, Blue	4,490	4,224	3,359	2,681	2,958	2,721	1,752	3,169	947.4
Tuna, Albacore	1,078	1,520	1,630	1,584	1,136	1,077	1,258	1,326	245.2
Snake Mackerel	1,049	1,026	1,183	1,689	1,568	1,502	1,221	1,320	264.3
Shark, Silky	1,874	1,695	1,212	1,840	1,227	1,238	949	1,434	363.4

Note: The top 10 species comprised 81.2% of total bycatch in 2022.

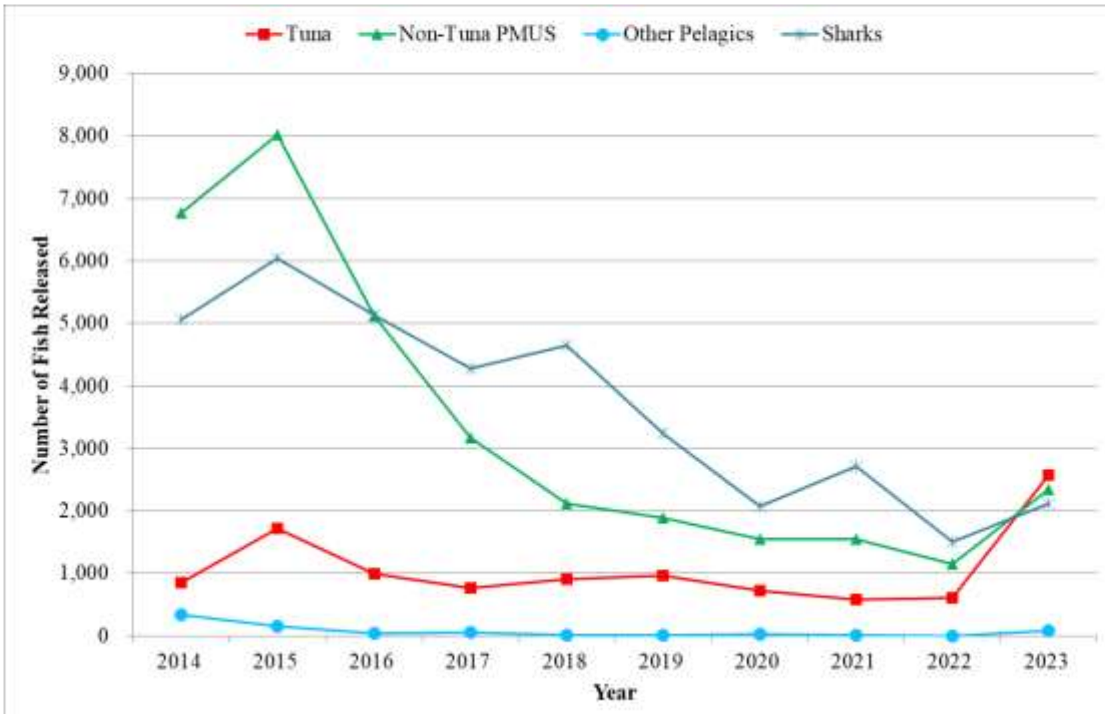


Figure 17. Number of fish released by longline vessels in American Samoa according to federal logbook data

Supporting data shown in Table A-16.

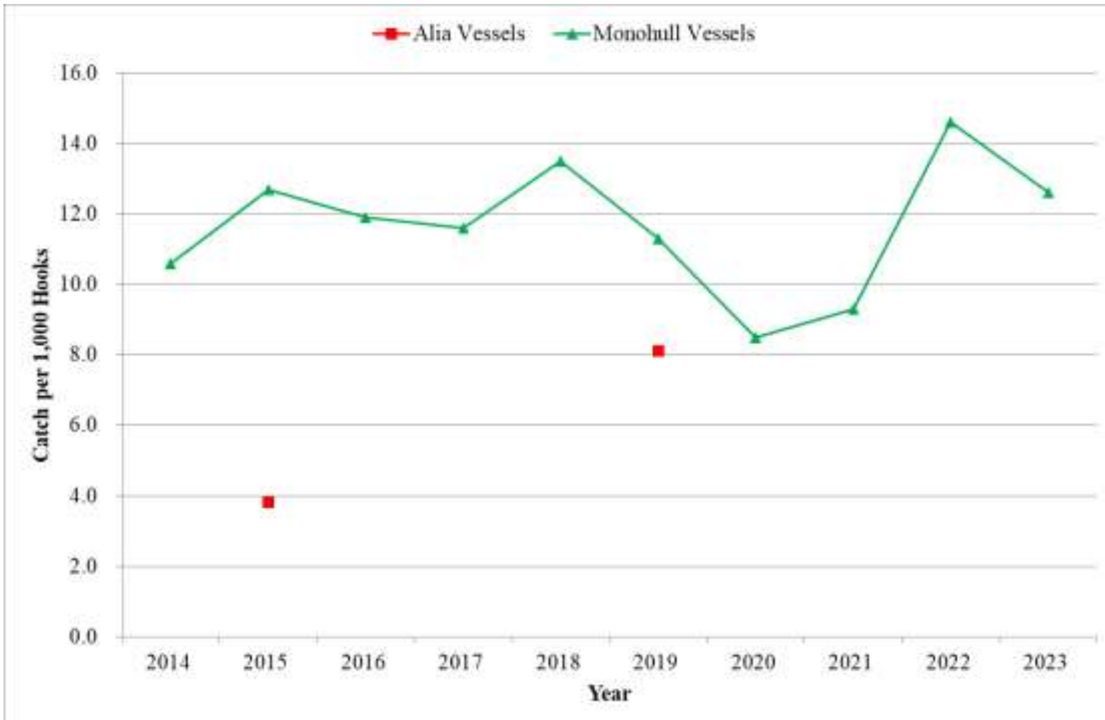


Figure 18. Albacore catch per 1,000 hooks by monohull vessels from longline logbook data in American Samoa

Note: Data for alia vessels are typically non-disclosed due to confidentiality rules. Supporting data shown in Table A-17.

Table 8. Catch per 1,000 hooks for alia vessels in American Samoa from 1996 to 1998

Species	Alia 1996	Alia 1997	Alia 1998
Skipjack tuna	0.1	1.2	3.7
Albacore tuna	40.6	32.8	26.6
Yellowfin tuna	6.5	2.7	2.2
Bigeye tuna	1.3	0.3	0.3
TUNAS TOTAL	**48.5**	**37.0**	**32.8**
Mahimahi	2.3	2.2	1.7
Blue marlin	0.9	0.7	0.5
Wahoo	0.8	0.9	2.2
Swordfish	0.0	0.1	0.0
Sailfish	0.2	0.2	0.1
NON-TUNA PMUS TOTAL	**4.2**	**4.3**	**4.6**
Pelagic fishes (unknown)	0.0	0.0	0.2
OTHER PELAGICS TOTAL	**0.0**	**0.0**	**0.2**
TOTAL PELAGICS	**52.7**	**41.3**	**37.6**

Table 9. Catch per 1,000 hooks for two types of longline vessels in American Samoa from 1999 to 2002

Species	Alia 1999	Monohull 1999	Alia 2000	Monohull 2000	Alia 2001	Monohull 2001	Alia 2002	Monohull 2002
Skipjack tuna	5.0	4.5	2.0	1.7	3.1	2.1	6.0	4.9
Albacore tuna	18.8	14.8	19.8	28.0	27.3	32.9	17.2	25.8
Yellowfin tuna	6.7	2.1	6.2	3.1	3.3	1.4	7.1	1.3
Bigeye tuna	0.7	0.5	0.4	1.0	0.6	1.0	0.6	0.9
TUNAS TOTAL	**31.2**	**21.9**	**28.4**	**33.8**	**34.3**	**37.4**	**30.9**	**32.9**
Mahimahi	2.2	0.3	1.7	0.4	3.4	0.5	4.0	0.6
Black marlin	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0
Blue marlin	0.5	0.1	0.5	0.2	0.4	0.2	0.2	0.3
Striped marlin	0.0	0.2	0.1	0.3	0.0	0.1	0.1	0.0
Wahoo	2.1	1.2	1.2	1.0	1.5	0.6	2.7	1.0
Swordfish	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.0
Sailfish	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0
Spearfish	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Moonfish	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1
Oilfish	0.0	0.6	0.0	0.1	0.0	0.2	0.0	0.5
Pomfret	0.0	0.2	0.0	0.1	0.0	0.1	0.0	0.1
NON-TUNA PMUS TOTAL	**5.1**	**3.1**	**3.7**	**2.5**	**5.6**	**1.8**	**7.3**	**2.6**
Barracudas	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
OTHER PELAGICS TOTAL	**0.3**	**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.4**
TOTAL PELAGICS	**36.6**	**25.2**	**32.1**	**36.3**	**39.9**	**39.2**	**38.2**	**35.9**

Table 10. Catch per 1,000 hooks for two types of longline vessels in American Samoa from 2003 to 2005

Species	Alia 2003	Monohull 2003	Alia 2004	Monohull 2004	Alia 2005	Monohull 2005
Skipjack tuna	4.7	2.9	3.0	3.9	1.0	2.7
Albacore tuna	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 TOTAL	**29.5**	**22.4**	**26.3**	**21.3**	**19.3**	**23.6**
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

Species	Alia 2003	Monohull 2003	Alia 2004	Monohull 2004	Alia 2005	Monohull 2005
Striped marlin	0.0	0.0	0.1	0.0	0.1	0.0
Wahoo	1.8	1.1	3.0	1.6	2.3	1.4
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	0.0
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	0.0	0.1
NON-TUNA PMUS TOTAL	**5.0**	**2.4**	**5.5**	**3.1**	**4.9**	**2.5**
Pelagic fishes (unknown)	0.2	0.2	0.0	0.1	0.0	0.1
OTHER PELAGICS TOTAL	**0.2**	**0.2**	**0.0**	**0.1**	**0.0**	**0.1**
TOTAL PELAGICS	**34.7**	**25.0**	**31.8**	**24.5**	**24.2**	**26.2**

Table 11. Catch per 1,000 hooks for all types of longline vessels in American Samoa from 2006 to 2011

Species	All Vessels 2006	All Vessels 2007	All Vessels 2008	All Vessels 2009	All Vessels 2010	All Vessels 2011
Skipjack tuna	3.2	2.3	2.4	2.3	2.4	2.5
Albacore tuna	18.4	18.4	14.2	14.8	17.4	12.1
Yellowfin tuna	1.6	1.9	1.0	1.1	1.8	2.0
Bigeye tuna	0.9	0.9	0.5	0.6	0.8	0.7
TUNAS TOTAL	**24.1**	**23.5**	**18.1**	**18.8**	**22.4**	**17.3**
Mahimahi	0.4	0.1	0.1	0.2	0.1	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
Swordfish	0.1	0.0	0.0	0.0	0.0	0.0
Sailfish	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	0.0	0.1	0.1	0.1	0.1	0.1
NON-TUNA PMUS TOTAL	**2.9**	**2.2**	**2.0**	**2.5**	**2.5**	**2.4**
Pelagic fishes (unknown)	0.0	0.0	0.0	0.0	0.1	0.0
OTHER PELAGICS TOTAL	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**0.0**
TOTAL PELAGICS	**27.0**	**25.7**	**20.1**	**21.3**	**25.0**	**19.7**

Table 12. Catch per 1,000 hooks for all types of longline vessels from 2013 to 2017

Species	All Vessels 2012	All Vessels 2013	All Vessels 2014	All Vessels 2015	All Vessels 2016	All Vessels 2017
Skipjack tuna	4.3	1.1	2.5	2.0	2.0	1.5
Albacore tuna	14.8	11.7	10.6	12.7	11.9	11.5
Yellowfin tuna	1.2	1.9	2.5	2.6	2.6	3.6
Bigeye tuna	0.6	0.4	0.7	0.6	0.5	0.4
TUNAS TOTAL	**20.9**	**15.1**	**16.3**	**17.9**	**17.0**	**17.0**
Mahimahi	0.1	0.2	0.2	0.1	0.1	0.2
Blue marlin	0.1	0.1	0.1	0.1	0.1	0.1
Wahoo	0.7	0.7	0.7	0.7	0.7	0.7
Spearfish	0.1	0.1	0.1	0.1	0.0	0.0
Moonfish	0.1	0.0	0.0	0.0	0.0	0.0
Oilfish	0.8	0.7	0.6	0.8	0.6	0.3
Pomfret	0.1	0.1	0.1	0.1	0.1	0.1
Thresher shark	0.0	0.0	0.0	0.0	0.1	0.1
Silky shark	0.0	0.0	0.1	0.1	0.1	0.1
White tip oceanic shark	0.1	0.1	0.1	0.1	0.1	0.1
Blue shark	0.4	0.2	0.4	0.5	0.5	0.4
Shortfin mako shark	0.0	0.0	0.0	0.1	0.0	0.0
NON-TUNA PMUS TOTAL	**2.5**	**2.2**	**2.4**	**2.7**	**2.4**	**2.1**
Pelagic fishes (unknown)	0.1	0.1	0.0	0.0	0.0	0.0
OTHER PELAGICS TOTAL	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	0.0
TOTAL PELAGICS	**23.5**	**17.4**	**18.7**	**20.6**	**19.4**	**19.1**

Table 13. Catch/1,000 hooks for all types of longline vessels in American Samoa from 2018 to 2023

Species	All Vessels 2018	All Vessels 2019	All Vessels 2020	All Vessels 2021	All Vessels 2022	All Vessels 2023
Skipjack tuna	1.8	2.2	2.7	1.5	1.4	1.6
Albacore tuna	13.5	11.3	8.4	9.3	14.6	12.6
Yellowfin tuna	1.7	1.9	2.6	2.3	1.5	2.7
Bigeye tuna	0.4	0.4	0.3	0.3	0.3	0.5
TUNAS TOTAL	**17.4**	**15.8**	**14.0**	**13.4**	**17.8**	**17.4**
Mahimahi	0.1	0.0	0.1	0.0	0.2	0.0
Blue marlin	0.1	0.1	0.1	0.1	0.2	0.2
Wahoo	0.5	0.4	0.4	0.3	0.3	0.3

Species	All Vessels 2018	All Vessels 2019	All Vessels 2020	All Vessels 2021	All Vessels 2022	All Vessels 2023
Oilfish	0.3	0.2	0.3	0.2	0.2	0.4
Pomfret	0.0	0.1	0.1	0.1	0.1	0.1
Thresher shark	0.1	0.0	0.0	0.0	0.0	0.0
Silky shark	0.1	0.1	0.2	0.1	0.1	0.2
White tip oceanic shark	0.1	0.1	0.1	0.1	0.0	0.1
Blue shark	0.5	0.3	0.3	0.3	0.2	0.3
NON-TUNA PMUS TOTAL	**1.8**	**1.3**	**1.6**	**1.2**	**1.3**	**1.6**
Barracudas	0.0	0.0	0.0	0.0	0.0	0.1
OTHER PELAGICS TOTAL	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**
TOTAL PELAGICS	**19.2**	**17.1**	**15.6**	**14.6**	**19.1**	**19.1**

2.1.7 AMERICAN SAMOA TROLLING BYCATCH AND CPUE

Data for participation, effort, landings, and revenue are found in previous sections of this chapter. Statistics summarizing bycatch for American Samoa trolling are shown in Table 14.

Table 14. American Samoa trolling bycatch summary (released fish)

Year	Number Release	Percent Release	Number Kept	Number Caught	Charter
2014	0	0.0	2,789	2,789	F
2015	0	0.0	616	616	F
2016	0	0.0	1,374	1,374	F
2017	0	0.0	915	915	F
2018	0	0.0	743	743	F
2019	0	0.0	640	640	F
2020	0	0.0	465	465	F
2021	0	0.0	601	601	F
2022	0	0.0	132	132	F
2023	0	0.0	49	49	F

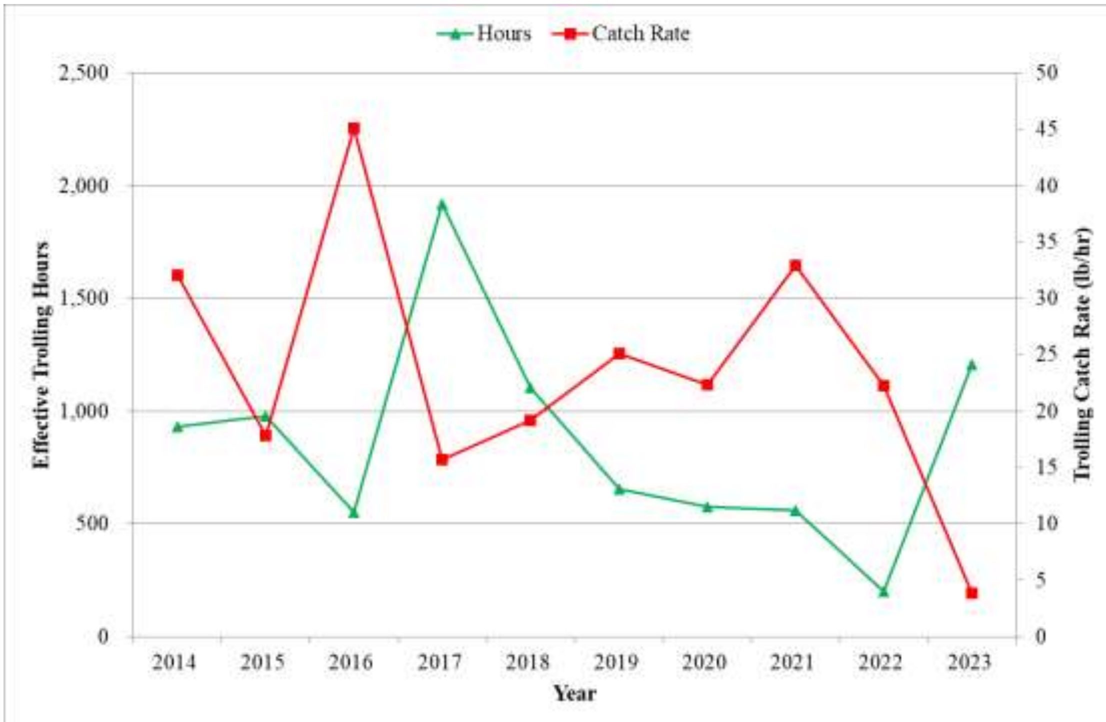


Figure 19. Catch-per-hour for trolling and number of trolling hours in American Samoa
Supporting data shown in Table A-18.

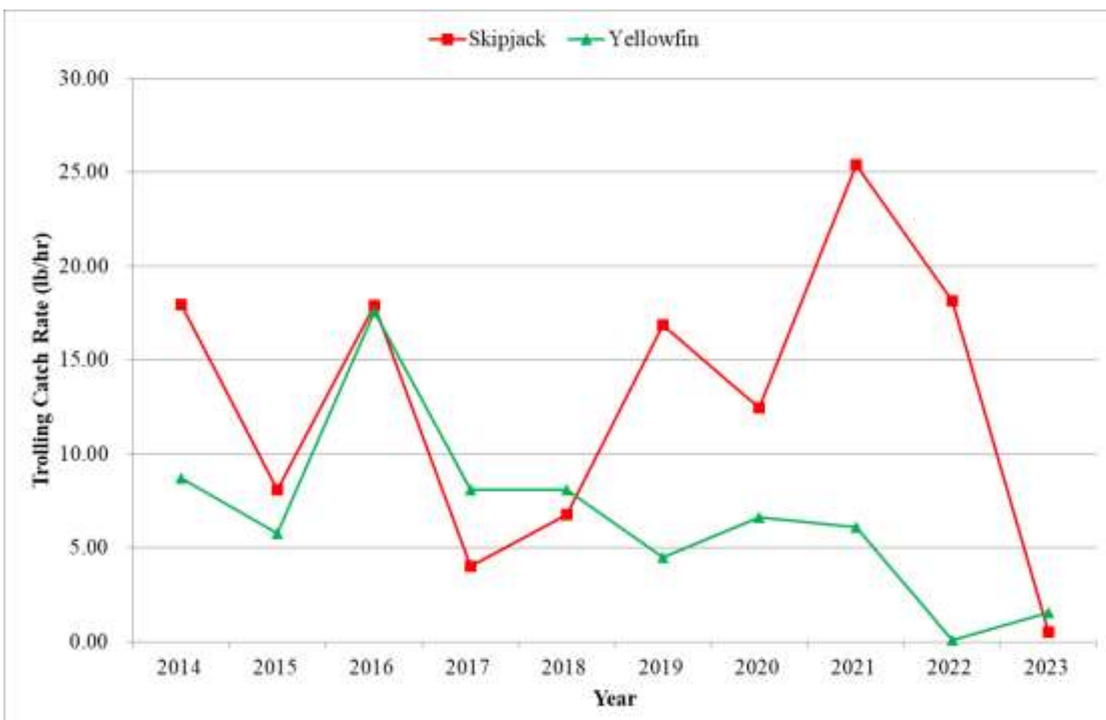


Figure 20. Trolling CPUE for skipjack and yellowfin tuna in American Samoa
Supporting data shown in Table A-19.

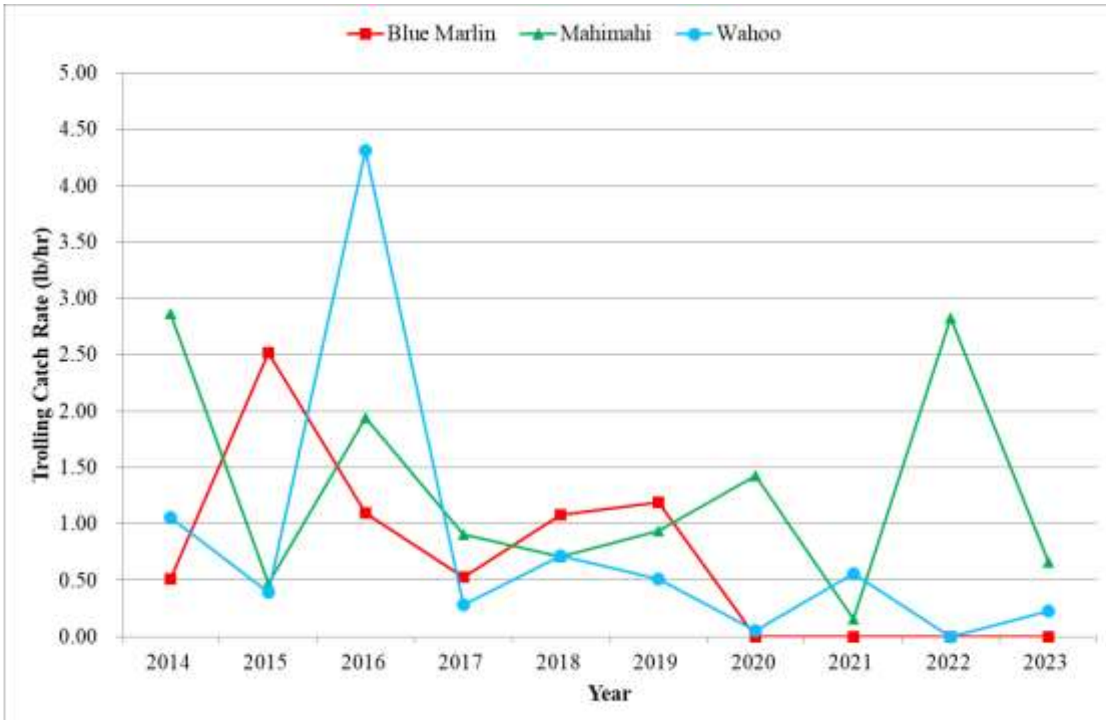


Figure 21. Trolling CPUE for blue marlin, mahimahi, and wahoo in American Samoa
Supporting data shown in Table A-20.

2.2 COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS

2.2.1 DATA SOURCES

This fishery is characterized by the Commonwealth of the Northern Mariana Islands (CNMI) Department of Lands and Natural Resources, Division of Fish and Wildlife (DFW), using data from its commercial purchase invoice collection and the boat-based creel survey. Commercial invoices are provided by DFW to all known fish (ray-finned and shellfish) purchasers. These invoices are then collected by DFW either biweekly or as requested by purchasers. Some purchasers prefer to report their purchases electronically via the Sell-it-Log-it (SILI) application and anticipate its implementation. Submission of paper reports will remain available as needed.

Currently, commercial invoices and boat-based creel data are only collected in Saipan. However, fishing in waters off of other islands can be identified in both these data. Although commercial invoices have been collected in Saipan since the mid-1970s, only data collected since 1983 are considered accurate enough to be used. It is believed that the commercial purchase data includes about 50-60% of commercial landings for pelagic species in 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 recovers costs by selling portions of catches. The number of fish purchasers has changed over time, so DFW has requested updated records of current businesses from CNMI Department of Finance. These records will identify which businesses (by North American Industry Classification System [NAICS] codes) purchase fish and are not yet reporting transactions to DFW.

The boat-based creel survey has been ongoing since April 2000. Although there are no creel surveys performed on other islands, trips to other islands that return to Saipan do get surveyed and their fishing areas do get identified.

The boat-based creel survey collects participation, trip, catch, effort, and economic data from the boat-based fishery. There were 43 boat-based surveys conducted between January 1 and December 31, 2023. Expanded total catch for pelagic decreased from 237,140 pounds in 2022 to 126,493 pounds in 2023 (-46.66%). Tuna species made up 98,329 pounds (77.73%) of total pelagic catch.

There were 43 boat-based surveys conducted between January 1 and December 31, 2023. A total of 119 interviews were completed with an expanded catch of 184,105 pounds.

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 increases in catches of pelagic species. This report does not include any data from longline vessels.

Percent species composition is calculated by weight for the sampled catch (raw interview data) for each method and applied to the pounds 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

Predictive adjustments are applied in the boat-based creel expansion while none are applied to commercial invoice data. Total pelagic catch derived from boat-based creel expansions decreased from 237,140 pounds in 2022 to 126,493 pounds in 2023(-46.66%). Fewer surveys were completed in 2023 (43 surveys) than in 2022 (52) due to the depletion of grant award funds. 63 interview surveys were completed in 2023 compared to 84 in 2022 (-25.00%), thus the observed decreased total catch is likely due to less sampling effort.

Landings. In the creel expansion, skipjack tuna was the most-caught species with a total catch of 76,217 pounds (60.25% of pelagic fishery). Yellowfin tuna and Wahoo followed as second and third in the creel expansion respectively. Expanded catch for yellowfin tuna was 19,368 pounds (15.31% of pelagic fishery) while that for wahoo was 13,875 pounds (10.97% of pelagic fishery). Percent changes for skipjack tuna, yellowfin tuna, and wahoo are -42.19%, +36.53%, and -33.31% respectively.

Skipjack commercial landings decreased from 172,059 pounds in 2022 to 83,413pounds in 2023 (-51.52%). Yellowfin tuna were commercial landings increased from 11,217 pounds in 2022 to 15,069 pounds in 2023 (+34.34%). Mahimahi commercial landings decreased from 33,096 pounds in 2022 to 10,922 pounds in 2023 (-67.00%). Wahoo commercial landings decreased from 7,356 pounds in 2022 to 2,998 pounds in 2023 (-59.24%). Blue marlin commercial landings decreased from 1,638 pounds in 2022 to 774 pounds in 2023 (-52.75%).

Effort. Estimated trolling trips decreased from 2,974 trips in 2022 to 2,369 trips in 2023 (-20.34%). From commercial invoices, there were 1,087 trips that caught pelagic species from 77 fishers. The percent change for trips from commercial invoices was -38.32% while that for number of fishers was -18.95%. The exact number of vessels registered for non-commercial and commercial fishing is currently unknown.

Boat Ramps. There are seven boat ramps in the CNMI, four in Saipan, two in Rota, and one in Tinian. Saipan has Sugar Dock, Fishing Base, Smiling Cove Marina, Lower Base, and Tanapag ramp. Smiling Cove Marina has berth parking available for tenants and floating docks for loading passengers and cargo. Fishing charter vessels are also berthed here along with non-fishing vessels. Other boating access facilities in Saipan are used by fishing and non-fishing vessels while offering no tenant berth. Rota has two marinas, Rota West Harbor Marina with berthing for tenants and one without. Tinian Marina Facility has a ramp and tenant berthing available. Sugar Dock was removed from access point surveys due to sand deposition making the ramp there inaccessible in 2022 and replaced with Lower Base.

Weather. There was a category four tropical cyclone that moved westward south of Rota. There was severe damage to infrastructure and only minor harm to human life. Rota has since recovered as of this writing. Besides this, no extraordinary weather events occurred. Typical high surf and small-craft advisories were issued throughout the year when wind speed increased seasonally.

Fish Aggregating Devices (FADs). No new FADs were deployed in 2023. As of writing, all FADs in Saipan are awaiting replacement. The status of the single FAD in Rota is unconfirmed. DFW Fisheries Research staff will confirm themselves when time and resources permit.

CPUE. Expanded trolling CPUE decreased from 16.43 pounds/gear-hour in 2022 to 10.26 pounds/gear-hour in 2023 (-37.55%).

Revenue. Total value for pelagic fish purchases was $365,865.20 while mean dollar/pound was $3.08.

Bycatch. No bycatch was observed during boat-based creel surveys in 2023.

2.2.3 PLAN TEAM RECOMMENDATIONS

While there were no Plan Team recommendations to the Council relevant to the CNMI pelagic fisheries data module, the Pelagic Plan Team developed several associated work items, including:

- Endorse the Archipelagic Plan Team work item to review 2023 CNMI creel survey expansion and commercial landings data, noting that numbers for pelagic fisheries also seem relatively low for the year.
- Supplement the Archipelagic Plan Team working group to develop a non-commercial module for territorial pelagic MUS similar to the one recently developed for territorial archipelagic BMUS and ECS.

2.2.4 OVERVIEW OF PARTICIPATION AND EFFORT

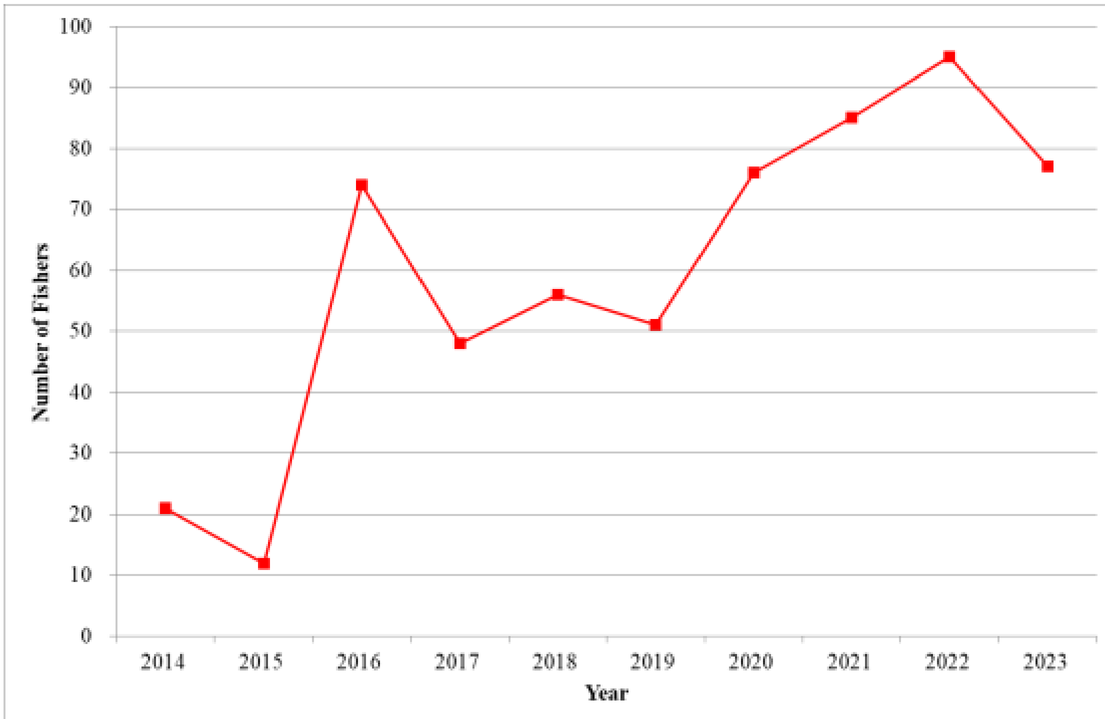


Figure 22. Number of fishers with commercial pelagic landings in the CNMI

Note: Due to reporting methods, this number includes duplicate counts. Supporting data shown in Table A-22.

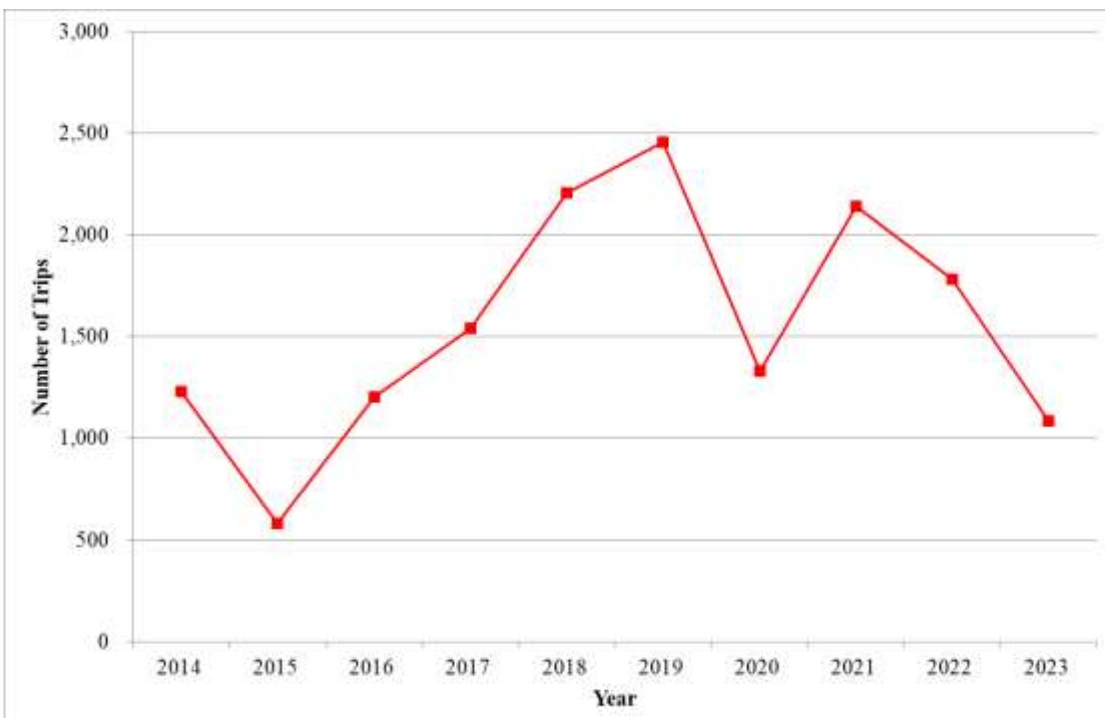


Figure 23. Number of trips with commercial pelagic landings in the CNMI

Supporting data shown in Table A-23.

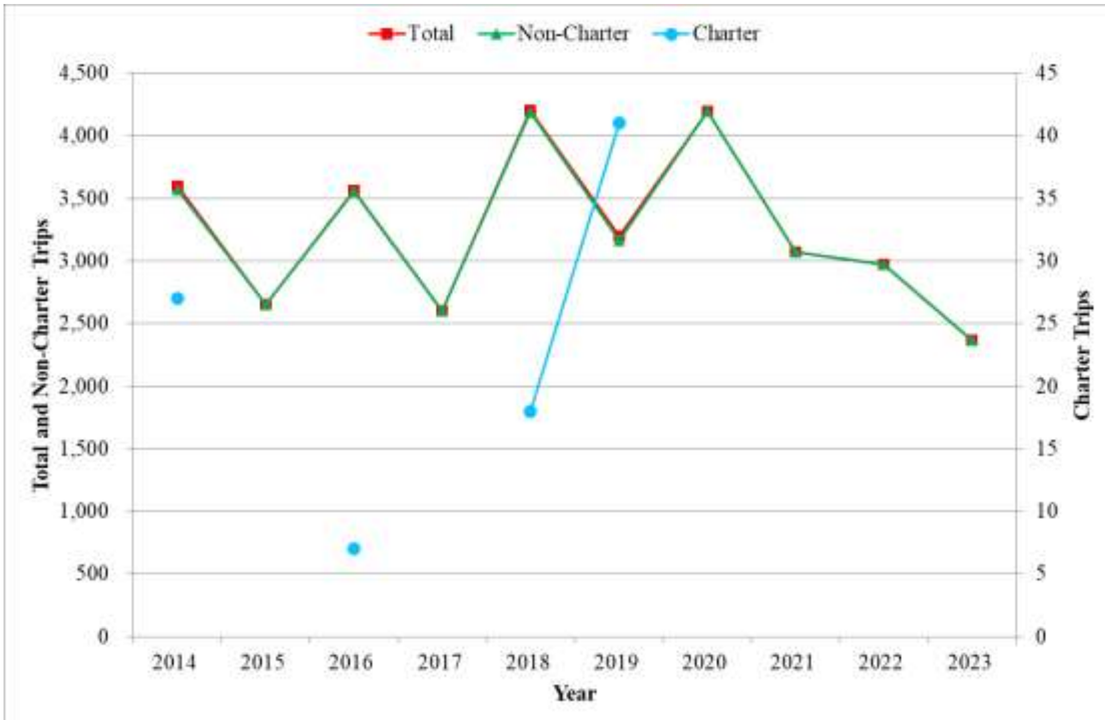


Figure 24. Estimated number of trolling trips from boat-based creel surveys in the CNMI
Supporting data shown in Table A-24.

Figure 25. Estimated number of trolling hours from boat-based creel surveys in the CNMI
Supporting data shown in Table A-25.

Figure 26. Estimated average troll trip length from boat-based creel surveys in the CNMI
Supporting data shown in Table A-26.

2.2.5 OVERVIEW OF LANDINGS

Table 15. Pelagic species composition of boat-based creel survey total estimated catch (lb) in the CNMI in 2023

Species	Total Landings	Non-Charter	Charter
Skipjack Tuna	76,217	76,217	0
Yellowfin Tuna	19,368	19,368	0
Saba (Kawakawa)	2,744	2,744	0
Tunas (Misc.)	0	0	0
Tunas Total	**98,329**	**98,329**	**0**
Mahimahi	11,427	11,427	0
Wahoo	13,875	13,875	0
Blue Marlin	0	0	0
Sailfish	0	0	0
Spearfish	0	0	0
Sharks	0	0	0
Sickle Pomfret	0	0	0
Non-Tuna PMUS Total	**25,302**	**25,302**	**0**
Dogtooth Tuna	906	906	0
Rainbow Runner	1,889	1,889	0

Species	Total Landings	Non-Charter	Charter
Barracuda	67	67	0
Troll Fish (Misc.)	0	0	0
Other Pelagics Total	**2,862**	**2,862**	**0**
Total Pelagics	**126,493**	**126,493**	**0**

Note: Total pelagic landings may be 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 surveys.

Table 16. Commercial pelagic landings (lb), value ($), and average price ($) in the CNMI in 2023

Species	Pounds	Value	Average Price
Skipjack Tuna	83,412.53	249,644.65	2.99
Yellowfin Tuna	15,068.95	50,317.55	3.34
Saba (Kawakawa)	128.50	561.88	4.37
Tunas Total and Average Price	**98,609.98**	**300,524.08**	**3.05**
Mahimahi	10,921.56	33,655.95	3.08
Wahoo	2,997.70	10,646.41	3.55
Blue Marlin	773.75	2,660.00	3.44
Sailfish	262.50	625.00	2.38
Sickle Pomfret	251.18	955.06	3.80
Non-Tuna PMUS Total and Average Price	**15,206.69**	**48,542.42**	**3.19**
Dogtooth Tuna	4,369.14	14,283.04	3.27
Rainbow Runner	728.13	2,459.38	3.38
Barracuda	17.50	56.25	3.21
Other Pelagics Total and Average Price	5,114.77	16,798.67	3.28
Pelagics Total and Average Price	**118,931.44**	**365,865.17**	**3.08**

Note: Total pelagic landings may be 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. Bycatch summary for pelagic fisheries in the CNMI

Year	Number Release	Percent Release	Number Kept	Number Caught	Charter
2014	0	0.0	2,413	2,413	F
2015	0	0.0	2,573	2,573	F
2016	0	0.0	1,667	1,667	F
2017	0	0.0	2,214	2,214	F
2018	0	0.0	1,761	1,761	F
2019	0	0.0	1,270	1,270	F
2020	2*	0.1	1,929	1,931	F

Year	Number Release	Percent Release	Number Kept	Number Caught	Charter
2021	0	0.0	2,600	2,600	F
2022	0	0.0	1,021	1,021	F
2023	0	0.0	797	797	F
2014	0	0.0	15	15	T
2015	0	0.0	17	17	T
2016	0	0.0	59	59	T
2017	0	0.0	4	4	T
2018	0	0.0	67	67	T
2019	0	0.0	74	74	T
2020	0	0.0	112	112	T

* Both individuals released were mahimahi.

Note: Bycatch information is calculated from raw interview creel survey data and represents the percent of fish caught or percent of interviews with bycatch.

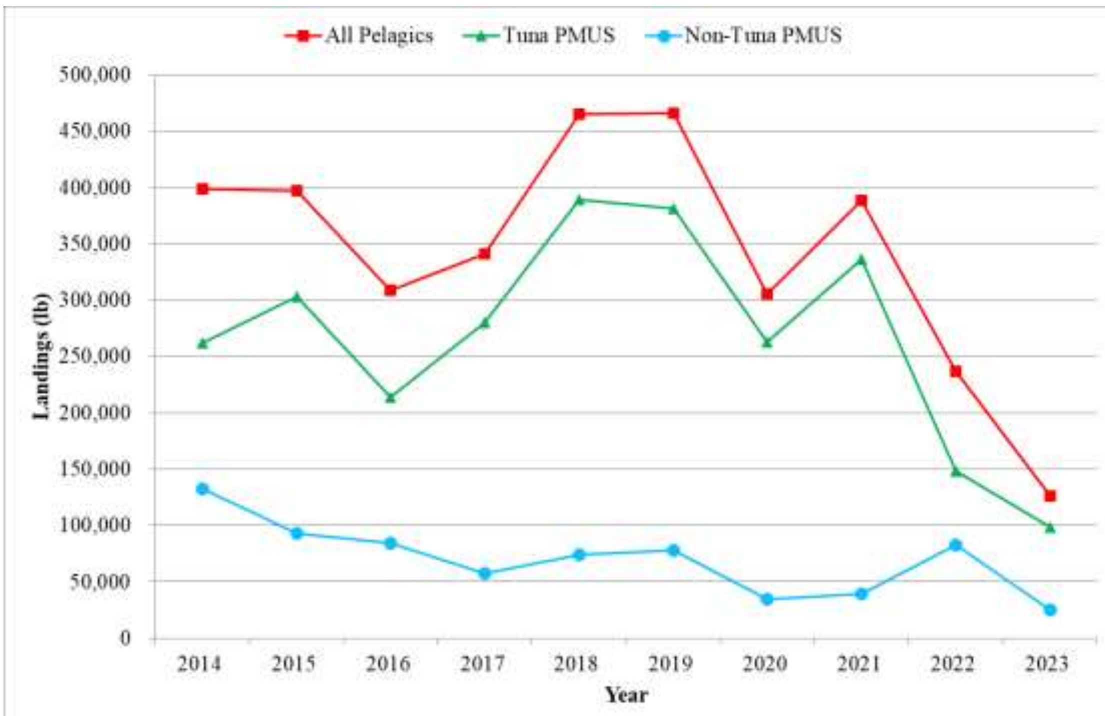


Figure 27. Total estimated catch for all pelagics, tuna PMUS, and non-tuna PMUS from boat-based creel surveys in the CNMI

Supporting data shown in Table A-27.

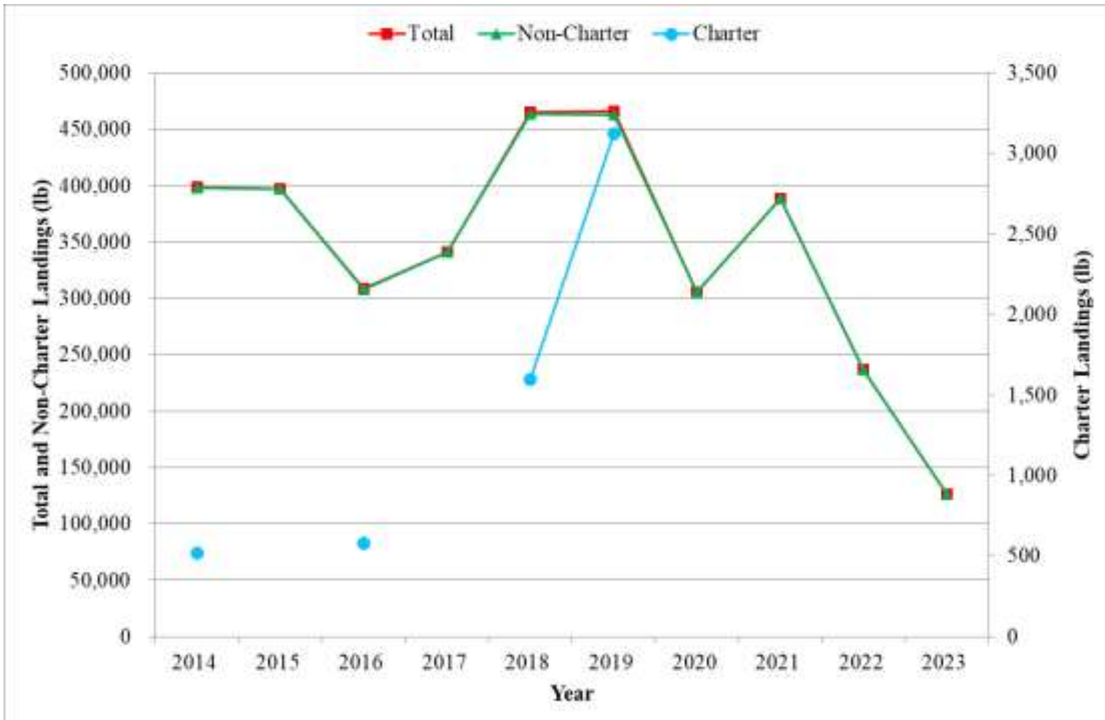


Figure 28. Total estimated catch for all pelagics in the CNMI
Supporting data shown in Table A-28.

Figure 29. Total estimated catch for tuna PMUS in the CNMI
Supporting data shown in Table A-29.

Figure 30. Total estimated catch for non-tuna PMUS in the CNMI

Supporting data shown in Table A-30.

Figure 31. Total estimated catch for skipjack tuna in the CNMI

Supporting data shown in Table A-31.

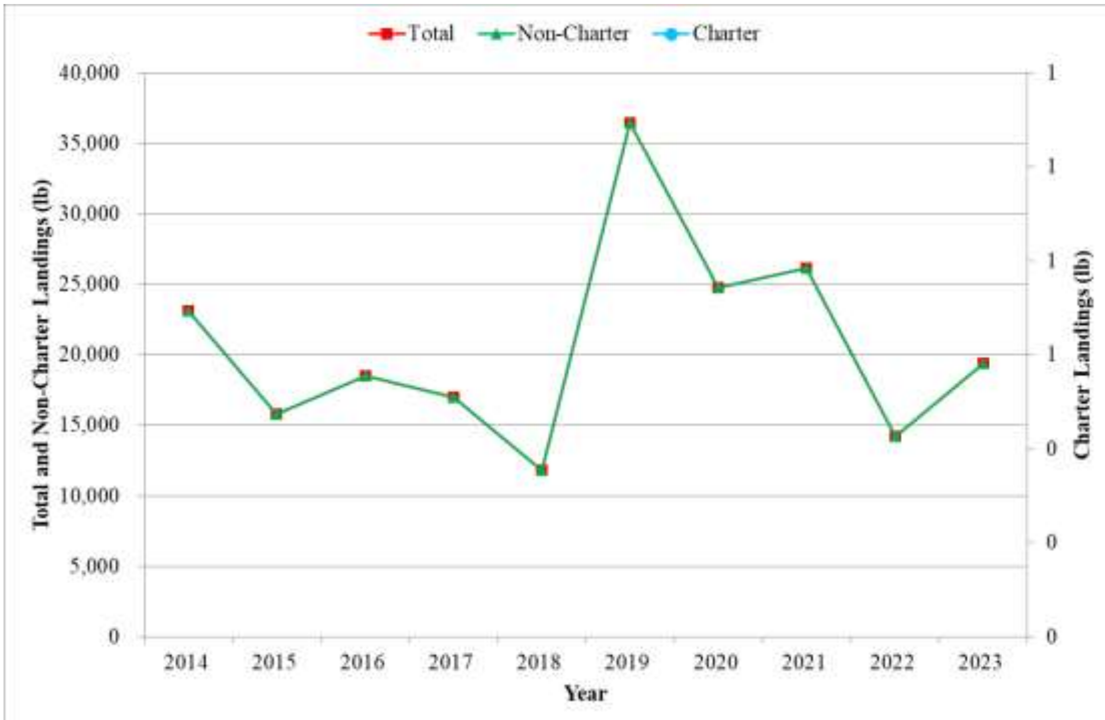


Figure 32. Total estimated catch for yellowfin tuna in the CNMI

Supporting data shown in Table A-32.

Figure 33. Total estimated catch for mahimahi in the CNMI

Supporting data shown in Table A-33.

Figure 34. Total estimated catch for wahoo in the CNMI
Supporting data shown in Table A-34.

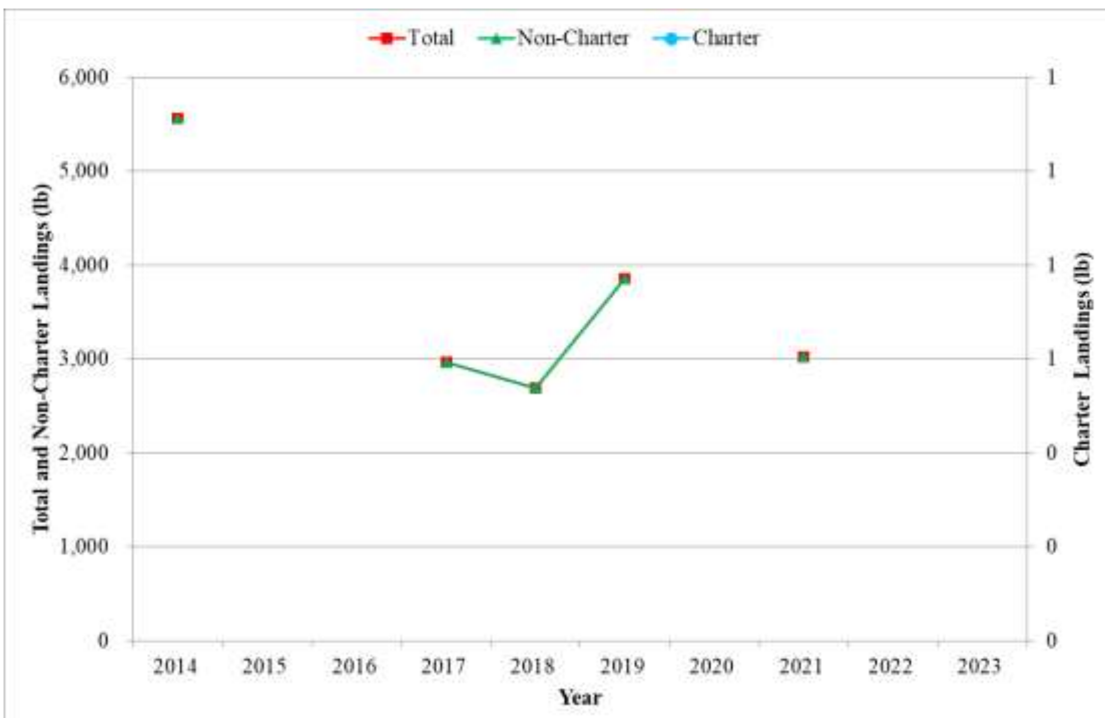


Figure 35. Total estimated catch for blue marlin in the CNMI
Supporting data shown in Table A-35.

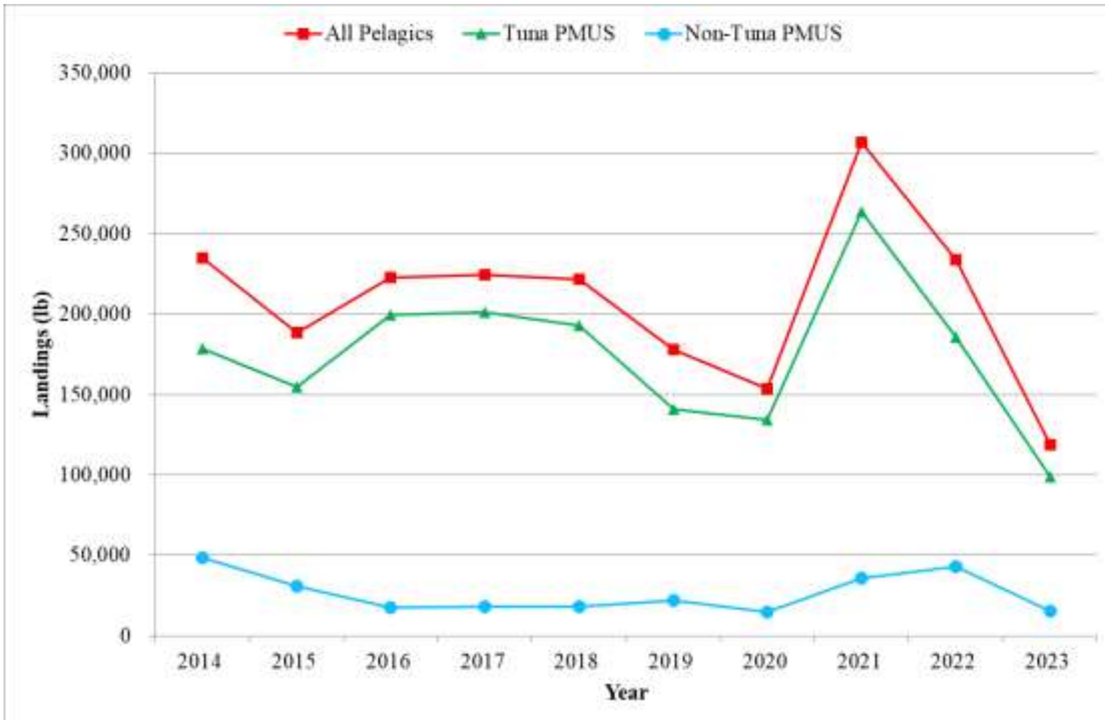


Figure 36. Commercial purchase landings for all pelagics, tuna PMUS, and non-tuna PMUS in the CNMI

Supporting data shown in Table A-36.

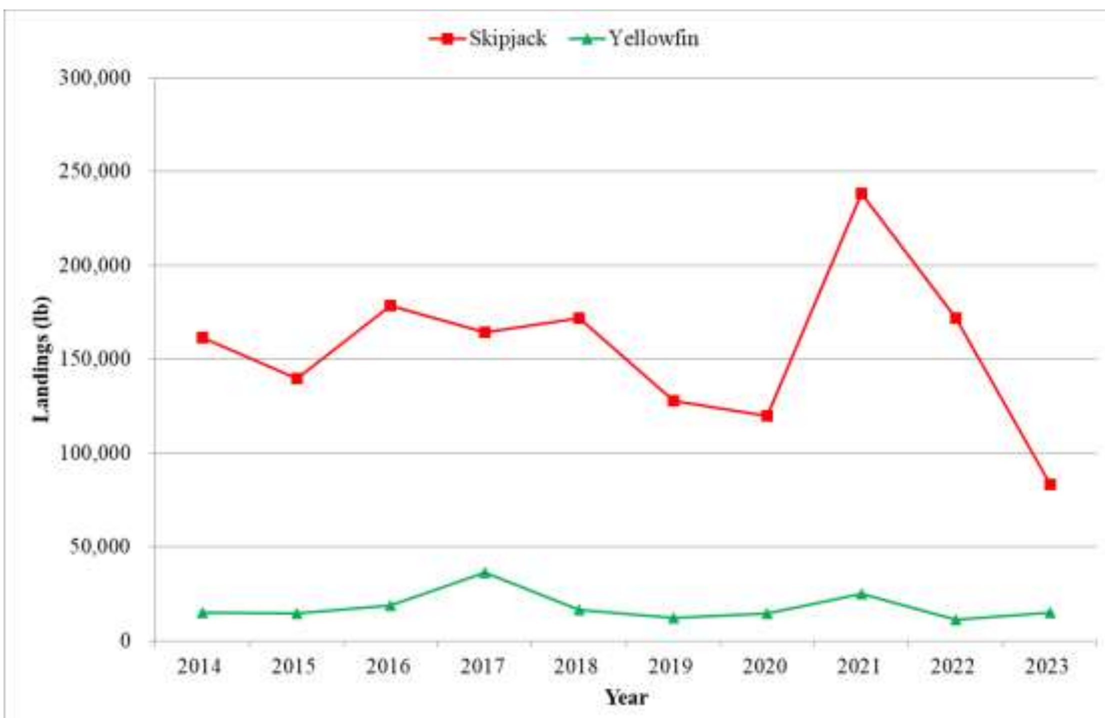


Figure 37. Commercial purchase landings for skipjack and yellowfin tunas in the CNMI

Supporting data shown in Table A-37.

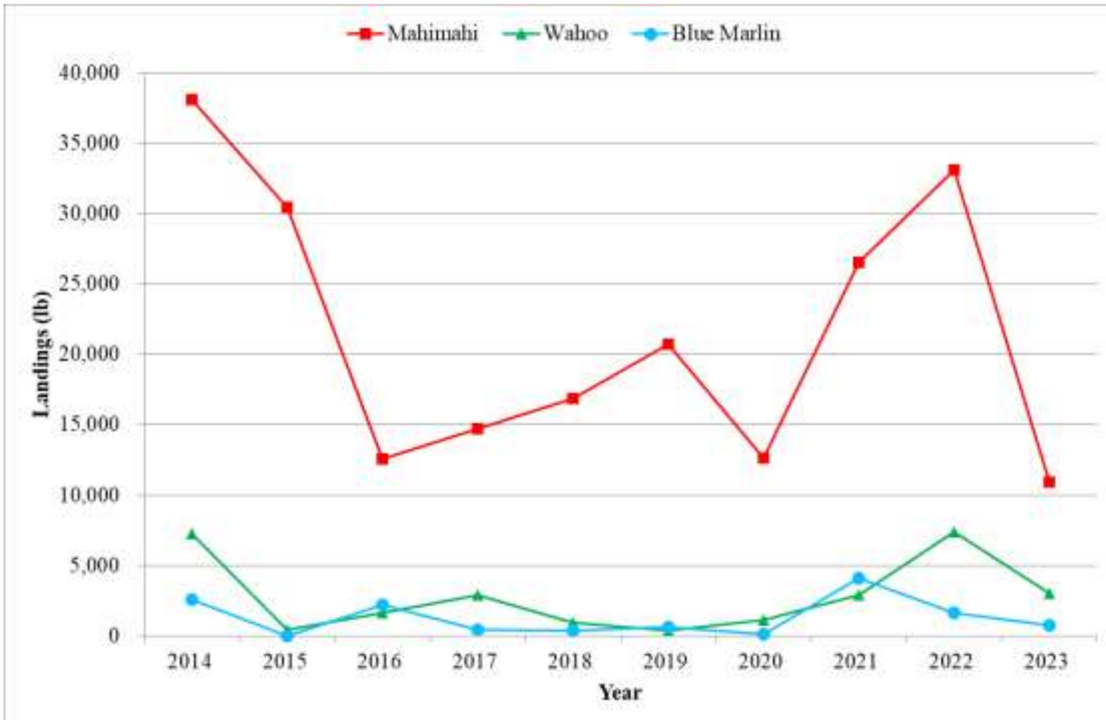


Figure 38. Commercial purchase landings for mahimahi, wahoo, and blue marlin in the CNMI

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. “Pounds per hour trolled” is determined from creel survey interviews and includes charter and non-charter sectors, while “pounds per trip” is determined from commercial invoice receipts.

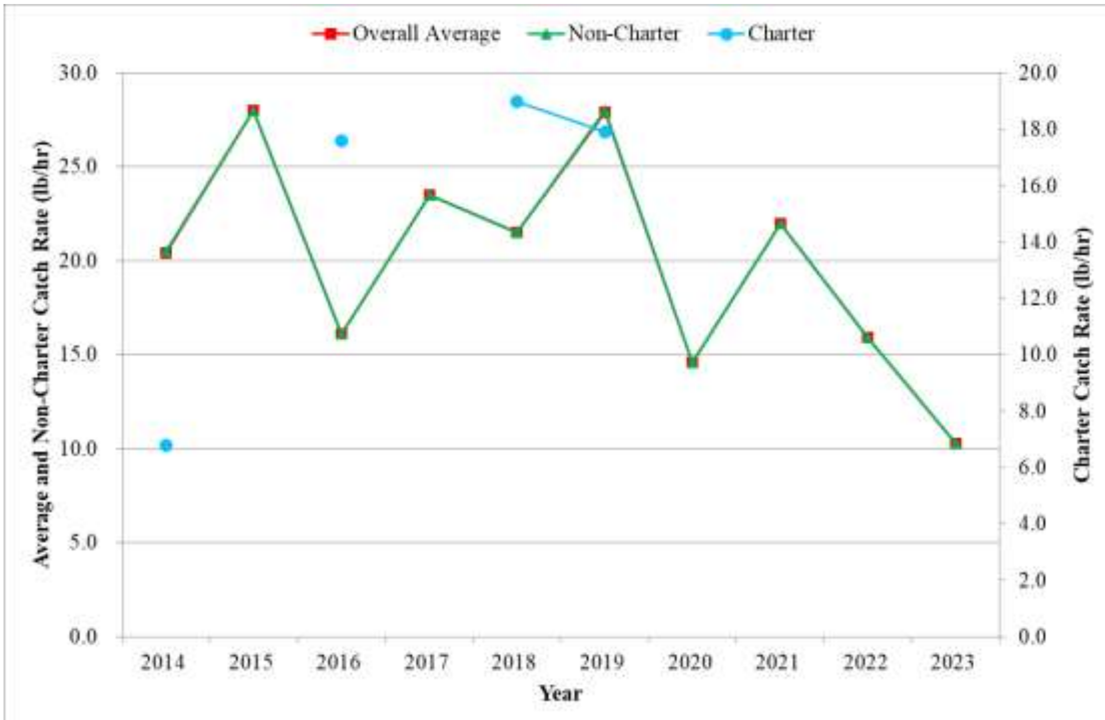


Figure 39. Estimated total trolling catch rates (lb/hr) in the CNMI

Supporting data shown in Table A-39.

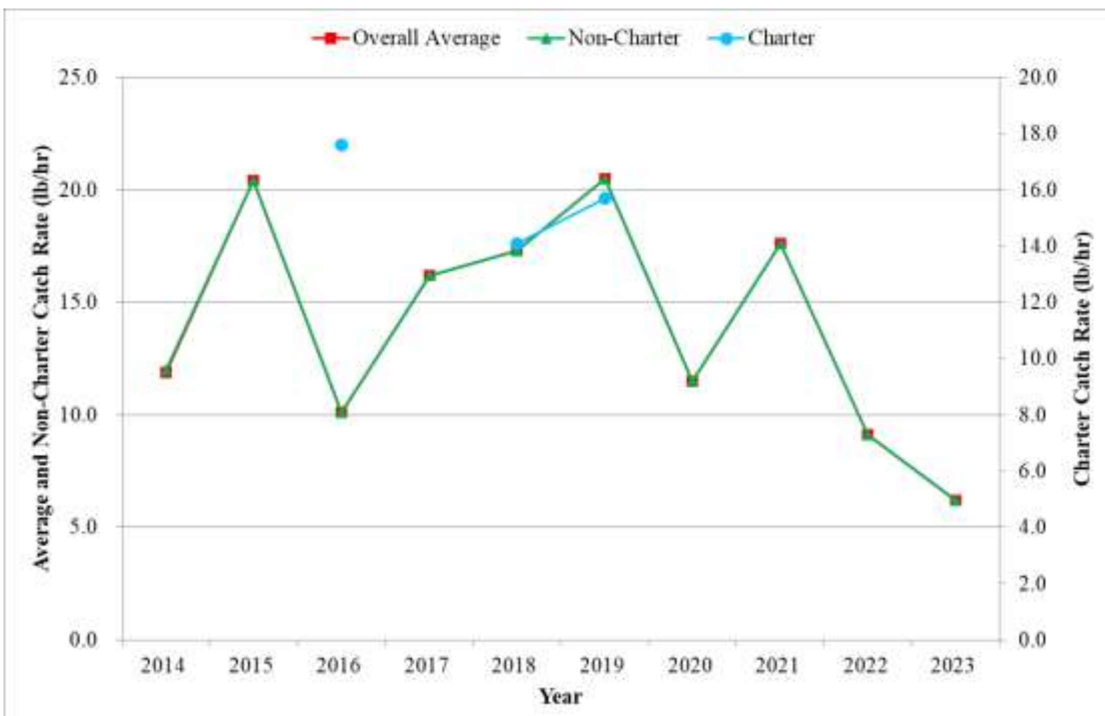


Figure 40. Estimated trolling catch rates (lb/hr) for skipjack tuna in the CNMI

Supporting data shown in Table A-40.

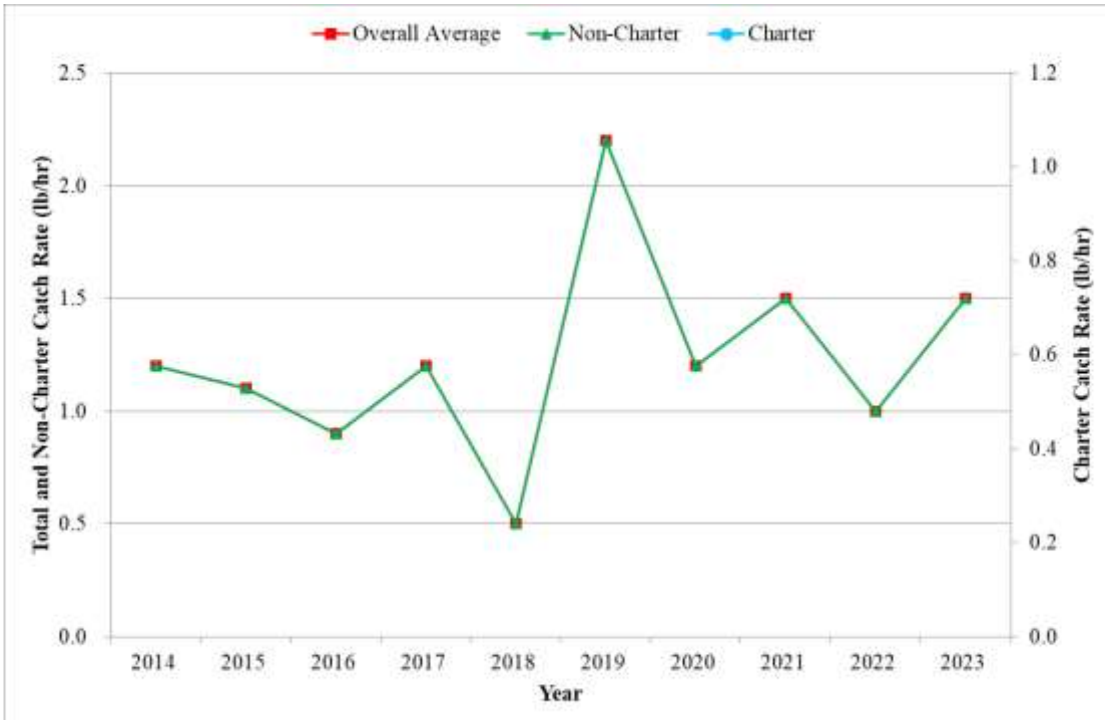


Figure 41. Estimated trolling catch rates (lb/hr) for yellowfin tuna in the CNMI
Supporting data shown in Table A-41.

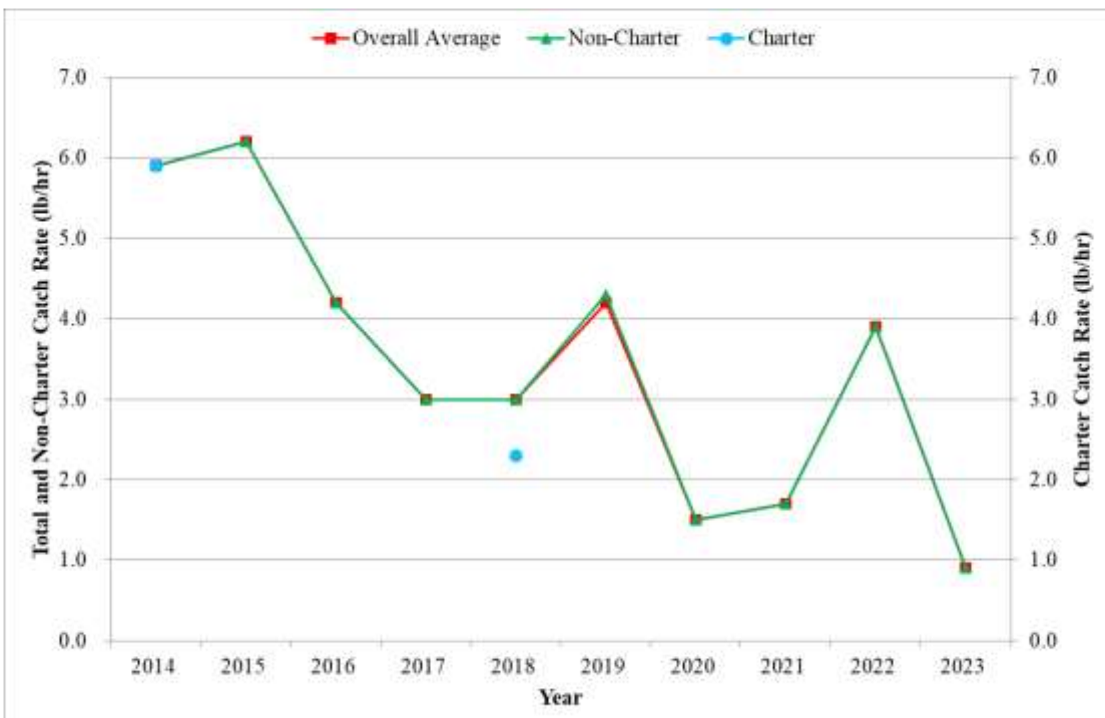


Figure 42. Estimated trolling catch rates (lb/hr) for mahimahi in the CNMI
Supporting data shown in Table A-42.

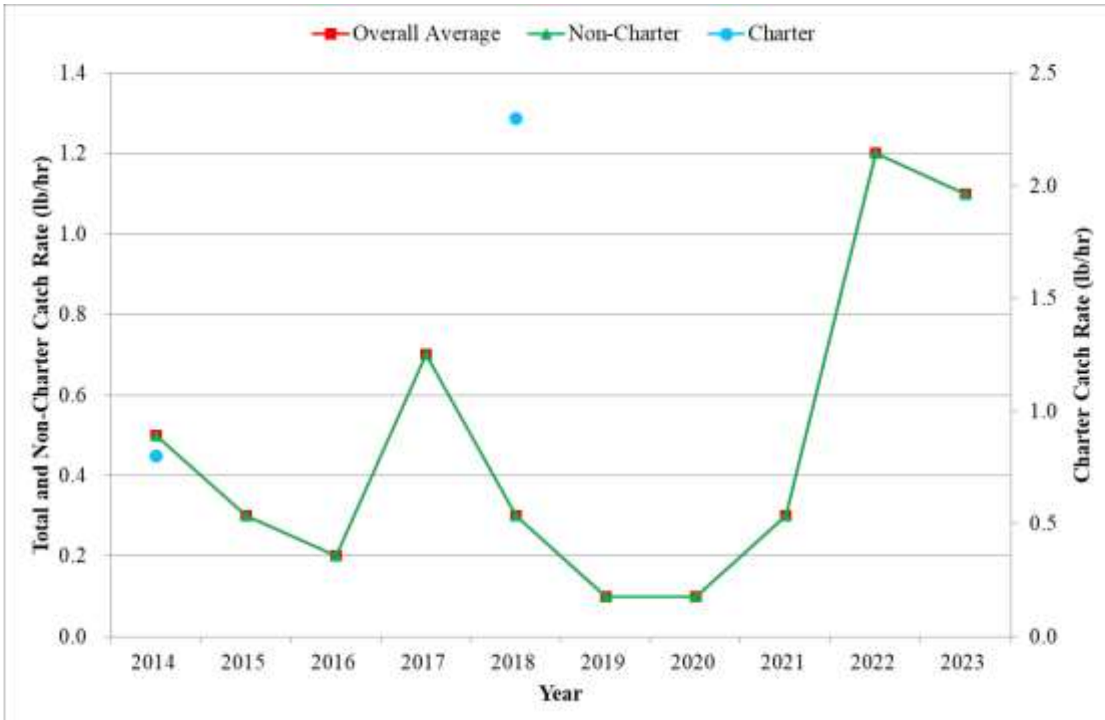


Figure 43. Estimated trolling catch rates (lb/hr) for wahoo in the CNMI

Supporting data shown in Table A-43.

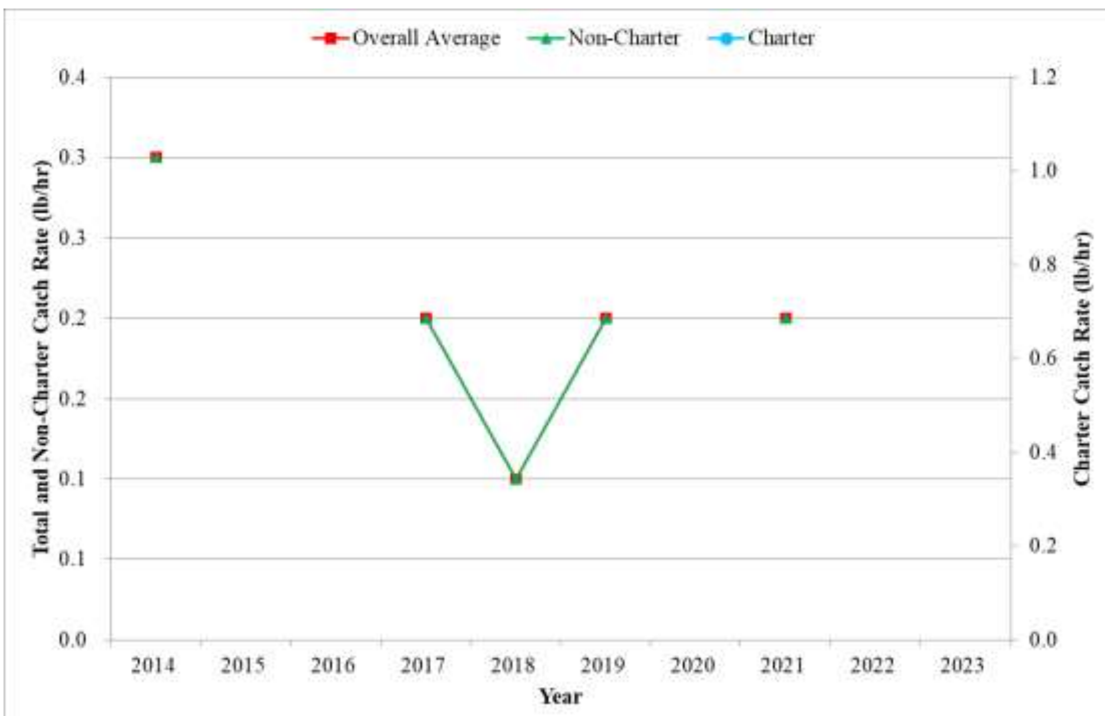


Figure 44. Estimated trolling catch rates (lb/hr) for blue marlin in the CNMI

Supporting data shown in Table A-44.

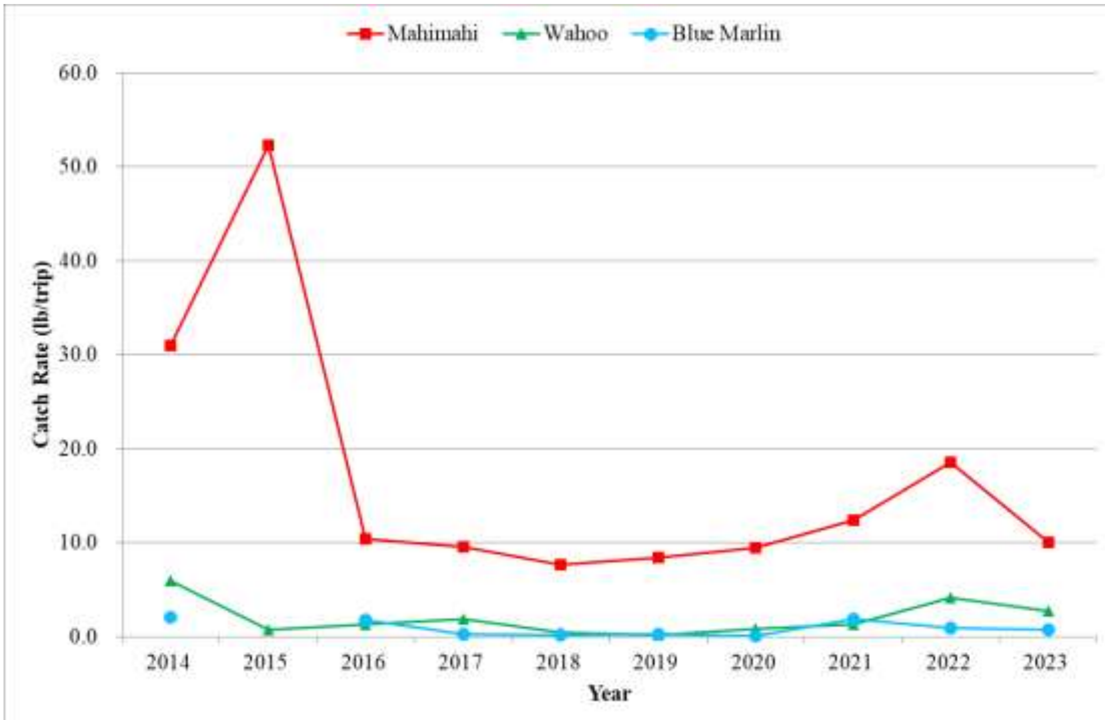


Figure 45. Estimated trolling catch rates (lb/trip) for mahimahi, wahoo, and blue marlin in the CNMI

Supporting data shown in Table A-45.

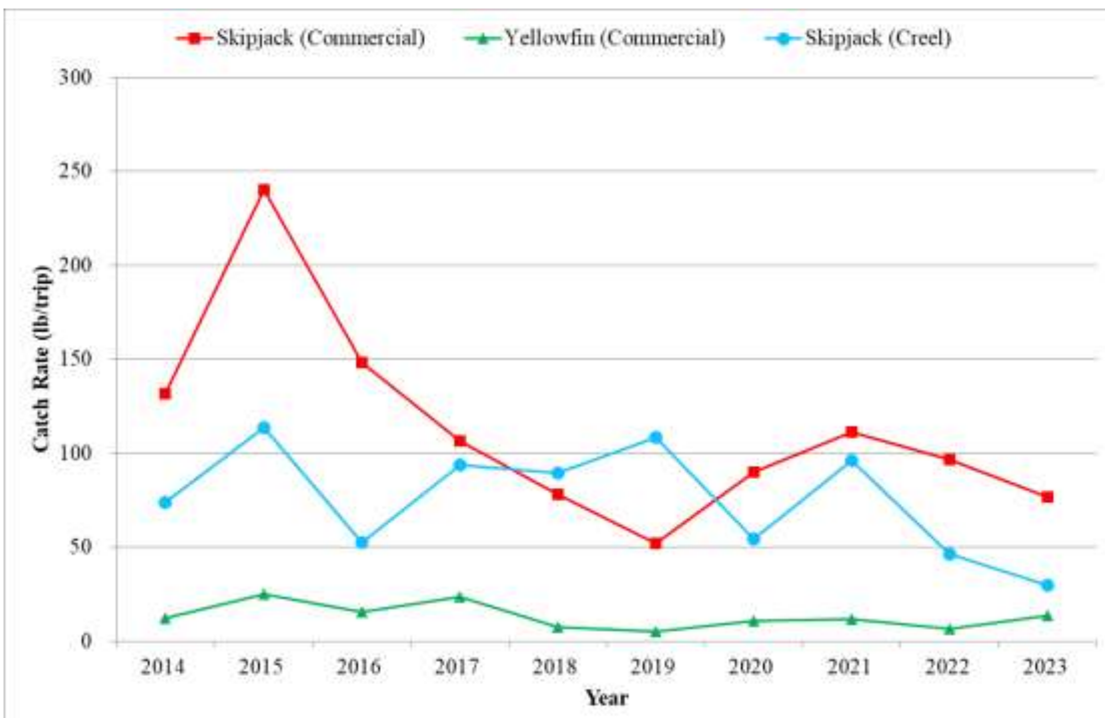


Figure 46. Estimated trolling catch rates (lb/trip) for skipjack and yellowfin tuna in the CNMI

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 PIFSC and the WPFMC. Data are gathered through the offshore creel survey data program. In the past 10 years, DAWR staff have logged between 89 and 97 survey days annually (see Table A-47). The number of trips logged in boat logs has varied from 837 to 1,147 during that period, with the number of interviews slightly greater than half of that year’s total trips. In 2023, DAWR completed 93 of 96 scheduled survey days (May 26, 2023 last day of typhoon Mawar), documented 837 trips and conducted 457 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 PIFSC-sponsored commercial landings system through the commercial receipt book. Transshipment landings data are obtained from the Bureau of Statistics and Plans. All transshipment through Guam ceased as of December 31, 2020.

DAWR has added one biologist in the past 12 months, which should help address chronic manpower shortages of the past. 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 in 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 vary widely in the 43-year time series, ranging between 383,000 and 958,000 lb. The average total catch has shown a slowly increasing trend over the reporting period. The 2023 total expanded pelagic landings were 718,342 lb, an increase of 14.1% when compared with the catch from 2023. Tuna PMUS landings in 2023 were 589,551 lb, an increase of 29.9%, while non-tuna PMUS decreased 30.3% to 115,442 lb in 2023. Landings consisted primarily of five major species: mahimahi, wahoo, bonita or skipjack tuna, yellowfin tuna, and Pacific blue marlin, with skipjack comprising over 68.4% of total landings. Other minor species caught include rainbow runner, barracudas, and pomfrets. Sharks were also caught during 2023, with sharks noted in specific fishermen interviews conducted in 2023 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. 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 in 2023 from the previous year's levels. Skipjack increased by 17.2%, and yellowfin increased by 186%. Wahoo catch decreased 19.9%, mahimahi catch decreased by 44.2%, and blue marlin increased by 63.2%.

Effort. The number of boats involved in Guam's pelagic fishery gradually increased from 193 in 1983 to a high of 546 in 2021. There were 464 boats involved in Guam's pelagic fishery in 2023, an increase of 3.3% from 2022. The majority of the fishing boats are less than 10 m (33 ft) in length and are usually owner-operated by fishers who earn a living outside of fishing. Most fishers sell a portion of their catch, and it is difficult to make a distinction between recreational, subsistence, and commercial fishers. A small but economically significant segment (~5%) of the pelagic fishery is made up of marina-berthed charter boats that are operated primarily by full-time captains and crews. Data and figures for non-charter fishing, charter operations, and bycatch are represented in this report.

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 1995 to 2009, DAWR surveys recorded an annual average of 13.5 weekday trips to the south, and 31 weekend trips to the south, for a total of 44.5 trips per year. Since 2010, DAWR surveys have recorded an annual average of 6.7 weekday trips to the south, and 19.8 weekend trips to the south, for an average of 26.5 trips per year, a decrease of 40.5% per year. As the majority of NTMs for W-517 cover weekdays, the decrease in weekday trips is greater at 50.4%.

According to the NTM announcements for 2023, there were 144 days closed in W-517, due to military exercises.

Also in 2023, there were 110 small-craft advisory days, 142 high-surf advisory/warning days, and 14 typhoon warning days (i.e., seven in May and seven in October).

The small-boat bottomfish and trolling fisheries in Guam relies on boat ramp access and FADs. Recent activities to support the Guam fishery follow.

On Guam, 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 landowners and Department of Public Works officials to develop a new boat launching facility in Talo'fo'fo' Bay on the east side of Guam, and land ownership may determine final placement.

CPUE. Trolling catch rates (lb/per hour fished) for 2023 were 16.8 lb/hr, an increase from 2022. Total CPUE increased by 43% in 2023. Skipjack tuna showed a decrease in CPUE, while yellowfin tuna showed an increase in CPUE from 2022 to 2023. Marlin showed an increase in CPUE from 2022 to 2023. Mahi showed a decrease in CPUE and wahoo CPUE increased from 2022 to 2023. The fluctuations in CPUE are possibly due to variability in the year-to-year abundance and availability of the stocks.

Revenues. Commercial data for Guam pelagic fisheries are non-disclosed due to confidentiality rules that prevent data derived from fewer than three sources to be reported. Because there were fewer than three vendors that reported sales of pelagic fish on Guam in 2023, the data are not able to be presented in this report.

A majority of troll fishers 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 low bycatch in the charter fishery. In 2023, interview data indicated there was again a low bycatch rate; there were 94 fish reported as bycatch in 6,607 tallied fish caught, for a 1.42% rate. Bycatch occasionally occurs in the troll fishery including sharks, shark-bitten and undersized fish.

In 2023, fishers were asked if they experienced a shark interaction. There was a total of 457 interviews for boat-based fishing in 2023, with 120 of these inappropriate for determining shark interaction. Of the remaining 337 interviews, 167 reported interactions with sharks and 170 reported no interactions with sharks for a 49.6% positive rate for interviews where fishers were asked about shark interactions.

2.3.3 PLAN TEAM RECOMMENDATIONS

While there were no Plan Team recommendations to the Council relevant to the Guam pelagic fisheries data module, the Pelagic Plan Team developed several associated work items, including:

- Supplement the Archipelagic Plan Team working group to develop a non-commercial module for territorial pelagic MUS similar to the one recently developed for territorial archipelagic BMUS and ECS.

2.3.4 OVERVIEW OF PARTICIPATION

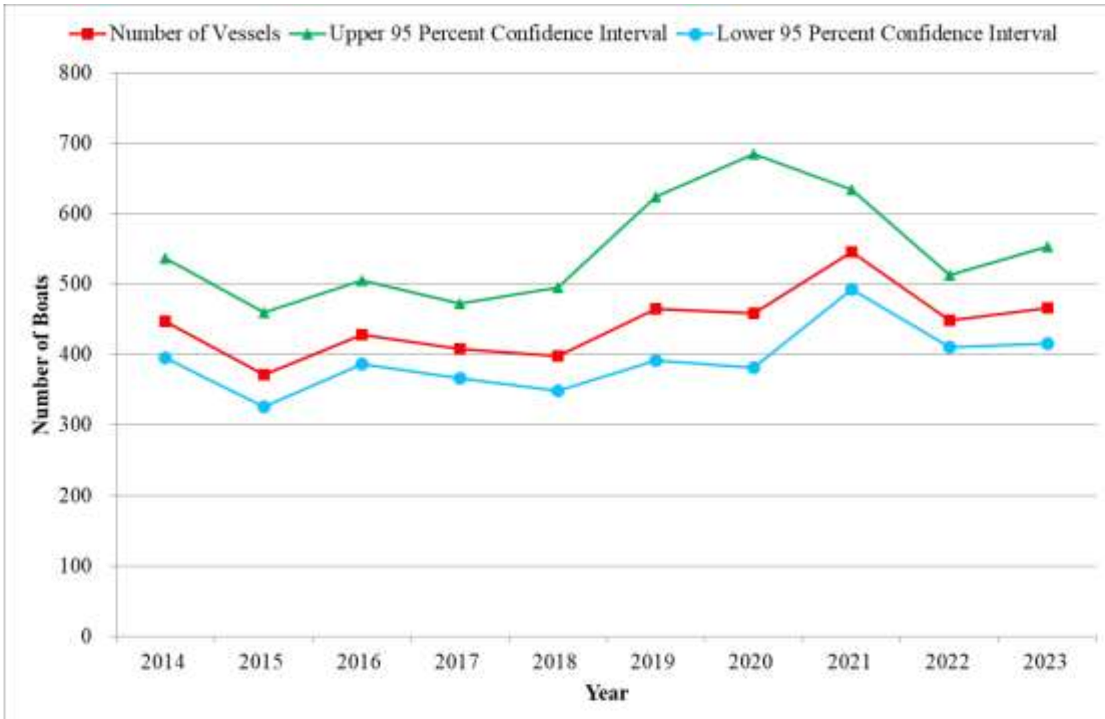


Figure 47. Total estimated number of vessels in Guam pelagic fisheries

Supporting data shown in Table A-48.

2.3.5 OVERVIEW OF TOTAL AND REPORTED COMMERCIAL LANDINGS

Table 18. Total estimated, non-charter, and charter landings (lb) for Guam in 2023

Species	Total	Non-Charter	Charter
Skipjack Tuna	491,671	487,837	3,834
Yellowfin Tuna	97,424	96,339	1,086
Kawakawa	456	456	0
Albacore	0	0	0
Bigeye Tuna	0	0	0
Other Tuna PMUS	0	0	0
TUNAS Total	**589,551**	**584,632**	**4,920**
Mahimahi	52,698	51,621	1,078
Wahoo	45,682	42,059	3,623
Blue Marlin	14,199	11,007	3,192
Black Marlin	0	0	0
Striped Marlin	0	0	0
Sailfish	2,077	2,077	0
Shortbill Spearfish	0	0	0
Swordfish	0	0	0

Species	Total	Non-Charter	Charter
Oceanic Sharks	786	0	786
Pomfrets	0	0	0
Oilfish	0	0	0
NON-TUNA PMUS Total	**115,442**	**106,764**	**8,679**
Dogtooth Tuna	3,210	3,206	4
Rainbow Runner	8,068	7,906	162
Barracudas	1,723	1,723	0
Double-lined Mackerel	0	0	0
Misc. Troll Fish	348	348	0
OTHER PELAGICS Total	**13,349**	**13,183**	**166**
TOTAL PELAGICS	**718,342**	**704,579**	**13,765**

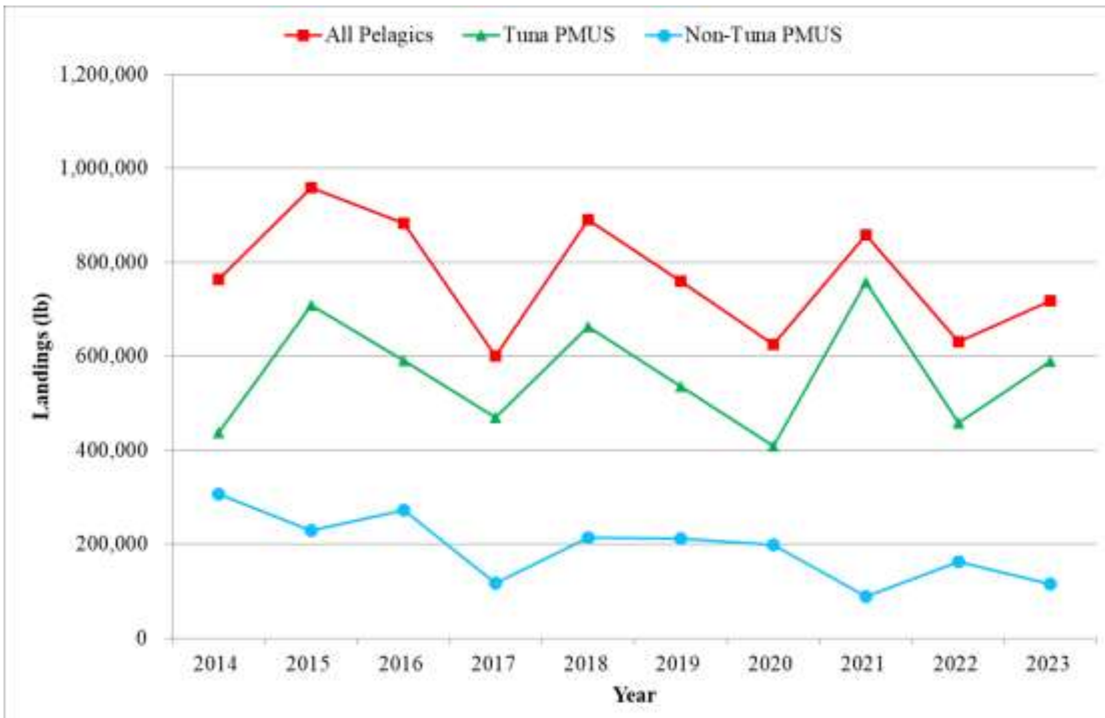


Figure 48. Total estimated landings for all pelagics, tuna PMUS, and non-tuna PMUS from boat-based creel surveys in Guam

Supporting data shown in Table A-49.

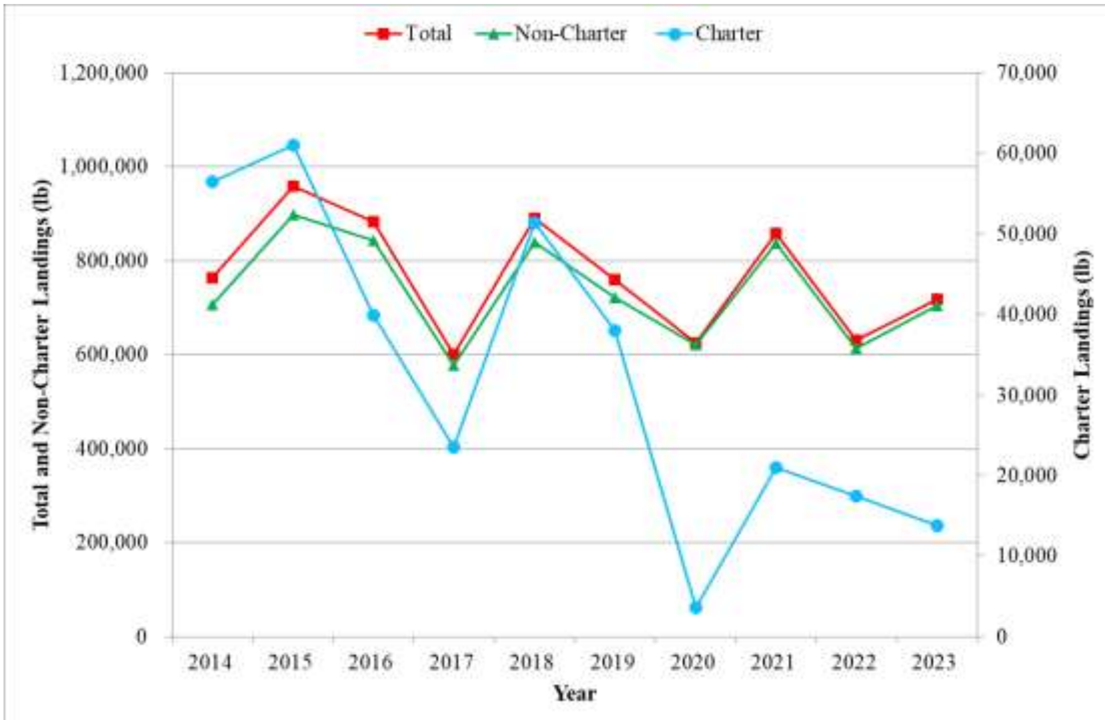


Figure 49. Total estimated landings for all pelagics in Guam

Supporting data shown in Table A-50.

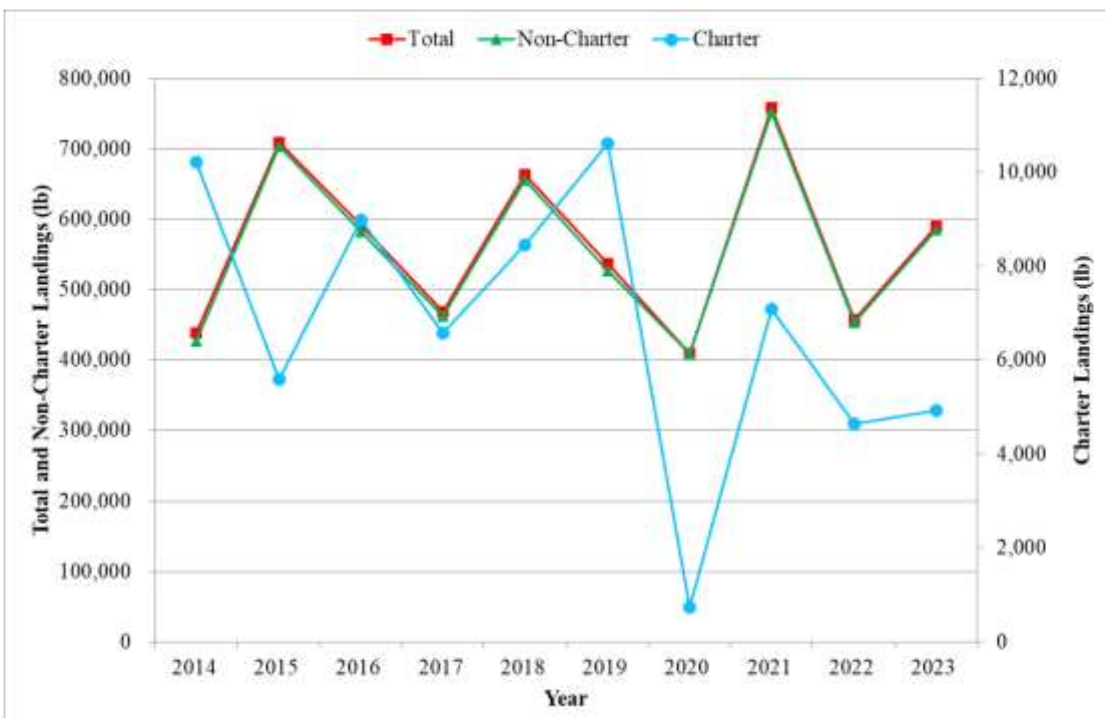


Figure 50. Total estimated landings for tuna PMUS in Guam

Supporting data shown in Table A-51.

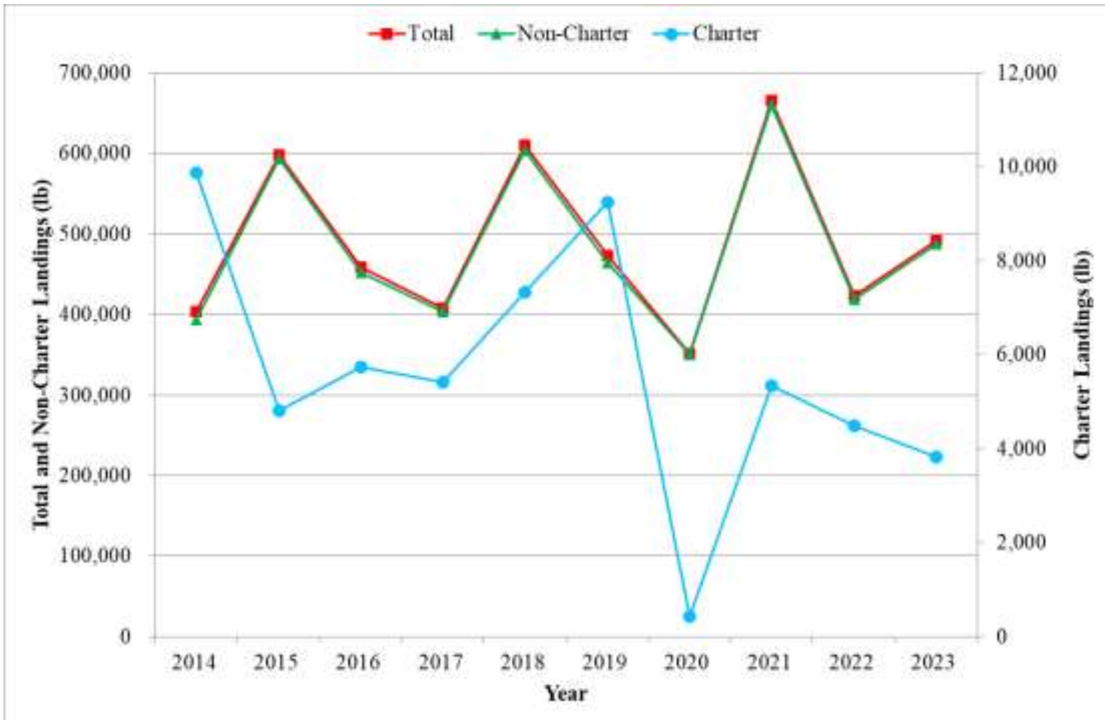


Figure 51. Total estimated landings for skipjack tuna in Guam

Supporting data shown in Table A-52.

Figure 52. Total estimated landings for yellowfin tuna in Guam

Supporting data shown in Table A-53.

Figure 53. Total estimated landings for non-tuna PMUS in Guam

Supporting data shown in Table A-54.

Figure 54. Total estimated landings for mahimahi in Guam

Supporting data shown in Table A-55.

Figure 55. Total estimated landings for wahoo in Guam

Supporting data shown in Table A-56.

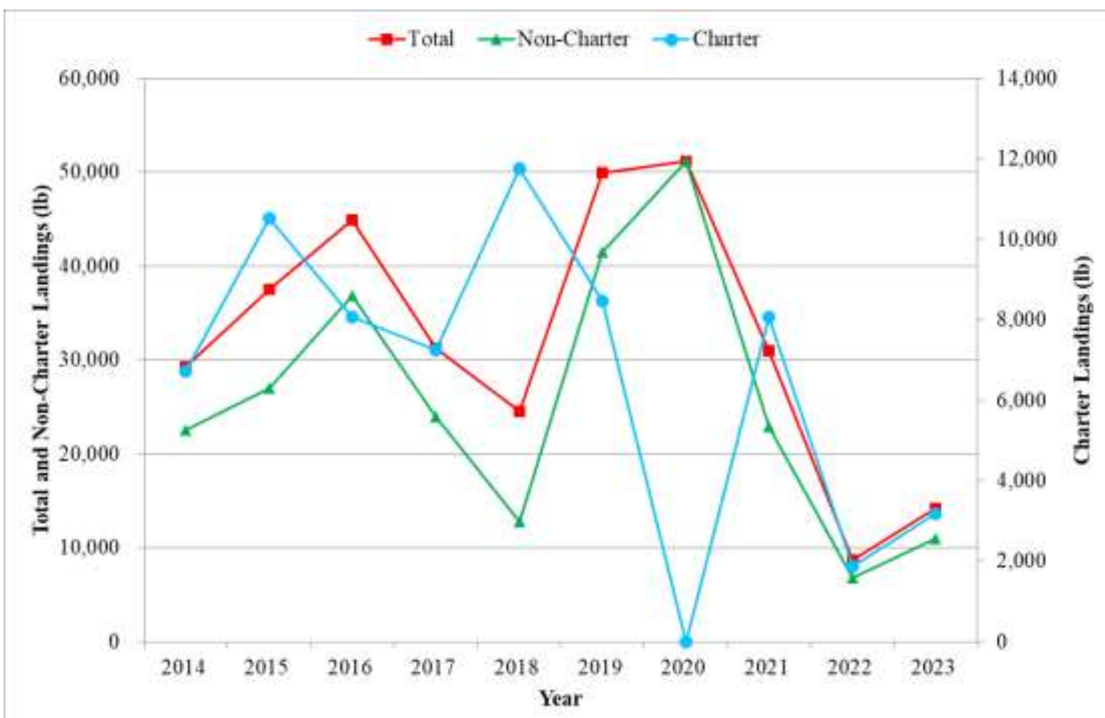


Figure 56. Total estimated landings for blue marlin in Guam

Supporting data shown in Table A-57.

Table 19. Bycatch summary for pelagic trolling fisheries in Guam

Year	Number Release	Percent Release	Number Kept	Number Caught	Charter
2014	21	0.4	5,320	5,341	F
2015	0	0.0	6,807	6,807	F
2016	0	0.0	8,867	8,867	F
2017	0	0.0	6,369	6,369	F
2018	2	0.0	7,987	7,989	F
2019	150	2.0	7,334	7,484	F
2020	4	0.1	3,218	3,222	F
2021	14	0.2	7,785	7,799	F
2022	72	1.2	5,772	5,844	F
2023	94	1.4	6,607	6,701	F
2014	0	0.0	496	496	T
2015	0	0.0	444	444	T
2016	6	1.6	369	375	T
2017	0	0.0	231	231	T
2018	0	0.0	284	284	T
2019	0	0.0	315	315	T
2020	0	0.0	40	40	T
2021	0	0.0	174	174	T
2022	0	0.0	130	130	T
2023	1	0.7	143	144	T

Table 20. Bycatch species summary for pelagic trolling fisheries in Guam

Year	Species	Number Release	Percent Release	Number Kept	Number Caught	Charter
2014	Barracudas	1	2.6	38	39	F
2014	Skipjack Tuna	19	0.5	3,914	3,933	F
2014	Yellowfin Tuna	1	0.4	271	272	F
2018	Wahoo	1	0.2	568	569	F
2018	Yellowfin Tuna	1	0.3	343	344	F
2019	Skipjack Tuna	148	2.5	5,862	6,010	F
2019	Yellowfin Tuna	2	0.4	531	533	F
2020	Mahimahi	4	1.9	204	208	F
2021	Skipjack Tuna	10	0.2	6,724	6,734	F
2021	Yellowfin Tuna	4	0.5	775	779	F
2022	Blue Marlin	1	11.1	8	9	F
2022	Mahimahi	6	2.9	200	206	F
2022	Skipjack Tuna	65	1.3	5,062	5,127	F

Year	Species	Number Release	Percent Release	Number Kept	Number Caught	Charter
2023	Mahimahi	1	0.4	256	257	F
2023	Skipjack Tuna	67	1.3	5,268	5,335	F
2023	Wahoo	4	1.4	290	294	F
2023	Yellowfin Tuna	22	3.1	694	716	F
2016	Mahimahi	3	2.2	133	136	T
2016	Skipjack Tuna	3	2.4	124	127	T
2023	Skipjack Tuna	1	1.1	92	93	T

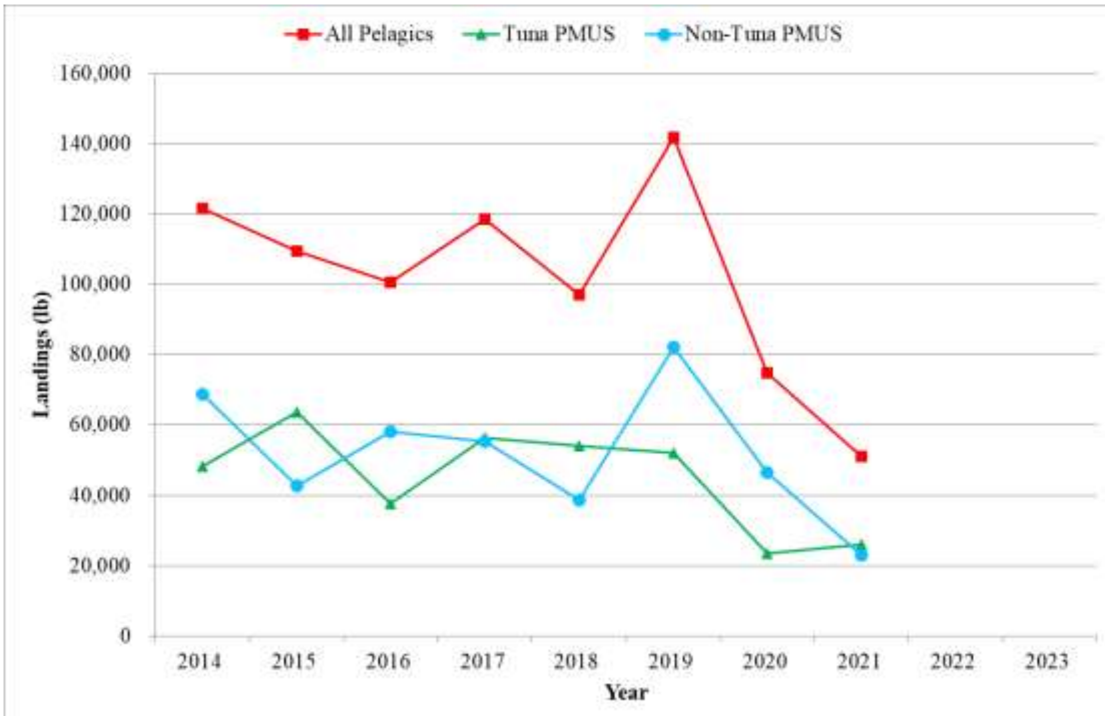


Figure 57. Commercial purchase landings for all pelagics, tuna PMUS, and non-tuna PMUS in Guam

Supporting data shown in Table A-58.

2.3.6 OVERVIEW OF EFFORT AND CPUE

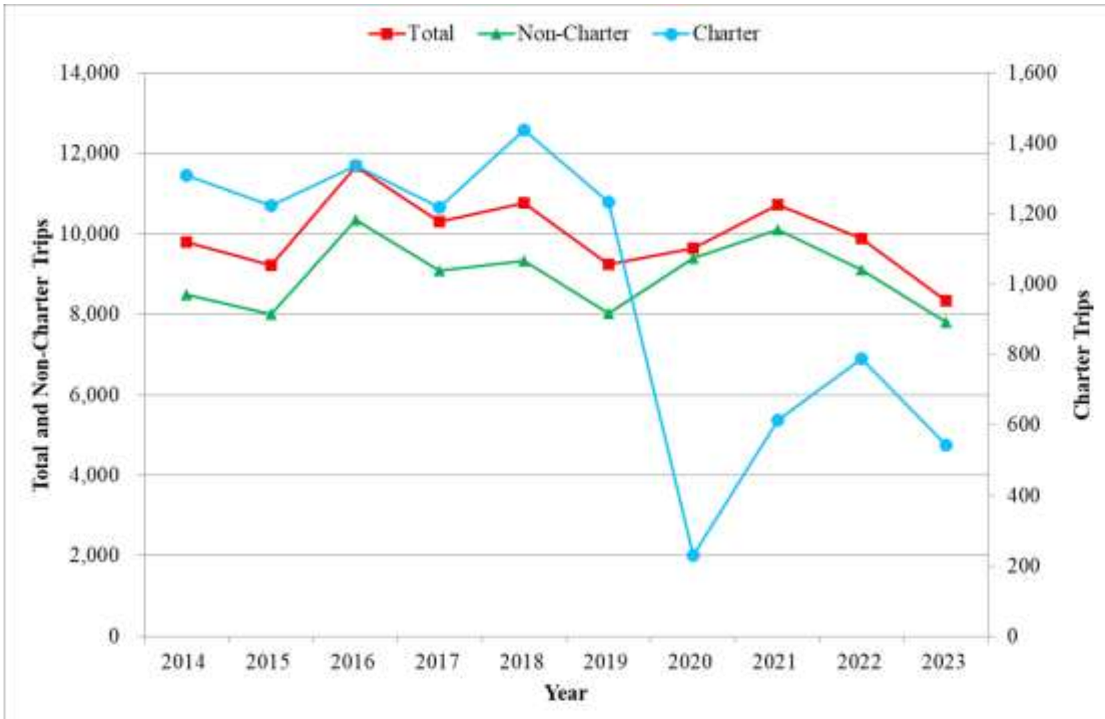


Figure 58. Estimated number of trolling trips from boat-based creel surveys in Guam
Supporting data shown in Table A-59.

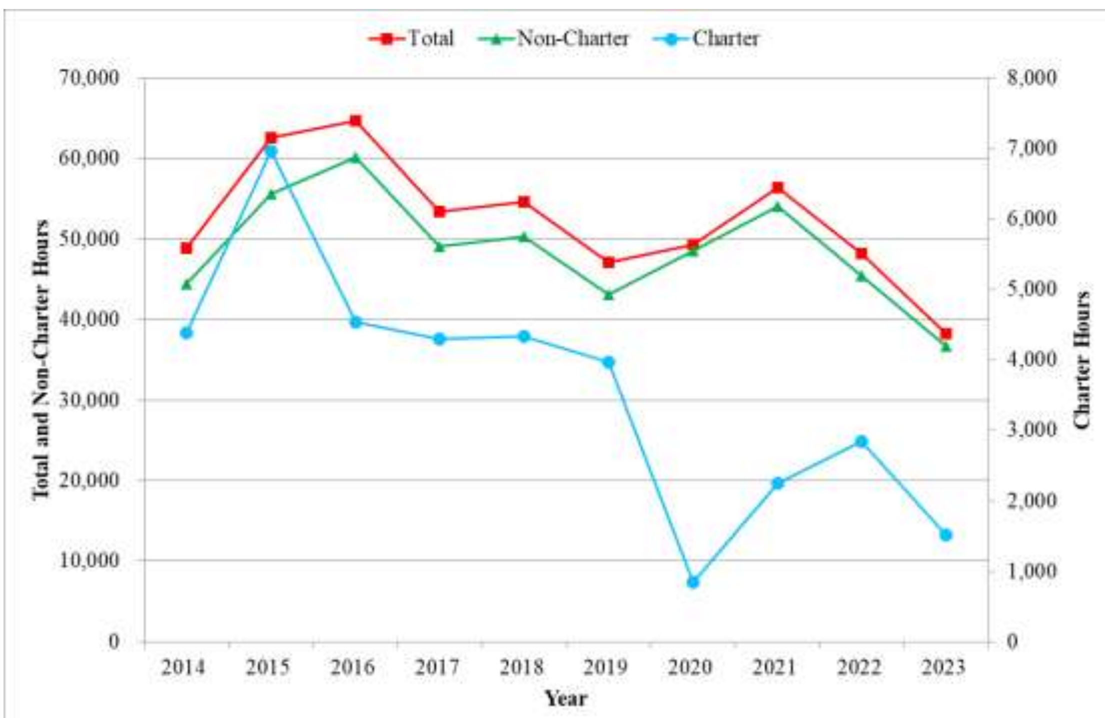


Figure 59. Estimated number of trolling hours from boat-based creel surveys in Guam
Supporting data shown in Table A-60.

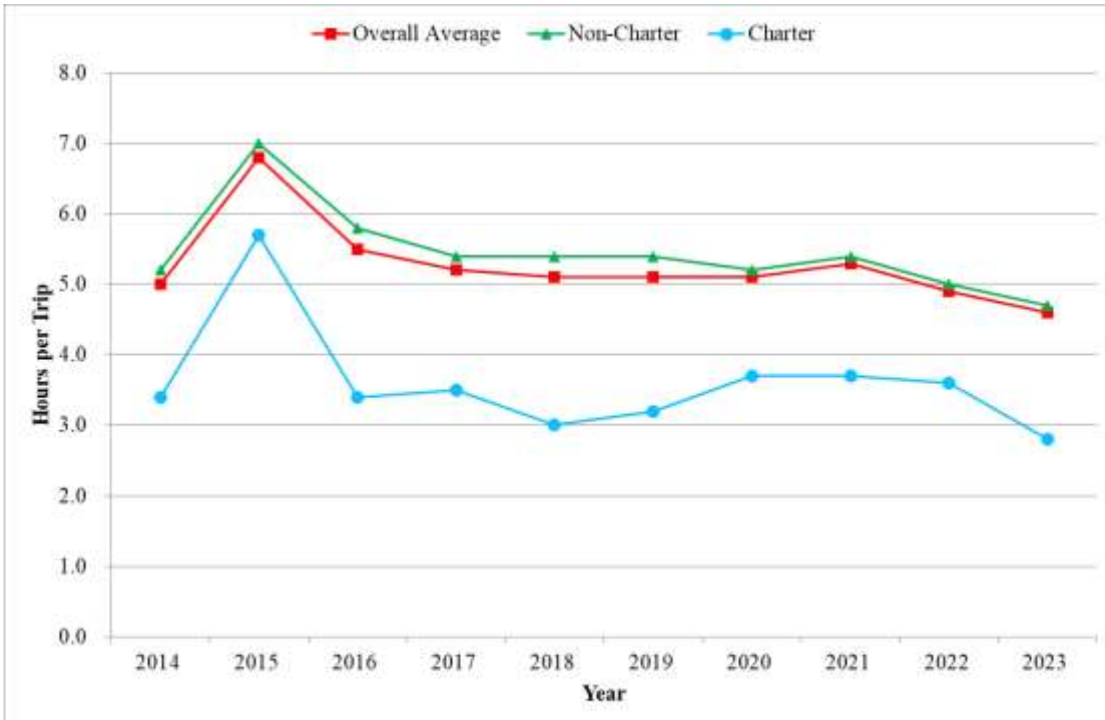


Figure 60. Estimated fishing trip length (hr/trip) from boat-based creel surveys in Guam
Supporting data shown in Table A-61.

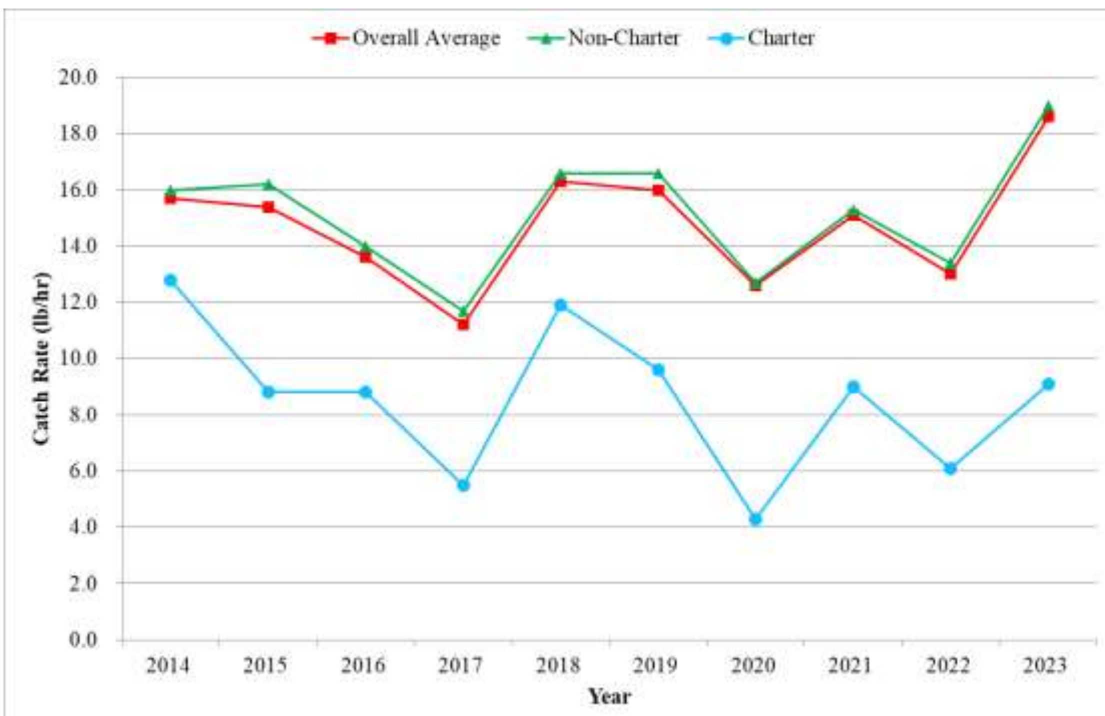


Figure 61. Estimated total trolling catch rates (lb/hr) in Guam
Supporting data shown in Table A-62.

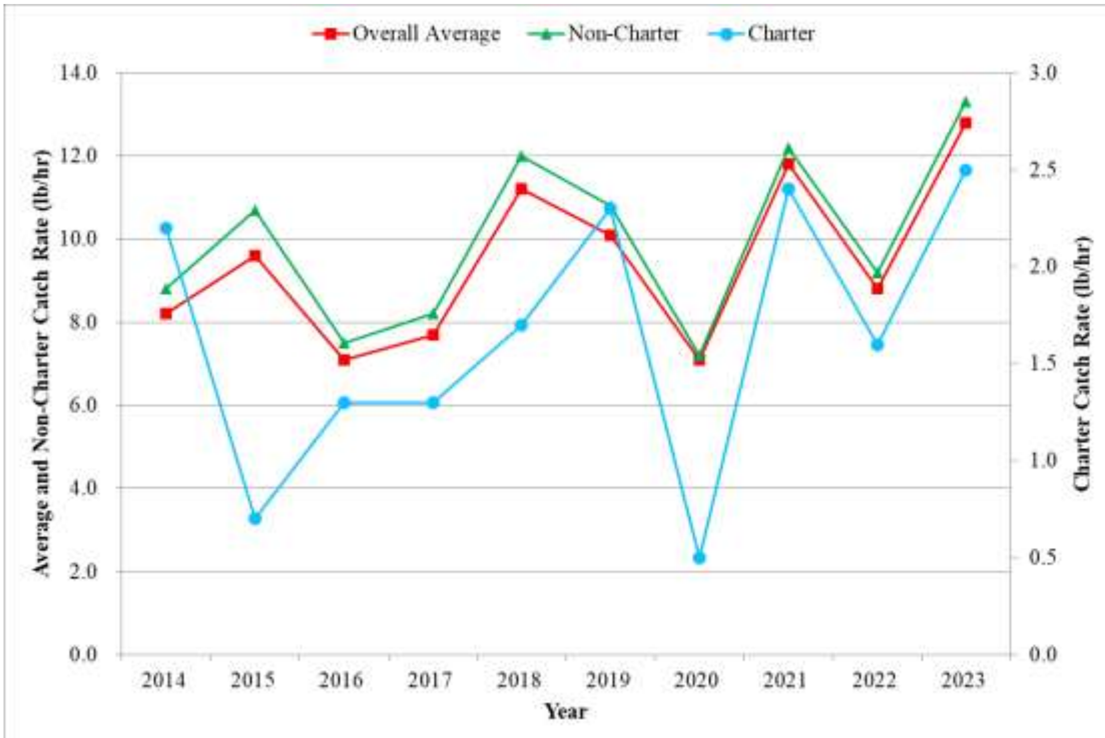


Figure 62. Estimated trolling catch rates (lb/hr) for skipjack tuna in Guam

Supporting data shown in Table A-63.

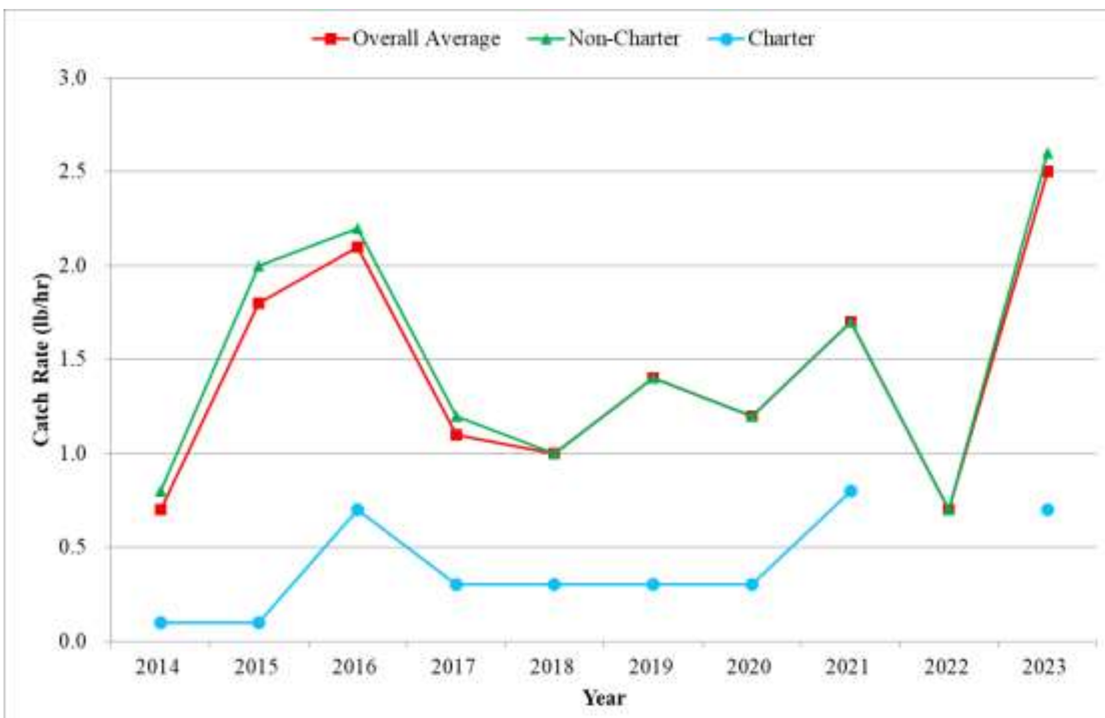


Figure 63. Estimated trolling catch rates (lb/hr) for yellowfin tuna in Guam

Supporting data shown in Table A-64.

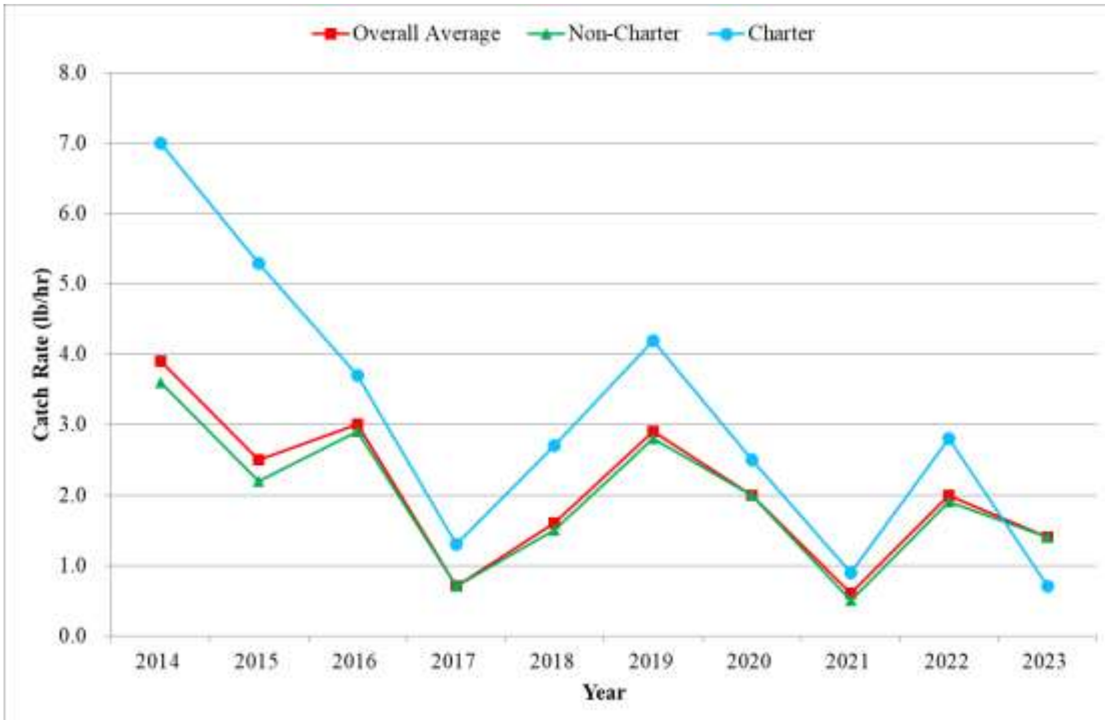


Figure 64. Estimated trolling catch rates (lb/hr) for mahimahi in Guam

Supporting data shown in Table A-65.

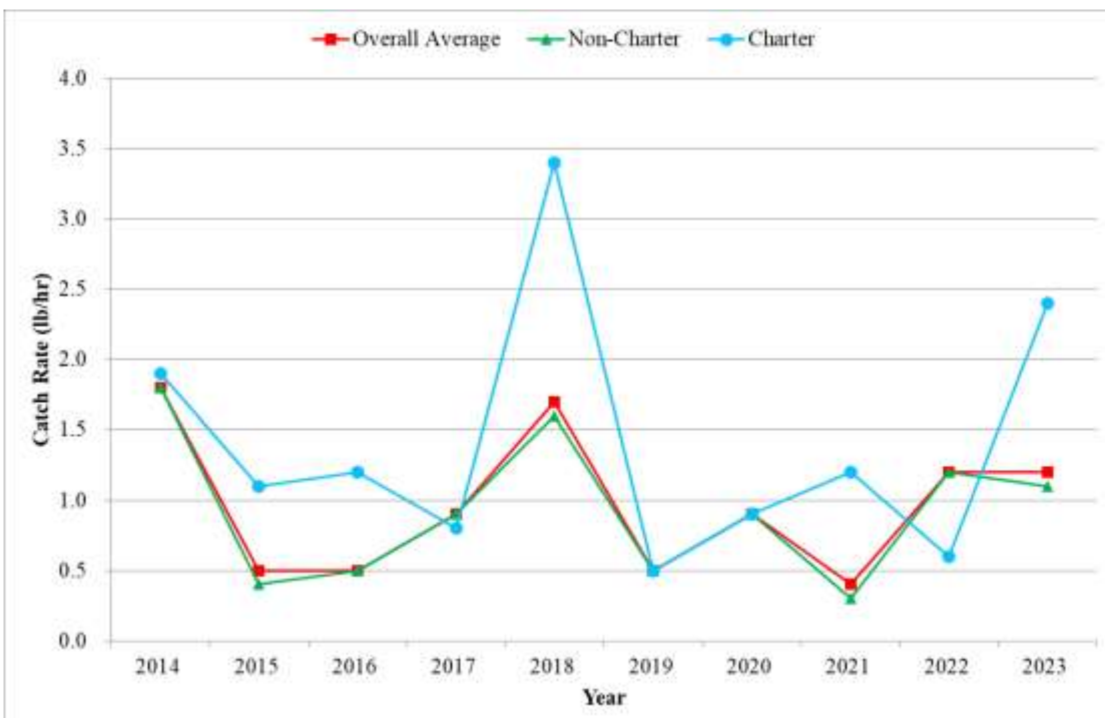


Figure 65. Estimated trolling catch rates (lb/hr) for wahoo in Guam

Supporting data shown in Table A-66.

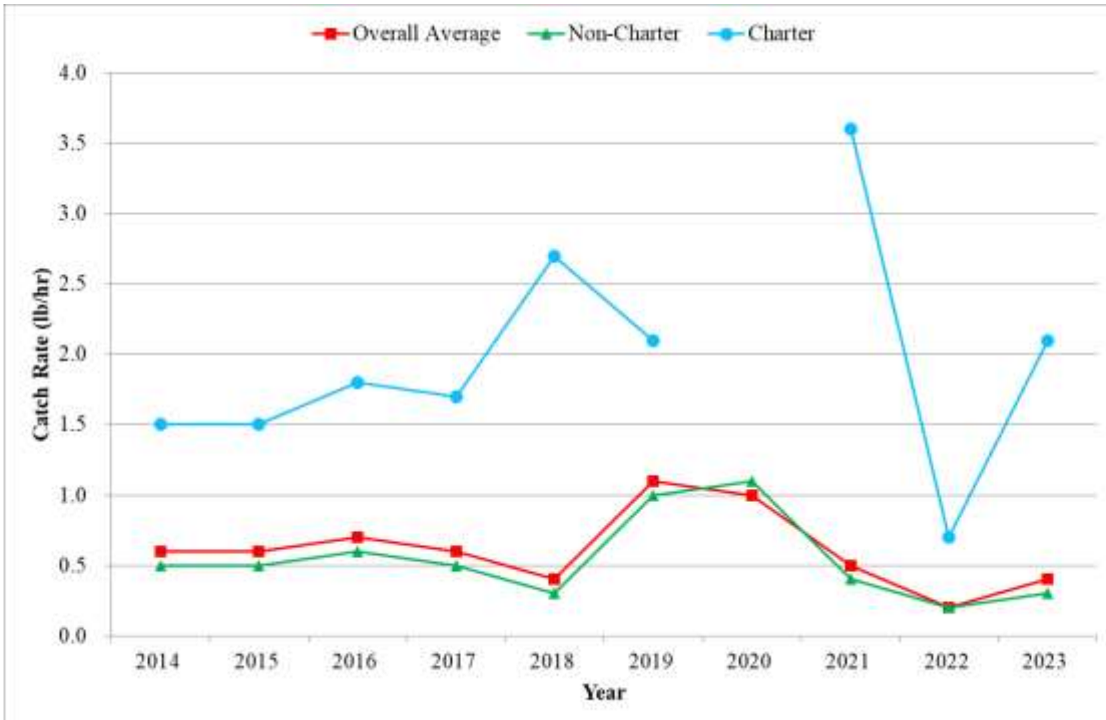


Figure 66. Estimated trolling catch rates (lb/hr) for blue marlin in Guam

Supporting data shown in Table A-67.

2.4 HAWAII

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 PIFSC's longline logbook data.

Any fisherman who takes marine species for commercial purposes is required by HDAR 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 Hawaii-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, fish catches and catch-per-unit-effort (CPUE). 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 Hawaii-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 were 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 lb and marlins greater than 40 lb 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. Additional caveats to interpretation of logbook catch include billfish misidentifications that can bias some billfish species catch (Walsh et al. 2005). The PIFSC Stock Assessment Program works to correct billfish catch (Sculley 2021), however challenges integrating corrected billfish catch into the annua SAFE report preclude their inclusion.

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 Hawaii 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.

Main Hawaiian Islands (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 include 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, Kaho’olawe, Lana’i, Moloka’i, O’ahu, Kaua’i and Ni’ihau.

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), Kaka line (5), 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 "LBS SOLD" and 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 "LBS BOUGHT" and "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 Consumer Price Index (CPI).

2.4.2 SUMMARY OF HAWAII PELAGIC FISHERIES

The following is a summary of effort, catch, CPUE, size of fish, revenue and bycatch for the main pelagic fisheries (deep-set and shallow-set longline, MHI troll, MHI handline, and offshore handline). With COVID-19 recovery into its third year, catches and revenue were below the 10-year average in 2023. With La Niña in early 2023, weather and ocean patterns rapidly transitioned into El Niño by the summer and into 2024. Seasonality of certain species may have been affected by El Niño such as high yellowfin tuna catches and low bigeye tuna catches at the end of the year. There were 10 hurricanes in the Pacific Ocean, most which dissipated in the eastern Pacific Ocean, four which crossed into the western central Pacific one which was a major hurricane that passed far south of the Hawaiian Islands and another which passed closer but was downgraded into a tropical storm by the time it came to Hawaii. The Pacific Missile Range Facility (PMRF) issued only 3 Notice of Hazardous Operation in 2023, each which cover a period of time and area boundaries which could possibly affect fishing area for longline vessels.

Participation. A total of 3,132 fishermen were licensed in 2023 by the HDAR, including 1,829 (58%) who indicated that their primary fishing method and gear were intended to catch pelagic fish. This is an 2% decrease in fishing licenses from the previous year. Most licenses that indicated pelagic fishing as their primary method were issued to longline fishermen (50%) and trollers (31%). The remainder was issued to ika-shibi and palu-ahi (handline) (19%).

Catch. Hawaii commercial fisheries caught and landed 30.0 million pounds of pelagic species in 2023, slightly higher from the previous year. Although each fishery targets or intends to catch a particular pelagic species, a variety of other species were also caught. The deep-set longline fishery targeted bigeye and yellowfin tuna. This was the largest of all pelagic fisheries and its total catch comprised 86% (25.7 million pounds) of all pelagic fisheries. The shallow-set longline fishery targeted swordfish and its catch was 1.6 million pounds, or 5% of the total catch. The MHI troll fishery targeted tunas, marlins and other PMUS caught 1.8 million pounds or 5% of the total. The MHI handline fishery targeted yellowfin tuna while the offshore handline fishery targeted bigeye tuna. The MHI handline fishery accounted for 940,000 pounds (2% of the total). The offshore handline fishery was responsible for 454,000 pounds or less than 1% of the total catch.

The largest component of the pelagic catch was tunas, which comprised 78% of the total in 2023. Bigeye tuna alone accounted for 62% of the tunas and 48% of all the pelagic catch. Billfish catch made up 13% of the total catch in 2023. Swordfish was the largest of these, at 50% of the billfish and 6% of the total catch. Catches of other PMUS represented 9% of the total catch in 2023 with ono being the largest component at 32% of the other PMUS and 3% of the total catch.

Effort. There was a record 150 active Hawai`i-permitted deep-set longline vessels in 2023, three more than the previous year. The number of deep-set trips was 1,594 along with 22,105 sets made in 2023. The number of hooks set by the deep-set longline fishery was a record 66.3 million hooks in 2023. The Hawai`i-permitted shallow-set longline fishery operates mainly in the first half of the year. In 2023, 23 vessels made 71 trips and 853 sets, which was 1 more vessel, 2 more trips and 4 less sets than the previous year. The number of hooks set by this fishery was 1.1 million in 2023, the same as the previous year. The number of days fished by MHI troll fishers has been trending lower from its peak in 2014, with 1,151 fishers logging 14,500 days fished around the MHI in 2023. There were 370 MHI handline fishers that fished 2,837 days in 2023 and was the lowest participation and effort through the ten-year period. The offshore handline fishery only had 6 fishers and 252 days fished in 2023.

CPUE. The deep-set longline fishery targets bigeye tuna and nominal CPUE for this species trended down to its lowest level (2.5 fish per 1,000 hooks) in 2023. Yellowfin tuna CPUE peaked in 2017 and was above the 10-year average for the past 3 years. Albacore CPUE was the lowest of the large tunas but peaked at 0.5 in 2023. Blue marlin and striped marlin CPUEs were at their respective the ten-year average. In contrast, blue shark had the second highest CPUE even though all fish logged were released. The Hawai`i-permitted shallow-set longline fishery targets swordfish and had a CPUE of 7.9 fish in 2023, down from 12.7 fish in 2017. Blue shark, a bycatch species for this fishery too, had a CPUE of 6.3 fish, almost the same as the previous two years. The MHI troll fishery CPUE for yellowfin tuna and blue marlin were both down in 2023. MHI troll CPUE for skipjack tuna reached a ten-year high in 2023 while mahimahi and ono CPUE varied with no clear trend. MHI handline CPUE for yellowfin showed a strong, consistent upward pattern from 2019 through 2022 but dropped in 2023. Albacore and bigeye tuna CPUE were not only much lower than yellowfin tuna but below their respective long-term CPUEs. Bigeye tuna and yellowfin tuna CPUE varied significantly over the ten-year period.

Fish Size. With the exception of bigeye tuna and moonfish the average weight for the remaining pelagic species were close to or below their respective long-term average weight in the deep-set longline fishery. Bigeye tuna caught in the deep-set fishery was 85 pounds in 2023, 4 pounds above the long-term average. All billfish species caught by this fishery were below their 10-year average weight while other PMUS species were close to long-term mean weights. The mean size of swordfish was 131 pounds in 2023, much lower from the 10-year average weight. The pattern of average weight for tunas, billfish and other PMUS in by the shallow-set longline fishery was similar to fish size in the deep-set longline fishery. Swordfish caught by the shallow-set longline fishery was 168 pounds, below the 10-year average weight. In general, the average weight of most fish caught by the shallow-set longline fishery is higher than fish caught by the deep-set longline fishery. The average weight for bigeye tuna, yellowfin tuna, blue marlin and swordfish caught by the troll and handline fisheries were above their long-term averages in 2023.

Revenue. The total revenue from Hawai'i's pelagic fisheries was $118.1 million in 2023. This was a decrease of $15.8 million, or down 12% from the previous year. Although the recovery from the COVID pandemic continued, the market was weaker with lower fish prices in 2023. Revenue of tunas represented $97.0 million or 82% of the total pelagic revenue with bigeye tuna ($66.9 million) and yellowfin tuna ($28.4 million) representing 57% and 24%, respectively in 2023. Billfish contributed $12.0 million or 10% of the total revenue with swordfish accounting for 7% of the total revenue. The deep-set longline revenue was $100.5 million in 2023, representing 85% of the total revenue for pelagic fish in Hawai'i. The shallow-set longline fishery revenue was $6.8 million, a decrease of $3.2 million in 2023 accounting for 6% of the revenue. Most of shallow-set trips land their catch in Hawaii rather than off-loading in California. Revenue from all small boat fisheries decreased in 2023. The MHI troll revenue was $6.0 million or 5% of the total in 2023. The MHI handline fishery decreased to $2.6 million (3% of total revenue). The offshore handline fishery was $1.3 million in 2023.

Bycatch. A total of 98,897 fish were released by the deep-set longline fishery in 2023 of which PMUS sharks accounted for 84% of the deep-set longline bycatch. There is almost no market demand for sharks in Hawai'i. Of all shark species combined, 99.9% of the deep-set longline shark catch was released. Conversely, bycatch rate for the deep-set longline fishery was only 4% for targeted and incidentally caught pelagic species in 2023. A total of 8,270 fish were released by the shallow-set longline fishery in 2023. PMUS sharks accounted for 91% of the shallow-set longline bycatch. Of all shark species combined, 100% of the shallow-set longline shark catch were released. Conversely, bycatch rate for the shallow-set longline fishery was 5% for targeted and incidentally caught pelagic species in 2023. Since shallow-set longline trips are often longer than deep-set trips, the shallow-set sector conserves space for swordfish, which they target, and foregoes keeping other pelagic species due to their short shelf life.

2.4.3 PLAN TEAM RECOMMENDATIONS

While there were no Plan Team recommendations to the Council relevant to the CNMI pelagic fisheries data module, the Pelagic Plan Team developed several associated work items, including:

- Excluding the pelagic Hawaii non-commercial module from the 2023 annual SAFE reports due to concerns of the efficacy of HMRFS data and how readers of the reports may interpret the presentation of non-commercial fishery point estimates. The Plan Teams note that a (non-Plan Team) multi-sector stakeholder working group will continue making progress and report back at the joint intersessional meeting.

2.4.4 OVERVIEW OF PARTICIPATION – ALL FISHERIES

Table 21. Number of HDAR Commercial Marine Licenses

	Number of licenses	
Primary Fishing Method	**2022**	**2023**
Trolling	540	566
Longline	956	910
Ika Shibi & Palu Ahi	359	347
Aku Boat (Pole and Line)	9	6
Total Pelagic	1,864	1,829
Total All Methods	3,201	3,132

2.4.5 OVERVIEW OF LANDINGS AND ECONOMIC DATA

Table 22. Hawaii commercial pelagic catch, revenue, and price by species

	2022			**2023**		
Species	**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	457	$670	$2.13	1,125	$861	$1.18
Bigeye tuna	14,799	$75,947	$5.25	14,520	$66,885	$4.95
Bluefin tuna	3	$37	$7.75	4	$42	$9.27
Skipjack tuna	460	$888	$2.94	393	$717	$2.94
Yellowfin tuna	7,175	$29,079	$4.38	7,351	$28,433	$4.06
Other tunas	3	$5	$3.82	4	$20	$4.63
Tuna PMUS subtotal	**22,897**	**$106,625**	**$4.91**	**23,397**	**$96,958**	**$4.51**
Billfish PMUS						
Swordfish	2,049	$10,660	$5.02	1,892	$8,077	$4.14
Blue marlin	1,243	$2,430	$2.79	949	$1,986	$2.31
Spearfish (hebi)	296	$658	$2.22	441	$617	$1.39
Striped marlin	645	$2,385	$2.95	445	$1,247	$2.58
Other marlins	27	$78	$2.42	42	$55	$1.88
Billfish PMUS subtotal	**4,260**	**$16,211**	**$3.92**	**3,769**	**$11,983**	**$3.18**
Other PMUS						
Mahimahi	782	$3,263	$4.41	895	$3,070	$3.58
Ono (wahoo)	669	$3,233	$4.84	900	$2,629	$3.02
Opah (moonfish)	526	$1,735	$5.34	492	$1,266	$3.80
Oilfish	165	$206	$1.18	131	$226	$1.56
Pomfrets (monchong)	429	$2,621	$5.57	366	$1,935	$4.65
PMUS Sharks	10	$0	$0.00	8	$0	$0.00
Other PMUS subtotal	**2,580**	**$11,058**	**$4.65**	**2,792**	**$9,126**	**$3.48**
Other pelagics	**4**	**$5**	**$1.48**	**3**	**$6**	**$2.09**
Total pelagics	**29,741**	**$133,900**	**$4.74**	**29,961**	**$118,073**	**$4.23**

Table 23. Hawaii commercial pelagic catch, revenue, and price by fishery

Fishery	2022 Catch (1,000 lbs)	2022 Ex-vessel revenue ($1,000)	2022 Average price ($/lb)	2023 Catch (1,000 lbs)	2023 Ex-vessel revenue ($1,000)	2023 Average price ($/lb)
Deep-set longline	24,256	$109,686	$4.80	25,657	$100,555	$4.23
Shallow-set longline	1,874	$9,982	$4.90	1,597	$6,829	$4.13
MHI trolling	1,774	$7,157	$4.60	1,596	$5,988	$4.32
MHI handline	957	$4,184	$4.58	571	$2,634	$4.84
Offshore handline	571	$1,768	$3.03	348	$1,310	$3.61
Other gear	311	$1,122	$3.65	191	$756	$3.94
Total	**29,741**	**$133,900**	**$4.74**	**29,961**	**$118,073**	**$4.23**

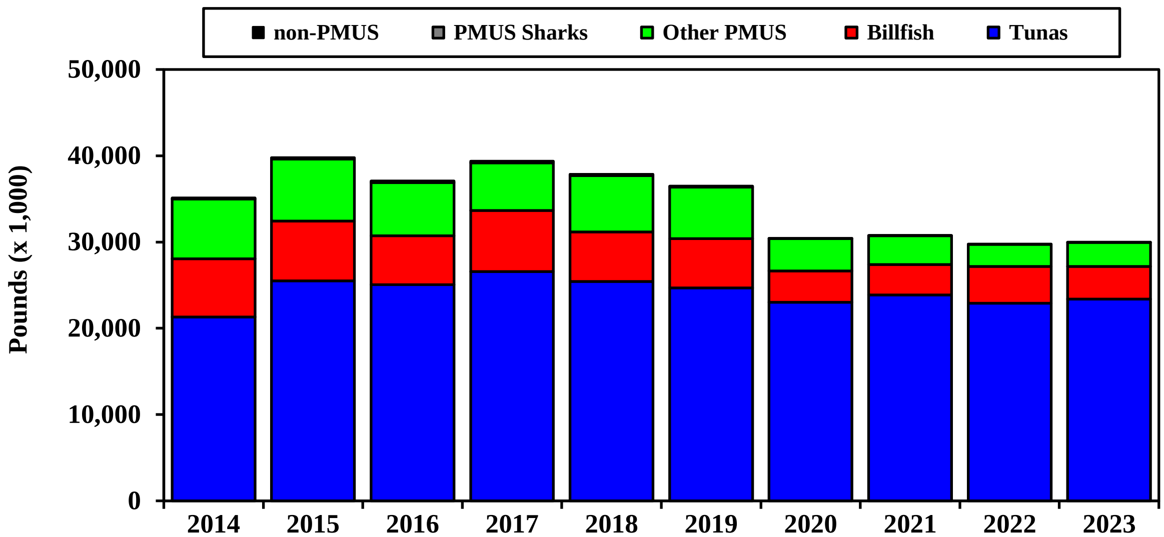


Figure 67. Hawaii commercial tuna, billfish, other PMUS and PMUS shark catch

Supporting data shown in Table A-68.

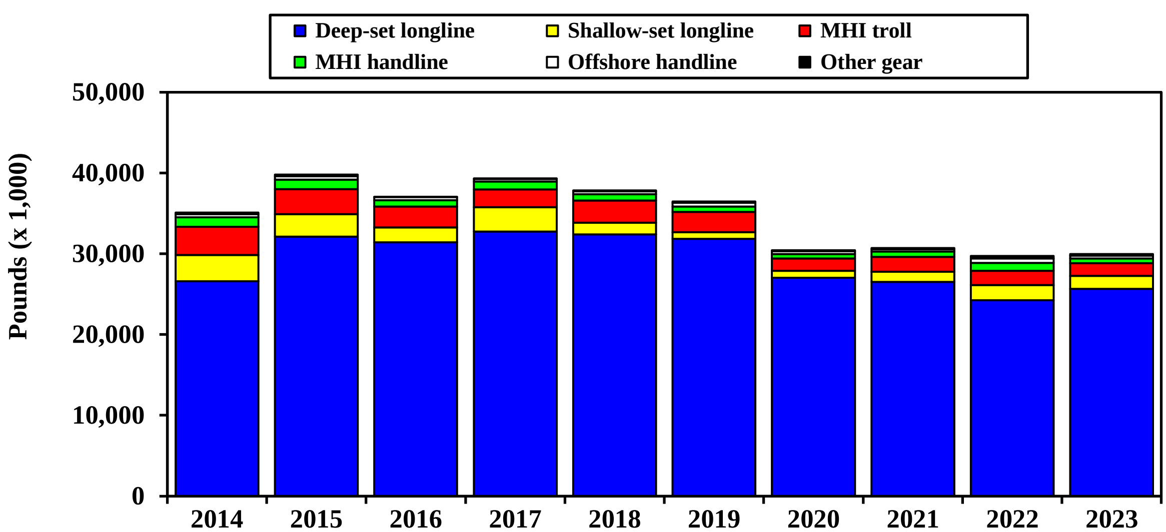


Figure 68. Total commercial pelagic catch by gear type

Supporting data shown in Table A-69.

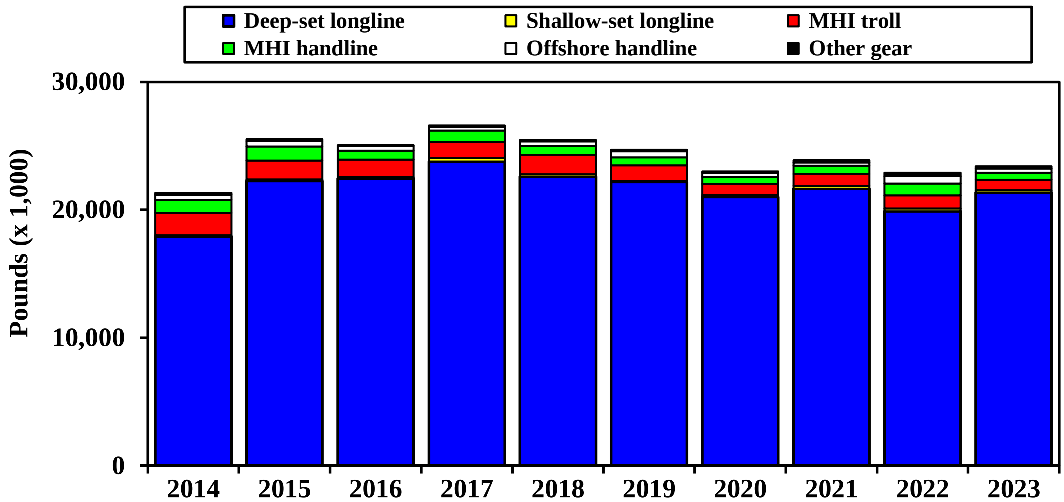


Figure 69. Hawaii commercial tuna catch by gear type

Supporting data shown in Table A-70.

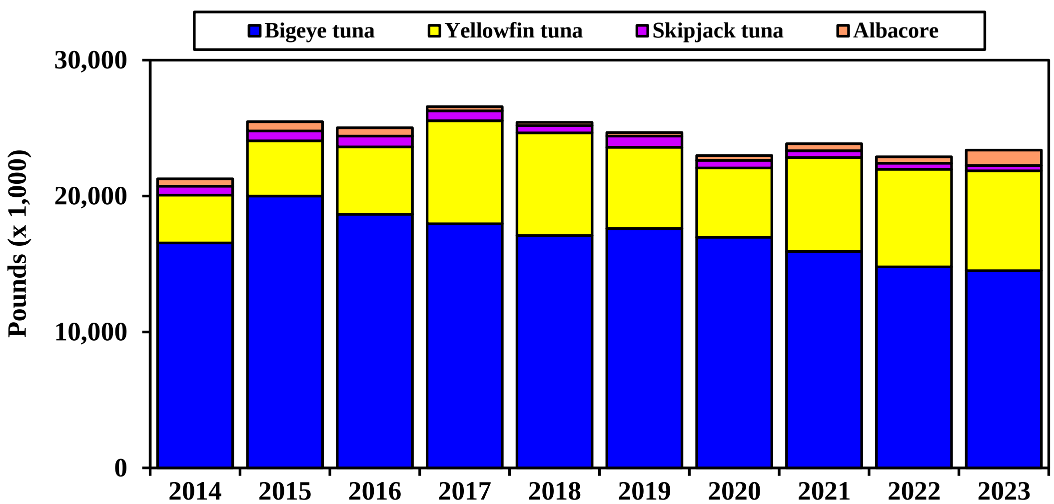


Figure 70. Species composition of tuna catch

Supporting data shown in Table A-71.

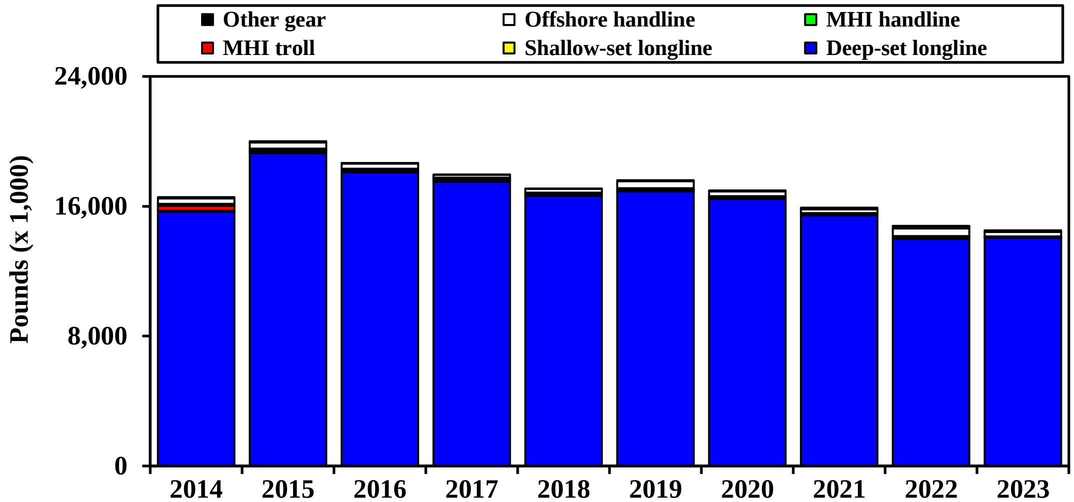


Figure 71. Hawaii bigeye tuna catch by gear type

Supporting data shown in Table A-72.

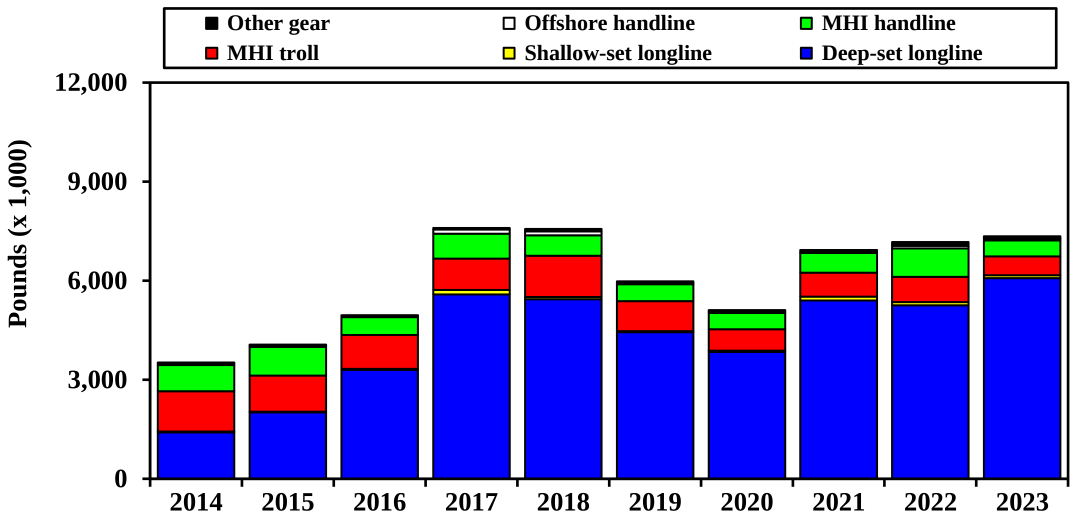


Figure 72. Hawaii yellowfin tuna catch by gear type

Supporting data shown in Table A-73.

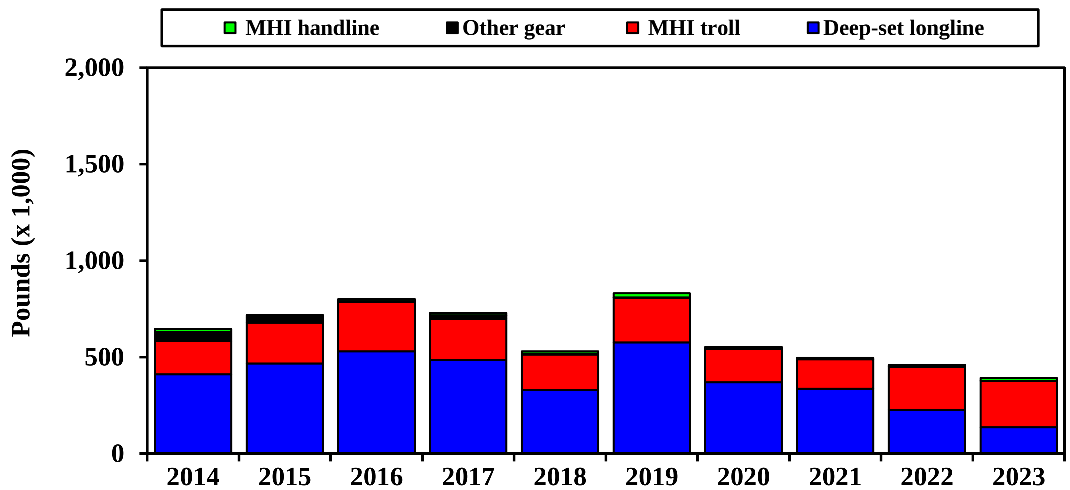


Figure 73. Hawaii skipjack tuna catch by gear type

Supporting data shown in Table A-74.

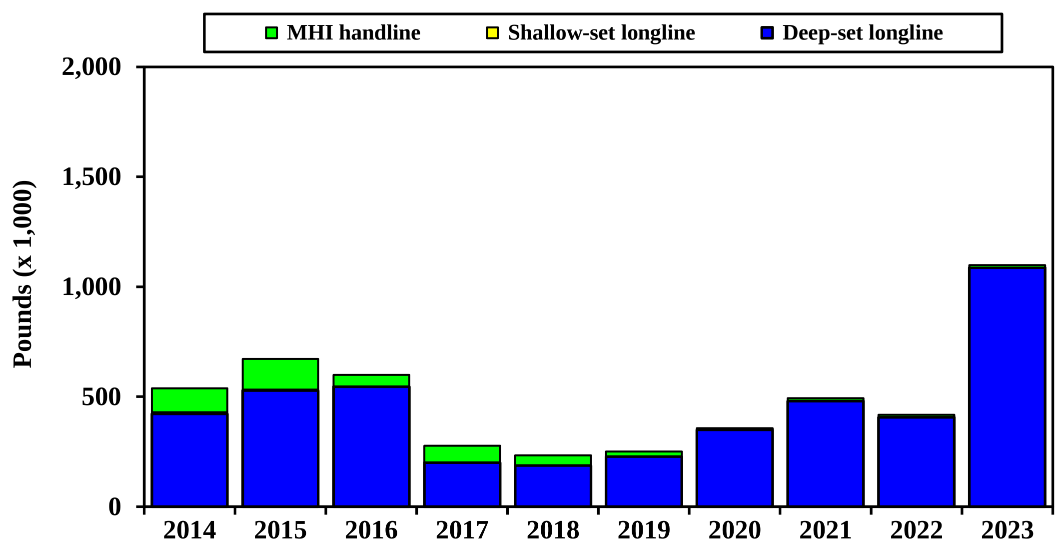


Figure 74. Hawaii albacore catch by gear type

Supporting data shown in Table A-75.

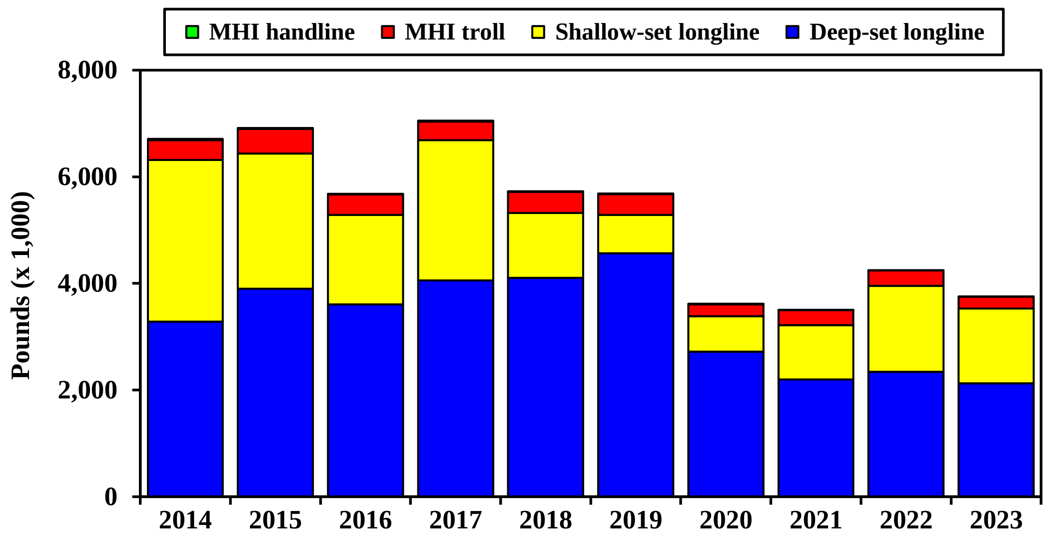


Figure 75. Hawaii commercial billfish catch by gear type

Supporting data shown in Table A-76.

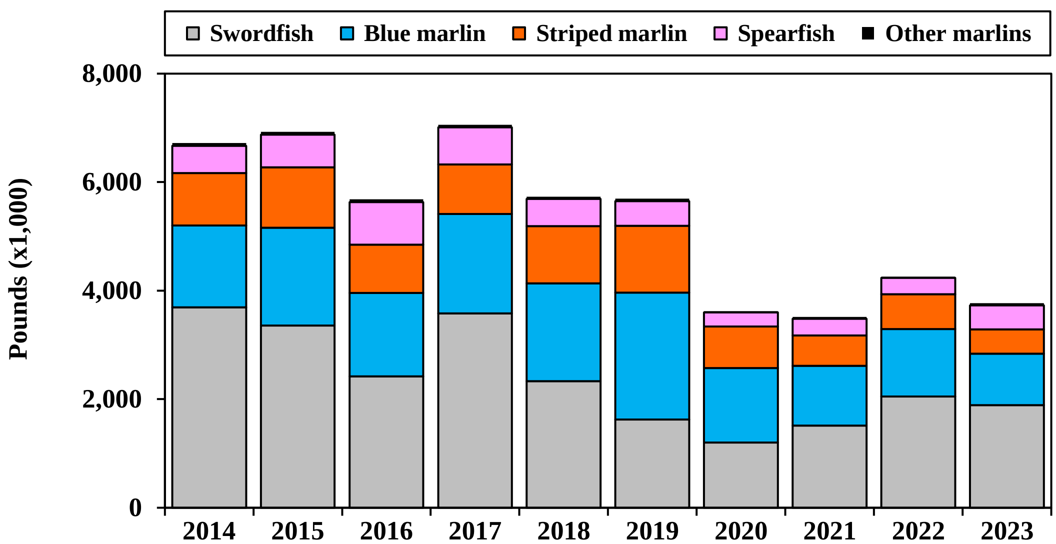


Figure 76. Species composition of billfish catch

Supporting data shown in Table A-77.

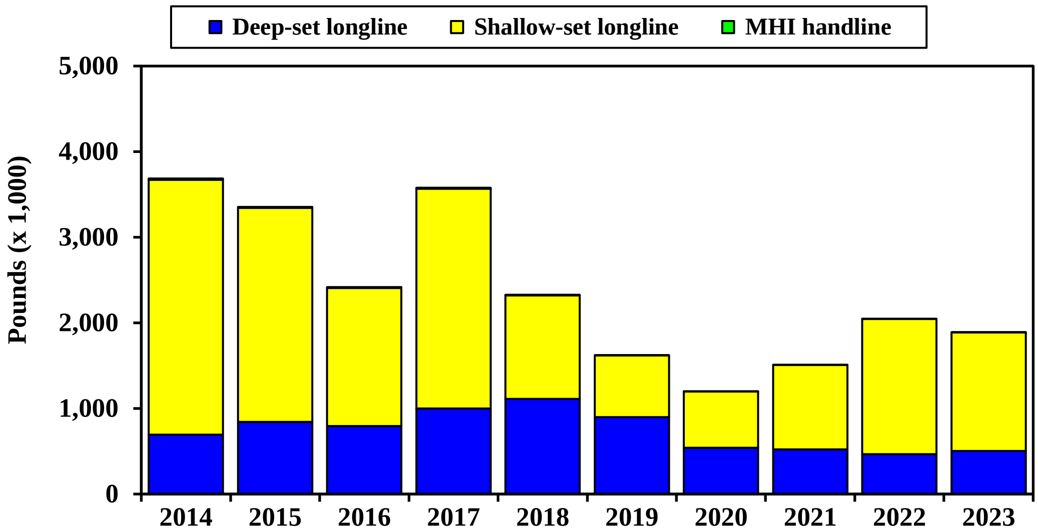


Figure 77. Hawaii swordfish catch by gear type

Supporting data shown in Table A-78.

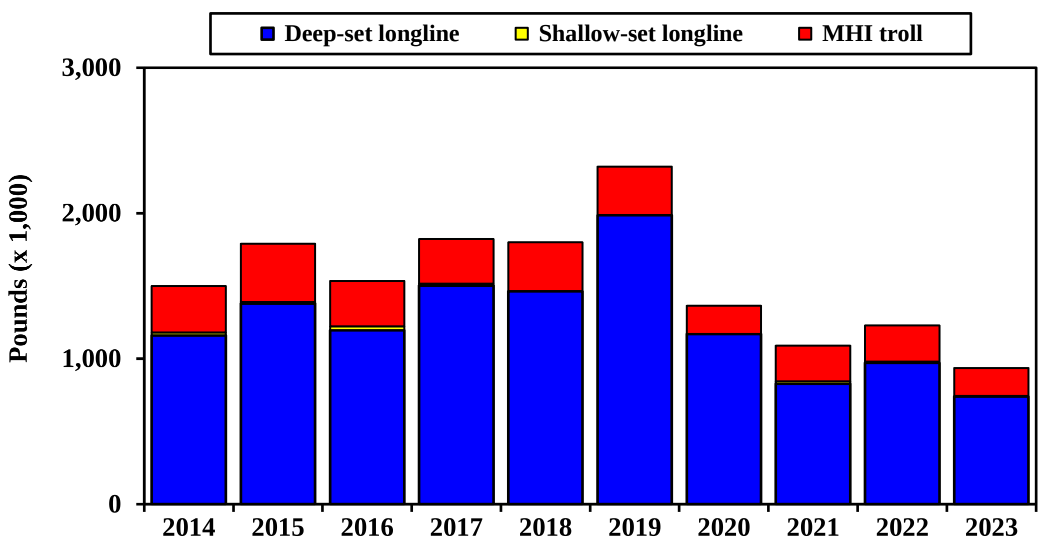


Figure 78. Hawaii blue marlin catch by gear type

Supporting data shown in Table A-79.

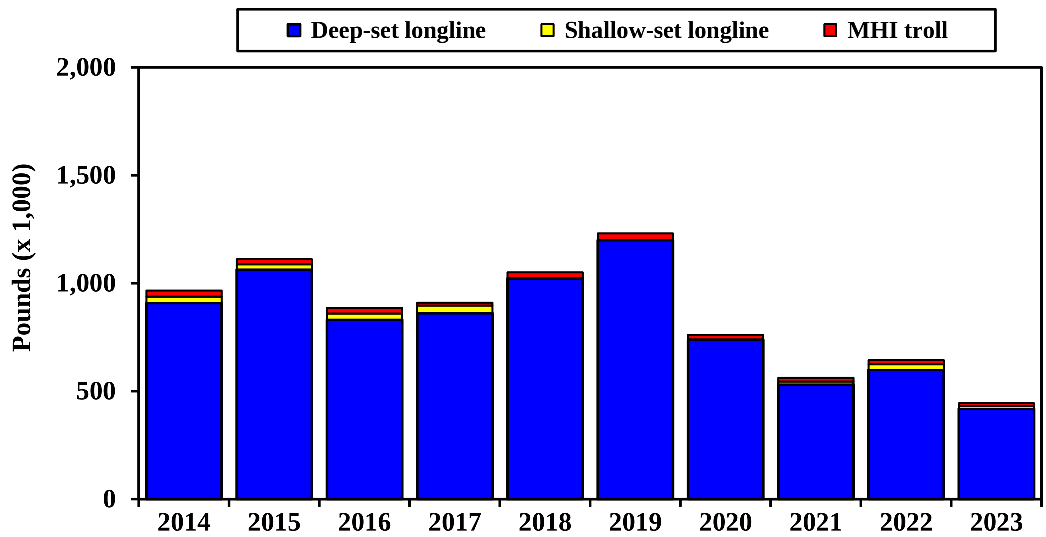


Figure 79. Hawaii striped marlin catch by gear type

Supporting data shown in Table A-80.

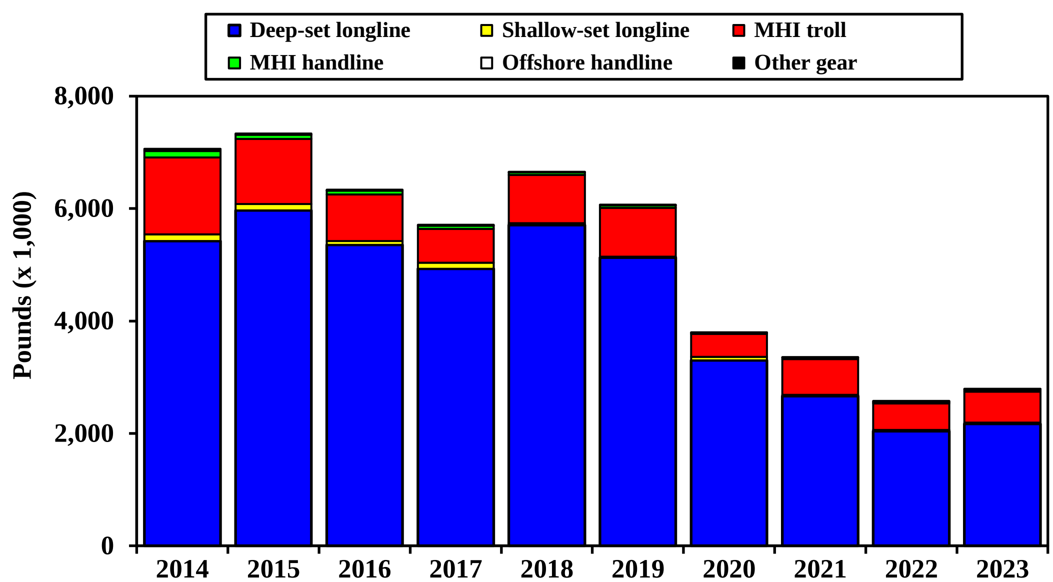


Figure 80. Hawaii commercial catch of other PMUS by gear type

Supporting data shown in Table A-81.

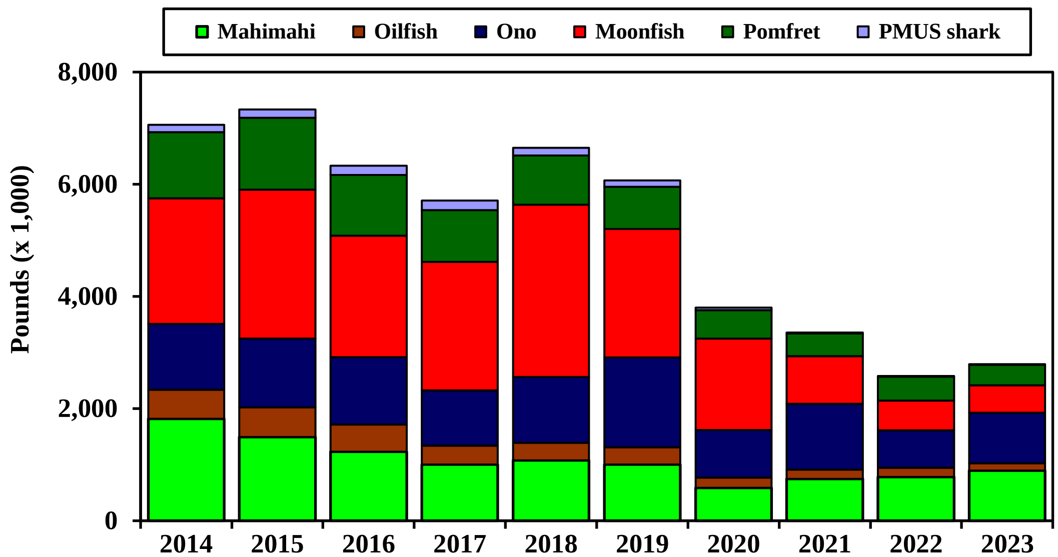


Figure 81. Species composition of other PMUS catch

Supporting data shown in Table A-82.

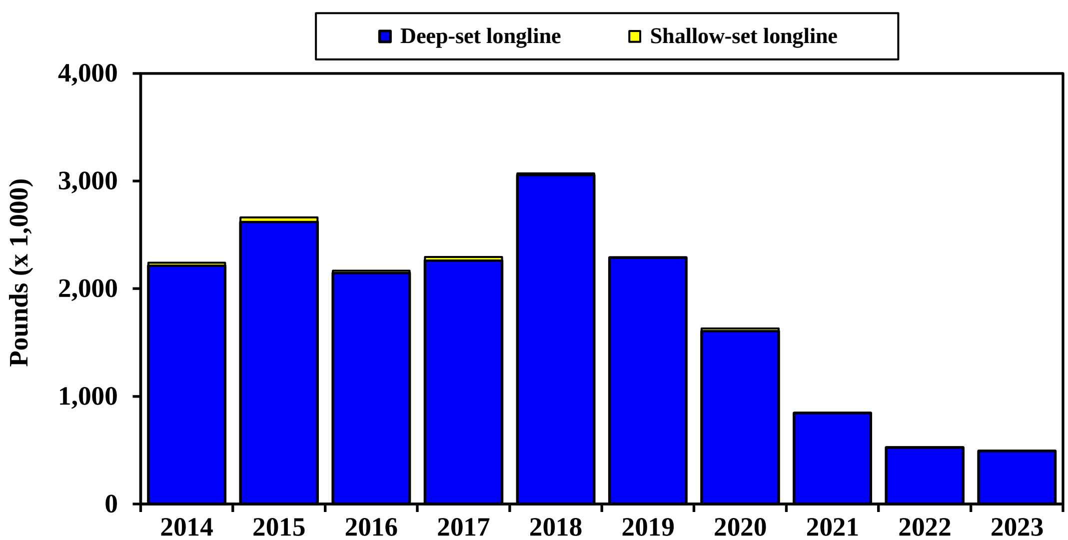


Figure 82. Hawaii moonfish catch by gear type

Supporting data shown in Table A-83.

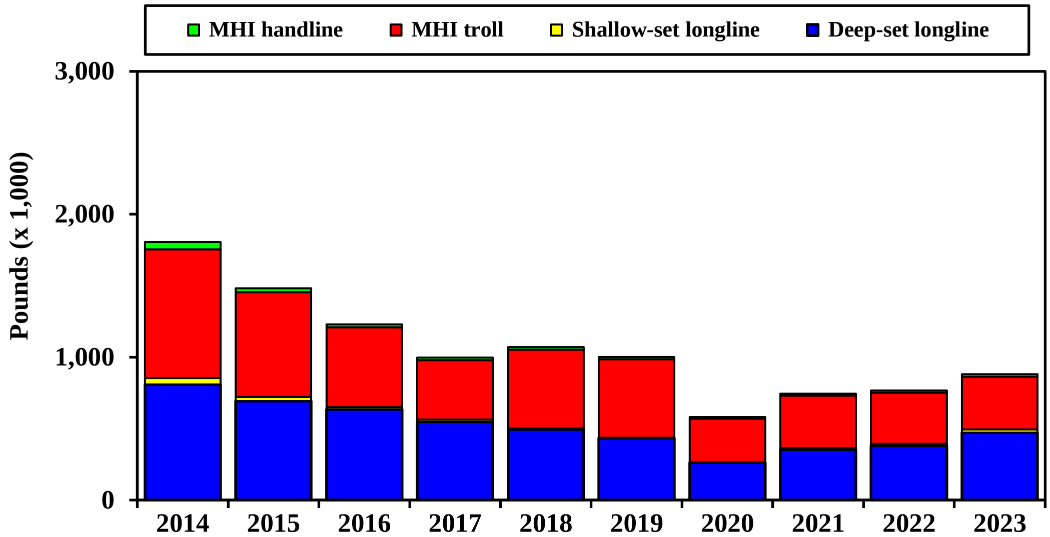


Figure 83. Hawaii mahimahi catch by gear type

Supporting data shown in Table A-84.

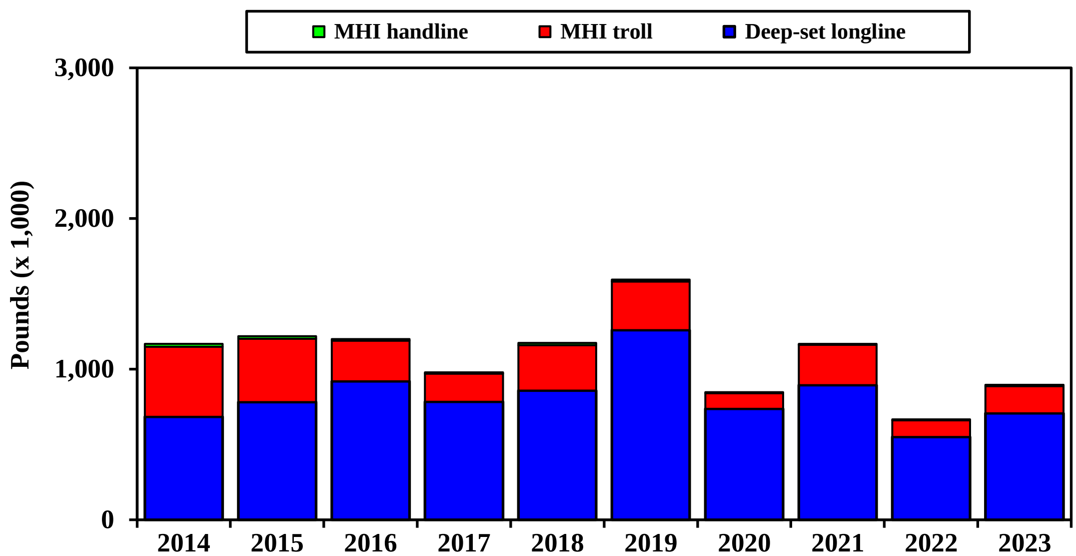


Figure 84. Hawaii ono (wahoo) catch by gear type

Supporting data shown in Table A-85.

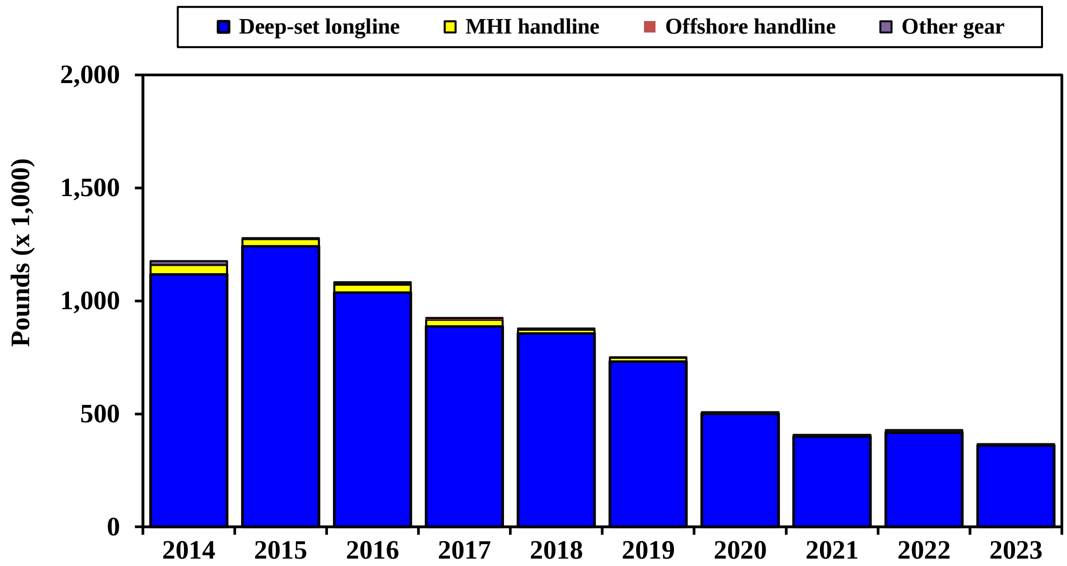


Figure 85. Hawaii pomfret catch by gear type

Supporting data shown in Table A-86.

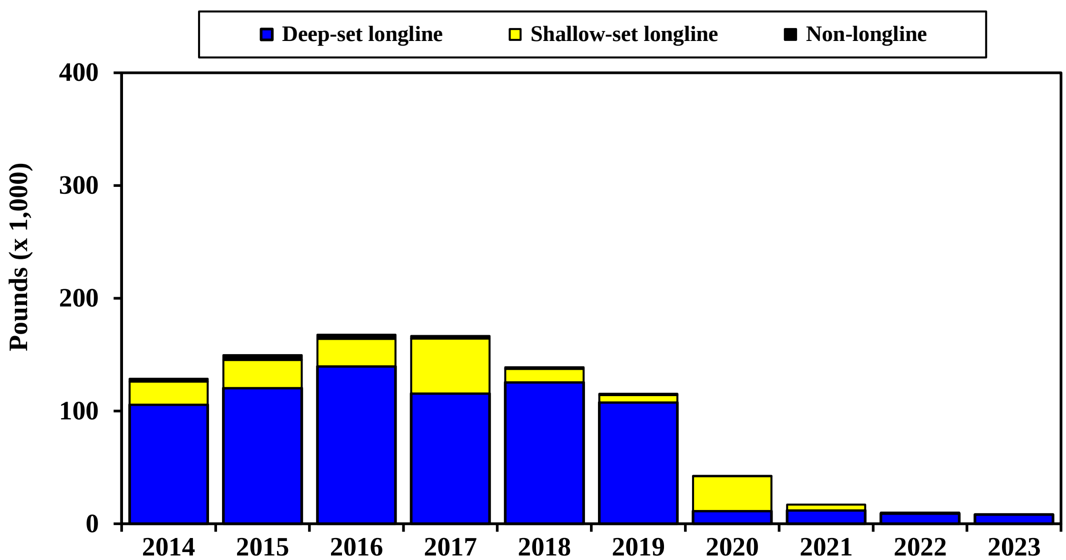


Figure 86. Hawaii PMUS shark catch by gear type

Supporting data shown in Table A-87.

2.4.6 HAWAII DEEP-SET LONGLINE FISHERY EFFORT, LANDINGS, REVENUE, AND CPUE

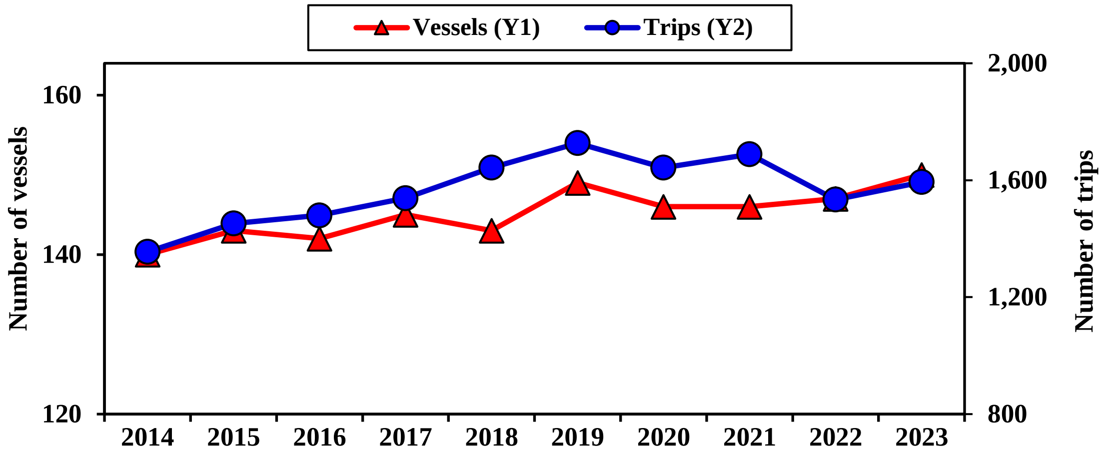


Figure 87. Number of Hawaii-permitted deep-set longline vessels and trips

Supporting data shown in Table A-88.

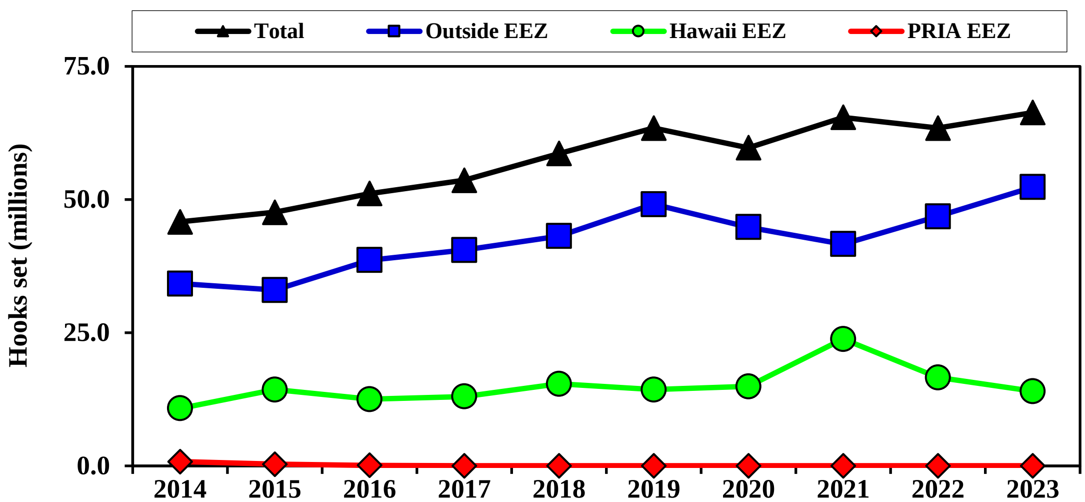


Figure 88. Number of hooks set by the Hawaii-permitted deep-set longline fishery

Supporting data shown in Table A-89.

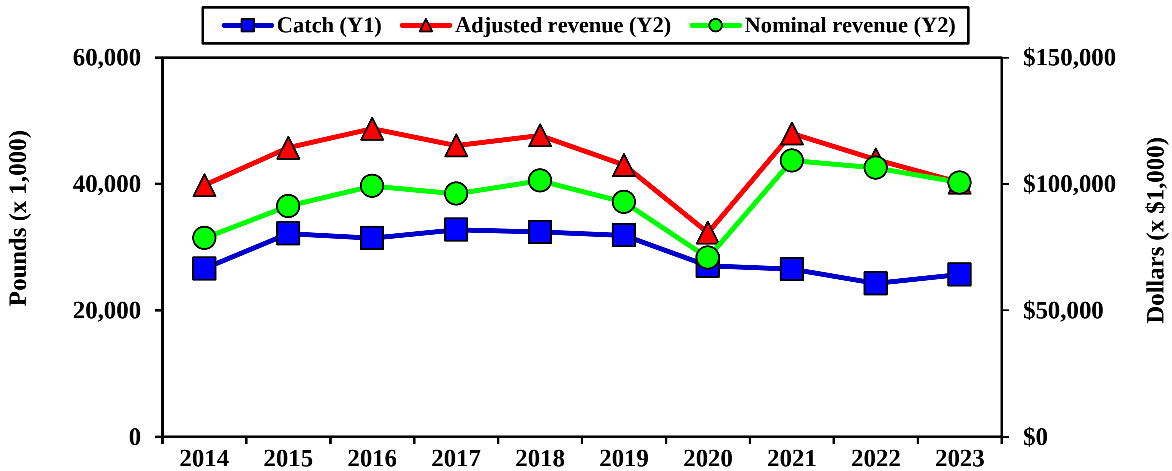


Figure 89. Catch and revenue for the Hawaii-permitted deep-set longline fishery
Supporting data shown in Table A-90.

Table 24. Hawaii-permitted deep-set longline catch (number of fish) by area

	Tunas			Billfish				Other PMUS				
Year	Bigeye tuna	Yellowfin tuna	Albacore	Swordfish	Blue marlin	Striped marlin	Spearfish	Mahimahi	Ono (Wahoo)	Moonfish	Pomfrets	PMUS sharks
Hawaii+PRIAs EEZ												
2014	43,441	5,199	1,764	866	1,036	5,020	4,248	8,899	4,090	2,172	10,921	20,533
2015	60,987	11,842	3,089	1,324	2,561	5,945	7,087	15,360	6,388	2,754	21,960	25,395
2016	44,704	13,438	1,656	1,233	1,773	3,881	7,189	9,092	5,722	2,323	15,746	23,520
2017	52,275	24,333	277	822	2,296	4,311	5,507	8,843	5,126	1,794	12,699	27,666
2018	46,397	19,626	292	1,619	2,916	5,387	5,034	10,219	7,205	2,637	13,077	26,592
2019	39,571	12,176	167	1,126	3,859	5,735	3,747	6,073	8,203	2,142	13,209	30,233
2020	41,850	13,807	75	761	2,387	3,179	2,603	4,691	5,243	1,234	9,548	30,443
2021	58,682	26,606	516	1,267	2,522	4,087	5,066	6,449	11,004	777	9,486	37,446
2022	35,414	20,500	650	761	1,725	3,292	3,483	5,751	3,783	478	6,016	22,373
2023	26,229	15,092	1,433	735	1,179	2,819	4,587	4,593	4,029	326	4,459	19,285
Outside EEZ												
2014	170,261	11,406	6,756	3,604	4,475	9,558	11,348	61,365	18,296	23,564	69,311	51,058
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
2016	175,867	32,820	8,197	3,870	4,444	7,700	16,828	39,397	24,440	22,029	65,864	65,377
2017	172,039	55,283	3,831	4,751	5,720	8,705	15,161	37,297	20,279	22,999	55,005	71,282
2018	172,662	42,106	3,363	4,492	4,642	10,340	10,443	33,912	24,090	30,548	42,870	76,087
2019	181,754	49,999	4,177	3,775	9,066	14,734	12,548	31,700	36,311	22,844	39,891	95,520
2020	165,165	40,594	8,461	3,102	5,790	9,600	7,372	17,258	19,118	15,372	26,529	87,844
2021	128,268	54,688	12,031	2,846	3,725	5,559	6,505	23,376	21,740	7,564	24,637	76,551
2022	136,184	63,543	10,888	2,868	5,384	7,849	7,561	30,004	13,723	4,477	25,686	66,753
2023	140,354	68,191	30,533	3,289	4,535	4,220	11,238	37,500	19,791	4,488	24,683	63,821
All areas												
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
2016	221,149	46,470	9,853	5,118	6,261	11,588	24,027	48,494	30,217	24,352	81,690	89,091
2017	224,391	79,620	4,108	5,576	8,018	13,019	20,668	46,146	25,426	24,794	67,736	98,986
2018	219,072	61,758	3,655	6,114	7,560	15,727	15,477	44,138	31,303	33,185	55,949	102,799
2019	221,344	62,177	4,344	4,901	12,926	20,469	16,296	37,779	44,546	24,986	53,102	125,811
2020	207,015	54,401	8,536	3,863	8,177	12,779	9,975	21,949	24,361	16,606	36,077	118,287
2021	186,962	81,301	12,547	4,113	6,247	9,646	11,573	29,825	32,750	8,341	34,125	114,058
2022	171,598	84,043	11,538	3,629	7,109	11,141	11,044	35,755	17,506	4,955	31,702	89,126
2023	166,625	83,316	31,973	4,024	5,714	7,046	15,827	42,094	23,834	4,814	29,147	83,125

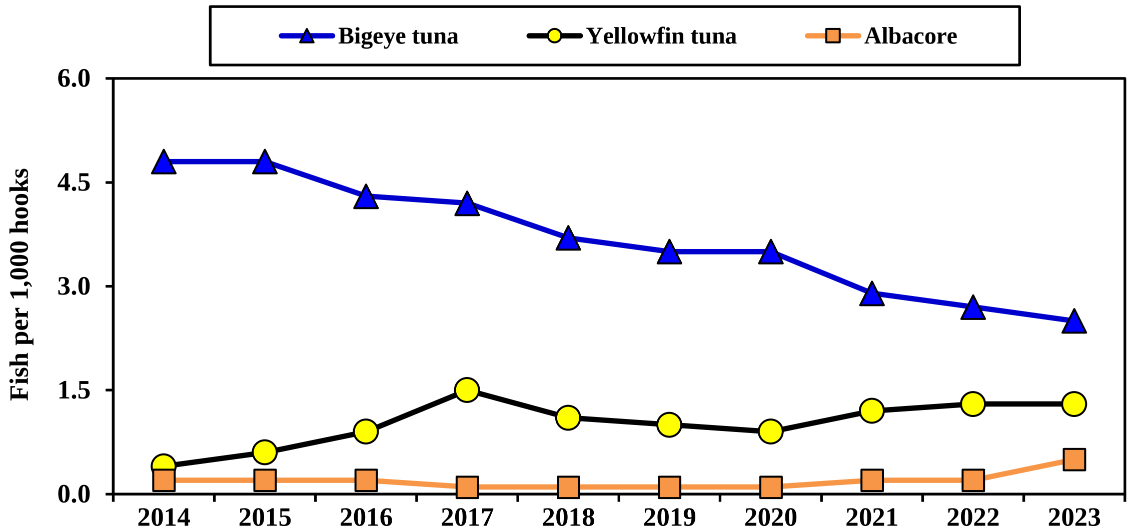


Figure 90. Tuna CPUE for the Hawaii-permitted deep-set longline fishery

Supporting data shown in Table A-91.

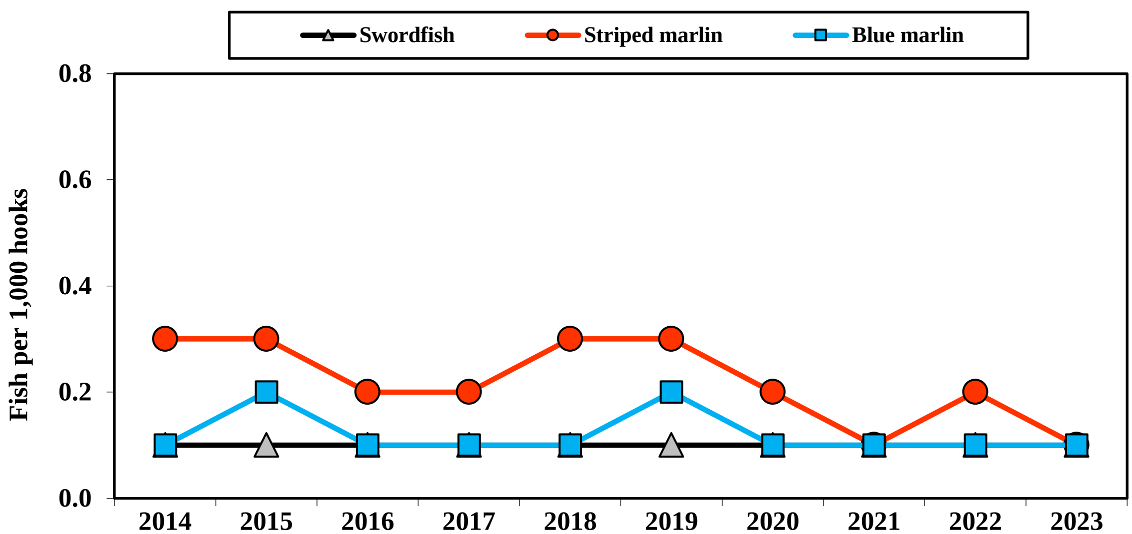


Figure 91. Billfish CPUE for the Hawaii-permitted deep-set longline fishery

Supporting data shown in Table A-92.

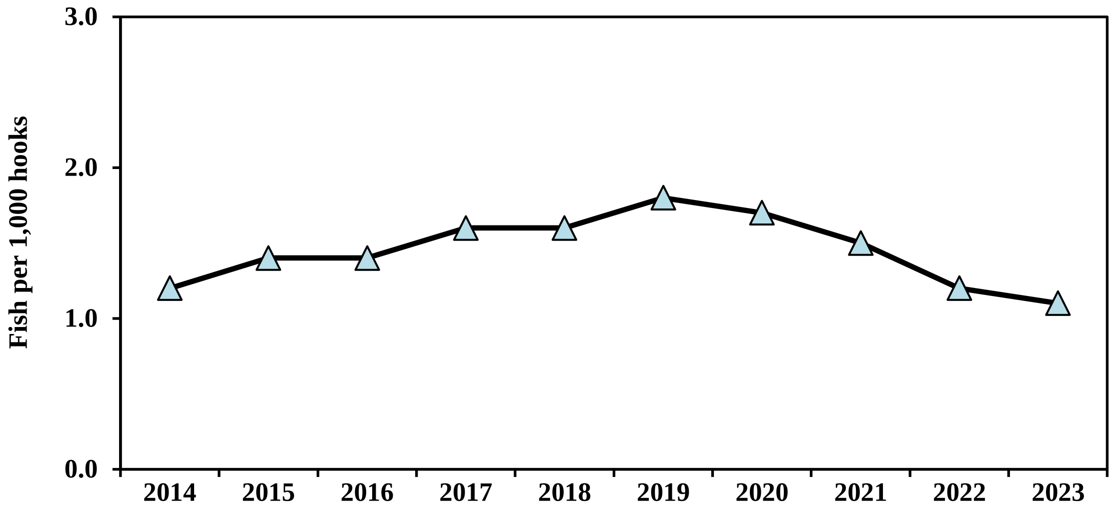


Figure 92. Blue shark CPUE for the Hawaii-permitted deep-set longline fishery

Supporting data shown in Table A-93.

Table 25. Total estimated bycatch in number of fish for the top 10 bycatch species from the Pacific Islands Region Observer Program for the Hawaii deep-set longline fishery

Species	2016	2017	2018	2019	2020	2021	2022	Average	SD
Lancetfish, Longnose	229,791	230,048	309,551	275,802	288,339	217,244	153,865	243,520	52,455.4
Shark, Blue	102,250	123,166	119,306	134,067	139,284	124,209	87,911	118,599	17,930.4
Snake Mackerel	110,655	120,432	79,308	49,481	43,862	67,877	59,556	75,882	29,604.4
Escolar	37,860	35,052	44,873	47,973	50,556	53,089	45,225	44,947	6,520.9
Shark, Bigeye Thresher	11,639	9,551	6,519	10,399	9,754	13,313	11,746	10,417	2,161.4
Stingray, Pelagic	6,958	6,608	7,234	10,949	9,357	8,526	9,533	8,452	1,599.2
Pomfret, Dagger	6,464	7,443	8,188	8,929	5,667	9,450	5,936	7,440	1,481.8
Tuna, Bigeye	20,723	20,800	24,053	19,481	20,596	12,360	5,773	17,684	6,343.4
Tuna, Yellowfin	5,615	9,455	5,201	7,434	6,138	10,804	5,064	7,102	2,245.7
Tuna, Unidentified	5,731	6,337	5,164	6,855	4,097	5,052	4,899	5,448	932.2

Note: The top 10 species comprised 91.5% of total bycatch in 2022.

Table 26. Released catch, retained catch, and total catch for the Hawaii-permitted deep-set longline fishery in 2023

	Deep-set longline fishery			
	Released catch	**Percent released**	**Retained catch**	**Total Catch**
Tuna				
Albacore	2,766	8.7	29,207	31,973
Bigeye tuna	1,738	1.0	164,887	166,625
Bluefin tuna	2	18.2	9	11
Skipjack tuna	86	1.2	6,952	7,038
Yellowfin tuna	1,318	1.6	81,998	83,316
Other tunas	4	100.0	0	4
Tuna PMUS Subtotal	**5,914**	**2.0**	**283,053**	**288,967**
Billfish				
Swordfish	178	4.4	3,846	4,024
Blue marlin	49	0.9	5,665	5,714
Striped marlin	33	0.5	7,013	7,046
Shortbill spearfish	195	1.2	15,632	15,827
Other billfishes	8	1.3	615	623
Billfish PMUS Subtotal	463	1.4	32,771	33,234
Other PMUS				
Mahimahi	461	1.1	41,633	42,094
Wahoo	96	0.4	23,738	23,834
Moonfish	26	0.5	4,788	4,814
Oilfish	1,804	23.0	6,028	7,832
Pomfret	171	0.6	28,976	29,147
Other PMUS Subtotal	**2,558**	**2.4**	**105,163**	**107,721**
Non-PMUS fish	**6,604**	**97.8**	**150**	**6,754**
Total non-shark	**15,539**	**3.6**	**421,137**	**436,676**
PMUS Sharks				
Blue shark	74,942	100.0	0	74,942
Mako sharks	1,500	98.6	22	1,522
Thresher sharks	5,961	99.6	23	5,984
Oceanic whitetip shark	460	100.0	0	460
Silky shark	217	100.0	0	217
PMUS Shark Subtotal	**83,080**	**99.9**	**45**	**83,125**
Non-PMUS sharks	**278**	**100.0**	**0**	**278**
Grand Total	**98,897**	**19.0**	**421,182**	**520,079**

Table 27. Average weight (lb) of the catch by the Hawaii-permitted deep-set longline fishery

Hawaii-permitted deep-set longline fishery																						
	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
2014	73	84	50	17		158	62	205	30	58	258	12	30	89	14	17	201	214
2015	85	74	52	18	239	165	81	185	33	59	219	12	31	91	13	18	195	219
2016	83	73	55	17	253	165	73	196	31	51	242	13	31	88	13	19	179	183
2017	79	72	49	19	253	190	67	188	32	63	286	12	31	92	13	20	181	200
2018	78	89	52	19	277	189	66	197	32	64	185	11	28	93	15	22	182	184
2019	78	74	53	18	269	189	60	156	28	29	182	12	28	92	14	22	190	190
2020	81	71	39	18	245	145	58	144	26	36	247	12	30	99	14	23	184	183
2021	84	69	39	19	233	129	56	134	26	42	149	12	27	102	12	21	184	183
2022	83	64	37	18	245	131	55	137	26	46	133	11	32	106	13	20	184	183
2023	85	74	37	20	255	131	60	131	27	48	120	11	30	103	12	22	184	183
Average	**80.9**	**74.4**	**46.3**	**18.3**	**252.1**	**159.2**	**63.8**	**167.3**	**29.1**	**49.6**	**202.1**	**11.8**	**29.8**	**95.5**	**13.3**	**20.4**	**186.4**	**192.2**
SD	**3.9**	**7.2**	**7.3**	**0.9**	**13.9**	**24.7**	**8.2**	**29.6**	**2.8**	**11.7**	**56.9**	**0.6**	**1.6**	**6.4**	**0.9**	**2.0**	**6.9**	**13.9**

2.4.7 HAWAII SHALLOW-SET LONGLINE FISHERY EFFORT, LANDINGS. REVENUE, AND CPUE

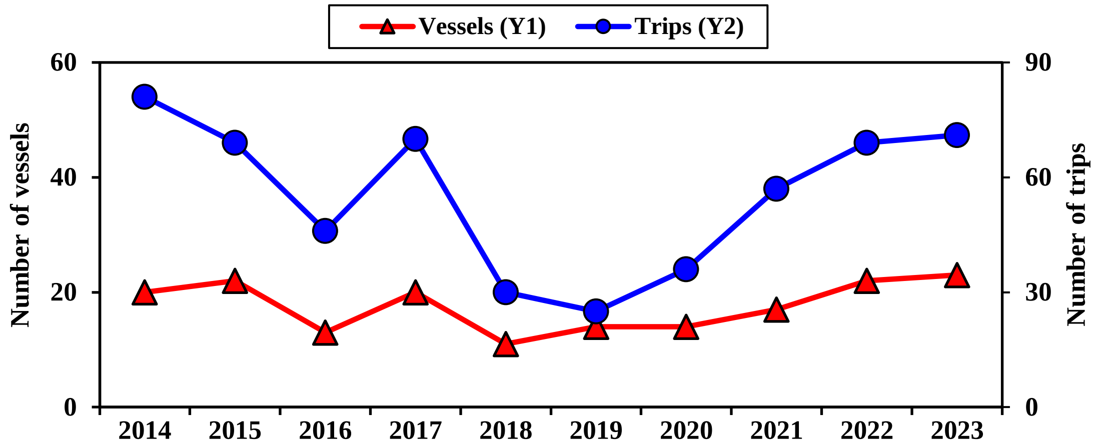


Figure 93. Number of Hawaii-permitted shallow-set longline vessels and trips
Supporting data shown in Table A-94.

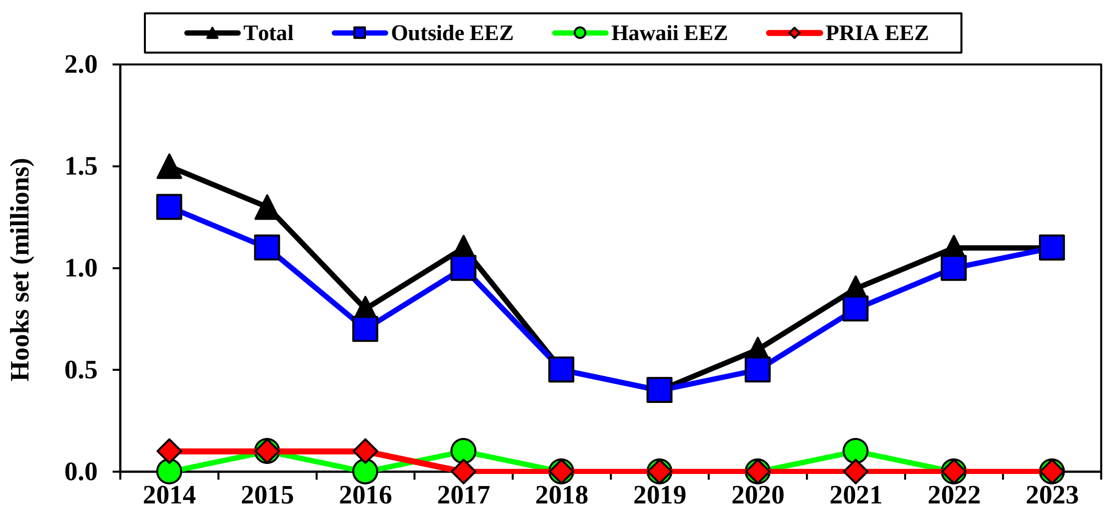


Figure 94. Number of hooks set by the Hawaii-permitted shallow-set longline fishery
Supporting data shown in Table A-95.

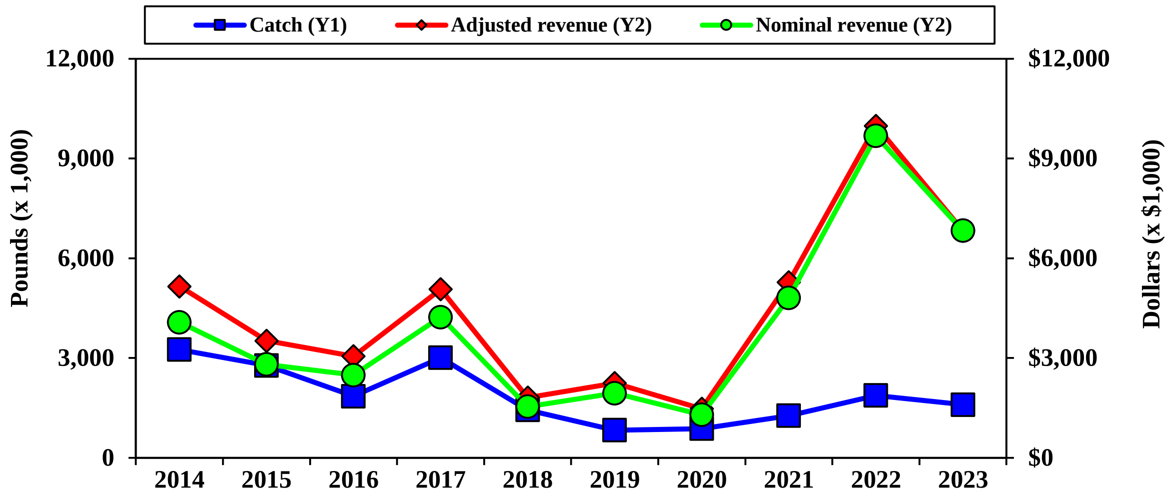


Figure 95. Catch and revenue for the Hawaii-permitted shallow-set longline fishery

Supporting data shown in Table A-96.

Table 28. Hawaii-permitted shallow-set longline catch (number of fish) by area

Year	Tunas			Billfish				Other PMUS				PMUS sharks
	Bigeye tuna	Yellowfin tuna	Albacore	Swordfish	Blue marlin	Striped marlin	Spearfish	Mahimahi	Ono (Wahoo)	Moonfish	Pomfrets	
Hawaii+PRIA EEZ												
2014	27	57	1	1,689	54	137	37	968	19	0	4	1,280
2015	40	36	1	2,001	23	111	40	804	5	0	3	1,537
2016	20	47	5	1,157	68	104	45	69	19	0	2	1,142
2017	12	31	1	779	32	88	38	38	10	0	2	580
2018	12	11	0	58	1	1	0	12	1	0	0	22
2019												
2020												
2021	100	94	0	424	41	69	65	34	23	4	36	482
2022	7	51	0	185	13	33	10	13	3	1	0	247
2023	1	1	0	13	0	8	0	2	1	0	0	25
Outside EEZ												
2014	810	124	662	13,646	21	231	134	3,321	25	515	228	10,173
2015	1,305	103	305	12,988	26	155	66	1,822	11	645	121	12,489
2016	921	254	54	8,573	27	225	115	1,065	20	271	16	10,737
2017	1,518	1,522	286	13,141	26	323	122	1,263	64	431	37	10,268
2018	1,279	767	137	6,052	4	61	44	627	25	172	24	2,887
2019	874	331	81	3,435	0	12	18	247	3	31	5	3,195
2020	1,099	456	356	4,374	7	23	24	229	9	300	12	6,605
2021	873	1,067	626	6,074	50	123	38	1,218	38	20	1	5,733
2022	947	1,016	1,395	9,426	36	355	52	1,488	32	28	6	6,896
2023	670	905	841	8,554	23	165	35	2,355	51	12	6	7,523
All areas												
2014	837	181	664	15,449	75	368	171	4,289	44	535	233	11,632
2015	1,345	139	306	14,989	49	266	106	2,626	16	645	124	14,026
2016	941	301	59	9,730	95	329	160	1,134	39	271	18	11,879
2017	1,530	1,553	287	13,928	58	411	160	1,301	74	431	39	10,852
2018	1,291	778	137	6,110	5	62	44	639	26	172	24	2,909
2019	874	331	81	3,435	0	12	18	247	3	31	5	3,195
2020	1,114	497	356	4,594	23	30	26	241	12	302	12	7,012
2021	973	1,161	626	6,498	91	192	103	1,252	61	24	37	6,215
2022	954	1,067	1,395	9,611	49	388	62	1,501	35	29	6	7,143
2023	671	909	841	8,567	23	173	35	2,357	52	12	7	7,555

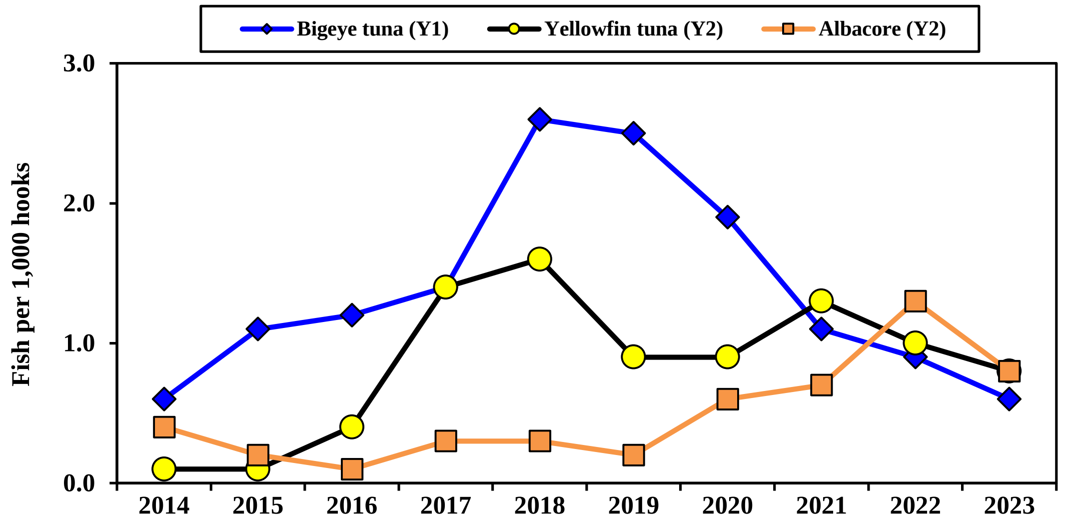


Figure 96. Tuna CPUE for the Hawaii-permitted shallow-set longline fishery

Supporting data shown in Table A-97.

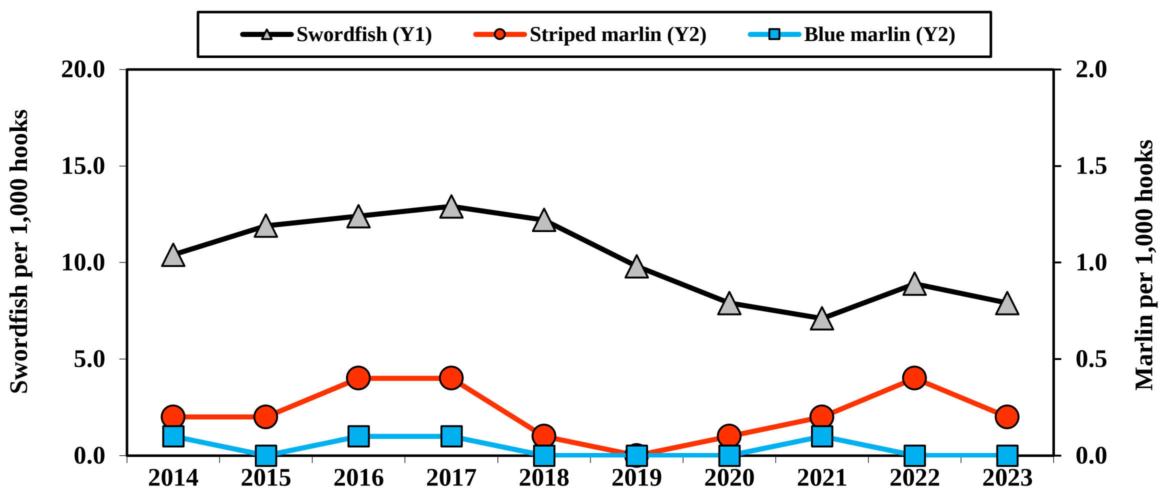


Figure 97. Billfish CPUE for the Hawaii-permitted shallow-set longline fishery

Supporting data shown in Table A-98.

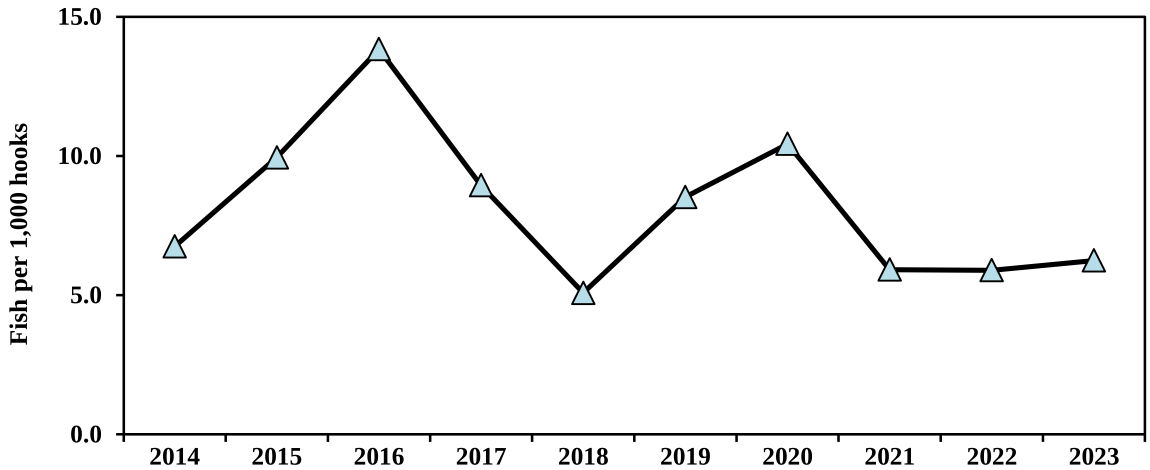


Figure 98. Blue shark CPUE for the Hawaii-permitted shallow-set longline fishery

Supporting data shown in Table A-99.

Table 29. Total estimated bycatch in number of fish for the top 10 bycatch species from the Pacific Islands Region Observer Program for the Hawaii shallow-set longline fishery

Species	2016	2017	2018	2019	2020	2021	2022	Average	SD
Shark, Blue	11,853	10,102	4,115	4,225	6,949	6,446	8,252	7,420	2,882.1
Lancetfish, Longnose	1,784	2,728	1,211	1,232	1,268	2,480	3,150	1,979	803.6
Shark, Shortfin Mako	968	1,085	537	298	1,151	808	1,224	867	342.0
Escolar	459	765	150	122	152	521	557	389	250.5
Swordfish	1,049	1,419	735	254	251	499	541	678	428.7
Oilfish	171	327	114	57	248	219	359	214	109.1
Snake Mackerel	315	638	62	16	31	98	151	187	222.9
Stingray, Pelagic	245	284	440	82	328	171	123	239	124.6
Tuna, Albacore	5	28	6	1	51	63	82	34	32.1
Dolphinfish	1	0	34	18	20	75	69	31	30.4

Note: The top 10 species comprised 96.8% of total bycatch in 2022.

Table 30. Released catch, retained catch, and total catch for the Hawaii-permitted shallow-set longline fishery in 2023

	Shallow-set longline fishery			
	Released catch	Percent released	Retained catch	Total Catch
Tuna				
Albacore	19	1.4	1,376	1,395
Bigeye tuna	7	0.7	947	954
Bluefin tuna	0	0.0	4	4
Skipjack tuna	0	0.0	31	31
Yellowfin tuna	12	1.1	1,055	1,067
Other tunas	0	-	0	0
Tuna PMUS Subtotal	**38**	**1.1**	**3,413**	**3,451**
Billfish				
Swordfish	262	2.7	9,349	9,611
Blue marlin	0	0.0	49	49
Striped marlin	3	0.8	385	388
Shortbill spearfish	0	0.0	62	62
Other billfishes	1	8.3	11	12
Billfish PMUS Subtotal	**266**	**2.6**	**9,856**	**10,122**
Other PMUS				
Mahimahi	3	0.2	1,498	1,501
Wahoo	0	0.0	35	35
Moonfish	2	6.9	27	29
Oilfish	96	42.3	131	227
Pomfret	2	33.3	4	6
Other PMUS Subtotal	**103**	**5.7**	**1,695**	**1,798**
Non-PMUS fish	**3**	**23.1**	**10**	**13**
Total non-shark	**410**	**2.7**	**14,974**	**15,384**
PMUS Sharks				
Blue shark	6,355	100.0	0	6,355
Mako sharks	709	99.4	4	713
Thresher sharks	44	100.0	0	44
Oceanic whitetip shark	26	100.0	0	26
Silky shark	5	100.0	0	5
Shark PMUS Subtotal	**7,139**	**99.9**	**4**	**7,143**
Non-PMUS sharks	**5**	**100.0**	**0**	**5**
Grand Total	**7,554**	**33.5**	**14,978**	**22,532**

Table 31. Average weight (lb) of the catch by the Hawaii-permitted shallow-set longline fisheries

Hawaii-permitted shallow-set longline fishery																		
	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
2013	107	111	27	17	187	216	92	281	34	-	-	12	42	82	15	23	177	-
2014	87	131	24	14	268	212	91	278	36	51	-	12	42	71	16	24	202	243
2015	79	120	22	16	-	184	97	292	37	51	-	12	39	76	13	22	150	243
2016	86	103	34	16	-	179	97	304	39	51	-	14	33	83	13	21	215	243
2017	98	94	35	18	187	200	102	259	39	51	-	12	36	83	14	20	179	243
2018	89	98	36	15	187	214	94	412	36	-	-	10	39	84	14	25	184	243
2019	72	92	35	17	-	217	126	-	35	51	-	9	39	83	16	22	165	-
2020	90	76	28	18	187	148	89	160	34	-	-	12	36	83	17	19	175	243
2021	95	101	34	19	225	160	76	177	25	51	-	10	32	84	17	20	175	243
2022	106	92	28	18	210	169	65	182	26	42	-	9	35	80	12	29	175	-
Average	**90.9**	**101.8**	**30.3**	**16.8**	**207.3**	**189.9**	**92.9**	**260.6**	**34.1**	**49.7**	---	**11.2**	**37.3**	**80.9**	**14.7**	**22.5**	**179.7**	**243.0**
SD	**11.0**	**15.6**	**5.1**	**1.5**	**30.7**	**25.4**	**16.0**	**78.9**	**4.9**	**3.4**	---	**1.6**	**3.5**	**4.2**	**1.8**	**3.0**	**18.1**	**0.0**

2.4.8 MHI TROLL FISHERY EFFORT, LANDINGS, REVENUE, AND CPUE

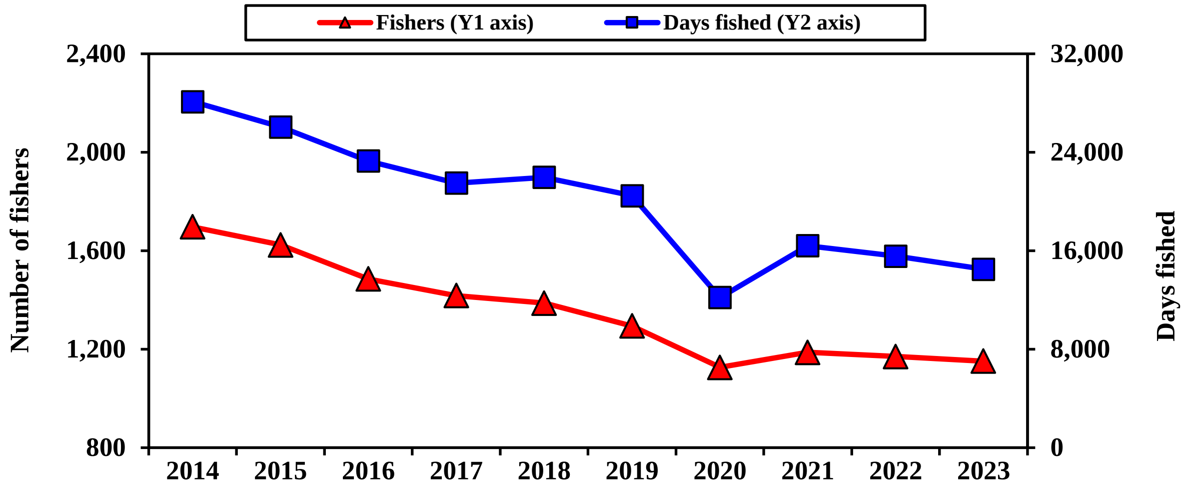


Figure 99. Number of MHI troll fishers and days fished

Supporting data shown in Table A-100.

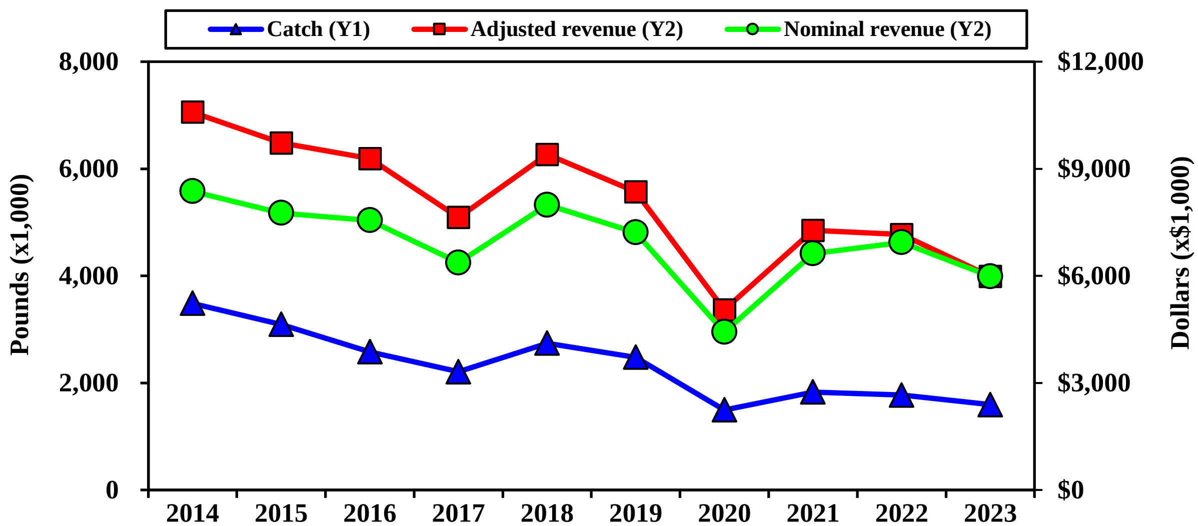


Figure 100. Catch and revenue for the MHI troll fishery

Supporting data shown in Table A-101.

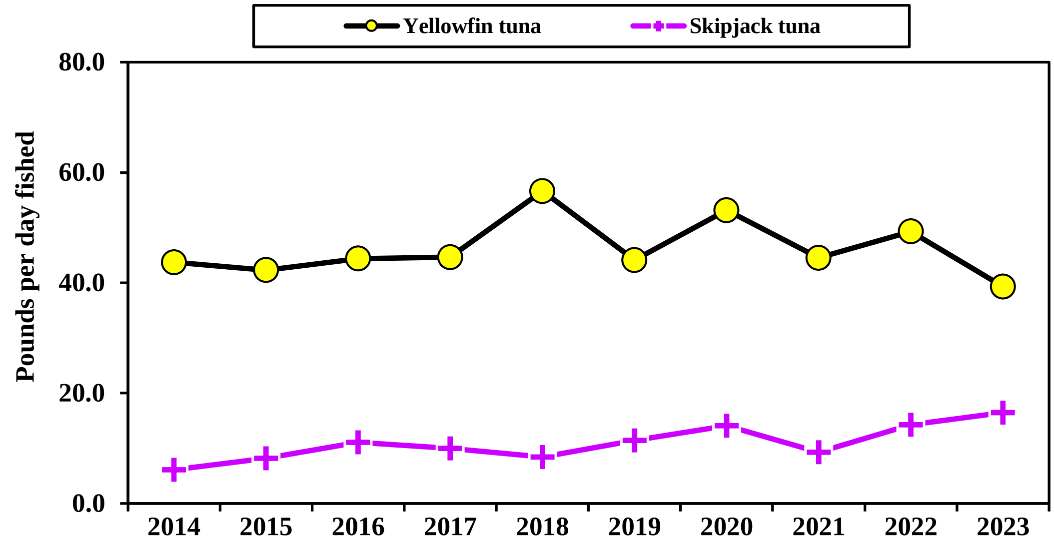


Figure 101. Tuna CPUE for the MHI troll fishery

Supporting data shown in Table A-102.

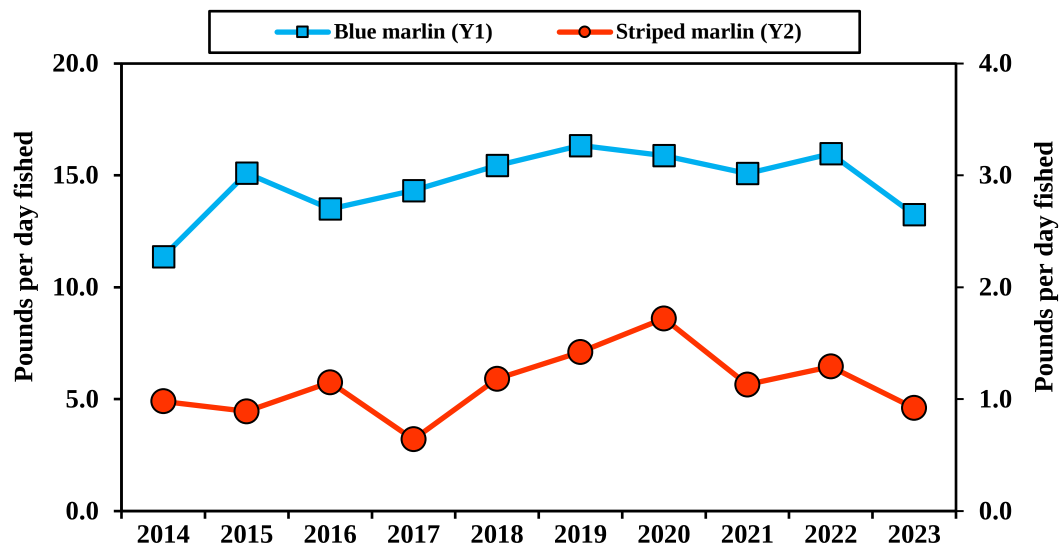


Figure 102. Marlin CPUE for the MHI troll fishery

Supporting data shown in Table A-103.

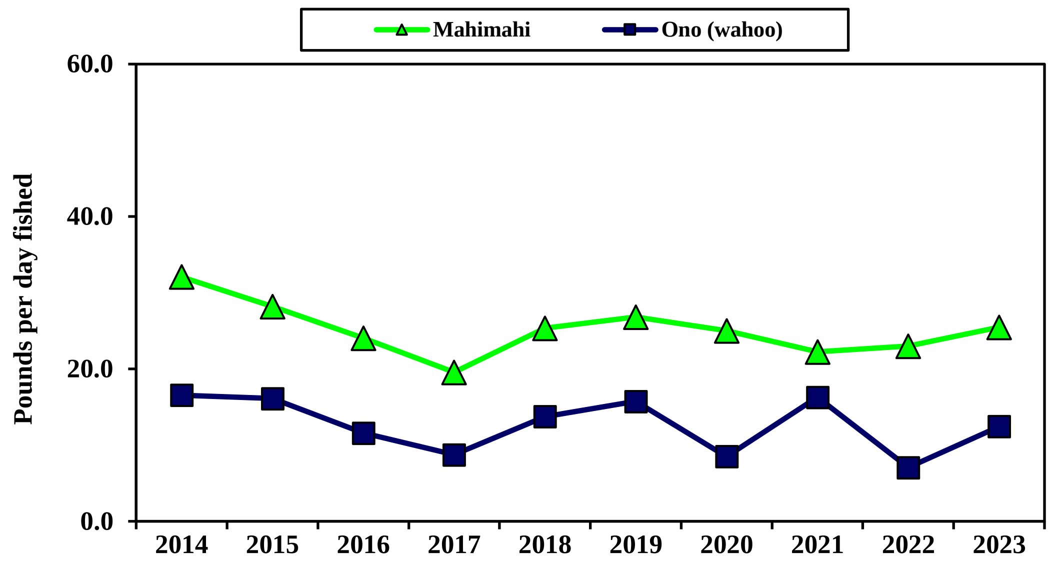


Figure 103. Mahimahi and Ono CPUE for the MHI troll fishery

Supporting data shown in Table A-104.

2.4.9 MHI HANDLINE FISHERY EFFORT, LANDINGS, REVENUE, AND CPUE

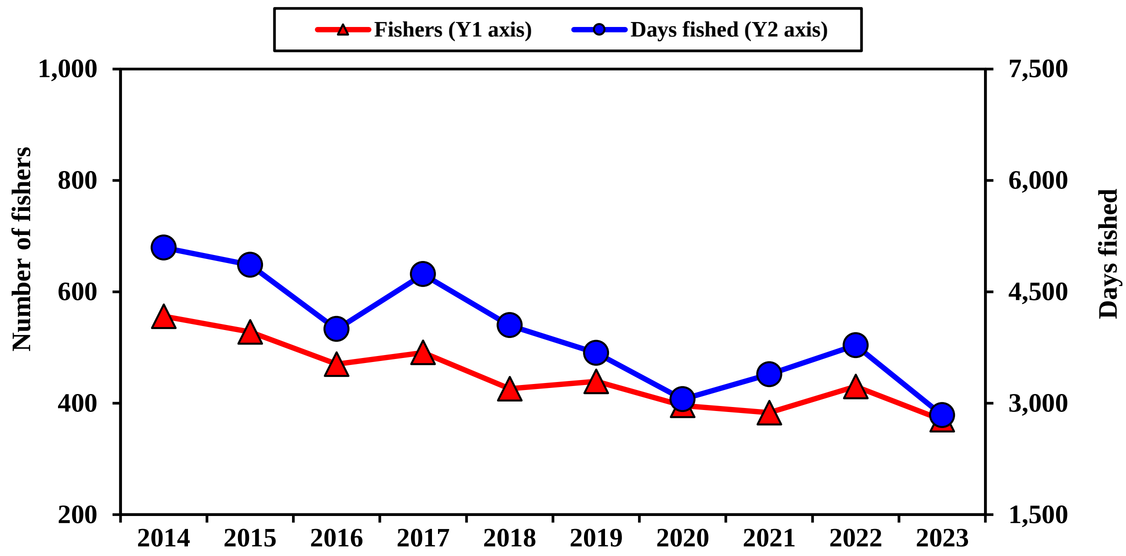


Figure 104. Number of MHI handline fishers and days fished

Supporting data shown in Table A-105.

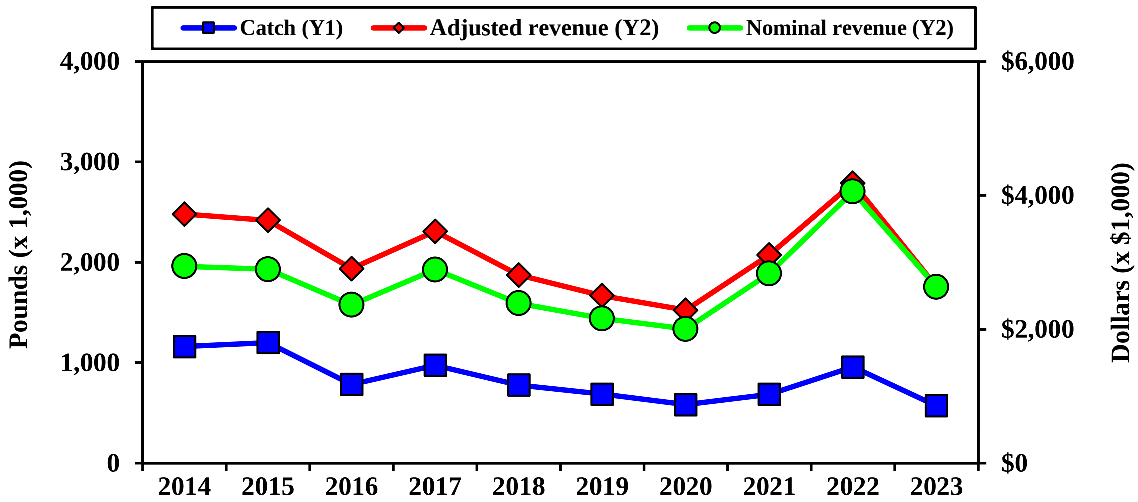


Figure 105. Catch and revenue for the MHI handline fishery

Supporting data shown in Table A-106.

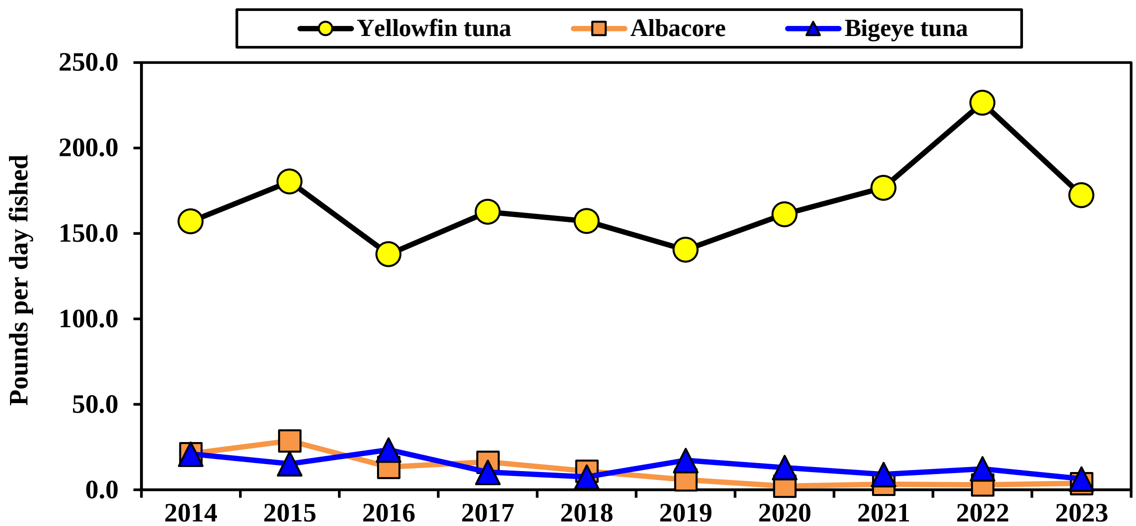


Figure 106. Tuna CPUE for the MHI handline fishery

Supporting data shown in Table A-107.

2.4.10 OFFSHORE HANDLINE FISHERY EFFORT, LANDINGS, REVENUE, AND CPUE

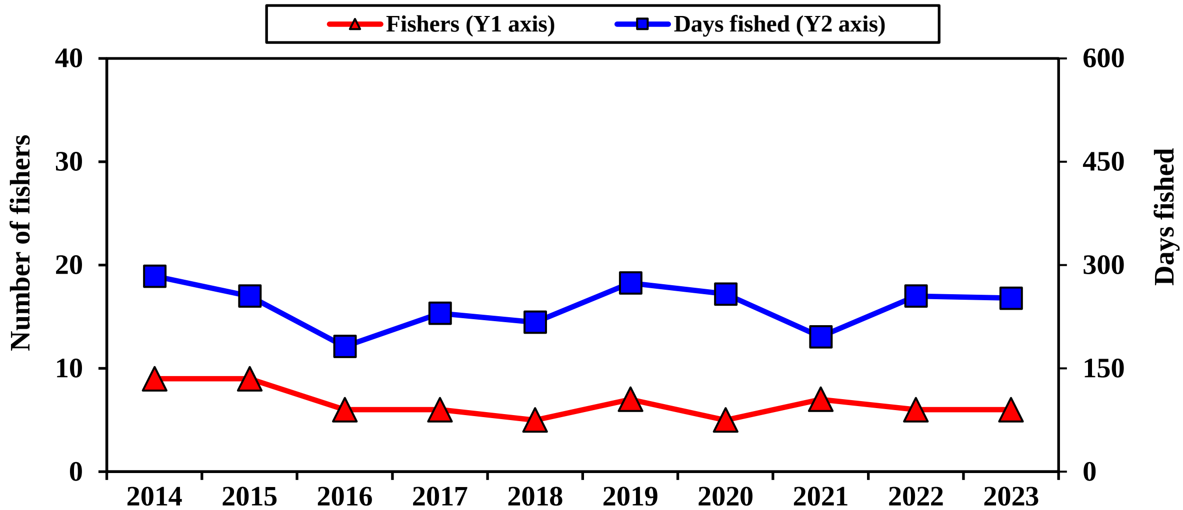


Figure 107. Number of offshore handline fishers and days fished

Supporting data shown in Table A-108.

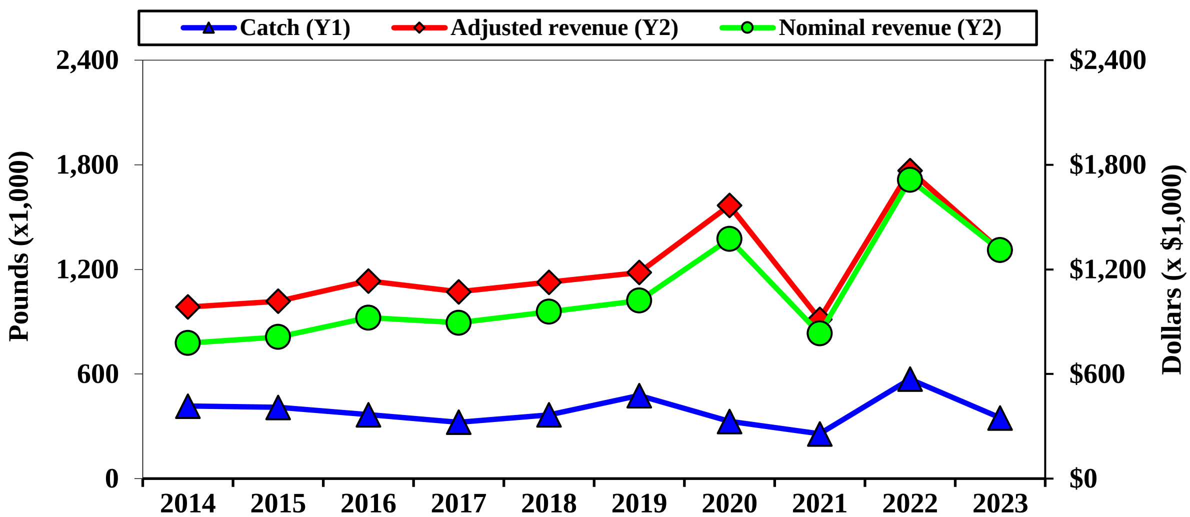


Figure 108. Catch and revenue for the offshore tuna handline fishery

Supporting data shown in Table A-109.

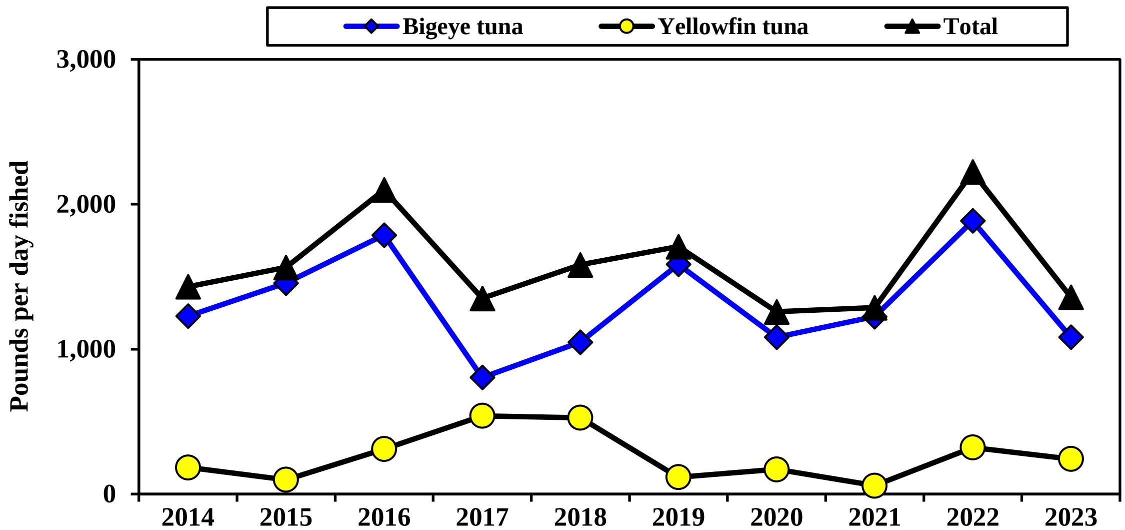


Figure 109. Tuna CPUE for the offshore tuna handline fishery

Supporting data shown in Table A-110.

Table 32. Average weight (lb) of the catch by the Hawaii troll and handline fisheries

	Tunas				Billfish			Other PMUS	
Year	**Albacore**	**Bigeye tuna**	**Skipjack tuna**	**Yellowfin tuna**	**Blue marlin**	**Striped marlin**	**Swordfish**	**Mahimahi**	**Ono (wahoo)**
2014	43.8	24.1	6.7	34.5	245.4	49.5	118.9	12.3	22.0
2015	44.1	21.5	8.1	33.9	170.5	72.9	96.4	13.2	21.7
2016	47.7	20.9	8.4	33.7	145.1	63.1	117.0	12.0	23.0
2017	53.0	24.1	9.1	42.9	175.1	73.7	121.4	11.0	23.1
2018	52.5	25.4	7.9	45.2	193.2	66.6	110.6	11.8	20.5
2019	54.5	22.8	8.9	33.0	150.8	62.2	129.8	12.7	21.0
2020	55.3	25.9	11.8	39.8	124.5	46.3	159.3	12.3	21.8
2021	58.2	26.1	10.1	31.7	151.0	79.2	107.9	12.7	22.1
2022	57.4	29.7	11.4	49.0	164.1	66.9	103.1	11.8	24.4
2023	49.5	33.7	8.5	43.5	178.5	62.0	141.3	12.8	20.8
Average	**51.6**	**25.4**	**9.1**	**38.7**	**169.8**	**64.2**	**120.6**	**12.3**	**22.0**
SD	**5.2**	**3.9**	**1.6**	**6.1**	**32.9**	**10.3**	**18.8**	**0.6**	**1.2**

2.4.11 PELAGIC SMALL BOAT FISHERY BYCATCH SUMMARIES

CML holders are required to report all fishing activity regardless of whether the marine life is ultimately kept. Bycatch is reported at the species or species group level along with count (pieces), gear, reporting grid number and other trip details. Fishers are not required to report bycatch in weight.

2.4.11.1 FISHERY DEFINITIONS

Fishery definitions included in Section 2.4.1 were created to account for all landings of pelagic species. Because pelagic species are occasionally caught incidentally or misreported in fisheries that do not target them directly, fishery definitions were intentionally kept broad, e.g., the deep-sea handline, a gear used primarily to target bottomfish, was included in the MHI pelagic handline fishery definition to account for pelagic species incidentally caught by the gear and/or catch of species like pomfrets which the gear is occasionally used to target. When accounting for bycatch this presents an issue as the typically non-pelagic fisheries included in these definitions tend to have relatively high bycatch that is otherwise non-pelagic and may mischaracterize bycatch in pelagic fisheries. Fishery definitions as they pertain to bycatch have been modified to herein to remove such non-pelagic fisheries and therefore differ from those used to define catch. Specifically, the gear "Casting, Light Tackle, Spinners or Whipping" was removed from MHI Troll Fishery definition and "Deep Sea or Bottom Handline Methods," "Inshore Handline or Cowrie Shell," and "Kaka line" were removed from the MHI Handline Fishery definition.

2.4.11.2 BYCATCH SUMMARIES

Over 50% of the reported bycatch for the MHI troll fishery in 2023 was comprised of blue marlin and yellowfin tuna (Table 33). High releases of blue marlin and other billfish are due in part to charter fishing operations in which all captains and crews involved are required to hold CMLs. Sport fishing charter trips, especially those fishing the waters off West Hawaiʻi Island, often fish for billfish as a primary target though a large number are released. The State of Hawaii has a three-pound minimum size limit on the commercial sale of ahi (yellowfin and bigeye tuna). High releases of yellowfin tuna, an otherwise commercially valuable and sought after food fish, may be due to undersized fish being discarded. Other top bycatch species for the MHI troll fishery are characteristic of this fishery and include both typically high-value species such as mahimahi, aku, and ono that may be released because they are not at a marketable size as well as other species such kāhala, kākū, and miscellaneous sharks that have low market value. Small inshore species such as menpachi, 'āweoweo, and halalū were likely misreported while on a mixed-gear trip, e.g., trolling and inshore handline. Though bycatch QA/QC methodologies are being introduced, DAR currently does not scrutinize bycatch data to the same degree of catch data resulting in such species being included.

Reported bycatch for the MHI handline fishery was mostly comprised of yellowfin tuna and aku (Table 34). Again, yellowfin tuna have a three-pound minimum size for commercial sale imposed by the State of Hawaii that results in releases of undersized fish. Other top bycatch species for this fishery are reflective of common pelagic catch and other species such as jacks and bottomfish that are occasionally caught incidentally. The majority of the data in Table 34 is withheld due to confidentiality rules, specifically that less than three CML holders reported catch of the species in a given year. Though bycatch in this pelagic fishery relative to overall catch is thought to be low, underreporting is almost certainly occurring.

Bycatch for other pelagic fisheries including the offshore handline and offshore troll fisheries are not reported here due to the data confidentiality rules. Both of these fisheries are extremely small in terms of participation compared with the MHI trolling and handline fisheries. Bycatch data for the offshore troll and handline fisheries will be presented in future reports as confidentiality rules allow.

Table 33. Total reported commercial bycatch (number of individuals) from the MHI troll fishery for fishing years 2014-2023

Species	**2023**	**2022**	**2021**	**2020**	**2019**	**2018**	**2017**	**2016**	**2015**	**2014**
Thunnus albacares; Yellowfin Tuna	969	332	586	615	780	551	497	835	1,240	1,593
Katsuwonus pelamis; Aku	457	248	224	187	124	151	193	417	411	711
Makaira mazara or *Makaira nigricans*; Blue Marlin	427	518	497	386	1,167	949	651	681	1,269	797
Coryphaena hippurus; Mahimahi	263	155	146	197	213	216	282	248	427	623
Acanthocybium solandri; Ono	59		49	20	56	66	60			51
Euthynnus affinis; Kawakawa	57	30							202	437
Tetrapturus angustirostris; Shortbill Spearfish	38	30	30		77	146	181	280	180	159
Seriola dumerili; Kāhala	37	91	87	53	94	100	92	59		
Selachii (infraclass); Shark (Misc.)	30	29	21							
Thunnus obesus; Bigeye Tuna	23		28	36	110			148	170	394
Kajikia audax; Striped Marlin		48	21	38	101	54		64	75	149
Sphyraena barracuda; Kākū		36		26	37				58	
Caranx ignobilis; White Pāpio/Ulua				27				59	55	
Myripristis spp.; Menpachi						n.d.	n.d.	n.d.		
Heteropriacanthus cruentatus; 'Āweoweo						n.d.	n.d.			
Selar crumenophthalmus (Juvenile); Halalū							n.d.			
Caranx melampygus; 'Ōmilu										47
Percent of all Bycatch	*97*	*96*	*97*	*95*	*94*	*66*	*57*	*87*	*96*	*97*

Note: n.d. = non-disclosed due to data confidentiality rules; the species presented in this table represent the ten species most frequently released in each year over the past ten years.

Table 34. Total reported commercial bycatch (number of individuals) from the MHI handline fishery for fishing years 2014-2023

Species	**2023**	**2022**	**2021**	**2020**	**2019**	**2018**	**2017**	**2016**	**2015**	**2014**
Thunnus albacares; Yellowfin Tuna	264	160	246	118	183	261	168	283	434	476
Katsuwonus pelamis; Aku	73	31	n.d.	n.d.	n.d.	n.d.	13	20	44	58

Species	**2023**	**2022**	**2021**	**2020**	**2019**	**2018**	**2017**	**2016**	**2015**	**2014**
Elagatis bipinnulata; Kamanu	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	26	n.d.	n.d.
Coryphaena hippurus; Mahimahi	n.d.	12	n.d.	n.d.	44	13	23	n.d.	n.d.	47
Thunnus obesus; Bigeye Tuna	n.d.	n.d.	13	n.d.	46	n.d.	92	34	40	63
Pristipomoides filamentosus; 'Opakapaka	n.d.			n.d.						
Thunnus alalunga; Tombo	n.d.						15			n.d.
Acanthocybium solandri; Ono	n.d.		n.d.	n.d.	n.d.	21	n.d.	28	n.d.	n.d.
Aphareus rutilans; Lehi	n.d.									
Etelis carbunculus; Ehu	n.d.									
Belonidae (family); 'Aha		n.d.	n.d.			n.d.				
Selachii (infraclass); Shark (Misc.)		n.d.	n.d.	n.d.			n.d.			
Seriola dumerili; Kāhala		n.d.		12	n.d.	20		7	n.d.	
Sphyrna spp.; Hammerhead Shark		n.d.								
Acanthurus dussumieri; Palani		n.d.								
Sphyraena barracuda; Kākū			n.d.	n.d.						
Alopias vulpinus; Thresher Shark			n.d.					6		4
Euthynnus affinis; Kawakawa					n.d.	n.d.			n.d.	n.d.
Carcharhinus longimanus or *Triaenodon obesus*					n.d.				5	
Balistidae (family); Humuhumu					n.d.					
Caranx melampygus; 'Ōmilu						n.d.				
Prionace glauca; Blue Shark							n.d.			
Selar crumenophthalmus; Akule							n.d.	n.d.	n.d.	
Carangidae (family); Pāpio, Ulua (Misc.)								n.d.		
Xiphias gladius; Broadbill Swordfish										n.d.
Percent of all Bycatch	*83*	*70*	*66*	*65*	*59*	*65*	*78*	*89*	*75*	*88*

Note: n.d. = non-disclosed due to data confidentiality rules; the species presented in this table represent the ten species most frequently released in each year over the past ten years.

2.5 NON-COMMERCIAL PELAGIC FISHERIES

2.5.1 OVERVIEW OF NON-COMMERCIAL PELAGIC FISHERIES

Fishing, either for subsistence, sustenance, or recreation continues to be an important activity throughout the Western Pacific region in its four major populated island areas: Hawaii, American Samoa, Guam, and the CNMI. These non-commercial fisheries are important in island communities that depend on fish and other marine organisms as one of its few local sources of protein. This section was not updated in the 2021 or 2022 report in preparation of a revised section in the 2023 annual SAFE report, consistent with recommendations by the Council’s Pelagic Plan Team.

In Hawaii, non-commercial shoreline fishing was more popular than boat-based fishing up to and after World War 2. Boat-based fishing during this period referred primarily to fishing from traditional canoes (Glazier 1999). All fishing was greatly constrained during World War 2 through time and area restrictions, which effectively stopped commercial fishing and confined non-commercial fishing to inshore areas (Brock 1947). Following World War 2, the advent of better fishing equipment, new small boat hulls, and marine inboard and outboard engines led to a growth in small vessel-based non-commercial fishing.

A major period of expansion of small vessel non-commercial fishing occurred between the late 1950s and early 1970s through the introduction of fiberglass technology to Hawaii and the further refinement of marine inboard and outboard engines. By the early 1960s there were an estimated 5,300 small boats in the State being used for non-commercial fishing. By the 1980s, the number of non-commercial craft had risen to almost 13,000 vessels, and this number increased further to about 15,000 vessels in the 1990s. There are many fishing clubs in Hawaii, and a variety of different recreational fishing tournaments organized by both clubs and independent tournament organizers. Hawaii also hosts between 150 and 200 boat-based fishing tournaments, about 30 of which are considered major international competitions. This level of interest in recreational fishing is sufficient to support local fishing magazines, *Hawaii Fishing News* and *Lawai’a*, with articles about local recreational fishing, as well as several recreational fishing television programs.

Elsewhere in the Western Pacific region, non-commercial 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 to 15 people along with their families. Four such clubs were founded in Guam over the past 20 years, but none lasted for more than a 2 to 3 years (Gerry Davis, NMFS PIRO, pers. comm.). There was also a Guam Boating Association, comprised of mostly fishermen, with several hundred members. This organization functioned as a fishing club for about 10 years before disbanding. Some school groups and the boy scouts have formed fishing clubs focused on rod and reel fishing, and there is still one spearfishing club (Marianas Underwater Fishing Federation) that is active. There are also some limited fishing tournaments in Guam, including a fishing derby for children organized by the DAWR.

Every summer in Guam, the fishing community gathers to partake in several fishing derbies and the *Gupot Y Peskadot* (i.e., Fishermen’s Festival). This includes several fishing competitions such as the Kid’s Fishing Derby, In-Shore Tournament (rod and reel), Spearfishing Challenge and Guam Marianas International Fishing Derby (trolling).

There are a few fishing clubs in the in the Northern Mariana Islands. The Saipan Fishermen's Association (SFA) has been in existence since 1985 and is the sponsor of the annual Saipan International Fishing Tournament usually held in August or September. The SFA also developed a "Tasi to Table" Youth Fishing Club, which provides fishing experiences and training to high school students. One spearfishing club, the Marianas Apnea Spearfishing Club, was founded in 2007 and continues to instill traditional cultural fishing skills among the people of the CNMI to encourage sustainable fishing.

Levine and Allen (2009) provided 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 (2009) 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 discern as one fishing outing could be motivated by any combination of the three reasons.

Boat-based recreational fishing in American Samoa has been influenced primarily by 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 (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 were local small-scale commercial fishermen. In 1996, three days of tournament fishing contributed about one percent of the total domestic landings. Typically, seven 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).

Most tournament participants operated 28-foot *alia* vessels, 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 non-existent in American Samoa. Landing fish to meet cultural obligations is of such high importance such that releasing fish would generally be considered a failure to meet these responsibilities (Tulafono 2001). Nevertheless, some pelagic fishermen who fish for subsistence release fish that are in excess of their subsistence needs.

Most of the non-commercial boat-based fishing is done by the Pago Pago Game Fishing Association (PPGFA), which was founded in 2003 to host regular fishing competitions. The PPGFA has annually hosted international tournaments with fishermen from neighboring Samoa and Cook Islands attending. The non-commercial vessels extensively use anchored FADs, and venture to the various outer banks such as 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) during tournaments. 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 is no full-time regular charter fishery in American Samoa similar to those in Hawaii, CNMI, or Guam. However, Pago Pago Marine Charters does include fishing charters among the services it offers.

There is also some non-commercial fishing activity within portions of the PRIA, namely at Midway, Wake Island, and Palmyra Atoll. There are no resident populations at Howland

Island, Baker Island, Johnston Atoll, or Jarvis Island, 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. The company operated five vessels for charter fishing, consisting of three 22 to 26 foot catamarans for lagoon and nearshore fishing operations and two 38 foot sportfishing vessels used for blue water trolling. In addition, there were approximately seven small vessels maintained and used by Midway residents for non-commercial fishing. Of these seven, three vessels engaged primarily in offshore trolling for PMUS including yellowfin tuna, wahoo, 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, small boats are operated within the lagoon for trolling. There are several craft used for non-commercial fishing at the military base on Wake Island, including two landing craft and two small vessels.

2.6 INTERNATIONAL

This section of the 2023 annual SAFE report has not yet been revised with the most current data. The report will be updated when this content becomes available. The text and figures presented here are identical to the 2022 annual SAFE report.

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. The tables of this section show the catches of pelagic MUS by U.S. longline (Hawaii and California-based) and U.S. territorial longline fisheries in the Western and Central Pacific Fisheries Commission (WCPFC) Convention Area from 2018-2022, as reported by NMFS to the WCPFC. The catches for 2022 are preliminary.

Table 41 through Table 43 provide the U.S. longline landings as submitted to the WCPFC and Inter-American Tropical Tuna Commission (IATTC).

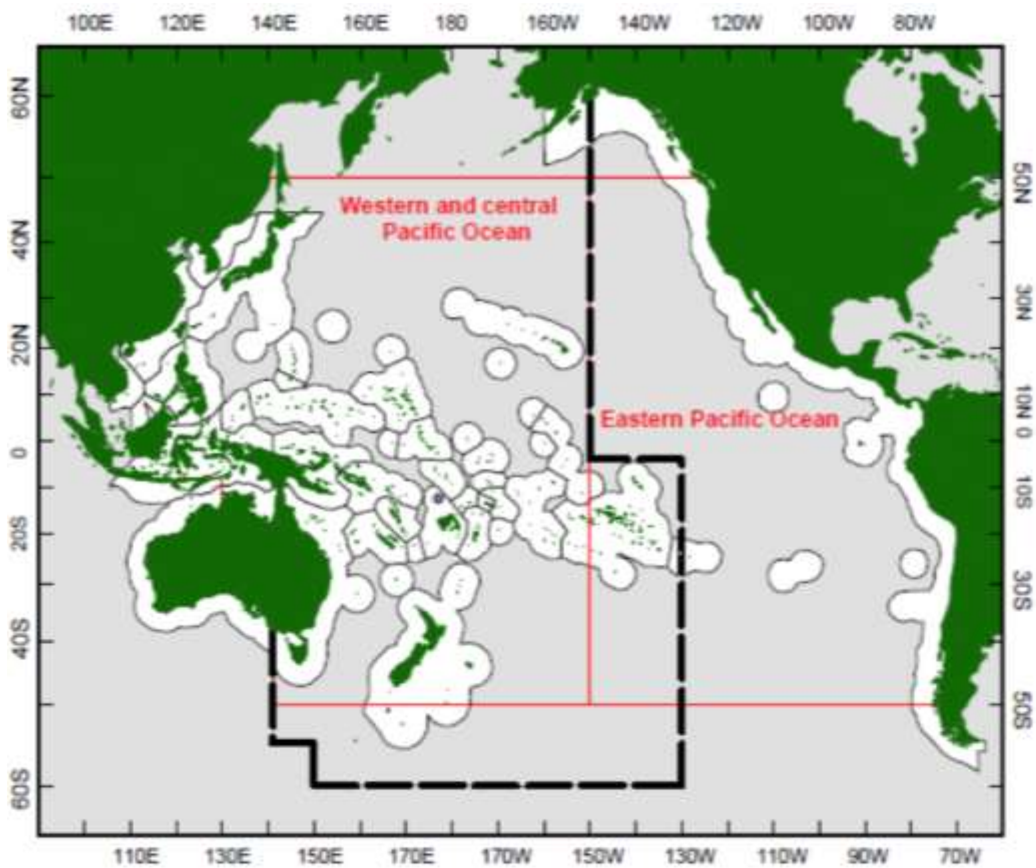


Figure 110. The Western and Central Pacific Ocean, Eastern Pacific Ocean and the WCPFC Convention Area (WCP–CA) [in dashed lines])

2.6.2 DATA SOURCES

The data sources for the international module of the annual SAFE report are obtained from the various literature of the WCPFC, the IATTC, and the International Scientific Committee for Tuna and Tuna-like species (ISC). These references can be found in Section 5. Additional sources of data include the U.S. data submissions to the WCPFC and IATTC documented in this module.

2.6.3 PLAN TEAM RECOMMENDATIONS

There were no recommendations for the International module by the Pelagic Plan Team for the 2022 annual SAFE report to be forwarded to the Council, only work items to Pelagic Plan Team members on improvements to other modules.

2.6.4 SUMMARY OF FISHERIES

This section presents the total catch of tuna species in the Pacific Ocean as reported to the Pacific Community (PC) from all member countries. Table 35 and Figure 111 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.

Table 35. Estimated annual catch (mt) of tuna species in the Pacific Ocean

Year	Albacore	Bigeye	Skipjack	Yellowfin	Total
2012	181,609	269,535	2,001,883	838,293	3,291,320
2013	175,643	243,627	2,106,861	811,623	3,337,754
2014	162,971	260,928	2,248,280	867,743	3,539,922
2015	155,110	250,282	2,118,867	849,259	3,373,518
2016	126,953	249,087	2,127,260	915,382	3,418,682
2017	151,899	232,958	1,935,840	936,873	3,257,570
2018	137,543	245,827	2,133,155	953,881	3,470,406
2019	143,530	227,566	2,385,974	935,555	3,692,625
2020	113,437	252,578	2,016,127	962,476	3,344,618
2021	111,656	222,013	1,950,558	1,034,496	3,318,723
Average	146,035	245,440	2,102,481	910,558	3,404,514
STD deviation	24,113	14,665	138,201	68,211	131,933

Source: PC (2022).

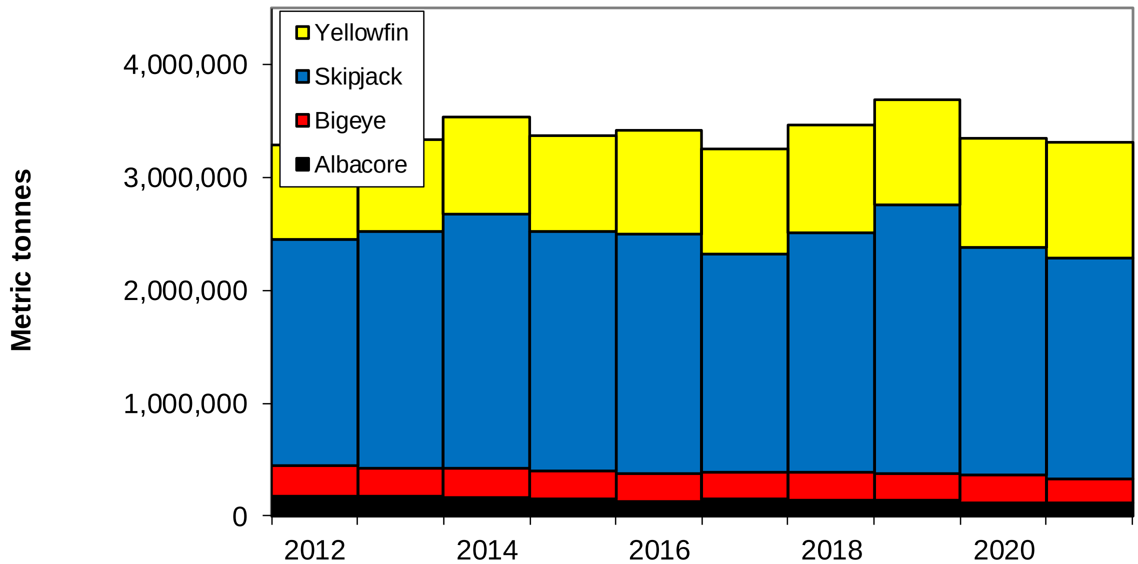


Figure 111. Estimated total annual catch of tuna species in the Pacific Ocean
Source: PC (2022).

2.6.4.1 PURSE SEINE FISHERY IN THE WCPFC

Source: WCPFC-SC18-2022 GN-WP-01

Vessels: The majority of the historic WCP–CA purse seine catch has come from the four main Distant Water Fishing Nation (DWFN) fleets – Japan, Korea, Chinese-Taipei and USA, which combined numbered 163 vessels in 1992, but declined to a low of 111 vessels in 2006 (due to reductions in the US fleet), before some rebound in recent years (up to 129 vessels in 2017 and 124 vessels in 2020). The Pacific Islands fleets have gradually increased in numbers over the past two decades to a level of 142 vessels in 2021. The remainder of the purse seine fishery includes several fleets which entered the WCPFC tropical fishery during the 2000s (e.g., China, Ecuador, El Salvador, New Zealand, and Spain).

The total number of purse seine vessels was relatively stable over the period 1990-2006 (in the range of 180–220 vessels), but thence until 2014, the number of vessels gradually increased, attaining a record level of 308 vessels in 2015, before steadily declining since (to 267 vessels in 2020). Further declines occurred in 2020 and 2021 with a significant reduction in vessels from one component of the US purse seine fleet.

The provisional 2021 purse seine catch of 1,740,370 mt was the lowest catch since 2011, and around 360,000 mt lower than the record catch in 2019 (2,101,405 mt). The 2021 purse seine skipjack catch (1,254,022 mt: 72% of the catch) was a clear drop of around 440,000 mt on the record in 2019 (~1,700,000 mt). The 2021 purse seine catch for yellowfin tuna (405,915 mt; 23% of the total purse seine tuna catch) was around 95,000 mt lower than the record catch in 2017 (501,109 mt) but still amongst the highest annual catches for this fishery. The provisional catch estimate for bigeye tuna for 2021 (79,167 mt) was the highest since 2014 and a clear increase on the relatively low purse seine bigeye tuna catch in 2019 (49,958 mt). The increased bigeye tuna catches in both 2020 and 2021 appears to be related to a higher number of associated sets in conjunction with La Nina conditions.

Despite the FAD closure for certain periods in each year since 2010, drifting FAD sets remain an important fishing strategy, particularly to the east of 160°E. The relatively high proportion of unassociated sets in the eastern areas (e.g. Gilbert Islands) was a feature of the fishery in 2015–2016 (i.e. corresponding to El Niño conditions). The move to ENSO-neutral conditions, then weak La Niña during 2017 into early 2018 resulted in more effort in the area west of 160°E compared to recent years, and a higher use of drifting FADs in the area east of 160°E. By late 2018, weak El Niño conditions presided over the fishery and relatively high catches were taken in the eastern tropical areas, in and adjacent to the waters of Tokelau and the Phoenix Group. El Niño conditions continued into 2019 with purse seine effort extending further to the east compared to recent years and very good catches were taken in a few concentrated areas of the eastern tropical waters. The La Niña conditions experienced in 2020 and 2021 resulted in a general westward shift of fishing effort compared to 2019.

In general, the distribution of effort for most fleets in 2021 is similar to 2020 activities, no doubt related to the prevailing (La Niña) conditions in both years. The US fleet typically fishes in the more eastern areas as was the case during 2020 with effort extended into the Gilberts, Phoenix and Line Islands, the Cook Islands, Tokelau and the adjacent eastern high seas areas with increasingly less effort west of 160°E; during 2021, the US fleet fished even further east, in the Line Group and the high seas areas north of the Cook Islands and French Polynesian EEZs. The difference in areas fished by the non-Pacific islands' fleets (Figures 3.4.2–3.4.5) is related to the areas they have access to and perhaps also related to fishing strategy (e.g., use of traditional fishing grounds, e.g. FSM, PNG and the Solomon Islands by the Japan fleet).

Table 36. Total reported purse seine catch (mt) of skipjack, yellowfin, and bigeye tuna in the Pacific Ocean

Year	Skipjack	Yellowfin	Bigeye	Total
2012	1,639,189	596,199	142,654	2,378,042
2013	1,754,271	590,836	133,891	2,478,998
2014	1,878,005	613,970	141,875	2,633,850
2015	1,722,044	563,285	123,883	2,409,212
2016	1,713,933	650,823	130,787	2,495,543
2017	1,588,071	711,486	133,783	2,433,340
2018	1,738,252	621,186	138,817	2,498,255
2019	2,043,578	580,485	119,181	2,743,244
2020	1,700,197	620,375	151,824	2,472,396
2021	1,652,329	683,445	134,111	2,469,885
Average	1,742,987	623,209	135,081	2,501,277
STD Deviation	131,166	46,518	9,419	108,914

Source: PC (2022) and IATTC (2022).

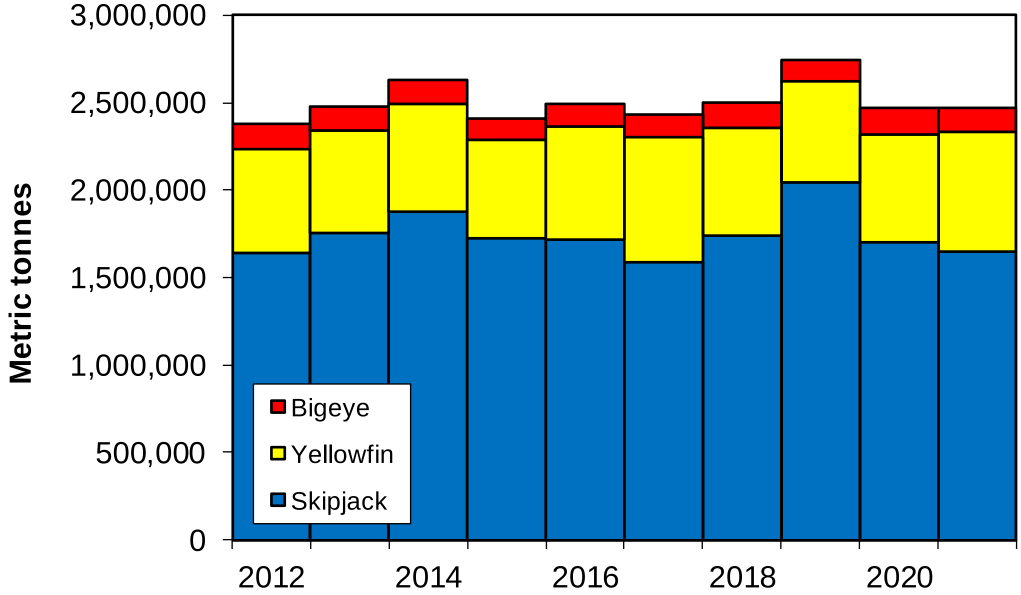


Figure 112. Total purse seine catch of skipjack, yellowfin, and bigeye tuna in the Pacific Ocean

Source: PC (2022) and IATTC (2022).

2.6.4.2 LONGLINE FISHERIES IN THE WCPFC

Source: WCPFC-SC18-2022 GN-WP-01

The longline fishery now accounts for only 8–10% of the total WCP–CA catch (OFP, 2021), but approaches the much larger purse seine catch in landed value. It provides the longest time series of catch estimates for the WCP– CA, with estimates available since the early 1950s. The total number of vessels involved in the fishery generally fluctuated between 3,000 and 6,000 for the period 1970–2004, although for some distant-water fleets, vessels operating in areas beyond the WCP–CA could not be separated out and more representative vessel numbers for WCP–CA have only become available in recent years. Total longline vessel numbers have slowly declined over the past 15 years, with the provisional estimate of 1,543 vessels in 2021 showing a 57% drop on vessel numbers in 2005 and a 9% drop on 2019 vessel numbers, mainly due to a decline in the category of non Pacific Islands domestic fleets, but also no doubt due to the impacts of COVID-19.

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. Voluntary reduction in vessel numbers by at least one fleet has occurred in recent years;
- 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. There are several foreign offshore fleets based in Pacific Island countries.

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, PNG, Samoa, Solomon Islands, Tonga, Tuvalu 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, although the latter fleet has not fished recently. Vessel numbers have stabilized in recent years, but they may also vary depending on charter arrangements.
- Tropical offshore bigeye/yellowfin-target fishery includes "offshore" sashimi longliners from Chinese-Taipei, based in Micronesia, Guam, Philippines and 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.
- 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 tuna 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 Hawaiian 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 and Portugal (one vessel started fishing in 2011).
- 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 (191,666 mt) for 2021 is the lowest catch since 1993 at this stage, acknowledging the negative impacts due to COVID-19 but also that coverage of available 2021 data is not yet complete. The COVID-19 restrictions played a role in the distribution of 2021 effort in the longline fishery, with clear declines in effort in both the south Pacific Albacore fishery and in the tropical longline fishery. The *La Niña* conditions during 2020 and 2021 may also have contributed to lower catches in the longline fishery, although further investigation would be required to confirm this hypothesis.

The WCP–CA albacore longline catch (66,475 mt – 35%) for 2021 was the lowest since 1996, and nearly 40,000 mt lower than the record of 106,142 mt attained in 2010. The provisional bigeye catch (49,511 mt – 26%) for 2021 was the lowest since 1983, and well down on the bigeye catch levels experienced in the 2000s (e.g. the 2004 longline bigeye catch was 99,709 mt). The yellowfin catch for 2021 (71,847 mt – 37%), as in 2020, was a significant drop on the high catch level in 2019 (106,279 mt).

The distant-water fleet dynamics have continued 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 variation 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 1,524 mt in 2021) and vessel numbers (366 in 2004 to 71 in 2021). The Chinese-Taipei distant-water longline fleet bigeye catch declined from 16,888 mt in 2004 to 3,667 mt in 2021, mainly related to a substantial drop in vessel numbers (137 vessels in 2004 reduced to 85 vessels in 2021). The Korean distant-water longline fleet experienced some decline in bigeye and yellowfin catches since the period of highest catches 15–20 years ago in line with a reduction in vessel numbers – from 184 vessels active in 2002 reduced to 94 vessels in 2021.

In contrast, the China longline fleet catches of albacore tuna have been amongst the highest ever in recent years (this fleet caught on average 20,000–25,000 mt of albacore tuna in the WCP-CA in recent years, although the 2021 albacore tuna catch was 16,076 mt).

With domestic fleet sizes continuing to increase as foreign-offshore and distant-water fleets decrease, this evolution in fleet dynamics no doubt has some effect on the species composition of the catch. For example, the increase in effort by the Pacific Islands domestic fleets has primarily been in albacore fisheries, although this had been balanced to some extent by the switch to targeting bigeye tuna (from albacore) by certain vessels in the distant-water Chinese-Taipei fleet almost a decade ago. More detail on individual fleet activities during recent years is available in the WCPFC–SC18 National Fisheries Reports.

Fleet distribution: Effort by the large-vessel, distant-water fleets of Japan, Korea and Chinese-Taipei accounts 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, mainly in international 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 latter now predominantly using the handline gear). The growth in domestic fleets targeting albacore tuna in the South Pacific over the past decade has been noted; the most prominent fleets in this category are the Cook Islands, Samoa, Fiji, French Polynesia, Solomon Islands (when chartering arrangements are active), Tonga and Vanuatu fleets.

Table 37. Total reported longline catch (mt) of PMUS in the Pacific Ocean

Year	Albacore	Yellowfin	Bigeye	Striped Marlin	Black Marlin	Blue Marlin	Swordfish	Total
2012	122,167	100,620	120,138	6,469	2,007	18,262	43,570	413,233
2013	117,437	88,129	101,807	5,881	1,820	20,037	41,032	376,143
2014	108,978	109,024	110,774	5,625	2,201	20,982	39,422	397,006
2015	112,161	115,012	114,921	5,268	2,522	20,231	44,691	414,806
2016	92,514	101,677	98,618	4,335	1,313	18,598	42,056	359,111
2017	116,876	96,707	93,486	4,411	1,138	16,454	38,103	367,175
2018	102,436	110,195	98,618	4,321	1,245	15,774	40,117	372,706
2019	107,067	117,327	97,015	4,872	1,161	14,393	34,514	376,349
2020	87,568	87,017	84,261	4,923	1,513	11,145	36,027	312,454
2021	89,574	86,664	68,303	4,953	1,345	10,172	35,354	296,365
Average	105,678	101,237	98,794	5,106	1,627	16,605	39,489	368,535
STD deviation	12,300	11,533	15,058	712	484	3,765	3,478	38,773

Source: SPC (2022) and IATTC (2022).

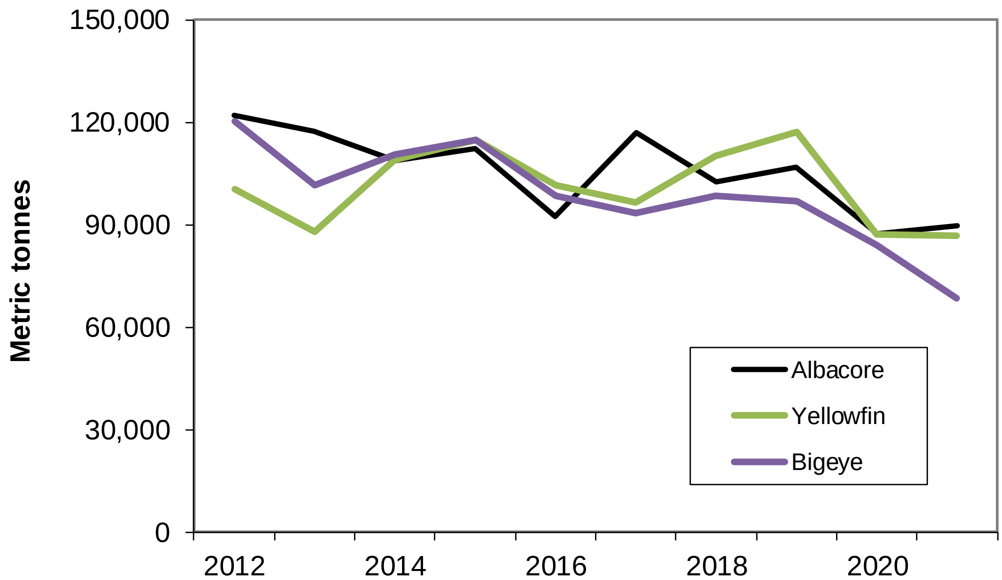


Figure 113. Reported longline tuna catches in the Pacific Ocean
Source: PC (2022) and IATTC (2022).

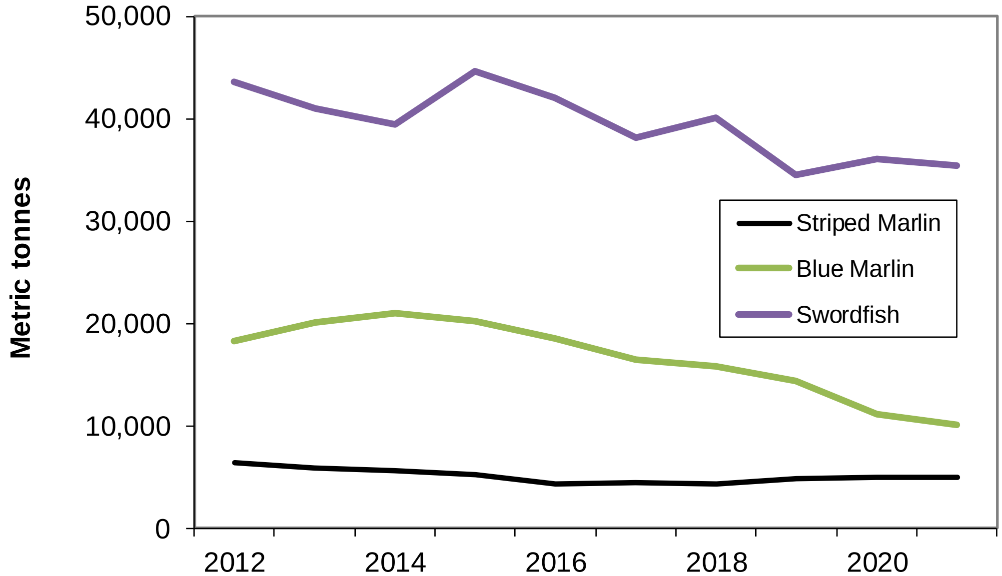


Figure 114. Reported longline billfish catches in the Pacific Ocean
Source: SPC (2022) and IATTC (2022).

2.6.4.3 POLE-AND-LINE FISHERY IN THE WCPFC

Source: WCPFC-SC18-2022 GN-WP-01

Vessels: Economic factors and technological advances in the purse seine fishery (primarily targeting the same species, skipjack) have resulted in a gradual decline in the number of vessels in the pole-and-line fishery and in the annual pole-and-line catch during the past 15–20 years. The gradual reduction in numbers of vessels has occurred in all pole-and-line fleets over the past decade. Pacific Island domestic fleets have declined in recent years – fisheries formerly operating in Fiji, Palau and Papua New Guinea are no longer active, only one vessel is now operating (occasionally) in Kiribati, and fishing activity in the Solomon Islands fishery during the 2000s was reduced substantially from the level experienced during the 1990s. Several vessels continue to fish in Hawai'i, and the French Polynesian *bonitier* fleet remains active (30 vessels in 2021), but an increasing number of vessels have turned to longline fishing. Vessel and catches from Indonesian pole-and-line fleet have also declined over recent years. There is continued interest in pole-and-line fish associated with certification/ecolabelling.

Catch: The provisional 2021 pole-and-line catch (123,528 mt) was lower than the 2020 catch (200,345 mt) and at this stage, the lowest annual catch since the early-1960s, due to reduced catches in both the Japanese and the Indonesian fisheries, although 2021 estimates are provisional at this stage. Skipjack accounts 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 (5– 10% in recent years) is taken by the Japanese coastal and offshore fleets in the temperate waters of the north Pacific. Yellowfin tuna (recently 10–15%) and a small component of bigeye tuna (1–4%) make up the remainder of the catch. There are only four pole and-line fleets currently active in the WCPO (French Polynesia, Japan, Indonesia and Solomon Islands). Japanese distant-water and offshore fleets (67,910 mt in 2021), and the

Indonesian fleets (54,204 mt in 2021), account for nearly all of the WCP–CA pole-and-line catch (99% in 2021). 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 (although the vessel numbers have been stable at around 75-80 over the past 5 years). 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 around 1,000 mt (1,200 mt in 2021 from 4 vessels).

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, Hawaii, and Fiji
- a seasonal albacore/skipjack fishery east of Japan (largely an extension of the Japan home-water fishery).

Table 38. Total reported pole-and-line catch (mt) of skipjack in the Pacific Ocean

Year	Catch
2012	170,841
2013	169,189
2014	148,851
2015	151,317
2016	156,603
2017	123,466
2018	183,935
2019	158,225
2020	159,440
2021	146,840
Average	156,871
STD deviation	16,328

Source: PC (2022).

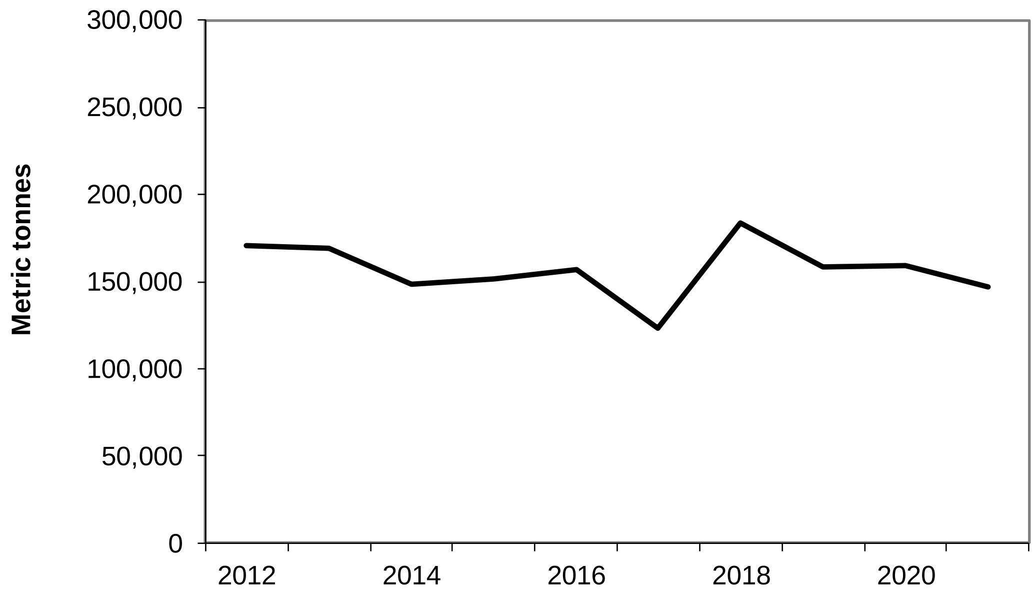


Figure 115. Reported pole-and-line catch (mt) in the Pacific Ocean
Source: PC (2022).

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 PMUS, the Council adopted a maximum sustainable yield (MSY) control rule shown in Figure 116. 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.

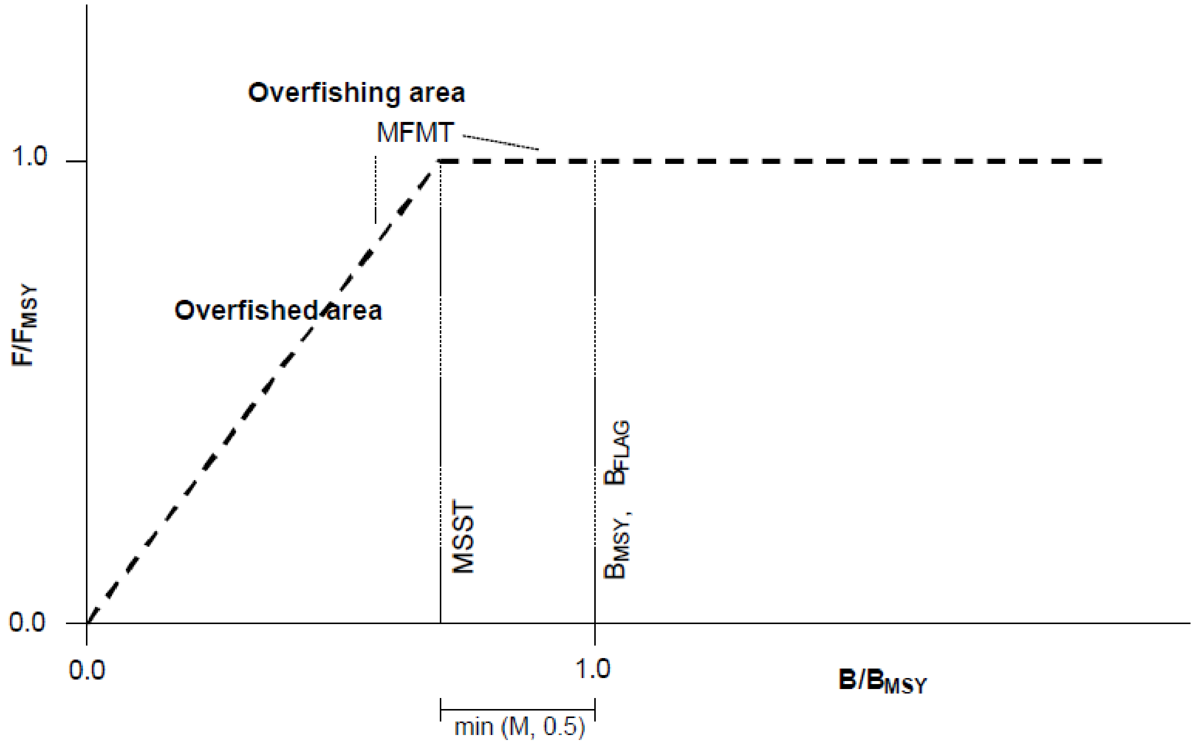


Figure 116. MSY control rule and reference points for pelagic MUS

2.6.6 INFORMATION ON OFL, ABC, AND ACL

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 Pacific Community's Oceanic Fisheries Program (OFP-SPC) conducts stock assessments as the science provider to the WCPFC. Like the IATTC, the PC-OFP 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 39 summarizes the stock assessments for pelagic MUS completed or scheduled for completion between 2017 and 2022.

Table 39. Schedule of completed stock assessments for WPFMC PMUS

Management Unit Species	Year Completed	Management Unit Species	Year Completed
Albacore (S. Pacific)	2021	Swordfish (N. Pacific)	2018
Albacore (N. Pacific)	2020	Wahoo	
Other tuna relatives (*Auxis* sp.)		Yellowfin Tuna (WCPO)	2020
(*allothunnus* sp., *Scomber* sp.)		Kawakawa	
Bigeye Tuna (WCPO)	2020	**Bluefin Tuna (Pacific)**	**2022**
Black Marlin		Common Thresher Shark	
Blue Marlin	2021	Pelagic Thresher Shark	
Mahimahi		Bigeye Thresher Shark	2017 - risk assessment
Oilfishes		Shortfin Mako Shark	2018
Opah		Longfin Mako Shark	
Pomfrets		**Blue Shark (N. Pacific)**	**2022**
Sailfish		Silky Shark	2018
Shortbill Spearfish		Oceanic Whitetip Shark	2019
Skipjack Tuna (WCPO)	**2022**	Salmon Shark	
Striped Marlin (N. Pacific)	2019	Squid	

The following pages include links to the most recent stock assessments and assessment results completed in 2022, including descriptions provided in the WCPFC SC18 Summary Report. For more information on stock assessments and assessment results completed prior to 2021, please see the past pelagic annual SAFE reports.

2.6.7.1 SKIPJACK TUNA

Stock assessment: Castillo Jordan et al. (2022).

Link: https://meetings.wcpfc.int/node/16242.

a. Stock status and trends

SC18 noted that the total catch in 2021 was 1,547,945t, a 10% decrease from 2020 and a 14% decrease from the 2016-2020 average. Purse seine catch in 2021 (1,254,022t) was a 11% decrease from 2020 and a 13% decrease from the 2016-2020 average. Pole and line catch (97,908t) was a 39% decrease from 2020 and a 37% decrease from the 2016-2020 average catch. Catch by other gears totalled 192,182t and was a 25% increase from 2020 and 5% decrease from the average catch in 2016-2020.

SC18 adopted the 2022 assessment and a structural uncertainty grid was used to develop management advice which included axes for tag mixing (three options), growth (two options) and steepness (three options), resulting in 18 models (Table SKJ-01). All models within the grid were equally weighted. The assessment grid of models estimated that the overall median recent spawning depletion ($SB_{recent}/SB_{F=0}$) is 0.51 (80th percentile 0.43-0.64), which is close to the interim target reference point (TRP) of 0.50 (CMM 2021-01). No grid models were below the limit reference point (LRP) of 0.20 $SB_{F=0}$. The median of F_{recent}/F_{MSY} was 0.32 (80th percentile 0.18-0.45) (Table SKJ-02). The 2022 stock assessment of skipjack tuna for the WCPO, indicated that according to WCPFC reference points the stock is not overfished, nor undergoing overfishing.

Catches of skipjack tuna in the WCPO have increased from approximately 250,000 metric tonnes in the late 1970s to a peak catch of approximately 2,000,000 metric tonnes in 2019; catches have dropped from 2019 to 2021 (Figure SKJ-02). Catches are dominated by purse seine fisheries in equatorial regions 6, 7, and 8, and purse seine and other gears in region 5 (Figure SKJ-03). Catches are dominated by pole-and-line in the northern regions 1–4 and continue to be low compared to those in the equatorial regions (Figures SKJ-03 and SKJ-04). The spawning potential and total biomass, while showing variability over time, do not show sustained long-term declining trends (Figures SKJ-05 and SKJ-08). In contrast, the trajectory of spawning potential depletion ($SB/SB_{F=0}$) shows a long-term trend towards a more depleted status (Figure SKJ-09). The spawning potential depletion trajectory was largely driven by the model estimates of increased levels of unfished spawning potential over time which are in turn driven by the model estimates of increasing recruitment over time (Figure SKJ-05). The model estimated increased recruitment over time to account for the increased catches in the face of a relatively stable biomass that is partly informed by several long-term stable CPUE indices of abundance (i.e., pole-and-line fishery indices) within the assessment. However, it is noted that spawning potential, recruitment and total biomass are estimated to have declined since around 2010 (Figure SKJ-05).

Fishing mortality continues to increase over time for the adult and juvenile components of the stock, with fishing mortality being consistently higher for adults (Figure SKJ-06).

Fishery impact analyses show that the purse seine fisheries continue to dominate the impact in the equatorial regions 6, 7, and 8, with similar impacts by the ‘associated’ and ‘unassociated’ components, except for region 8 where ‘associated’ fishing appears to have more impact (Figure SKJ-07). Fishery impacts in region 5 are dominated by purse seine and other gears, and in regions 1-4, by pole-and-line, but with increasing impact of purse seine over time (Figure SKJ-07).

The influences of the structural uncertainty grid axes on key management quantities are shown in Figure SKJ-10. Tag mixing assumptions that applied longer tag mixing periods, and the externally estimated growth curve, resulted in more optimistic estimates of spawning potential depletion and spawning potential and lower fishing mortality.

Majuro and Kobe plots summarising stock status for the 18 models in the structural uncertainty grid are included for the ‘latest’ (2021, Figure SKJ-11) and ‘recent’ periods (2018-2021, Figure SKJ-12). These plots show that the stock status estimates across the 18 models are all within the zones indicating that the stock is not overfished nor undergoing overfishing.

The assessment provided a range of diagnostic analyses derived from the diagnostic model that indicated conflict between tag and CPUE data and instability in the convergence minima. Despite this, the model showed low retrospective bias and the important spawning potential depletion management quantities were robust to the differences in model convergence. However, as noted by several CCMs, data conflicts and the instability in model convergence minima require follow-up work and should be improved.

SC18 noted that the skipjack assessment continues to show that the stock is currently moderately exploited and the level of fishing mortality is sustainable.

SC18 noted that the stock was assessed to be above the adopted LRP and fished at rates below F_{MSY} with 100% probability. Therefore, the skipjack stock is not overfished, nor subject to overfishing. At the same time, it was also noted that fishing mortality is continuously increasing for both adult and juvenile stages while the estimated spawning potential has shown a declining trend since the mid to late 2000s, and spawning potential depletion reached a historically low level in recent years.

SC18 noted that levels of fishing mortality and depletion differ between regions, and that fishery impact was highest in the tropical region (Regions 5, 6, 7 and 8 in the stock assessment model), mainly due to the purse seine fisheries in the equatorial Pacific and the "other" fisheries within the Western Pacific.

b. Management advice and implications

SC18 did not achieve a consensus on the management advice for skipjack tuna in the WCPO.

2.6.7.2 BLUEFIN TUNA

Stock assessment: ISC (2022a).

Link: https://isc.fra.go.jp/pdf/ISC22/ISC22_ANNEX06_Report_of_the_PBFWG_Workshop_Dec2021.pdf.

a. Stock status and trends

SC18 welcomed successful completion of an updated Pacific bluefin tuna (PBF) stock assessment and noted the following stock status and conservation information provided by ISC.

SC18 noted the following stock status from ISC:

PBF spawning stock biomass (SSB) has gradually increased in the last 10 years, and the rate of increase is accelerating. These biomass increases coincide with a decline in fishing mortality, particularly for fish aged 0 to 3, over the last decade. The latest (2020) SSB is estimated to be10.2% of SSB_0.

1) No biomass-based limit or target reference points have been adopted for PBF, but the PBF stock is overfished relative to the potential biomass-based reference points (20%SSB_0) adopted for other tuna species by the IATTC and WCPFC. On the other hand, SSB reached its initial rebuilding target (SSB_{MED} = 6.3%SSB_0) in 2019, 5 years earlier than originally anticipated by the RFMOs.
2) No fishing mortality-based reference points have been adopted for PBF by the IATTC and WCPFC. The recent (2018-2020) $F_{\%SPR}$ is estimated to produce a fishing intensity of 30.7%SPR and is below the level corresponding to overfishing for many F-based reference points proposed for tuna species (Table PBF2), including SPR20%.

SC18 noted that while the gradual improvement of the Pacific bluefin tuna stock is a step in the right direction, it must be remembered that the current spawning biomass of the stock is only 10.2% of the unfished level. This is well below the LRP of 20% adopted for the key tuna species in WCPFC and suggests the Pacific bluefin tuna stock remains overfished relative to the LRP of key tuna species.

SC18 noted some CCMs encourage a precautionary approach towards the management of Pacific bluefin tuna until such time as the second rebuilding target is met, especially as the stock assessment and projection results are based on certain assumptions, including those on future recruitment, that may not always be met.

SC18 supported the continued monitoring of recruitment and spawning stock biomass, and research on a recruitment index for the stock assessment given the uncertainty in future recruitment and the influence of recruitment on stock biomass, as well as the impact of changes in fishing operations due to management changes.

b. Management advice and implications

SC18 noted that the updated stock assessment presented at SC18 indicates that the stock is likely recovering as planned or possibly faster, which suggests that the measures incorporated in CMM 2021-02 appear to be working as intended.

SC18 recommended that the Commission exercise a precautionary approach, and noted that the PBF stock is still in a depleted state (10.2% of SSB_0) when it considers any revisions to the current CMM. Consideration of any increases to the catch limit needs to be weighted against reducing the probability of recovering to the second rebuilding target.

SC18 further welcomed ISC’s effort on further investigation of structural uncertainty to incorporate it in future management advice.

SC18 noted the following management information from ISC:

After the steady decline in SSB from 1996 to the historically low level in 2010, the PBF stock has started recovering, and recovery has been more rapid in recent years, consistent with the implementation of stringent management measures. The 2020 SSB was above the initial rebuilding target but remains below the second rebuilding target adopted by the WCPFC and IATTC. However, stock recovery is occurring at a faster rate than anticipated by managers when the Harvest Strategy to foster rebuilding (WCPFC HS 2017-02) was implemented in 2014. The fishing mortality ($F_{\%SPR}$) in 2018-2020 has been reduced to a level producing 30.7%SPR, the lowest observed in the time series. Based on these findings, the following information on the conservation of the Pacific bluefin tuna stock is provided:

1. The PBF stock is recovering from the historically low biomass in 2010 and has exceeded the initial rebuilding target ($SSB_{MED1952-2014}$) five years earlier than expected. The rate of recovery is increasing and under all projection scenarios evaluated, it is very likely the second rebuilding target (20%SSB_0 with 60% probability) will be achieved (probabilities > 90%) by 2029 (Table PBF-3). The risk of SSB falling below the historical lowest observed SSB at least once in 10 years is negligible.
2. The projection results show that increases in catches are possible without affecting the attainment of the second rebuilding objective. Increases in catch should consider both the rebuilding rate and the distribution of catch between small and large fish.
3. The projection results assume that the CMMs are fully implemented and are based on

certain biological and other assumptions. For example, these future projection results do not contain assumptions about discard mortality. Although the impact of discards on SSB is small compared to other fisheries, discards should be considered in future harvest scenarios.

4. Given the uncertainty in future recruitment and the influence of recruitment on stock biomass as well as the impact of changes in fishing operations due to the management, monitoring recruitment and SSB should continue and research on a recruitment index for the stock assessment should be pursued.
5. The results of projections from sensitivity models with lower productivity assumptions show that this conservation information is robust to uncertainty in stock productivity.

2.6.7.3 NORTH PACIFIC BLUE SHARK

Stock assessment: ISC (2022).

Link: **https://isc.fra.go.jp/pdf/ISC22/ISC22_ANNEX12_Stock_Assessment_for_Blue_Shark.pdf**.

a. Stock status and trends

SC18 thanked ISC for the updated stock assessment for North Pacific blue shark and noted the following conclusions on the stock status provided by ISC.

Target and limit reference points have not yet been established for pelagic sharks in the Pacific Ocean by either the WCPFC or the IATTC. Stock status was reported in relation to MSY-based reference points. The following information on the status of North Pacific BSH was provided.

The median of the annual spawning stock biomass (SSB) from the model ensemble had a steadily decreasing trend until 1992 and slightly increased until recent years. The median of the annual F from the model ensemble gradually increased in the late 1970s and 1980s and suddenly dropped around 1990, which slightly preceded the high-seas drift gillnet fishing ban, after which it has been slightly decreasing. The median of the annual age-0 recruitment estimates from the model ensemble appeared relatively stable with a slightly decreasing trend over the assessment period except for 1988, which shows a large pulse. The historical trajectories of stock status from the model ensemble revealed that North Pacific BSH had experienced some level of depletion and overfishing in previous years, showing that the trajectories moved through the overfishing zone, overfished and overfishing zone, and overfished zone in the Kobe plots relative to MSY reference points. However, in the last two decades, median estimates of the stock condition returned into the not overfished and not overfishing zone.

Based on these findings, the following information on the status of the North Pacific BSH is provided:

1) Median female SSB in 2020 was estimated to be 1.170 of SSB_{MSY} (80^{th} percentile, 0.570 - 1.776) and is likely (63.5% probability) not in an overfished condition relative to MSY-based reference points.
2) Recent annual F ($F_{2017\text{-}2019}$) is estimated to be below F_{MSY} and overfishing of the stock is very likely (91.9% probability) not occurring relative to MSY-based

reference points.

3) The base case model results show that there is a 61.9% joint probability that NPO BSH stock is not in an overfished condition and that overfishing is not occurring relative to MSY based reference points.

SC18 noted that the current assessment is an improvement over the previous assessment and supports the model ensemble approach taken in the 2022 stock assessment as a more comprehensive way of characterizing structural uncertainty in stock status. However, SC18 noted that the model ensemble did not consider some key uncertainties, in particular natural mortality or stock-recruitment steepness and SC18 recommended a more thorough use of the model ensemble approach is recommended to better represent uncertainty for future assessments.

b. Management advice and implications

SC18 noted the following conservation information from ISC.

Stock projections of biomass and catch of NPO BSH from 2020 to 2030 were performed assuming four different harvest policies: $F_{current}$ (2017-2019), F_{MSY}, $F_{current}$+20%, and $F_{current}$-20% and evaluated relative to MSY-based reference points. Based on these findings, the following conservation information is provided:

1) Future projections in three of the four harvest scenarios ($F_{current}$ (2017-2019), $F_{current}$+20%, and $F_{current}$-20%) showed that median SSB in the North Pacific Ocean will likely (>50 probability) increase; the F_{MSY} harvest scenario led to a decrease in median SSB.

2) Median estimated SSB of BSH in the North Pacific Ocean will likely (>50 probability) remain above SSB_{MSY} in the next ten years for all scenarios except F_{MSY}; harvesting at F_{MSY} decreases SSB below SSB_{MSY} (Figure E5).

3) There remain some uncertainties in the time series based on the quality (observer vs. logbook) and timespans of catch and relative abundance indices, limited size composition data for several fisheries, the potential for additional catch not accounted for in the assessment, and uncertainty regarding life history parameters. Continued improvements in the monitoring of BSH catches, including recording the size and sex of sharks retained and discarded for all fisheries, as well as continued research into the biology, ecology, and spatial structure of BSH in the North Pacific Ocean are recommended.

SC18 noted that recent estimated recruitment was below the average level from the Beverton-Holt stock recruit relationship, and that if these low recruitments persist into the future then the projection results could be overly optimistic.

Table 40. Estimates of stock status in relation to overfishing and overfished reference points for WPFMC PMUS

Stock	Overfishing reference point	Is overfishing occurring?	Approaching Overfishing (2 yr)	Overfished reference point	Is the stock overfished?	Approaching Overfished (2 yr)	Assessment results[1]	Natural mortality[2]	MSST
Skipjack Tuna (WCPO)	$F_{2017-2020}/F_{MSY}=0.32$	No	No	$SB_{2018-2022}/SB_{MSY}=3.12$, $SB_{2018-2021}/SB_{F=0}=0.52$	No	No	Castillo et al. (2022), SC18 report	>0.5 yr-1	0.5 SB_{MSY}
Skipjack Tuna (EPO)	NA	NA	NA	NA	NA	NA	Maunder (2018)	NA	NA
Yellowfin Tuna (WCPO)	$F_{2014-2017}/F_{MSY}=0.37$	No	No	$SB_{2018}/SB_{MSY}=2.43$, $SB_{2018}/SB_{F=0}=0.54$	No	No	Vincent et al. (2020)	0.8-1.6 yr^{-1}	0.5 SB_{MSY}
Yellowfin Tuna (EPO)	$F/F_{MSY}=1.01$	Yes, because F>MFMT	Not applicable	$SB_{2015-2017}/SB_{MSY}=1.08$, $B_{2015-2017}/B_{MSY}=1.35$	No	No	Minte-Vera et al. (2018)	0.2-0.7 yr^{-1}	0.5 B_{MSY}
Albacore (S. Pacific)	$F_{2015-2018}/F_{MSY}=0.25$	No	No	$SB_{2019}/SB_{MSY}=2.50$ $SB_{2019}/SB_{F=0}=0.37$	No	No	Castillo Jordan et al. (2021)	0.2-0.4 yr^{-1}	0.6 SB_{MSY}
Albacore (N. Pacific)	$F_{2015-2017}/F_{MSY}=0.60$	No	No	$SB_{2015-2017}/SB_{F=0}=0.43$	No	No	ISC (2020)	0.4 yr^{-1}	0.6 B_{MSY}
Bigeye Tuna (WCPO)	$F_{2014-2017}/F_{MSY}=0.74$	No	No	$SB_{2018}/SB_{MSY}=1.70$, $SB_{2018}/SB_{F=0}=0.38$	No, because SSB>MSST	No	Ducharme-Barth et al. (2020)	0.4 yr^{-1}	0.6 SB_{MSY}
Bigeye Tuna (EPO)	$F_{2015-2017}/F_{MSY}=1.15$	Yes, because F>MFMT	Not applicable	$SB_{2015-2017}/SB_{MSY}=1.02$, $B_{2012-2015}/B_{MSY}=0.91$	No, because SSB>MSST	Not applicable	Xu et al. (2018)	0.1-0.25 yr^{-1}	~0.75 B_{MSY}
Pacific Bluefin Tuna	F is 30.7% SPR	No	Not applicable	$SB_{2019}/SB_{F=0}=0.102$	Yes, because SSB<MSST	Not applicable	ISC (2022)	0.25-1.6 yr-1	~0.75 B_{MSY}
Blue Marlin (Pacific)	$F_{2017-2019}/F_{MSY}=0.6$	No	Unknown	$SB_{2017-2019}/SB_{MSY}=1.13$	No	Unknown	ISC (2021)	0.22-0.42 yr^{-1}	~0.7 SB_{MSY}
Swordfish (WCNPO)	$F_{2013-2015}/F_{MSY}=0.45$	No	Unknown	$SB_{2016}/SB_{MSY}=1.87$	No	Unknown	ISC (2018a)	0.3 yr^{-1}	0.7 B_{MSY}
Swordfish (EPO)	$F_{2012}/F_{MSY} = 1.11$	Yes, because F > MFMT	Not applicable	$SB_{2012}/SB_{MSY} =1.87$	No	Unknown	ISC (2014)	0.35 yr^{-1}	0.65 B_{MSY}
Striped Marlin WC (N. Pacific)	$F_{2015-2017}/F_{MSY}=1.07$	Yes, because F>MFMT	Not applicable	$SB_{2017}/SB_{MSY}=0.38$	Yes, because SSB_{2017}<MSST	Not applicable	ISC (2019)	0.4 yr^{-1}	0.6 SB_{MSY}

Stock	Overfishing reference point	Is overfishing occurring?	Approaching Overfishing (2 yr)	Overfished reference point	Is the stock overfished?	Approaching Overfished (2 yr)	Assessment results[1]	Natural mortality[2]	MSST
Striped Marlin (NEPO)	Not provided in assessment	No	No	SB_{2009}/SB_{MSY}=1.5	No	Unknown	Hinton and Maunder (2011)	0.5 yr^{-1}	0.5 B_{MSY}
Blue Shark (N. Pacific)[2]	$F_{2017-2019}/F_{MSY}$=0.445	No	Unknown	SB_{2020}/SB_{MSY}=1.17	No	Unknown	ISC (2022)	0.145-0.785 yr-1	~0.8 SB_{MSY}
Oceanic white-tip shark (WCPO)[3]	F_{2016}/F_{MSY}=3.30	Yes	Not applicable	SB_{2016}/SB_{MSY}=0.11	Yes	Not applicable	Tremblay-Boyer et al. (2019), SC15 Report	0.18 yr^{-1}	0.82 B_{MSY}
Silky shark (WCPO) [3]	F_{2016}/F_{MSY}=1.61	Yes	Not applicable	SB_{2016}/SB_{MSY}=1.18	No	Unknown	Clarke et al. (2018), SC14 Report	0.18 yr^{-1}	0.82 B_{MSY}
Silky Shark (EPO)[3]	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Lennert-Cody et al. (2018)	Unknown	Unknown
Longfin mako shark (N. Pacific)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Shortfin mako shark (N. Pacific)	$F_{2013-2015}/F_{MSY}$=0.62	No	Unknown	SB_{2016}/SB_{MSY}=1.36	No	Unknown	ISC (2018b)	0.128 yr^{-1}	0.872 B_{MSY}
Common thresher shark (N. Pacific)	F/F_{MSY}=0.21	No	Unknown	SB/SB_{MSY}=1.3	No	Unknown	Teo et al. (2018)	0.04 yr^{-1}	0.96 B_{MSY}
Bigeye thresher shark (N. Pacific)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Pelagic thresher shark (N. Pacific)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Salmon shark (N. Pacific)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Mahimahi (Pacific)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Wahoo (Pacific)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown

Stock	Overfishing reference point	Is overfishing occurring?	Approaching Overfishing (2 yr)	Overfished reference point	Is the stock overfished?	Approaching Overfished (2 yr)	Assessment results[1]	Natural mortality[2]	MSST
Opah (Pacific)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Pomfret (family Bramidae, W. Pacific)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Black marlin (Pacific)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Shortbill spearfish (Pacific)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Sailfish (Pacific)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Kawakawa (Pacific)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Oilfish (family Gempylidae, Pacific)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Other tuna relatives (*Auxis* spp., *Allothunnus* spp., and *Scomber* spp, Pacific)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Squids (Pacific)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown

[1]For some WCPO stocks, the Scientific Committee of the WCPFC may adjust the weighting of the structural uncertainty grid, based on scientific uncertainty, used to derive median limit reference points. For these stocks, the reference to the SC meeting report at which the weighting decision was made is provided in addition to the stock assessment report reference.
[2]Estimates based on Boggs et al. (2000) or assumed in the assessments.
[3]As of this publication, NMFS has not yet determined that this stock assessment is the best scientific information available for the purposes of stock status determination.

2.6.8 U.S. LONGLINE LANDINGS REPORTED TO WCPFC AND IATTC FOR 2022

The tables of this section show the catches of pelagic MUS by U.S. longline (Hawaii and California-based) and U.S. territorial longline fisheries in the WCPFC Convention Area from 2018-2022, as reported by NMFS to the WCPFC in 2023. The catches for 2022 are preliminary.

Table 41. U.S. and territorial longline catch (mt) by species in the WCPFC Statistical Area, 2018-2022

	U.S. in North Pacific Ocean					CNMI in North Pacific Ocean					Guam in North Pacific Ocean					American Samoa in North Pacific Ocean					American Samoa in South Pacific Ocean					Total				
	2022	**2021**	**2020**	**2019**	**2018**	**2022**	**2021**	**2020**	**2019**	**2018**	**2022**	**2021**	**2020**	**2019**	**2018**	**2022**	**2021**	**2020**	**2019**	**2018**	**2022**	**2021**	**2020**	**2019**	**2018**	**2022**	**2021**	**2020**	**2019**	**2018**
Vessels	142	137	135	138	136	119	131	119	128	121	0	0	0	0	0	133	24	122	127	113	11	12	11	18	14	153	150	146	156	151
Species																														
Albacore, NPO	108	105	48	88	59											22	30	8	12	11						129	135	57	101	70
Albacore, SPO																					1,073	835	542	1,050	1,542	1,073	835	542	1,050	1,542
Bigeye tuna	3,237	3,748	3,546	3,459	3,393	544	1,500	925	999	993						1,546	405	1,563	1,514	798	19	30	23	31	53	5,346	5,683	6,058	6,003	5,236
Pacific bluefin tuna	1	1	0	1	0																				1	1	1	1	2	1
Skipjack tuna	84	130	124	198	105											10	15	16	28	15	39	53	63	69	76	133	198	203	295	196
Yellowfin tuna	1,969	2,021	1,199	1,556	1,868											184	274	160	220	209	148	214	222	189	261	2,301	2,509	1,581	1,965	2,339
Other tuna	0	0	0	0	0																									
TOTAL TUNA	**5,399**	**6,005**	**4,918**	**5,302**	**5,425**	**544**	**1,500**	**925**	**999**	**993**						**1,762**	**725**	**1,747**	**1,774**	**1,034**	**1,278**	**1,132**	**851**	**1,339**	**1,934**	**8,984**	**9,362**	**8,442**	**9,415**	**9,384**
Black marlin																														
Blue marlin	351	332	440	747	529											52	31	44	83	38	47	34	28	29	32	450	397	513	860	598
Sailfish	8	9	5	12	9											1	1	1	2	1	1	1	1	2	1	9	11	7	16	11
Spearfish	111	110	94	154	171											8	10	11	16	15	1	1	0	2	1	120	121	105	173	187
Striped marlin, NPO	230	196	241	397	332											25	30	47	62	44						255	226	288	458	375
Striped marlin, SPO																					2	3	2	2	1	2	3	2	2	1
Other marlins	0	1	1	0	1																					0	1	1	0	1
Swordfish, NPO	735	528	266	510	590											26	39	40	44	41						760	567	306	555	631
Swordfish, SPO	0	0	0	0	0																3	3	3	4	6	3	3	3	4	6
TOTAL BILLFISH	**1,436**	**1,177**	**1,047**	**1,821**	**1,631**											**111**	**111**	**143**	**208**	**138**	**53**	**42**	**33**	**39**	**41**	**1,600**	**1,329**	**1,223**	**2,068**	**1,811**
Blue shark																									3					3
Mako shark	1	1	2	32	36											0	0	0	3	5	0	0	0	0	0	1	1	2	35	42
Thresher	2	1	1	4	2											0	1	0	1	0	0	0	0	1	1	2	1	1	5	2
Other sharks																														
Oceanic whitetip shark																														
Silky shark																														
Hammerhead shark																														
Tiger shark																														
Porbeagle																														
TOTAL SHARKS	**3**	**1**	**3**	**36**	**38**											**0**	**1**	**0**	**3**	**5**	**0**	**0**	**0**	**1**	**4**	**3**	**2**	**3**	**40**	**47**
Mahimahi	129	109	75	123	155											14	18	11	20	14	6	1	5	2	5	149	128	92	145	174
Moonfish	80	109	198	368	390											12	26	40	59	58	0	1	1	1	1	92	136	238	428	449
Oilfish	57	52	55	89	98											7	6	8	15	14	0	0	0	0	0	64	58	63	103	112
Pomfret	138	132	157	246	265											17	18	23	29	32	0	0	0	0	0	155	150	181	275	298
Wahoo	194	314	239	401	264											25	41	35	60	34	12	16	18	18	31	231	371	292	479	329
Other fish	1	2	1	1	4											0	0	0	1	0	0	1	0	0	0	2	3	2	2	5
TOTAL OTHER	**600**	**718**	**726**	**1,228**	**1,178**											**74**	**109**	**118**	**184**	**153**	**18**	**19**	**24**	**21**	**37**	**692**	**846**	**867**	**1,433**	**1,367**
GEAR TOTAL	**7,437**	**7,901**	**6,694**	**8,387**	**8,272**	**544**	**1,500**	**925**	**999**	**993**						**1,946**	**945**	**2,008**	**2,169**	**1,329**	**1,350**	**1,193**	**908**	**1,400**	**2,016**	**11,278**	**11,539**	**10,535**	**12,955**	**12,610**

Table 42. U.S. longline catch (mt) by species in the North Pacific Ocean, 2018-2022

	U.S. (ISC)				
	2022	**2021**	**2020**	**2019**	**2018**
Vessels	147	146	147	149	143
Species					
Albacore, North Pacific	201	226	156	104	87
Albacore, South Pacific					
Bigeye tuna	6,374	7,039	7,445	7,692	7,591
Pacific bluefin tuna	1	1	2	2	1
Skipjack tuna	103	153	168	261	150
Yellowfin tuna	2,427	2,501	1,733	2,029	2,500
Other tuna					
TOTAL TUNA	**9,107**	**9,920**	**9,504**	**10,088**	**10,327**
Black marlin					
Blue marlin	444	382	531	901	664
Sailfish	9	12	7	18	13
Spearfish	130	132	116	199	219
Striped marlin, North Pacific	283	247	336	545	465
Striped marlin, South Pacific					
Other marlins		1	2	1	1
Swordfish, North Pacific	927	684	543	734	1,052
Swordfish, South Pacific					
TOTAL BILLFISH	**1,793**	**1,459**	**1,534**	**2,398**	**2,414**
Blue shark					
Mako shark	2	5	16	47	60
Thresher	3	3	3	5	2
Other sharks					
Oceanic whitetip shark					
Silky shark					
Hammerhead shark					
Tiger shark					

	U.S. (ISC)				
	2022	**2021**	**2020**	**2019**	**2018**
Porbeagle					
TOTAL SHARKS	**5**	**8**	**19**	**52**	**62**
Mahimahi	178	166	119	198	227
Moonfish	239	385	740	1,039	1,392
Oilfish	75	74	83	140	143
Pomfret	189	182	227	332	389
Wahoo	250	406	334	571	390
Other fish	1	2	2	2	4
TOTAL OTHER	**932**	**1,214**	**1,505**	**2,281**	**2,545**
GEAR TOTAL	**11,837**	**12,601**	**12,563**	**14,819**	**15,348**

Table 43. U.S. longline catch (mt) by species in the Eastern Pacific Ocean, 2018-2022

	All U.S. vessels					**U.S. vessels ≥ 24 m**					**U.S. vessels ≤ 24 m**				
	2022	**2021**	**2020**	**2019**	**2018**	**2022**	**2021**	**2020**	**2019**	**2018**	**2022**	**2021**	**2020**	**2019**	**2018**
Vessels	108	112	121	126	121	22	23	27	30	30	86	89	94	96	91
Albacore, North Pacific	72	90	100	4	17	15	20	16	1	3	57	71	84	3	13
Albacore, South Pacific															
Bigeye tuna	1,047	1,386	1,410	1,720	2,408	178	357	332	507	524	869	1,029	1,078	1,212	1,883
Pacific bluefin tuna			1					1							
Skipjack tuna	8	8	28	35	30	1	2	4	9	9	7	5	24	26	21
Yellowfin tuna	274	205	374	254	422	41	51	82	75	99	233	155	292	179	323
Other tuna															
TOTAL TUNA	**1,402**	**1,690**	**1,913**	**2,013**	**2,876**	**236**	**430**	**435**	**593**	**635**	**1,166**	**1,260**	**1,478**	**1,420**	**2,241**
Black marlin															
Blue marlin	41	19	47	71	98	7	3	6	16	11	35	16	41	55	87
Sailfish	1	2	1	4	3	-	1	-	1	1	1	1	1	2	2
Spearfish	11	13	11	28	32	2	4	2	7	7	9	9	9	21	25
Striped marlin, North Pacific	28	21	48	87	90	3	6	11	23	15	24	15	37	64	74

	All U.S. vessels					**U.S. vessels ≥ 24 m**					**U.S. vessels ≤ 24 m**				
	2022	**2021**	**2020**	**2019**	**2018**	**2022**	**2021**	**2020**	**2019**	**2018**	**2022**	**2021**	**2020**	**2019**	**2018**
Striped marlin, South Pacific															
Other marlins				1					1						
Swordfish, North Pacific	167	117	237	179	422	96	90	194	110	215	71	27	43	69	207
Swordfish, South Pacific															
TOTAL BILLFISH	**247**	**172**	**345**	**369**	**644**	**108**	**103**	**213**	**158**	**249**	**140**	**68**	**132**	**211**	**395**
Blue shark															
Mako shark	1	5	14	12	19	1	4	13	8	11		1	1	4	8
Thresher	1	1	2			1	1	1							
Other sharks															
Oceanic whitetip shark															
Silky shark															
Hammerhead shark															
Tiger shark															
Porbeagle															
TOTAL SHARKS	**2**	**6**	**16**	**13**	**19**	**2**	**5**	**14**	**9**	**11**		**1**	**2**	**4**	**8**
Mahimahi	35	39	32	55	57	6	9	6	14	11	29	29	26	41	46
Moonfish	147	249	502	612	944	25	54	116	196	258	122	195	386	416	686
Oilfish	11	16	20	36	30	2	4	6	10	9	8	12	15	26	22
Pomfret	34	32	47	57	91	5	8	8	17	30	29	24	38	40	61
Wahoo	31	51	60	110	91	4	12	12	33	22	28	39	48	77	69
Other fish		1					1								
TOTAL OTHER	**259**	**387**	**662**	**870**	**1,215**	**42**	**88**	**149**	**270**	**331**	**216**	**300**	**513**	**600**	**884**
GEAR TOTAL	**1,909**	**2,255**	**2,936**	**3,264**	**4,754**	**388**	**626**	**811**	**1,029**	**1,226**	**1,522**	**1,629**	**2,125**	**2,235**	**3,528**

3 FISHERY ECOSYSTEMS

3.1 FISHER OBSERVATIONS

Hawaii fishermen Clay Tam and Roy Morioka started the fisher observations initiative in 2020 to add traditional and local ecological knowledge, and on-the-water observations to complement fishery-dependent data sources in the annual SAFE reports. Previous fisher observations from 2022 can be found in the pelagic and the respective archipelagic reports (WPFMC 2022a; WPFMC 2022b; WPFMC 2022c; WPFMC 2022d).

Starting in 2021, the Council collected fisher observations for pelagic fisheries during quarterly advisory panel meetings for Hawaiʻi, American Samoa, Guam, and the CNMI. Input collected at these meetings was limited to Advisory Panel members. The Council also convened two meetings dedicated to fisher observations in February 2022, one for Guam and the CNMI on February 23, 2022, and one for Hawaiʻi on February 24, 2022. There were no American Samoa fisher observations meetings in 2022 to review 2021 information due to the COVID-19 pandemic. The Guam and CNMI, and Hawaiʻi annual fisher observations meetings included some Advisory Panel members but also included individuals from the fishing community in those areas. The full results from these annual fisher observations meetings are available as PIFSC data reports (Ayers et al., 2022a, 2022c, 2023).

For 2023, fisher observations for pelagic species were collected during quarterly Advisory Panel meetings for each of the respective jurisdictions. Annual fisher observation meetings were held for American Samoa, Guam and CNMI, and Hawaiʻi in 2024 to cover 2023. Pelagic fisher observations from 2023 will begin with a summary quarterly advisory panel meetings, separated by island area/jurisdiction, then followed by a summary of pelagic management unit species data collected from the fisher observations meetings.

3.1.1 INFORMATION FROM ADVISORY PANEL MEETINGS

3.1.1.1 AMERICAN SAMOA

First Quarter (January-March)

Fishers noted good sportfishing, with a marlin caught weighing over 400 pounds. Locals organized fishing tournaments every day. Longline fishing was slow in the first quarter. Some boats reported bluefin tuna catches, which is rare for American Samoa. Purse seine fishing had been steady, and with the three-month FAD closure starting July 1, effort was expected shift to targeting schoolfish in the WCPFC area or move to the IATTC area where they could still fish on FADs. DMWR recently deployed five FADs after three years with no active FADs. Fishers appreciated DMWR Director Archie Soliai getting the FADs deployed. Fishers were still waiting for updates on the Super Alia program. One AP member reported meeting with the American Samoa Department of Education about a training program for kids to learn technical skills so that they can learn about fishing jobs and participate in local fisheries. They questioned whether the AP might have a budget to help fund training opportunities. Not many kids are getting into fishing unless they live in Manuʻa. Few locals work on the boats that sell fish to local markets or the cannery, as crew on these vessels are often Filipino or other nationalities. In regard to PRIA Sanctuary scoping meetings, AP members questioned whether testimony from American Samoa would be considered the same as testimony from the U.S. mainland.

Second quarter (April-June)

AP members noted a large number of foreign vessels offloading fish in the harbor, but there was not a lot of fish for buyers. One AP member was concerned that a lot of the fish that is offloaded from foreign vessels may not be stored properly, and much of this fish ends up in stores via the black market. Reportedly, the foreign vessels offload mahimahi and wahoo to the canneries. Another AP member said the NOAA Office of Law Enforcement (OLE) is trying to track foreign bycatch, all of which is supposed to be offloaded at the cannery, but some ends up in local markets. The fishers were concerned that the American Samoa Government could be losing money, affecting local fishers and the local food supply. They also reported not a lot of small *alias* fishing. Another AP member reported that it is very difficult to hire local captains to run the longline vessels; they asked the U.S. Congress to temporarily suspend the Jones Act to help hire captains. The AP also provided an update on the Super Alia Program. The first vessel is ready for sea trials and inspection, with the intention of shipping it in September 2024. The hope is for all the vessels to be down in American Samoa within two years. They received an incubator grant from the U.S. Department of the Interior to train people to fish the boats, including education, economics, and navigation, with U.S. Coast Guard partners. The super alia vessel will have a 12 mile hydraulically operated longline drum, electric bottomfish reels, and dual Yanmar diesel engines. It will be able to carry 4,000 pounds of fish and ice.

Third Quarter (July-September)

The AP reported hot weather, and they recently finished a three-day fishing tournament in November. They also brought up the issue of bycatch offloaded by foreign vessels that ends up in stores, especially skipjack, yellowfin tuna and other pelagic species, which is something they view as a problem because it is competition for their boats. There was a two-month high seas closure for FAD fishing. Some of the purse seine boats fish the high seas for schools of fish, while other move effort to Kiribati EEZ and other areas. Kiribati fishing has been good, even though the fishing area is relatively small. The Starkist cannery has received a lot of fish from the Purse Seiners. One AP member noted rising water temperatures. The weather was strong and they were monitoring a big hurricane, but the fishing has been good. The AP tuned into a presentation by the Secretariat of the Pacific Community for WCPFC members. In the presentation, scientists projected warming water temperatures should shift tuna stocks east, which may benefit American Samoa fisheries. Around Thanksgiving, there was a fishing tournament with a good turnout: 15 boats, 11 of which were local with the remaining 4 from neighboring Samoa. Fishers landed 7,377 lbs of pelagic fish over the three-day tournament.

3.1.1.2 CNMI

First Quarter (January-March)

CNMI fishers reported rough ocean conditions after Typhoon Mawar, with most Tinian fishers not going out. NOAA held PRIA marine sanctuary scoping meetings on Tinian, which the Tinian fishing community appreciated. The meetings were attended by eight members of the Tinian fishing community along with the mayor. Other Tinian fishers expressed concern about the lack of public outreach about NOAA surveys and public comment periods, particularly for those with limited media access.

Second quarter (April-June)

Fishing had been slow, but Saipan held several fishing derbies, which were more successful than the 2019 derby. Fishers observed several marlins, with few caught. Tinian fishers reported poor weather around the island and that their breakwater is already gone. The new marina will be put out to bid soon and they are laying a fuel line from the marina to the airport. One fisher reported that shark depredation appeared to slow down when fishing remote reef areas, an improvement over depredation rates over the past few years. Ocean conditions had been calmer than usual for the months of May through July, which is better for fishing. Fuel prices remained high, around $7.50/gallon. Fishers reported good wahoo fishing in the recent weeks and good markets around Tinian with the influx of construction workers. Work is underway at Garapan Fishing Base to reinforce the fishing area.

Third quarter (July-September)

Fishers reported rougher water with fish observed far out from land, particularly bigger fish. Mahimahi season appeared to be start early. Another fisher noted the rough water and challenging fishing. They reported a nice run of wahoo and yellowfin tuna, but made it clear they had to go out further to find them. One fisher reported boats running over corals coming to Sugar Dock and Fishing Base at lower tides. Most fishing activity was on the west side of Saipan and Tinian due to the rougher water. There were two fishing derbies on Tinian, with one focused on trolling. Wahoo were running during the tournament and the largest wahoo caught was 23 lb. A large amount of fish was donated or sold at the dock. Gas prices hovered around $7.00/gallon.

3.1.1.3 GUAM

Second quarter (April-June)

Shark depredation reports were mixed. One fisher reported observing shark depredation no matter where fished, while another reported that they were landing more tunas than they had in previous years. Fishers noted nice summer weather after Typhoon Mawar made landfall on Guam with predominant winds out of the southwest due to the storm activity instead of easterly. Due to changing wind conditions, the ocean conditions on the east and north side of Guam had been calm. One fisher reported not targeting pelagic fish but said that there did not seem to be as many marlin around. Another fisher said that a couple boats would catch some pelagic fish, while the rest of the boats get nothing or just a few tunas. They felt that this could have been due in part to the changing winds and currents after the typhoon. Another fisher reported a productive trolling year, catching more yellowfin tuna than bonita, when in most years it is the other way around. Examining the catch from other boats, it might have been an even split between the two.

Third quarter (July-September)

Fishers observed an abundance of sesyun/pompano after a FAD was deployed. Even a day after deployment, fishers were getting more hits there.

3.1.1.3.1 Hawaii Island

First quarter (January-March)

Kailua-Kona fishers reported a strong bigeye tuna and marlin bite with good prices for quality fish. They also noted a deeper thermocline than usual with aggressive ahi bites on the bag. Hilo fishers reported strong yellowfin tuna bite, whether trolling, bag, or ika-shibi gear was used.

Second quarter (April-June)

The ahi bite slowed off of Kona in the second quarter, but marlin catches remained strong. Hilo fishers reported that three of five state FADs had been deployed. Ahi bite remained strong and ono bite was steady, with larger mahimahi caught compared to the first quarter. Wailoa Boat Ramp parking and basin entry dredging continue to affect small boat activity there.

Third quarter (July-September)

Kailua-Kona reported easterly tradewinds and daily afternoon showers, with inconsistent fishing for pelagic MUS. A $0.21/gallon increase in fuel costs compared to the previous year affected fishing participation. Kona fishers mentioned catching decent sized aku on the FADs. A world cup marlin was caught off of Kona. Hilo fishers reported wide open marlin, yellowfin, and otaru bite, with slowing ono and mahimahi fishing. Hilo fishers reported calm conditions with very little rainfall. Fuel prices remained high, but the boat ramps were full due to good catch rates.

Fourth quarter (October-December)

Kailua-Kona fishers felt that high fuel costs affected fishers and fishing trips. Pelagic catch slowed down considerably, with otaru still being caught. Shoaling continued around the Wailoa Harbor, which remained a hazard for all vessels. Funding was approved to dredge the harbor, but the funds have not been released yet so work could start. There was a noticeable change in sea state as the Hilo coast transitioned into a winter pattern.

3.1.1.3.2 Kauai

First quarter (January-March)

Kauai fishers reported a steady ahi bite in the first quarter carrying over from 2022. They also noted an abundance of small squid at night with aku catches full of quid in their bellies.

Third quarter (July-September)

Kauai fishers reported that two more FADs were deployed on the west side of the island with fish aggregations already starting. Yellowfin and otaru bites remained steady, but ono catch slowed. Fishers reported a strong aku bite with sizes from two to 27 lb.

Fourth quarter (October-December)

North Shore Kauai fishers noted mahimahi coming up to the surface but reported slow fishing conditions. Kauai fishers also reported mellow early season north swells. Mahimahi fishing began to pick up on the westside (i.e., fish weighing in the high teens and low 20s) along with a good ika bite. They also reported good recruitment of small tunas and big akule on the buoys.

3.1.1.3.3 Maui

Second quarter (April-June)

Maui reported a very good ono bite with some smaller sized mahimahi also caught. Maui fishers also noted an abundance of sardines offshore.

3.1.1.3.4 Oahu

First quarter (January-March)

Oahu fishers reported good prices for ahi with increased shallow set longline effort for swordfish and a 50% decrease in prices from 2022. Weather conditions were less than ideal with many high wind days that caused fishers to decrease fishing effort.

Second quarter (April-June)

Oahu longliners reported catching more fish on shorter trips, but fish were lower quality. Ahi and ono bite slowed, but Oahu fishers mentioned a late season mahimahi bite.

Third quarter (July-September)

Hawaii longliners reported spotty fishing with bigeye tuna being harder to catch and an increase in tombo catches. Captains reported that it was more profitable to catch tombos than trying to catch bigeye. The market had some issues moving all the tombos, for which prices ranged from $3.10-3.20/ lb). The industry questioned the economics, with trip costs outweighing potential profits.

Fourth quarter (October-December)

Oahu trollers reported an usually strong late season ahi bite.

3.1.2 INFORMATION FROM THE AMERICAN SAMOA ANNUAL SUMMIT

The Council convened a meeting on January 29, 2024 from 6:30-8:00pm SST to discuss fisher observations from 2023. The meeting was attended by nine American Samoa fishers, including five Advisory Panel members and four members of the fishing community. One third of those attending the 2024 meeting also attended the meeting the previous year.

Social

In discussing issues affecting their fishery, American Samoa fishers discussed fishing infrastructure issues including improvements to boat ramps made with Sustainable Fisheries funds. They also mentioned upgrades to alia vessels made possible by funds from the Council. Microjigging became a popular form of fishing for large pelagic fish species, with several fishers reporting catching large dogtooth tuna. Microjigging caught on after a couple fishers were successful with it and shared the technique with others in the community. During the meeting, fishers expressed their gratitude for being able to go fishing and share their catch with the community.

Economic

Issues related to the economics of fishing occupied much of the discussion. Fishers expressed frustration with market conditions, including a lack of ice (flake ice) needed to preserve the quality of fish necessary to fetch good prices at markets. Fishers also described how longline ‘bycatch’ makes its way to markets, but also that a lot of pelagic catch is primarily caught on FADs in areas further away from American Samoa. A lot of pelagic catch in markets stems from purse seine vessels that offload to the cannery.

Biological

Fishers recalled good sized mahimahi, yellowfin tuna, and skipjack catch, with large numbers of sizable yellowfin tuna and marlin caught during the Buds and Suds fishing tournament.

Depredation continues to be an issue in American Samoa, as in other jurisdictions. One fisher said that up to 85% of their catch is predated by sharks.

Physical/Oceanographic

Fishers reported that El Nino caused increases in water temperature which caused them to look around more for fish when trolling.

3.1.3 INFORMATION FROM THE CNMI ANNUAL SUMMIT

The Council convened a meeting on January 29, 2024 from 6:30-8:00pm SST to discuss fisher observations from 2023. The meeting was attended by 9 American Samoa fishers, including 5 Advisory Panel members and 4 members of the fishing community. One third of those attending the 2024 meeting also attended the meeting the previous year.

Social

CNMI fishers referenced the military buildup and its impact on fishing.

Economic

CNMI fishers referenced high fuel prices, sometimes over $7/gallon with diesel fuel about $0.10 higher than regular unleaded.

Biological

CNMI fishers reported seasonal mahimahi and wahoo runs. Some of the wahoo weighed in the 70 lb range. One CNMI fisher reported strange parasites on the gills of a wahoo resembling large tangerines. Fishers also noted mahimahi with abnormalities including a black nose and belly.

Physical/Oceanographic

High winds affected fishing trips at times, forcing the cancellation of two fishing derbies and limited small boat fishing trips.

Management

CNMI fishers requested that a DOD representative be present at Council meetings to listen to fishing community concerns over loss of fishing areas and access. CNMI fishers also commented about critical habitat meetings and in particular, the lack of in-person meetings on the islands of Tinian and Rota to collect community input.

3.1.4 INFORMATION FROM THE GUAM ANNUAL SUMMIT

The Council convened a meeting on Wednesday January 31, 2024 from 6:30-8:00pm CST to discuss fisher observations from 2023. The meeting was attended by 6 Guam fishers, including 5 Advisory Panel members and 1 member of the fishing community. In 2023, 17% of those attending the 2023 meeting also attended the 2022 meeting.

Social

Guam fishers referenced several fishing infrastructure issues affecting pelagic fishing in 2023. These included new FADs deployed in 2023, congestion at boat ramps, a new radar system that could be used to measure currents, and sand buildup at the mouth of a boat harbor.

Economic

Guam fishers mentioned spending money to replace fishing gear while Typhoon Mawar kept them out of the water. Other fishers mentioned high prices for diesel fuel (more than $5/gallon) and how fish markets were inundated with mahimahi. The excess supply of mahimahi led some fishers to target other pelagic species. Although it was not mentioned in the meeting, the Guam Fishermen's Co-op building in Hagåtña was destroyed during Typhoon Mawar. The Guam co-op has been a consistent fish buyer, seller, and tourist destination since 1977 (Taitano II 2023).

Biological

Guam fishers described learning how to tag sharks to better understand their migration patterns, and a decent run of mahimahi and wahoo. Another reported that fish were not biting as well down south.

Physical/Oceanographic

Typhoon Mawar, its landfall and lingering impacts decreased fishing trips for Guam fishers. Debris from the storm filled the Agana boat basin, limited ice availability, and hindered fish market sales. One Guam fisher recalled a good wahoo bite in November after predominant east tradewinds returned.

Management

Guam fishers were concerned with public scoping meetings and public input processes for marine sanctuaries, critical habitat, and sea turtles. They were concerned that future regulations may further limit or restrict fishing. A Guam fisher suggested that a Department of Defense representative should attend all Council meetings to explain fishing closures for training exercises.

3.1.5 INFORMATION FROM THE HAWAII ANNUAL SUMMIT

Social

Hawaiʻi fishers frequently discussed issues related to fishing infrastructure, from FADs that had been recently deployed or replaced or others that had become unmoored. Other fishers referenced conflicts with divers or tourists at boat ramps during ʻahi runs. Hilo reported good turnouts for fishing tournaments and Kauaʻi had to cancel a fishing tournament on the north shore due to Hanalei bridge maintenance.

Economic

Hawaiʻi longliners shifted effort from bigeye tuna to tombos and increased shallow set effort for swordfish. Hawaiʻi small boat fishers mentioned challenges associated with competition from foreign imports and outer island fishers cited difficulties preserving fish to send to the auction block in Honolulu. Fuel prices remained high, but reports were mixed on whether it affected small boat fishing effort. Kauai fishers reported difficult wholesale market conditions and other islands mentioned increases in roadside and social media sales.

Biological

Hawaiʻi fishers reported a good year trolling for pelagic MUS such as ahi, otado, and marlin, with an unusually strong ʻahi run late in the year. In terms of sizes, ahi were frequently landed in the 80-90 lb range, with some larger pieces weighing in at 130 lb or more. Fishers landed a few large marlin and noted an abundance of large otados (from 30-50 lb). Ono were caught in shallower waters off of Kauai (around 100’ depth). Hawaii longliners had a difficult time catching bigeye tuna and switched to targeting tombos in the third quarter. 2023 was a strong year for tombos with several fishers reporting catching double digits on fishing trips. Some fishers felt that the ahi season may be shifting to later in the year. Orcas were also sighted around Hawai‘i island and west Oahu.

Physical/Oceanographic

Kona fishers reported a deeper thermocline than usual. In general, fishers did not report unusually warm or cool water temperatures or stronger/lighter than usual wind conditions.

3.2 SOCIOECONOMICS

The socioeconomics section outlines the pertinent economic, social, and community information available for assessing the performance of Fishery Ecosystem Plan (FEP) management measures for the Pelagic Fisheries (WPFMC 2009d). This section meets the objective "Support Fishing Communities" adopted at the 165th Council meeting; specifically, it identifies the various social and economic groups and their interconnections within the region's fishing communities. The section begins with an overview of the socioeconomic context for the region, and then provides a summary of relevant general studies and data for each jurisdiction, followed by summaries of relevant studies and data for each specific fishery within the jurisdiction.

In 1996, the Magnuson-Stevens Fishery Conservation and Management Act's (MSA) National Standard 8 (NS8) specified that conservation and management measures take into account the importance of fishery resources to fishing communities. In doing so, the measures would ensure the community's sustained participation in fisheries and minimize associated adverse economic impacts provided that these considerations do not compromise local conservation. Unlike other regions of the United States, the settlement of the Western Pacific region was intimately tied to the sea (Figure 117), which is reflected in local culture, customs, and traditions.

Figure 117. Settlement of the Pacific Islands[1]

[1] Source: Wikimedia Commons, https://commons.wikimedia.org/wiki/File:Polynesian_Migration.svg.

Polynesian voyagers relied on the ocean and marine resources on their long voyages in search of new islands, as well as in sustaining established island communities. Today, the population of the region also represents many Asian cultures from Pacific Rim countries, which hold similar significance for many marine resources. Thus, fishing and seafood are integral ways of life in the local community. This is reflected in the amount of seafood eaten in the region in comparison with the rest of the United States, as well as in the language, customs, ceremonies, and community events of the region. Because fishing is such an integral part of the culture, it is difficult to discern commercial from non-commercial fishing, with many trips involving multiple motivations and multiple uses of the catch landed. While economics are an important consideration, fishermen report other motivations (e.g., customary exchange) as being equally important, if not more so. Due to changing economies and westernization, recruitment of younger fishermen has become a concern for the sustainability of fishing and fishing traditions in the region. During the COVID-19 pandemic, the diversification of the fisheries in the region and their ability to adapt to shift from a national and global economy to a local one played a vital role in supporting local food systems, nutrition, food security, and community social cohesion (Kleiber et al. 2022; Smith et al. 2022).

3.2.1 RESPONSE TO PREVIOUS COUNCIL RECOMMENDATIONS

At its 194th meeting in March 2023, the Council directed staff to work with the State of Hawaii and NMFS to move forward with the Hawaii small-boat engagement and community meetings to address critical data needs. NMFS is planning to participate in the engagement and community meetings as they are scheduled. In addition, the Council recommended a working group to revise the Council's Pelagic Fisheries Research Plan. PIFSC Social-Ecological and Economic Systems (SEES) Program staff provided Council staff with status updates on activities in the existing WPFMC Pelagic Fisheries Research Plan and worked with Council staff to contribute content to the revised plan. The Council also directed staff to request NMFS include territorial representatives on the Equity and Environmental Justice (EEJ) Working Group to provide expertise needed to identify, effectively engage with and address the needs of Pacific Island communities. Membership on the PIR EEJ Working Group from NMFS staff in the territories was specifically sought and included. Finally, the Council established a working group to work on the national review of National Standards 4, 8, and 9. PIFSC SEES Program staff contributed to the national review.

At its 195th meeting in June 2023, the Council directed staff to proceed with developing program area priorities linked with management objectives for the 2025-2029 MSA Research Priorities. PIFSC SEES Program staff contributed to updates of the MSA Research Priorities. In addition, the Council directed Pelagic Plan Team to include in future EEJ modules a focus on impacts of regulations. Equitable distribution of benefits will be included in the PIR EEJ Implementation Plan. Further, the Council endorsed the SSPC recommendations regarding fisher observations, and directed staff and SSPC to coordinate broader engagement and outreach. In 2023, PIFSC SEES Program staff continued to provide support and analysis for the fisher observation sections of the SAFE report, which have now broadened from an annual summit to include regular updates during each scheduled meeting. In addition to the annual SAFE report, full data reports are generated and archived in the PIFSC library repository. The Council also directed staff to work with the non-commercial fishing community to document those areas used for non-commercial fishing. PIFSC SEES Program staff began discussions with the Advisory Panel to consider potential for participatory mapping projects.

Also at its 195th meeting, the Council requested that NOAA evaluate the holistic impacts of the proposed PRI sanctuary on fishing fleets that have historically fished the PRIA EEZ. PIFSC SEES Program staff contributed to analysis and preparation of a report on "Fishery Management Scenarios for the Monument Adjacent Area within the Proposed Pacific Remote Islands Sanctuary" (Sabater et al. 2023). The Council also requested NOAA conduct an economic study that considers effects to American Samoa-based fishery on the proposed ELAPS rulemaking. PIFSC SEES Program staff conducted analysis and prepared the report “Economic Contributions of U.S. Commercial Fisheries in American Samoa” (Chan 2023). Finally, the Council requested PIFSC to continue to pursue funding for the SEES Program to conduct cost-earnings surveys for the Hawaii longline fishery at their regular five-year intervals. In 2023, the PIFSC SEES Program continued to seek funding and OMB approval to continue regular data cost-earnings data collections.

At its 196th meeting in September 2023, the Council requested that the PIFSC SEES Program’s small-boat fishing survey be replicated in other jurisdictions. The next iteration of the small-boat fishing survey is planned for implementation in the Mariana Archipelago in 2025, with outreach beginning in Fiscal Year 2024.

At its 197th meeting in December 2023, the Council directed staff to coordinate with advisory group representatives, PIRO, PIFSC and other relevant entities as appropriate to finalize the IRA project proposal. PIFSC SEES Program staff provided background on federal needs and priorities and provided feedback as subject matter experts on topics considered for IRA project proposals developed by Council staff. In addition, the Council directed staff to convene a workshop of Council staff, PIFSC, PIRO and SSC members to finalize and prioritize the MSRA 2025-2029 research priorities. PIFSC SEES Program staff prepared updates on SEES work support of MSRA 2020-2024 Research Priorities in preparation for development of the next five-year research priorities. Finally, the Council requested the PIFSC SEES Program conduct seafood market surveys. Presentations were planned for Council meetings in 2024.

3.2.2 SOCIAL AND CULTURAL ELEMENTS

3.2.2.1 EQUITY AND ENVIRONMENTAL JUSTICE

NOAA Fisheries EEJ goals are to 1) Prioritize identification, equitable treatment, and meaningful involvement of underserved communities, 2) Provide equitable delivery of services and 3) Prioritize EEJ in our mandated and mission work with demonstrable progress.

NOAA Fisheries commitment to EEJ is particularly relevant to the Pacific Islands Region. While every community is a fishing community in the Pacific Islands Region, there are specific features of these communities that can create barriers to EEJ. While some are shared across the region such as comparatively smaller populations and geographic isolation for NOAA Fisheries headquarters, others are specific to the cultural and political context of each archipelago, territory and commonwealth.

3.2.2.1.1 Underserved Communities

In defining underserved communities, the national EEJ strategy includes groups that are relevant to pelagic fisheries in the PIR. This includes, but is not limited to Pacific Islanders, fishing crew, and territorial and commonwealth communities. More nuanced and detailed understanding of which communities are underserved in which contexts and why has been identified as an action in the PIR EEJ implementation plan (to be published July, 2024).

3.2.2.1.2 Next Steps

The EEJ subgroup of the APT/PT identified the following priority areas for future work:

- Demographics: have a better understanding of the demographics of the people participating in fisheries, and how those may shift over time.
- Defining communities and fisheries: including underserved communities, as well commercial and non-commercial fisheries.
- Management impacts: understand how different communities, demographic, or fisheries groups are impacted by fisheries management
- EEJ implementation: identify key EEJ issues and update yearly
- Fish flow: track what happens to fish after it has been caught.

3.2.2.2 AMERICAN SAMOA

3.2.2.2.1 Introduction

As described in Chapter 1, fishing has played a crucial role in American Samoan culture and society since the Samoan archipelago was populated. An overview of American Samoa history, culture, geography, and relationship with the U.S. is described in Section 1.3 of the American Samoa FEP (WPFMC 2009a). Since the early 2000s, a number of studies have synthesized more specifics about the role of fishing and marine resources in American Samoa, as well as information about the people who engage in the fisheries or use of fishery resources (Armstrong et al. 2011; Grace-McCaskey 2015; Kleiber and Leong 2018; Levine and Allen 2009; Richmond and Levine 2012). These studies describe the importance of marine resources in cultural, economic, and subsistence aspects of Samoan village life. Fishing was held in high esteem in traditional Samoan culture, with proficiency in fishing bringing high social status; fishing activities were featured prominently in Samoan mythology as well. The basic units of Samoan social structure are the family and village, with the family as the central unit. The village leadership would decide, according to season, what sort of community fishing should take place. The tautai, or master fishermen of the village, were key decision makers who were awarded higher status than others when it came to matters of fishing (even those that might otherwise outrank him). Village-level systems of governance and resource tenure are still largely intact, and Samoan cultural systems and representation are formally incorporated into the Territorial Government. Reciprocity is emphasized over individual accumulation. Gifts of food (especially fish and other marine resources) mark every occasion and help maintain Samoan social structure to this day. Women and fa’afafine (a third gender within traditional Samoan culture) engaged in fishing have emphasized the important role of fishing in intergenerational relationships and cultural subsistence with respect to elder care, and domestic labour, art, and design (Fisk et al. 2023).

Recent studies have found that American Samoa is ethnically and culturally very homogeneous (Levine et al. 2016; Richmond and Levine 2012). Polynesians account for the vast majority of the territory’s people (93%). The primary language spoken at home is Samoan (91%), although English is often spoken in school and business settings. Contemporary American Samoan culture is characterized by a combination of traditional Samoan values and systems of social organization, as well as the strong influence of Christianity. Maintaining *fa'a Samoa*, or "the Samoan way", was considered a priority under the territorial constitution. Given the cultural homogeneity, nearly everyone in American Samoa accepts and complies with Samoan traditions of land and resource tenure.

However, over the last half century or more, fishing has become less prominent as a central and organizing community force. Through this time, modern fishing gears and new technologies were introduced, tuna canneries became a major economic force in Pago Pago, the population more than tripled, and the gradual but continuous introduction of Western cultural norms and practices altered locals' relationship with the sea. While many traditions and village-based systems of governance have been maintained, the islands have experienced a shift from a subsistence-oriented economy, where sharing of fish catch was extremely important, to a cash-based economy, where fishing is often viewed as a more commercial venture.

A recent study by Levine et al. (2016) found that American Samoans still consume seafood frequently, with 78% of respondents stating that they eat fish or seafood at least once a week. Most American Samoans purchase seafood from stores or restaurants, with 65% of survey respondents listing this as their first or second choice for obtaining seafood. Other common means for obtaining fish include markets and roadside vendors (45%) and fish caught by household members (37%). This corroborates Levine and Allen's (2009) observation that American Samoans largely rely on, and in many cases prefer, store-bought food to locally-caught fish, with the majority of fish consumed in American Samoa imported from Samoa.

The introduction of outboard engines and other technology in the 1950s and 1960s allowed American Samoan boats to go farther and faster, but also made it necessary for boat owners and operators to sell a portion of their catch to pay for fuel and engine maintenance. The disruption of other traditional values, as well as the introduction of a cash economy based primarily on government jobs and cannery employment, also decreased reliance on traditional, subsistence fishing and allowed commercial fishing to develop on the islands (Levine and Allen, 2009).

Unlike other areas within the Western Pacific region, American Samoa also experienced the development of domestic industrial-scale fisheries, including tuna processing, transshipment, and home port industries. This is due to the excellent harbor at Pago Pago, 390,000 km^2 of surrounding exclusive economic zone (EEZ), and certain special provisions of U.S. law that allowed the development of the fish processing industry. For example, the territory is exempt from the Nicholson Act, which prohibits foreign ships from landing their catches in U.S. ports, and American Samoan products with less than 50 percent market value from foreign sources enter the U.S. duty free.

The two most important economic sectors are the American Samoa Government (ASG), which receives income and capital subsidies from the Federal Government and tuna canning. According to the last published Statistical Yearbook (American Samoa Government 2023), main imports include fish brought in for processing. Exports are primarily canned tuna and associated products. In 2022, domestic exports from American Samoa amounted to $376, 899,000, of which $370,824,000 (over 98%) was from canned tuna (American Samoa Government 2023). Private businesses and commerce comprise a third sector. Unlike some of its South Pacific neighbors, American Samoa has never had a robust tourist industry.

In 2022, the ASG employed 7,224 people (43% of total employment; American Samoa Government 2023), and the private sector employed 7,426 people (Figure 118). Supporting data for Figure 118 are provided in Table A-111. The canneries employed 2,275 people, which is 13% of the total people employed in the territory. Ancillary businesses involved in re-provisioning the fishing fleet generate a significant number of jobs and income for local residents.

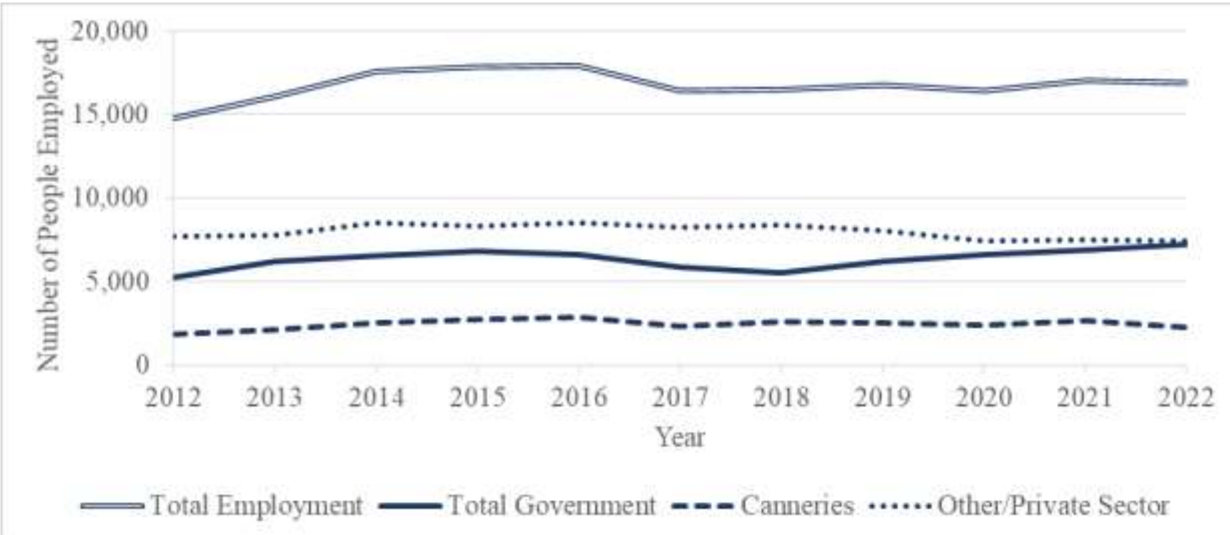


Figure 118. American Samoa employment estimates[1]

[1] Source: American Samoa Government (2023).

The canneries have been operating since 1954, represent the largest private-sector source of employment in the region, and, until recently, were the principal industry in the territory. Although as many as 90% of cannery workers are not American Samoa citizens, the canneries play a large role in the American Samoa economy (e.g., via delivery of goods or services to tuna processors and expenditures and buying patterns of cannery workers). Trends in world trade, specifically reductions in tariffs, have been reducing the competitive advantage of American Samoa's duty-free access to the U.S. canned tuna market, and the viability of the canneries has been uncertain for nearly a decade. In 2009, the Chicken of the Sea cannery closed, resulting in a loss of approximately 2,000 jobs. It was bought by Tri Marine International, which invested $70 million in rebuilding and expansion before reopening in 2015. In October 2016, StarKist Co. suspended operations due to lack of fish, partly because of the Effort Limit Area for Purse Seine (ELAPS) closures (Pacific Islands Report 2016). That same month, Tri Marine International announced that it would suspend production indefinitely in December 2016 (Honolulu Star Advertiser 2016). There are currently no plans to reopen (Pacific Islands Report 2017). Starkist Samoa is currently the only cannery operating in American Samoa and is the largest private employer with about 2,000 workers.

Even before Tri Marine International's closure, American Samoa's economy was identified as being in a highly transitional state that should be monitored closely (McCaskey 2015). It will be important to monitor any changes and developments related to the tuna industry, given the historically close connection between the tuna canneries, employment levels, population trends, and the economic welfare of the territory. It is also possible that increased federal aid in recent years has masked the full extent of the economic recession.

Members of the American Samoa fishing community had also expressed concerns about the impact of National Marine Sanctuary of American Samoa (NMSAS) expansion in 2012 and management of the Rose Atoll Marine National Monument, which was established in 2009. In both of these cases, the local communities have been concerned about the impacts on fishing practices as well as broader social and cultural issues, such as traditional marine tenure and the ability of villages to manage their own resources.

In 2017, understanding the relationship of pelagic fisheries with cultural fishing practices took on a greater focus. During the peak of longline landings in 2002, NMFS created a Large Vessel Prohibited Area (LVPA) to prevent gear conflicts and catch competition between large and small vessels, as well as to preserve opportunities for fishing by American Samoa's small boat ("alia") fleet (NOAA 2017). Since 2002, both large and small vessels have experienced declining catch rates, fish prices, and increasing fuel and operating costs. In 2016, NMFS published an exemption to the LVPA rule to allow large U.S. vessels holding a federal American Samoa longline limited entry permit to fish in portions of the LVPA (NOAA 2016). NMFS and the Council were then sued by the American Samoa Government, who claimed that the 1900 and 1904 Deeds of Cession were not considered in the rulemaking process. The U.S. District Court ruled in favor of American Samoa in March 2017, requiring NMFS to preserve American Samoan cultural fishing practices as part of their obligations to the Deeds of Cession. A study examining dimensions of cultural fishing for the small and large longline fleets found that these fisheries play an important role in maintaining cultural practices, primarily through sharing of catch (Kleiber and Leong 2018). The Council took action to provide a four-year exemption for vessels permitted under the American Samoa Longline Limited Entry permit, which reduced the area closed to large vessels from 25.5 to 11.5%. In September 2020 the Ninth Circuit Court of Appeals reversed the District Court decision in favor of NMFS. In February 2021, the ASG appealed to the Supreme Court of the United States, but the writ of certiorari was denied June 21, 2021. NMFS published the original 2016 LVPA exemption as a final rule, effective July 6, 2021.

The proposed Pacific Remote Islands National Marine Sanctuary raised concerns about potential impacts to the American Samoa economy related to potential reduction in fish offloaded at the cannery. A study using an IMPLAN model to examine economic contributions of U.S. commercial fisheries in American Samoa found that indirect, induced, and value-added effects of purse seine, longline, and small boat fisheries contributed the equivalent of 20% of total employment, 18% of total labor income, more than a quarter of the total economic output, and more than one-fifth of the 2019 GDP in American Samoa (Chan 2023). Hypothetical scenarios of reduced fish landings of 10%, 30%, and 50% showed large ripple effects on the local economy, leading to a potential 2-10% reduction in employment, 2-9% reduction in labor income, 2-11% reduction in GDP, and 3-14% reduction in output (Chan 2023).

3.2.2.2.2 People Who Fish

Few studies have been conducted that include demographics or other information about people who fish in American Samoa. Information at the fishery level will be reported in the fishery specific sections below. Qualitative research has resulted in some general observations about trends in fishing by American Samoans.

One household survey by Levine et al. (2016) found that over half of residents participate in fishing or gathering of marine resources. Approximately 15% reported fishing once a week or more and over 30% of households stated that they engaged in fishing or gathering at least once a month. Commercial fishing is very uncommon in American Samoa, with only 3% of those who fish stated that they frequently did so to sell their catch and 62% never selling their catch. More commonly, people fish to feed themselves and their family or to give to extended friends, family, pastors, and village leaders.

While fishing and marine resources are universally considered to be important aspects of *fa'a Samoa*, limited income has made American Samoans less inclined to engage in strenuous fishing activities when food imports are relatively more available (Levine and Allen 2009). Only a small number of American Samoans engage in boat-based or commercial fishing. Although unemployment in the territory has increased, the percentage of individuals participating in subsistence activities (including fishing for food or home use) decreased between 2000 and 2013 (Grace McCaskey 2015). However, a large number of island residents have been employed by the canneries in Pago Pago, which facilitated the availability of low-cost fish for many residents and ensured that the livelihood of American Samoans is still tightly tied to fishing activities. A total of 33 fishers responded to a cost-earnings survey of the American Samoa small boat fishery conducted in 2021, of an estimated 60 potential active participants (Dombrow et al. 2023). Approximately 90% engaged in nearshore or shallow bottomfish fishing, 81% engaged in deep-water bottomfish fishing, and 75% went trolling. The largest percentage of respondents (27%) identified part-time commercial fishing as their primary motivation, followed by full-time commercial (21%) and cultural fishing (18%). While fishers sold approximately 46% of their catch, they gave away 26% and kept about 21% for personal or family consumption; nearly all fishers (94%) gave away a portion of their catch and 97% kept some catch for personal and family consumption (Dombrow et al., 2023).

As described in the FEP, American Samoans have been discouraged from working on foreign longline vessels delivering tuna to the canneries for a number of reasons, including harsh working conditions, low wages, and long fishing trips. While American Samoans prefer employment on the U.S. purse seine vessels, the capital-intensive nature of purse seine operations limits the number of job opportunities for locals in that sector.

Local fishermen have indicated an interest in participating in the more lucrative overseas markets for fresh fish. However, they are limited by inadequate shore-side ice and cold storage facilities, as well as infrequent and expensive air transportation.

As noted by Levine and Allen (2009), the trend of decreasing reliance on local fish as a food source is reflective of a society that has been undergoing a shift from a subsistence-oriented economy to a cash economy. Changes such as a decrease in leisure time, a shift in dietary preferences towards store-bought foods, a preference to buy fish at the market rather than expend effort in fishing, and an increased availability of inexpensive imported reef fish from Western Samoa and Tonga are also likely contributing to decreasing rates of subsistence fishing in the region (Richmond and Levine 2012).

However, during the COVID-19 pandemic, the local focus of American Samoa fisheries played a vital role in supporting local food systems, nutrition, food security, and community social cohesion (Kleiber et al. 2022). In 2023, fishers were still concerned about the slow rollout of COVID relief and CARES Act funds (Ayers et al. 2023).

3.2.2.2.3 American Samoa Longline

The American Samoa longline fishery only includes landings in American Samoa by American Samoa longline permitted vessels, it does not include the bigeye landings in Hawaii by the dual (Hawaii and American Samoa) permitted vessels. The American Samoa longline fishery is a limited entry fishery with a maximum of 60 permits. Under the limited access program, NMFS issued a total of 60 initial longline limited entry permits starting from 2005 to qualified candidates. The American Samoa longline limited entry permit is required for anyone using longline gear to fish for pelagic species within the EEZ around America Samoa or anyone landing or transshipping pelagic species in American Samoa that were caught within the EEZ around American Samoa. The total active permits (vessels) fishing in the South Pacific Ocean and landed in American Samoa in 2016 was 20. The American Samoa longline permit may be used to fish and land catch with longline gear in the EEZ around Guam, the CNMI, and the Pacific Remote Island Area (PRIA). It may not, however, be used to fish with longline gear in the Hawaii EEZ.

The American Samoa longline fishery faces many challenges in recent years. A cost-earnings study conducted in 2009 had already indicated a thin profit margin and significant economic challenges encountered by the longline fleet (Arita and Pan 2013). Pan (2015) also observed that at the end of 2013, the majority of the vessels in the American Samoa fleet were tied up at dock, and 18 vessels posted "For Sale" signs. They noted that the collapse of the fishery seemed inevitable due to the poor economic performance resulting from the continuous decline in catch per unit effort, increases in fuel prices, and a sharp drop in albacore prices in 2013. The small-scale alia fleet has been greatly reduced in recent years.

3.2.2.2.4 American Samoa Trolling

According to Levine and Allen (2009), until 1995, boat-based fishing in was primarily trolling and bottomfish handlining, with the pelagic fishery in American Samoa being largely troll-based. In 1996, the majority of trolling fishermen converted their alias to longlining, especially larger commercial trollers, although some continued to troll occasionally. Consequently, the alia fishery has experienced a decline in its catch and effort. In 1996, seven of the 35 trolling vessels rarely sold catch; their captains primarily fished for recreation on weekends, holidays, or competed in fishing tournaments. By 2001, longlining became the dominant fishing method in American Samoa and the number of trolling boats, and their total catch dropped dramatically. Nevertheless, alia longlining has dropped dramatically since then. The landings and revenue by alia longline are not included in this section but are included in the American Samoa longline section.

A small-boat cost-earnings survey in 2021 found that 75% of small-boat fishers engaged in tolling, with 100% of respondents in the Manu‘a Islands participating in trolling (Dombrow et al. 2023). Tolling trips had the highest median trip costs, and boat fuel composed the majority of tip costs (Dombrow et al. 2023).

3.2.2.3 CNMI

3.2.2.3.1 Introduction

An overview of CNMI history, culture, geography, and relationship with the U.S. is described in Section 1.3 of the FEP for the Mariana Archipelago (WPFMC 2009c). The CNMI is situated at the northern end of the archipelago. Over the past decade, a number of studies have synthesized more specifics about the role of fishing and marine resources across CNMI, as well as information about the people who engage in the fisheries or use fishery resources.

The ancestors of the indigenous Chamorros first arrived in the Mariana Archipelago around 3,500 years ago and relied on seafood as their principal source of protein (see Chapter 1, Allen and Amesbury 2012; Grace McCaskey 2014). Similar to other archipelagos in the Western Pacific, fish and marine resources have played a central role in shaping the social, cultural, and economic fabric of CNMI that continues today. They fished for both reef and pelagic species, collected mollusks and other invertebrates, and caught sea turtles. The occupation of CNMI by foreign nations dramatically changed the island's ecosystems, reshaped communities, and disrupted fishing traditions. In the 17th and 18th centuries, Spanish colonizers destroyed the Chamorros' seagoing canoes, suppressed offshore fishing practices, and relocated populations from their traditional home. CNMI was briefly occupied by Germany from 1899 to the beginning of World War 2. During World War 2, CNMI was occupied by the Japanese military, and then was captured by the United States. Throughout this time, fishing remained an important activity. Later immigrants to the islands from East and Southeast Asia also possessed a strong fishing tradition. Today, only Saipan, Rota, and Tinian are permanently inhabited, with 90% of the population on the island of Saipan. Although the CNMI has transitioned to a tourism-based economy, fishing still plays an important cultural role and serves as a reliable source of local food (Ayers 2018).

3.2.2.3.2 People Who Fish

Allen and Amesbury (2012) summarized results of studies that demonstrated the sociocultural importance of fishing to Saipan residents. In a 2005 study, most of the active or commercial fishermen who responded to the survey had fished more than 10 years. They most often participated in snorkel spear fishing at night (participated in by 73% of the fishermen) and snorkel spear fishing during daytime (58% of the fishermen), followed by hook-and-line less than 100 ft. deep (36%), trolling (21%) cast net (talaya; 14%) hook-and-line more than 100 ft. deep (9%), trapping (octopus, crabs, etc.; 19%), foraging the reef (8%); 18% said they participated in one or more other techniques. Less than a third (30%) said they owned a boat. Their primary reasons for fishing were social and cultural, including that they just really like fishing (32%), they need the fish to feed their family (23%), giving catch to family and friends strengthened social bonds (13%), their family has always fished (12%), and it strengthens bonds with their children/family (6%). Only 4% said they needed the money from the fish they sold. Other motivations included strengthening the bond with their fellow fishermen, fishing to catch fish for fiestas/parties, and seasonal fishing for manahak, ti'ao, and i'e (2% each).

The fishermen reported fishing an average of 71 days a year, with 26% going once every 2 to 3 days and 24% fishing once every 2 weeks. They also reported a decrease in their amount of fishing over time, fishing an average of 93 days a year 10 years ago. Saipan reef fish were the most frequently caught species (caught by 54% of the fishermen), followed by shallow-water bottomfish (23%) and reef invertebrates such as octopus, shellfish, and crabs (14%).

As in other parts of the region, much of their catch was consumed by themselves and immediate family (70%), with another 20% consumed by extended family and friends. Only 8% of the catch was sold. Only 18 respondents identified themselves as commercial fishermen. They reported a median monthly income of ~$200 from fishing, with an average of just over $1,000 per month. Costs exceeded sales for almost every income category of fishermen, suggesting that for most fishing is not a profitable business and that they sell their catch to recover some of the costs. Interviews with elder fishers conducted from 2009-2010 corroborated this finding, with the most common motivation to keep fish for food (94%) and commercial sale listed as the second most common reason (40%), including some expense fishing or minor sales of excess fish; giving away fish (19%) or providing for special occasions (10%) were also prominent motivations (Iwane and Levine, 2023).

While fish remains an important part of the local diet and an integral part of the people's history and culture, adaptation to and integration with a more westernized lifestyle appears to have changed people's diets on Saipan. Nearly half (45%) of the survey respondents reported eating "somewhat less fish" than they did 10 years ago, although the majority still ate fish between 1 and 3 times a week. The majority also purchased their fish from a store or restaurant (40%) while 31% purchase fish from roadside vendors. Less common was acquiring fish from an extended relative/friend (13%) or their own catch (11%). Most of the fish consumed came from the U.S. mainland (41%), while the next most important source was from inside Saipan's reef (31%), deep water or pelagic fish caught off Saipan (23%) or imported from other Pacific islands such as Chuuk (10%).

Few other surveys have been conducted on fishing in general in CNMI. A household survey conducted in 2012 found that 37% of respondents said they or someone else in their household was a fisherman (Kotowicz and Allen 2015). Respondents from fishing households tended to be younger, have lower education levels, and have a higher rate of unemployment than respondents from non-fishing households.

The designation of the Marianas Trench Marine National Monument ("the Monument") in 2009 has resulted in concerns about loss of fishing access (Richmond and Kotowicz 2015; Kotowicz and Richmond 2013; Kotowicz and Allen 2015; and Kotowicz et al. 2017). Despite long distance, high cost, and inconvenience, travel to the areas now protected by the Monument were rare but culturally significant events, and fishing was an essential component. While CNMI residents generally supported designation of the monument, awareness was low (Kotowicz et al. 2017). In addition, fishing households showed higher awareness of the Monument but were less likely to strongly support it.

3.2.2.3.3 CNMI Trolling

While proportionally few residents own a boat, more than 400 vessels were registered in the CNMI small boat fleet between 2010 and 2011 (Allen and Amesbury 2012). More than 200 of the vessels were active and operating in CNMI waters, and more than 100 of the vessels were involved in fishing activities. However, estimates of active vessels have declined in recent years. The active small boat fleet targets tunas, other small pelagics (through trolling), and bottomfish, although with the increases in the price of gas, pelagic fishing has dropped off somewhat. The fish are marketed locally, given away to family and friends, or used for ceremonial purposes such as parties, culturally significant fiestas, and each village's patron saint's day.

On Saipan, fisheries managers estimated the active small boat fleet at approximately 100 vessels in 2010 and 2011, but it is likely that active vessels have declined in recent years. Full-time commercial fishing is primarily conducted by ethnic nonindigenous minorities, namely Filipino residents (who fish primarily as independent owners and/or operators) and recent immigrants from the Federated States of Micronesia (who are primarily employed for wages). Chamorro and Carolinians, in contrast, primarily fish for recreational and subsistence purposes, selling catch to recoup costs. A few vessel owner operators are considered “Pescadores”, a term used to refer to fishermen who provide fish for important community and familial events. Pescadores customarily provide 100-200 lb of reef fish for cooked dishes and pelagic species for kelaguen (i.e., a raw fish dish) for community and family celebrations. The system of seafood distribution underwent significant changes from approximately 2000-2010 with the establishment of large seafood vendors. In contrast to individual fishermen/vendors who only market their own catch, large vendors typically own and operate a number of vessels and purchase catch from independent fishermen to sell, which is reportedly depressing prices. In addition, increases in fuel prices, low market prices for fish, and downturns in the domestic economy have led to a general decline in participation in this fishery since 2000, with respect to numbers of fishermen, trips, landings, and seafood purchasers. The Saipan Fishermen’s Association (SFA) is a nonprofit organization established in 1985 that holds annual fishing derbies and participated in community involvement projects, such as beach cleanup.

On Tinian, estimates of fleet size range from 15 to 20 vessels in 2010 and 2011. An estimated 1 to 3 fishermen fished consistently with the primary intent of selling fish. Respondents suggested that fishing and eating of fish was more habitual, rather than geared toward a particular event. Increasing fuel prices have reportedly led to the decline in number of active fishermen, and fishermen frequently sell fish to cover fuel costs. Three restaurants and two stores in Tinian purchase fish, although fishermen also sell house to house and commonly have an established clientele. A few charter boats serve tourist clientele; however, they do not land much catch and even trolling trips serve more as photo opportunities. Charter boats are reportedly owned by nonlocal residents and target tourists from their country of origin (Japan, China, or Korea).

On Rota, fishermen target pelagic species when in season, and fish for bottomfish the rest of the year. Like on the other islands, the number and activity of fishermen have declined as a result of increased fuel prices. Family members will often make requests for certain kinds of fish, but they will also contribute money to purchase fuel for a fishing trip. In addition, fishermen will often check demand with local restaurants, based on fuel prices. In 2010-2011, fishermen sold catch to three restaurants, or to neighbors and friends within the community (door to door or from a cooler on the roadside). One general store sold fish caught by a family member, who fishes specifically to sell. Rota holds one fishing derby in celebration of San Francisco, the saint of their island.

A survey of the small boat fleet was also conducted in 2011 (Hospital and Beavers 2014). On average, respondents were 41 years old and had been boat fishing for an average of 15 years, providing evidence of a deep tradition of boat fishing in the CNMI. They were more likely to identify themselves as Chamorro relative to the general population of the CNMI, although they were equally likely to have been born in the CNMI. In general, small boat fishermen were more educated than the general population and of comparable affluence. Pelagic trolling as the most popular gear type, followed by deep water bottomfish fishing, shallow-water bottomfish, and spear fishing. Most (71%) fishermen reported fishing at a Fish Aggregating Device (FAD) during the past 12 months, and on nearly 22% of their fishing trips. A high degree of seasonal fishing effort was reported across most subgroups of the fleet, although fishermen on Tinian and Rota were more likely to fish year-round.

Hospital and Beavers (2014) found that a majority of fishermen (74%) reported selling at least a portion of their catch in the past 12 months. However, less than half (43%) of survey respondents indicated that they could always sell all the fish that they wanted. A significant percentage of fish caught was consumed at home (28%) or given away to relatives, friends, or for cultural events (38%), reflecting the strong family and social connections associated with fishing in the CNMI. Approximately 29% of fish catch was sold, with the remaining catch either released (2%) or exchanged for goods and services (3%). Even fishermen who regularly sell fish still retain approximately 22% of their catch for home consumption and participation in traditional fish-sharing networks and customary exchange. Additionally, 86% of respondents considered the pelagic fish they catch to be an important source of food. These findings validate the importance of fishing in building and maintaining social and community networks, perpetuating fishing traditions, and providing fish to local communities as a source of food security.

Fishing in the CNMI is a social activity; only 3% of fishermen reported to fish alone, while 70% reported that their boat is used without them on occasion. In addition, the majority of fishermen (57%) agreed that as a fisherman, they are respected by the greater community. While nearly a third of respondents were neutral (27%) and some were hesitant to express an opinion or simply did not know (13%), the study found that very few (3%) felt that they were not respected by the community.

Overall, the CNMI small boat fisheries are a complex mix of subsistence, cultural, recreational, and quasi-commercial fishermen whose fishing behaviors provide evidence of the importance of fishing to the people of the CNMI. For nearly all fishery participants, the social and cultural motivations for fishing far outweigh any economic prospects. Nearly all fishermen supplement their income with other jobs and are predominantly subsistence fishermen, selling occasionally to recover trip expenses.

3.2.2.4 GUAM

3.2.2.4.1 Introduction

An overview of Guam's history, culture, geography, and relationship with the U.S. is described in Section 1.3 of the Fishery Ecosystem Plan for the Mariana Archipelago (WPFMC 2009c). Guam is the largest and southernmost island of the archipelago. It is also the largest and most heavily populated island in Micronesia. Over the past decade, a number of studies have synthesized more specifics about the role of fishing and marine resources across Guam, as well as information about the people who engage in the fisheries or use fishery resources.

The ancestors of the indigenous Chamorros first arrived in the Marianas around 3,500 years ago and were expert fishermen and seafarers, relying on seafood as their principal source of protein (Allen and Bartram 2008; Grace-McCaskey 2014; Hospital and Beavers 2012). They fished on the high seas in large sailing canoes (proas) and used numerous methods to catch reef and bottomfish from boats Similar to other archipelagos in the Western Pacific, fish and marine resources have played a central role in shaping the social, cultural, and economic fabric of Guam that continues today. Chamorros fished for both reef and pelagic species, collected mollusks and other invertebrates, and caught sea turtles.

The occupation of Guam by foreign nations dramatically changed the island's ecosystems, reshaped communities, and disrupted fishing traditions. In the 17th and 18th centuries, Spanish colonizers destroyed the Chamorros' seagoing canoes, suppressed offshore fishing practices, and relocated populations from their traditional home. Following the Spanish-American War in 1898, the U.S. Navy took control of Guam, until it was occupied by Japan from 1941 to 1944. Guam became a U.S. territory in 1950, and the U.S. military is currently in the process of building up an even greater presence on the island. Throughout this time, fishing has remained an important activity, although by the beginning of the American period in 1898, the indigenous inhabitants had lost many of their seafaring and fishing skills and even the native names of many of the offshore species. Later immigrants to the islands from East and Southeast Asia also possessed a strong fishing tradition. In 2000, for Guam's population that identified as a single ethnicity 37% were Chamorro, followed by 32% Asian (about 80% of whom were Filipino), 17% other Pacific Islander, 7% white and 1% black. Despite rapid socioeconomic change, households still reflect the traditional pattern of extended families with multigenerational clustering of relatives, especially in Guam's southern villages. Social occasions such as neighborhood parties, wedding and baptismal parties, wakes and funerals, and especially the village fiestas that follow the religious celebrations of village patron saints all require large quantities of fish and other traditional foods, reflecting the role of fish in maintaining social ties and cultural identities. Sometimes fish are also sold to earn money to buy gifts for friends and relatives on important Catholic religious occasions such as novenas, births and christenings, and other holidays.

Since the late 1970s, Guam's most important commercial fisheries activity has been its role as a major regional fish transshipment center and resupply base for domestic and foreign tuna fishing fleets. Services provided include fueling, provisioning, unloading, air and sea transshipment, net and vessel repairs, crew repatriation, medical care, and warehousing. 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 in 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. As early as 2006, it was noted that the Port of Guam had lost much of its competitive advantage compared to alternative transshipment locations in the western Pacific and elsewhere, a trend that may not be reversible.

Otherwise, commercial fisheries have a relatively minor contribution to Guam's economy; the social and cultural importance of fisheries in Guam dwarfs their commercial value. Nearly all Guam domestic fishermen hold jobs outside the fishery, with fishing typically supplementing family subsistence. High value is placed on sharing one's fish catch with relatives and friends, and this social obligation extends to part-time and full-time commercial fishermen alike. A 2005 survey of Guam households found that nearly one-quarter (24 percent) of the fish consumed was caught by the respondent or an immediate family member, and an additional 14 percent was caught by a friend or extended family member (Allen and Bartram 2008). However, a little more than half (51%) of the fish consumed was purchased at a store or restaurant and 9% was purchased at a flea market or from a roadside stand. The same study found that annual seafood consumption in Guam is estimated to be about 60 lb per capita, with approximately 43% imported from the U.S.

The Westernization of Guam, particularly since World War II, not only resulted in a transition from a subsistence to wage-based economy but also contributed to dramatic changes in eating patterns, including lower seafood consumption. Indeed, recent years have seen steady declines in the market demand for fresh local fish across Guam (Hospital and Beavers 2012). While some families continue to supplement their diet by fishing and farming, no existing communities are completely dependent on local fishing as a source of food. A household survey conducted in 2016 found that only 29% of respondents participate in fishing (NCRMP 2016a).

As recently as the early 1970s, relatively few people in Guam fished offshore, because boats and deep-sea fishing equipment were prohibitively expensive (Allen and Bartram 2008). During the economic boom from the late 1980s through most of the 1990s, Guam developed a small boat fishery that conducts trolling and bottomfish fishing, mostly within 30 miles of shore.

The Guam Fishermen's Cooperative Association (GFCA) plays an important role in preserving important fishing traditions. It began operations in 1976 and was incorporated in 1977. In 2006, its membership included 164 full-time and part-time fishermen from every district in Guam, and it processed and marketed approximately 80% of the local commercial catch. In addition, it plays a role in fisheries data collection, marine education and training, and fisheries conservation and management. The GFCA strives to provide benefits not just to fishermen but to residents throughout Guam, benefitting the broader Guam community. It utilizes a Hazard Analysis and Critical Control Point (HACCP) system to ensure safe seafood, and tests fish for potential toxins or whenever requested by the Guam Department of Health and Sanitation. It has also become a focal point for community activities such as the Guam Marianas International Fishing Derby, cooking competitions, the Guam Fishermen's Festival, dissemination of educational materials on marine resources, vessel safety and seafood preparation, public meetings on resource management issues, and communications via radio base to relay information and coordinate rescues. It also has adopted a policy of purchasing local origin products that benefits 40 small businesses in Guam, regularly donates seafood for village functions and charitable activities, and provides assistance to victims of periodic typhoons with emergency supplies of ice and fuel. In addition, the GFCA has become a voice for Guam fishermen in the policy arena to ensure that concerns of fishermen are incorporated into issues such as the military buildup.

Fishing in Guam continues to be important not only in contributing to the subsistence needs of the Chamorro and other residents but in preserving their histories and identities. Knowledge of how fish are distributed and consumed locally is crucial to understanding the social and cultural significance of fishing in Guam.

3.2.2.4.2 People Who Fish

Few studies have been conducted on fishing in Guam in general. A household survey conducted in 2012 found that 35% of respondents said they or someone else in their household was a fisherman (Kotowicz and Allen 2015). Respondents from fishing households tended to have lower education levels and have a higher rate of unemployment than respondents from non-fishing households.

A few studies have targeted pelagic fishermen or the small boat fleet. There is some indication that interest in small-boat commercial fishing for skipjack may be emerging using a specialized form of handlining (Iwane et al. 2023). While these boats also engage in bottomfish fishing and reef fishing, the primary pelagic fishing method is trolling, thus, results of these studies will be reported in the Guam Troll section.

3.2.2.4.3 Guam Trolling

As noted in Chapter 1, Guam's primary pelagic fishing method is trolling. While the majority of trolling activity is non-commercial, pelagic fish catch from troll fisheries historically account for about 80 percent of the island's boat-based fisheries commercial harvest. In addition, Guam's charter fishing fleet is considered a commercial fleet and trolls for pelagic fish. In 1998, the charter fleet attracted approximately 3% of visitors to Guam and consisted of about 12 core boats.

In 2001, pelagic fishers were interviewed to develop a profile of contemporary demographic and sociological characteristics of Guam's pelagic fishers (for full report see Rubenstein, 2001). Their study was designed to capture a representative sample of the majority of pelagic fishers and included 97 respondents. Of these, all but two were men, and neither of the two women were Pacific Islanders, reflecting the strong cultural values in Micronesia that discourage women from involvement in pelagic fishing. With respect to ethnic distribution of fishers, indigenous Chamorros reflected the general population of Guam (41%). Micronesians were over-represented, forming nearly 18% of the fishing population, but only about 6% of the general population, as were Euro-Americans, comprising 27% of the fishing population but only about 18% of the general population. Asians were under-represented; 7% of the pelagic fishing population was Filipino versus nearly 23% of the general population. Other Asian nationalities accounted for 3% of the pelagic fishing population versus 13% of the general population. Respondents were significantly more affluent than the general population on average, although there was a wide range of variation. Almost three quarters (72%) of respondents either owned or co-owned a boat. While trolling was the most common method of fishing (occurring on 70% of trips), many fishers also reported both trolling and bottomfish fishing on the same trip.

There were three main motivations for fishing. The predominant motivation (65%) emphasized personal enjoyment, and a number of respondents within this category (especially Chamorros and other Micronesians) emphasized the sense of cultural identity they derive from fishing. A second motivation (18%) was consumption of fish for family subsistence, and the final motivation (16%) was income. However, more than half (51%) identified multiple motivations. In addition, nearly all fishers (96%) reported regularly giving fish to family (36%), friends (13%), or both (47%). Most (53%) said they did not give fish to people other than family and close friends; of those who did occasionally, the main recipients were church fiestas (32%) and other church events or organizations (20%), reflecting Guam's long and well-entrenched Catholic tradition.

More than half of the respondents (58%) reported that they sell portions of their catches, although again with multiple motivations. People who sold fish one to four times per month (53%) were mostly seeking to recover some of the cost of fishing and boat ownership, whereas those who sold fish eight or more times per month (36%) were more likely selling to make a profit. The majority of fishers (69%) earned less than $500 monthly from fish sales. A number reported that infrequent fish sales subsidize the cost of fishing equipment and boats, a common theme in the Western Pacific region. There were 22% of respondents who earned more than $1,000 per month, relying heavily on fishing for their income.

In 2011, another survey was conducted of the small boat fleet, which found similar patterns (Hospital and Beavers, 2012). On average, fishermen responding to the survey were 44 years old and reported to have been boat fishing for an average of 20 years. Respondents were also more educated and more affluent than the general population. The majority of respondents described themselves as Chamorro (72%) followed by white (23%) with relatively small proportions of Filipinos (6%), Micronesians (6%), other ethnicities (5%), and Carolinians (1%). While the percentage of Micronesians was lower than in the 2001 study, the researchers noted that efforts to engage Filipinos and Micronesians were less successful than the investigators had hoped. As in the previous study, there was considerable evidence of co-ownership and sharing of fishing vessels. In addition, fishermen reported the use of multiple gear types, with pelagic trolling as the most popular gear type followed by shallow-water bottomfish fishing and deepwater bottomfish fishing. Almost all (96%) fishermen reported fishing at a Fish Aggregating Device (FAD) during the past 12 months, and on nearly half (53%) of their fishing trips. Fishing for bottomfish and reef fish was highly seasonal compared to pelagics; whereas over half of the survey respondents (54%) fished all year for pelagics, only 16% fished year-round for bottomfish and reef fish.

A larger proportion of fishermen reported selling at least a portion of their fish (70%) than in the 2001 study, and 82% of could always sell all the fish that they wanted to sell. However, nearly 30% reported that they had not sold any fish in the past 12 months, and nobody reported selling all the fish they caught. Instead, cost recovery was cited as the primary motivation for the sale of fish, with fish sales contributing very little to personal income for the majority (59%). In fact, 64% of fishermen reporting the sale of fish earned fishing revenues of less than $1000, which would not cover overall trip expenditures for the year. Sale of pelagic fish contributes to nearly 67% of fishing income, with another 20% from bottomfish revenues, and the rest from reef fish.

While respondents sold approximately 24% of their total catch, 29% was consumed at home, while 42% was given away. The remaining catch was either released (2%) or exchanged for goods and services (3%). This diversity of catch disposition extends to fishermen who regularly sell fish, as they still retain approximately 30% of their catch for home consumption and participation in traditional fish-sharing networks and customary exchange. Additionally, 78% consider the pelagic fish they catch to be an important source of food, 79% for bottomfish, and 85% for reef fish. These findings validate the importance of fishing in terms of building and maintaining social and community networks, perpetuating fishing traditions, and providing food security to local communities.

Like with CNMI, fishing in Guam is a social activity. Only 7% of fishermen reported fishing alone, and 45% reported that their boat is used without them on occasion. In addition, 61% reported to be a member of a fishing club, association, or group. The majority of fishermen (60%) also agreed that as a fisherman, they are respected by the Guam community. Very few felt that they were not respected by the community.

There was also an open-ended portion of the survey that asked for comments. The two most prevalent themes were that of a rising population and rising fuel costs. Many believed that the expanding population would increase the demand for fish and number of fishermen, yet at the same time, others noted that fuel costs and economic considerations could restrict fishing. In addition, there was concern about the designation of Marianas Trench Marine National

Monument (the Monument), especially since respondents felt that the Marine Preserve Areas established in 1997 had already displaced them from their traditional fishing grounds. Military exercises also affected fishing trips. Other studies have also documented concerns about fishing access related to the designation of the Monument (see Richmond and Kotowicz 2015; Kotowicz and Richmond 2013; and Kotowicz and Allen 2015). Despite long distance, high cost, and inconvenience, travel to the areas now protected by the Monument were rare but culturally significant events, and fishing was an essential component.

Similar to the CNMI, Guam's small boat fisheries are a complex mix of subsistence, cultural, recreational, and quasi-commercial fishermen whose fishing behaviors provide evidence of the importance of fishing to the island of Guam. For nearly all fishery participants, the social and cultural motivations for fishing far outweigh any economic prospects. Nearly all fishermen supplement their income with other jobs and are predominantly subsistence fishermen, selling occasionally to recover trip expenses.

3.2.2.5 HAWAII

3.2.2.5.1 Introduction

The geography and overall history of the Hawaiian Archipelago, including indigenous culture and current demographics and description of fishing communities is described in section 1.3 of the Fishery Ecosystem Plan for the Hawaii Archipelago (WPFMC 2009b). Over the past decade, a number of studies have synthesized more specifics about the role of fishing and marine resources across the Hawaiian archipelago, as well as information about the people who engaging in the fisheries or use fishery resources.

As described in Chapter 1, a number of studies have outlined the importance of fishing for Hawaiian communities through history (e.g., Geslani et al. 2012; Richmond and Levine 2012). Traditional Native Hawaiian subsistence relied heavily on fishing, trapping shellfish, and collecting seaweed to supplement land-based diets. Native Hawaiians also maintained fishponds, some of which date back thousands of years are still used today. The Native Hawaiian land and marine tenure system, known as ahupuaʻa-based management, divided the islands into large parcels called moku, which are reflected in modern political boundaries (Census County Districts).

Immigrants from many other countries with high seafood consumption and cultural ties to fishing and the ocean came to work on the plantations around the turn of the 20th Century, establishing in Hawaii large populations of Chinese, Japanese, Koreans, Filipinos, and Portuguese, among others. In 1985, the Compact of Free Association also encouraged a large Micronesian population to migrate to Hawaii. According to the 2020 Census, the State of Hawaii's population is almost 1.5 million. Ethnically, it has the highest percentage of Asian Americans (37.2%) and Multiracial Americans (25.3%) and the lowest percentage of White Americans (22.9%) of all states. Approximately 27% of the population identifies as Native Hawaiian or part Native Hawaiian. Tourism from many of these Asian countries also increases the demand for fresh, high-quality seafood, especially sushi, sashimi, and related raw fish products such as poke.

Today, fishing continues to play a central role in the local Hawaiian culture, diet, and economy. In 2012, an estimated 486,000 people were employed in marine-related businesses in Hawaii, with the level of commercial fishing-related employment well above the national average

(Richmond et al. 2015). The Fisheries Economics of the United States 2019 report found that the commercial fishing and seafood industry in Hawaii (including the commercial harvest sector, seafood processors and dealers, seafood wholesalers and distributors, importers, and seafood retailers) generated $786 million in sales impacts and approximately 7,693 full and part-time jobs that year (NMFS 2022). It is estimated that recreational anglers took 3.5 million fishing trips, with $400 million in sales impacts and 2,911 full- and part-time jobs were generated by recreational fishing activities in the State during 2019. Similarly, the 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (USFWS 2011) estimated that 157 thousand people over 16 years old participated in saltwater angling in Hawaii in 2011. They fished approximately 1.9 million days, with an average of 12 days per angler. This study estimated that fishing-related expenditures totaled $203 million, with each angler spending an average of $651 on trip-related costs. These numbers are not significantly different from those reported on the 2006 and 2001 national surveys. Due to changes in data availability NMFS does not currently report recreational angler participation at the State level.

Seafood consumption in Hawaii is estimated at approximately two to three times higher than the entire U.S., and Hawaii consumes more fresh and frozen finfish while shellfish and processed seafood is consumed more across the entire U.S. (see Geslani et al. 2010 and Davidson et al. 2012 for review). In addition, studies have shown that seafood is eaten frequently, nearly one-third of residents ate seafood about once a week and only 3% never consumed seafood, although there is a decreasing trend in the percent of residents who consume seafood every day or a few times a week and an increase in residents who consume seafood 1-3 times a month (NCRMP 2016b; Allen et al. 2022). Fresh seafood is the most popular type of seafood purchased, and while most is purchased at markets or restaurants, a sizeable amount is reported as caught by friends, neighbors, or extended family (NCRMP 2016b; Davidson et al. 2012).

At the same time, local supply is inadequate in meeting the high seafood demand. In 2010, 75% of all seafood consumed in the State of Hawaii was imported from either the U.S. mainland or foreign markets, and the rise in imported fish has influenced the price of local catch (Arita et al. 2011; Hospital et al. 2011). In addition, rising costs of fuel and other expenses have made it more difficult to recover trip costs (Hospital et al. 2011). A majority of commercial fishermen report selling their fish simply to recover these costs, not necessarily to make income (Hospital et al. 2011). Many describe the importance of sharing fish as a part of maintaining relationships within family or other networks as being more important than earning income from fishing (Calhoun et al. 2020).

Pelagic fish play a large role in seafood consumption, with Hawaii residents regularly consuming substantial amounts of fresh bigeye and yellowfin tuna as ‘ahi poke (bite-sized cubes of seasoned raw tuna) and ‘ahi sashimi (sliced raw tuna). ‘Ahi is also a significant part of cultural celebrations, especially during the holiday period from late November (Thanksgiving) through late January to mid-February (Lunar New Year). Changes in bigeye regulations can have far-reaching effects not only on the fishing community in Hawaii but also on the general population (Richmond et al. 2015). While most of the fresh tuna consumed in Hawaii is supplied by the local industry, market observations suggest that imported tuna is becoming more commonplace to meet local demands (Pan 2014). However, on average, only 18% of tuna consumed is imported (Dombrow et al. 2022).

Examination of the seascape of compliance across the US Pacific Island region found, that while the literature highlights the importance of enforcement, local experts emphasized barriers of capacity, governance process, and the lack of data. This suggests that non-instrumental and governance approaches can complement enforcement and should be part of an integrated compliance approach both in the region (Ayers and Leong 2020).

3.2.2.5.2 People Who Fish

Hawaii includes a mix of commercial, non-commercial, and subsistence characteristics across fisheries. Pelagic fish are caught not only by the industrial-scale Hawaii longline fishery, but also by small boat fishermen. The longline fishery will be addressed in the following section. Within the small boat fleet, there is a nearly continuous gradation from the full-time and part-time commercial fleet to the charter and personal recreation fleets. A single boat (and trip) will often utilize multiple gear types and target fish from multiple fisheries. Thus, other than the longline fishery, the other fisheries are typically not studied individually. Rather, studies have typically been conducted based on ability to reach potential respondents. Studies have targeted fishermen via State of Hawaii Commercial Marine Licenses (CMLs; Chan and Pan 2017; Madge et al. 2016), shoreline and boat ramp intercepts (Hospital et al. 2011; Madge et al. 2016), and vessel and angler registries (Madge et al. 2016).

The Hawaii small boat pelagic fleet was studied in 2007-2008 (hereafter, referred to as the 2008 study), following a design last used in 1997 (Hospital et al. 2011). This work was updated in 2014 and 2021 (Chan and Pan 2017; Chan 2023). All studies found that the small boat pelagic fleet is predominantly owner-operated and a male dominated activity (98% of respondents were male in all studies). The ethnic composition was predominantly Asian (45% in 2008, 41% in 2014, 38.6% in 2021) and White (23% in 2008, 26% in 2014, 26.5% in 2021), which is similar to the State population as a whole. In 2021, proportionally more Native Hawaiians and Pacific Islanders responded to the survey than are represented in the general population (18.6% vs. 10%). In addition, the majority of respondents had a household income above $50,000 (75% in 2008, 69% in 2014, 76% in 2021).

These studies also asked respondents to identify their motivation for fishing and allowed for multiple responses, whereas the 2014 survey had asked how they defined themselves as a fisherman. When comparing primary motivations to self-identified fisherman type, the percentage of part-time commercial fishermen decreased from 51% to 30% while the percentage of recreational expense fishermen increased from 27% to 34% and subsistence fishermen increased from 3% to 16%, perhaps in response to the COVID-19 pandemic – the survey conducted in 2021 asked respondents about conditions and activities in 2020. When comparing all three motivations reported in 2021, recreational expense, subsistence, and part-time commercial were listed by almost half or more of respondents, whereas all other motivations were reported by fewer than 30% (Chan 2023). Different activities were then compared based on motivations.

As previously mentioned, the Hawaii small boat pelagic fishery is a mixed-gear fishery. In 2008, 47% of respondents reported using more than one gear type, predominantly trolling (for pelagic fish) and handline (for bottomfish). In 2014, 65% of respondents reported trolling as their most common gear, while 16% indicated bottomfish handline, and 12% stated pelagic handline was their most commonly used gear. Trolling was more commonly used by recreational fishermen whereas pelagic handline and bottomfish gears were more commonly used by commercial fishermen. In the 2021 study, trolling was still the most common gear type, but dropped to 54%. The other answer choices were changed slightly, but the majority of remaining responses still reflected bottomfish (23%) and pelagic (14%) gear types. The 2014 and 2021 studiesy also asked about species composition of catch. While 93over 90% of the respondents reporting landing pelagic fish in the past year in both studies, about half of respondents in the 2014 study also reported they caught and landed bottomfish or reef fish. In the 2021 study 56% of respondents reported catching bottomfish while 16% reported catching reef fish. Results from the 2021 study were compared to the State of Hawaii DAR reporting system and were found to match very well. Thus, the small boat fleet includes not only a mixture of gear types, but also targets both pelagic and insular fish stocks.

Studies also examined fisher motivations and self-identification vs. their commercial and non-commercial activities. Many people who considered themselves recreational, subsistence, or cultural fishers still sold fish. In 2008, 42% of fishermen self-classified as commercial fishermen, yet 60% of respondents reported selling fish in the past 12 months. In addition, just over 30% of fishermen who self-classified as recreational reported selling fish in the past year. Results for the 2014 study are shown in Table 44.

Table 44. Catch disposition by fisher category

	Number of respondents (n)	**Caught and released (%)**	**Given away (%)**	**Consumed at home (%)**	**Sold (%)**
All Respondents (2014)	738	5.6	13.9	15.4	65.0
By Fisherman Classification…					
Full-time commercial	55	6.2	9.4	11.6	72.8
Part-time commercial	369	5.2	12.9	14.4	67.5
Recreational expense	200	6.7	19.8	21.7	51.8
Purely recreational	78	5.4	37.3	29.6	27.6
Subsistence	24	1.9	20.7	31.0	46.5
Cultural	8	4.0	36.8	22.5	36.7
All Respondents (2021)	328	3.7	12.4	14.3	69.6
By Primary Motivation:					
Recreational expense	*98*	6.5	25.4	23.0	45.1
Part-time commercial	*92*	4.6	13.5	12.9	69.0
Subsistence	*47*	2.9	23.9	28.4	44.8
Full-time commercial	*34*	2.7	4.8	9.5	83.0
Purely recreational	*25*	6.0	36.5	30.3	27.1
Cultural	*4*	0.9	17.9	18.7	62.5

Source: Chan and Pan (2017); Chan (2023)

In 2021, the average value of fish sold by all respondents was approximately $11,913 and was seen to match well with the State of Hawaii DAR Dealer Reporting System (Chan 2023). Full-time commercial fishermen reported the highest value of fish sold ($35,709 annually), part-time commercial fishermen reported $8,983 annually, cultural fishermen $19,250, recreational expenses fishermen $3,917, subsistence fishermen $6,382, and purely recreational fishermen reported selling $2,939 annually. When adjusted for inflation, average annual revenue for full - and part-time commercial fishers decreased 5% and 11% respectively from 2014 values. Recreational expense revenue increased by 29%, while revenue from purely recreational fishing increased 162%, revenue from subsistence fishing increased 197%, and revenue from cultural fishing increased 338%. While income from fish selling served as an important source of personal income for full-time commercial fishermen, the majority of fishermen reported selling fish to cover trip expenses, not necessarily to make a profit; few fishermen reported substantial, if any, profits from fishing. In the 2008 study, respondents expressed concern about their ability to cover trip costs, noting that trip costs continued to increase from year to year, but fish prices remained relatively flat.

The 2008 study was also the first attempt to quantify the scale of unsold fish that was shared within community networks. Approximately 38% of pelagic fish caught by commercial fishermen was not sold, 97% of survey respondents indicated they participated in fish sharing networks with friends and relatives, and more than 62% considered the fish they catch as an important food source for their family. Community networks were also present in the outlets where fish were sold, which included the United Fishing Agency (UFA) auction in Honolulu, dealers/wholesalers, markets/stores, restaurants, roadside, but also sales to friends, neighbors, and coworkers. The 2014 study documented 27.3% of sales to friends, neighbors, or coworkers, which jumped to 49% in 2021 and 7.9% of sales at roadside/farmers' markets, which rose to 14% in 2021, illustrating the importance of informal markets. In addition, Table 59 also documents the importance of giving away fish for all self-classification categories, reflecting the prevalence of a gift economy. In the 2014 study, 17% of respondents (who all held CMLs) sold no fish in the past 12 months.

Taken together, the results from these studies suggest a disconnect between the disposition of Hawaii fishermen and public perception of their fishing activity relative to current regulatory frameworks. The small boat fleet is extremely heterogeneous with respect to gear type, target species, and catch disposition, while regulations attempt to treat each separately with clear distinctions between commercial and recreational activities. In addition to providing income, the Hawaii small boat fleet serves many vital nonmarket functions, including building social and community networks, perpetuating fishing traditions, and providing fish to local communities.

A survey was also conducted on the attitudes and preferences of Hawaii non-commercial fishers (see Madge et al. 2016). Nearly all survey respondents were male (96%). Their average age was 53, and, on average, they had engaged in non-commercial saltwater fishing in Hawaii for 31 years. The majority had household income equal to or greater than $60,000, reported high levels of education, and reflected a large racial diversity (primarily various Asian ethnicities and White). They primarily fished via private motorboat (61%), followed by shore, including beach, pier, and bridge (38%). Offshore trolling and whipping/casting, and free-dive spearfishing were the most frequent gears reported as "always" used, and a majority of respondents reported using multiple gears on a single fishing trip.

As with the small boat fleet, even though this study targeted "non-commercial fishermen", 9% reported that their primary motivation for fishing was to sell some catch to recover trip expenses. However, the primary motivation for the majority (51%) was purely for recreational purposes (only for sport or pleasure). A total of 78% of respondents indicated they "always" or "often" share catch with family and friends, and only 35% indicated they "never" supply fish for community/cultural events. Fishing for home/personal consumption was the most important trip catch outcome (36% rated it "extremely important"), followed by catching enough fish to be able to share with friends and family (20%). Thirty-six percent indicated that their catch was extremely or very important to their regular diet. Thus, similar to the small boat fleet, non-commercial fishermen demonstrate mixed motivations that include commercial activities. They also play an important role in providing fish via social and community networks, even though they report their primary motivation as fishing only for sport or pleasure.

NMFS and the Hawaii DAR have been collecting information on recreational fishing in Hawaii, administered through the Hawaii Marine Recreational Fishing Survey (HMRFS; see Allen and Bartlett 2008; Ma and Ogawa 2016). The program collected data from 1979-1981, but not from 1982-2000, and then began annual data collection again in 2001. A dual survey approach is currently used. A telephone survey of a random sample of households determines how many have done any fishing in the ocean, their mode of fishing, methods used, and effort. The telephone survey component will be discontinued after 2017 due to declining land line coverage. Concurrently, surveyors conduct in-person intercept surveys at boat launch ramps, small boat harbors, and shoreline fishing sites. Fisher county of residence and zip code are regularly collected in the intercept surveys but has not yet been compared to the composition of the general public. As observed in the other surveys, this program documented wide range of gears used to catch a variety of both pelagic and insular fish. The majority of trips from the onsite interviews were from “pure recreational fishermen” (defined as people who do not sell their catch), with an average of almost 60% to over 80% depending on year and island. However, they also noted that in Hawaii the divisions between commercial, non-commercial, or recreational are not clearly defined, and results suggested that the majority of catch for some categories of fishermen may be consumed by themselves or given away, further reinforcing common themes from other studies.

3.2.2.5.3 Hawaii Longline

The Hawaii longline fishery (HLF) is the dominant commercial fishery in the Hawaiian Islands and is described in detail in Richmond et al. (2015). It operates out of the port of Honolulu, and in 2018 there were 142 active vessels. The majority of longline fish is sold at the Honolulu fish auction, modeled after the Tsukiji auction in Tokyo, where dealers bid on individual fish. Over 40 dealers representing a variety of different market strategies regularly purchase fish at the auction. Many dealers represent locally-owned small businesses. Additional businesses connected to the bigeye fishery include processors, airline and shipping companies, ice distributors, gear stores, restaurants, and retail outlets.

Owners and operators of Hawaii’s longline vessels comprise three main ethnic groups: Korean-American (K-A), Vietnamese-American (V-A), and Euro-American (E-A) (Allen and Gough 2007); and the crew is predominantly Filipino (Allen and Gough, 2006). Unlike the broader Asian-American population in Hawaii, most HLF K-A and V-A fishers are first generation immigrants and speak limited English. E-A fishers largely consist of individuals from the mainland U.S. whose native language is English. The fishery is considered well regulated, although there are concerns about growing social and economic impacts from increased competition and regulation. Social network analysis revealed that fishers interacted more within ethnic groups than across ethnic groups. V-A fishers reported the most cross-scale linkages, whereas K-A fishers reported only one tie to an industry leader outside their community (Barnes-Mauthe et al. 2013). This indicates that the interests of K-A fishers may not be adequately represented in the management and policy arena. It also supports previous research that suggests the three ethnic communities should not be assumed to utilize the same fishing practices, exhibit the same attitudes toward fishery management and regulations, or display the same level of trust across groups. According to Kalberg and Pan (2015), The V-A group had the highest number of active vessels in 2012 (n=70), while the E-A had 44 active vessels, and K-A had 15. In addition, on average each vessel had more foreign crew than U.S. crew members.

An economic model documented some of the major changes to the fishery's role in the local economy, based on 2005 data (Arita et al. 2011). These included rising fuel costs, a steady rise in foreign crewmembers, and weakening profits. From 2003-2004, a study was conducted on Filipino crew members in the longline fleet (Allen and Gough 2006). Filipino crew sampled ranged from 21 to 52 years of age in 2003; the average age was 37, and 55% were older than 36. A total of 89% had completed high school, nearly 30% also completed an associate or trade school degree (often focused on maritime studies), an additional 16% completed at least some college coursework, and 5% completed college studies. In many cases, they had received more formal education than the captains or owners for whom they were working in Hawaii. Crew were responsible for an average of five dependents, and all respondents indicated that their households depended heavily on the Hawaii longline industry for income, with 63% relying on the fishery as their sole source of income. Many had an extensive background in commercial fishing, with an average of 11 years of experience. In comparison, only 25% of respondents reported more than 5 years total involvement in seafaring in a 2004 study of overall seafarers. While there are a number of challenges to obtaining foreign laborers for employment on Hawaii longline vessels, they are often willing to work for less money and earn more money as a crew member than they would in their home country. Crew must reside on the vessel and do not receive a 'shore pass' to leave the pier area. However, many developed strong social networks and a number of Hawaii-based Filipinos developed businesses in the pier area to serve crew needs. The average annual income of a Hawaii-longline crew member was well over double the average earned in the Philippines; even the lowest paid crew members earned 62% more than the family average for the Philippines and did not have to pay for food or housing while living on the longline vessel. Nearly 70% reported high or very high levels of job satisfaction while nearly 80% reported a reasonable income and no problem with their workload or living conditions.

In 2010, the bigeye tuna fishery experienced the first extended closure of the western and central Pacific Ocean (WCPO) to U.S. longliners from the State of Hawaii. Richmond et al. (2015) monitored the socioeconomic impacts of this closure to examine how the bigeye fishery community (including fishermen, a large fish auction, dealers, processors, retailers, consumers, and support industries) perceived and were affected by the constraints of the 40-day closure over the holiday season. During the closure period, they found a reduced supply and quality of bigeye landed, an increase in price for high quality fish, and longer distances traveled to fish in rougher waters. These factors resulted in increased stress and in some cases lost revenue for individuals and businesses connected to the fishery. Different stakeholder groups responded differently to the closure, with fish dealers among those most affected. Some dealers chose to purchase high quality tuna despite abnormally high prices and sell at a loss to maintain relationships with their customers. During the closure, U.S. boats could continue to fish for bigeye in the Eastern Pacific Ocean and foreign and dual permitted vessels could still fish in the WCPO, which mitigated some of the impacts to the fishery. U.S. legislation and federal rules that have prevented subsequent closures of the fishery have since been put in place.

Frozen tuna treated with carbon monoxide to enhance color has appeared in Hawaii markets since the late 1990s. It is often labeled as "Tasteless Smoke" and is sold in markets in thawed form, which is similar in appearance to fresh 'ahi poke. The price of Tasteless Smoke tuna is lower than the price of fresh tuna landed by local vessels. During the closure, imported products were available in retail markets and the price in the retail market stayed consistent, suggesting that local and imported products are substitutes and that imports increase quickly to meet demand when local landings are low (Pan 2014). However, conversation with multiple dealers suggested that only a few dealers increased their reliance on imports during the closure (Richmond et al. 2015).

In the fall of 2016, concerns about the working conditions of foreign crewmembers garnered national media attention. In response, the Hawaii Longline Association commissioned a follow-up study, based on the methodology developed by Allen and Gough (2006), and conducted by one of the same researchers (see Gough 2016). Many of the same crew members were interviewed in both 2006 and 2016 due to high retention in the fleet. The study interviewed crew from 75% of Hawaii longline vessels on crew recruitment and fees, on board conditions and access, pay structure, medical care, document retention on board, and grievance mechanisms. There were no indications of foreign crew employed against their will, nor were there records of respondents who wished to return to their country of origin but were unable to do so; trends reported did not reflect forced labor or human trafficking. While no exploitation was reported, the study also identified potential operational flaws that could result in exploitation of foreign crew. It also suggested recommendations to improve those systems to reduce industry vulnerability to scrutiny, including safeguards for both crew and vessel owners.

On August 26, 2016, a Presidential proclamation expanded the Papahānaumokuākea Marine National Monument to include the majority of the United States Exclusive Economic Zone surrounding the Hawaiian Islands, which would largely affect the longline fleet. An internal report noted the potential for differential impacts (e.g., based on target species, vessel size, or ethnicity; see PIFSC 2017). For example, the shallow-set fishery appears to have nominally higher share of catch, effort, and revenues from the Northwest Hawaiian Islands, compared to the deep-set fishery. Multiple evaluations of the effects from the Monument expansion were published in 2020 (Chan 2020; Lynham et al. 2020).

3.2.2.5.4 Hawaii Trolling

Trolling was one of the gear types included in the 2014 and 2021 Small Boat Surveys (Chan and Pan 2017; Chan 2023). Fisher demographics and catch disposition were summarized in Chapter 2. Most small boat fishermen trolled, with 65% of respondents stating that trolling was their most commonly used gear in 2014 and 54% in 2020. In 2014, approximately half of their trips occurred in State waters, and half in federal waters. Also reported in the 2014 study, a higher percentage of those who identified troll as their most commonly used gear reported using only a single gear (35%) in comparison to respondents who most commonly used other gear types; however, a larger percentage (45%) reported using two types of gear. In 2020, trolling was most commonly used by those whose primary motivation was cultural, although this was a very small number (4). The next highest percentages were purely recreational (65.4%) and recreational expense (64.2%), although respondents spanned all response categories (full-time commercial, part-time commercial, recreational expense, purely recreational, subsistence, and cultural). This finding corroborates the observation that the troll fishery has a significant cultural and subsistence role in Hawaii’s fishing communities (Markrich and Hawkins 2016).

3.2.2.5.5 Hawaii Pelagic Handline

Pelagic handline was one of the gear types included in the 2014 Small Boat Survey (Chan and Pan 2017) and was modified to the motivation “bait for pelagic” in 2021 (Chan 2023). Fisher demographics and catch disposition were summarized in Chapter 2. Only 12% of respondents indicated this category was their most commonly used gear in 2014, 14% in 2021. In 2014, a larger percentage of their fishing trips occurred in State waters (62%) vs. federal waters (38%).

In addition, in comparison to respondents who most commonly used other gear types, those who identified pelagic handline as their most commonly used gear in 2014 reported the lowest percentage of single gear use (8%). They predominantly reported using two types of gear (49%). In both years, pelagic handline was most commonly used by fishermen whose primary motivation was full-time commercial (57.4% in 2014, 24.2% in 2021) and respondents spanned all response categories except cultural in 2021. This finding corroborates the observation that the pelagic handline fishery has a significant cultural and subsistence role in Hawaii's fishing communities (Markrich and Hawkins 2016).

3.2.2.5.6 Offshore Handline

Pelagic offshore handline was one of the gear types included in the 2014 Small Boat Survey (Chan and Pan 2017) and fisher demographics and catch disposition on the offshore handline were available in Chan and Pan (2019b).

3.2.2.5.7 Other Gears (including Aku Boat/Pole and Line)

This category represents pelagic species caught by methods or in areas other than those methods of longline, MHI troll and handline, and offshore handline. There is currently no socioeconomics information specific to this group of fisheries. Aku boat was included in the group. 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 are also included in this category.

3.2.3 ECONOMIC PERFORMANCE OF MAIN COMMERCIAL FISHERIES

3.2.3.1 AMERICAN SAMOA

3.2.3.1.1 American Samoa Longline

3.2.3.1.1.1 Commercial Participation, Landings, Revenue, and Prices

The American Samoa longline fishery includes large longline vessels and small longline vessels (alia boats). Alia longline fishing has experienced declining trends in participation over the years, and no alia vessels participated in fishing activities in recent three years (i.e., 2021-2023) In 2023, there were only 10 large longline vessels (64 feet or larger), one less than in 2022, that actively fished in American Samoa EEZ. The American Samoa longline fishery mainly targets albacore, which differs from the Hawaii longline fishery targeting bigeye tuna and swordfish. The American Samoa longline fishery, especially the large longline vessels, sell the majority of their catch to the local cannery. The species sold to the local cannery includes four tuna species, albacore, yellowfin, bigeye, and skipjack, and one non-tuna species, wahoo.

In 2023, the total fleet revenue (i.e., estimated landed value for the five species sold to cannery only) was $2.82 million from 2.69 million pounds of total landings (for all species). The five species (Albacore, yellowfin, bigeye, skipjack, and wahoo) sold to cannery composed 94% of the total American Samoa longline commercial landings (estimated pounds kept). No official statistical data was available on the sold value of the 6% of the non-cannery species landings. In 2023, albacore composed over 86% of the commercial value sold to cannery while the other four primary species (yellowfin, bigeye, skipjack, and wahoo) contributed 14% of the revenue. Wahoo was one of the five species that canneries accepted and commonly sold in local markets. Traditionally, most all wahoo harvested by American Samoa longline are sold to the canneries. In recent years, fishers indicated they sold more wahoo to local markets instead of the cannery since local markets pay a higher price for wahoo. However, we used cannery price to estimate the total commercial landings of wahoo because the portion and price that sold to local markets for wahoo are not available.

Figure 119 presents the trends of commercial landings and revenue (for cannery only) from 2003-2022. Revenue presented here represents only the revenue from sale to the cannery. Supporting data for Figure 119 are provided in Table A-112. In general, American Samoa longline landings and revenue have been declining since 2008. Commercial landings in 2023 were down 15% compared to 2022. Revenue decreased 32% in 2023 due to lower landings and lower fish price.

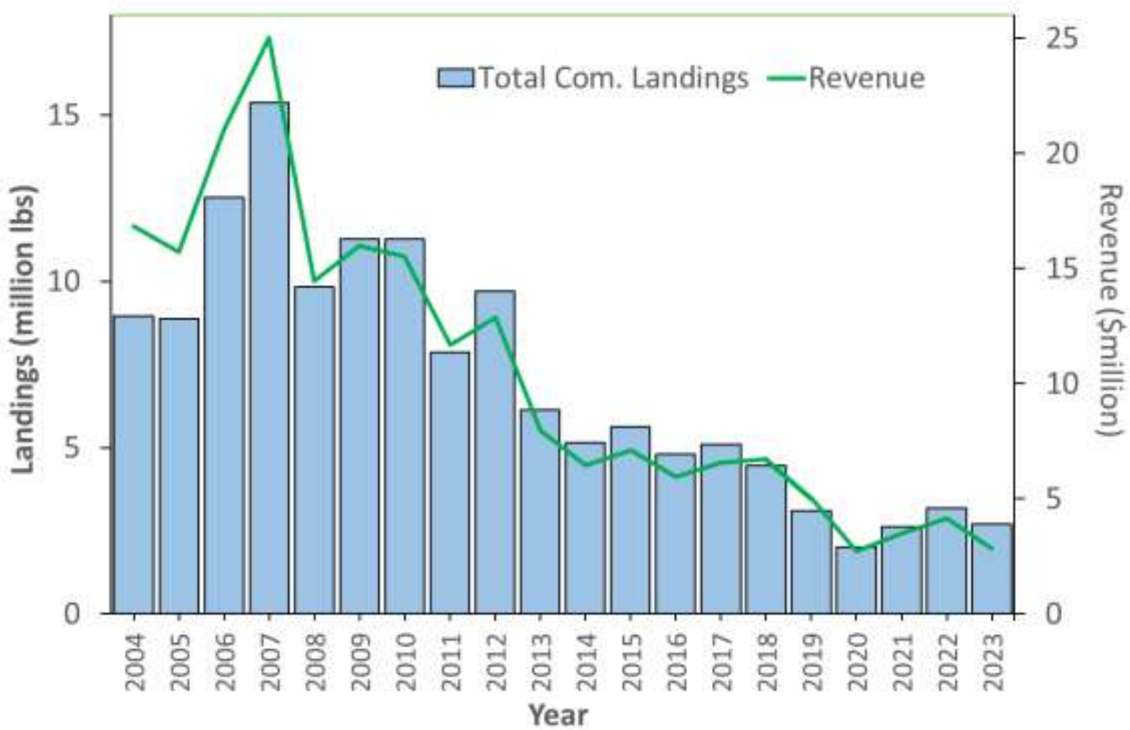


Figure 119. Commercial landings and revenue for the American Samoa longline fishery (adjusted to 2023 dollars)[1]

[1] Data source: Pacific Islands Fisheries Science Center: Fishery Economic Performance Measures (Tier 1 indicators). https://inport.nmfs.noaa.gov/inport/item/46097. CPI information for 2023 was not available and assumed to be the same as 2022.

Fish price data for the five main species harvested by American Samoa longline have been collected through annual in-person interviews by PIFSC economists with owners or agents of the fishery since 2012. During 2020 and 2021 were collected by the PIRO observer program in American Samoa, as travel restrictions were in place during the pandemic period and no in-person interviews with local fishermen were able to be conducted.

Trends in albacore price from 2012 to 2023 are presented in Figure 120. Supporting data for Figure 120 are presented in Table A-113. The albacore price continued dropping in 2023, from its highest peak in 2019. The albacore price increased substantially in 2018 because the American Samoa-based US longline fleet secured certification from the Marine Stewardship Council (MSC) and Starkist Co., which led to the higher albacore price with an additional $200 per metric ton provided for vessels that fish exclusively in the US EEZ around American Samoa. The nominal average albacore price in 2019 reached a historical high of $1.61 per pound (whole weight), or $3,542 per metric ton. However, both nominal and the adjusted price decreased after 2019. The nominal price of albacore in 2023 dropped to $1.50 per pound. Table A-113 also shows the average fish price of all species sold to canneries.

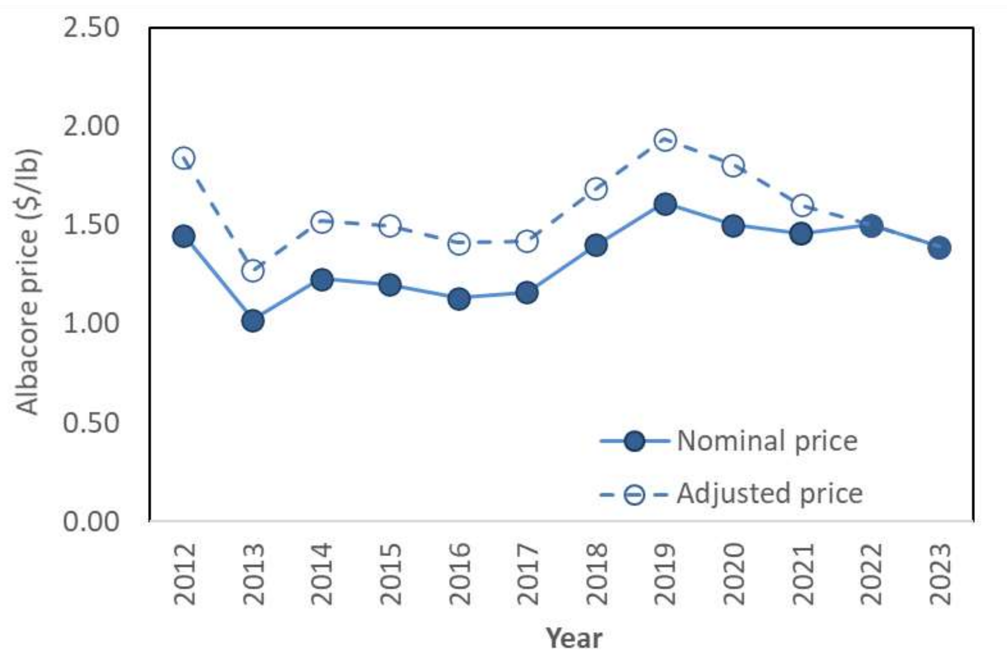


Figure 120. Albacore whole-weight price as reported by American Samoan fishers (adjusted to 2023 dollars)[1]

[1] Data source: PIFSC Continuous Economic Data Collection Program (Pan 2018).

3.2.3.1.1.2 Fishing Costs

The American Samoa longline continuous economic data collection program started in 2006, the same time as PIRO started their observer program in the fishery (Pan 2018 and Pan 2019). Fisher participation in the economic data collection program is voluntary. Similar to the Hawaii longline fisheries' continuous economic data collection program, the American Samoa continuous economic data collection obtains information on the fishery via a form requesting data on 10 variable cost items common to American Samoa longline trip expenditures, excluding labor costs. For the main cost items, including diesel fuel, engine oil, and bait, information is collected on unit price, quantity used, and total cost. For other items, such as gear, provisions, and communications, information is collected on total cost only. It was often difficult for observers to collect trip cost data when vessels were operated by hired captains. In an effort to increase the number of observations for the economic data collection program, PIFSC economists began to supplement observer data by traveling to American Samoa to conduct in-person interviews of owners or agents starting in 2012. The details of the data collection program are described in a NOAA technical memorandum (Pan 2018).

Although cost data from 2020 and 2021 were not available at the reporting time because there were no in-person surveys conducted during these two years due to pandemic-related travel restrictions, the data gap were able to fill out during the 2023 in person survey with fishermen (owners or agents). Fishing trip cost data prior to 2006 were not available since trip cost data collection did not begin until 2006.

Figure 121 shows the cost structure for an average American Samoa longline trip in 2023 . In 2023, the average trip costs were $44,838. Fuel usually comprises over 50% of trip costs and in 2023 the percentage of fuel cost was 56%, lower than the 61% in the previous year (i.e., 2022). While cost per trip data were collected, we present the cost per set (not per trip) to show the change across years, as the variation in trip length is considerable across years and cost per set could better reflect cost trend overtime for this fishery. Figure 122 presents the trends in costs per set for 2006 to 2023. The cost per set in 2023 was slightly lower than 2022 due to lower fuel price (i.e., $3.37 in 2023 and $4.02 in 2022).

The data supporting Figure 122 are presented in Table A-114. Using the average cost per set can be a better index to examine the cost trend across years because the average trip length (total trip days) for the American Samoa longline fleet varies substantially.

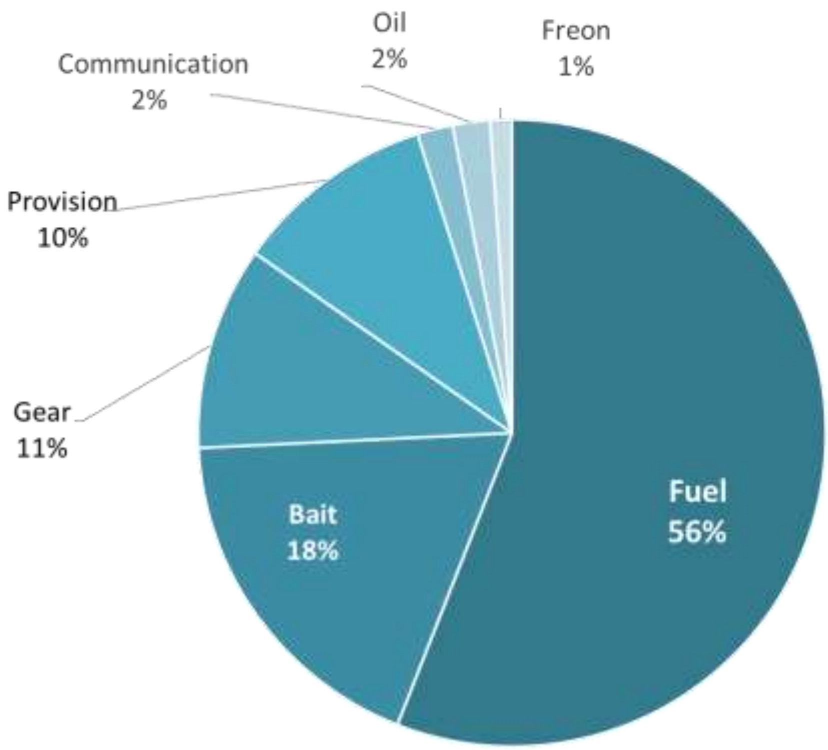


Figure 121. The cost structure for an average American Samoa longline trip in 2023[1]

[1] Data source: PIFSC Continuous Economic Data Collection Program (Pan 2018).

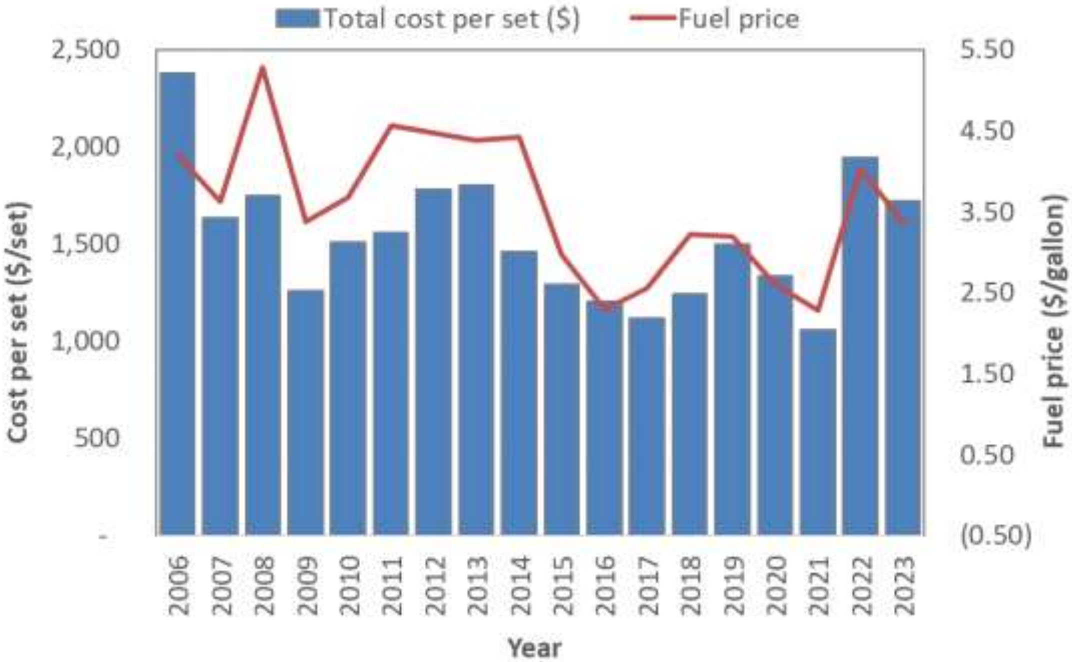


Figure 122. Costs per set[1] for the American Samoa longline fishery not including labor cost and fixed costs (adjusted to 2023 dollars)[2]

[1] Data source: PIFSC Continuous Economic Data Collection Program (Pan 2018).

3.2.3.1.1.3 Economic Performance Indicators

The continuous economic data collection program allows for the monitoring of variation in fishing costs over time (Pan 2018). Compiling the revenue with cost and effort data, it is possible to measure the economic performance in terms of net revenue and monitor changes over time.

Figure 123 presents trends in net revenue per set for the period from 2006 to 2023. The data supporting Figure 123 are provided in Table A-114. Using the average net revenue per set can be a better index than the average net revenue per trip to present the revenue and cost trends because the average trip length (i.e., in total trip days) for the American Samoa longline fleet has varied substantially over the years. Figure 123 shows a downward trend in the economic performance (in net revenue per set) from 2006 to 2013 but also indicates a recovery since 2014 and continued improvement through 2019. However, net revenue per set decreased again in 2020. The economic performance per set improved in 2022 due to higher albacore CPUE. However, net revenue per set dropped again in 2020 and 2023.

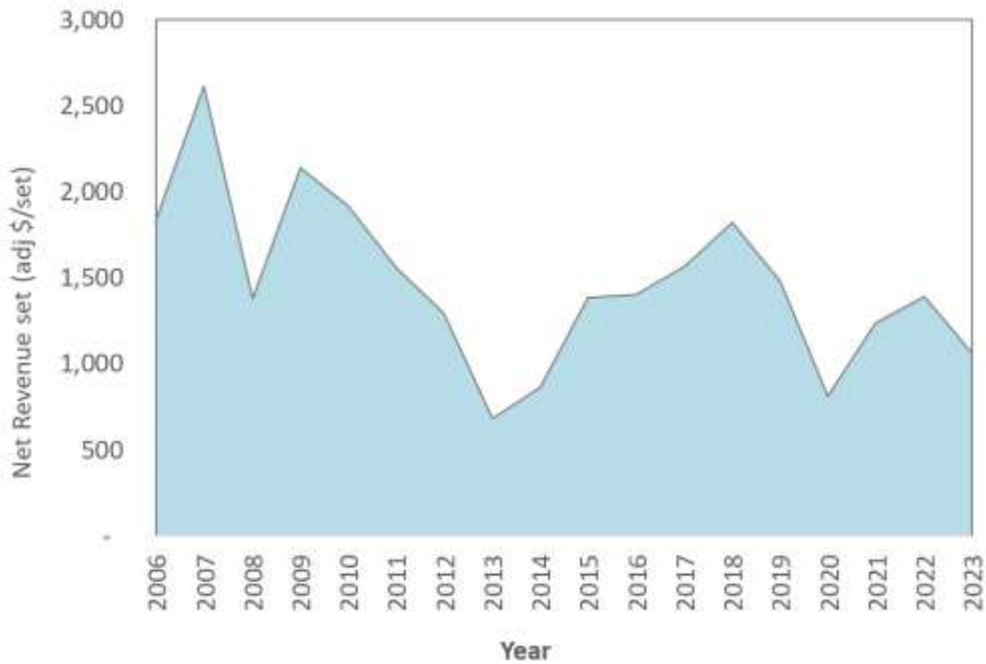


Figure 123. Net revenue per set for the American Samoa longline fishery (adjusted to 2023 dollars)[1]

[1] Data source: PIFSC economic data collection program (Pan 2018).

In addition to the measurement of the net revenue, NOAA Fisheries has established a national set of economic performance indicators to monitor the economic health of the nation's fisheries (Brinson et al. 2015). The PIFSC Socioeconomics Program has used this framework to evaluate select regional fisheries; specifically, the American Samoa Longline, Hawaii Longline, and Main Hawaiian Islands (MHI) Deep 7 bottomfish fisheries. These indicators include metrics related to catch, effort, and revenues. For the American Samoa longline fishery, this section will present revenue performance metrics of (a) total revenue per day at sea, (b) annual revenue per vessel, and (c) Gini coefficient (while b and c are both shown in the same figure) of annual revenue per vessel.

The Gini coefficient (value 0 to 1) measures the equality of the distribution of revenue among active vessels in the fishery. A value of zero represents a perfectly equal distribution of revenue amongst these vessels, whereas a value of one represents a perfectly unequal distribution, in the case that a single vessel earns all of the revenue. Data on aggregate revenue from species in fishery per-day-at-sea and revenue per vessel calculation (for Gini coefficient) are from Pacific Islands Fisheries Science Center, data run for the Fishery Economic Performance Measures (Tier 1 indicators).

Trends in fishery revenue per day are shown Figure 124, while the trends in revenue per vessel and distribution among vessels (i.e., the Gini coefficient) are shown in Figure 125. The revenue is presented in nominal terms to be consistent with the national Tier 1 measure. Supporting data are provided in Table A-115. The revenue per fishing day has been steady in nominal value but shows a decreasing trend in adjusted values, while the change in revenue per vessel in nominal value over time was greater than per fishing day. In nominal value, revenue per vessel in recent 10 years (i.e., 2013-2024) were generally lower than the previous 10 years (i.e., 2004-2012). The revenue per vessel and per day in 2022 were relatively higher, reflecting higher CPUE in 2022, but both went down again in 2023. The Gini coefficient was higher in 2023 compared to 2021 and 2022, indicating that the variation of revenue received among individual vessels in the fleet was relatively greater in 2023. In general, the Gini coefficient of American Samoa longline was relatively variable over time, especially compared to the Hawaii longline fishery.

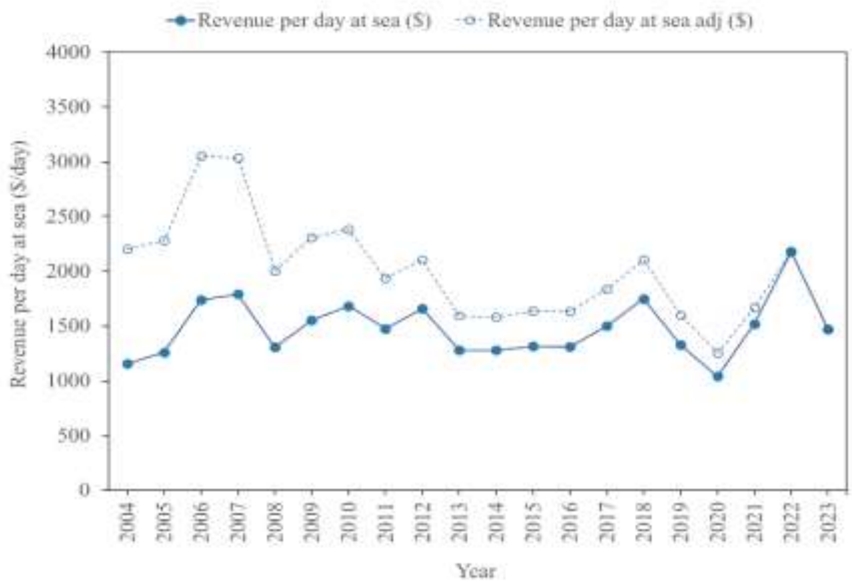


Figure 124. Revenue per-day-at-sea for the American Samoa longline fishery[1]

[1] Data sourced from the Pacific Islands Fisheries Science Center: Fishery Economic Performance Measures (Tier 1 indicators). https://inport.nmfs.noaa.gov/inport/item/46097.

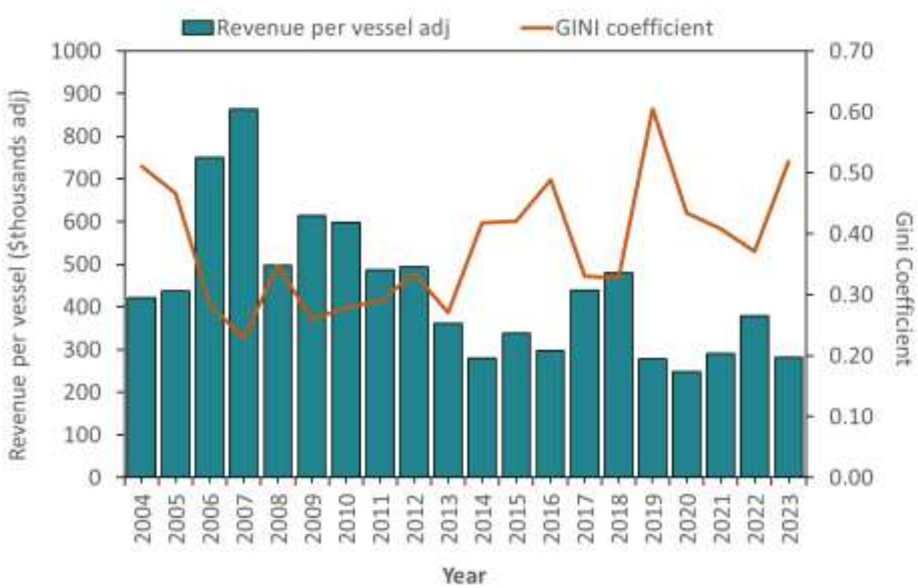


Figure 125. Revenue distribution (revenue per vessel and Gini coefficient) for the American Samoa longline fishery[1]

[1] Data sourced from the Pacific Islands Fisheries Science Center: Fishery Economic Performance Measures (Tier 1 indicators). https://inport.nmfs.noaa.gov/inport/item/46097.

3.2.3.1.2 American Samoa Trolling

3.2.3.1.2.1 Commercial Participation, Landings, Revenue, and Prices

This section describes trends in commercial participation, landings, revenue, and price for the American Samoa troll fishery. The PMUS harvested by alia longliners are not included in this section as alia fishing is included with longlining despite the small size of vessels. Figure 126 presents the trends of revenue and pounds sold for the troll fishery from 2004 to 2023, and Figure 127 presents the trend in price for PMUS sold by the trollers during this period. Supporting data for Figure 126 and Figure 127 are presented in Table A-116. There were 15 years of commercial landings and revenue data during the 20-year period were available to present while the other five year data were confidential due to fewer than three vendors submitting commercial receipts to the data collection program. In 2023, PMUS pounds sold and revenue by trolling (including trolling from mixed gear trips) were 5,010 lb (valued at $10,469). On average, the PMUS commercial landings have been 18% of total PMUS landings for the non-longline pelagic fisheries (average by the years with commercial landings data available.

It is worth noting that the data for pounds caught and pounds sold are collected by two different data collection methods. The data for pounds sold were collected through "Commercial Sales Receipt Books" Program, while the data for pounds caught were collected through Boat-based and Shore-based creel surveys and expanded to an estimated total. The coverage rates of two data collection methods may change independently across individual years. Therefore, the two time-series may not move coherently with each other. For example, the low percentage of pounds sold compared to pounds caught could be due to the low coverage of dealer participation in the Commercial Receipt Books Program. In addition, the data summary for PMUS in socioeconomic module is based on the PMUS species defined in the Ecosystem Management Plan and the raw dataset frozen on March 15, 2023.

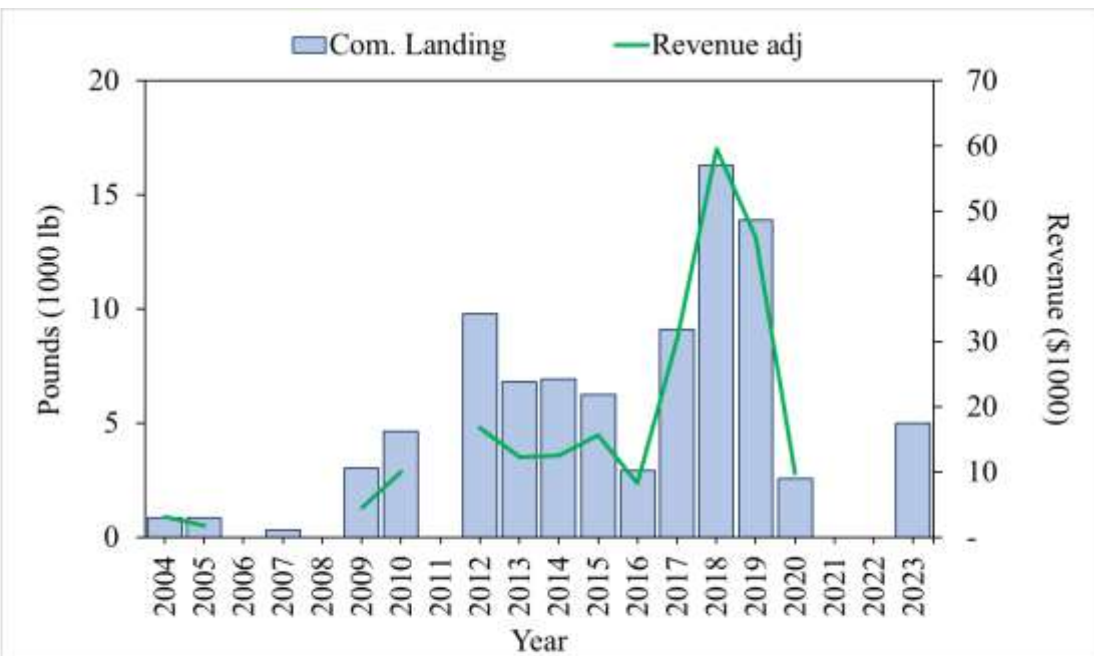


Figure 126. PMUS pounds sold and revenue in the American Samoa troll fishery (adjusted to 2023 dollars)[1]

[1] Data sourced from the PIFSC WPacFIN.

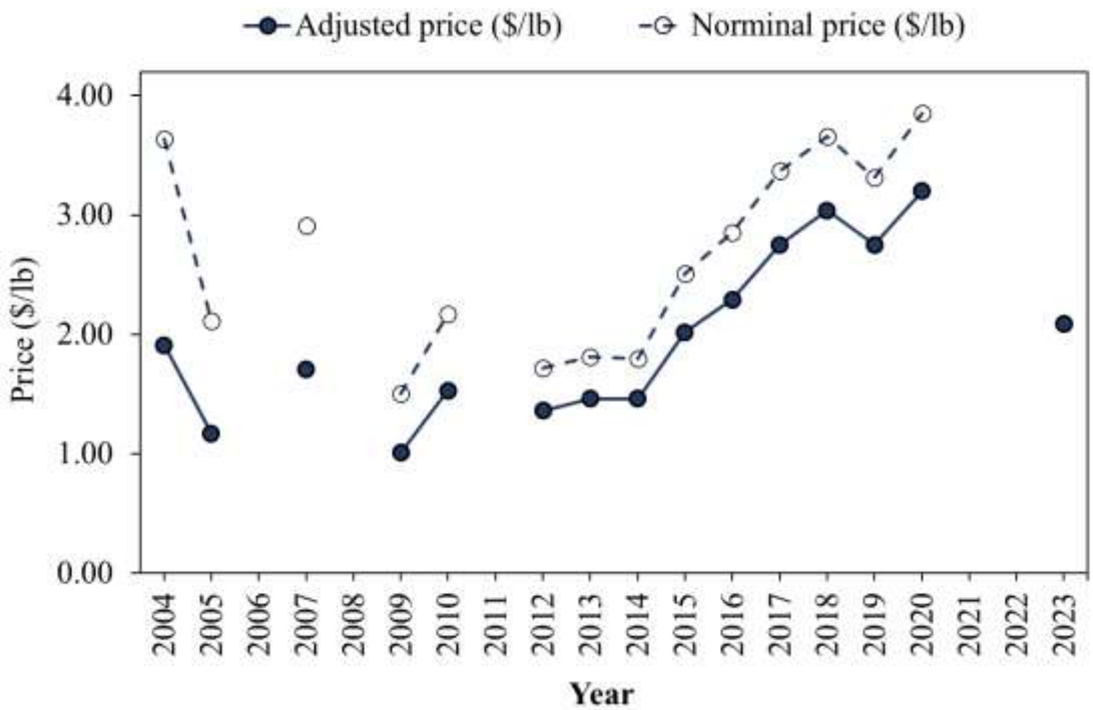


Figure 127. Adjusted and nominal price of PMUS harvested by trolling in American Samoa (adjusted to 2023 dollars)[1]

[1] Data sourced from PIFSC. Only 15 years of sale data were available to present.

3.2.3.1.2.2 Fishing Costs

Since 2009, PIFSC economists have maintained a continuous small boat economic data collection program in American Samoa through collaboration with the PIFSC Fisheries Research and Monitoring Division (FRMD). The economic data collection gathers fishing expenditure data for boat-based reef fish, bottomfish, and pelagic fishing trips (trolling) on an ongoing basis. Data for fishing trip expenses include gallons of fuel used, price per gallon of fuel, cost of ice used, cost of bait & chum used, cost of fishing gear lost, and the engine type of the boat. 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 PIFSC FRMD.

Figure 128 presents the average costs for American Samoa troll trips from 2009 to 2023 (adjusted to 2023 dollars). Supporting data for Figure 128 are presented in Table A-117. In general, the fishing costs of an average troll trip slightly declined during the period of 2011 to 2016, mainly as a result of decreased fuel costs. Since 2017, fuel costs have risen primarily due to fuel price increases and trip costs picked in 2021. Trip costs in 2023 ($39 per trip on average) were lower than 2021 and 2022 due to fuel usage per trip and fuel price decreasing in 2023.

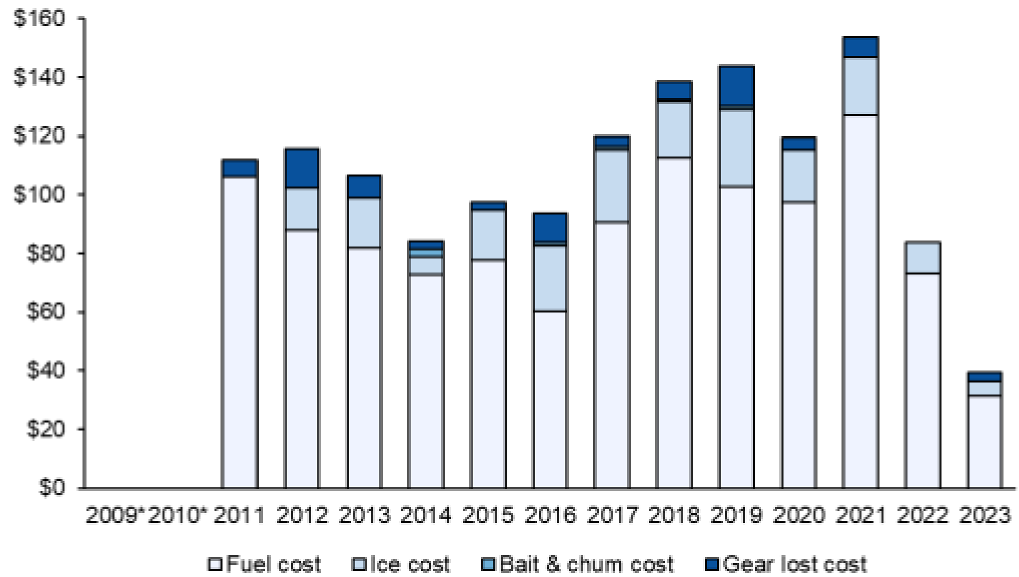


Figure 128. Average cost for American Samoa troll trips (adjusted to 2023 dollars)[1]

[1] Data sourced from Chan and Pan (2019a). * Confidential data.

3.2.3.2 CNMI

3.2.3.2.1 CNMI Trolling

3.2.3.2.1.1 Commercial Participation, Landings, Revenue, and Prices

This section presents the pounds sold, revenue, and price for all PMUS in the CNMI by all gears. Unlike American Samoa, the data for pounds sold by gear are not available for the CNMI. Figure 129 and Figure 130 present the trends of total pounds sold and revenue for all PMUS in the CNMI from 2004 to 2023. Supporting data for these two figures are presented in Table A-118.

Pelagic fishing is an important commercial fishery in the CNMI. Nearly half a million pounds of pelagic species are landed annually, and about 50% of landed pelagic fish were sold to markets from 2004 to 2023 based on the commercial receipts. However, both commercial and total PMUS landings went down considerably in 2023. Revenue from PMUS sold were $366 thousand from 119 thousand pounds sold in 2023. In 2023, about 94% of total PMUS landed were sold, which is much higher than in previous years. The high ratio of commercial landings to total landings since 2021 is likely a result of improvements in the implementation of the commercial data collection program. In the CNMI, a mandatory reporting program was implemented in 2019 and follow-up outreach efforts have resulted in increased vendor reporting participation, as 37 out of 42 vendors reported in 2021. The average pelagic fish price has increased since 2007 gradually. Fish price was $3.08/lb in 2023, same as the price in 2022.

It is worth noting that the data for pounds caught and pounds sold are collected by two different data collection methods. The data for pounds sold were collected through “Commercial Sales Receipt Books” Program and expanded to an estimated total. While the data for pounds caught were collected through Boat-based and Shore-based creel surveys. Both data series are generated from an expansion algorithm built on a non-census data collection program, and the survey coverage rates of two data collection methods may change independently in individual years. Therefore, the two time-series may not move coherently with each other. For example, the low percentage of pounds sold compared to pounds caught could be due to the low coverage of dealer participations in the Commercial Receipt Books Program or vice versa.

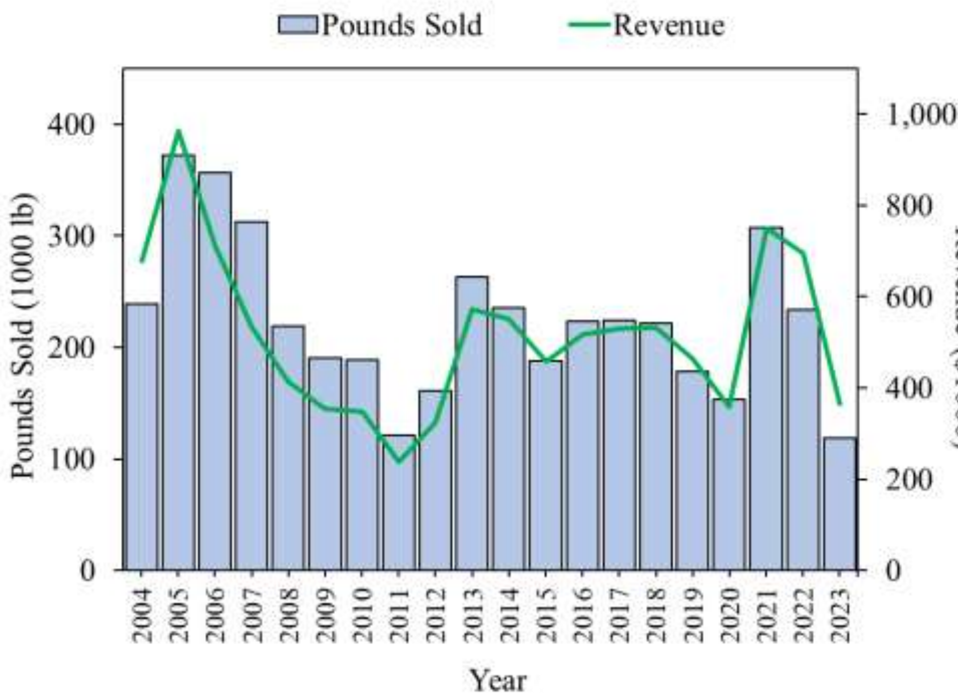


Figure 129. PMUS pounds sold and revenue in the CNMI for all gears (adjusted to 2023 dollars)[1]

[1] Data sourced from PIFSC FRMD.

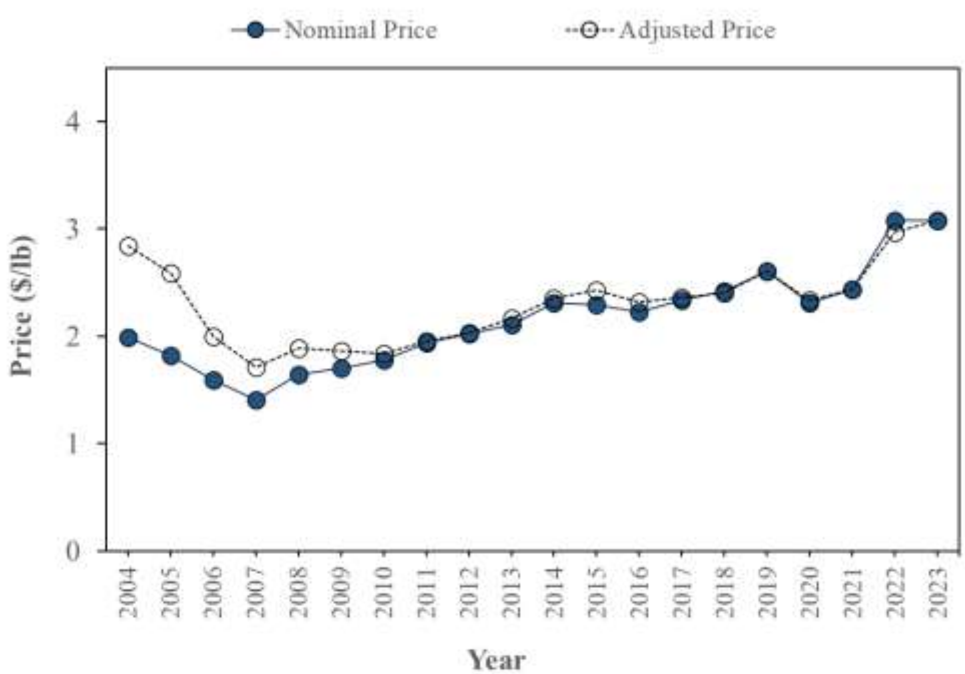


Figure 130. Adjusted and nominal prices of PMUS for fish sold in the CNMI from all gears[1]

[1] Data sourced from PIFSC FRMD.

3.2.3.2.1.2 Fishing Costs

Since 2009 the PIFSC Socioeconomics Program has maintained a continuous economic data collection program in Saipan through collaboration with the PIFSC FRMD. The economic data collection program gathers fishing expenditure data for boat-based reef fish, bottomfish, and pelagic fishing trips on an ongoing basis. Data for fishing trip expenses include gallons of fuel used, price per gallon of fuel, cost of ice used, cost of bait & chum used, cost of fishing gear lost, and the engine type of the boat. 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 PIFSC FRMD.

Figure 131 presents the average trip costs for CNMI troll trips from 2009 to 2022 (adjusted to 2022 dollars). In general, the costs of trolling trips had small changes across years. Costs moved up and down mainly related to changes in fuel costs. In 2023, the average cost of trolling trips was around $88, $13 lower than 2022. Fuel cost is the main component of the trolling trip costs and fuel price in 2023 was $5.41, lower than that in 2022. Supporting data for Figure 131 is presented in Table A-119.

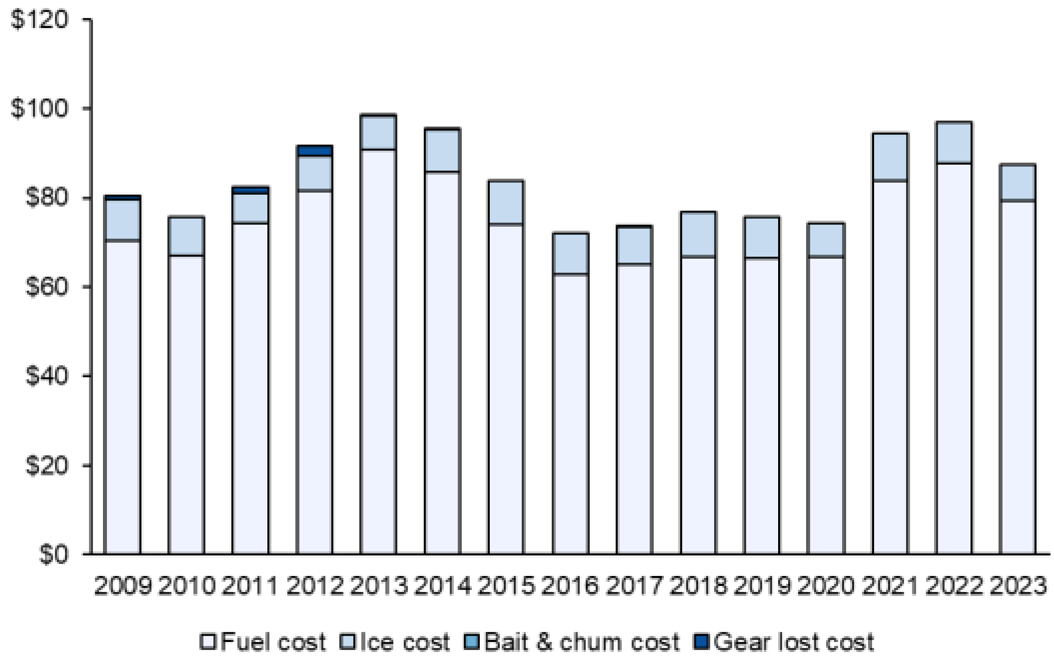


Figure 131. Average cost for CNMI troll trips (adjusted to 2023 dollars)[1]

[1] Data sourced from PIFSC Continuous Cost Data Collection Program (Chan and Pan 2019a). Trip cost data collection began in 2009.

3.2.3.3 GUAM

3.2.3.3.1 Guam Trolling

3.2.3.3.1.1 Commercial Participation, Landings, Revenue, and Prices

This section describes trends in commercial landings, revenue, and price of PMUS in Guam. Figure 132 presents the trends of pounds sold and revenue for PMUS in Guam fisheries and Figure 133 presents the trend of PMUS price during 2004 to 2023. Supporting data for Figure 132 and Figure 133 are shown in Table A-120.

Pelagic fishing is an important fishery in Guam. The average annual total pounds landed has been around 668,000 lb with 141,744 lb of commercial landings for the 15 years with data presented. Figure 132 shows only 15 years of commercial landings and revenue during the period between 2004 and 2023, because the data for the other years were confidential when there were fewer than three reporting vendors. For the 15 years presented, the average pounds sold were 20% of the total pounds landed annually. The average price of all PMUS was relatively flat over the 15 years and it was at $2.37/lb in 2021, the most recent year with data presented, while the nominal price showed slowly increase over time, but inflation adjusted price showed a slowly decreasing trend.

It should be noted that the data for pounds caught and pounds sold are collected by two different data collection methods. The data for pounds sold were collected through “Commercial Sales Receipt Books” Program, while the data for pounds caught were collected through Boat-based and Shore-based creel surveys. Both data series are generated from an expansion algorithm built on a non-census data collection program, and the survey coverage rates of two data collection methods may change independently in individual years. Therefore, the two time-series may not move coherently with each other. For example, the low percentage of pounds sold compared to pounds caught could be due to the low coverage of dealer participations in the Commercial Receipt Books Program, or vice versa.

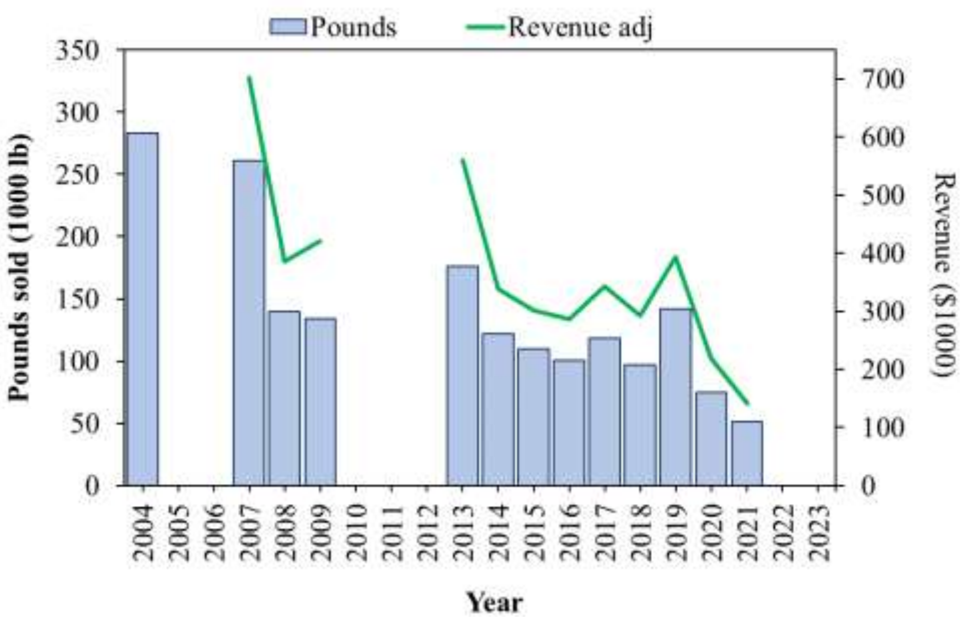


Figure 132. PMUS pounds sold and revenue in Guam for all gears (adjusted to 2023 dollars)[1]

[1] Data sourced from PIFSC FRMD.

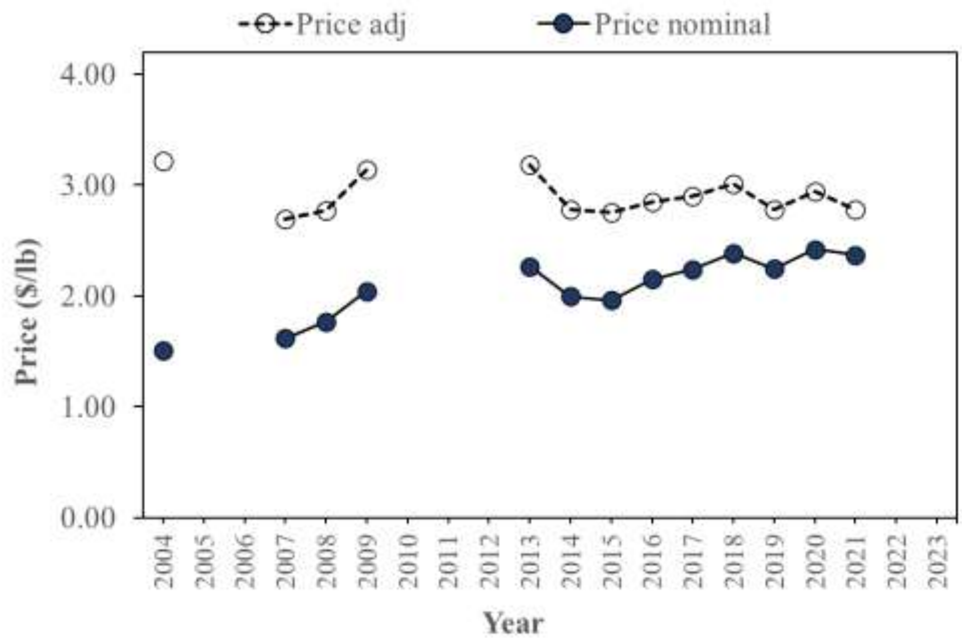


Figure 133. Adjusted and nominal prices of PMUS for fish sold in the CNMI from all gears[1]

[1]Data sourced from PIFSC FRMD.

3.2.3.3.1.2 Fishing Costs

Since 2011, the PIFSC Socioeconomics Program has maintained a continuous economic data collection program on Guam through collaboration with PIFSC FRMD. The economic data collection gathers fishing expenditure data for boat-based reef fish, bottomfish, and pelagic fishing trips on an ongoing basis. Data for fishing trip expenses include gallons of fuel used, price per gallon of fuel, cost of ice used, cost of bait & chum used, cost of fishing gear lost, and the engine type of the boat. 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 PIFSC FRMD.

Figure 134 shows the trend of costs for trolling trips in Guam from 2011 to 2023. Costs tend to move up and down over time mainly due to changes in fuel costs. The average cost of trolling trips in 2023 was $77 in Guam, $16 less than the previous year. The total trip cost was lower than the previous year due to a lower fuel usage per trip (even with slightly higher fuel price) in 2023. Supporting data for Figure 134 are presented in Table A-121.

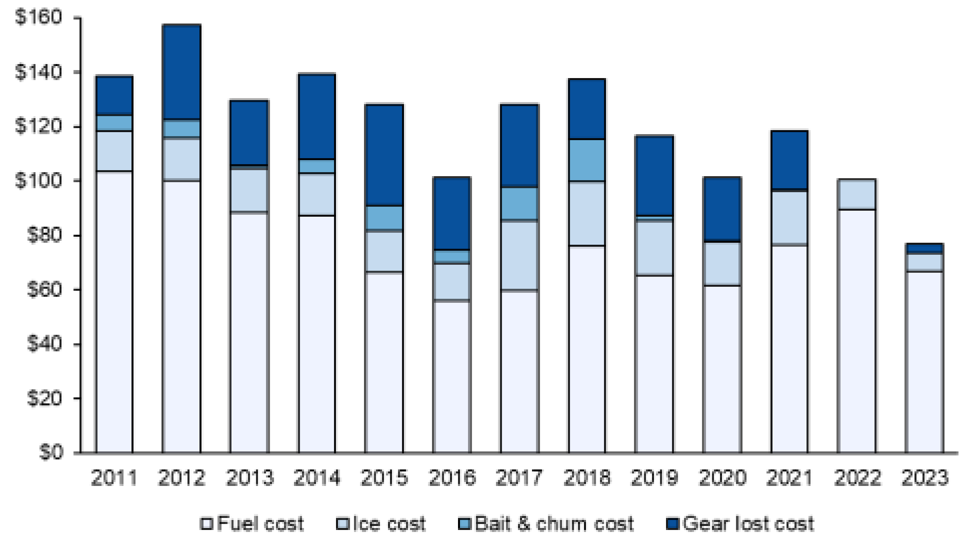


Figure 134. Average cost for Guam troll trips (adjusted to 2023 dollars)[1]

[1] Data sourced from PIFSC (Chan and Pan 2019a).

3.2.3.4 HAWAII

3.2.3.4.1 Hawaii Longline

3.2.3.4.1.1 Commercial Participation, Landings, Revenue, and Prices

The Hawaii permitted longline fishery conducts two types of fishing to target the bigeye tuna (deep-set) and swordfish (shallow-set) by setting the fishing gear at different depths in the water column. Most of the vessels only target tuna while some vessels switch between these two types of fishing depending on the season. The majority of the catches by the Hawaii permitted longline vessels were landed and sold in Honolulu, while some of catches were landed and sold on the West Coast of the US Mainland. For the period from 2003 to 2020 for which landings and revenue data are available, the fish landed and sold on the West Coast increased gradually since 2008 and stabilized from 2009 to 2020. Based on the West Coast dealers' reports, an average of $5.3 million in revenue (2.3 million pounds sold) was generated annually from West Coast during the years from 2015 to 2020, and the average annual revenue sold in Hawaii was $94 million (26 million pounds sold). However, the data of commercial landings for the West Coast were not available from 2021 to 2023. Due to the concerns of incomplete market reports, the total commercial landings and revenue trend of the Hawaii longline presented in Figure 135 were generated only from total pounds kept, value, and the fish price from Hawaii dealers.

The total active number of vessels landing fish in 2023 was 147, with three additional vessel compared to the 2022. The fleet generated total revenues sold in Hawaii markets (revenue generated from HDAR dealer reports) as presented in Figure 135, which only included the total revenue generated from HDAR dealer reports. The pounds sold in Hawaii markets reported from the HDAR dealers only accounted for 98% of the total estimated value of the total pelagic landings (estimated by the pounds kept from fishermen's report in 2023 assuming all pounds caught were landed and sold) by the entire fleet. In general, the total commercial landings and revenue of the Hawaii permitted longline fleet showed an upward trend for the period of 2004 to

2017 but has seen declines since 2018, particularly in 2020. The commercial landings during 2021 and 2023 were higher than 2020, but not yet recovered compared to 2019. In 2021, the fleet revenue increased to a historical high ($115 million), mainly due to higher fish prices in 2021 while commercial landings in 2021 were at the level similar to 2020. In 2023, the total pounds sold in the Hawaii market was 22.4 million pounds valued at $107 million. The average fish prices of all species in 2023 decreased to $4.77/lb in 2023 from $5.27/lb in 2022 (adjusted). In 2023, total commercial landings (pounds sold) in Hawaii markets) were 4% higher than 2022, but total revenue decreased by 6% (based on nominal value and landed year data), and decreased 9% in inflation adjusted value.

Please note that the revenue in the fishery economic performance section here may different from the revenue reported in the fishery performance section, because the revenue here were compiled based on the landed year while the other used hauled year. In addition, the total revenue of Hawaii longline can be estimated based on the reported pounds kept from the NMFS logbooks and the fish price data from fish sales of Hawaii markets. Thus, the total estimated landings by Hawaii longline fleet in 2023 was 26.48 million pounds, valued at 109.6 million, decreasing by 6% in nominal value and 9% in nominal value compared to 2022. The total estimated landings in 2023 decreased 4%, while the revenue decreased by 7% of nominal value and by 10% of inflation adjusted value. Supporting data of Figure 135 are presented in Table A-122.

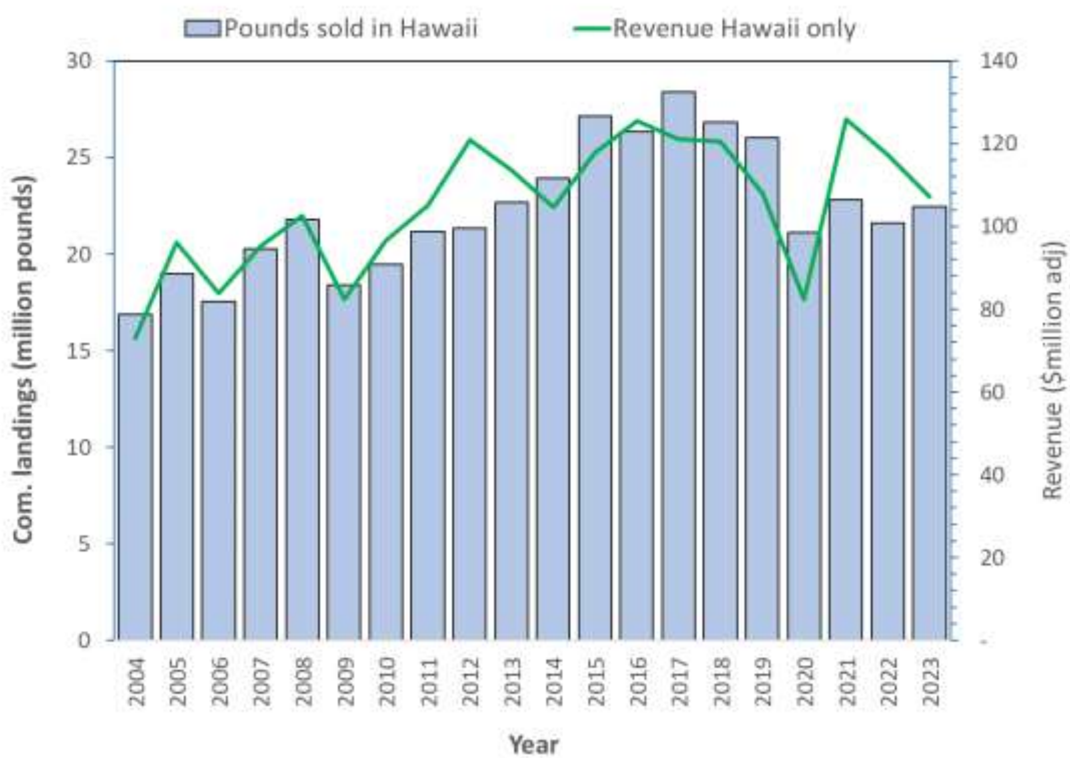


Figure 135. Commercial landings and revenue of Hawaii-permitted longline fleet (landed in Hawaii markets; adjusted to 2023 dollars)[1]

[1] Source: PIFSC Tier 1 indicators data request.

Figure 136 shows the trends of the revenue composition (based on the estimated total value, instead of sold revenue in Hawaii market) from the main species (bigeye, swordfish, and yellowfin) and others from 2004 to 2023, and Figure 137 shows the price trends for bigeye, swordfish, and yellowfin for the same period. Supporting data for Figure 136 and Figure 137 are presented in Table A-123 and Table A-124, respectively.

It can be observed that bigeye tuna comprised the majority of fishery revenue for the longline fleet during 2004 to 2023. The estimated revenue from yellowfin tuna has grown since 2017 while revenue from swordfish had declined since 2012. The percentage of revenue from swordfish went up again in 2021 and 2022 slightly. In 2023, bigeye tuna comprised 62% of revenue for Hawaii permitted longline vessels, followed by yellowfin tuna at 21%, swordfish at 7%, and other species at 11% of the total Hawaii longline revenue, while the 20-year averages were 65%, 11%, 8%, and 16%, respectively. Fish prices have fluctuated in general and it seems that the prices of the three species converged on each other. The price of bigeye tuna peaked in 2012 and has decreased since then. Yellowfin tuna price has varied over time, peaking in 2013 and declined thereafter. However, yellowfin tuna price went up considerably in 2018, approaching bigeye tuna prices. In 2023, the nominal prices of all the three main species went down, decreased by 6%, 10%, and 13%, respectively, compared to that in 2022.

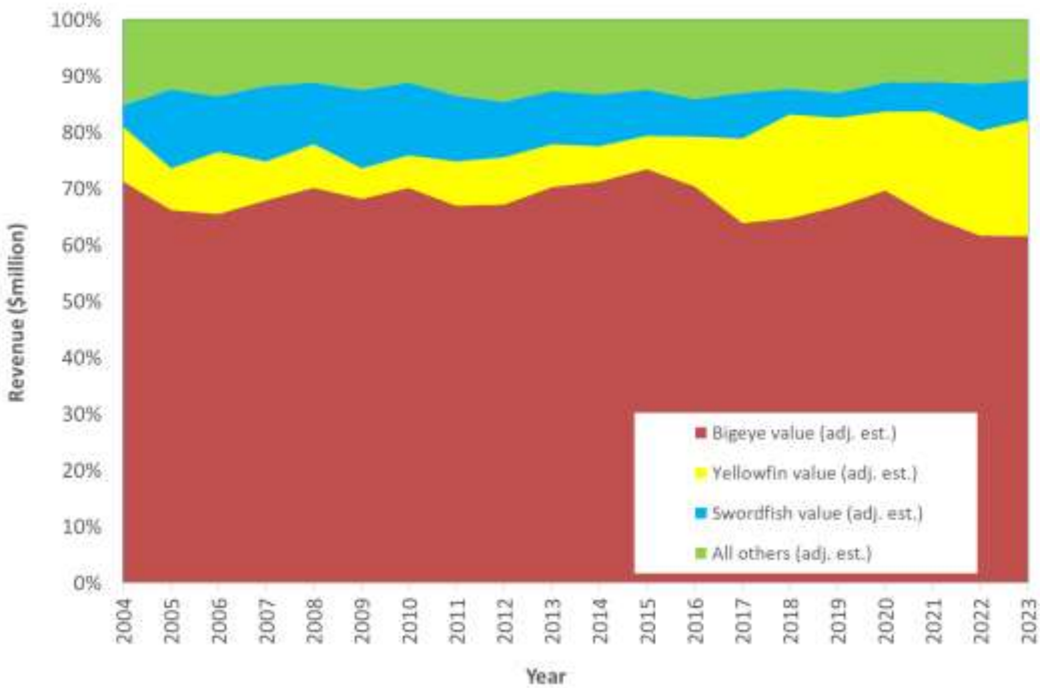


Figure 136. Trends in Hawaii longline revenue species composition (nominal value)[1]

[1] Data Source: PIFSC Tier 1 data request.

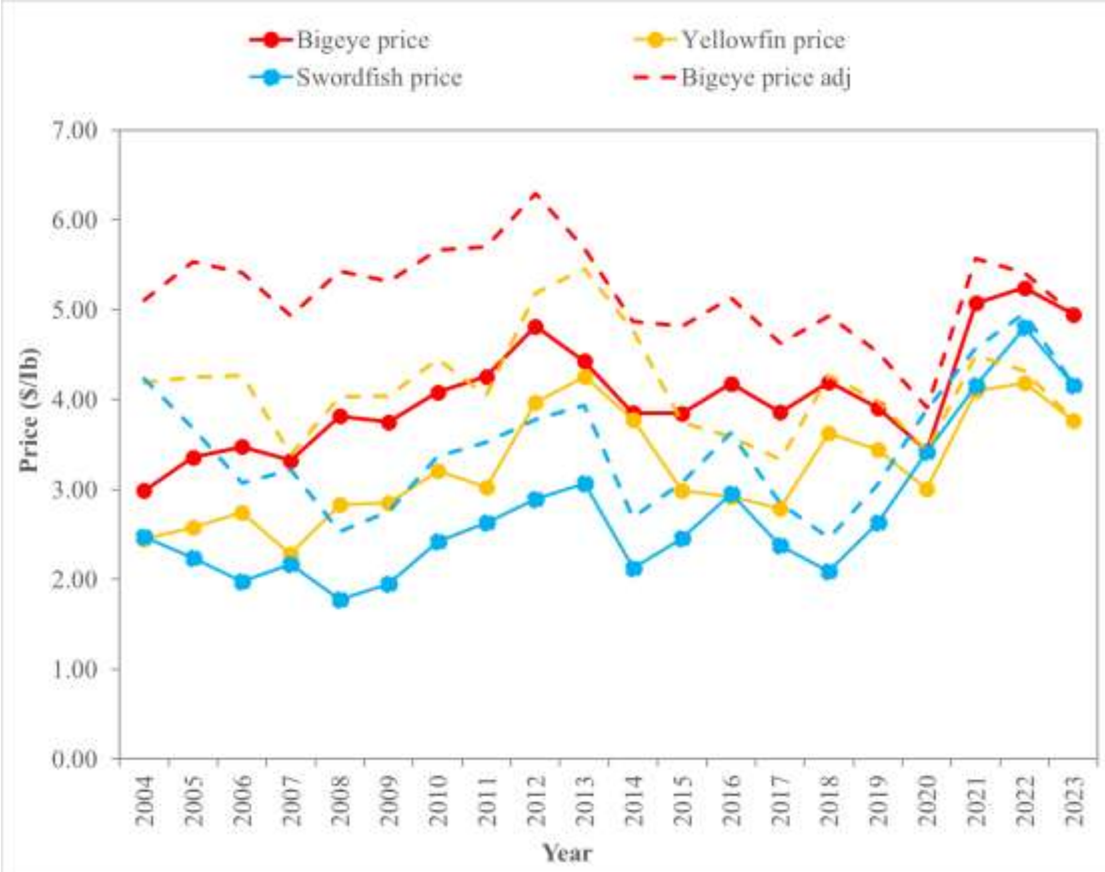


Figure 137. Adjusted and nominal price trends for three main species (bigeye tuna, yellowfin tuna, and swordfish) harvested by the Hawaii longline fishery[1]

[1] Source: Pacific Islands Fisheries Science Center, Tier 1 data request.

3.2.3.4.1.2 Fishing Costs

The Economic Cost Data Collection Program for the Hawaii longline fishery was the first to establish continuous (routine) trip expenditure collection in the Pacific Islands Region. The program was implemented in August 2004 through cross-agency collaboration by the PIFSC Economics Program and the NOAA Observer Program managed by PIRO (Pan 2018). Before the establishment of these programs, trip-level economic information on the fisheries was limited primarily to the dockside value of landed fish. Data on fishing expenses were obtained intermittently through one-time surveys conducted roughly every five years (Hamilton et al. 1996; O'Malley and Pooley 2002; Kalberg and Pan 2016). The continuous economic data collection program has provided important trend data to track changes in economic performance for the Hawaii longline fishery on a continuous basis.

The continuous data collection form is comprised of eight cost items commonly arising in Hawaii longline trips, but it excludes labor costs. Non-labor cost items collected include diesel fuel, engine oil, bait, ice, as well as total costs for gear replacement, provisions, and communications. The form requests unit price, quantity used, and total costs of fuel, bait, and oil usage. In addition, the total number of crew members, and the subset who are not United States nationals, is collected for both tuna and swordfish trips. Survey forms are produced and available in first languages (i.e., English, Korean, and Vietnamese) to ease survey burden.

The project is designed to collect data from all observed trips. Observers conduct interviews with the captains on board while returning to port or when a trip is completed. The participation of fishers in the economic data survey is voluntary. Observers accompany 100% of the Hawaii-based shallow-set longline trips (targeting swordfish) and about 20% of the deep-set trips (targeting bigeye tuna). Since the economic data collection project was implemented in August 2004, the average response rate based on observed trips has been around 60%. The data collection program would not succeed without the generous support of vessel owners and operators. A detailed description of the continuous data collection program can be found in a NOAA technical memorandum (Pan 2018).

This report presents trip-level fishing costs for each type of longline trip since shallow-set (swordfish) trips often have a longer trip length compared to deep-set (bigeye tuna) trips. The data series of trip costs and net revenue data have been presented in the annual SAFE report from 2005 to present, as the first full-year's data were available beginning in 2005. Average swordfish trip costs generally are higher than a tuna trip because the trip length of a swordfish trip is longer than a tuna trip. The average trip length for swordfish trips was 31 days per trip during the period of 2005 to 2023, while it was 23 days for tuna trips. A decreasing trend in trip length for swordfish trips has been observed over recent years. The average trip length of 28 days per trip in 2023 was considerably lower than the 19-year average (i.e., 31 days). The average tuna trip length has been relatively steady over the 19-year period.

In terms of cost structure in 2023, fuel cost accounts for the largest share of total fishing trip costs (i.e., non-labor items) for both tuna and swordfish trips. Figure 138 and Figure 141 show the cost structures of an average tuna and swordfish trip, respectively, in 2023. In 2023, fuel cost was the leading item of trip costs, comprising 54% of the tuna trip costs, lower than that in 2022 (57%). Bait was the second largest item making up 24% of tuna trip costs. Fuel and bait costs together made up over 81% of the trip costs for tuna fishing. For swordfish trips, the cost of fuel also made up 55% of swordfish trip costs, lower than 2022 (57%), while bait cost made up 16% of total swordfish trip costs. The cost of the lightstick gear is unique to swordfish fishing, and it made up 10% of the total trip costs of swordfish trips in 2023. In 2023, the average trip cost for swordfish trips was $49,385 while it was $33,546 for tuna trips. Supporting data for Figure 140 and Figure 141 are presented in Table A-125 and Table A-126.

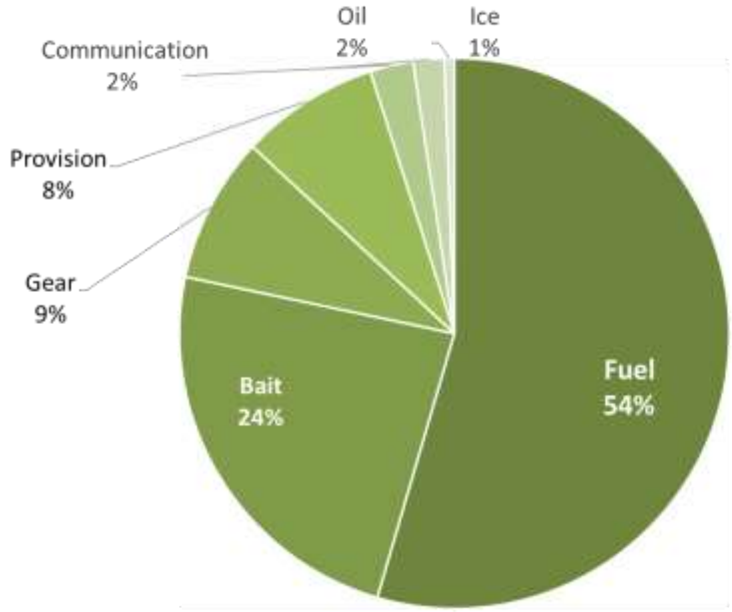


Figure 138. The cost structure of an average deep-set fishing trip[1]

[1] Data source: PIFSC continuous economic data collection program (Pan 2018).

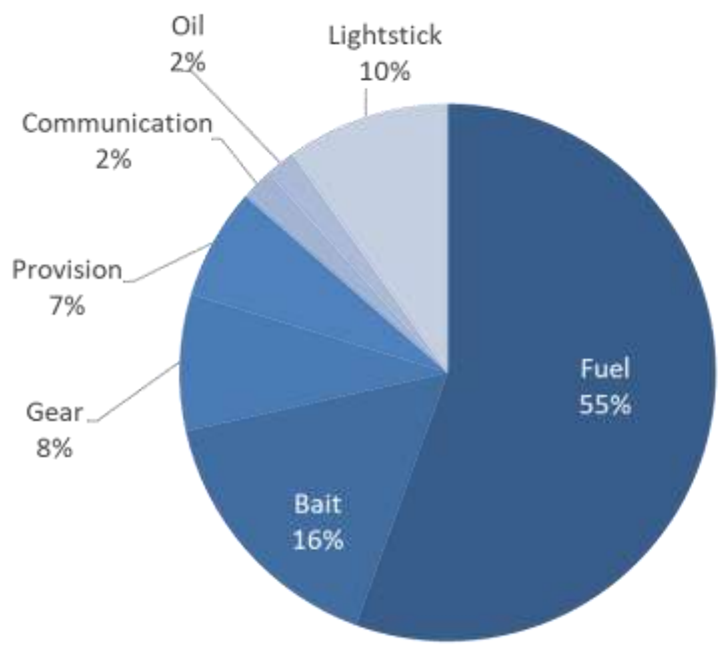


Figure 139. The cost structure of an average shallow-set fishing trip[1]

[1] Data source: PIFSC continuous economic data collection program (Pan 2018).

Figure 140 and Figure 141 show the trends of average trip costs for tuna and swordfish trips, respectively, in the Hawaii longline fishery for the 2005-2023 period. Supporting data for Figure

140 and Figure 141 are presented in Table A-125 and Table A-126. The average trip costs for both trip types differ, and swordfish trips (i.e., with longer trip lengths) usually cost more than tuna trips. The variations of trip costs across years were mainly the results of fuel costs across years, while the other trip costs were relatively steady across years. In 2023, trip costs for tuna fishing ($33,546) went down 6% compared to that in 2022, due to lower fuel price. The trip costs of swordfish fishing wend up 3%, probably due to longer trip length in 2023 compared to 2022.

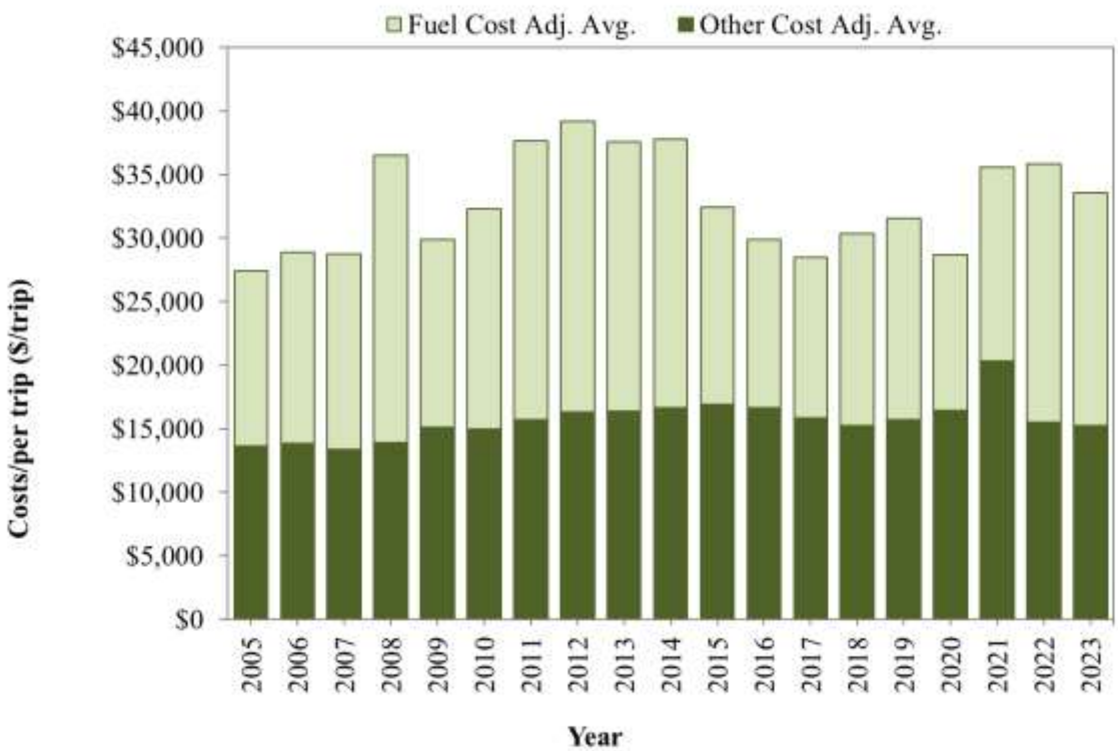


Figure 140. Average trip costs for Hawaii longline deep-set fishing (adjusted to 2023 dollars)[1]

[1] Data source: PIFSC continuous economic data collection program (Pan 2018).

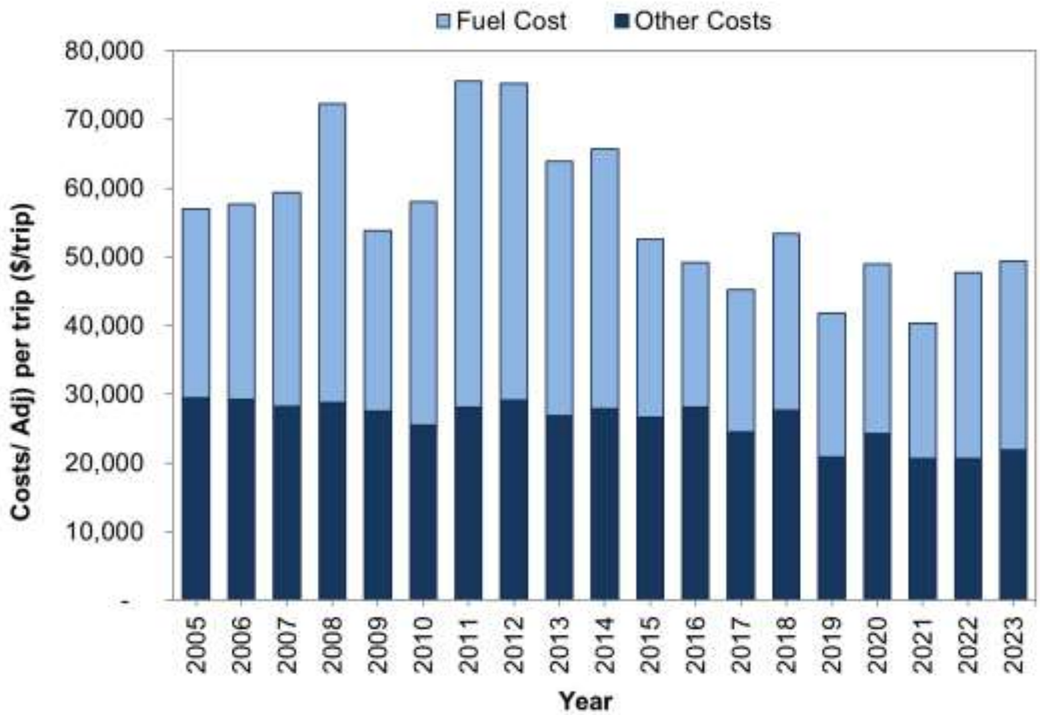


Figure 141. Average trip costs for Hawaii longline shallow-set fishing (adjusted to 2023 dollars)[1]
[1] Data source: PIFSC continuous economic data collection program (Pan 2018).

3.2.3.4.1.3 Economic Performance Indicators

The continuous economic data collection program allows for the monitoring of trends in fishing cost over time (Pan 2018). Compiling revenue data with cost and effort data allows for the measurement of the economic performance in terms of trip net revenue. Figure 142 and Figure 143 present the trends of trip net revenues for two trip types for the period of 2005 to 2023. Supporting data for Figure 142 and Figure 143 are presented in Table A-127 and Table A-128, respectively. The net revenue of tuna (i.e., deep-set) fishing varied across years and peaked in 2016. However, tuna trip net revenue was in a downward trend after 2016, and it was near a historical low in 2020 considering the period of 2005-2023. In 2021 the net revenue went up but decreased again in 2022 and 2023 to $35,753 per trip. The net trip revenue for swordfish trips was highest in 2022 and it went down in 2023 ($125,570 in 2022 vs. 57,560 in 2023).

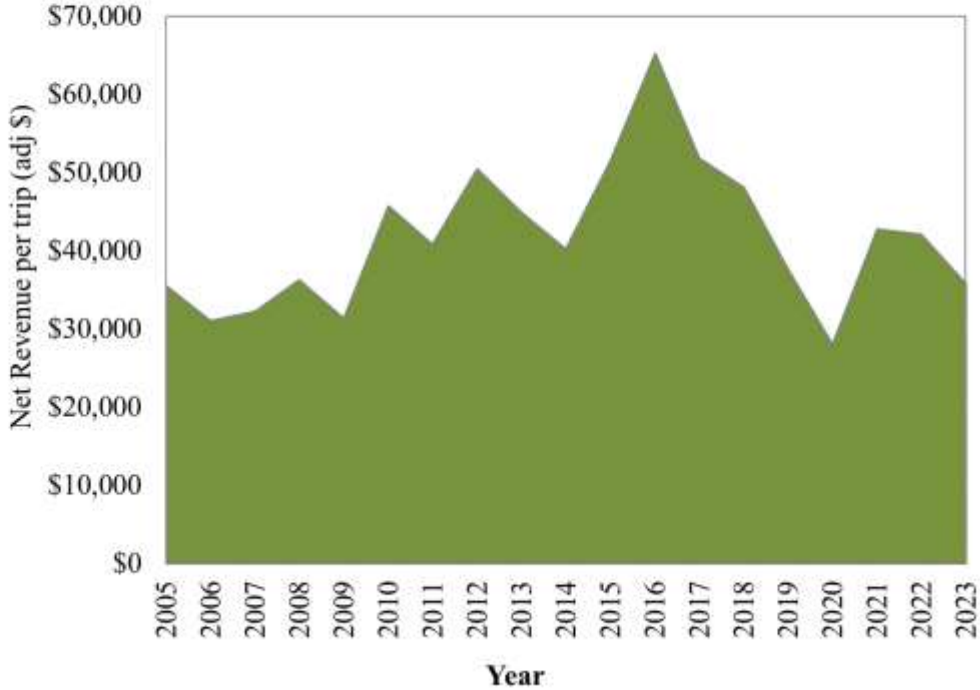


Figure 142. Average net revenue per trip for Hawaii longline deep-set trips (adjusted to 2023 dollars)[1]

[1] Data source: PIFSC continuous economic data collection program (Pan 2018).

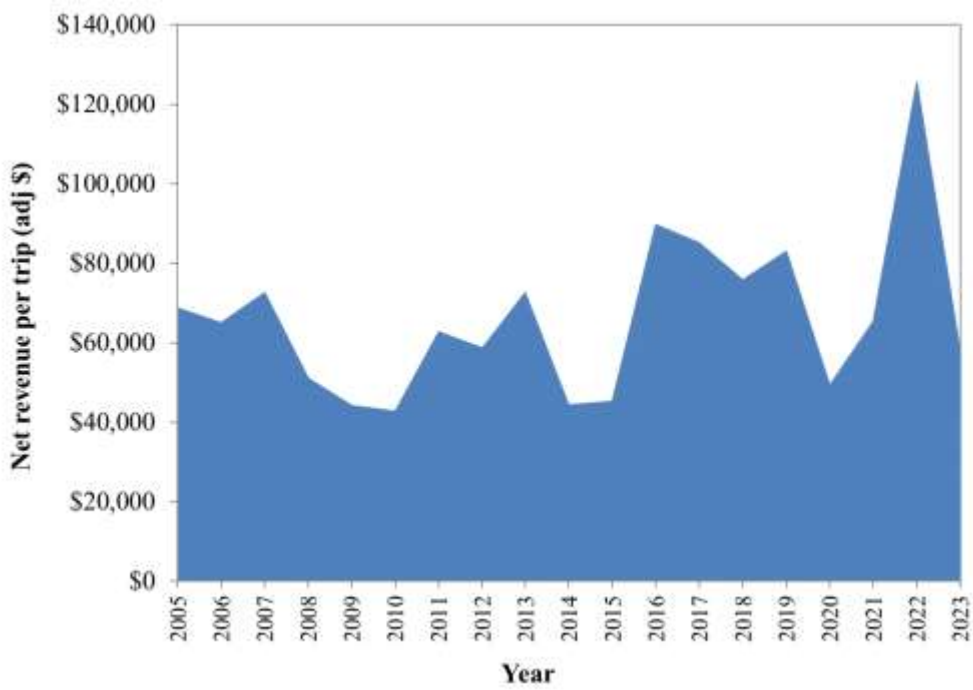


Figure 143. Average net revenue per trip for Hawaii longline shallow-set trips (adjusted to 2022 dollars)[1]

[1] Data source: PIFSC continuous economic data collection program (Pan 2018).

In addition to the measurement of the net revenue, NOAA Fisheries has established a national set of economic performance indicators to monitor the economic health of the nation's fisheries (Brinson et al. 2015). The PIFSC SEES Program has used this framework to evaluate select regional fisheries; specifically, the American Samoa Longline, Hawaii Longline, and Main Hawaiian Islands (MHI) Deep 7 bottomfish fisheries. These indicators include metrics related to catch, effort, and revenue. For the American Samoa longline fishery, this section presents revenue performance metrics of the total revenue per day at sea, annual revenue per vessel, and the Gini coefficient based on individual vessels.

The Gini coefficient measures the equality of the distribution of revenue among active vessels in the fishery. A value of zero represents a perfectly equal distribution of revenue amongst these vessels, whereas a value of one represents a perfectly unequal distribution, in the case that a single vessel earns all of the revenue. Data on aggregate revenue from species in fishery per-day-at-sea and revenue per vessel calculation (for Gini coefficient) are sourced from PIFSC FRMD. Figure 144 and Figure 145 present the revenue per-day-at-sea, revenue per vessel, and the Gini coefficient for the Hawaii longline fisheries during the period of 2004 to 2023. Supporting data for Figure 144 and Figure 145 are presented in Table A-129.

One of the economic performance indicators, revenue per-day-at-sea for the Hawaii longline fishery, presents an upward trend through 2016 that has declined since then, while the revenue per-day-at-sea was at its lowest in 2020. It increased notably in 2021 and 2022 was at a similar level as 2021. However, it went down again in 2023. Another economic performance indicator, revenue per vessel, held relatively steady from 2004-2023 with a slowly increasing trend through 2018. The revenue per vessel dropped notably in 2020 but seemingly recovered in 2021 and 2022, but it went down in 2023. The income distribution (i.e., Gini coefficient in terms of revenue per vessel) among vessels is relatively stable over the same period but low (0.17) in 2023, which indicates that the variation of revenue received by individual vessels was small across the fleet.

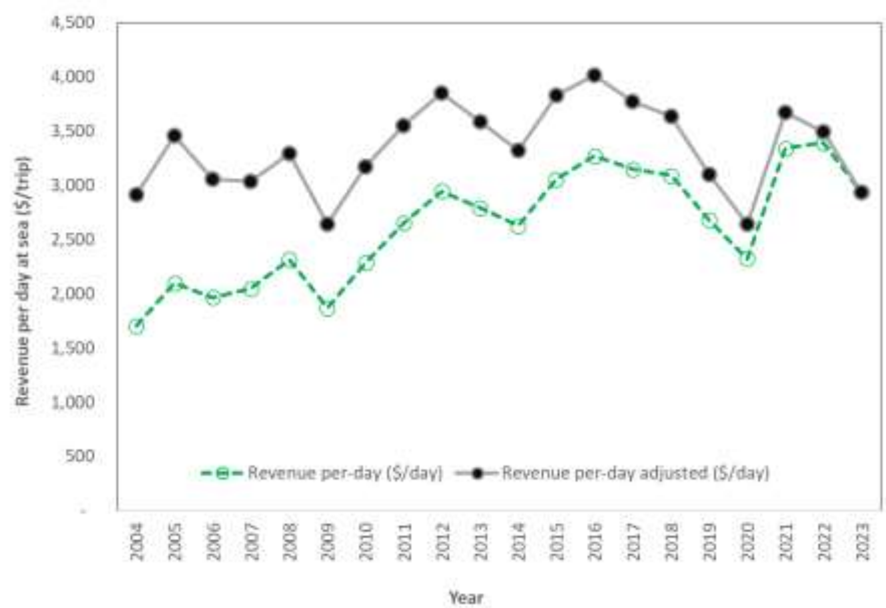


Figure 144**.** Revenue per-day-at-sea for the Hawaii longline fishery (adjusted to 2023 dollars)[1]

[1] Data Source: PIFSC Tier 1 indicators data request.

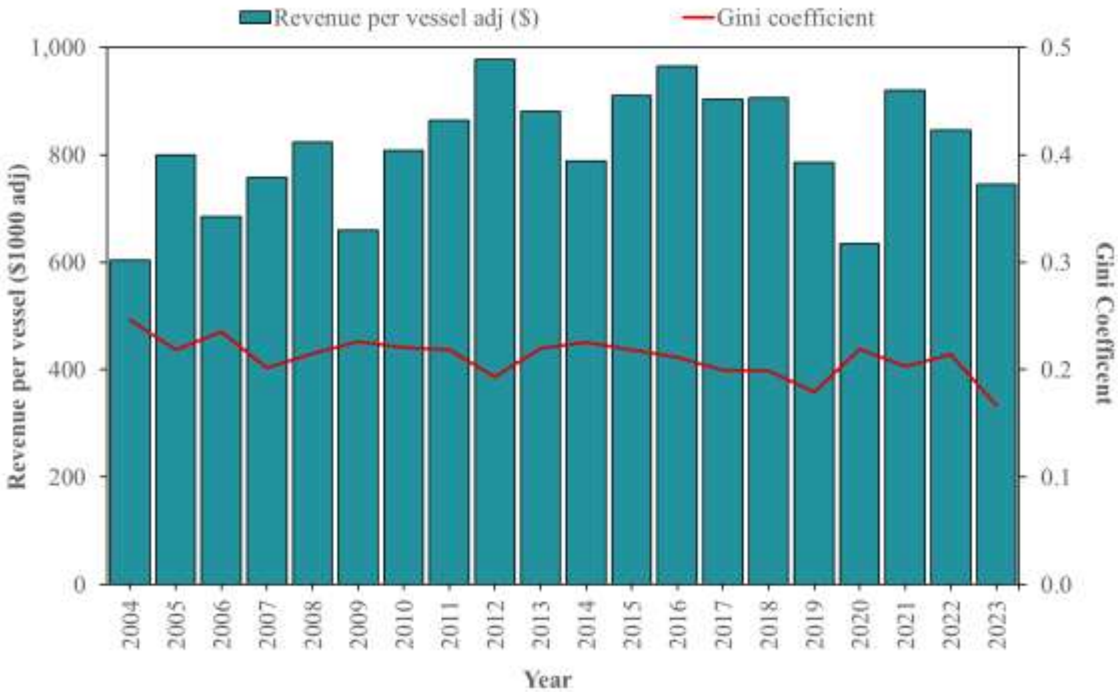


Figure 145. Revenue per vessel and Gini coefficient for the Hawaii longline fishery[1] (adjusted to 2023 dollars)[2]

[1] Revenue per vessel includes the estimation of revenue landed on the West Coast.

[2] Data source: PIFSC Tier 1 indicators data request

3.2.3.4.2 Overview of the Hawaii Non-Longline Gears for PMUS

In addition to the Hawaii permitted longline vessels, there are the smaller scale fisheries, such as the MHI troll, MHI handline, offshore handline, aku boats (i.e., pole and line), among other gears, that harvest PMUS and sell to the Hawaii markets. The following figures present an overview of these various gears in terms of pounds sold, revenue, price, and participants. Aku boats were not included in "other gears" because the fishery has been declining and the number of active vessels has been less than three since 2010. In terms of participants in the fisheries, Figure 146 presents the total fishers participating in these non-longline PMUS fisheries, including the total number of fishers who reported PMUS caught in fishers reports and the total number of fishers who reported PMUS sold in the dealer reports. The number of fishers has experienced a downward trend since 2013 and decreased considerably in 2020 with 191 fewer fishers than 2019. In 2023, the number of fishers for PMUS was 1175, decreased by 16 compared to 2022. The number of fishers with fish sold in 2023 were 962, 108 fewer than 2022.

Including pelagic fish landed and sold in the Hawaii markets from all gear types (including longline), the total revenue generated from Hawaii's pelagic fisheries sold in Hawaii markets was $118 million in 2023. The Hawaii non-longline fisheries contributed 9% of the total PMUS revenue sold in Hawaii markets in 2023. Among the total revenue of the non-longline gears, the MHI troll was the leading sector with $6.0 million revenue or 56% of total revenue generated by non-longline gears in 2023 (not including aku boat due to confidential data). The MHI handline fishery followed at $2.6 million (25%). The offshore handline fishery was worth $1.3 million (12%) in 2023. There has been a sharp decline in aku boat fishing during the reporting period and detailed figures are not reported since 2019 due to confidentiality considerations. Figure 147 presents the trend of commercial landings by different non-longline gears, and Figure 148 presents the trend of commercial revenue by non-longline gears. Both commercial landings and revenue peaked in 2004 and 2012 and were in general declining trends after 2012. Compared to the estimated landings reported from fishers' reports, 81% of PMUS caught were sold during the period of 2004-2023 but was 85% in 2023. Both total PMUS landings (pounds kept) and commercial landings (pounds sold) decreased in 2023 compared to 2022. Supporting data for the Figure 147 and Figure 148 are presented in Table A-130 and Table A-131, respectively.

Figure 149 presents the price trends of PMUS harvested and sold by different gears, 2004-2023 (adjusted to 2023 dollars). As dealer data do not record gear types, the prices by species by gear were estimated by assuming that the gear distributions of fish sold in the dealers reports by species were the same as in fishers' reports. Thus, the prices by species by gear presented here may not reflect the actual price differences among gears for the same species. The estimated price data by species by gear are presented in Figure 149. In general, pelagic fish price went down slightly in 2022 for all gear types, while all prices had increased in 2021. Supporting data for Figure 149 are presented in Table A-132. Figure 150 presents the fishing trip costs by the three main small boat gears for pelagic fishing.

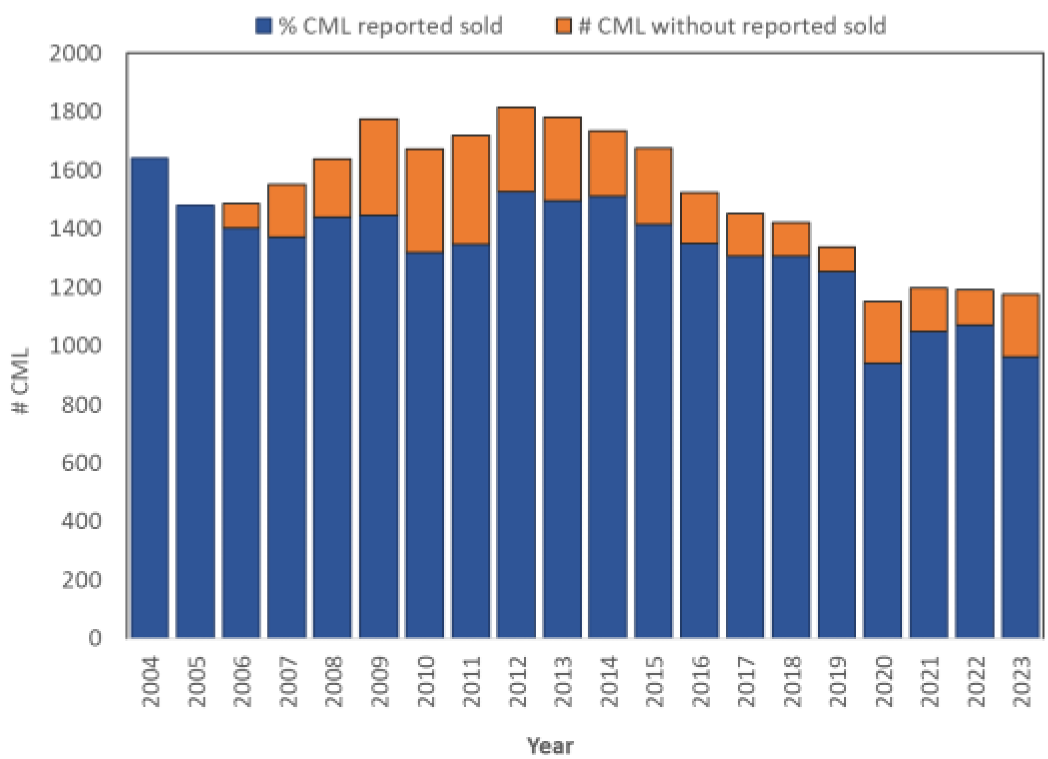


Figure 146. Total number of licensed fishers participating in small scale (i.e., non-longline) PMUS fisheries in Hawaii[1]

[1] Data source: PIFSC Pelagic Module data request.

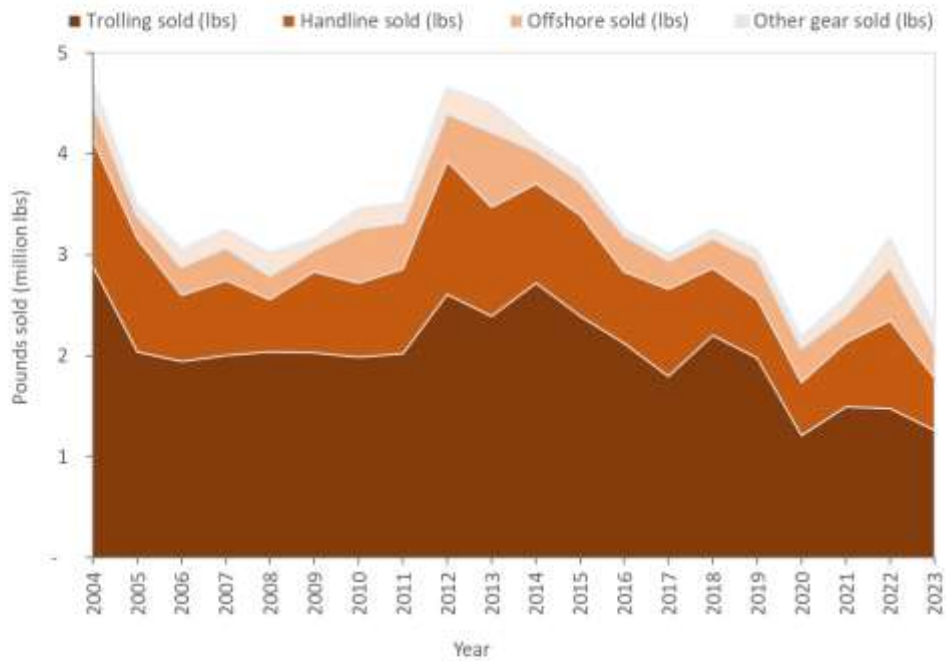


Figure 147. Total pounds sold from MHI commercial non-longline gears[1]

[1] Data source: PIFSC Pelagic Module data request.

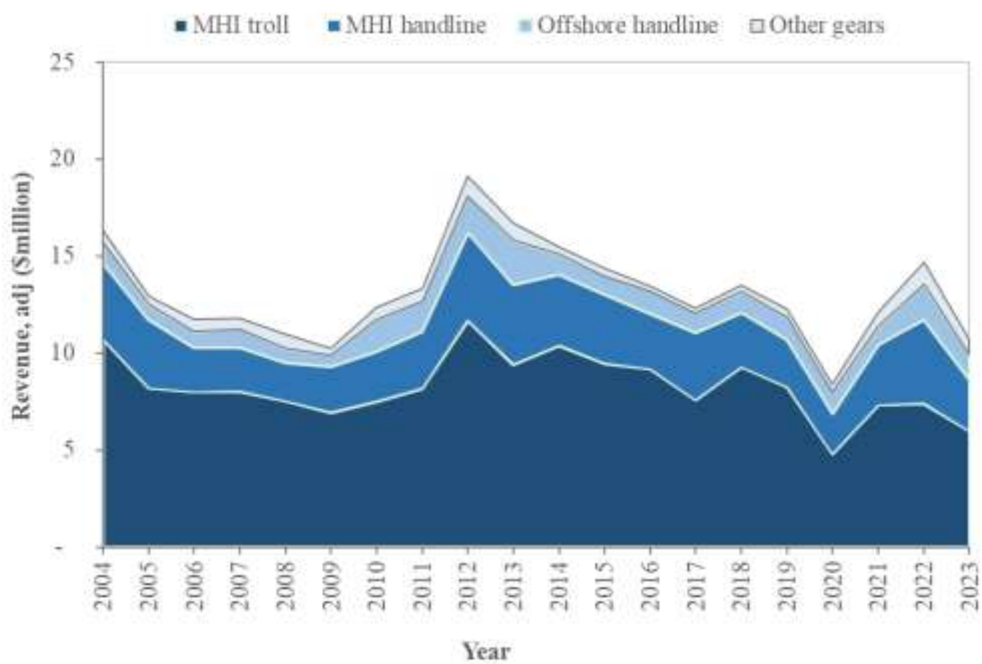


Figure 148. Revenue from Hawaii pelagic non-longline gears (adjusted to 2023 dollars)[1]

[1] Data source: PIFSC Pelagic Module data request.

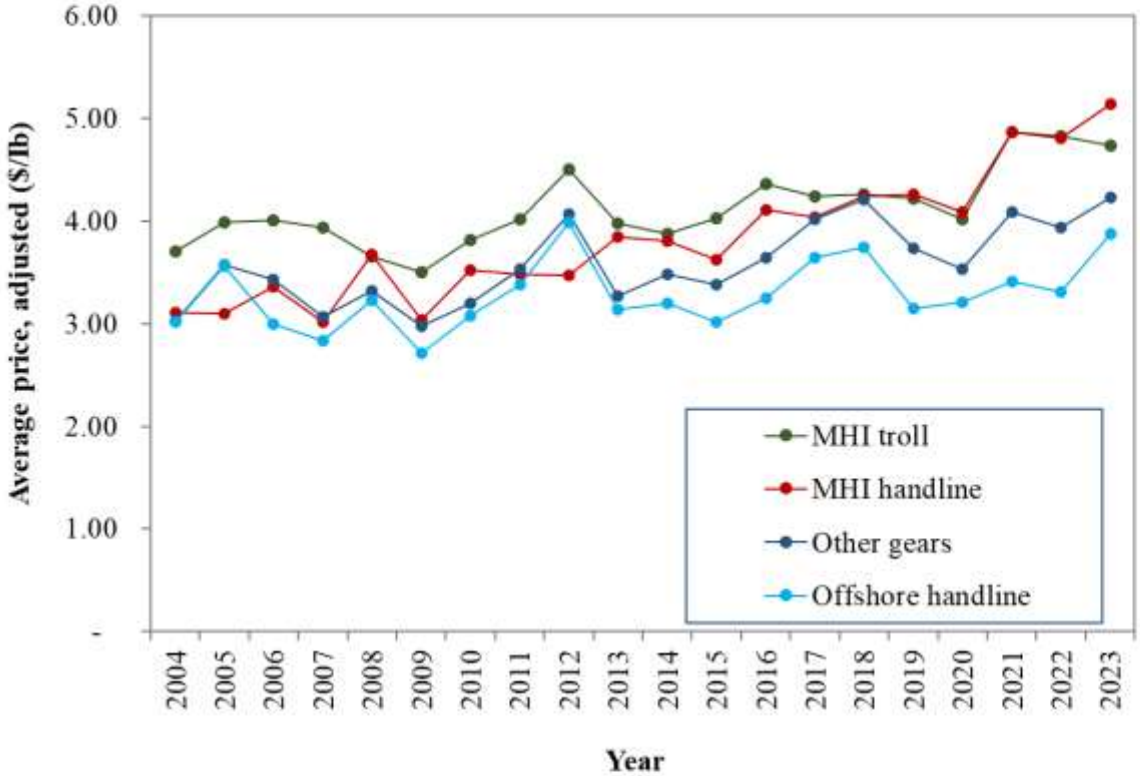


Figure 149. Price trends of PMUS by gear (adjusted to 2023 dollars)[1]

[1] Data source: PIFSC Pelagic Module data request.

3.2.3.4.2.1 Fishing Costs

There is no continuous cost data collection program established for the non-longline PMUS fisheries in Hawaii. Past periodic research has documented the costs of pelagic small boat fishing in Hawaii; both trip expenditure and annual fishing expenditures (i.e., fixed costs) are provided in the literature (Hamilton and Huffman, 1998; Hospital et al. 2011; Chan and Pan 2017; Chan 2022). The trip costs by gear type, collected in 2014 and 2021 studies (Chan and Pan 2017; Chan 2022), are presented in Figure 150.

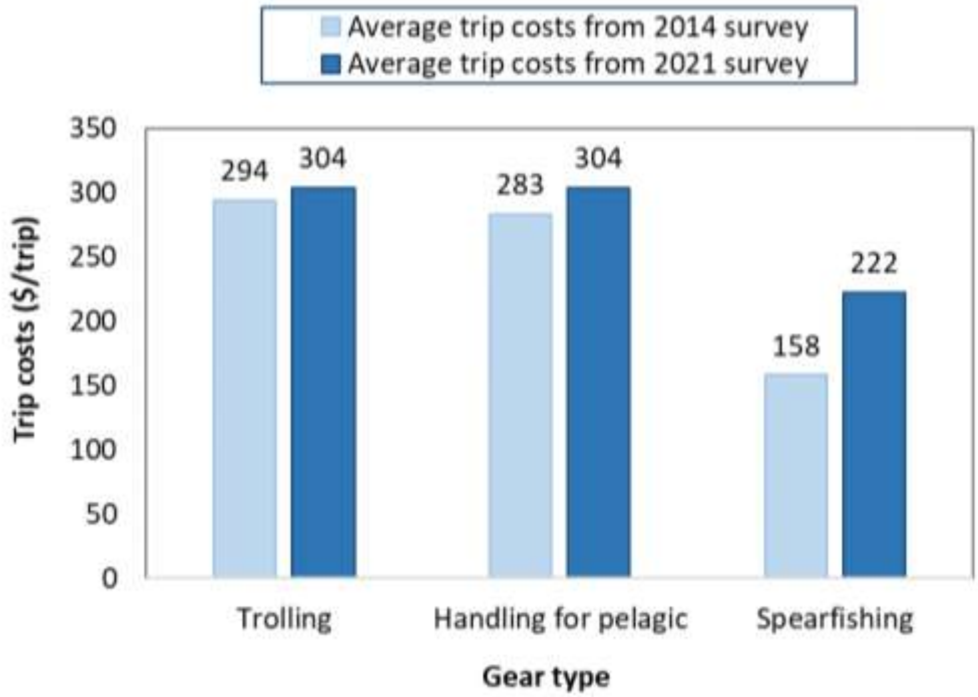


Figure 150. Fishing trip cost by gear type in 2014 and 2021[1]

[1] Data sourced from a 2014 and 2021 Hawaii small boat survey (Chan and Pan 2017 and Chan 2022)

3.2.3.4.3 Hawaii Trolling

3.2.3.4.3.1 Commercial Participation, Landings, Revenue, and Prices

This section describes trends in commercial participation, landings, revenues, and prices for the Hawaii troll fishery. Figure 151 presents the pounds sold and revenue (adjusted to 2022 dollars) for the MHI troll fishery from 2004-2023. Supporting data of Figure 151 are presented in Table A-130 and Table A-131. Among the non-longline gears, the Hawaii troll fishery landed the largest amount of pelagic fish. The commercial revenue from Hawaii troll fishery peaked in 2012 with revenue of over $10 million (inflation adjusted to 2023 dollars) from 2.6 million pounds sold, while commercial landings peaked in 2014. Since then, both commercial landings and revenue have experienced a declining trend. Landings and revenue decreased in 2023 compared to 2022. Price information is available in Figure 149.

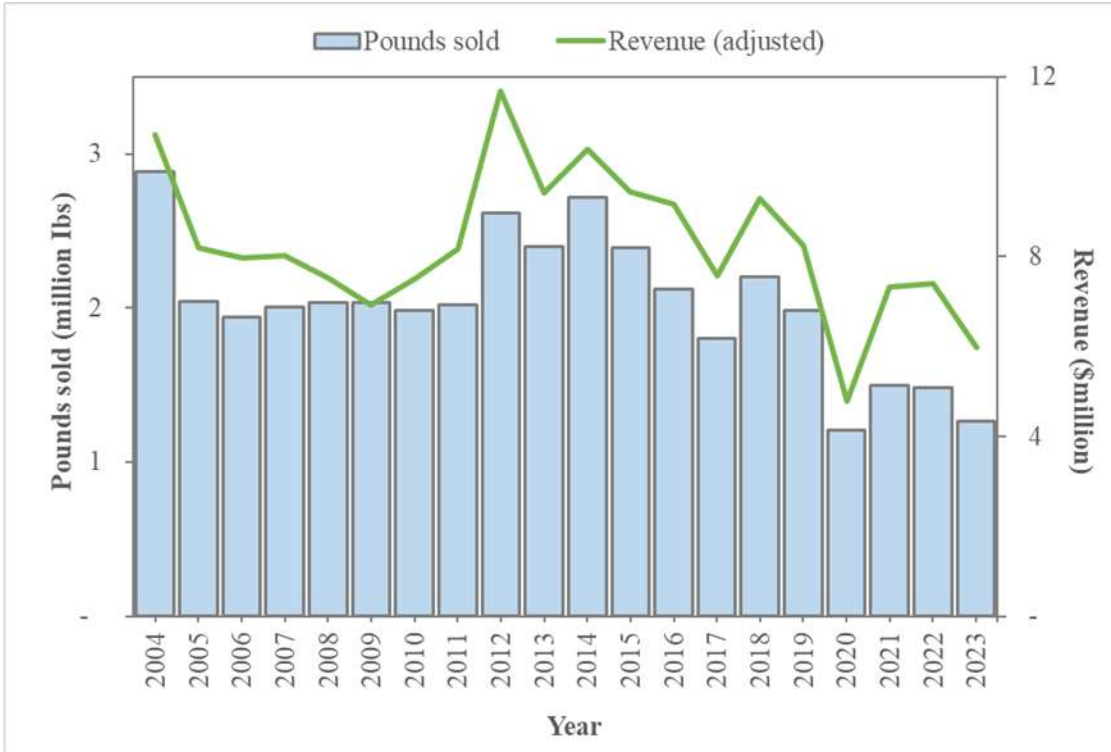


Figure 151. Pounds sold and revenue for the MHI troll fishery (adjusted to 2023 dollars)[1]

[1] Data source: PIFSC Pelagic Module data request.

3.2.3.4.3.2 Fishing Costs

There are no continuous cost data collection program established for the non-longline PMUS fisheries in Hawaii. Past periodic research has documented the costs of pelagic small boat fishing in Hawaii; both trip expenditure and annual fishing expenditures (fixed costs) are provided in the literature (Hamilton and Huffman 1997; Hospital et al. 2011; Chan and Pan 2017; Chan 2022). The most updated cost data for a Hawaii trolling trip are presented in Figure 150.

3.2.3.4.4 Hawaii Pelagic Handline

3.2.3.4.4.1 Commercial Participation, Landings, Revenue, and Prices

This section describes trends in commercial participation, landings, revenues, and prices for the Hawaii pelagic handline fishery. Figure 152 presents the pounds sold and revenue (adjusted to 2022 dollars) for the MHI handline fishery from 2004-2023. Supporting data for Figure 152 can be found in Table A-130 and Table A-131. The landings and revenue from the Hawaii handline fishery peaked in 2012 with 1.3 million pounds sold, valued at over $4 million (adjusted in 2023 dollars), before experiencing a general declining trend since 2013. Commercial landings of Hawaii handline in 2023 were 0.6 million pounds, valued at $2.6 million, both were lower than that in 2022. Price information is available in Figure 149.

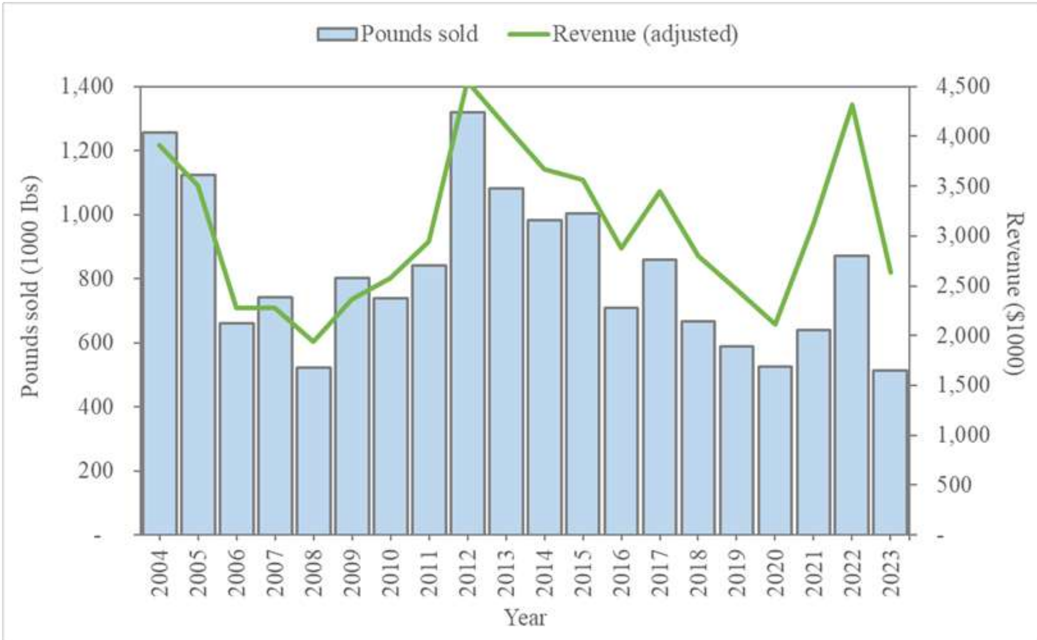


Figure 152. Pounds sold and revenue for MHI handline fishery (adjusted to 2023 dollars)[1]

[1] Data sourced from the PIFSC Pelagic Module data request.

3.2.3.4.4.2 Fishing Costs

There is no continuous cost data collection program established for the non-longline PMUS fisheries in Hawaii. Past periodical research has documented the costs of pelagic small boat fishing in Hawaii; both trip expenditure and annual fishing expenditures (fixed costs) are provided in the literature (Hamilton and Huffman 1997; Hospital et al. 2011; Chan and Pan 2017; Chan 2022). The most recent cost data for MHI handline trips are presented Figure 150.

3.2.3.4.5 Offshore Handline

3.2.3.4.5.1 Commercial Participation, Landings, Revenue, and Prices

This section describes trends in pounds sold and revenues for the Hawaii offshore handline fishery. Figure 153 presents the pounds sold and revenue (adjusted to 2022 dollars) of the offshore handline, 2004-2023. Supporting data for Figure 153 can be found in Table A-130 and Table A-131. The offshore handline fishery seems relatively stable in most of the years during the period of 2004-2023, except that the pounds sold and revenue jumped up considerably in 2013. The offshore handline in 2023 went down compared to 2022. Price information is available in Figure 149.

Figure 153. The pounds sold and revenue for the offshore handline (adjusted to 2022 dollars)[1]

[1] Data sourced from the PIFSC Pelagic Module data request.

3.2.3.4.5.2 Fishing Costs

Fishing costs for offshore handline were first studied in the 2014 Hawaii small boat survey (Chan and Pan 2019b). Fishing trip costs were collected from the 2014 Hawaii small boat survey (Chan and Pan 2017). Fishermen were asked their fishing trip costs for the most common and second most common gear types they used in the past 12 months and the survey provides information on the variable costs incurred during the operation of vessel including boat fuel, truck fuel, oil, ice, bait, food and beverage, daily maintenance and repair, and other. However, the 2021 survey did not receive any updated cost information on the offshore handline.

3.2.3.4.6 Other Gears (Including Aku Boat/Pole and Line)

3.2.3.4.6.1 Commercial Participation, Landings, Revenue, and Prices

This section will describe trends in commercial pounds sold and revenues for the “other gears”. Figure 154 presents the pounds sold and revenue (adjusted to 2023 dollars) of the other gears 2004-2023 (excluding aku boats because data are confidential from 2019 to 2022 and the dramatic changes from over $1 million revenue in 2005 to under $2000 in 2016) during the reporting period). Supporting data for Figure 154 can be found in Table A-130 and Table A-131. After a period of continuous declines, the commercial landings and revenue from the other-gear-group (excluding Aku fishing) has risen slowly since 2017. In 2022, the revenue generated from the other gears 2022 went up to historical high, while in 2023 it went down.

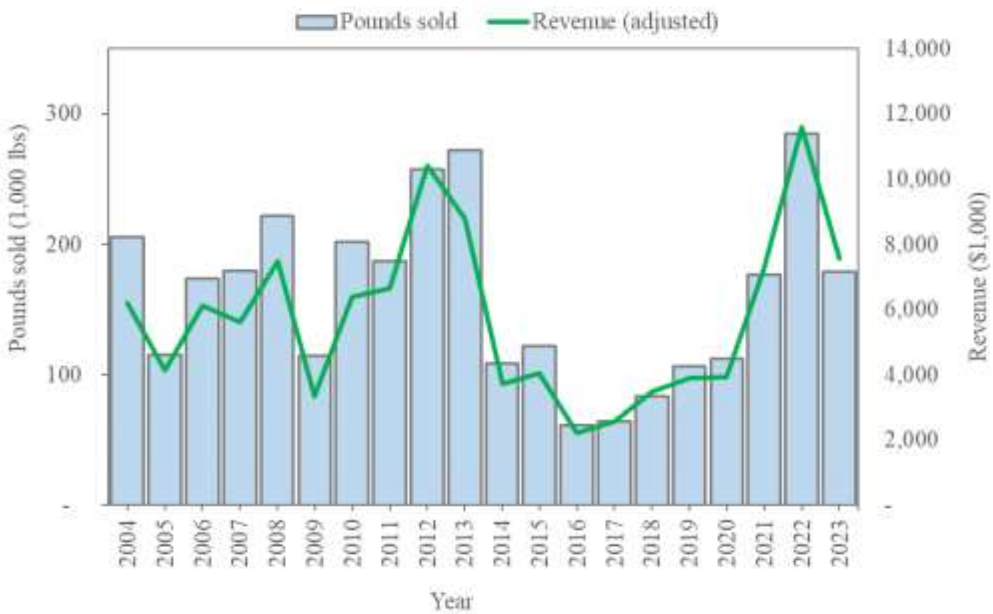


Figure 154. Pounds sold and revenue for all other pelagic gears in Hawaii (excluding aku boat; adjusted to 2023 dollars)[1]

[1] Data source: PIFSC Pelagic Module data request.

3.2.3.4.6.2 Fishing Costs

Fishing cost data for the other presented gears were not available at the time of publication.

3.2.4 ONGOING RESEARCH AND INFORMATION COLLECTION

Each year, the PIFSC reports on the status of economic data collections for select regional commercial fisheries. This supports a national economic data monitoring effort known as the Commercial Fishing Economic Assessment Index (CFEAI). Details on the CFEAI and access to data from other regions is available at: https://www.st.nmfs.noaa.gov/data-and-tools/CFEAI-RFEAI/.

The table below represents the most recent data available for CFEAI metrics for select regional commercial fisheries for 2023. Entries for Pelagic fisheries are bolded in red. These values represent the most recent year of data for key economic data monitoring parameters (fishing revenues, operating costs, and fixed costs). The assessment column indicates the most recent publication year for specific economic assessments (returns above operating cost, profit), where available.

Table 45. Pacific Islands Region 2023 Commercial Fishing Economic Assessment Index

	2023 CFEAI (Current)				
	2023 Reporting Year (e.g. 1/2023-12/2023)				
	Data			Assessment	
Pacific Islands Fisheries	Anticipated Fishing Revenue Most Recent Year	Anticipated Operating Cost Most Recent Year	Anticipated Fixed Cost Most Recent Year	Anticipated Returns Above Operating Costs (Quasi Rent) Assessment Most Recent Year	Anticipated Profit Assessment Most Recent Year
HI Longline	**2023**	**2023**	**2023**	**2023**	**2016**
ASam Longline	**2023**	**2023**	**2016**	**2023**	**2019**
HI Offshore Handline	**2023**	**2021**	**2021**	**2019**	**2019**
HI Small Boat (pelagic)	**2023**	**2021**	**2021**	**2023**	**2023**
HI Small Boat (bottomfish)	2023	2021	2021	2023	2023
HI Small Boat (reef)	2023	2021	2021	2023	2023
Guam Small boat	**2023**	**2023**	**2019**	**2019**	
CNMI Small boat	**2023**	**2023**	**2019**	**2019**	
ASam Small boat	**2023**	**2023**	**2021**	**2023**	

PIFSC also generates projections for upcoming fiscal years, and the table below provides the projected CFEAI report for 2023 (*all projected activities and analyses are subject to funding*). Based on early projections PIFSC intends to maintain ongoing economic data collections for the Hawaii and American Samoa longline fisheries (Pan 2018, PIRO (Pan 2018) and small boat fisheries in American Samoa, Guam and the CNMI (Chan and Pan 2019a) during 2023.

The Economic Cost Data Collection Program for tracking change of Hawaii longline and American Samoa longline has been done in collaboration between PIFSC with the Pacific Islands Regional Observer Program (PIROP) to provide a 20-year time series of trip-level expenditures excluding labor cost (Pan 2018). However, there is uncertainty with the continuation of this data collection program due to the digitization of the PIROP system, whereas the economic performance data has been collected through paper forms. The data collection program may need to explore approaches to continue the data collection in the most feasible and efficient format for useful representation.

Table 46. Pacific Islands Region 2024 Commercial Fishing Economic Assessment Index

	2024 Projected CFEAI				
	2024 Reporting Year (e.g. 1/2024-12/2024)				
	Data			Assessment	
Pacific Islands Fisheries	Anticipated Fishing Revenue Most Recent Year	Anticipated Operating Cost Most Recent Year	Anticipated Fixed Cost Most Recent Year	Anticipated Returns Above Operating Costs (Quasi Rent) Assessment Most Recent Year	Anticipated Profit Assessment Most Recent Year
HI Longline	**2024**	**2024**	**2023**	**2024**	**2024**
ASam Longline	**2024**	**2024**	**2016**	**2024**	**2019**
HI Offshore Handline	**2024**	**2021**	**2021**	**2019**	**2019**
HI Small Boat (pelagic)	**2024**	**2021**	**2021**	**2023**	**2023**
HI Small Boat (bottomfish)	2024	2021	2021	2023	2023
HI Small Boat (reef)	2024	2021	2021	2023	2023
Guam Small boat	**2024**	**2024**	**2019**	**2024**	
CNMI Small boat	**2024**	**2024**	**2019**	**2024**	
ASam Small boat	**2024**	**2024**	**2021**	**2023**	

PIFSC fielded an update to the Hawaii small boat cost earnings survey (Chan and Pan 2017; Hospital et al. 2011) during calendar year 2021 and report was published (Chan 2023). This survey provided updated information on operating costs and fixed costs for the Hawaii pelagic small boat fisheries, as well as numerous elements related to fishing behavior, market participation, and fishery demographics. PIFSC also fielded an update the Hawaii longline cost-earnings survey in 2023 and this survey provided updated information on fixed costs, labor costs, and allow for a more in depth analysis of economic performance for the fleet while the last survey was fielded in 2013(Kalberg and Pan 2016). Data analysis and summary have been undertaken and PIFSC intends final survey results to be published during 2024-2025.

A cost-earnings survey of the American Samoa small boat fishery was completed during 2021. This survey will provide updated data on fishing revenues, operating costs, and fixed costs, as well as numerous elements related to fishing behavior, market participation, and fishery demographics for American Samoa boat-based fisheries. Report based on the survey was published (Dombrow and Hospital 2023).

PIFSC completed a cost-earnings survey of small boat fisheries in Guam and the CNMI during 2018-2019 to serve as an update to the previous 2011 cost-earnings survey (Hospital and Beavers 2012, 2014). This 2018-2019 survey collected data on fishing revenues, operating costs, and fixed costs, as well as numerous elements related to fishing behavior, market participation, and fishery demographics. Efforts to complete the analysis of the 2018-2019 cost-earnings have been delayed due to staff departures coupled with COVID-19 monitoring requirements and PIFSC intends final survey results to be published during 2024.

PIFSC will continue to collect and monitor annual community social indicators (Kleiber et al. 2018; Hospital and Leong 2021) for Hawaii fishing communities, in accordance with a national project to describe and evaluate community well-being in terms of environmental justice, economic vulnerability, and gentrification pressure.

Community social indicators have also been generated for American Samoa, the CNMI and Guam (Kleiber et al. 2018). However, indicators in the Western Pacific rely solely on decennial Census data and cannot be updated until 2020 Census data becomes available, likely during 2023.

3.2.5 RELEVANT PIFSC ECONOMICS AND HUMAN DIMENSIONS PUBLICATIONS: 2023

Publication	**MSRA priority**
Abrams, KM, Molder AL, Nankey P, Leong K. 2023. Encouraging Respectful Wildlife Viewing Among Tourists: Roles for Social Marketing, Regulatory Information, Symbolic Barriers, and Enforcement. Social Marketing Quarterly. https://doi.org/10.1177/15245004231153085	HC3.2.2 HC3.2.3 HC3.2.4
Cai, J, Chan HL, Yan X, Leung PS. 2023 A global assessment of species diversification in aquaculture. Aquaculture 576: 739837. https://doi.org/10.1016/j.aquaculture.2023.739837	HC1.1.6 HC1.1.3
Chan HL. 2023. How climate change and climate variability affected trip distance of a commercial fishery. PLOS Clim 2(2): e0000143.	HC2.1.3 HC2.1.4

https://doi.org/10.1371/journal.pclm.0000143 https://journals.plos.org/climate/article?id=10.1371/journal.pclm.0000143	
Sabater M, Schumacher B, Borges P, Hospital J, Makaiau J, Jones TT, Walker R, Chow M. 2023. Fishery Management Scenarios for the Monument Adjacent Area within the Proposed Pacific Remote Islands Sanctuary. Pacific Islands Fisheries Science Center, PIFSC White Paper, 23 p.	HC3.1.2 PF3.1.1 HC1.1.6
Pacific Islands Fisheries Science Center. 2023. Assessment of Potential Costs Associated with Future Monument Expansion Area Fishing Trips. Pacific Islands Fisheries Science Center, PIFSC Internal Report, IR-23-05, 13 p.	HC3.1.2 HC1.1.1
Parke M, Lumsden B, Beidron I, Rykaczewski R, Woodworth-Jefcoats P, Wren J, Tanaka K, Ahrens R, Ruzicka J, O'Malley J, Trianni M, Oleson E, Barbeiri M, Allen C, Bradford A, Robinson S, Gaos A, Leong K, Fisk J, Gove J, Whitney J. 2023. Ecosystem-based Fisheries Science in a Data-limited Region. U.S. Dept. of Commerce, NOAA Technical Memorandum NOAA-TM-NMFS-PIFSC-141, 37 p. https://doi.org/10.25923/2aec-eb81	IF8.1.1 IF8.1.8 HC2.1.2
Perng LY, Walden J, Leong KM, DePiper GS, Speir C, Blake S, Norman K, Kasperski S, Weijerman M, Oleson KLL. 2023. Identifying social thresholds and measuring social achievement in social-ecological systems: A cross-regional comparison of fisheries in the United States. Marine Policy (152): 105595. https://doi.org/10.1016/j.marpol.2023.105595	HC2.1.2 HC2.1.4
Thunberg, E., A. Kitts, G. Ardini, HL Chan. A. Chen, B. Garber-Yonts, J. Hilger, C. Hutt, C. Liese, S. Lovell, M. McGregor, M. Pan, D. Records, G. Silva, E. Steiner, S. Stohs, M. Travis, S. Werner, and S. Warpinski. 2023. A Snapshot Update of NOAA Fisheries Data Collection of Commercial and For-Hire Fishery Costs and Earnings. U.S. Dept. of Commerce, NOAA Technical Memorandum NMFS-F/SPO-245, 71 p. https://spo.nmfs.noaa.gov/content/tech-memo/snapshot-update-noaa-fisheries-data-collection-commercial-and-hire-fishery-cost	HC1.1.1
White House Subcommittee on Ocean Science and Technology (SOST) - Interagency Working Group on Ocean Acidification (IWG-OA). 2023. Ocean Chemistry Coastal Community Vulnerability Assessment. Pacific Islands Chapter. https://oceanacidification.noaa.gov/wp-content/uploads/2023/08/IWGOA_Vulnerability_Assessment_2023.pdf	HC1.1.5 HC2.2.1
Woodworth-Jefcoats P, Jacobs A, Ahrens R, Barkley H, Barlow A, Bolen L, Carvalho F, Chung A, Crigler E, DeMello J, Fitchett M, Fox M, Asuka I, Larin P, Lumsden B, Makaiau J, McGregor M, Oliver T, O'Malley J, Richards B, Robinson S, Sabater M, Sculley M, Seeley M, Sweeney J, Tanaka K, Taylor K, Yamada Z 2023. Pacific Islands Regional Action Plan to implement the NOAA Fisheries Climate Science Strategy Through 2024 U.S. Dept. of Commerce, NOAA Technical Memorandum NOAA-TM-NMFS-PIFSC-142, 35 p. https://doi.org/10.25923/2jjs-tx42	HC2.2.1 HC2.2.2 HC3.1.2

3.3 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, elasmobranchs, and corals. Most of these species are protected under the Endangered Species Act (ESA), Marine Mammal Protection Act (MMPA), and/or the Migratory Bird Treaty Act (MBTA). A list of protected species found in or near waters where fisheries managed under the Pelagic FEP operate and a list of critical habitat designations in the Pacific Ocean are included in Appendix B.

3.3.1 HAWAII SHALLOW-SET LONGLINE FISHERY

3.3.1.1 INDICATORS FOR MONITORING PROTECTED SPECIES INTERACTIONS AND EFFECTIVENESS OF MANAGEMENT MEASURES IN THE HAWAII SHALLOW-SET LONGLINE FISHERY

This report monitors the status of protected species interactions in the Hawaii shallow-set longline fishery using the following indicators:

- General interaction trends over time
- Effectiveness of FEP conservation measures
- Take levels compared to the incidental take statement (ITS) levels under the ESA
- Take levels compared to marine mammal Potential Biological Removals (PBRs), where applicable

Details of these indicators are discussed below.

3.3.1.1.1 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 are required to remove trailing gear from oceanic whitetip sharks and cut the line as close to the hook as possible.
- Longline vessel owners/operators can choose between side-setting or stern-setting longline gear with additional regulatory specifications to reduce seabird interactions (e.g., night-setting, 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.
    - Vessel owners and operators required to annually attend protected species workshop
    - Closure for remainder of year when fishery reaches annual interaction limits (“hard caps”). Since September 17, 2020, the fishery has operated under a hard cap of 16 leatherback turtles and no hard cap for loggerhead turtles (see Section 3.3.1.3.2 of this report)

- Effective September 17, 2020, vessels required to return to port when an individual trip interaction limit of 5 loggerhead turtles or 2 leatherback turtles is reached, with additional requirements if the vessel reaches the same trip limit for the second time in a calendar year (see Section 3.3.1.3.2 of this report)

3.3.1.1.2 ESA Consultations

On June 26, 2019, NMFS issued a biological opinion on the effects of the shallow-set fishery on ESA-listed marine species (NMFS 2019). In total, 49 listed resources comprised of 40 listed species and nine critical habitat designations occur within the area the shallow-set fishery operates and were analyzed in the 2019 Biological Opinion. These also include listed fish, marine invertebrates, and other critical habitat in vessel transiting areas of the shallow-set fishery primarily in California (Long Beach, San Francisco, and San Diego).

NMFS concluded that the continued authorization of the fishery is not likely to jeopardize the continued existence of any of the following: endangered North Pacific loggerhead sea turtle distinct population segment (DPS); endangered leatherback sea turtle; endangered Mexico breeding population of olive ridley sea turtle, and threatened (other) populations of olive ridley sea turtle; threatened Eastern Pacific green sea turtle DPS; threatened Central North Pacific green sea turtle DPS; threatened East Indian-West Pacific green sea turtle DPS; endangered Central West Pacific green sea turtle DPS; threatened Southwest Pacific green sea turtle DPS; endangered Central South Pacific green sea turtle DPS; threatened oceanic whitetip shark; threatened giant manta ray; and threatened Guadalupe fur seal.

In its 2019 Biological Opinion, NMFS issued an ITS for the loggerhead, leatherback, green, olive ridley, Guadalupe fur seal, oceanic whitetip shark, and giant manta ray, which were derived from interaction predictions generated by McCracken (2018) using a Bayesian inferential approach (Table 48). These predictions are based on observer data from 2005-2017 for all species, except for loggerheads (2005-2018) where more recent data were available.

Additionally, the 2019 Biological Opinion concluded that the shallow-set fishery may affect, but is not likely to adversely affect the following: hawksbill sea turtle; MHI insular false killer whale DPS; Mexico and Central America humpback whale DPSs; fin whale; blue whale; North Pacific right whale; sei whale; sperm whale; Eastern Pacific scalloped hammerhead shark DPS; and listed fish and invertebrate species common to transiting areas off the coast of California (Central California coast coho salmon, Central Valley spring-run Chinook salmon, Sacramento River winter-run Chinook salmon, Central California coast steelhead, California coast steelhead, Southern North American green sturgeon, Black abalone, and White abalone).

The 2019 Biological Opinion also concluded that the shallow-set fishery is not likely to adversely modify designated critical habitat for the following: leatherback sea turtle; Hawaiian monk seal; MHI insular false killer whale; Steller sea lion; and critical habitat for listed fish and invertebrate species common to transiting areas off the coast of California (Central California coast coho salmon, Sacramento River winter-run Chinook salmon, California coast steelhead, Southern North American green sturgeon, and Black abalone).

On October 27, 2023, NMFS reinitiated ESA Section 7 consultation for the shallow-set longline fishery due to exceedance of the ITS of 36 loggerhead sea turtles in the 2019 Biological Opinion, and determined that the conduct of the fishery during the period of the consultation will not violate ESA Sections 7(a)(2) and 7(d). On March 12, 2024, NMFS issued a Supplemental

Biological Opinion for loggerhead sea turtles, which concluded that the shallow-set longline fishery is not likely to jeopardize species. The new ITS took effect when the Supplemental Biological Opinion was signed, and thus did not apply in 2023. The 2019 Biological Opinion remains valid for all other species.

Table 47. Summary of ESA consultations for the Hawaii shallow-set longline fishery

Species or DPS	Consultation Date	Consultation Type[a]	Outcome[b]
Loggerhead turtle, North Pacific DPS	2019-06-26	BiOp	LAA, non-jeopardy
Leatherback turtle	2019-06-26	BiOp	LAA, non-jeopardy
Olive ridley turtle	2019-06-26	BiOp	LAA, non-jeopardy
Green turtle	2019-06-26	BiOp	LAA, non-jeopardy
Hawksbill turtle	2019-06-26	BiOp	NLAA
False killer whale, MHI insular DPS	2019-06-26	BiOp	NLAA
Fin whale	2019-06-26	BiOp	NLAA
Blue whale	2019-06-26	BiOp	NLAA
North Pacific right whale	2019-06-26	BiOp	NLAA
Sei whale	2019-06-26	BiOp	NLAA
Sperm whale	2019-06-26	BiOp	NLAA
Hawaiian monk seal	2019-06-26	BiOp	NLAA
Guadalupe fur seal	2019-06-26	BiOp	LAA, non-jeopardy
Scalloped hammerhead shark, Eastern Pacific DPS	2019-06-26	BiOp	NLAA
Oceanic whitetip shark	2019-06-26	BiOp	LAA, non-jeopardy
Giant manta ray	2019-06-26	BiOp	LAA, non-jeopardy
Listed fish and invertebrate species[c]	2019-06-26	BiOp	NLAA
Short-tailed albatross	2012-01-06	BiOp (FWS)	LAA, non-jeopardy
Critical Habitat	**Consultation Date**	**Consultation Type[a]**	**Outcome[b]**
Hawaiian monk seal	2019-06-26	BiOp	NLAA
False killer whale, MHI insular DPS	2019-06-26	BiOp	NLAA
Leatherback turtle	2019-06-26	BiOp	NLAA
Steller sea lion	2019-06-26	BiOp	NLAA
Listed fish and invertebrate species[d]	2019-06-26	BiOp	NLAA

[a] BiOp = Biological Opinion; LOC = Letter of Concurrence.
[b] LAA = likely to adversely affect; NLAA = not likely to adversely affect.
[c] Listed fish and invertebrate species = Central California coast coho salmon, Central Valley spring-run Chinook salmon, Sacramento River winter-run Chinook salmon, Central California coast steelhead, California coast steelhead, Southern North American green sturgeon, Black abalone, and White abalone.
[d] Listed fish and invertebrate species = Central California coast coho salmon, Sacramento River winter-run Chinook salmon, California coast steelhead, Southern North American green sturgeon, and Black abalone.

Table 48. Summary of Incidental Take Statements (ITS) for the Hawaii shallow-set longline fishery

Species	ITS Time Period	Takes	Mortalities	Source BiOp
Loggerhead turtle (North Pacific DPS)	1-year	36	6	NMFS (2019)
Leatherback turtle	1-year	21	3	NMFS (2019)
Olive ridley turtle	1-year	5	1	NMFS (2019)
Green turtle	1-year	5	1	NMFS (2019)
Oceanic whitetip shark	1-year	102	32	NMFS (2019)
Giant manta ray	1-year	13	4	NMFS (2019)
Guadalupe fur seal	1-year	11	9	NMFS (2019)
Short-tailed albatross	5-year	1 injury or death		USFWS (2012)

3.3.1.1.3 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, potential biological removal (PBR) estimates, bycatch estimates, and status. The most recent SARs are available online at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region.

The Hawaii shallow-set longline fishery is a Category II under the MMPA 2024 List of Fisheries (LOF; 89 FR 12257, February 16, 2024), meaning that this fishery has occasional incidental mortality and serious injuries of marine mammals. The 2024 LOF lists the following marine mammal stocks that are incidentally killed or injured in this fishery:[3]

- Bottlenose dolphin, HI Pelagic stock
- False killer whale, HI Pelagic stock
- Guadalupe fur seal
- Risso's dolphin, 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 at least 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.

3.3.1.2 DATA SOURCE FOR MONITORING PROTECTED SPECIES INTERACTIONS IN THE HAWAII SHALLOW-SET LONGLINE FISHERY

Protected species interactions in the Hawaii longline fishery have been monitored through mandatory observer coverage since 1994. Observer coverage in the Hawaii longline fishery was between 3 and 5 percent from 1994 through 1999 and increased to 10 percent in 2000. Since

[3] This fishery is listed in the LOF under Commercial Fisheries in the Pacific Ocean and Commercial Fisheries on the High Seas. Stocks from both lists are included here.

2004, the shallow-set component of the Hawaii longline fishery has had 100 percent observer coverage.

NMFS uses the date of the interaction for tracking interactions against the ITS and the shallow-set longline sea turtle hard caps, while the PIRO Observer Program Quarterly and Annual Reports through 2020 summarized interaction data by vessel arrival dates. As a result, the annual number of interactions counting toward the ITS and hard caps may differ from the numbers reported on the historical Observer Program Quarterly and Annual Reports.[4] Starting in 2021, the PIRO Observer Program Quarterly and Annual Reports began summarizing interaction data by haul begin dates (proxy for interaction date). This report presents protected species interactions summarized by interaction date for the Hawaii shallow-set longline fishery. For the Hawaii deep-set and American Samoa longline fisheries, the annual observed interactions are based on vessel arrival date. This difference in reporting between fisheries is due to differences in management needs and observer coverage rates. In the shallow-set fishery, which has 100% observer coverage, interactions are tracked in near-real time to monitor the fleet-wide hard caps and individual trip limits for sea turtles. In the Hawaii deep-set and American Samoa longline fisheries, which have partial observer coverage, total interactions are extrapolated by PIFSC at the trip level as opposed to individual sets or interaction dates using vessels arrival date.

In 2006 and 2019, the shallow-set longline fishery closed in March, and in 2018 the fishery closed in May (see Section 3.3.1.3.2, this report). Due to these early closures in first and second quarters, data for these years are not representative of typical fishing years and should be interpreted with caution.

3.3.1.3 SEA TURTLE INTERACTIONS IN THE HAWAII SHALLOW-SET LONGLINE FISHERY

Table 49 summarizes the sea turtle interaction data based on interaction date to allow comparison with the hard caps. The incidental take data in this section were compiled from unpublished observer data and are for monitoring purposes. Since there is full observer coverage for this fishery, all sea turtle interactions have been documented. Many of these interactions have been examined further by PIFSC, and updated information necessary for any data analyses is available from PIFSC. The incidental take data for the fourth quarter of 2007 were combined with 2008 data due to vessel confidentiality rules.

Nearly all sea turtles observed in the Hawaii shallow-set longline fishery from 2004 to 2023 (Table 49) were released alive, with the exception of four total loggerhead turtles released dead in 2018, 2020, and 2023, and one olive ridley turtle released dead in 2019. Additionally, one loggerhead in 2013 was entangled in marine debris that was entangled with fishing gear and NMFS did not count this turtle towards the annual shallow-set interaction limit. Unidentified hardshell turtles are classified by NMFS as loggerheads per protocol and count towards the annual shallow-set interaction limit or individual trip limit for loggerheads. The highest interaction rates involved both leatherback and loggerhead turtles, whereas interactions with greens, olive ridleys, and unidentified hard shell turtles were much less frequent.

The observed number of sea turtle takes per year has been variable for green, olive ridley, leatherback, and unidentified hard shell turtles. Higher numbers of interactions with loggerhead turtles were observed starting in late 2017. In total, 21, 33, and 20 loggerhead turtles were

[4] https://www.fisheries.noaa.gov/resource/data/pacific-islands-longline-quarterly-and-annual-reports

observed in 2017, 2018, 2019, respectively, based on interaction date summary (Table 49). The fishery was closed May-December 2018 due to a stipulated settlement, and March-December 2019 due to reaching the loggerhead hard cap, thus interaction rate data for these years are not directly comparable to other years in which the fishery operated throughout the year. Loggerhead turtle interactions in 2020 were lower than the previous three years, although shallow-set effort in 2020 was not reflective of a typical fishing year due to 1) the shallow-set vessels voluntarily reducing effort in the first quarter after majority of the 2020 loggerhead turtle interactions were observed in January; and 2) impacts from the COVID-19 pandemic especially in second quarter. Observed loggerhead turtle interactions in 2021 and 2022 returned to 2017-2019 levels with 19 and 24 interactions respectively. In 2023, the observed number of loggerhead turtle interactions was the highest (48) since the reopening of the fishery in 2004. Recognizing the relatively high turtle catch in 2023, the Pelagic Plan Team at its May 2023 meeting formed a working group to initiate a detailed review of fishery performance under the loggerhead and leatherback turtle trip interaction limits. The Working Group will provide report to the Pelagic Plan Team at its May 2024 meeting. Additional discussion regarding the higher number of loggerhead turtle interactions observed since 2017 is provided in Section 3.3.1.3.2, and a summary of an analysis evaluating the experimental oceanographic TurtleWatch product is provided in Section 4.1.

Table 49. Observed takes, mortalities (M), and takes per fishing effort (1,000 hooks) for sea turtles in the Hawaii shallow-set longline fishery based on interaction date for comparison with the shallow-set sea turtle hard caps, 2004-2023[a]

Year	Observer Coverage (%)	Sets	Hooks	Green		Leatherback		Loggerhead		Olive ridley		Unidentified hard shell	
				Takes	Takes/ 1,000 hooks	Takes	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks	Takes	Takes/ 1,000 hooks
2004	100	135	115,718	0	0.000	1	0.009	1	0.009	0	0.000	0	0.000
2005	100	1646	1,358,247	0	0.000	8	0.006	10	0.009	0	0.000	0	0.000
2006	100	850	676,716	0	0.000	2	0.003	17[b]	0.022	0	0.000	2[c]	0.003
2007[d]	100	1569	1,353,761	0	0.000	5	0.004	15	0.011	1	0.001	0	0.000
2008	100	1595	1,460,042	1	0.001	2	0.001	0	0.000	2	0.001	0	0.000
2009	100	1761	1,694,550	1	0.001	9	0.005	3	0.002	0	0.000	0	0.000
2010	100	1872	1,835,182	0	0.000	8	0.004	7	0.004	0	0.000	0	0.000
2011	100	1474	1,505,467	4	0.003	16	0.011	12	0.008	0	0.000	0	0.000
2012	100	1364	1,476,969	0	0.000	7[e]	0.005	6	0.004	0	0.000	0	0.000
2013	100	962	1,074,909	0	0.000	10	0.009	6[f]	0.006	0	0.000	1[g]	0.001
2014	100	1338	1,470,683	1	0.001	16	0.011	14	0.010	1	0.001	1	0.001
2015	100	1156	1,274,805	0	0.000	5	0.004	13	0.011	1	0.001	0	0.000
2016	100	727	796,165	0	0.000	5	0.006	15	0.019	0	0.000	0	0.000
2017	100	1005	1,083,216	2	0.002	4	0.004	21(1)	0.019	4	0.004	0	0.000
2018	100	420	486,013	1	0.002	6	0.012	33(1)	0.068	1	0.002	0	0.000
2019	100	314	374,487	0	0.000	0	0.000	20	0.053	2(1)	0.005	0	0.000
2020	100	479	624,579	0	0.000	2	0.003	15(1)	0.024	0	0.000	0	0.000
2021	100	804	1,026,373	1	0.001	3	0.003	19	0.019	2	0.002	1	0.001
2022	100	971	1,242,997	0	0.000	11	0.009	24	0.019	2	0.002	0	0.000
2023	100	909	1,139,864	0	0.000	11	0.010	48(1)	0.042	2	0.002	1[g]	0.001

[a] Take data based on interaction dates. Set and hook data based on haul begin date as a proxy for interaction date.
[b] The released conditions of one loggerhead was unknown.
[c] The released condition of one unidentified hard shell turtle was unknown.
[d] 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.
[e] The released condition of one leatherback was unknown.
[f] 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.
[g] Turtles listed as an unidentified hard shell sea turtle in the Observer Program Status Report are classified as a loggerhead per protocol for the shallow-set interaction limit and count toward the annual shallow-set limit or individual trip limit.
Sources: PIRO Sustainable Fisheries Division unpublished data.

3.3.1.3.1 Comparison of Interactions with ITS

Due to a fishery closure in March 2019, the Hawaii shallow-set longline fishery in 2019 operated solely under the ITSs in the 2012 Biological Opinion (NMFS 2012). The ITS from the June 26, 2019 Biological Opinion took effect in January 2020 when the fishery reopened.

Under the 2019 Biological Opinion, NMFS will monitor the ITSs for the Hawaii shallow-set longline fishery annually starting in January 2020 to track incidental take. NMFS uses the date of the interaction for tracking sea turtle interactions against the ITS (Table 50), regardless of when the vessel returns to port. NMFS uses the post-hooking mortality criteria (Ryder et al. 2006) to estimate sea turtle mortality rates. Total mortality estimates are rounded to the nearest integer.

The ITS for loggerhead sea turtles were exceeded in 2023. On October 27, 2023, NMFS reinitiated ESA Section 7 consultation for the shallow-set longline fishery due to exceedance of the ITS of 36 loggerhead sea turtles in the 2019 Biological Opinion, and determined that the conduct of the fishery during the period of the consultation will not violate ESA Sections 7(a)(2) and 7(d). On March 12, 2024, NMFS issued a Supplemental Biological Opinion for loggerhead sea turtles, which concluded that the shallow-set longline fishery is not likely to jeopardize species. The new ITS took effect when the Supplemental Biological Opinion was signed, and thus did not apply in 2023.

The 2019 Biological Opinion remains valid for all other species, and no other ITS was exceeded in 2023.

Table 50. Observed interactions and estimated total mortality (M) (using Ryder et al. 2006) of sea turtles in the Hawaii shallow-set longline fishery compared to the 1-year ITS in the 2019 Biological Opinion[a]

Species	1-year ITS Interactions (M)	Interactions (M)			
		2020	2021	2022	2023
Green turtle	5(1)	0(0)	1(0)	0(0)	0(0)
Leatherback turtle	21(3)	2(1)	3(1)	11(3)	11(3)
Loggerhead turtle (North Pacific DPS)	36(6)	15(2)	20(4)[c]	24(4)	49(10)[c]
Olive ridley turtle	5(1)	0(0)	2(0)	2(0)	2(0)

[a] Mortality estimates are round to the nearest whole number.
[b] Takes are counted based on interaction date.
[c] Includes one unidentified hardshell turtle.

3.3.1.3.2 Effectiveness of FEP Conservation Measures

Management measures in the Hawaii 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 from squid bait to mackerel bait, resulted in an 89% decrease in sea turtle interactions in 2004-2006 compared to interactions observed in 1994 through 2002 (Gilman et al. 2007). A more recent analysis, including observer data through 2014, show that these mitigation measures continue to be effective with reductions in leatherback and loggerhead turtle interaction rates of 84% and 95%, respectively, for the post-regulation period (Swimmer et al. 2017). The rate of deeply hooked sea turtles, which is thought to result in higher mortality levels, also declined after those measures were implemented (Gilman et al. 2007).

From 2012 to 2018, the fishery did not reach the annual hard cap for either leatherback or loggerhead turtles (26 and 34, respectively, based on the 2012 Biological Opinion ITSs). The Hawaii shallow-set longline fishery was closed in May 2018 pursuant to a settlement agreement. At the time of the closure, the fishery had 33 loggerhead interactions (Table 49), thus the fishery was closed prior to reaching the annual hard cap limit of 34 turtles. From 2004 to 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 the leatherback hard cap in 2011 (Table 49). Due to the 2018 stipulated settlement agreement, the hard cap limit of 17 loggerhead turtles was reinstated based on the 2004 Biological Opinion when the fishery reopened on January 1, 2019, and remained in place until September 17, 2020. In 2019, the fishery closed on March 19 due to reaching the loggerhead hard cap limit of 17[5], and the fishery reopened on January 1, 2020.
In 2017–2019, loggerhead turtle interactions in the Hawaii shallow-set longline fishery were higher than levels previously observed since the fishery reopened in 2004. A total of 21 loggerhead interactions were observed in 2017, 33 loggerhead interactions observed from January 2018 to the fishery closure in May, and 20 loggerhead interactions observed from January 2019 to the fishery closure in March. The increase in loggerhead interactions may be explained by the high reproductive output at their source nesting beaches in Japan. Loggerhead turtle nest counts increased nearly an order of magnitude from 1997 to 2014. The high levels of nesting likely resulted in higher hatchling production. Most of the loggerhead turtles observed interacting with the Hawaii shallow-set longline fishery in 2017 and 2018 were in the range of 40 to 60 cm straight carapace length, which is estimated to be approximately 3 to 10 years in age and consistent with the period of high nesting in Japan.

In response to the higher number of loggerhead turtle interactions in the shallow-set fishery, the Council in 2018 developed management measures to provide managers and fishery participants with the necessary tools to respond to and mitigate fluctuations in loggerhead and leatherback turtle interactions, and to ensure a continued supply of fresh swordfish to U.S. markets, consistent with the conservation needs of these sea turtles. At its 179th Meeting in August 2019, the Council took final action to amend the Pelagic FEP to modify sea turtle mitigation measures for the shallow-set fishery, incorporating provisions required under the 2019 Biological Opinion Reasonable and Prudent Measures (RPMs) and Terms and Conditions 1a and 1b. Specifically, the Council recommended 1) setting an annual fleet-wide hard cap limit on the number of leatherback turtle interactions at 16, consistent with RPMs and Terms and Conditions 1a under the 2019 Biological Opinion; 2) not setting an annual fleet-wide hard cap limit on the number of North Pacific loggerhead turtle interactions; and 3) establishing individual trip interaction limits for loggerhead and leatherback turtles for the shallow-set fishery, consistent with RPMs and Terms and Conditions 1b under the 2019 Biological Opinion. NMFS published the Notice of Availability for Amendment 10 on January 23, 2020 (85 FR 3889) and the proposed rule on February 4, 2020 (85 FR 6131). Amendment 10 became effective on April 22, 2020, and the

[5] The actual observed number of interactions for 2019 was 20 loggerhead turtles due to the fishery having multiple observed interactions on the day the hard cap was reached.

regulations implementing the amendment became effective on September 17, 2020 (85 FR 57988).

As part of the final action for Amendment 10, the Council recommended an annual review of the fishery's performance under the trip interaction limits in the annual SAFE report. The review is scheduled to be reported out at the 199th Council meeting in June 2024. Table 51 shows the distribution of the shallow-set vessels' interactions with loggerhead and leatherback turtle interactions from January 1 – December 31, 2023. The current limits are five loggerhead turtle interactions per trip or two leatherback turtle interactions per trip. In 2023, two trips reached the leatherback trip limit and one trip reached the loggerhead trip limit.

Table 51. Number of shallow-set longline trips by the number of loggerhead and leatherback turtle interactions per trip, January 1 – December 31, 2023. The total number of trips in this period was 74

Loggerhead turtles		Leatherback turtles	
Number of turtles per trip	Number of trips[a]	Number of turtles per trip	Number of trips
0	49[b]	0	65
1	12[b]	1	7
2	6	≥2	2
3	4	--	--
≥4	2	--	--

[a] Number of trips based on haul begin date.
[b] Includes one unidentified hardshell turtle.

3.3.1.4 MARINE MAMMAL INTERACTIONS IN THE HAWAII SHALLOW-SET LONGLINE FISHERY

Table 52 through Table 56 summarize the incidental take data of marine mammals from 2004 to 2023 in the Hawaii shallow-set longline fishery. Since there is full observer coverage for this fishery, all marine mammal interactions are 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 further examined by NMFS, and updated information necessary for any data analyses is available from PIFSC. The incidental take data for the fourth quarter of 2007 were combined with 2008 data due to vessel confidentiality rules.

The majority of observed cetacean interactions and all mortalities during this time period involved small dolphin species (Table 52). Of these species, Risso's dolphins had the highest rate of interactions over time, followed by bottlenose dolphins, striped dolphins, common dolphins, and rough-toothed dolphins with a single take. In 2023, a spotted dolphin was recorded observed in the fishery for the first time. Marine mammals grouped as small whales (Table 53) and large whales (Table 54) had comparatively lower rates of interactions than most small dolphin species. Small and large whales with observed interactions since 2004 include false killer whale, Blainville's beaked whale, unidentified *Kogia* species, ginkgo-tooth beaked whale, Bryde's whale, humpback whale, and fin whale. Observed interactions with unidentified cetaceans are shown in Table 55.

Interactions with pinnipeds, including Northern elephant seals, Guadalupe fur seals, and unidentified pinniped species have been occasionally observed since 2013 (Table 56). All pinniped interactions were observed outside of the EEZ off of California, while fishing under the Hawaii longline limited entry permit. No pinniped interactions were observed in 2016, 2018, 2021, and 2023.

Most of the pinniped interactions to date have occurred in the fourth quarter in areas east of 130 degrees west. Effort in this quarter has increased since 2012, which likely partially explains the increase in pinniped interactions. However, demographic and oceanographic influences may also be playing a role in the increase in interactions, particularly for Guadalupe fur seals. The rebound of this species from near extinction has resulted in an increase in both the overall number of seals and their spatial extent, as they reoccupy the northern portion of their historic migration range (e.g., D'Agnese et al. 2020). Further, foraging studies have indicated that during anomalous warming events in the northeastern Pacific, such as those that occurred between 2014 and 2016, Guadalupe fur seals expand their foraging areas to the north and offshore (Amador-Capitanachi et al. 2020). These conditions may have also precipitated the Unusual Mortality Event, which has involved the stranding of over 700 predominantly young Guadalupe fur seals along the US West Coast between 2015 and 2021.[6] Although the marine heatwave of 2014-2016 was the largest and longest on record since monitoring began in 1982, large marine heatwaves have occurred each year since 2019.[7] The occurrence of Guadalupe fur seal interactions in 2015-2017, 2020, and 2022 is thus not surprising. In 2018, 2021and 2023, there was limited fishing effort east of 130 degrees west and no pinniped interactions, suggesting a dynamic relationship between oceanographic conditions and fishing effort is likely driving pinniped interactions in this fishery.

[6] https://www.fisheries.noaa.gov/national/marine-life-distress/2015-2021-guadalupe-fur-seal-unusual-mortality-event-california

[7] https://www.integratedecosystemassessment.noaa.gov/california-current-marine-heatwave-tracker-blobtracker

Table 52. Observed takes, mortalities (M), and takes per fishing effort (1,000 hooks) for dolphins in the Hawaii shallow-set longline fishery, 2004-2023[a]

Year	Observer Coverage (%)	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
2004	100	88	76,750	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2005	100	1,604	1,328,806	0	0.000	1	0.001	0	0.000	0	0.000	0	0.000
2006	100	939	745,125	1	0.001	2(1)	0.003	0	0.000	0	0.000	0	0.000
2007[b]	100	1,496	1,292,036	3	0.002	3	0.002	0	0.000	0	0.000	0	0.000
2008	100	1,487	1,350,127	0	0.000	4(1)	0.003	0	0.000	0	0.000	1	0.001
2009	100	1,833	1,767,128	0	0.000	3	0.002	0	0.000	0	0.000	0	0.000
2010	100	1,879	1,828,529	2	0.001	7(1)	0.004	0	0.000	0	0.000	2(1)	0.001
2011	100	1,579	1,611,395	2	0.001	4	0.002	0	0.000	1[c]	0.001	0	0.000
2012	100	1,307	1,418,843	1	0.001	0	0.000	0	0.000	0	0.000	1	0.001
2013	100	912	1,000,084	2(1)	0.002	3	0.003	1(1)	0.001	0	0.000	0	0.000
2014	100	1,349	1,509,727	4	0.003	6(2)	0.004	0	0.000	1	0.001	2	0.001
2015	100	1,178	1,286,628	2	0.002	3(2)	0.002	0	0.000	0	0.000	0	0.000
2016	100	778	849,681	1	0.001	2	0.002	0	0.000	0	0.000	1	0.001
2017	100	973	1,051,426	0	0.000	2	0.002	0	0.000	0	0.000	1	0.001
2018	100	476	546,371	1	0.002	2	0.004	0	0.000	0	0.000	0	0.000
2019	100	312	374,487	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2020	100	455	588,481	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2021	100	763	972,692	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2022	100	971	1,242,997	1	0.001	2	0.002	0	0.000	0	0.000	0	0.000
2023	100	909	1,139,864	2(1)	0.002	2(1)	0.002	0	0.000	0	0.000	0	0.000

[a] Take data based on interaction dates. Set and hook data based on haul begin date as a proxy for interaction date..
[b] 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.
[c] Animal is identified as only a common dolphin in the Observer Program Status Report.
Source: 2004-2020 PIRO Observer Program Annual and Quarterly Status Reports, PIRO Sustainable Fisheries Division unpublished data.

Table 53. Observed takes, mortalities (M), and takes per fishing effort (1,000 hooks) for small whales in the Hawaii shallow-set longline fishery, 2004-2023[a]

Year	Obs. Cov. (%)	Sets	Hooks	Blainville's beaked whale		False killer whale		*Kogia* spp.		Pygmy sperm whale		Ginkgo-toothed beaked whale	
				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
2004	100	135	115,718	0	0.000	0	0.000	0	0.000	0	0.000	2004	100
2005	100	1,646	1,358,247	0	0.000	0	0.000	0	0.000	0	0.000	2005	100
2006	100	850	676,716	0	0.000	0	0.000	0	0.000	0	0.000	2006	100
2007[b]	100	1,569	1,353,761	0	0.000	0	0.000	0	0.000	0	0.000	2007[b]	100
2008	100	1,595	1,460,042	0	0.000	1	0.001	1	0.001	0	0.000	2008	100
2009	100	1,761	1,694,550	0	0.000	1	0.001	0	0.000	0	0.000	2009	100
2010	100	1,872	1,835,182	0	0.000	0	0.000	0	0.000	0	0.000	2010	100
2011	100	1,474	1,505,467	1	0.001	1	0.001	0	0.000	0	0.000	2011	100
2012	100	1,364	1,476,969	0	0.000	1	0.001	0	0.000	0	0.000	2012	100
2013	100	962	1,074,909	0	0.000	0	0.000	0	0.000	0	0.000	2013	100
2014	100	1,338	1,470,683	0	0.000	1	0.001	0	0.000	1	0.001	2014	100
2015	100	1,156	1,274,805	0	0.000	0	0.000	0	0.000	0	0.000	2015	100
2016	100	727	796,165	0	0.000	0	0.000	0	0.000	0	0.000	2016	100
2017	100	1,005	1,083,216	0	0.000	0	0.000	0	0.000	0	0.000	2017	100
2018	100	420	486,013	0	0.000	0	0.000	0	0.000	0	0.000	2018	100
2019	100	314	374,487	0	0.000	0	0.000	0	0.000	0	0.000	2019	100
2020	100	479	624,579	0	0.000	1	0.002	0	0.000	0	0.000	2020	100
2021	100	804	1,026,373	0	0.000	0	0.000	0	0.000	0	0.000	2021	100
2022	100	971	1,242,997	0	0.000	0	0.000	0	0.000	0	0.000	2022	100
2023	100	909	1,139,864	0	0.000	0	0.000	0	0.000	0	0.000	2023	100

[a] Take data based on interaction dates. Set and hook data based on haul begin date as a proxy for interaction date.

[b] 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.

Source: 2004-2020 PIRO Observer Program Annual and Quarterly Status Reports; PIRO Sustainable Fisheries Division unpublished data.

Table 54. Observed takes, mortalities (M), and takes per fishing effort (1,000 hooks) for large whales in the Hawaii shallow-set longline fishery, 2004-2023[a]

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	135	115,718	0	0.000	0	0.000	0	0.000
2005	100	1,646	1,358,247	1	0.001	0	0.000	0	0.000
2006	100	850	676,716	0	0.000	1	0.001	0	0.000
2007[b]	100	1,569	1,353,761	0	0.000	0	0.000	0	0.000
2008	100	1,595	1,460,042	0	0.000	1	0.001	0	0.000
2009	100	1,761	1,694,550	0	0.000	0	0.000	0	0.000
2010	100	1,872	1,835,182	0	0.000	0	0.000	0	0.000
2011	100	1,474	1,505,467	0	0.000	1	0.001	0	0.000
2012	100	1,364	1,476,969	0	0.000	0	0.000	0	0.000
2013	100	962	1,074,909	0	0.000	0	0.000	0	0.000
2014	100	1,338	1,470,683	0	0.000	0	0.000	0	0.000
2015	100	1,156	1,274,805	0	0.000	1	0.001	1	0.001
2016	100	727	796,165	0	0.000	0	0.000	0	0.000
2017	100	1,005	1,083,216	0	0.000	0	0.000	0	0.000
2018	100	420	486,013	0	0.000	0	0.000	0	0.000
2019	100	314	374,487	0	0.000	0	0.000	0	0.000
2020	100	479	624,579	0	0.000	0	0.000	0	0.000
2021	100	804	1,026,373	0	0.000	0	0.000	0	0.000
2022	100	971	1,242,997	0	0.000	0	0.000	0	0.000
2023	100	909	1,139,864	0	0.000	0	0.000	0	0.000

[a] Take data based on interaction dates. Set and hook data based on haul begin date as a proxy for interaction date.
[b] 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.
Source: 2004-2020 PIRO Observer Program Annual and Quarterly Status Reports; PIRO Sustainable Fisheries Division unpublished data.

Table 55. Observed takes, mortalities (M), and takes per fishing effort (1,000 hooks) for unidentified dolphins, beaked whales, whales, and cetaceans in the Hawaii shallow-set longline fishery, 2004-2023[a]

Year	Obs. Cov. (%)	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	135	115,718	0	0.000	0	0.000	0	0.000	2004	100
2005	100	1,646	1,358,247	0	0.000	0	0.000	0	0.000	2005	100
2006	100	850	676,716	0	0.000	0	0.000	0	0.000	2006	100
2007[c]	100	1,569	1,353,761	0	0.000	0	0.000	0	0.000	2007[c]	100
2008	100	1,595	1,460,042	0	0.000	0	0.000	2	0.001	2008	100
2009	100	1,761	1,694,550	0	0.000	0	0.000	0	0.000	2009	100
2010	100	1,872	1,835,182	1	0.001	0	0.000	1	0.001	2010	100
2011	100	1,474	1,505,467	0	0.000	1	0.001	1	0.001	2011	100
2012	100	1,364	1,476,969	0	0.000	0	0.000	1	0.001	2012	100
2013	100	962	1,074,909	0	0.000	2	0.002	0	0.000	2013	100
2014	100	1,338	1,470,683	0	0.000	0	0.000	0	0.000	2014	100
2015	100	1,156	1,274,805	0	0.000	0	0.000	0	0.000	2015	100
2016	100	727	796,165	0	0.000	0	0.000	0	0.000	2016	100
2017	100	1,005	1,083,216	0	0.000	0	0.000	0	0.000	2017	100
2018	100	420	486,013	0	0.000	0	0.000	0	0.000	2018	100
2019	100	314	374,487	0	0.000	0	0.000	0	0.000	2019	100
2020	100	479	624,579	0	0.000	0	0.000	0	0.000	2020	100
2021	100	804	1,026,373	0	0.000	1	0.001	0	0.000	2021	100
2022	100	971	1,242,997	0	0.000	1	0.001	0	0.000	2022	100
2023	100	909	1,139,864	0	0.000	1	0.001	1	0.001	2023	100

[a] Take data based on interaction dates. Set and hook data based on haul begin date as a proxy for interaction date.
[b] Unidentified species identification based on PIRO Observer Program classifications. Unidentified cetacean refers to a marine mammal not including pinnipeds (seal or sea lion), and for the purpose of this table, includes animals coded as unidentified whales; 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] 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.

Source: 2004-2020 PIRO Observer Program Annual and Quarterly Status Reports; PIRO Sustainable Fisheries Division unpublished data.

Table 56. Observed takes, mortalities (M), and takes per fishing effort (1,000 hooks) for pinnipeds in the Hawaii shallow-set longline fishery, 2004-2023[a]

Year	Obs. Cov. (%)	Sets	Hooks	Northern elephant seal		Guadalupe fur seal		Unidentified pinniped		Unidentified sea lion		Unidentified seal		Unidentified fur seal	
				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	Takes (M)	Takes/ 1,000 hooks
2004	100	135	115,718	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2005	100	1,646	1,358,247	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2006	100	850	676,716	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2007[b]	100	1,569	1,353,761	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2008	100	1,595	1,460,042	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2009	100	1,761	1,694,550	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2010	100	1,872	1,835,182	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2011	100	1,474	1,505,467	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2012	100	1,364	1,476,969	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2013	100	962	1,074,909	1	0.001	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2014	100	1,338	1,470,683	1	0.001	0	0.000	0	0.000	1	0.001	0	0.000	0	0.000
2015	100	1,156	1,274,805	0	0.000	1	0.001	3[c]	0.002	2[c]	0.002	0	0.000	0	0.000
2016	100	727	796,165	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2017	100	1,005	1,083,216	0	0.000	3[c]	0.003	0	0.000	0	0.000	0	0.000	0	0.000
2018	100	420	486,013	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2019	100	314	374,487	0	0.000	0	0.000	0	0.000	0	0.000	1	0.003	0	0.000
2020	100	479	624,579	0	0.000	7	0.011	0	0.000	0	0.000	0	0.000	2	0.003
2021	100	804	1,026,373	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2022	100	971	1,242,997	0	0.000	2(1)	0.002	1	0.001	0	0.000	0	0.000	0	0.000
2023	100	909	1,139,864	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000

[a] Take data based on interaction dates. Set and hook data based on haul begin date as a proxy for interaction date.
[b] 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.
[c] The interactions with these pinnipeds and sea lions occurred off the California coast, outside the EEZ, while fishing under the Hawaii Longline Permit.
Source: 2004-2020 PIRO Observer Program Annual and Quarterly Status Reports; PIRO Sustainable Fisheries Division unpublished data.

3.3.1.4.1 Comparison of Interactions with ITS

The 2019 Biological Opinion includes a 1-year ITS of 11 interactions and 9 mortalities with the Guadalupe fur seal. NMFS will monitor the ITSs for the Hawaii shallow-set longline fishery annually starting in January 2020 to track incidental take. NMFS uses the date of the interaction for tracking pinniped interactions against the ITS (Table 57) regardless of when the vessel returns to port. Prior to 2021, NMFS counted interactions based on vessel arrival dates in the PIRO Observer Program Quarterly and Annual Reports. For this reason, the number of annual interactions counted against an ITS may vary from those reported on the Observer Program's quarterly and annual reports. For the purpose of ITS tracking, NMFS uses the mortality rate estimate of 0.80 from the 2019 Biological Opinion to estimate the Guadalupe fur seal mortalities.

Table 57. Observed interactions and estimated total mortalities (M) of Guadalupe fur seals in the Hawaii shallow-set longline fishery compared to the 1-year ITS in the 2019 Biological Opinion[a]

Species	1-year ITS Interactions (M)	Interactions (M)			
		2020	2021	2022	2023
Guadalupe fur seal	11(9)	7(6)	0(0)	2(2)	0(0)
Unidentified fur seal[b]	N/A	2(2)	0(0)	0(0)	0(0)
Unidentified pinniped	N/A	0(0)	0(0)	1(1)	0(0)

[a] Takes are counted based on interaction date.
[b] Unidentified fur seal interactions are also tracked as the ITS was based on interaction data that included unidentified pinniped species that may have been Guadalupe fur seals.

3.3.1.4.2 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 Hawaii shallow-set longline fishery is presented in Table 58. The PBR of a stock reflects only marine mammals of that stock observed within the EEZ around Hawaii, with the exception of the Hawaii stock of humpback whales and Guadalupe fur seals 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.

For marine mammal stocks where the PBR is available, the mean annual M&SI for the shallow-set longline fishery inside the EEZ around Hawaii is well below the corresponding PBR in the time period covered by the current SAR (Table 58).

Table 58. Summary of mean annual mortality and serious injury (M&SI) and potential biological removal (PBR) by marine mammal stocks with observed interactions in the Hawaii shallow-set longline fishery

Stock	Years Included in 2022 SAR	Outside EEZ[a]	Inside EEZ	
		Mean Annual M&SI	Mean Annual M&SI	PBR (Inside EEZ only)[c]
Bottlenose dolphin, HI Pelagic	2014-2018	2	0	undetermined
Risso's dolphin, HI	2014-2018	2.8	0	61
Rough-toothed dolphin, HI	2014-2018	0	0	548
Striped dolphin, HI	2014-2018	0.5	0	291
Blainville's beaked whale, HI	2014-2018	0	0	5.6
False killer whale, HI Pelagic	2015-2019	0.0	0	16
Short-finned pilot whale, HI	2014-2018	0	0	87
Kogia spp. whale (Pygmy or dwarf sperm whale), HI	2014-2018	Pygmy = 0 Dwarf = 0	Pygmy = 0 Dwarf = 0	Pygmy = 257 Dwarf = undetermined
Humpback whale, HI	2016-2020	0		127[b]
Fin whale, HI	2014-2018	0	0	0.2
Guadalupe fur seal, CA	2013-2017	0.4		1,062[b]

[a] PBR estimates are not available for portions of the stock outside of the U.S EEZ around Hawaii, except for the Central North Pacific stock of humpback whales for which PBR applies to the entire stock.
[b] PBR and M&SI for the Hawaii stock for humpback whales and Guadalupe fur seals apply to the entire stock.
[c] PBR estimates for Hawaii stocks are only available for portions of the stock within the U.S. EEZ around Hawaii.
Source: Final 2022 Marine Mammal SARs.

3.3.1.5 SEABIRD INTERACTIONS IN THE HAWAII SHALLOW-SET LONGLINE FISHERY

Table 59 summarizes the incidental take data of seabirds from 2004 to 2022 in the Hawaii shallow-set longline fishery. Since there is full observer coverage for this fishery, the interactions in Table 63 represent fishery-wide totals.

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 any given year). 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 further examined by NMFS, and updated information necessary for any data analyses is available from NMFS.

NMFS annually publishes the report Seabird Interactions and Mitigation Efforts in Hawaii 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. Recent reports are available at: https://www.fisheries.noaa.gov/pacific-islands/bycatch/seabird-interactions-pelagic-longline-fishery.

The majority of observed interactions and all mortalities during this time period involved Laysan albatrosses and black-footed albatrosses. The fishery has also had a small number of interactions with shearwaters and a northern fulmar, all of which were released injured, and one interaction with an unidentified gull that was released dead. NMFS identified the shearwaters as sooty shearwaters (NMFS 2016). There have been no observed takes of short-tailed albatrosses by this fishery.

Table 59 shows an increase in takes of black-footed albatrosses 2008 through 2017. Black-footed albatross takes from 2018 to 2020 were lower, which may be explained by temporal patterns in interactions. In typical years, the majority of black-footed albatross interactions occur in the second quarter (April-June), but there was lower than average or no fishing effort in that quarter in 2018 through 2020. The shallow-set longline fishery was closed May-December 2018 and March-December 2019 and had limited effort in the second quarter in 2020 due to the COVID-19 pandemic. Laysan albatross interactions were also low in 2017-2018. Interaction rate data for 2018-2020 are therefore not directly comparable to other years in which the fishery operated throughout the year. In 2023, Laysan and black-footed albatross interactions were within the range of expected levels with the fishery operating year-round.

In the process of developing a regulatory amendment to modify seabird mitigation measures in the Hawaii deep-set longline fishery (see Section 3.3.2.5), the Council at the 185th meeting in March 2021 considered options for modifying the shallow-set longline fishery seabird mitigation measures. Based on input from its advisory bodies and industry representatives and because conditions differ in the shallow-set longline fishery as compared to the deep-set longline fishery, the Council recommended additional research under an Experimental Fishing Permit (EFP) and development of an appropriate combination of mitigation measures for the shallow-set longline fishery. The Council placed high priority on identifying a combination of mitigation measures that maintain effectiveness of seabird deterrence during dusk compared to the existing night-setting suite of measures, to provide operational flexibility in starting the setting operations before sunset.

NMFS received an EFP application from the Hawaii Longline Association in November 2021 to conduct a pilot study of tori lines with gear setting starting at dusk, and the Council at its 189th meeting in December 2021 recommended the issuance of the EFP. NMFS issued the EFP on March 24, 2022, and the study was initiated in 2022. Field trials were delayed to early 2024, and a project report is expected by fall 2024.

3.3.1.5.1 Comparison of Interactions with ITS

The short-tailed albatross ITS in the USFWS 2012 Biological Opinion for the Hawaii 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 albatrosses in the fishery, the ITS has not been exceeded as of the end of 2023.

Table 59. Observed takes, mortalities (M), and takes per fishing effort (1,000 hooks) for seabirds in the Hawaii shallow-set longline fishery, 2004-2023[a]

Year	Obs. Cov. (%)	Sets	Hooks	Laysan Albatross		Black-footed Albatross		Northern fulmar		Unidentified shearwater		Unidentified gull		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)	Takes/ 1,000 hooks	Takes (M)
2004	100	135	115,718	1	0.009	0	0.000	0	0.000	0	0.000	0	0.000	0
2005	100	1,646	1,358,247	62(18)	0.046	7(4)	0.005	0	0.000	0	0.000	0	0.000	0
2006	100	850	676,716	8(3)	0.0112	3(3)	0.004	0	0.000	0	0.000	0	0.000	0
2007[b]	100	1,569	1,353,761	40(6)	0.030	8(2)	0.006	0	0.000	0	0.000	0	0.000	0
2008	100	1,595	1,460,042	33(11)	0.023	6(4)	0.004	0	0.000	0	0.000	0	0.000	0
2009	100	1,761	1,694,550	81(17)	0.048	30(7)	0.018	0	0.000	1[c]	0.001	0	0.000	0
2010	100	1,872	1,835,182	40(7)	0.022	38(11)	0.021	1	0.001	0	0.000	0	0.000	0
2011	100	1,474	1,505,467	49(10)	0.033	19(5)	0.013	0	0.000	0	0.000	0	0.000	0
2012	100	1,364	1,476,969	62(11)	0.042	37(10)	0.025	0	0.000	0	0.000	0	0.000	0
2013	100	962	1,074,909	45(10)	0.042	28(17)	0.026	0	0.000	2[c]	0.002	0	0.000	0
2014	100	1,338	1,470,683	39(2)	0.027	32(14)	0.022	0	0.000	1[c]	0.001	0	0.000	0
2015	100	1,156	1,274,805	43(6)	0.034	38(10)	0.030	0	0.000	0	0.000	0	0.000	0
2016	100	727	796,165	25(3)	0.031	40(12)	0.050	0	0.000	0	0.000	0	0.000	0
2017	100	1,005	1,083,216	6(1)	0.006	53(20)	0.049	0	0.000	0	0.000	1(1)	0.001	0
2018	100	420	486,013	2	0.004	7(2)	0.014	0	0.000	0	0.000	0	0.000	0
2019	100	314	374,487	15(3)	0.040	19(5)	0.051	0	0.000	0	0.000	0	0.000	0
2020	100	479	624,579	26	0.042	5	0.008	1	0.002	0	0.000	0	0.000	0
2021	100	804	1,026,373	10(1)	0.010	45(11)	0.044	0	0.000	2	0.002	0	0.000	0
2022	100	971	1,242,997	38(5)	0.031	72(20)	0.057	0	0.000	0	0.000	0	0.000	0
2023	100	909	1,139,864	15(2)	0.011	23(4)	0.018	0	0.000	0	0.000	0	0.000	0

[a] Take and effort data are based on haul begin dates.
[b] 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.
[c] These birds were later identified as sooty shearwaters in the NMFS Seabird Annual Report.
Source: 2004-2020 PIRO Observer Program Annual and Quarterly Status Reports; PIRO Sustainable Fisheries Division unpublished data.

3.3.1.6 ELASMOBRANCH INTERACTIONS IN THE HAWAII SHALLOW-SET LONGLINE FISHERY

Table 60 summarizes the incidental take data of ESA-listed elasmobranchs from 2004 to 2023 in the Hawaii shallow-set longline fishery.

Oceanic whitetip sharks constitute the majority of the interactions. Observed oceanic whitetip shark interactions were substantially lower in 2004, 2006, 2018, and 2019 likely due to fishery closures. Spatial distribution of shallow-set fishing effort primarily overlaps with oceanic whitetip shark distribution (south of 30°N) in the summer months (May-June). Most of the oceanic whitetip sharks that are caught in the shallow-set fishery are released alive. Interactions in 2022 were the highest observed since 2011. Although it is premature to derive any theories on the factors driving the higher interaction rates, one possibility is the potential for increased spatial overlap of oceanic whitetip habitat with fishing effort due to warming oceans. Higher interaction rates may also be the result of potential increases in population density in the region because of international management measures prohibiting retention of the species through IATTC since 2011 and WCPFC since 2013 (WCPFC measure implemented under U.S. regulations in 2015), but these require further investigation.

Giant manta ray interactions with this fishery are rare. There were no observed interactions with scalloped hammerheads in the shallow-set fishery since 2004. Furthermore, 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.

Table 60. Observed and estimated interactions with elasmobranchs in the Hawaii shallow-set longline fishery, 2004-2023[a]

Year	Obs. Cov. (%)	Sets	Hooks	Scalloped hammerhead shark		Oceanic whitetip shark		Giant manta ray	
				Takes (M[b])	Takes/ 1,000 hooks	Takes (M[b])	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks
2004	100	135	115,718	0	0.0000	3	0.0259	0	0.0000
2005	100	1,646	1,358,247	0	0.0000	348(32)	0.2562	0	0.0000
2006	100	850	676,716	0	0.0000	1	0.0015	0	0.0000
2007	100	1,569	1,353,761	0	0.0000	98(7)	0.0724	5(2)	0.0037
2008	100	1,595	1,460,042	0	0.0000	48(8)	0.0329	0	0.0000
2009	100	1,761	1,694,550	1(1)	0.0006	53(13)	0.0313	0	0.0000
2010	100	1,872	1,835,182	0	0.0000	90(17)	0.0490	6	0.0033
2011	100	1,474	1,505,467	0	0.0000	78(9)	0.0518	3(2)	0.0020
2012	100	1,364	1,476,969	1(1)	0.0007	24(2)	0.0162	0	0.0000
2013	100	962	1,074,909	0	0.0000	27(2)	0.0251	0	0.0000
2014	100	1,338	1,470,683	0	0.0000	21(3)	0.0143	1	0.0007
2015	100	1,156	1,274,805	0	0.0000	22(2)	0.0173	0	0.0000
2016	100	727	796,165	0	0.0000	32(3)	0.0402	0	0.0000
2017	100	1,005	1,083,216	0	0.0000	29(1)	0.0268	2	0.0018
2018	100	420	486,013	0	0.0000	1(1)	0.0021	0	0.0000
2019	100	314	374,487	0	0.0000	0	0.0000	0	0.0000
2020	100	479	624,579	0	0.0000	13(1)	0.0208	0	0.0000
2021	100	804	1,026,373	0	0.0000	45(6)	0.0438	0	0.0000
2022	100	971	1,242,997	0	0.0000	54(7)	0.0434	3	0.0024
2023	100	909	1,139,864	0	0.0000	13	0.0114	0	0.0000

[a] Take and effort data are based on haul begin dates.
[b] Mortality numbers include sharks that were released dead or retained (prior to applicable prohibition on retention).
Source: PIRO Sustainable Fisheries Division unpublished data.

3.3.1.6.1 Comparison of Interactions with ITS

An ITS is not required to provide protective coverage for oceanic whitetip sharks and giant manta rays because there are no take prohibitions under ESA section 4(d) for these species. However, the 2019 Biological Opinion includes 1-year ITSs for oceanic whitetip sharks and giant manta rays to serve as a check on the no-jeopardy conclusion by providing a reinitiation trigger if the level of take analyzed in the Biological Opinion is exceeded.

NMFS will monitor the ITSs for the Hawaii shallow-set longline fishery annually starting in January 2020 to track incidental take. NMFS uses the date of the interaction (begin haul date) for tracking elasmobranch interactions against the ITS (Table 61) regardless of when the vessel returns to port. Prior to 2021, NMFS counted sea turtle interactions based on vessel arrival dates the PIRO Observer Program Quarterly and Annual Reports. For this reason, the number of annual interactions counted against an ITS may vary from those reported on the Observer Program's quarterly and annual reports. For the purpose of ITS tracking, NMFS uses the mortality rate estimates of 0.19 for oceanic whitetip sharks and 0.41 for large rays from the 2019 Biological Opinion to estimate mortalities.

Table 61. Observed interactions and estimated total mortalities (M) of oceanic whitetip shark and giant manta ray in the Hawaii shallow-set longline fishery compared to the 1-year ITS in the 2019 Biological Opinion[a]

Species	1-year ITS Interactions (M)	Interactions (M[c])			
		2020	2021	2022	2023
Oceanic whitetip shark	102(32)	13(3)	45(13)	54(16)	13(2)
Giant manta ray	13(4)	0(0)	0(0)	3(1)	0
Manta/Mobula[b]		1(0)	4(2)	0	1(0)

[a] Takes are counted based on begin haul date.
[b] 24.6% of manta/mobula interactions are also tracked as the ITS for giant manta ray was based on interaction data that included rays classified as manta/mobula in the observer record that may have been giant manta rays.
[c] Mortality rates are from the 2019 Biological Opinion and are based on 2004-2018 interaction data.

3.3.2 HAWAII DEEP-SET LONGLINE FISHERY

3.3.2.1 INDICATORS FOR MONITORING PROTECTED SPECIES INTERACTIONS AND EFFECTIVENESS OF MANAGEMENT MEASURES IN THE HAWAII DEEP-SET LONGLINE FISHERY

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

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

3.3.2.1.1 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.
- Longline vessel owners/operators are required to remove trailing gear from oceanic whitetip sharks and cut the line as close to the hook as possible.
- 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").
- Vessel owners and operators are required to annually attend a protected species workshop.
- When deep-set longline fishing, the use of wire leaders is prohibited.

The final rule for the following regulatory amendment to the Pelagic FEP that affect conservation measures for the Hawaii deep-set longline fishery was issued on March 1, 2024 (89 FR 15062) and will took effect on April 1, 2024; thus this rule was not yet in effect during the 2023 calendar year:

- Replace blue-dyed thawed bait and strategic offal discharge measures required for stern-setting deep-set longline vessels with a new tori line requirement (Council final action in December 2021; see Section 3.3.2.5) of this report for more information.

3.3.2.1.2 ESA Consultations

During the first half of 2023, the Hawaii deep-set longline fishery was covered under a NMFS Biological Opinion dated September 19, 2014 (NMFS 2014) and associated supplements. A new Biological Opinion went into effect May 18, 2023.

A USFWS Biological Opinion dated January 6, 2012, concluded that the fishery is not likely to jeopardize short-tailed albatrosses (USFWS 2012). This Biological Opinion remains valid.

NMFS concluded in the 2014 Biological Opinion 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 60). The humpback whale Hawaii DPS was delisted under the ESA in 2016, so interactions are no longer monitored against the ITS. 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. In 2017, NMFS completed a Supplement to the 2014 Biological Opinion for green, loggerhead, and olive ridley sea turtles due to exceedance of the ITS for these three species (NMFS 2017).

On October 4, 2018, NMFS reinitiated ESA Section 7 consultation for the deep-set fishery for all ESA-listed species under NMFS jurisdiction occurring in the action area due to three re-initiation triggers: listing of the oceanic whitetip shark and giant manta ray; designation of MHI insular false killer whale critical habitat; and exceeding the ITS for East Pacific green sea turtle DPS in mid-2018. On October 4, 2018, NMFS determined that the conduct of the fishery during the period of consultation will not violate ESA Sections 7(a)(2) and 7(d) (updated April 15, 2020, December 18, 2020, November 17, 2021, and January 11, 2023).

On September 28, 2022, NMFS issued a Supplemental Biological Opinion to the 2014 Biological Opinion for the two new listed species, and concluded that the deep-set fishery is not likely to jeopardize the continued existence of the oceanic whitetip shark and giant manta ray.

On May 18, 2023, NMFS issued a Biological Opinion covering all applicable ESA-listed species, which concluded that the fishery is not likely to jeopardize the following species: giant manta ray; Indo-West Pacific scalloped hammerhead shark; oceanic whitetip shark; Central North Pacific, East Indian-West Pacific, East Pacific, Southwest Pacific, Central West Pacific and Central South Pacific green sea turtles; leatherback sea turtles; North Pacific loggerhead sea turtles; olive ridley sea turtles, sperm whale, and main Hawaiian Islands insular false killer whale. The new ITSs took effect when the new Biological Opinion was signed. The new ITS has a 5-year term and all captures in 2023 will count towards the first year of the term, although captures prior to the date on the 2023 Biological Opinion signature are exempted under the previous biological opinion.

NMFS and USFWS have issued ITSs for species included in the Biological Opinions and determined these levels of take would not jeopardize the species (Table 63). Exceedance of the ITSs requires reinitiation of consultation on the fishery under the ESA.

Table 62. Summary of ESA consultations for the Hawaii deep-set longline fishery

Species or DPS	Consultation Date	Consultation Type[a]	Outcome[b]
Loggerhead turtle, North Pacific DPS	2023-05-18[c]	BiOp	LAA, non-jeopardy
Leatherback turtle	2023-05-18[c]	BiOp	LAA, non-jeopardy
Olive ridley turtle (all species or DPS)	2023-05-18[c]	BiOp	LAA, non-jeopardy
Green turtle (all species or DPS)	2023-05-18[c]	BiOp	LAA, non-jeopardy
Giant manta ray	2023-05-18[c]	BiOp	LAA, non-jeopardy
Oceanic whitetip shark	2023-05-18[c]	BiOp	LAA, non-jeopardy
Scalloped hammerhead shark, Indo-West Pacific DPS	2023-05-18[c]	BiOp	LAA, non-jeopardy
False killer whale, MHI insular DPS	2023-05-18[c]	BiOp	LAA, non-jeopardy
Sperm whale	2023-05-18[c]	BiOp	LAA, non-jeopardy
Fin whale	2023-05-18[c]	BiOp	NLAA
Blue whale	2023-05-18[c]	BiOp	NLAA
North Pacific right whale	2023-05-18[c]	BiOp	NLAA
Sei whale	2023-05-18[c]	BiOp	NLAA
Mexican humpback whale	2023-05-18[c]	BiOp	NLAA
Southern Resident killer whale	2023-05-18[c]	BiOp	NLAA
Hawaiian monk seal	2023-05-18[c]	BiOp	NLAA
Scalloped hammerhead shark, Eastern Pacific DPS	2023-05-18[c]	BiOp	NLAA
Hawksbill turtle	2023-05-18[c]	BiOp	NLAA
Loggerhead turtle, south Pacific DPS	2023-05-18[c]	BiOp	NLAA
Listed fishes and invertebrate species[d]	2023-05-18[c]	BiOp	NLAA
Short-tailed albatross	2012-01-06	BiOp (FWS)	LAA, non-jeopardy
Critical Habitat	**Consultation Date**	**Consultation Type[a]**	**Outcome[b]**
Main Hawaiian Islands insular false killer whale	2023-05-18[c]	BiOp	NLAA
Steller sea lion	2023-05-18[c]	BiOp	NLAA
Hawaiian monk seal	2023-05-18[c]	BiOp	NLAA
Leatherback sea turtle	2023-05-18[c]	BiOp	NLAA
Listed fishes and invertebrate species[e]	2023-05-18[c]	BiOp	NLAA

[a] BiOp = Biological Opinion.
[b] LAA = likely to adversely affect; NLAA = not likely to adversely affect.
[c] With correction to the Incidental Take Statement Table in the Hawaii Deep-set Longline Fishery Biological Opinion on May 22, 2023.
[d] Listed fish and invertebrate species = Central Coast coho, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, California coast steelhead, California Central Valley and southern

California coast steelhead, Southern North American green sturgeon, Corals, Black and white abalone
[e] Critical habitat for listed fish and invertebrate species = Central Coast coho, Sacramento River winter-run Chinook salmon, California coast steelhead, Southern North American green sturgeon, Black abalone.

Table 63. Summary of ITSs for the Hawaii deep-set longline fishery

Species	ITS Time Period	Takes	Source BiOp
Loggerhead turtle, North Pacific DPS	5-year running sum	43	NMFS 2023
Leatherback turtle	5-year running sum	92	NMFS 2023
Olive ridley turtle (all species or DPS)	5-year running sum	592	NMFS 2023
Green turtle (all species or DPS)	5-year running sum	77	NMFS 2023
Sperm whale	5-year running sum	6	NMFS 2023
False killer whale (MHI insular DPS)	5-year running sum	0.427 or 1 observed	NMFS 2023
Scalloped hammerhead shark (Indo-West Pacific DPS)[a]	5-year running sum	14	NMFS 2023
Oceanic whitetip shark [a]	5-year running sum	10,589	NMFS 2023
Giant manta ray [a]	5-year running sum	181	NMFS 2023
Short-tailed albatross	5-year	2	USFWS 2012

[a] An ITS is not required 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.

3.3.2.1.3 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 recent SARs are available online at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region.

The Hawaii deep-set longline fishery is a Category I fishery under the MMPA 2024 LOF (89 FR 12257, February 16, 2024), meaning that NMFS has determined that this fishery has frequent incidental mortality and serious injuries of marine mammals. The 2024 LOF lists the following marine mammal stocks that are incidentally killed or injured in this fishery:[8]

- 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
- *Kogia* spp. (Pygmy or dwarf sperm whale), HI stock
- Risso's dolphin, HI stock
- Rough-toothed dolphin, HI stock
- Short-finned pilot whale, 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

[8] This fishery is listed in the LOF under Commercial Fisheries in the Pacific Ocean and Commercial Fisheries on the High Seas. Stocks from both lists are included here.

report focuses on available long-term interaction trends and summarizes relevant information from the most recent SAR.

3.3.2.2 DATA SOURCE FOR MONITORING PROTECTED SPECIES INTERACTIONS IN THE HAWAII DEEP-SET LONGLINE FISHERY

Protected species interactions in the Hawaii longline fishery have been monitored through mandatory observer coverage since 1994. Observer coverage in the Hawaii longline fishery was between 3 and 5 percent from 1994 through 1999, increased to 10 percent in 2000, then to 20 percent in 2001.

In response to the emerging COVID-19 crisis, and to ensure the safety and protect the health of fishermen, observers, and others, NMFS issued an emergency action on March 27, 2020 (85 FR 17285), to provide the authority, on a case-by-case basis, to waive observer coverage. This action was extended on September 21, 2020 (85 FR 59199) and again on March 29, 2021 (86 FR 16307). Under this emergency action, a NMFS Regional Administrator, Office Director, or Science Center Director had the ability to waive observer coverage requirements if:

- Local, state, or national governments, or private companies or organizations that deploy observers pursuant to NMFS regulations, restrict travel or otherwise issue COVID-19-related social control guidance, or requirement(s) addressing COVID-19-related concerns, such that it is inconsistent with the requirement(s) or not recommended to place an observer(s); or
- No qualified observer(s) are available for placement due to health, safety, or training issues related to COVID-19.

The PIRO Regional Administrator granted waivers on a case-by-case basis consistent with the emergency rule resulting in reduced annual coverage for the Hawaii deep-set longline fishery for 2020 and 2021 at 15.25% and 17.84% respectively. Observer coverage was also variable in 2020 ranging from 7.7% to 18.2% in a quarter. While 2021 saw an improved coverage rate and less coverage variability (14.3% to 21.1% in a quarter), fleet-wide interaction estimates for 2021 may still have greater uncertainty than usual. Annual observer coverage rate returned to 20.2% in 2022. On October 1, 2023, NMFS changed observer coverage in the Hawaii deep-set longline fishery from 20 to 15% due to increased program costs and is evaluating options to manage observer efforts moving forward, including assessing alternative long-term options such as electronic technologies to supplement monitoring and collecting fishery data. Annual coverage in 2023 was 17.4%.

This report summarizes protected species interactions in the Hawaii 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 methods used to estimate the annual total interactions. Comparison of annual incidental takes within a year to the ITSs are based on the interaction date rather than the vessel arrival date, consistent with the 2014 BiOp and associated supplements. Annual summary data presented in this report may differ from those in the PIRO Observer Program Quarterly and Annual Reports, which began summarizing interaction data by haul begin dates (proxy for interaction date) in 2021.

3.3.2.3 SEA TURTLE INTERACTIONS IN THE HAWAII DEEP-SET LONGLINE FISHERY

Table 64 summarizes the incidental take data of sea turtles from 2002 to 2023 in the Hawaii deep-set longline fishery. The incidental take data in this section were compiled from the PIRO Observer Program Annual Status Reports through 2020 and from PIRO Sustainable Fisheries Division unpublished data beginning in 2021 and are for monitoring purposes. Many of these interactions have been further examined by NMFS, and updated information necessary for any data analyses is available from 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 are not available, a standard expansion factor estimate is used (EF Est. = 100 / % observer coverage * # takes).

Observed sea turtle takes year to year were variable. The most commonly observed sea turtle species being olive ridley sea turtles, whereas interactions with leatherbacks, greens, and loggerheads were much less frequent.

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 Hawaii deep-set longline fishery. Leatherback turtle interactions in 2017-2019 were lower than 2014-2015.

The highest number of observed olive ridley interactions occurred in 2016 with 31 takes. This was followed by three years of high olive ridley interactions with 26, 18, and 29 interactions in 2017, 2018, and 2019, respectively. Interactions in 2020-2023 were within the range observed prior to 2016. Due to the depth of the deep-set longline gear, most of the interactions result in mortalities. The higher level of olive ridley turtle interactions was considered in the 2023 Biological Opinion, which concluded that the fishery is not likely to jeopardize olive ridley turtles after considering this higher level of interaction. The Council’s Protected Species Advisory Committee at its March 2017 meeting discussed the olive ridley turtle interaction trend and recommended evaluation of the increasing trend in conjunction with the previously recommended effort to evaluate ecosystem factors influencing bycatch in the longline fishery. This recommendation led to a collaborative ecosystem-based fisheries management project between Council, PIFSC, PIRO and University of Florida to develop a protected species ensemble random forest (PSERF) model. Additional information on this effort is included in Section 4.1.

Top variables for defining olive ridley turtle interaction determined using the PSERF model indicate an influence of mean wind direction and shows that SW-W-NW winds seem to have higher probability of interactions than normal. Eddy-based features such as Okubo-Weiss (negative values indicate vorticity dominated regions e.g., eddies), eddy kinetic energy (positive values indicate high eddy activity) and current speed also seems to have higher than average probability of interactions. Together, these seem to indicate that features that result in higher turtle movement rates (wind, currents) or aggregate turtles (eddies) increase the probability of interactions with olive ridley turtles. Aggregate mean characteristics from the fishing sets indicate that for sets from 2015-2019, higher eddy activity, higher current speeds, and winds blowing from the west-southwest increased whereas these conditions waned after 2020.

Table 64. Observed takes, mortalities (M), takes per fishing effort (1,000 hooks), and estimated annual takes using expansion factor estimates and ME for sea turtles in the Hawaii deep-set longline fishery, 2002-2023[a]

Year	Obs. Cov. (%)	Sets	Hooks	Green				Leatherback				Loggerhead				Olive ridley				Unidentified hard shell			
				Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME
				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		
2002	24.6	3,523	6,786,303	1(1)	0.0001	-	3	2	0.0003	-	5	4(1)	0.0006	-	17	7(7)	0.0010	-	31	0	0.0000	-	-
2003	22.2	3,204	6,442,221	0	0.0000	-	0	1(1)	0.0002	-	4	0	0.0000	-	0	3(3)	0.0005	-	14	0	0.0000	-	-
2004	24.6	3,958	7,900,681	1(1)	0.0001	-	5	3	0.0004	-	15	0	0.0000	-	0	13(13)	0.0016	-	46	0	0.0000	-	-
2005	26.1	4,602	9,360,671	0	0.0000	-	0	1	0.0001	-	4	0	0.0000	-	0	4(4)	0.0004	-	16	0	0.0000	-	-
2006	21.2	3,605	7,540,286	2(2)	0.0003	-	6	2(2)	0.0003	-	9	0	0.0000	-	0	11(10)	0.0015	-	54	0	0.0000	-	-
2007	20.1	3,506	7,620,083	0	0.0000	-	0	2	0.0003	-	4	1(1)	0.0001	-	7	7(7)	0.0009	-	26	0	0.0000	-	-
2008	21.7	3,915	8,775,951	0	0.0000	-	0	1	0.0001	-	11	0	0.0000	-	0	3(3)	0.0003	-	18	0	0.0000	-	-
2009	20.6	3,520	7,877,861	0	0.0000	-	0	1(1)	0.0001	-	4	0	0.0000	-	0	4(4)	0.0005	-	18	0	0.0000	-	-
2010	21.1	3,580	8,184,127	1(1)	0.0001	-	1	1(1)	0.0001	-	6	1(1)	0.0001	-	6	4(3)[b]	0.0005	-	10	0	0.0000	-	-
2011	20.3	3,540	8,260,092	1(1)	0.0001	-	5	3	0.0004	-	14	0	0.0000	-	0	7(6)	0.0008	-	36	0	0.0000	-	-
2012	20.4	3,659	8,768,728	0	0.0000	-	0	1(1)	0.0001	-	6	0	0.0000	-	0	6(6)	0.0007	-	34	0	0.0000	-	-
2013	20.4	3,830	9,278,133	1(1)	0.0001	-	5	3	0.0003	-	15	2(2)	0.0002	-	11	9(9)	0.0010	-	42	0	0.0000	-	-
2014	20.8	3,831	9,608,244	3(3)	0.0003	-	16	7(2)	0.0007	-	38	0	0.0000	-	0	8(7)	0.0008	-	50	0	0.0000	-	-
2015	20.6	3,728	9,393,234	1(1)	0.0001	-	4	4(2)	0.0004	-	18	2(2)	0.0002	-	9	13(12)	0.0014	-	69	0	0.0000	-	-
2016	20.1	3,880	9,872,439	1(1)	0.0001	-	5	3(1)	0.0003	-	15	2(1)	0.0002	-	7	31(28)	0.0031	-	162	1(1)	0.0001	-	5
2017	20.4	3,832	10,148,195	3(1)	0.0003	-	18	0	0.0000	-	0	3	0.0003	-	12	26(23)	0.0026	-	119	0	0.0000	-	-
2018	20.4	4,332	11,751,144	3(3)	0.0003	-	17	2	0.0002	-	12	1(1)	0.0001	-	4	18(16)	0.0015	-	96	0	0.0000	-	-
2019	20.5	4,697	12,948,077	2(2)	0.0002	-	12	3	0.0002	-	14	0	0.0000	-	0	29(28)	0.0022	-	138	0	0.0000	-	-
2020	15.25	3,131	8,738,011	2(2)	0.0002	-	13	4	0.0005	-	31	3(1)	0.0003	-	19	11(9)	0.0013	-	79	0	0.0000	-	-
2021	17.84	3,972	11,454,331	3(3)	0.0003	-	17	1	0.0001	-	8	1	0.0001	-	5	7(5)	0.0006	-	46	0	0.0000	-	-
2022	20.22	4,314	12,473,293	1(1)	0.0001	-	6	5	0.0004	-	24	3	0.0002	-	19	10(8)	0.0008	-	49	0	0.0000	-	-
2023	17.41	3,807	10,988,431	2(2)	0.0002	11	-	4	0.0004	23	-	0	0.0000	-	-	12(11)	0.0011	69	-	1(1)	0.0001	6	-

[a] Take and effort data are based on vessel arrival dates.
[b] One olive ridley turtle interaction (released injured) occurred inside the American Samoa EEZ. This interaction was included in the Observer Program Annual Report for the Hawaii deep-set fishery because the vessel departed Honolulu under the Hawaii longline permit.
Sources: Take data—2002-2020 PIRO Observer Program Annual and Quarterly Status Reports, PIRO Sustainable Fisheries Division unpublished data. Expansion estimates for 2002-2003, NMFS 2005.
ME—McCracken, 2005; McCracken, 2006; McCracken, 2007; McCracken, 2008; McCracken, 2009; McCracken, 2010; McCracken, 2011b; McCracken, 2012; McCracken, 2013; McCracken, 2014; McCracken 2017c, McCracken 2017d, McCracken 2019b, McCracken 2019d, McCracken and Cooper 2020a, McCracken and Cooper (in review).

3.3.2.3.1 Comparison of Interactions with ITS

The 2023 Biological Opinion includes ITSs for sea turtle species based on the maximum 5-year running sum for each species (Table 65). The new ITS went into effect May 18, 2023. For the purposes of monitoring the ITS, all captures in 2023 will count towards the first year of the 5-year term. Exceeding the maximum 5-year running sum within any 5 or fewer consecutive years will lead to reinitiating consultation of the impact of this fishery on these species.

NMFS uses the interaction date for tracking sea turtle interactions against the ITS, regardless of vessel arrival date. Prior to 2021, NMFS in its PIRO Observer Program Quarterly and Annual Reports counted sea turtle interactions based on vessel arrival dates. 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.

Table 65. Estimated total interactions (extrapolated using quarterly observer coverage) of sea turtles in the Hawaii deep-set longline fishery compared to the 5-year running sum ITS in the 2023 Biological Opinion[a]

Species	5-year running sum ITS Interactions	Estimated Total Interactions and Mortalities
		2023
Leatherback turtle	92	23(8)
Green turtle	77	10(10)
Loggerhead turtle	43	0
Olive ridley turtle (all species or DPS)	592	63(60)

[a] Takes are counted based on interaction date.

3.3.2.4 MARINE MAMMAL INTERACTIONS IN THE HAWAII DEEP-SET LONGLINE FISHERY

Table 66 through Table 69 summarize the incidental take data of marine mammals from 2002 to 2023 in the Hawaii 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. 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 further examined, and updated information necessary for any data analyses is available from 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 are not available, a standard expansion factor estimate is listed in the table (EF Est. = 100 / % observer coverage * # takes).

The majority of observed interactions and all observed mortalities since 2002 involved dolphin and small whale species. False killer whales also had the highest interaction rate over the entire 2002-2023 period, with the highest number of observed interactions occurring in 2019 and 2021. Short-finned pilot whales, bottlenose dolphins, Risso's dolphins, and rough-toothed dolphins are also occasionally observed, but in 2023, only one Risso's dolphin and two rough-toothed dolphin interactions were observed and none were observed of the other species. Rough-tooth dolphin interactions were notably higher in 2020 compared to past years, but no contributing factors are readily apparent, with interactions closer to baseline levels for 2021 through 2023. Very few interactions were observed with striped dolphins, pantropical spotted dolphins, Blainville’s beaked whales, pygmy killer whales, and *Kogia* spp. whales. Interactions with marine mammals grouped as large whales were also rare, with observed interactions recorded with humpback whales and one sperm whale in 2011 (Table 68). Observed interactions with unidentified cetacean groups are shown in Table 69. In 2023, there were four observed unidentified cetacean interactions.

Table 66. Observed takes, mortalities (M), takes per fishing effort (1,000 hooks), and estimated annual takes using expansion factor estimates and ME for dolphins in the Hawaii deep-set longline fishery, 2002-2023[a]

Year	Obs. Cov. (%)	Sets	Hooks	Bottlenose dolphin				Pantropical spotted dolphin				Rough-toothed dolphin				Risso's dolphin				Striped dolphin			
				Observed				Observed				Observed				Observed				Observed			
				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	Take s (M)	Takes/ 1,000 hooks	EF Est.	ME	Takes (M)	Takes/ 1,000 hooks	EF Est.	M E
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	0.0000	-	0	2(1)	0.0002	-	10	0[b]	0.0000	-	4[b]
2016	20.1	3,880	9,872,439	1	0.0001	-	5	0	0.0000	-	0	1(1)	0.0001	-	5	0	0.0000	-	0	0	0.0000	-	0
2017	20.4	3,832	10,148,195	1	0.0001	-	7	0	0.0000	-	0	0	0.0000	-	0	1	0.0001	-	5	0	0.0000	-	0
2018	20.4	4,332	11,751,144	1	0.0001	-	3	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0
2019	20.5	4,697	12,948,077	0	0.0000	-	0	0	0.0000	-	0	1	0.0001	-	4	1(1)	0.0001	-	7	0	0.0000	-	0
2020	15.25	3,131	8,738,011	1	0.0001	-	10	0	0.0000	-	0	5(2)	0.0006	-	29	2	0.0002	-	16	0	0.0000	-	0
2021	17.84	3,972	11,454,331	3	0.0003	17	-	0	0.0000	0	-	2(1)	0.0002	11	-	0	0.0000	0	-	0	0.0000	0	-
2022	20.22	4,314	12,473,293	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-	1	0.0001	5	-	0	0.0000	0	-
2023	17.41	3,807	10,988,431	0	0.0000	0	-	0	0.0000	0	-	2	0.0002	11	-	1	0.0001	6	-	0	0.0000	0	-

[a] Take and effort data are based on vessel arrival dates.
[b] One unidentified dolphin was later identified as a striped dolphin but is listed as an unidentified dolphin in the 2015 Annual Observer Report.
Source: Take data—2002-2020 PIRO Observer Program Annual and Quarterly Status Reports, PIRO Sustainable Fisheries Division unpublished data.
ME—McCracken, 2005; McCracken, 2006; McCracken, 2011a; McCracken, 2016; McCracken, 2017b; McCracken 2019c, McCracken and Cooper 2022c.

Table 67. Observed takes, mortalities (M), takes per fishing effort (1,000 hooks), and estimated annual takes using expansion factor estimates and ME for small whales in the Hawaii deep-set longline fishery, 2002-2023[a]

Year	Obs. Cov. (%)	Sets	Hooks	Blainville's beaked whale				False killer whale				*Kogia* spp.				Pygmy killer whale				Short-finned pilot whale			
				Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME
				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		
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	-	55	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	-	21	0	0.0000	-	0	0	0.0000	-	0	1	0.0001	-	4
2016	20.1	3,880	9,872,439	0	0.0000	-	0	7	0.0007	-	39	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0
2017	20.4	3,832	10,148,195	0	0.0000	-	0	8(2)	0.0008	-	45	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0
2018	20.4	4,332	11,751,144	0	0.0000	-	0	12	0.0010	-	49	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0
2019	20.5	4,697	12,948,077	0	0.0000	-	0	15(3)	0.0012	-	75	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0
2020	15.25	3,131	8,738,011	0	0.0000	-	0	4	0.0005	-	22	1	0.0001	-	4	0	0.0000	-	0	0	0.0000	-	0
2021	17.84	3,972	11,454,331	0	0.0000	0	-	15(2)	0.0013	84	-	0	0.0000	0	-	0	0.0000	0	-	1	0.0000	6	-
2022	20.22	4,314	12,473,293	0	0.0000	0	-	7	0.0006	35	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-
2023	17.41	3,807	10,988,431	0	0.0000	0	-	6	0.0006	34	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-

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

Source: Take data—2002-2020 PIRO Observer Program Annual and Quarterly Status Reports, PIRO Sustainable Fisheries Division unpublished data

ME—McCracken, 2005; McCracken, 2006; McCracken, 2011a; McCracken, 2016; McCracken, 2017b; McCracken 2019c, McCracken and Cooper 2022c.

Table 68. Observed takes, takes per fishing effort (1,000 hooks), and estimated annual takes using expansion factor estimates and ME for large whales in the Hawaii deep-set longline fishery, 2002-2023[a]

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
2016	20.1	3,880	9,872,439	0	0.0000	-	0	0	0.0000	-	0
2017	20.4	3,832	10,148,195	0	0.0000	-	0	0	0.0000	-	0
2018	20.4	4,332	11,751,144	0	0.0000	-	0	0	0.0000	-	0
2019	20.5	4,697	12,948,077	0	0.0000	-	0	0	0.0000	-	0
2020	15.25	3,131	8,738,011	0	0.0000	-	0	0	0.0000	-	0
2021	17.84	3,972	11,454,331	0	0.0000	0	-	0	0.0000	0	-
2022	20.22	4,314	12,473,293	0	0.0000	0	-	0	0.0000	0	-
2023	17.41	3,807	10,988,431	0	0.0000	0	-	0	0.0000	0	-

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

Source: Take data—2002-2020 PIRO Observer Program Annual and Quarterly Status Reports, PIRO Sustainable Fisheries Division unpublished data.

ME—McCracken, 2005; McCracken, 2006; McCracken, 2011a; McCracken, 2016; McCracken, 2017b; McCracken 2019c; McCracken and Cooper 2022c.

Table 69. Observed takes, takes per fishing effort (1,000 hooks), and estimated annual takes using expansion factor estimates for unidentified species of cetaceans in the Hawaii deep-set longline fishery, 2002-2023[a]

Year	Obs. Cov. (%)	Sets	Hooks	Unidentified cetacean[b]			Unidentified whale[b]			Unidentified dolphin[b]			Unidentified beaked whale[b]		
				Observed		EF Est.	Observed		EF Est.	Observed		EF Est.	Observed		EF Est.
				Takes	Takes/ 1,000 hooks		Takes	Takes/ 1,000 hooks		Takes	Takes/ 1,000 hooks		Takes	Takes/ 1,000 hooks	
2002	24.6	3,523	6,786,303	2	0.0003	8	0	0.0000	0	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	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
2005	26.1	4,602	9,360,671	1	0.0001	4	0	0.0000	0	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	0	0.0000	0
2007	20.1	3,506	7,620,083	1	0.0001	5	0	0.0000	0	1	0.0001	5	0	0.0000	0
2008	21.7	3,915	8,775,951	2	0.0002	9	2	0.0002	9	0	0.0000	0	0	0.0000	0
2009	20.6	3,520	7,877,861	0	0.0000	0	3	0.0004	15	0	0.0000	0	0	0.0000	0
2010	21.1	3,580	8,184,127	0	0.0000	0	3	0.0004	14	0	0.0000	0	0	0.0000	0
2011	20.3	3,540	8,260,092	2	0.0002	10	0	0.0000	0	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	0	0.0000	0
2013	20.4	3,830	9,278,133	2	0.0002	10	0	0.0000	0	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	0	0.0000	0
2015	20.6	3,728	9,393,234	1	0.0001	5	0	0.0000	0	1[c]	0.0001	5	0	0.0000	0
2016	20.1	3,880	9,872,439	2	0.0002	10	0	0.0000	0	0	0.0000	0	1	0.0001	5
2017	20.4	3,832	10,148,195	4	0.0004	20	0	0.0000	0	0	0.0000	0	0	0.0000	0
2018	20.4	4,332	11,751,144	4	0.0003	20	0	0.0000	0	0	0.0000	0	0	0.0000	0
2019	20.5	4,697	12,948,077	3	0.0002	15	0	0.0000	0	0	0.0000	0	1	0.0001	5
2020	15.3	3,131	8,738,011	4	0.0005	26	0	0.0000	0	0	0.0000	0	1	0.0001	7
2021	17.8	3,972	11,454,331	4(1)	0.0003	22	0	0.0000	0	0	0.0000	0	0	0.0000	0
2022	20.22	4,314	12,473,293	2	0.0002	10	0	0.0000	0	0	0.0000	0	0	0.0000	0
2023	17.41	3,807	10,988,431	4	0.0004	23	0	0.0000	0	0	0.0000	0	0	0.0000	0

[a] Take and effort data are based on vessel arrival dates.
[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 Pacific Islands Fisheries Science Center.
[c] This dolphin was later identified as a striped dolphin but is listed as an unidentified dolphin in the 2015 Annual Observer Report.
Source: Take data—2002-2020 PIRO Observer Program Annual and Quarterly Status Reports, PIRO Sustainable Fisheries Division unpublished data.

3.3.2.4.1 Comparison of Interactions with ITS

The 2023 Biological Opinion includes ITSs for marine mammal species protected under the ESA based on the maximum 5-year running sum for each species, which includes sperm whales and the MHI insular DPS of false killer whales (Table 70). The new ITS went into effect May 18,

2023. For the purposes of monitoring the ITS, all captures in 2023 will count towards the first year of the 5-year term. Exceeding the maximum 5-year running sum within any 5 consecutive years will lead to reinitiating consultation of the impact of this fishery on these species.

NMFS uses the interaction date for tracking marine mammal interactions against the ITS, regardless of vessel arrival date. Prior to 2021, NMFS in its PIRO Observer Program Quarterly and Annual Reports counted marine mammal interactions based on vessel arrival dates. For this reason, the number of quarterly or annual marine mammal interactions counted against an ITS may vary from those reported in the Observer Program's quarterly and annual reports.

Table 70. Estimated total interactions (extrapolated using quarterly observer coverage) of cetaceans in the Hawaii deep-set longline fishery compared to the 5–year running sum ITS in the 2023 Biological Opinion[a]

Species	5-year running sum ITS Interactions	Estimated Total Interactions
		2023
Sperm whale	6	0
MHI insular false killer whale	0.427 or 1 observed	Data not yet available.

[a] Takes are counted based on interaction date.

3.3.2.4.2 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 Hawaii deep-set longline fishery is presented in Table 71. The PBR of a stock reflects only marine mammals of that stock observed within the EEZ around Hawaii, with the exception of the Hawaii 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 and not 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 Hawaii is well below the PBR in the time period covered by the most current SAR (Table 71).

The M&SI interactions inside the Hawaii EEZ for the HI Pelagic stock of false killer whales previously exceeded the PBR for this stock. 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 Hawaii-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 Hawaii-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. The M&SI interactions inside the Hawaii EEZ for the HI Pelagic stock for 2015 to 2019 was 9.8 in the latest SAR, which is below this stock's PBR (Table 71). Updated information in the draft 2023 SAR indicate that the M&SI interactions inside the Hawaii EEZ for the HI Pelagic Stock was 16.8 for the 2017-2021 period, which was above PBR. NMFS is proposing a management area for the pelagic false killer whales that include the EEZ and the areas outside of the EEZ. The PBR for this area in the draft 2023 SAR is 33, and the corresponding M&SI for the area is 47.

On July 24, 2018, the Southern Exclusion Zone (SEZ) was closed pursuant to the False Killer Whale Take Reduction Plan following two false killer whale interactions within the EEZ resulting in a M&SI (83 FR 33848). The SEZ was closed for the remainder of the year and was reopened on January 1, 2019. On February 22, 2019, the SEZ closed from reaching the closure trigger (84 FR 5356), and was reopened on August 25, 2020, after at least one of the reopening criteria defined in the Take Reduction Plan implementing regulations was met (85 FR 50959). In 2021, the revised SEZ trigger of four M&SI was met, but SEZ did not close because the fourth interaction was not confirmed until January 2022 when the timeframe for closing the SEZ in 2021 had passed (87 FR 12941). The SEZ trigger was not met in 2022 and 2023.

Table 71. Mean estimated annual M&SI and PBR by marine mammal stocks with observed interactions in the Hawaii deep-set longline fishery

Stock	Years Included in 2022 SAR	Outside EEZ[a]	Inside EEZ[b]	
		Mean Estimated Annual M&SI	Mean Estimated Annual M&SI	PBR (Inside EEZ only)
Bottlenose dolphin, HI Pelagic	2014-2018	3.0	0	undetermined
Pantropical spotted dolphin, HI Pelagic	2014-2018	0	0	265
Rough-toothed dolphin, HI	2014-2018	1.0	0	548
Risso's dolphin, HI	2014-2018	2.9	0	61
Striped dolphin, HI	2014-2018	0.4	0	291
Blainville's beaked whale, HI	2014-2018	0	0	5.6
False killer whale, MHI Insular	2015-2019	N/A	0.0	0.03
False killer whale, HI Pelagic	2015-2019	28.8	9.8	16
False killer whale, NWHI	2015-2019	N/A	0.1	1.4
False killer whale, Palmyra Atoll	2006-2010	N/A	0.3	6.4
Kogia spp. whale (Pygmy or dwarf sperm whale), HI	2014-2018	Pygmy = 0 Dwarf = 0	Pygmy = 0 Dwarf = 0	Pygmy = 257 Dwarf = undetermined
Pygmy killer whale, HI	2014-2018	0	0	59
Short-finned pilot whale, HI	2014-2018	0.3	0.9	87
Humpback whale, HI	2016-2020	0		127[c]
Sperm whale, HI	2014-2018	0	0	18

[a] PBR estimates are not available for portions of the stock outside of the U.S. EEZ around Hawaii, except for the Central North Pacific stock of humpback whales for which PBR applies to the entire stock.
[b] PBR estimates are only available for portions of the stock within the U.S. EEZ around Hawaii.
[c] PBR for the Hawaii stock for humpback whales apply to the entire stock.
Source: Final 2022 Marine Mammal SARs.

3.3.2.5 SEABIRD INTERACTIONS IN THE HAWAII 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 further examined by NMFS, and updated information necessary for any data analyses is available from NMFS. Observed take data are expanded to represent the estimated number of annual incidental takes for the entire fishery by PIFSC (hereafter "ME"). When ME are not available, a standard expansion factor estimate is 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 Hawaii 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. Recent reports are available at: https://www.fisheries.noaa.gov/pacific-islands/bycatch/seabird-interactions-pelagic-longline-fishery.

Table 72 and Table 73 summarize the incidental take data of seabirds from 2002 to 2023 in the Hawaii deep-set longline fishery. The most common observed interactions during this time period involved black-footed albatrosses and Laysan albatrosses. Additional takes of unidentified shearwaters, sooty shearwaters, brown boobies, red-footed boobies, unidentified gulls, unidentified albatross, and unidentified seabirds have been observed. Most of the unidentified shearwaters have been identified as sooty shearwaters (NMFS 2016). There have been no observed takes of short-tailed albatrosses by this fishery.

Interactions with black-footed albatrosses beginning in 2015 were substantially higher compared to previous years with the highest number observed in 2018. From 2019 to 2023, the observed number of black-footed albatross interactions has declined every year returning to pre 2015 interaction rates in 2023. Expanded annual estimated takes for other seabird species suggested a high degree of variability from year to year. Interactions with sooty shearwaters and boobies are relatively infrequent.

Black-footed albatross nests in the Northwestern Hawaiian Islands, and their main foraging habitat while nesting are the productive fronts to the north and east of the Hawaiian Islands. During a positive Pacific Decadal Oscillation (PDO), an intensification of the Westerlies displaces the frontal region to the south bringing with it cold productive waters, increasing the overlap between the albatross forage area and the deep-set longline fishing grounds, which in turn contribute to an increase in interactions with the longline fleet (Wren et al. 2019; Hyrenbach et al. 2021). During a negative PDO, the westerlies relax and the productive fronts the birds forage in are displaced northward reducing the overlap between the albatross foraging grounds and the deep-set longline fishing grounds, resulting in a reduction in interactions. The most recent positive PDO ended in 2016, and current conditions are in a negative PDO phase. PDO works in combination with El Niño Southern Oscillation (ENSO) where El Niño enhances (dampens) a positive (negative) PDO while a La Niña dampens (enhances) it. These large scale climate variabilities may in part explain why black-footed albatross interactions with the deep-set longline fishery peaked in 2019, which was a negative PDO and El Niño year, and has been declining ever since (negative PDO and La Niña).

In response to the higher BFAL interactions in the DSLL fishery beginning in 2015, the Council convened two workshops in 2017 and 2018. The 2017 workshop explored the causes of higher BFAL interactions (Hyrenbach et al. 2021), and the 2018 workshop reviewed seabird mitigation requirements and the best scientific information available for the Hawaii longline fishery (Gilman and Ishizaki 2018). The 2018 workshop identified blue-dyed bait as a candidate for removal from the existing suite of seabird mitigation measures, and identified deterrents such as tori lines to be a high priority for further research as a potential alternative to blue-dyed bait. Two joint cooperative research projects by the Council, Hawaii Longline Association, PIFSC and PIRO were implemented between 2019 and 2021 to design and test tori lines for use in the Hawaii deep-set longline fishery as an alternative mitigation measure to blue-dyed bait. The results of the studies showed that tori lines are significantly more effective in deterring albatross attempts and contacts on fishing gear compared to blue-dyed bait (Gilman et al. 2021; Chaloupka et al. 2021). The Council at its 189th Meeting on December 7-9, 2021, took final action and recommended regulatory amendments under the Pelagic FEP to improve the overall operational practicality and mitigation efficacy of required measures for the Hawaii deep-set longline fishery. Specifically, the Council recommended replacing blue-dyed thawed bait and strategic offal discharge measures required for stern-setting deep-set longline vessels with a new tori line requirement. In lieu of a regulatory requirement for a strategic offal discharge measure, the Council recommended implementing best practices training on offal management as part of the annual protected species workshop, based on the best practices as presented, or any update thereof. The Council additionally recommended tori line regulatory specifications. NMFS published the proposed rule for this regulatory amendment on October 17, 2023 (88 FR 71523), and final rule on March 1, 2024 (89 FR 15062). The regulatory amendment took effect on April 1, 2024. Additional history on this regulatory change is described in the regulatory amendment (WPFMC and NMFS 2023).

3.3.2.5.1 Comparison of Interactions with ITS

The short-tailed albatross ITS in the USFWS 2012 Biological Opinion for the Hawaii longline fishery is two incidental takes 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 albatrosses in the fishery, the ITS has not been exceeded as of the end of 2023.

Table 72. Observed takes, mortalities (M), takes per fishing effort (sets and 1,000 hooks), and estimated annual takes using expansion factor estimates and ME for albatross species in the Hawaii deep-set longline fishery, 2002-2023[a]

Year	Obs. Cov. (%)	Sets	Hooks	Laysan albatross				Black-footed albatross				Unidentified albatross				Short-tailed albatross
				Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME	Observed
				Takes (M)	Takes/ 1,000 hooks			Takes (M)	Takes/ 1,000 hooks			Takes (M)	Takes/1,000 hooks			Takes (M)
2002	24.6	3,523	6,786,303	16(13)	0.0024	65	-	18(17)	0.0027	73	-	0	0.0000	0	-	0
2003	22.2	3,204	6,442,221	44(44)	0.0068	198	-	24(23)	0.0037	108	-	0	0.0000	0	-	0
2004	24.6	3,958	7,900,681	2(2)	0.0003	-	10	4(4)	0.0005	-	16	0	0.0000	0	-	0
2005	26.1	4,602	9,360,671	6(6)	0.0006	-	43	12(12)	0.0013	-	82	0	0.0000	0	-	0
2006	21.2	3,605	7,540,286	1(1)	0.0001	-	7	17(17)	0.0023	-	70	0	0.0000	0	-	0
2007	20.1	3,506	7,620,083	7(7)	0.0009	-	44	14(14)	0.0018	-	77	0	0.0000	0	-	0
2008[d]	21.7	3,915	8,775,951	14(13)	0.0016	-	55	34(33)	0.0039	-	118	0	0.0000	0	-	0
2009	20.6	3,520	7,877,861	18(18)	0.0023	-	60	23(23)	0.0029	-	110	0	0.0000	0	-	0
2010	21.1	3,580	8,184,127	39(38)	0.0048	-	155	17(17)	0.0021	-	65	0	0.0000	0	-	0
2011	20.3	3,540	8,260,092	32(31)	0.0039	-	187	13(12)	0.0016	-	73	0	0.0000	0	-	0
2012	20.4	3,659	8,768,728	30(25)	0.0034	-	136	35(35)	0.0040	-	167	0	0.0000	0	-	0
2013	20.4	3,830	9,278,133	48(46)	0.0052	-	236	50(47)	0.0054	-	257	0	0.0000	0	-	0
2014	20.8	3,831	9,608,244	13(10)	0.0014	-	77	32(29)	0.0033	-	175	0	0.0000	0	-	0
2015	20.6	3,728	9,393,234	24(22)	0.0026	-	119	107(92)	0.0114	-	541	0	0.0000	0	-	0
2016	20.1	3,880	9,872,439	34(32)	0.0034	-	166	104(99)	0.0105	-	485	1(1)	0.0003	-	7	0
2017	20.4	3,832	10,148,195	38(38)	0.0037	-	226	97(85)	0.0096	-	471	0	0.0000	0	-	0
2018	20.4	4,332	11,751,144	33(29)	0.0028	-	157	194(168)	0.0165	-	931	0	0.0000	0	-	0
2019	20.5	4,697	12,948,077	45(44)	0.0035	-	231	146(139)	0.0113	-	767	0	0.0000	0	-	0
2020	15.25	3,131	8,738,011	59(55)	0.0068	-	315	96(87)	0.0110	-	590	0	0.0000	0	-	0
2021	17.84	3,972	11,454,331	38(35)	0.0033	-	244	87(80)	0.0076	-	536	0	0.0000	0	-	0
2022	20.22	4,314	12,473,293	56(56)	0.0045	-	366	47(45)	0.0038	-	269	0	0.0000	0	-	0
2023	17.41	3,807	10,988,431	11(11)	0.0010	63	-	32(31)	0.0029	184	-	0	0.0000	0	-	0

[a] Take and effort data are based on vessel arrival dates.
Source: Take data—2002-2019 PIRO Observer Program Annual and Quarterly Status Reports, PIRO Sustainable Fisheries Division unpublished data.
ME—McCracken, 2005; McCracken, 2006; McCracken, 2007; McCracken, 2008; McCracken, 2009; McCracken, 2010; McCracken, 2011b; McCracken, 2012; McCracken, 2013; McCracken, 2014; McCracken, 2017c; McCracken, 2017d; McCracken 2019d; McCracken and Cooper 2020b; McCracken and Cooper 2022a; McCracken and Cooper (in review).

Table 73. Observed takes, mortalities (M), takes per fishing effort (sets and 1,000 hooks), and estimated annual takes using expansion factor estimates and ME for other seabird species in the Hawaii deep-set longline fishery, 2002-2023[a]

Year	Obs. Cov. (%)	Sets	Hooks	Booby species				Sooty shearwater			Unidentified shearwater				Unidentified gull			
				Observed				Observed			Observed				Observed			
				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)	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	-	-
2003	22.2	3,204	6,442,221	0	0.0000	0	-	0	0.0000	0	0	0.0000	0	-	0	0.0000	-	-
2004	24.6	3,958	7,900,681	0	0.0000	0	-	0	0.0000	0	2(2)	0.0003	8	-	0	0.0000	-	-
2005	26.1	4,602	9,360,671	1(1)[b]	0.0001	4	-	0	0.0000	0	0	0.0000	0	-	0	0.0000	-	-
2006	21.2	3,605	7,540,286	0	0.0000	0	-	3(3)	0.0004	14	2(2)[c]	0.0003	9	-	0	0.0000	-	-
2007	20.1	3,506	7,620,083	0	0.0000	0	-	0	0.0000	0	0	0.0000	0	-	0	0.0000	-	-
2008[d]	21.7	3,915	8,775,951	1[e]	0.0001	-	4	0	0.0000	0	14(14)[c]	0.0016	-	62	0	0.0000	-	-
2009	20.6	3,520	7,877,861	0	0.0000	-	0	0	0.0000	0	4(4)[c]	0.0005	-	24	0	0.0000	-	-
2010	21.1	3,580	8,184,127	0	0.0000	-	0	0	0.0000	0	1(1)[c]	0.0001	-	0	0	0.0000	-	-
2011	20.3	3,540	8,260,092	0	0.0000	-	0	0	0.0000	0	3(3)[c]	0.0004	-	19	0	0.0000	-	-
2012	20.4	3,659	8,768,728	0	0.0000	-	0	1(1)	0.0001	5	6(6)[c]	0.0007	-	36	0	0.0000	-	-
2013	20.4	3,830	9,278,133	0	0.0000	-	0	0	0.0000	0	8(8)[c]	0.0009	-	43	0	0.0000	-	-
2014	20.8	3,831	9,608,244	0	0.0000	-	0	0	0.0000	0	1(1)[c]	0.0001	-	7	0	0.0000	-	-
2015	20.6	3,728	9,393,234	1(1)[g]	0.0001	-	6	5(4)	0.0005	5	0	0.0000	-	21[f]	0	0.0000	-	-
2016	20.1	3,880	9,872,439	2(1)[g]	0.0002	-	12	4(4)	0.0004	20	0	0.0000	0	-	0	0.0000	-	-
2017	20.4	3,832	10,148,195	0	0.0000	-	0	0	0.0000	0	0	0.0000	-	0	1	0.0001	-	6
2018	20.4	4,332	11,751,144	2(2)[h]	0.0002	-	11	0	0.0000	0	10(10)	0.0009	-	40	0	0.0000	-	0
2019	20.5	4,697	12,948,077	1(1)[i]	0.0001	-	4	0	0.0000	0	0	0.0000	-	0	0	0.0000	-	0
2020	15.25	3,131	8,738,011	1(1)[j]	0.0001	-	5	1(1)	0.0001	7	0	0.0000	-	0	0	0.0000	-	0
2021	17.84	3,972	11,454,331	0	0.0000	-	0	0	0.0000	0	2	0.0000	-	9	0	0.0000	-	0
2022	20.22	4,314	12,473,293	1(1)[j]	0.0001	-	6	0	0.0000	0	0	0.0000	-	0	0	0.0000	-	0
2023	17.41	3,807	10,988,431	2(1)	0.0002	11	-	1	0.0001	6	0	0.0000	0	-	0	0.0000	0	-

[a] Take and effort data are based on vessel arrival dates.
[b] This animal was identified as a brown booby on the 2005 PIRO Observer Program Annual and Quarterly Status reports.
[c] These were later identified as sooty shearwaters in NMFS Seabird Interactions and Mitigation Efforts in Hawaii Longline Fisheries (Seabird Annual Report).
[d] One *unidentified seabird* was released injured in the second quarter of 2008 (takes/1,000 hooks < 0.001, ME = 2).
[e] This animal was identified as a red-footed booby on the 2008 PIRO Observer Program Annual and Quarterly Status reports.
[f] These birds were identified as sooty shearwaters in the 2015 PIRO Observer Program Annual and Quarterly Status reports.
[g] These birds were identified as red-footed boobies in the 2015 and 2016 PIRO Observer Program Annual and Quarterly Status reports.
[h] One of the booby species was identified as a red-footed booby and one was identified as a brown booby on the 2018 PIRO Observer Program Annual and Quarterly Status reports.
[i] This animal was identified as a brown booby in the 2019 PIRO Observer Program Annual and Quarterly Status reports.
[j] This animal was identified as a brown booby in the unpublished observer data.
[k] One of the booby species was identified as a red-footed booby and one was identified as a masked booby in the unpublished observer data
Source: Take data—2002-2020 PIRO Observer Program Annual and Quarterly Status Reports, PIRO Sustainable Fisheries Division unpublished data.
ME—McCracken, 2005; McCracken, 2006; McCracken, 2007; McCracken, 2008; McCracken, 2009; McCracken, 2010; McCracken, 2011b; McCracken, 2012; McCracken, 2013; McCracken, 2014; McCracken, 2017c; McCracken, 2017d; McCracken 2019d; McCracken and Cooper 2020b, McCracken and Cooper 2022a, McCracken and Cooper (in review).

3.3.2.6 ELASMOBRANCH INTERACTIONS IN THE HAWAII DEEP-SET LONGLINE FISHERY

Table 74 summarizes the incidental take data for the Indo-west Pacific DPS of scalloped hammerhead sharks, oceanic whitetip sharks, and giant manta rays in the Hawaii deep-set longline fishery. The most common observed interactions from 2004 to 2023 were of oceanic whitetip sharks, with giant manta rays observed infrequently. Three observed interactions with the Indo-west Pacific DPS of scalloped hammerhead shark have been recorded since 2004. 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 are not available, a standard expansion factor estimate is listed in the table (EF Est. = 100 / % observer coverage * # takes).

The scalloped hammerhead shark data only include interactions that occurred within the range of the Indo-west Pacific DPS of scalloped hammerhead sharks, and do not include interactions occurred within the range of the Central Pacific DPS, which is not listed under the ESA. Giant manta rays were listed under the ESA on January 22, 2018 (83 FR 2916), and oceanic whitetip sharks were listed on January 30, 2018 (83 FR 4153).

In an effort to reduce impacts to oceanic whitetip sharks in the Hawaii deep-set longline fishery, the Hawaii Longline Association (HLA) announced in late 2020 that its members, comprising more than 90% of the Hawaii deep-set longline fleet of approximately 146 active vessels, would voluntarily switch from wire to monofilament leaders. At the 186th meeting in June 2021, the Council recommended that wire leaders be prohibited in the Hawaii deep-set fishery, along with the requirement to remove trailing gear in all longline fisheries operating under the Pelagic FEP. The proposed rule for this regulatory amendment was published on January 19, 2022 (87 FR 2742) and the final rule published on April 28, 2022 (87 FR 25153) with an effective date of May 31, 2022.

Table 74. Observed takes, mortalities (M), takes per fishing effort (sets and 1,000 hooks), and estimated annual takes using expansion factor estimates and ME for ESA-listed elasmobranch species in the Hawaii deep-set longline fishery, 2004-2023[a]

Year	Obs. Cov. (%)	Sets	Hooks	Scalloped hammerhead shark				Oceanic whitetip shark				Giant manta ray			
				Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME
				Takes (M[b])	Takes/ 1,000 hooks			Takes (M[b])	Takes/ 1,000 hooks			Takes (M[b])	Takes/ 1,000 hooks		
2004	24.6	3,958	7,900,681	2	0.0003	-	6	434(101)	0.0549	-	2,938	1	0.0001	-	3
2005	26.1	4,602	9,360,671	0	0.0000	-	0	341(80)	0.0364	-	1,282	2	0.0002	-	7
2006	21.2	3,605	7,540,286	0	0.0000	-	0	331(78)	0.0439	-	1,346	2(1)	0.0003	-	11
2007	20.1	3,506	7,620,083	1	0.0001	-	7	262(72)	0.0344	-	1,341	2	0.0003	-	5
2008	21.7	3,915	8,775,951	0	0.0000	-	0	144(36)	0.0164	-	741	2	0.0002	-	10
2009	20.6	3,520	7,877,861	0	0.0000	-	0	244(55)	0.0310	-	1,236	4	0.0005	-	23
2010	21.1	3,580	8,184,127	0	0.0000	-	0	253(44)	0.0309	-	1,198	17(1)	0.0021	-	95
2011	20.3	3,540	8,260,092	0	0.0000	-	0	225(43)	0.0272	-	1,176	1	0.0001	-	5
2012	20.4	3,659	8,768,728	0	0.0000	-	0	172(38)	0.0196	-	878	2	0.0002	-	11
2013	20.4	3,830	9,278,133	0	0.0000	-	0	196(36)	0.0211	-	973	1	0.0001	-	5
2014	20.8	3,831	9,608,244	0	0.0000	-	0	374(68)	0.0389	-	1,670	3	0.0003	-	11
2015	20.6	3,728	9,393,234	0	0.0000	-	0	531(139)	0.0565	-	2,654	2	0.0002	-	10
2016	20.1	3,880	9,872,439	0	0.0000	-	0	423(123)	0.0428	-	2,188	4	0.0004	-	22
2017	20.4	3,832	10,148,195	0	0.0000	-	0	242(57)	0.0238	-	1,257	0	0.0000	-	0
2018	20.4	4,332	11,751,144	0	0.0000	-	0	224(62)	0.0191	-	1,092	1	0.0001	-	3
2019	20.5	4,697	12,948,077	0	0.0000	-	0	435(99)	0.0336	-	2,125	0	0.0000	-	0
2020	15.25	3,131	8,738,011	0	0.0000	0	-	302(83)	0.0346	-	1,959	1	0.0001	-	7
2021	17.84	3,972	11,454,331	0	0.0000	-	0	522(103)	0.0456	-	3,084	2(2)	0.0002	-	11
2022	20.22	4,314	12,473,293	0	0.0000	-	0	480(130)	0.0385	-	2,362	0	0.0000	-	0
2023	17.41	3,807	10,988,431	0	0.0000	0	-	452(134)	0.0411	2,596	-	2	0.0002	11	-

[a] Take and effort data are based on vessel arrival dates.
[b] Mortality numbers include animals that were released dead, finned (prior to passage of the Shark Conservation Act of 2010), and kept.
Source: NMFS 2014 (2004-2013), PIRO Sustainable Fisheries Division unpublished data (2014-2018), McCracken 2019b; McCracken and Cooper 2020a; McCracken and Cooper 2021b.

3.3.2.6.1 Comparison of Interactions with ITS

An ITS is not required to provide protective coverage for the ESA listed elasmobranchs including the Indo-west Pacific scalloped hammerhead shark DPS, the oceanic whitetip shark, or the giant manta ray, because there are no take prohibitions under ESA section 4(d) for these species. However, ITS were included for these species in their relevant Biological Opinions to serve as a check on the no-jeopardy conclusions by providing a reinitiation trigger.

The 2023 Biological Opinion includes ITSs for ESA listed elasmobranchs based on a maximum 5-year running sum for each species (Table 75). The new ITS went into effect May 18, 2023. For the purposes of monitoring the ITS, all captures in 2023 will count towards the first year of the 5-year term. Exceeding the maximum 5-year running sum within any 5 consecutive years will lead to reinitiating consultation of the impact of this fishery on these species.

NMFS counts takes for the Indo-west Pacific DPS of scalloped hammerhead shark, oceanic whitetip shark, and giant manta ray based on the end of haul incidental take date.

Table 75. Estimated total interactions (extrapolated using quarterly observer coverage) of oceanic whitetip sharks and giant manta rays in the Hawaii deep-set longline fishery compared to the 5-year running sum ITS in the 2023 Biological Opinion[a]

Species	5-year Running Sum ITS	Estimated Total Interactions
		2023
Scalloped hammerhead shark, Indo-West Pacific DPS	14	0
Oceanic whitetip shark	10,589	2,568
Giant manta ray	181	12
Manta/Mobula[b]		110

[a] Take data are based on haul begin dates.
[b] 12% of manta/mobula interactions are also tracked as the ITS for giant manta ray was based on interaction data that included rays classified as manta/mobula in the observer record that may have been giant manta rays.

3.3.2.6.2 Effectiveness of FEP Conservation Measures

In June 2021, the Council recommended a regulatory amendment that would prohibit wire leaders in the Hawaii deep-set fishery and require removal of trailing gear for oceanic whitetip sharks in all longline fisheries operating under the Pelagic FEP. The rule change took effect in May 2022.

During 2021, the Hawaii deep-set longline fleet initiated the voluntary transition from wire to monofilament nylon leaders. Figure 158 shows the monthly proportion of leader material used for observed sets, with most of the vessels using monofilament nylon leaders by December 2021.

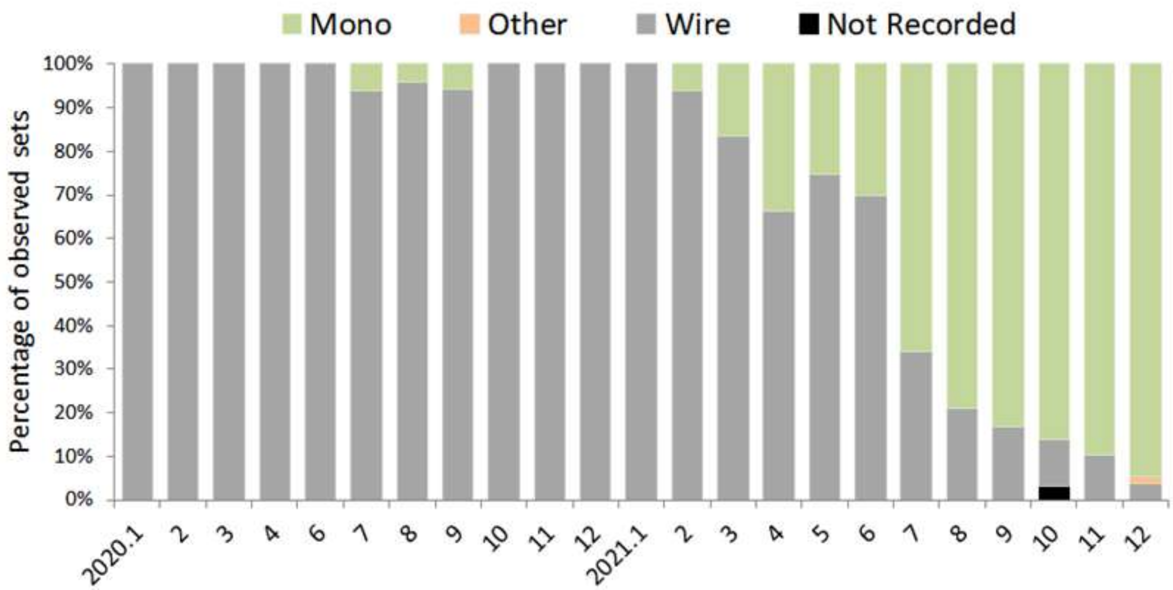


Figure 155. Leader material (based on observed sets) used in the Hawaii deep-set longline fishery by month before and during the voluntary transition period (2020–2021)

As part of the final action for the regulatory amendment, the Council recommended that observer data on leader material used in the Hawaii deep-set longline fishery be reported in the Annual Pelagic SAFE Report to track proportion of effort using leader material other than monofilament nylon. The annual proportion of leader material used for observed sets are shown in Table 76. In 2022, less than 6% , and in 2023 less than 3%, of observed sets used leader material other than monofilament nylon.

Table 76. Annual proportion of leader material used in the Hawaii deep-set longline fishery by month, 2020-2023[a]

Year	Obs. Sets	Mono		Wire		Other		Not Recorded	
		n	%	n	%	n	%	n	%
2020	3131	48	1.5%	3083	98.5%	0	0.0%	0	0.0%
2021	3972	2185	55.0%	1775	44.7%	0	0.0%	12	0.3%
2022[b]	4314	4059	94.1%	224	5.2%	31	0.7%	0	0.0%
2023	3807	3703	97.3	84	2.2%	20	0.5%	0	0.0%

[a] Based on leader material recorded for each observed set, by vessel arrival date.
[b] Wire leader prohibition went into effect in May 2022.

A new data collection form for the observer program was created in 2022 to track detailed information on protected elasmobranch interaction events and handling. The first shark recorded on this form was on April 29, 2022. Based on haul begin date, of the 327 oceanic whitetip shark events recorded on this new form in 2022, 29% were cut below the weight, 51% were estimated to have 1m or less line remaining, and the average length of branch line left on an oceanic whitetip shark after cutting the line was 2.8 m. Of the 440 oceanic whitetip shark events recorded on this form in 2023, 30% were cut below the weight, 51% were estimated to have 1m or less line remaining and the average length of branch line left on an oceanic whitetip shark after cutting the line was 2.7 m. Prior to the wire leader prohibition, the line was rarely cut below the weight due to difficulty of cutting through the wire from deck height, and the best available estimate of the average length of trailing gear remaining on an oceanic whitetip shark in the Hawaii deep-set longline fishery was 5.44 m (Hutchinson et al. 2021). The handling outcomes data from the new observer form indicate that the new rule on wire leader prohibition and handling requirements that went into effect in May 2022 has reduced the amount of trailing gear left on oceanic whitetip sharks.

3.3.3 AMERICAN SAMOA LONGLINE FISHERY

3.3.3.1 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 American Samoa longline fishery using the following indicators:

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

Details of these indicators are discussed below.

3.3.3.1.1 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.
- Longline vessel owners/operators are required to remove trailing gear from oceanic whitetip sharks and cut the line as close to the hook as possible.
- Longline vessel owners/operators are required to annually complete a protected species workshop.
- Owners and operators of vessels longer than 40 ft (12.2 m) must use longline gear that meet 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.

Additionally, the American Samoa longline fishery has had observer coverage since 2006.

3.3.3.1.2 ESA Consultations

During the first half of 2023, the American Samoa longline fishery was covered under a NMFS Biological Opinion dated October 30, 2015 (NMFS 2015) and associated supplements. A new Biological Opinion went into effect May 15, 2023.

NMFS concluded in the 2015 Biological Opinion 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 77). The 2015 Biological Opinion also included a Conference Opinion for the green turtle DPSs and an ITS, which became effective at the time of the final listing in 2016 (81 FR 20058, April 5, 2016). Several informal consultations conducted by NMFS and USFWS have concluded that the fishery is not likely to adversely affect two marine mammal species (humpback and sperm whale) or the Newell's shearwater. NMFS has also determined that the fishery has no effect on three marine mammal species (fin, blue, and sei whale) or three petrel species (Chatham, Fiji, and magenta petrel).

On April 3, 2019, NMFS reinitiated ESA Section 7 consultation for the American Samoa deep-set fishery for all ESA-listed species under NMFS jurisdiction occurring in the action area due to several re-initiation triggers: listing of the oceanic whitetip shark, giant manta ray, and chambered nautilus; and exceeding the ITS for the east Indian west Pacific, southwest Pacific, central South Pacific, and east Pacific green sea turtle DPS; hawksbill; and olive ridley sea turtles in 2018. On April 3, 2019, May 6, 2020, July 13, 2021, August 29, 2022, NMFS determined that the conduct of the fishery during the period of consultation will not violate ESA Sections 7(a)(2) and 7(d).

On October 27, 2022, NMFS issued a Supplemental Biological Opinion to the 2015 Biological Opinion for the two new listed species, and concluded that the deep-set fishery is not likely to jeopardize the continued existence of the oceanic whitetip shark and giant manta ray.

On May 15, 2023, NMFS issued a Biological Opinion covering all applicable ESA-listed species, which concluded that the fishery is not likely to jeopardize the following species: Leatherback sea turtle, green sea turtles in the East Pacific, East Indian-West Pacific, Southwest Pacific, Central West Pacific and Central South Pacific; olive ridley sea turtles; hawksbill sea turtles, oceanic whitetip sharks, Indo-West Pacific scalloped hammerhead sharks, and giant manta ray (Table 77). The 2023 Biological Opinion also concluded that the fishery is not likely to adversely affect South Pacific loggerhead turtles, sperm whales, or reef-building corals. The new ITSs took effect when the new Biological Opinion was signed. The new ITS has a 5-year term and all captures in 2023 will count towards the first year of the term, although captures prior to the date on the 2023 Biological Opinion signature are exempted under the previous biological opinion.

NMFS has issued ITSs for species with a non-jeopardy determination in the Biological Opinions (Table 78). Exceeding the ITSs requires reinitiation of consultation on the fishery under the ESA.

Table 77. Summary of ESA consultations for the American Samoa longline fishery

Species	Consultation Date	Consultation Type[a]	Outcome[b]
Leatherback turtle	2023-5-15	BiOp	LAA, non-jeopardy
Olive ridley turtle	2023-5-15	BiOp	LAA, non-jeopardy
Green turtle, Central South Pacific DPS	2023-5-15	BiOp	LAA, non-jeopardy
Green turtle, Southwest Pacific DPS	2023-5-15	BiOp	LAA, non-jeopardy
Green turtle, East Pacific DPS	2023-5-15	BiOp	LAA, non-jeopardy
Green turtle, Central West Pacific DPS	2023-5-15	BiOp	LAA, non-jeopardy
Green turtle, East Indian-West Pacific DPS	2023-5-15	BiOp	LAA, non-jeopardy
Hawksbill turtle	2023-5-15	BiOp	LAA, non-jeopardy
Loggerhead turtle, South Pacific DPS	2023-5-15	BiOp	NLAA
Scalloped hammerhead shark, Indo-West Pacific DPS	2023-5-15	BiOp	LAA, non-jeopardy
Oceanic whitetip shark	2023-5-15	BiOpc	LAA, non-jeopardy
Giant manta ray	2023-5-15	BiOpc	LAA, non-jeopardy
Sperm whale	2023-5-15	LOC	NLAA
Reef-building corals	2023-5-15	BiOp	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
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.
[c] Supplement to the 2015 BiOp.

Table 78. Summary of ITSs for the American Samoa longline fishery

Species	ITS Time Period	Takes	Source BiOp
Green turtle	5-year running sum	96	NMFS 2023
Leatherback turtle	5-year running sum	48	NMFS 2023
Olive ridley turtle	5-year running sum	61	NMFS 2023
Hawksbill turtle	5-year running sum	30	NMFS 2023
Scalloped hammerhead shark, Indo-West Pacific DPS[a]	5-year running sum	45	NMFS 2023
Oceanic whitetip shark[a]	5-year running sum	3,520	NMFS 2023
Giant manta ray[a]	5-year running sum	57	NMFS 2023

[a] An ITS is not required for the Indo-West Pacific DPS of scalloped hammerhead sharks, oceanic whitetip sharks and giant manta ray 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.

3.3.3.1.3 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 https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region.

The American Samoa longline fishery is a Category II under the MMPA 2024 LOF (89 FR 12257, February 16, 2024), meaning that this fishery has occasional incidental mortality and serious injuries of marine mammals. The 2024 LOF lists the following marine mammal stocks that are incidentally killed or injured in this fishery:

- False killer whale, American Samoa stock
- Rough-toothed dolphin, American Samoa stock
- Stiped dolphin, 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.

3.3.3.2 DATA SOURCE FOR MONITORING PROTECTED SPECIES INTERACTIONS IN THE AMERICAN SAMOA LONGLINE FISHERY

Protected species interactions in the American Samoa 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 ranged between 15-22 percent in 2012-2019.

In response to the emerging COVID-19 crisis, and to ensure the safety and protect the health of fishermen, observers, and others, NMFS issued an emergency action on March 27, 2020 (85 FR 17285), to provide the authority, on a case-by-case basis, to waive observer coverage. This action was extended on September 21, 2020 (85 FR 59199) and again on March 29, 2021 (86 FR 16307). Under this emergency action, a NMFS Regional Administrator, Office Director, or Science Center Director had the ability to waive observer coverage requirements if:

- Local, state, or national governments, or private companies or organizations that deploy observers pursuant to NMFS regulations, restrict travel or otherwise issue COVID-19-related social control guidance, or requirement(s) addressing COVID-19-related concerns, such that it is inconsistent with the requirement(s) or not recommended to place an observer(s); or

- No qualified observer(s) are available for placement due to health, safety, or training issues related to COVID-19.

The PIRO Regional Administrator granted waivers on a case-by-case basis consistent with the emergency rule resulting in reduced coverage for the American Samoa longline fishery for 2020 at 2.13%, for 2021 at 4.65%, for 2022 at 8.70%, and for 2023 8.82%. Observer coverage remained below pre-COVID-19 rates in 2022 and 2023 for this fishery due to the logistics and costs of deploying observers in American Samoa. NMFS is looking into designing a program that would allow for easier hire of local observers to increase coverage rates.

This report summarizes protected species interactions in the American Samoa longline fishery since 2006. Data for 2020 and 2021 are not reported due to data confidentiality rules associated with the low 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 methods used to estimate the annual total interactions. Comparison of annual incidental takes within a year to the ITSs are based on the interaction date rather than the vessel arrival date, consistent with the 2015 Biological Opinion and associated supplements. Annual summary data presented in this report may differ from those in the PIRO Observer Program Quarterly and Annual Reports, which began summarizing interaction data by haul begin dates (proxy for interaction date) in 2021.

3.3.3.3 SEA TURTLE INTERACTIONS IN THE AMERICAN SAMOA LONGLINE FISHERY

Table 79 summarizes the incidental take data of sea turtles from 2006 to 2023 in the American Samoa 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 further examined by NMFS, and updated information necessary for any data analyses is available from 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 are not available, a standard expansion factor estimate is used (EF Est. = 100 / % observer coverage * # takes). PIFSC generated estimated number of interactions for 2020-2021 based on observer data from 2012-2020 (McCracken and Cooper 2022a, 2022e).

Between 2006 and 2019, the PIRO Observer Program reported interactions with green, leatherback, olive ridley, and hawksbill sea turtles, but no observed interactions were reported with loggerhead sea turtles. The highest observed interaction rate involved green sea turtles, whereas interactions with leatherbacks, olive ridleys, and hawksbills were less frequent. 2020 and 2021 data cannot be reported due to confidentiality rules.

Green sea turtle takes were variable year to year, ranging between 0-11 observed takes (0-50 expanded annual estimated takes). From 2016 to 2019, four annual interactions per year with green turtles were observed, all of which resulted in mortalities. The interaction rate in 2018 was the highest since 2006. At its 170th Meeting in June 2017, the Council recommended evaluation of the effectiveness of the 2011 green turtle measure that required gear configuration to set hooks below 100 meters in the American Samoa longline fishery. PIFSC in response indicated they do not recommend evaluation at that time due to the low statistical power. At its 173rd Meeting in June 2018, the Council recommended PIFSC conduct an economic cost-benefit analysis on the use of large circle hooks in the American Samoa longline fishery to determine whether modifying the green turtle mitigation measures in the fishery may contribute to further reductions in interactions in the fishery without significant negative impacts on fishery operations and revenue. In response, PIFSC conducted a feasibility assessment for conducting a cost-benefit analysis, which indicated that a detailed analysis is not likely to provide new information beyond what is known from the Council-funded large circle hook study (Curran and Beverly 2012) due to data limitations (Raynor 2018).

All leatherback, olive ridley, and hawksbill sea turtle interactions were observed after 2010, with hawksbill interactions first occurring in 2016. Observer coverage was relatively low in 2006-2009 when interactions with these species were not observed (average observer coverage = 10.8%) compared to 2010-2019 (above 15%). Since leatherback, olive ridley, and hawksbill interactions with this fishery are relatively uncommon, it is possible the recent occurrence of interactions after 2010 is due to higher observer coverage as opposed to a true increase in interactions in the fishery.

Table 79. Observed takes, mortalities (M), takes per fishing effort (1,000 hooks), estimated annual takes using expansion factor estimates and ME for sea turtles in the American Samoa longline fishery, 2006-2023[a]

Year	Obs. Cov. (%)	Sets	Hooks	Green				Leatherback				Olive ridley				Hawksbill			
				Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME
				Takes (M)	Takes/ 1,000 hooks			Takes (M)	Takes/ 1,000 hooks			Takes (M)	Takes/ 1,000 hooks			Takes (M)	Takes/ 1,000 hooks		
2006	8.1	287	797,221	3(3)	0.0038	37	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	-	-
2007	7.1	410	1,255,329	1(1)	0.0008	14	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	-	-
2008	6.4	379	1,194,096	1(1)	0.0008	16	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	-	-
2009	7.7	306	880,612	3(3)	0.0034	39	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	-	-
2010	25.0	798	2,301,396	6(5)	0.0026	-	50	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	-
2011	33.3	1,257	3,605,897	11(10)	0.0031	-	32	2(1)	0.0006	-	4	1	0.0003	-	4	0	0.0000	-	-
2012	19.8	662	1,880,525	0	0.0000	-	0	1	0.0005	-	6	1(1)	0.0005	-	6	0	0.0000	-	-
2013	19.4	585	1,690,962	2(2)	0.0012	-	19	2(1)	0.0012	-	13	1	0.0006	-	4	0	0.0000	-	-
2014	19.4	565	1,490,416	2(2)	0.0013	-	17	0	0.0000	-	4	2	0.0013	-	5	0	0.0000	-	-
2015	22.0	504	1,441,706	0	0.0000	-	0	3(3)	0.0021	-	22	1	0.0007	-	6	0	0.0000	-	-
2016	19.4	424	1,179,532	4(4)	0.0034	-	17	1(1)	0.0008	-	3	3(3)	0.0025	-	12	1(1)	0.0008	-	4
2017	20.0	447	1,271,803	4(4)	0.0031	-	22	1	0.0008	-	3	2(2)	0.0016	-	12	0	0.0000	-	3
2018	17.5	276	732,476	4(4)	0.0055	-	20	1	0.0014	-	5	2(2)	0.0027	-	11	2(2)	0.0027	-	5
2019	15.7	380	1,087,860	4(4)	0.0037	-	26	1(1)	0.0009	-	7	3(3)	0.0028	-	29	0	0.0000	-	0
2020	2.13	*	*	*	*	*	11	*	*	*	7	*	*	*	6	*	*	*	2
2021	4.65	*	*	*	*	*	10	*	*	*	6	*	*	*	7	*	*	*	2
2022	8.70	90	260,768	0	0.0000	-	4	0	0.0000	-	2	1(1)	0.0038	-	8	0	0.0000	-	0
2023	8.82	154	507,460	2(2)	0.0039	23	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-

[a] Take and effort data are based on vessel arrival dates.
*2020 and 2021 data are not reported due to confidentiality rules.
Source: Take data—2006-2020 PIRO Observer Program Annual and Quarterly Status Reports
ME—McCracken, 2015; McCracken, 2017a; McCracken 2019a; McCracken 2020b; McCracken and Cooper 2022a; McCracken and Cooper 2022e.

3.3.3.3.1 Comparison of Interactions with ITS

The 2023 Biological Opinion includes ITSs for sea turtle species based on the maximum 5-year running sum for each species (Table 80). The new ITS went into effect May 15, 2023. For the purposes of monitoring the ITS, all captures in 2023 will count towards the first year of the 5-year term. Exceeding the maximum 5-year running sum within any 5 consecutive years will lead to reinitiating consultation of the impact of this fishery on these species.

NMFS uses the interaction date for tracking sea turtle interactions against the ITS, regardless of vessel arrival date. Prior to 2021, NMFS in its PIRO Observer Program Quarterly and Annual Reports counted sea turtle interactions based on vessel arrival dates. 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.

Table 80. Estimated total interactions[a] (extrapolated using quarterly observer coverage) of sea turtles in the American Samoa longline fishery compared to the 5-year running sum Incidental Take Statement (ITS) in the 2023 Biological Opinion

Species	5-year running sum ITS Interactions	Estimated Total Interactions and Mortalities
		2023[b]
Green turtle	96	13(12)
Leatherback turtle	48	0(0)
Olive ridley turtle	61	0
Hawksbill turtle	30	0(0)

[a] Takes are counted based on interaction date.
[b] Estimated total interactions for 2023 were calculated using the number of observed interactions multiplied by the expansion factor.

3.3.3.4 MARINE MAMMAL INTERACTIONS IN THE AMERICAN SAMOA LONGLINE FISHERY

Table 81 summarizes the incidental take data of marine mammals from 2006 to 2023 in the American Samoa longline fishery. 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 further examined by NMFS, and updated information necessary for any data analyses is available from 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). PIFSC generated estimated number of interactions for 2020-2021 based on observer data from 2012-2020 (McCracken and Cooper 2022b, 2022g), and the logbook and observer data were also used to derive the 2021 estimates (McCracken and Cooper 2022g).

Observed marine mammal interactions with the American Samoa longline fishery between 2006 and 2019 were relatively infrequent with only one striped dolphin interactions in 2019. False killer whales had the highest interaction rate over this period, followed by rough-toothed dolphins, Cuvier’s beaked whales, short-finned pilot whales, and 2 unidentified cetaceans. Between 2006 and 2022, there were 7 years of no observed marine mammal interactions with this fishery (2006, 2007, 2009, 2010, 2012, 2022 and 2023).

3.3.3.4.1 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.

Table 81. Observed takes, mortalities (M), takes per fishing effort (1,000 hooks), and estimated annual takes using expansion factor estimates for marine mammals in the American Samoa longline fishery, 2006-2023[a]

Year	Obs. Cov. (%)	Sets	Hooks	Cuvier's beaked whale			False killer whale				Rough-toothed dolphin				Short-finned pilot whale			Striped dolphin				Unidentified cetacean		
				Observed			Observed				Observed				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	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.
2006	8.1	287	797,221	0	0.0000	0	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	0	0.0000	0	-	0	0.0000	0
2007	7.1	410	1,255,329	0	0.0000	0	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	0	0.0000	0	-	0	0.0000	0
2008	6.4	379	1,194,096	0	0.0000	0	2(1)	0.0017	31	-	1	0.0008	16	-	0	0.0000	0	0	0.0000	0	-	0	0.0000	0
2009	7.7	306	880,612	0	0.0000	0	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	0	0.0000	0	-	0	0.0000	0
2010	25.0	798	2,301,396	0	0.0000	0	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	0	0.0000	0	-	0	0.0000	0
2011	33.3	1,257	3,605,897	1(1)	0.0003	3	3	0.0008	9	-	5	0.0014	15	-	0	0.0000	0	0	0.0000	0	-	2	0.0006	6
2012	19.8	662	1,880,525	0	0.0000	0	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	0	0.0000	0	-	0	0.0000	0
2013	19.4	585	1,690,962	0	0.0000	0	1	0.0006	5	-	1(1)	0.0006	5	-	0	0.0000	0	0	0.0000	0	-	0	0.0000	0
2014	19.4	565	1,490,416	0	0.0000	0	0	0.0000	0	-	0	0.0000	0	-	1	0.0007	5	0	0.0000	0	-	0	0.0000	0
2015	22.0	504	1,441,706	0	0.0000	0	2(1)	0.0014	-	5	0	0.0000	-	0	0	0.0000	0	0	0.0000	-	0	0	0.0000	0
2016	19.4	424	1,179,532	0	0.0000	0	2	0.0017	-	10	2(2)	0.0017	-	10	0	0.0000	0	0	0.0000	-	0	0	0.0000	0
2017	20.0	447	1,271,803	0	0.0000	0	1	0.0008	-	6	1	0.0008	-	4	0	0.0000	0	0	0.0000	-	0	0	0.0000	0
2018	17.5	276	732,476	0	0.0000	0	1	0.0014	-	5	1(1)	0.0014	-	3	0	0.0000	0	0	0.0000	-	2	0	0.0000	0
2019	15.7	380	1,087,860	0	0.0000	0	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	0	1	0.0009	-	5	0	0.0000	0
2020	2.13	*	*	*	*	*	1	*	-	5	1	*	-	3	0	*	-	0	0	*	-	0	*	*
2021	4.65	*	*	*	*	*	*	*	*		*	*	*		*	*	*		*	*	*		*	*
2022	8.70	90	260,768	0	0.0000	0	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-	0	0	0	-	0.0000	0
2023	8.82	154	507,460	0	0.0000	0	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	0	0.0000	0	-	0	0.0000	0

[a] Take and effort data are based on vessel arrival dates.
*2020 and 2021 data are not reported due to confidentiality rules.
Source: 2006-2020 PIRO Observer Program Annual and Quarterly Status Reports and unpublished observer data; McCracken 2020a; McCracken and Cooper 2022b; McCracken and Cooper 2022g.

3.3.3.5 SEABIRD INTERACTIONS IN THE AMERICAN SAMOA LONGLINE FISHERY

Table 82 summarizes the incidental take data of seabirds from 2006 to 2022 in the American Samoa 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 further examined by NMFS, and updated information necessary for any data analyses is available from 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 McCracken Estimates, or "ME"). When ME are not available, a standard expansion factor estimate is listed in the table (EF Est. = 100 / % observer coverage * # takes). 2020-2021 data cannot be reported due to confidentiality rules. PIFSC generated estimated number of interactions for 2020-2021 based on observer data from 2012-2020 (McCracken and Cooper 2022a, 2022e).

Observed seabird interactions with the American Samoa longline fishery between 2006 and 2023 were uncommon, including interactions with two unidentified shearwaters and one frigatebird. Additionally, the observer program report for 2015 included 13 observed interactions with black-footed albatrosses that occurred in the North Pacific with vessels departing American Samoa and landing in California. There was one unidentified shearwater was observed in 2019, and no other observed seabird interactions from 2016-2023.

Table 82. Observed takes, mortalities (M), takes per fishing effort (1,000 hooks), and estimated annual takes using expansion factor estimates and ME for seabirds in the American Samoa longline fishery, 2006-2023[a]

Year	Obs. Cov. (%)	Sets	Hooks	Black-footed Albatross				Unidentified shearwater				Unidentified frigatebird			
				Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME
				Takes (M)	Takes/ 1,000 hooks			Takes (M)	Takes/ 1,000 hooks			Takes (M)	Takes/ 1,000 hooks		
2006	8.1	287	797,221	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-
2007	7.1	410	1,255,329	0	0.0000	0	-	1(1)	0.0008	14	-	0	0.0000	0	-
2008	6.4	379	1,194,096	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-
2009	7.7	306	880,612	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-
2010	25.0	798	2,301,396	0	0.0000	0	-	0	0.0000	-	0	0	0.0000	-	0
2011	33.3	1,257	3,605,897	0	0.0000	0	-	1(1)	0.0003	-	2	0	0.0000	-	0
2012	19.8	662	1,880,525	0	0.0000	0	-	0	0.0000	-	0	0	0.0000	-	0
2013	19.4	585	1,690,962	0	0.0000	0	-	0	0.0000	-	0	1(1)	0.0006	-	5
2014	19.4	565	1,490,416	0	0.0000	-	0	0	0.0000	0	-	0	0.0000	-	0
2015	22.0	504	1,441,706	13(13)[b]	0.0090	-	13	0	0.0000	0	-	0	0.0000	-	0
2016	19.4	424	1,179,532	0	0.0000	0		0	0.0000	-	0	0	0.0000	0	-
2017	20.0	447	1,271,803	0	0.0000	0	-	0	0.0000	-	0	0	0.0000	0	-
2018	17.5	276	732,476	0	0.0000	0	-	0	0.0000	-	0	0	0.0000	0	-
2019	15.7	380	1,087,860	0	0.0000	0	-	1(1)	0.0009	-	7	0	0.0000	0	-
2020	2.13	*	*	*	*	*	0	*	*	*	1	*	*	*	1
2021	4.65	*	*	*	*	*	0	*	*	*	1	*	*	*	1
2022	8.70	90	260,768	0	0.0000	0	-	0	0.0000	-	0	0	0.0000	-	0
2023	8.82	154	507,460	0	0.0000	0		0	0.0000	0		0	0.0000	0	

[a] Take data are based on vessel arrival dates.
[b] These seabird interactions occurred in the North Pacific by vessels departing American Samoa and landing in California.
*2020 data are not reported due to confidentiality rules.
Source: 2006-2019 PIRO Observer Program Annual and Quarterly Status Reports
ME—McCracken, 2015a; McCracken, 2017a; McCracken 2020b; McCracken and Cooper 2022a; 2022e; McCracken 2023.

3.3.3.6 ELASMOBRANCH INTERACTIONS IN THE AMERICAN SAMOA LONGLINE FISHERY

Table 83 summarizes the incidental take data for the Indo-west Pacific DPS scalloped hammerhead sharks, oceanic whitetip sharks, and giant manta rays in the American Samoa longline fishery. Giant manta rays were listed under the ESA on January 22, 2018 (83 FR 2916), and oceanic whitetip sharks were listed on January 30, 2018 (83 FR 4153). On April 3, 2019, NMFS reinitiated consultation for the American Samoa longline fishery and determined that the conduct of the fishery during the period of consultation will not violate ESA Sections 7(a)(2) and 7(d). 2020 and 2021 data cannot be reported due to confidentiality rules. PIFSC generated estimated number of interactions for 2020-2021 based on observer data from 2012-2020 (McCracken and Cooper 2022a, 2022d).

Observed interactions with oceanic whitetip sharks are most common in the American Samoa longline fishery from 2006 to 2019. Scalloped hammerheads and giant manta rays are observed less frequently. There have been no observed takes of giant manta rays since 2014.

Table 83. Observed and estimated total elasmobranch interactions with the American Samoa longline fishery for 2006-2023[a]

Year	Obs. Cov. (%)	Sets	Hooks	Scalloped hammerhead				Oceanic whitetip				Giant manta ray			
				Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME
				Takes (M[b])	Takes/ 1,000 hooks			Takes (M[b])	Takes/ 1,000 hooks			Takes (M)	Takes/ 1,000 hooks		
2006	8.1	287	797,221	1(1)	0.0013	12	-	46(11)	0.0577	568	-	0	0.0000	0	-
2007	7.1	410	1,255,329	1	0.0008	14	-	62(18)	0.0494	873	-	0	0.0000	0	-
2008	6.4	379	1,194,096	0	0.0000	0	-	48(17)	0.0402	750	-	0	0.0000	0	-
2009	7.7	306	880,612	0	0.0000	0	-	45(13)	0.0511	584	-	1	0.0011	13	-
2010	25	798	2,301,396	4(1)	0.0017	-	17	130(37)	0.0565	-	1,176	3	0.0013	-	11
2011	33.3	1,257	3,605,897	2(1)	0.0006	-	7	116(44)	0.0322	-	319	3	0.0008	-	11
2012	19.8	662	1,880,525	0	0.0000	-	0	71(26)	0.0378	-	470	3	0.0016	-	29
2013	19.4	585	1,690,962	0	0.0000	-	0	88(15)	0.0520	-	407	2	0.0012	-	8
2014	19.4	565	1,490,416	1	0.0007	-	6	104(37)	0.0698	-	464	1	0.0007	-	2
2015	22.0	504	1,441,706	1(1)	0.0007	-	3	168(59)	0.1165	-	827	0	0.0000	-	3
2016	19.4	424	1,179,532	1	0.0008	-	8	197(70)	0.1670	-	788	0	0.0000	-	0
2017	20.0	447	1,271,803	1	0.0008	-	7	63(22)	0.0495	-	484	0	0.0000	-	0
2018	17.5	276	732,476	3	0.0041	-	8	108(39)	0.1474	-	513	0	0.0000	0	-
2019	15.7	380	1,087,860	0	0.0000	-	0	140(51)	0.1287	-	870	0	0.0000	0	-
2020	2.13	*	*	*	*	*	4	*	*	*	469	*	*	*	3
2021	4.65	*	*	*	*	*	3	*	*	*	467	*	*	*	3
2022	8.70	90	260,768	0	0.0000	-	2	25(8)	0.0096	-	355	0	0.0000	-	3
2023	8.82	154	507,460	0	0.0000	0	-	58(18)	0.0114	658	-	0	0.0000	0	-

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

[b] Mortality numbers include sharks that were released dead, finned (prior to the passage of the Shark Conservation Act of 2010), and kept.

*2020 data are not reported due to confidentiality rules.

Source: 2006-2019 PIRO Observer Program Annual and Quarterly Status Reports and unpublished observer data; McCracken 2015a; McCracken 2017a, McCracken 2019a; McCracken 2020b; McCracken and Cooper 2022a.

3.3.3.6.1 Comparison of Interactions with ITS

An ITS is not required to provide protective coverage for the ESA listed elasmobranchs including the Indo-west Pacific scalloped hammerhead shark DPS, the oceanic whitetip shark, or the giant manta ray, because there are no take prohibitions under ESA section 4(d) for these species. However, ITS were included for these species in their relevant Biological Opinions to serve as a check on the no-jeopardy conclusions by providing a reinitiation trigger.

The 2023 Biological Opinion includes ITSs for ESA listed elasmobranchs based on a maximum 5-year running sum for each species (Table 84). The new ITS went into effect May 15, 2023. For the purposes of monitoring the ITS, all captures in 2023 will count towards the first year of the 5-year term. Exceeding the maximum 5-year running sum within any 5 consecutive years will lead to reinitiating consultation of the impact of this fishery on these species.

NMFS counts takes for the Indo-west Pacific DPS of scalloped hammerhead shark, oceanic whitetip shark, and giant manta ray based on the end of haul incidental take date.

Table 84. Estimated total interactions (extrapolated using quarterly observer coverage) of oceanic whitetip sharks and giant manta rays in the American Samoa longline fishery compared to the 5-year running sum ITS in the 2023 Biological Opinion[a]

Species	5-year running ITS	Estimated Total Interactions
		2023
Scalloped hammerhead shark, Indo-West Pacific DPS	45	7
Oceanic whitetip shark	3,520	386
Giant manta ray	57	0
Manta/Mobula[b]		7

[a] Take data are based on haul dates.
[b] 28% of manta/mobula interactions are also tracked as the ITS for giant manta ray was based on interaction data that included rays classified as manta/mobula in the observer record that may have been giant manta rays.

3.3.4 HAWAII TROLL FISHERY

3.3.4.1 INDICATORS FOR MONITORING PROTECTED SPECIES INTERACTIONS IN THE HAWAII TROLL FISHERY

In this report, the Council monitors protected species interactions in the Hawaii troll fishery using proxy indicators such as fishing effort and changes in gear types as this fishery does not have observer coverage.

3.3.4.1.1 Conservation Measures

The Hawaii 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 requires any vessel fishing under the FEP to comply with sea turtle handling and release regulations.

3.3.4.1.2 ESA Consultations

In a Biological Opinion 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 handline fishing vessels (NMFS 2009). The Biological Opinion 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.

3.3.4.1.3 Non-ESA Marine Mammals

The MMPA requires NMFS to annually publish a 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 2024 LOF (89 FR 12257, February 16, 2024)), the Hawaii 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). The 2024 LOF lists the following marine mammal stock that may be incidentally killed or injured in this fishery:

- Pantropical spotted dolphin, HI stock

While NMFS lists Pantropical spotted dolphin as potentially interacting with the Hawaii troll fishery in the LOF, there is a lack of direct evidence of serious injury or mortality in this fishery (78 FR 23708, April 22, 2013).

3.3.4.2 STATUS OF PROTECTED SPECIES INTERACTIONS IN THE HAWAII TROLL FISHERY

NMFS has determined that the Hawaii 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, scalloped hammerhead shark, and non ESA-listed marine mammals, and has no effects on ESA-listed reef-building corals. The Hawaii troll fishery has minimal interactions with these protected species.

The ITS in the 2009 Biological Opinion 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 Chapter 2, 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.

3.3.5 MHI HANDLINE FISHERY

3.3.5.1 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.

3.3.5.1.1 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 requires any vessel fishing under the FEP to comply with sea turtle handling and release regulations.

3.3.5.1.2 ESA Consultations

In a Biological Opinion 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 handline fishing vessels (NMFS 2009). The Biological Opinion 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.

3.3.5.1.3 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 2024 LOF (89 FR 12257, February 16, 2024), 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).

3.3.5.2 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, scalloped hammerhead shark, and non ESA-listed marine mammals, and has no effects on ESA-listed reef-building corals. The MHI handline fishery has minimal interactions with these protected species.

The ITS in the 2009 Biological Opinion 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 Chapter 2, 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.

3.3.6 HAWAII OFFSHORE HANDLINE FISHERY

3.3.6.1 INDICATORS FOR MONITORING PROTECTED SPECIES INTERACTIONS IN THE HAWAII OFFSHORE HANDLINE FISHERY

In this report, the Council monitors protected species interactions in the Hawaii offshore handline fishery using proxy indicators such as fishing effort and changes in gear types as this fishery does not have observer coverage.

3.3.6.1.1 Conservation Measures

The Hawaii 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 requires any vessel fishing under the FEP to comply with sea turtle handling and release regulations.

3.3.6.1.2 ESA Consultations

In a Biological Opinion 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 handline fishing vessels. The Biological Opinion 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.

3.3.6.1.3 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 2024 LOF (89 FR 12257, February 16, 2024), the Hawaii 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).

3.3.6.2 STATUS OF PROTECTED SPECIES INTERACTIONS IN THE HAWAII OFFSHORE HANDLINE FISHERY

NMFS has determined that the Hawaii 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, scalloped hammerhead shark, and non ESA-listed marine mammals, and have no effects on ESA-listed reef-building corals. The Hawaii offshore handline fishery has minimal interactions with these protected species.

The ITS in the 2009 Biological Opinion 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 Chapter 2, 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.

3.3.7 AMERICAN SAMOA, GUAM, AND CNMI TROLL FISHERY

3.3.7.1 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.

3.3.7.1.1 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 requires any vessel fishing under the FEP to comply with sea turtle handling and release regulations.

3.3.7.1.2 ESA Consultations

In a Biological Opinion 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 handline fishing vessels. The Biological Opinion 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.

3.3.7.1.3 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 2024 LOF (89 FR 12257, February 16, 2024), 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).

3.3.7.2 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, scalloped hammerhead shark, and non ESA-listed marine mammals, and have no effects on ESA-listed reef-building corals. The American Samoa, Guam, and CNMI fisheries likely have minimal interactions with these protected species.

The ITS in the 2009 Biological Opinion 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 Chapter 2, no notable changes have been observed in the American Samoa, Guam, and CNMI troll fisheries. There is no other information to indicate that impacts to protected species from these fisheries have changed in recent years.

3.3.8 IDENTIFICATION OF EMERGING ISSUES

Oceanic whitetip sharks were listed under the ESA in 2018. This species is incidentally captured in the Hawaii and American Samoa longline fisheries. Observed interaction data have been added to this report. RFMO conservation measures implemented in the U.S. domestic fisheries has required non-retention of oceanic whitetip sharks since 2011 in the IATTC area and 2015 in the WCPFC area. Additionally, the Cooperative Institute for Marine and Atmospheric Research and the Hawaii Institute of Marine Biology is conducted a study to assess the post-release survivorship of five species of sharks including the oceanic whitetip shark released alive in the Hawaii and American Samoa longline fishery.

In the study (Hutchinson et al. 2021), PIFSC researchers worked with observer programs and fishermen to quantify post release mortality rates of blue (BSH), bigeye thresher (BTH), shortfin mako (SMA), oceanic whitetip (OCS), and silky sharks (FAL) that are incidentally captured in the Hawaii deep-set (HiDS) and OCS and FAL in the American Samoa (AS) tuna target longline fisheries, using pop-off archival satellite tags (PAT). This study also assessed the effects that standard shark bycatch handling and discard practices utilized in these fisheries may have on the post release fate of discarded sharks that are alive at haul back of the longline gear. Observers trained in the project methods collected shark condition and handling data on 19,all incidental elasmobranchs captured during the study. Tagging was not conducted on Hawaii shallow-set (HISS) trips targeting swordfish. The handling and damage data recorded by trained observers indicated that most of the five species of sharks considered in this study were released by cutting the line. Followed by; gear removal with jaw damage, gear removal with no damage to the shark, gear removal with removal of part of the shark (e.g., lobe of tail on tail-hooked BTH). A small proportion of these sharks escaped the gear on their own. Other handling methods that were observed included the use of a dehooker and a drag line. The length and composition of the trailing gear was also recorded by observers and varied by fishery and by species. The HIDS fishery left the greatest amount of trailing gear on sharks, where sharks were released with an average of 8.75 m, ranging in length from 1.0–25.0 m, typically composed of a stainless-steel hook, 0.5 m of braided wire leader, a 45-gram weighted swivel, and monofilament branchline.

Sharks released by cutting the line in American Samoa were released with an average of 2.98 m of trailing gear which is composed of a stainless-steel hook to an all monofilament line ranging in length from 1.0–10.0 m.

A proportional hazard model was implemented in a Bayesian framework to understand the impacts of several factors (fishery, condition at the vessel, handling and discard methods, approximate fork length, length of trailing gear) associated with the fishery interaction on survival. The baseline hazard was assumed to vary by species and tag deployment period. Of the species caught and tagged in the HIDS fishery, BSH had the lowest survival rate, followed by BTH, OCS, and SMA at their mean interaction conditions. For the species caught in the ASLL fishery, OCS had a lower survival rate than FAL at their mean interaction conditions. The only species tagged in both fisheries, OCS, had lower survival in the ASLL fishery than the HIDS fishery. The most influential factors reducing survival rates post release were; catch condition where injured animals had higher mortality rates, handling methods that either damaged the jaw or removed part of the tail (thresher sharks only), the amount of trailing gear left on an animal, tail hooking (thresher sharks only) and wire leader material. Additional details regarding the preliminary results of this study are available in Hutchinson et al. (2021). Currently, analysis is ongoing to incorporate data from tags deployed after 2019 and final results are forthcoming.

Currently, genetic samples are being taken from large Mobulids captured in the Hawaii longline fishery to help elucidate species identification issues, interaction rates, and eventually, population structure for the giant manta ray. To date, 37samples have been collected and 24 of those samples have been analyzed for species identification. To date, species collected include *M. mobular/japanica*, *M. thurstoni*, *M. tarapacana*; and one confirmed *M. birostris/alfredi*. More samples are needed for a larger sample size.

Previous efforts to understand the spatial relationships of loggerhead turtles and the Hawaii shallow-set longline fishery have included data generated from satellite tags deployed on both captive-reared turtles, and turtles incidentally caught in the fishery. Given captive-reared turtles may not be representative of the size or locations of turtles interacting with the modern Hawaii shallow-set longline fishery, efforts have been underway since 2020 to increase the sample size of satellite tags deployed on incidentally caught turtles. A total of 53 satellite tags were deployed between February 2020 and April 2024 on post-hooked loggerheads, and additional tags may be deployed in coming years.

A power-assisted deployment device (ADD), tag anchor, and pole extension that will enable longline observers (on deck) to attach satellite tags to leatherback turtles is currently in development. The prototypes of the ADD and tag anchor were recently produced and will be tested on leatherback turtles in the Atlantic during the coming years to evaluate the tagging apparatus and tag retention. The prototype of the pole extension is currently under development. If proven effective, the new device will allow observers to deploy tags on leatherback turtles bycaught in longline fisheries, generating urgently needed spatial ecology and mortality rate information on the species that can inform models and management decision making.

Potential interactions between Hawaii non-longline pelagic fisheries and cetaceans have been identified and are summarized in the most recent marine mammal SARs. Available information does not identify which type of fisheries may be causing injury to cetaceans nor the extent to which the cetacean populations may be impacted by such injuries. New information on this subject published in 2016 that are not included in the current SARs are summarized below.

Potential interactions between Hawaii non-longline pelagic fisheries and cetaceans have been identified and are summarized in the most recent marine mammal SARs. Available information does not identify which type of fisheries may be causing injury to cetaceans nor the extent to which the cetacean populations may be impacted by such injuries. New information on this subject published in 2016 that are not included in the current SARs are summarized below.

Madge, L., 2016. Exploratory study of interactions between cetaceans and small-boat fishing operations in the Main Hawaiian Islands (MHI). Pacific Islands Fisheries Science Center, Administrative Report H-16-07, 37 p. doi:10.7289/V5/AR-PIFSC-H-16-07.

Summary: The exploratory study was aimed at improving the understanding of fishery-cetacean interactions in the main Hawaiian Islands through interviews with small-boat fishermen on Oahu and the Big Island. The study highlighted that there is considerable uncertainty in species identification by fishermen of false killer whales and other odontocetes categorized as blackfish, and respondents generally reported avoiding interactions by leaving the fishing area when a blackfish is observed. The results of this study cannot be used to estimate frequency or assess the distribution of interactions due to the small sample size and non-random sampling method.

Table 85 summarizes current candidate ESA species, recent listing status, and post-listing activity (critical habitat designation and recovery plan development). Impacts from FEP-managed fisheries on any new listings and critical habitat designations will be considered in future versions of this report.

Table 85. Status of ESA listing, status reviews, critical habitat and recovery plan for species occurring in the Pelagic FEP region

Species		Listing/Petition Response Process			Post-Listing Activity	
Common Name	**Scientific Name**	**90-day Finding**	**12-month Finding / Proposed Rule**	**Final Rule**	**Critical Habitat/Other**	**Recovery Plan**
Oceanic whitetip shark	*Carcharhinus longimanus*	Positive (81 FR 1376, 1/12/2016)	Positive, threatened (81 FR 96304, 12/29/2016)	Listed as threatened (83 FR 4153, 1/30/18)	Critical habitat: Designation not prudent; no areas within US jurisdiction that meet definition of critical habitat (85 FR 12898, 3/5/2020) Other: Protective regulations under ESA 4(d) proposed (89 FR 41917, 5/14/2024)	Draft Recovery Plan published January 25, 2023 (88 FR 4817)
Chambered nautilus	*Nautilus pompilius*	Positive (81 FR 58895, 8/26/2016)	Positive, threatened (82 FR 48948, 10/23/17)	Listed as threatened (83 FR 48876, 09/28/2018)	Designation not prudent; no areas within US jurisdiction that meet definition of critical habitat (85 FR 5197, 01/29/2020)	TBA

Species		Listing/Petition Response Process			Post-Listing Activity	
Common Name	Scientific Name	90-day Finding	12-month Finding / Proposed Rule	Final Rule	Critical Habitat/Other	Recovery Plan
Giant manta ray	*Manta birostris*	Positive (81 FR 8874, 2/23/2016)	Positive, threatened (82 FR 3694, 1/12/2017)	Listed as threatened (83 FR 2916, 1/22/18)	Designation not prudent; no areas within US jurisdiction that meet definition of critical habitat (84 FR 66652, 12/5/2019)	In development, Recovery outline published 12/4/19 to serve as interim guidance until full recovery plan is developed.
Corals	N/A	Positive for 82 species (75 FR 6616, 2/10/2010)	Positive for 66 species (77 FR 73219, 12/7/2012)	20 species listed as threatened (79 FR 53851, 9/10/2014)	Critical habitat proposed (85 FR 76262, 11/27/2021, withdrawn) Critical habitat proposed (88 FR 83644, November 30, 2023)	In development; interim recovery outline in place, recovery workshops convened in May 2021.
False killer whale (MHI Insular DPS)	*Pseudorca crassidens*	Positive (75 FR 316, 1/5/2010)	Positive, endangered (75 FR 70169, 11/17/2010)	Listed as endangered (77 FR 70915, 11/28/2012)	Designated in waters from the 45 m depth contour to the 3,200 m depth contour around the MHI from Niihau east to Hawaii (83 FR 35062, 07/24/2018)	Final Recovery Plan published November 3, 2021 (85 FR 60615)
Green sea turtle	*Chelonia mydas*	Positive (77 FR 45571, 8/1/2012)	Identification of 11 DPSs, endangered and threatened (80 FR 15271, 3/23/2015)	11 DPSs listed as endangered and threatened (81 FR 20057, 4/6/2016)	Critical habitat proposed (88 FR 46572, 07/19/2023)	TBA
Loggerhead sea turtle (North Pacific DPS)	*Caretta caretta*	Positive (72 FR 64585, 11/16/2007)	9 DPSs listed as endangered and threatened (76 FR 15932, 03/22/2011)	9 DPSs listed as endangered and threatened (76 FR 58867, 10/24/2011)	Designated for Atlantic Ocean and Gulf of Mexico DPSs (79 FR 39855, 08/11/2014)	In development; 5-year status review published on 4/7/2020

3.3.9 IDENTIFICATION OF RESEARCH, DATA, AND ASSESSMENT NEEDS

The following research, data and assessment needs for pelagic fisheries were identified by the Council’s Plan Team:

- Maintain observer coverage in the longline fisheries to facilitate data collection to identify changes in ecosystem composition, including but not limited to, trophic cascades, spatial habitat partitioning, climate-driven variability and change, and fishery-induced changes;
- 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, olive ridley, albatrosses, elasmobranchs);

- Generate data on the spatial ecology, as well as post-hooking behaviors and survival rates for leatherback turtles interacting with the SSLL and DSLL fisheries;
- Ecosystem considerations on catch and bycatch in the DSLL fishery (e.g., bigeye tuna, albatrosses, leatherback, and olive ridley turtles) and SSLL fishery (e.g., black-footed albatross) as they relate to environmental and ecological drivers of changing species distribution and aggregation;
- Improve data collection for oceanic whitetip shark capture data in non-longline pelagic fisheries;
- Conduct genetic and telemetry research to improve understanding of population structure and movement patterns for listed elasmobranchs;
- Estimates of post release survival for incidental protected species;
- Improve observer data collection for bite-offs; and
- Build species distribution models (SDM) for protected species using existing telemetry data to assess how a changing ocean may affect the availability of preferred habitat and how this might impact fishery vulnerability under future climate change projections.

3.4 CLIMATE AND OCEANIC INDICATORS

Over the past few years, the Council has incorporated climate change into the overall management of the fisheries over which it has jurisdiction. This 2023 annual SAFE report includes a now standard section on indicators of climate and oceanic conditions in the Western Pacific Region. These indicators reflect both global climate variability and change, as well as trends in local oceanographic conditions.

The section begins with a brief summary of the state of the ocean and climate in 2023. This is followed by a list of all selected indicators. These indicators are then examined through summaries focused on natural climate variability and on anthropogenic climate change. Information on the background of these indicators, their development over time, and ongoing research needs can be found at the end of this section.

3.4.1 INDICATORS AT A GLANCE

Based on the information provided by the indicators in this chapter, long-term climate trends persisted in the Western Pacific region in 2023. Modes of interannual climate variability were mixed with ENSO transitioning to El Niño conditions and the PDO remaining negative. Hurricane activity and storm energy were below average in all Pacific basins except the Eastern Pacific. The atmospheric concentration of carbon dioxide continued to increase, ocean acidification intensified, and sea surface temperatures continued to rise. Chlorophyll concentrations at the ocean's surface exhibited no long-term trend, but the median size of phytoplankton has declined slightly over the past 26 years. The Subtropical Frontal Zone was north of average and the Transition Zone Chlorophyll Front was near average across much of the longline fishing grounds. Temperatures at 200–300 m below the surface were average. Bigeye tuna were slightly larger than average and swordfish slightly smaller, though no long-term trend is evident. Neither bigeye tuna weight-per-unit-effort nor the bigeye tuna recruitment index suggest there will be a pulse of increased recruitment or catch rates in the next few years. The bigeye tuna catch rate forecast suggests that catch will be fairly steady over the next four years.

Indicator	Trend	Current Status	Description and Rationale
Atmospheric Carbon Dioxide (CO_2)	Increasing	Record high	Atmospheric carbon dioxide is a measure of how human activity has already affected the climate system through the burning of fossil fuels.
Oceanic pH at Station ALOHA	Decreasing	Record low	Oceanic pH is a measure of how greenhouse gas emissions have already affected the ocean by increasing ocean acidity.
El Niño – Southern Oscillation (ENSO)	No trend	In historical range	The El Niño – Southern Oscillation (ENSO) cycle is known to affect Pacific fisheries, including tuna fisheries.
Pacific Decadal Oscillation (PDO)	No trend	In historical range	The Pacific Decadal Oscillation (PDO) changes phases over periods of 20–30 years, with secondary signatures for tropical fisheries.
Tropical Cyclones	Mixed trends	In historical range	Storms disrupt fishing effort, endanger life and safety at sea, and can damage fishing infrastructure on land.
Sea Surface Temperature (SST)	Increasing	Above average	SST is a measure of ocean temperatures, which vary naturally, are increasing due to climate change, and affect marine species.
200–300 m Ocean Temperature	Decreasing	Near average	These temperatures reflect those experienced by bigeye tuna during the day when they are targeted by the deep-set fishery.
Ocean Color	No trend	Near average	This indicator measures phytoplankton which are fishes' foundational food source
Subtropical Front (STF) and Transition Zone Chlorophyll Front (TZCF)	Not measured	In historical range	The STF and TZCF are targed by the swordfish fishery, used as migration and foraging corridors by marine species, and will be displaced northwards by climate change.
Estimated Median Phytoplankton Size	Decreasing	Below average	Fish size and abundance can be affected by median phytoplankton size, which in turn may be affected by climate variability and change.
Fish Community Size Structure	No trend	In historical range	Fish community size structure can be affected by a number of factors, including the climate.
Bigeye Tuna Weight-per-Unit-Effort	Not measured	In historical range	Tracking growing size classes through time can provide a strong indication of recruitment pulses, which may be affected by the climate.
Bigeye Tuna Recruitment Index	No trend	Record low	The timing of bigeye tuna recruitment pulses is not yet well understood, particularly in terms of how they are affected by the climate.
Bigeye Tuna Catch Rate Forecast	Not measured	In historical range	This indicator uses ocean conditions to forecast catch rates up to four years into the future.

Figure 156. Summary of the trends and status of the ocean and climate indicators in 2023

3.4.2 SELECTED INDICATORS

The primary goal for selecting the indicators used in this report is to provide fisheries-related communities, resource managers, and businesses with a climate-related situational awareness. In this context, indictors were selected to:

- Be fisheries relevant and informative;
- Build intuition about current conditions in light of a changing climate;
- Provide historical context; and
- Allow for recognition of patterns and trends.

In this context, this section includes the following climate and oceanic indicators:

- Atmospheric concentration of carbon dioxide (CO_2)
- Oceanic pH at Station ALOHA;
- El Niño – Southern Oscillation (ENSO);
- Pacific Decadal Oscillation (PDO);
- Tropical cyclones;
- Sea surface temperature (SST);
- Ocean temperature at 200-300 m depth;
- Ocean color;
- North Pacific Subtropical Front (STF) and Transition Zone Chlorophyll Front (TZCF);
- Estimated median phytoplankton size
- Fish community size structure;
- Bigeye tuna weight-per-unit-effort;
- Bigeye tuna recruitment index; and
- Bigeye tuna catch rate forecast.

3.4.2.1 NATURAL CLIMATE VARIABILITY SUMMARY

The ocean and climate indicators described here can be used to understand the effects of natural climate variability. The relationship between these indicators is illustrated in Figure 157.

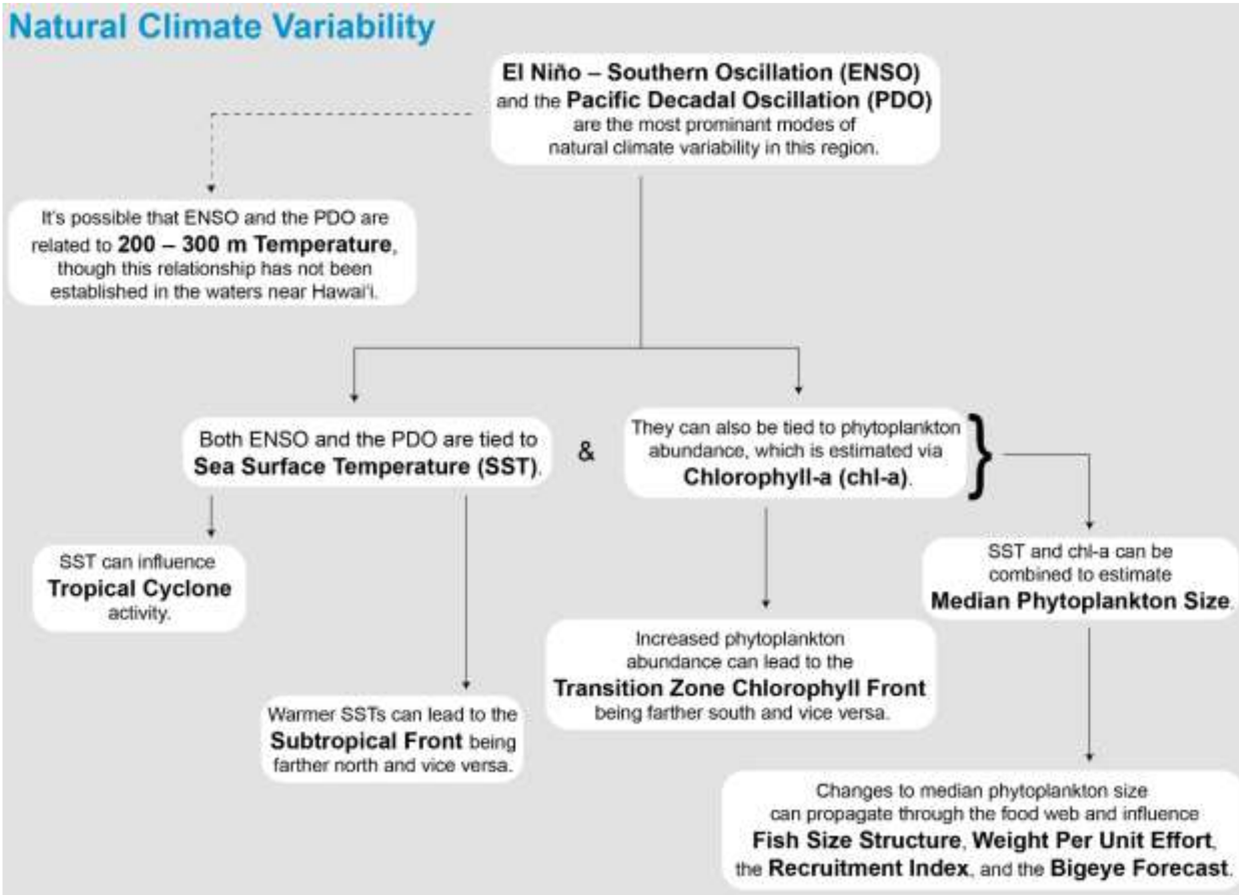


Figure 157. Schematic diagram illustrating the relationships between the ocean and climate indicators from the perspective of natural climate variability

The El Niño – Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO) are the most prominent modes of natural climate variability in the North Pacific. ENSO cycles are known to impact Pacific fisheries including tuna fisheries. The Oceanic Niño Index (ONI) is a measure of ENSO phase that focuses on ocean temperature, which has the most direct effect on these fisheries.

Both ENSO and the PDO are associated with interannual changes in sea surface temperature (SST), which is one of the most directly observable existing measures for tracking ocean temperature. Natural variability in SST impacts the marine ecosystem and pelagic fisheries. For example, higher SSTs can lead to the subtropical front being farther north and vice versa, which in turn affects the distance fishers may need to travel to reach longline fishing grounds. Changes in SST can also influence the number, location, strength, and seasonal timing of tropical cyclones.

ENSO and the PDO are also associated with interannual changes in phytoplankton abundance, which is observed through ocean color and estimated via chlorophyll-a (chl-a). Phytoplankton are the foundational food source for the species targeted by the region's longline fishery. Changes in phytoplankton abundance have the potential to impact fish abundance, size, and catch. Increased phytoplankton abundance can lead to the transition zone chlorophyll front

(TZCF) being farther south and vice versa, and changes in the location of this front particularly impact Hawai‘i’s swordfish fishery.

SST and chl-a can be combined to estimate median phytoplankton size. Changes to median phytoplankton can propagate through the food web and influence fish size structure, weight-per-unit-effort, and the bigeye tuna recruitment index. Furthermore, the recruitment index can be combined with median phytoplankton size to forecast bigeye tuna catch rates up to four years in advance.

It is possible that natural climate variability influences temperatures at 200–300 m below the surface where the bigeye fishery sets their hooks. However, this relationship has yet to be established.

Understanding the effects of natural climate variability, like ENSO and the PDO, on the ocean, marine ecosystems, and regional fisheries is an active area of research.

3.4.2.2 ANTHROPOGENIC CLIMATE CHANGE SUMMARY

The ocean and climate indicators described in this chapter can be used to understand the effects of anthropogenic climate change. The relationship between these indicators is illustrated in Figure 158.

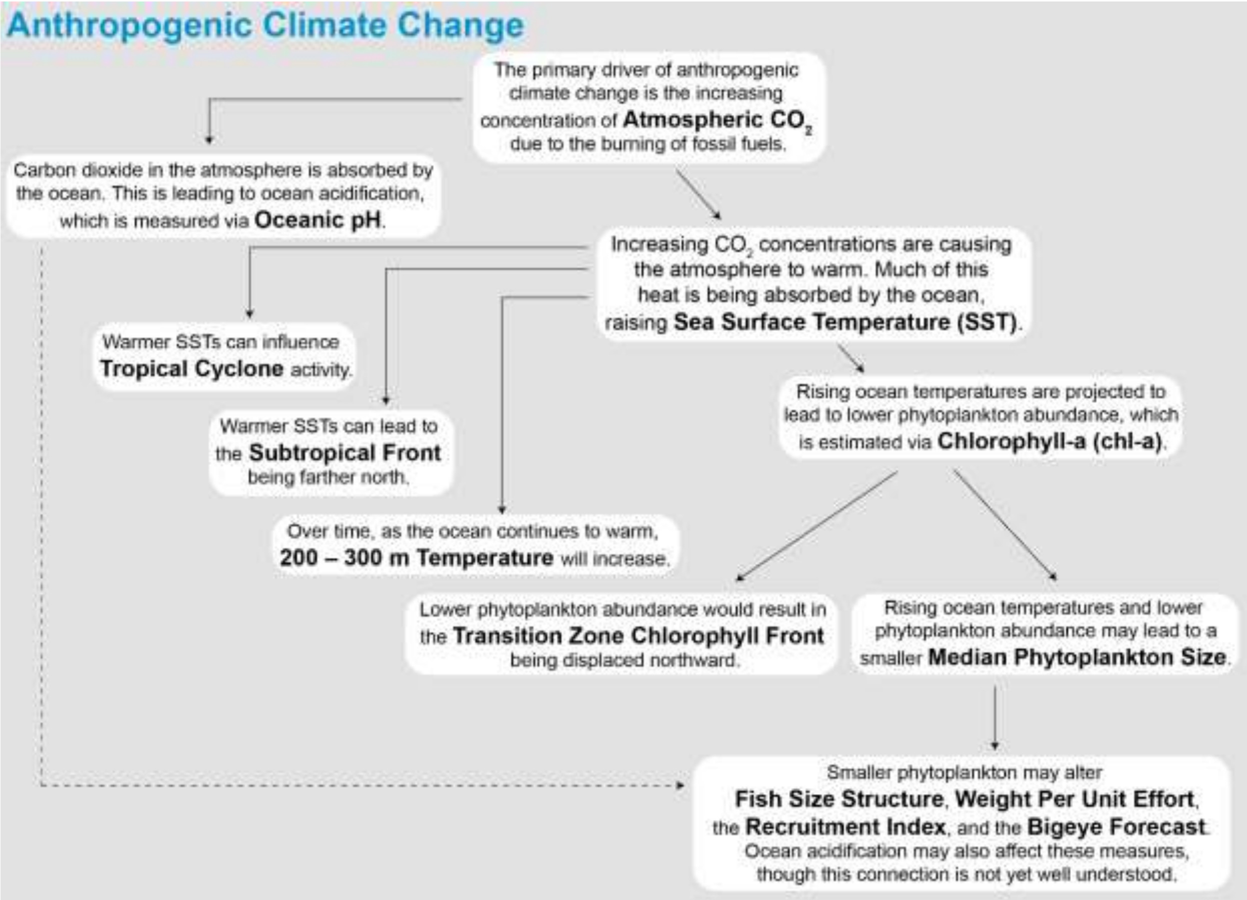


Figure 158. Schematic diagram illustrating the relationships between the ocean and climate indicators from the perspective of anthropogenic climate change

The primary driver of anthropogenic (human-caused) climate change is the increasing concentration of atmospheric carbon dioxide, CO2, due to the burning of fossil fuels. Therefore, atmospheric CO2 serves as a measure of what human activity has already done to affect the climate system through greenhouse gas emissions. The concentration of atmospheric CO2, and, in turn, its warming influence, is increasing more quickly over time.

Carbon dioxide in the atmosphere is absorbed by the ocean. This leads to ocean acidification, which is measured via pH. Therefore, oceanic pH is a measure of how greenhouse gas emissions have already impacted the ocean. Increasing ocean acidification limits the ability of marine organisms to build shells and other hard structures. Prey for commercially valuable fish are already being negatively affected by increasing ocean acidification.

Increasing carbon dioxide concentrations cause the atmosphere to warm. Much of this heat is then absorbed by the ocean, raising sea surface temperature (SST). SST is another measure of how greenhouse gas emissions are already impacting the ocean.

Rising sea surface temperatures may affect the number, strength, duration, track, and seasonal timing of tropical cyclones. The Accumulated Cyclone Energy index, or ACE Index, accounts for both the strength and duration of storms.

Over time, rising sea surface temperatures will warm deeper ocean waters. Changes in ocean temperature will affect tuna, and in turn, potentially their catchability. For example, fish may move to deeper waters or their habitat could be compressed geographically or vertically. Temperatures at 200–300 meters below the ocean's surface reflect those at the mid-range of depths targeted by the deep-set bigeye tuna fishery. Bigeye tuna have preferred thermal habitat, generally staying within waters between 8–14 ºC while they are at depth.

Rising ocean temperatures are projected to lead to lower phytoplankton abundance, which is observed through ocean color and estimated via chlorophyll-a (chl-a). Combined, rising ocean temperatures and lower phytoplankton abundance may lead to smaller median phytoplankton sizes. Smaller phytoplankton may alter fish size structure, weight-per-unit-effort, and the bigeye tuna recruitment index. Median phytoplankton size can be combined with the bigeye recruitment index to forecast catch rates.

Understanding the effects of anthropogenic climate change on the ocean, marine ecosystems, and regional fisheries is an active area of research.

3.4.2.3 ATMOSPHERIC CONCENTRATION OF CARBON DIOXIDE AT MAUNA LOA

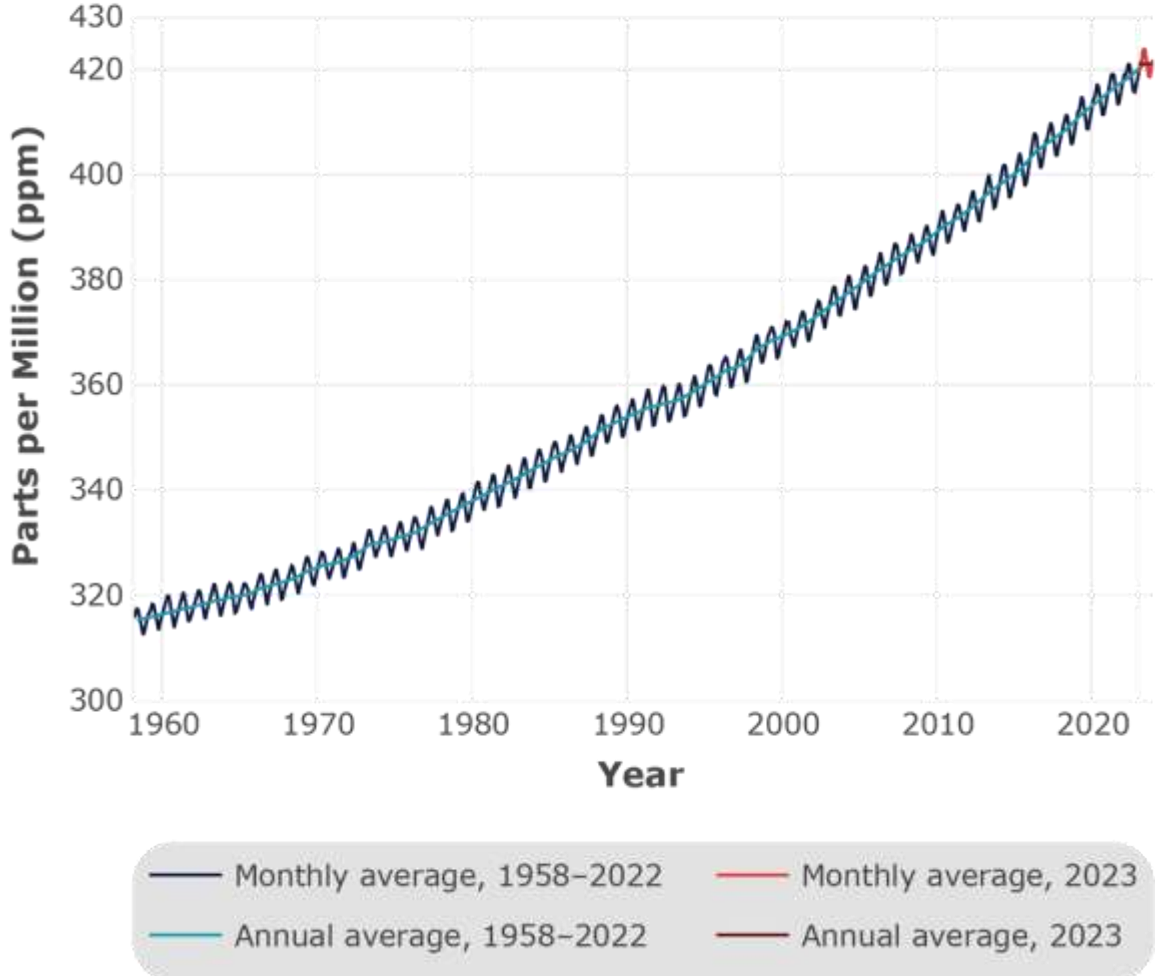


Figure 159. Concentration of atmospheric carbon dioxide at Mauna Loa Observatory on the island of Hawaii

Rationale: Atmospheric carbon dioxide (CO_2) 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, warming influence) of greenhouse gases in the atmosphere has increased substantially over the last several decades.

Status: Atmospheric CO_2 is increasing exponentially. This means that atmospheric CO_2 is increasing more quickly over time. In 2023, the annual mean concentration of CO_2 was 421.08 ppm. This is the highest annual value recorded. This year also saw the highest monthly value, which was 424 ppm. In 1959, the first year full of the time series, the atmospheric concentration of CO_2 was 316 ppm. The annual mean passed 350 ppm in 1988, and 400 ppm in 2015.

Description: Monthly mean atmospheric CO_2 at Mauna Loa Observatory, Hawai‘i in parts per million (ppm) from March 1958 to present. The observed increase in monthly average carbon dioxide concentration is primarily due 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 approximately one year. The annual variations at Mauna Loa, Hawaiʻi are due to the seasonal imbalance between the photosynthesis and respiration of terrestrial plants. During the summer growing season, photosynthesis exceeds respiration, and CO_2 is removed from the atmosphere. In the winter (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 its larger land mass.

Timeframe: Annual, monthly.

Region/Location: Mauna Loa, Hawaiʻi, but representative of global atmospheric carbon dioxide concentration. Note that due to the eruption of the Mauna Loa Volcano, measurements from Mauna Loa Observatory were suspended as of 29 November 2022. Observations from December 2022 to 4 July 2023 are from a site at the Maunakea Observatories, approximately 21 miles north of the Mauna Loa Observatory. Mauna Loa observations resumed in July 2023.

Measurement Platform: *In-situ* station.

Data available at: https://gml.noaa.gov/ccgg/trends/data.html.

Sourced from: Keeling et al. (1976), Thoning et al. (1989), and NOAA (2023a). Graphics produced in part using Stawitz (2023).

3.4.2.4 OCEANIC PH

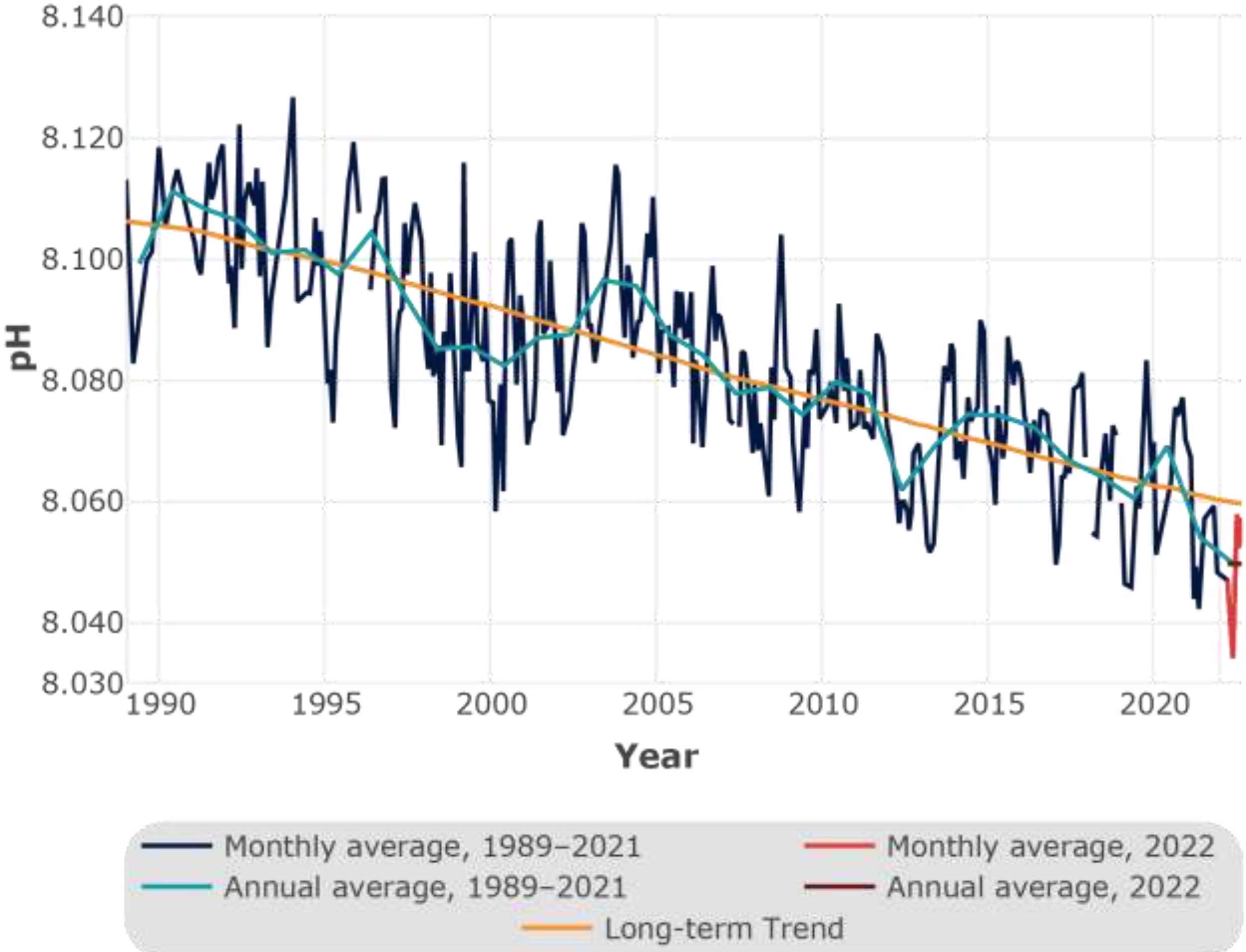


Figure 160. Time series and long-term trend of oceanic pH measured at Station ALOHA

Rationale: Oceanic pH is a measure of how greenhouse gas emissions have already impacted the ocean. This indicator demonstrates that oceanic pH has decreased significantly over the past several decades (i.e., the ocean has become more acidic). Increasing ocean acidification limits the ability of marine organisms to build shells and other calcareous structures. Recent research has shown that pelagic organisms such as pteropods and other prey for commercially valuable fish species are already being negatively impacted by increasing acidification (Feely et al. 2016). The full impact of ocean acidification on the pelagic food web is an area of active research (Fabry et al. 2008).

Status: The ocean is roughly 11.3% more acidic than it was 30 years ago at the start of this time series. Over this time, pH has declined by 0.047 at a constant rate. In 2022, the most recent year for which data are available, the average pH was 8.05. Additionally, for the 7th year, small variations seen over the course of the year are outside the range seen in the first year of the time series. The highest pH value reported for the most recent year (8.058) is lower than the lowest pH value reported in the first year of the time series (8.083).

Description: Trends in surface (5 m) pH at Station ALOHA, north of Oahu (22.75°N, 158°W), collected by the Hawai‘i Ocean Time-Series (HOT) from October 1988 to 2022 (2023 data are not yet available). Oceanic pH is a measure of ocean acidity, which increases as the ocean absorbs carbon dioxide from the atmosphere. Lower pH values represent greater acidity. Oceanic pH is calculated from total alkalinity (TA) and dissolved inorganic carbon (DIC). Total alkalinity represents the ocean's capacity to resist acidification as it absorbs CO_2 and the amount of CO_2 absorbed is captured through measurements of DIC. The multi-decadal time series at Station ALOHA represents the best available documentation of the significant downward trend in oceanic pH since the time series began in 1988. Oceanic pH varies over both time and space, though the conditions at Station ALOHA are considered broadly representative of those across the Western and Central Pacific's pelagic fishing grounds.

Timeframe: Monthly.

Region/Location: Station ALOHA: 22.75°N, 158°W.

Measurement Platform: *In-situ* station.

Data available at: https://hahana.soest.hawaii.edu/hot/hot-dogs/bseries.html.

Sourced from: Fabry et al. (2008), Feely et al. (2016), and the Hawai‘i Ocean Time-Series as described in Karl and Lukas (1996) and on its website (HOT 2024) using the methodology provided by Zeebe and Wolf-Gladrow (2001). Graphics produced in part using Stawitz (2023).

3.4.2.5 EL NIÑO – SOUTHERN OSCILLATION

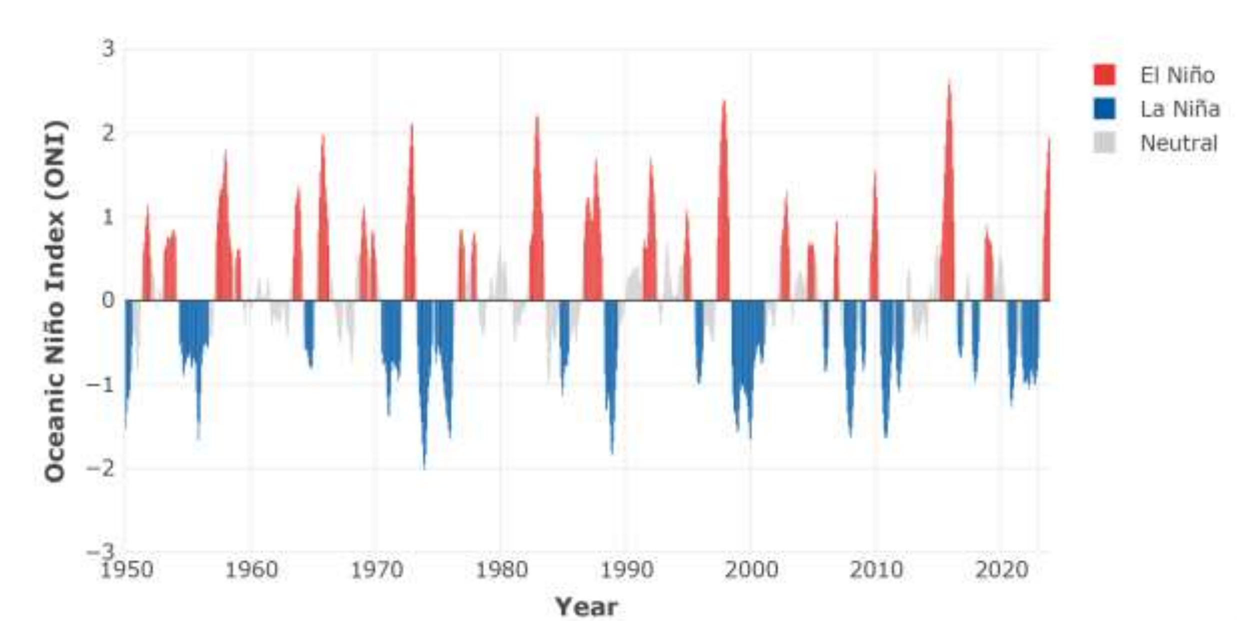


Figure 161. Oceanic Niño Index from 1950–2023 El Niño periods in red, La Niña periods in blue, and neutral periods in grey

Rationale: The El Niño – Southern Oscillation (ENSO) cycle is known to have impacts on Pacific fisheries including tuna fisheries. The Oceanic Niño Index (ONI) focuses on ocean temperature, which has the most direct effect on these fisheries.

Status: The ONI indicated a transition from La Niña to El Niño conditions in 2023. In 2023, the ONI ranged from -0.68 to 1.95. This is within the range of values observed previously in the time series.

Description: The three-month running mean (referred to as a season) of satellite remotely-sensed sea surface temperature (SST) anomalies in the Niño 3.4 region (5°S – 5°N, 120° – 170°W). The ONI is a measure of the ENSO phase. Warm and cool phases, termed El Niño and La Niña respectively, are based in part on an ONI threshold of ± 0.5 °C being met for a minimum of five consecutive overlapping seasons. Additional atmospheric indices are needed to confirm an El Niño or La Niña event, as the ENSO is a coupled ocean-atmosphere phenomenon. The atmospheric half of ENSO is measured using the Southern Oscillation Index.

Timeframe: Every three months.

Region/Location: Niño 3.4 region, 5°S – 5°N, 120° – 170°W.

Measurement Platform: *In-situ* station, satellite, model.

Data available at: https://www.cpc.ncep.noaa.gov/data/indices/oni.ascii.txt.

Sourced from NOAA CPC (2024). Graphics produced in part using Stawitz (2023).

3.4.2.6 PACIFIC DECADAL OSCILLATION

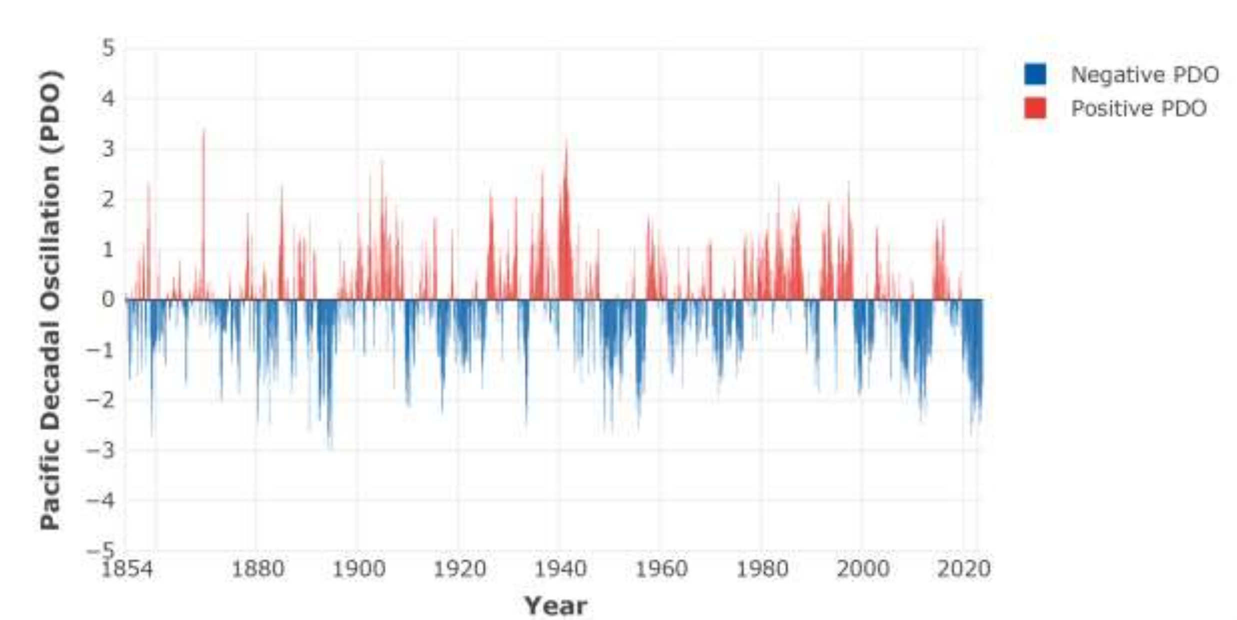


Figure 162. Pacific Decadal Oscillation from 1854–2023 with positive warm periods in red and negative cool periods in blue

Rationale: The Pacific Decadal Oscillation (PDO) was initially named by fisheries scientist Steven Hare in 1996 while researching connections between Alaska salmon production cycles and Pacific climate. Like ENSO, the PDO reflects changes between periods of persistently warm or persistently cool ocean temperatures, but over a period of 20 to 30 years (versus six to 18 months for ENSO events). The climatic fingerprints of the PDO are most visible in the Northeastern Pacific, but secondary signatures exist in the tropics.

Status: The PDO was negative in 2023. The index ranged from -2.47 to -0.949 over the course of the year. This is within the range of values observed previously in the time series.

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 cases of the PDO have been classified as either warm or cool, as defined by ocean temperature anomalies in the northeast and tropical Pacific Ocean. When SST is below average in the [central] North Pacific and warm along the North American coast, and when sea level pressures are below average in the North Pacific, the PDO has a positive value. When the climate 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. Description inserted from NOAA (2024b).

Timeframe: Annual, monthly.

Region/Location: Pacific Basin north of 20°N.

Measurement Platform: *In-situ* station, satellite, model.

Data available at: https://psl.noaa.gov/pdo/.

Sourced from: NOAA (2024b), Mantua (1997), and Newman (2016). Graphics produced in part using Stawitz (2023).

3.4.2.7 TROPICAL CYCLONES

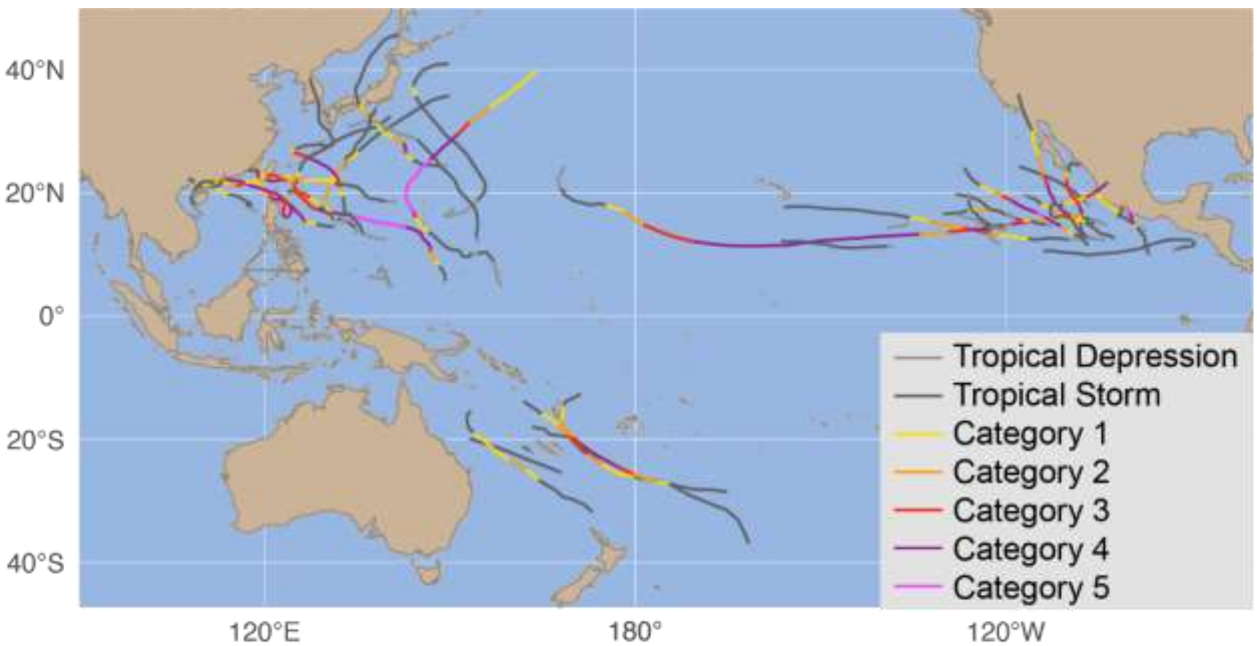


Figure 163. 2023 Pacific basin tropical cyclone tracks

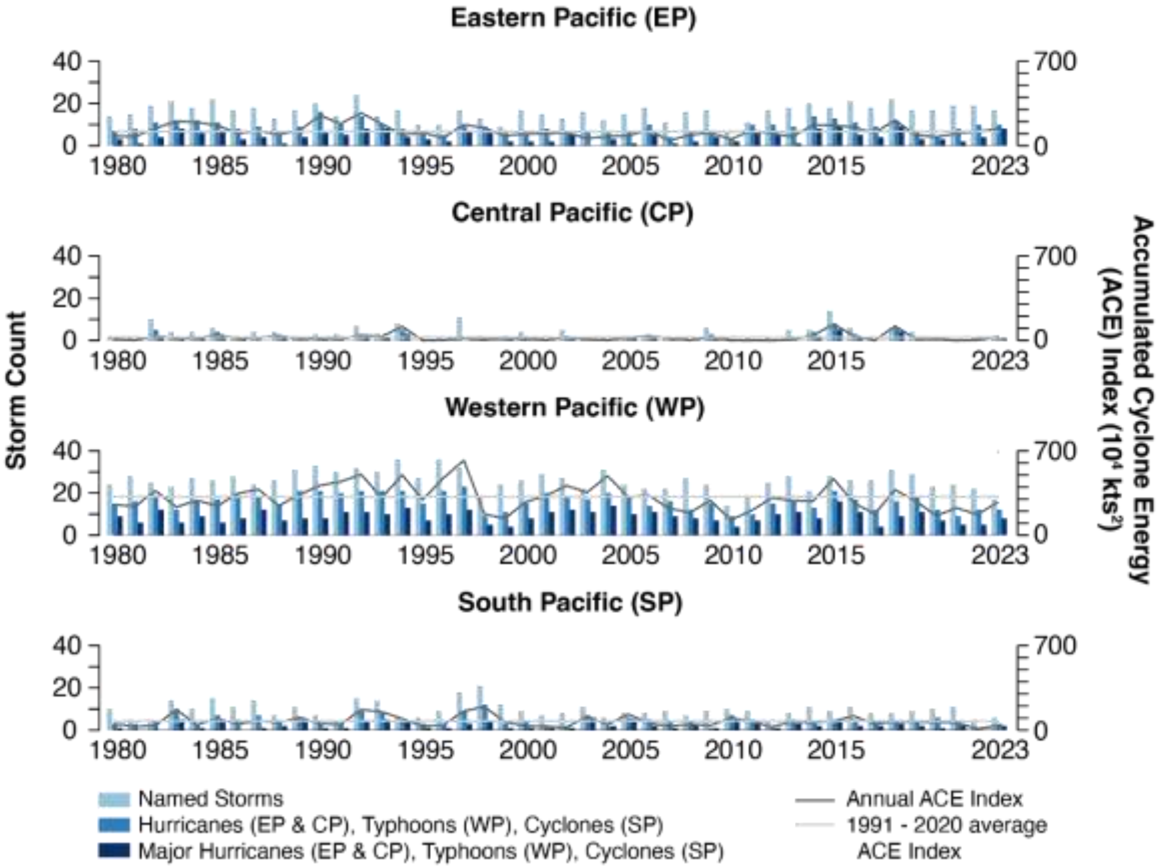


Figure 164. Storm counts (bars) and Accumulated Cyclone Energy (ACE) index values (lines) in each region of the Pacific. Both annual ACE index (black lines) and 1981 – 2020 average ACE index (grey lines) are shown

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, has had serious problems 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. Associated storm surge, the large volume of ocean water pushed toward shore by cyclones’ strong winds, can cause severe flooding and destruction.

Status:

Eastern North Pacific. Tropical cyclone activity was slightly above average in the Eastern Pacific in 2023. There were 17 named storms, 10 of which were hurricanes. There were 8 major hurricanes (category 3 or higher). The number of named and major storms, as well as Accumulated Cyclone Energy (ACE), were slightly the above 1991–2020 average.

Central North Pacific. In July, Hurricane Calvin became a major hurricane as it moved from Mexico towards Hawai‘i. Calvin led to tropical storm warnings in Hawai‘i but caused minimal damage. Of note in 2023 was Hurricane Dora, which formed in the Eastern Pacific on 31 July 2023, crossed into the Central Pacific on 6 August 2023, and carried on westward into the Western Pacific on 12 August 2023. Overall, Central Pacific tropical cyclone activity was below the 1991–2020 average in 2023. There were 2 named storms, one of which—Dora—reached hurricane status and became a major hurricane. On average (1991–2020), the central Pacific sees four named storms, two hurricanes, and one major hurricane each year. The 2023 ACE index was slightly above the 1991–2020 average. Portions of this summary inserted from https://www.ncei.noaa.gov/access/monitoring/monthly-report/tropical-cyclones/202307.

Western North Pacific. Typhoon Mawar, which formed in May, was just the third category 4 (winds ≥130 mph) typhoon to pass within 100 miles of Guam in the Western Pacific. It was the first major typhoon in that area since Mangkut in 2018. Mawar resulted in heavy rainfall and widespread power outages on the island. Despite Typhoon Mawar, tropical cyclone activity in the Western Pacific was below average. The Western Pacific saw the second-fewest named storms since 1951, with only 17 forming in 2023. Of these storms, 12 were typhoons and 8 became major typhoons. These counts were all below average (1991–2020), as was the ACE. Since 1980, the number of named storms and typhoons to form each year has decreased slightly at a rate of about 1 storm per decade. Portions of the summary inserted from https://www.ncei.noaa.gov/access/monitoring/monthly-report/tropical-cyclones/202305, and https://www.ncei.noaa.gov/access/monitoring/monthly-report/tropical-cyclones/202313.

South Pacific. South Pacific tropical cyclone activity was below average in 2023. There were 6 named storms, 3 of which became cyclones and 2 major cyclones. The 2023 ACE was less than the 1991–2020 average.

Description: This indicator uses historical data from the NOAA National Climate Data Center (NCDC) International Best Track Archive for Climate Stewardship to track the number of tropical cyclones in the western, central, eastern, and southern 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 each basin is tracked and Figure 164 shows the representative breakdown of Saffir-Simpson hurricane categories.

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 knots; 39 mph). Therefore, a storm's ACE Index value accounts for both strength and duration. Figure 164 shows the ACE values for each hurricane/typhoon season and has a horizontal line representing the average annual ACE value.

Timeframe: Annual.

Region/Location:

Eastern North Pacific: east of 140° W, north of the equator.
Central North Pacific: 180° - 140° W, north of the equator.
Western North Pacific: west of 180°, north of the equator.
South Pacific: south of the equator.

Measurement Platform: Satellite.

Data available at: https://www.ncei.noaa.gov/data/international-best-track-archive-for-climate-stewardship-ibtracs/v04r00/access/csv.

Sourced from: Knapp et al. (2010), Knapp et al. (2018), and NOAA (2024c).

3.4.2.8 SEA SURFACE TEMPERATURE (SST)

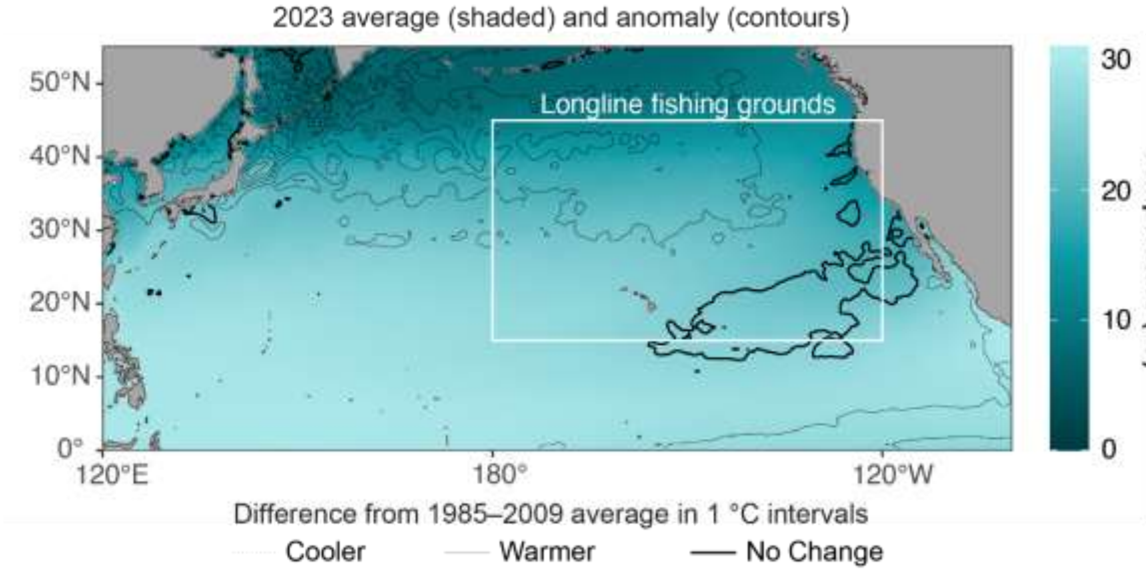


Figure 165. Average 2023 sea surface temperature (shaded) and the difference from the 1985–2009 average (contoured). The white rectangle identifies the area targeted by Hawai'i's longline fisheries. SST is averaged over this area for the time series shown in Figure 166 and Figure 167

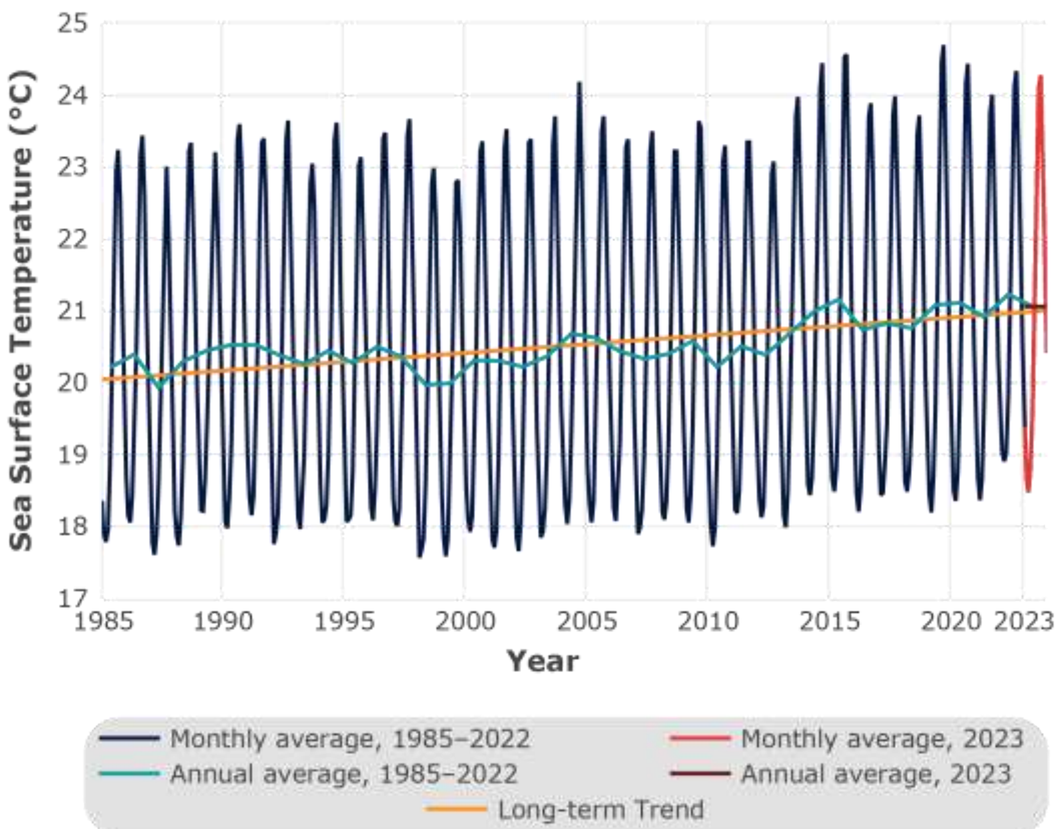


Figure 166. Time series of monthly average sea surface temperature over the longline fishing grounds outlined in Figure 165

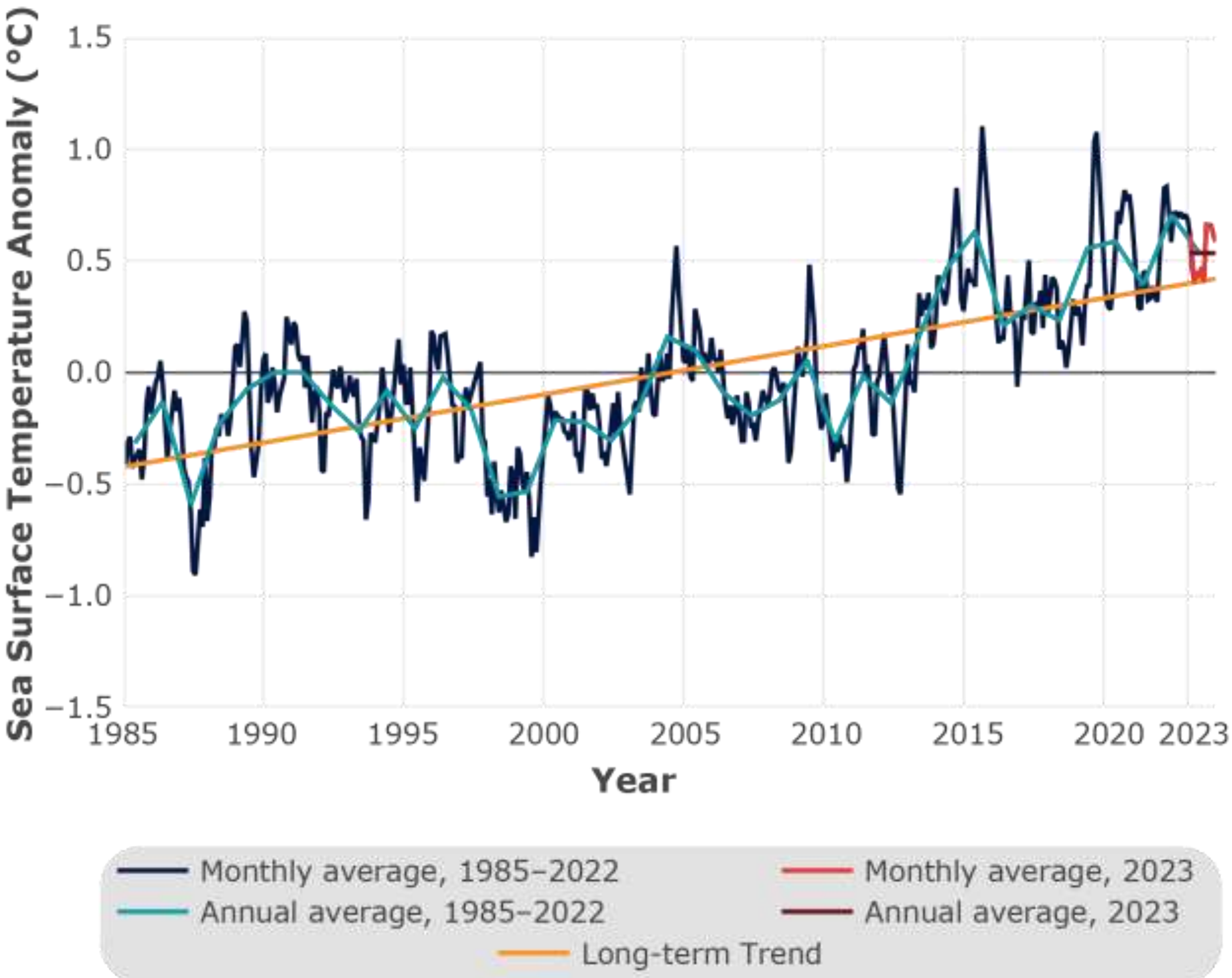


Figure 167. Time series of monthly average sea surface temperature anomaly over the longline fishing grounds outlined in Figure 165

Rationale: Sea surface temperature (SST) is one of the most directly observable existing measures for tracking increasing ocean temperatures. SST varies in response to natural climate cycles such as the El Niño – Southern Oscillation (ENSO) and is rising as a result of anthropogenic climate change. Both short-term variability and long-term trends in SST impact the marine ecosystem. Understanding the mechanisms through which organisms are impacted and the time scales of these impacts is an area of active research.

Status: Annual mean SST was 21.1 ºC in 2023. Over the period of record, SST across the longline fishing grounds has increased by 1 ºC and the monthly SST anomaly increased by 0.8 ºC, both at a rate of roughly 0.02 ºC yr^{-1}. Monthly SST values in 2023 ranged from 18.5–24.3 ºC, within the range of temperatures experienced over the past several decades (17.6–24.7 ºC). Overall, SST was above the long-term average across most of the Hawai‘i longline region in 2023. The exception to this was a patch of slightly cooler waters in the southeastern corner of the fishing grounds where very little fishing takes place.

Description: Satellite remotely sensed monthly sea surface temperature (SST) is averaged across the Hawai‘i-based longline fishing grounds (15° – 45°N, 180° – 120°W). A time series of monthly mean SST averaged over the Hawai'i longline region is presented. Additionally, spatial climatologies and anomalies are shown. CoralTemp data are used to calculate this indicator.

Timeframe: Monthly.

Region/Location: Hawai'i longline region: 15° – 45°N, 180° – 120°W.

Measurement Platform: Satellite.

Data available at: https://oceanwatch.pifsc.noaa.gov/erddap/griddap/CRW_sst_v3_1_monthly, https://oceanwatch.pifsc.noaa.gov/erddap/griddap/CRW_sst_v3_1_1985-2009-clim, and https://oceanwatch.pifsc.noaa.gov/erddap/griddap/CRW_sst_v3_1_2023-clim.

Sourced from: NOAA OceanWatch (2024a). Graphics produced in part using Stawitz (2023).

3.4.2.9 TEMPERATURE AT 300 M DEPTH

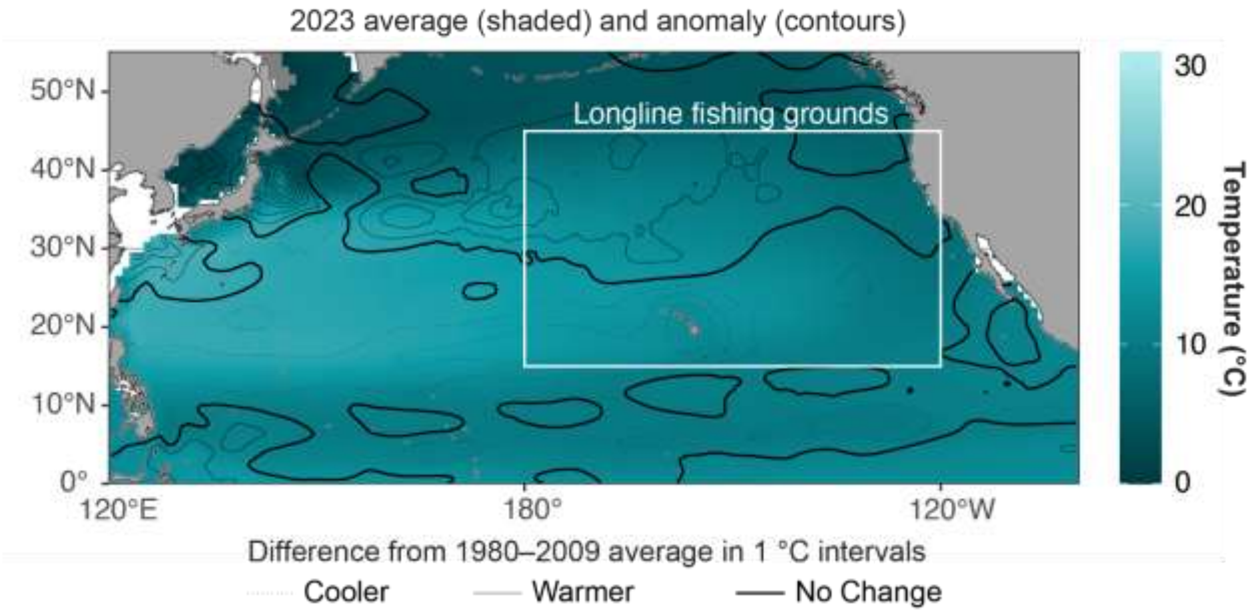


Figure 168. Average temperatures at 200–300 m depth in 2023 (shaded) and the difference from the 1980–2009 average (contoured). The white rectangle identifies the area targeted by Hawai'i's longline fisheries. Temperatures is averaged over this area for the time series shown in Figure 169

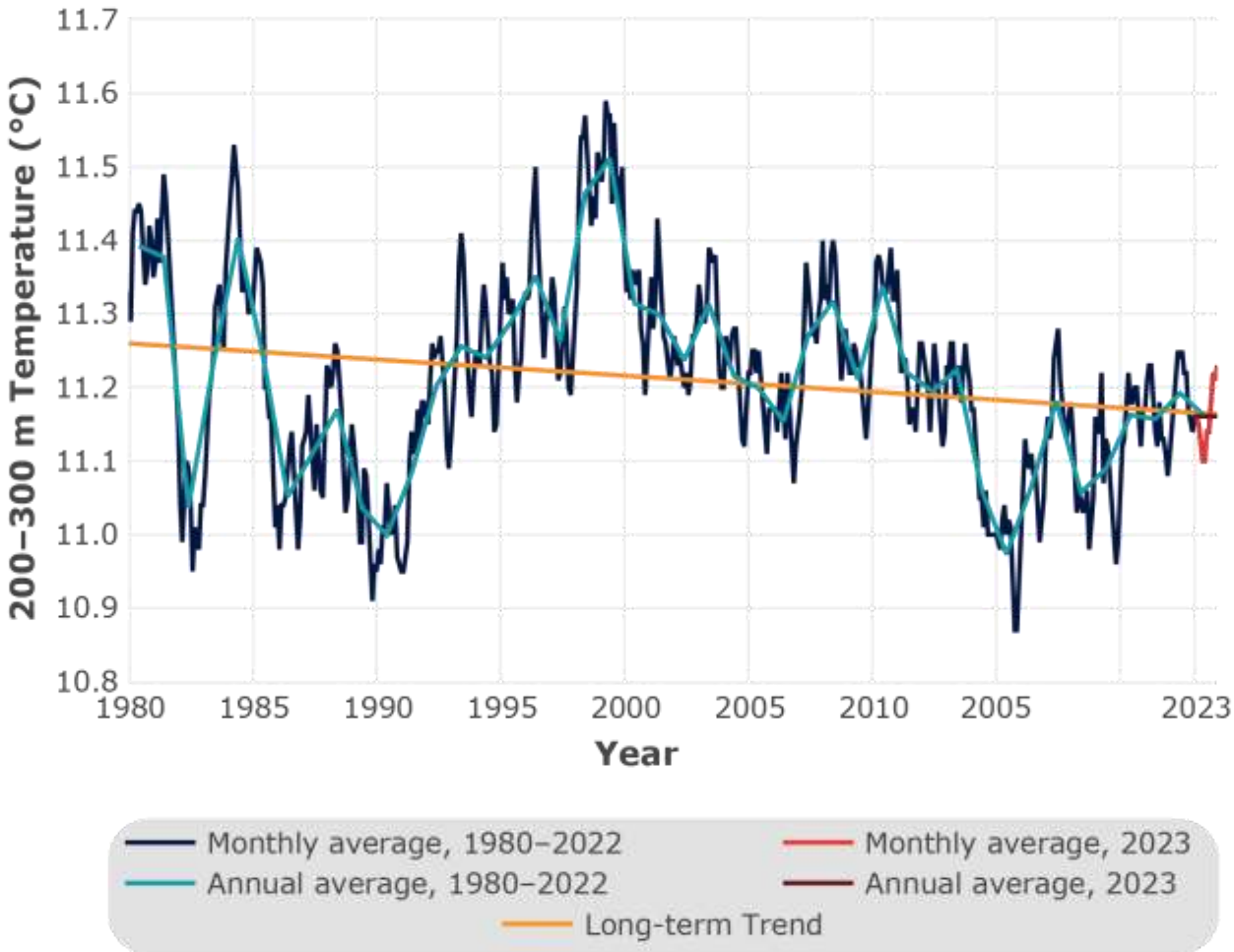


Figure 169. Time series of monthly 200–300 m temperatures over the longline fishing grounds outlined in Figure 168

Rationale: The temperature at 200–300 m reflects the temperature in the mid-range of depths targeted by the deep-set bigeye tuna fishery. Bigeye have preferred thermal habitat, generally staying within temperatures ranging from 8–14 °C while they are at depth (Howell et al. 2010). Changes in ocean temperature at depth will impact tuna, and in turn, potentially impact their catchability. Understanding the drivers of sub-surface temperature trends and their ecosystem impacts is an area of active research.

Status: In 2023, 200–300 m temperatures ranged from 11.1–11.23 °C with an average value of 11.16 °C. These temperatures are within the range of temperatures experienced over the past several decades (10.87–11.59 °C) and are within the bounds of bigeye tuna's preferred deep daytime thermal habitat (8–14 °C). Over the period of record (1980–2023), 200–300 m temperatures have declined by -0.1 °C. The spatial pattern of temperature anomalies was mixed with temperatures at depth around the main Hawaiian Islands roughly 0.5–1.5 °C below average, and temperatures north of about 30°N 0–0.5 °C above average.

Description: Ocean temperature at 200–300 m depth is averaged across the Hawai'i-based longline fishing grounds (15° – 45°N, 180° – 120°W). Global Ocean Data Assimilation System

(GODAS) data are used. GODAS incorporates global ocean data from moorings, expendable bathythermographs (XBTs), and Argo floats.

Timeframe: Annual, monthly.

Region/Location: Hawai‘i longline region: 15° – 45°N, 180° – 120°W.

Measurement Platform: *In-situ* sensors, model.

Sourced from: NOAA (2024d) and APDRC (2024). Graphics produced in part using Stawitz (2023).

3.4.2.10 OCEAN COLOR

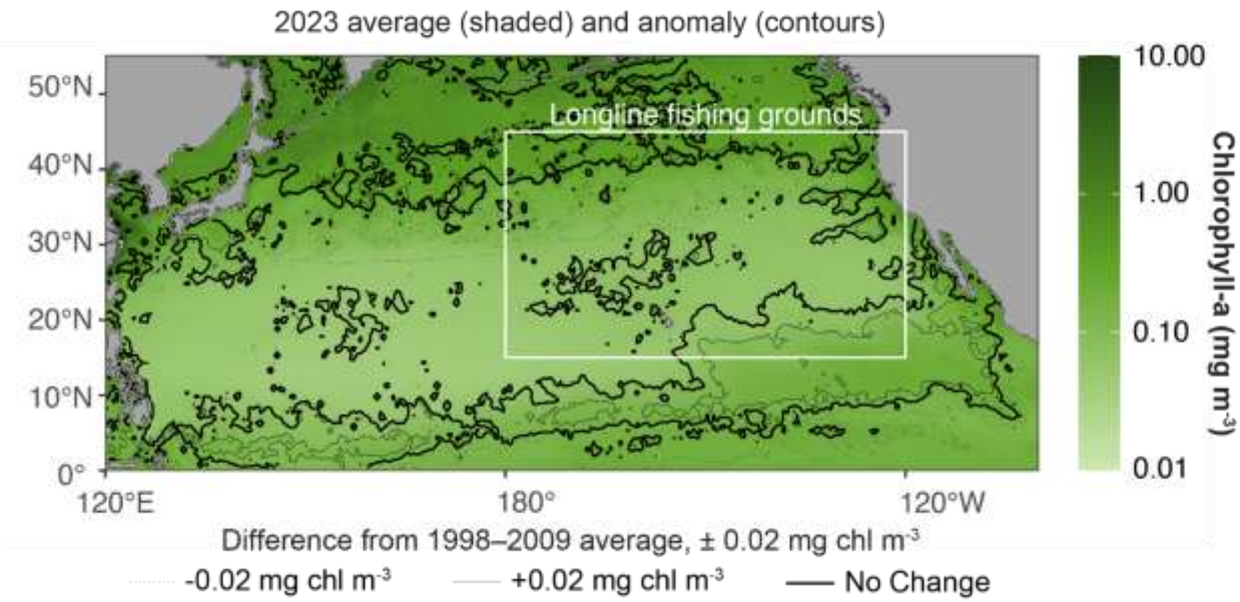


Figure 170. Average chlorophyll-a concentration in 2023 (shaded) and the difference from the 1998–2009 average (contoured). The white rectangle identifies the area targeted by Hawai‘i’s longline fisheries. Chlorophyll-a is averaged over this area for the time series shown in Figure 171 and Figure 172

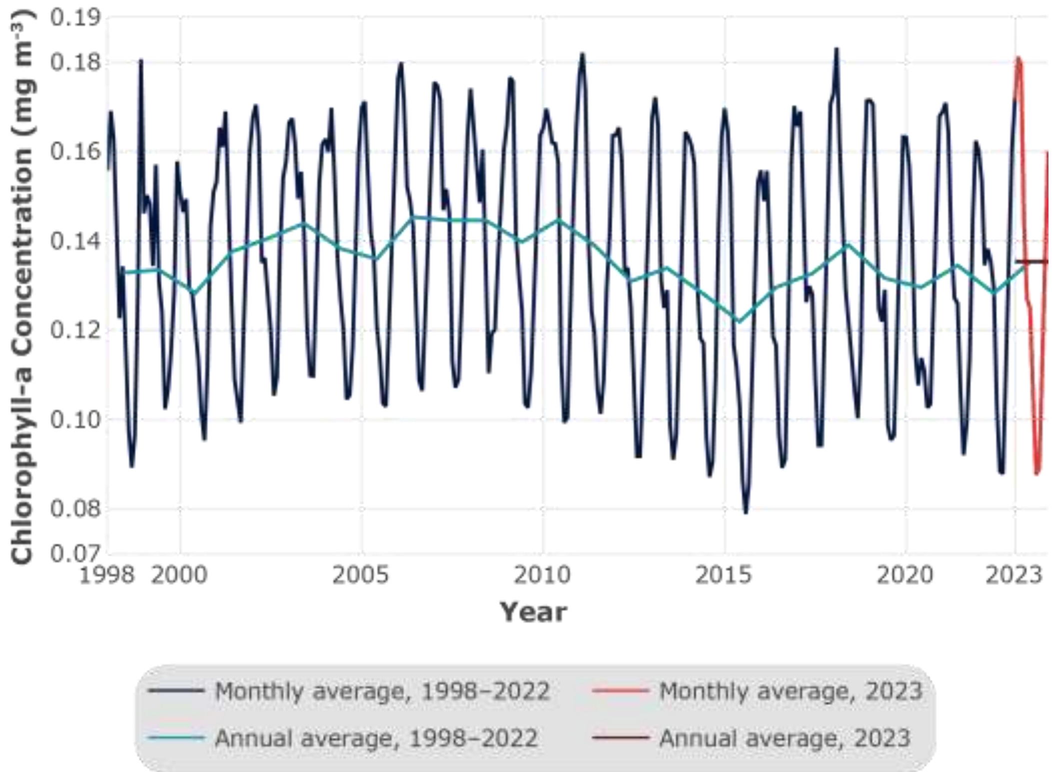


Figure 171. Time series of monthly average chlorophyll concentration over the longline fishing grounds outlined in Figure 172

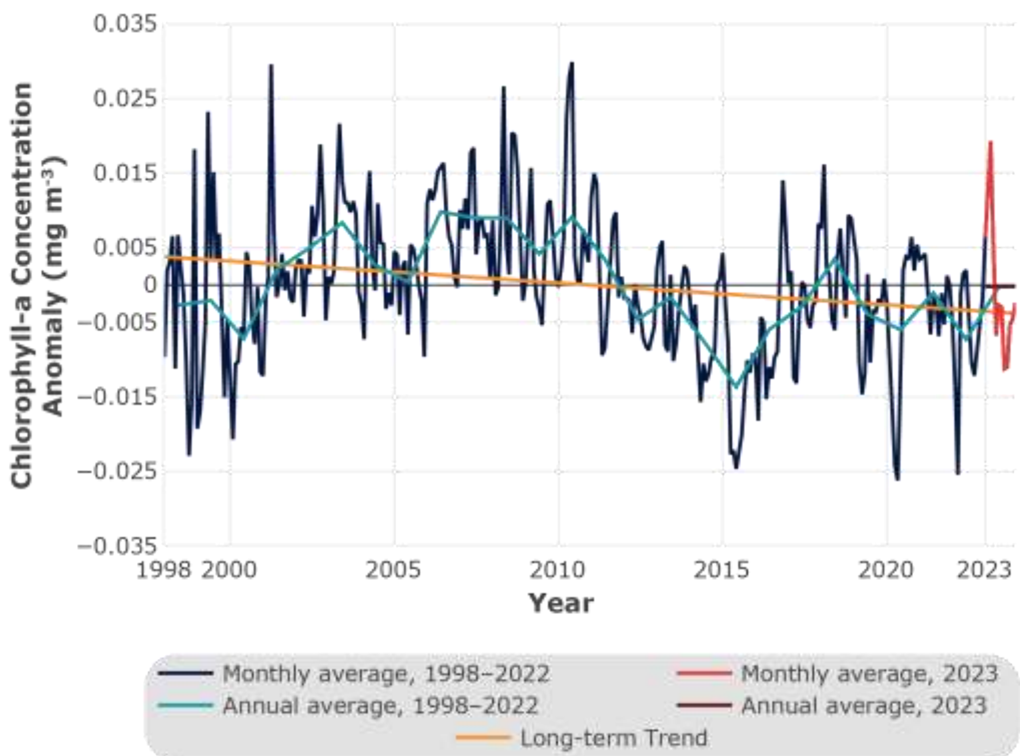


Figure 172. Time series of monthly average chlorophyll concentration anomaly over the longline fishing grounds outlined in Figure 171

Rationale: Phytoplankton are 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, size, and catch.

Status: The mean monthly chlorophyll concentration was 0.14 mg chl m^{-3} in 2023. Monthly mean chlorophyll concentrations ranged from 0.088–0.18 mg chl m^{-3}, which was within the range of values observed during the previous years of the time series (0.079–0.18 mg chl m^{-3}). There has been no significant trend in monthly average chlorophyll concentration over the time period, however chlorophyll anomalies have declined by 0.008 mg chl m^{-3}. Chlorophyll concentrations were fairly average across the southern portion of the longline fishing grounds and a little below average north of 30–35°N.

Description: Satellite remotely sensed ocean color is used to determine chlorophyll concentrations in the pelagic surface ocean. A time series of median monthly chlorophyll-a concentrations averaged over the Hawai‘i longline region is presented. Additionally, spatial climatologies and anomalies are shown. European Space Agency (ESA) Climate Change Initiative (CCI) data are used for this indicator (Sathyendranath et al. 2018).

Timeframe: Monthly

Region/Location: Hawai‘i longline region: 5° – 45°N, 180° – 120°W

Measurement Platform: Satellite

Data available at: https://oceanwatch.pifsc.noaa.gov/erddap/griddap/esa-cci-chla-monthly-v6-0, https://oceanwatch.pifsc.noaa.gov/erddap/griddap/esa-cci-chla-1998-2009-clim-v6-0, and https://oceanwatch.pifsc.noaa.gov/erddap/griddap/esa-cci-chla-2023-clim_v6-0.

Sourced from: NOAA OceanWatch (2024b) and Sathyendranath et al. (2018). Graphics produced in part using Stawitz (2023).

3.4.2.11 NORTH PACIFIC SUBTROPICAL FRONT (STF) AND TRANSITION ZONE CHLOROPHYLL FRONT (TZCF)

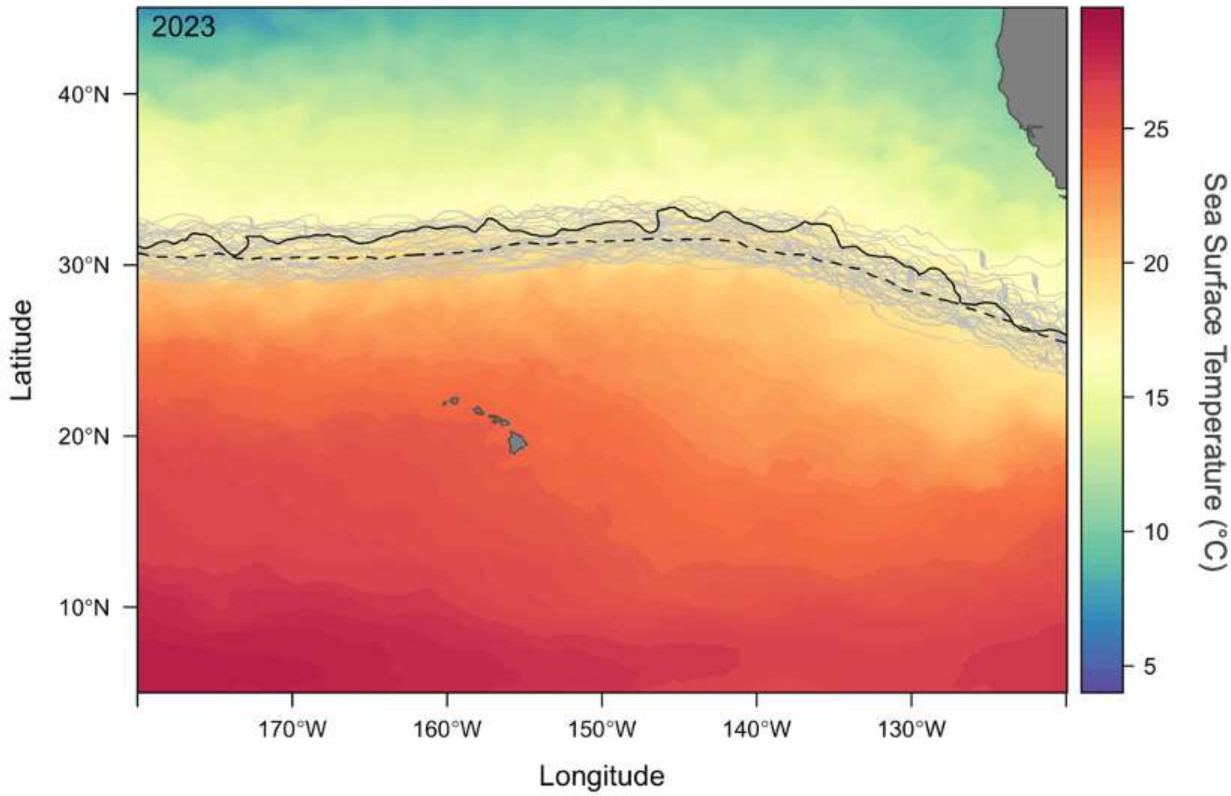


Figure 173. Average position of the subtropical front (STF) in 2023 (solid black line), over the 1985–2009 average (dotted line), locations from previous years (1985–2022; solid grey lines), and ocean temperatures for the first quarter of 2023 (shaded)

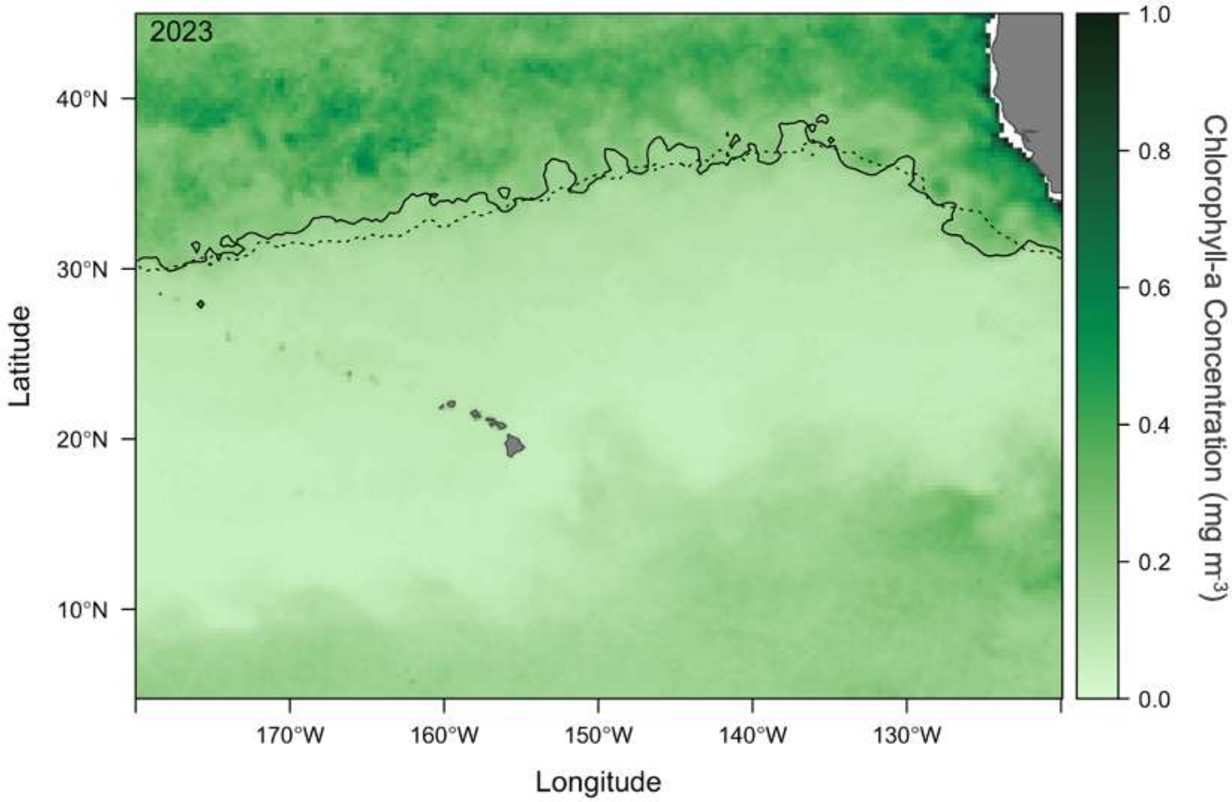


Figure 174. Average position of the transition zone chlorophyll front (TZCF) in 2023 (solid black line) over the 1998–2009 average (dotted black line) and ocean color for the first quarter of 2023 (shaded)

Rationale: 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. 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.

Status: During the first quarter of 2023, the STF was north of average across much of the fishing grounds. Though, unlike 2022, it was not near its historical northern limits. The TZCF was average across much of the fishing grounds, except between about 170°W and 155°W, where it was slightly north of average.

Description: The subtropical front (STF) is marked by the 18 °C sea surface temperature (SST) isotherm and the transition zone chlorophyll front (TZCF) by the 0.2 mg chl-a m^{-3} isopleth (Bograd et al. 2004; Polovina et al. 2001). They roughly mark the northern boundary of the North Pacific subtropical gyre as well as the northern extent of the Hawai‘i-based longline fishery. Both fronts migrate meridionally on a seasonal basis and their positions are impacted by the phase of the El Niño – Southern Oscillation (ENSO). Due to significant seasonal variation, the climatology and anomaly (2023) are presented for the first quarter of the year only. The STF is determined from CoralTemp data (see SST indicator) and the TZCF is determined from ESA CCI data (see Section 3.4.2.10).

Timeframe: Annual, seasonal

Region: Hawai‘i longline region: 5° – 45°N, 180° – 120°W

Measurement Platform: Satellite

Data available at: https://oceanwatch.pifsc.noaa.gov/erddap/griddap/CRW_sst_v3_1_monthly and https://oceanwatch.pifsc.noaa.gov/erddap/griddap/esa-cci-chla-monthly-v5-0.

Sourced from: Bograd et al. (2004), Polovina et al. (2001), and NOAA OceanWatch (2024a; 2024b).

3.4.2.12 ESTIMATED MEDIAN PHYTOPLANKTON SIZE

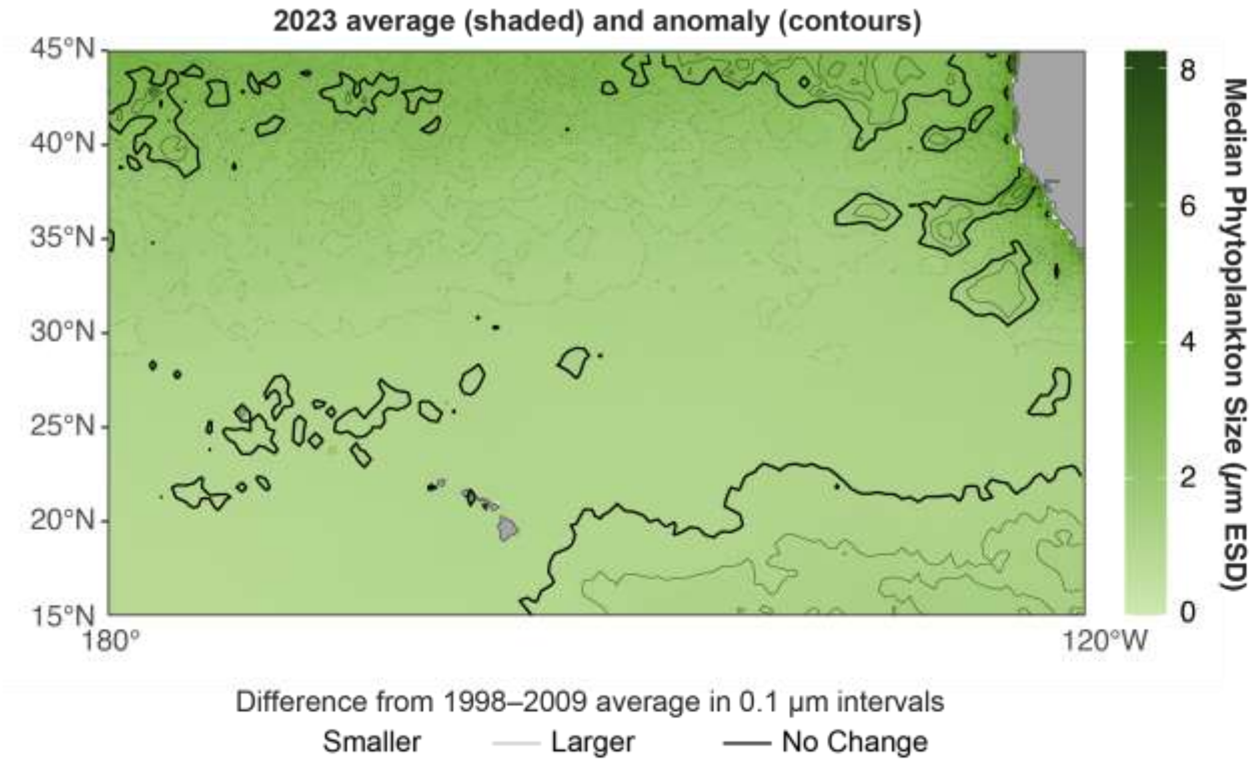


Figure 175. Average estimated median phytoplankton size in 2023 (shaded) and the difference from the 1998–2009 average (contoured) across the area targeted by Hawai‘i’s longline fisheries

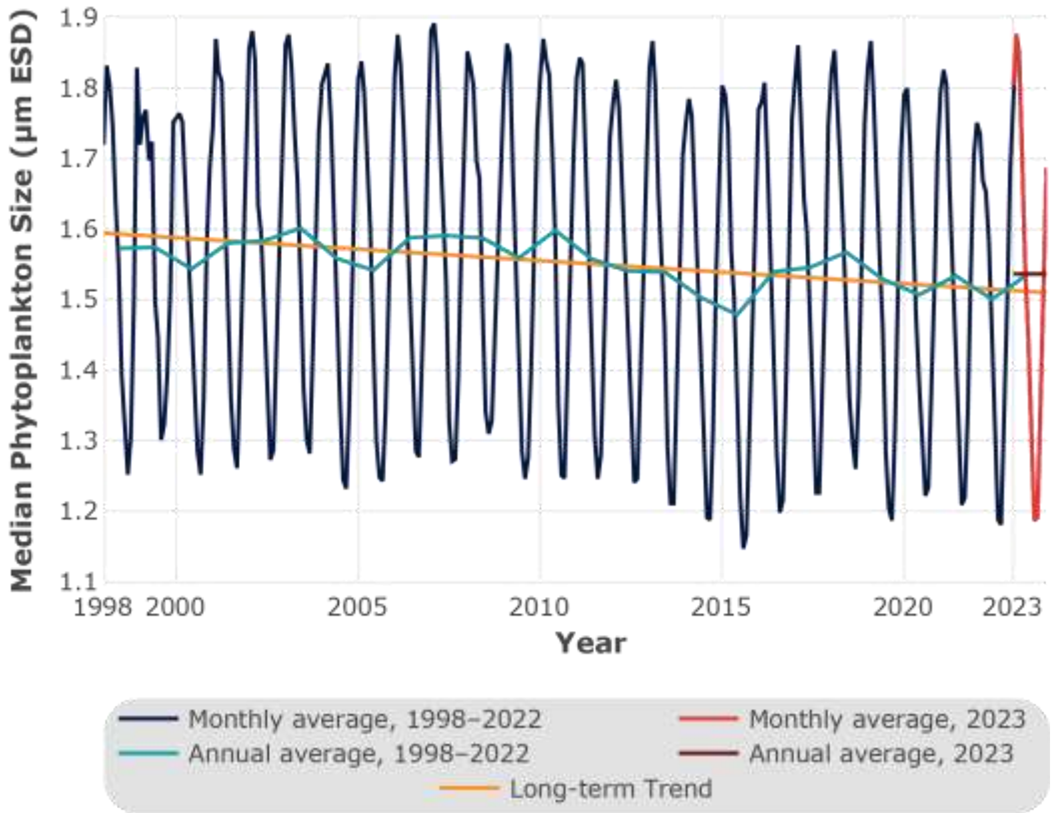


Figure 176. Time series of monthly median phytoplankton size over the longline fishing grounds shown in Figure 175

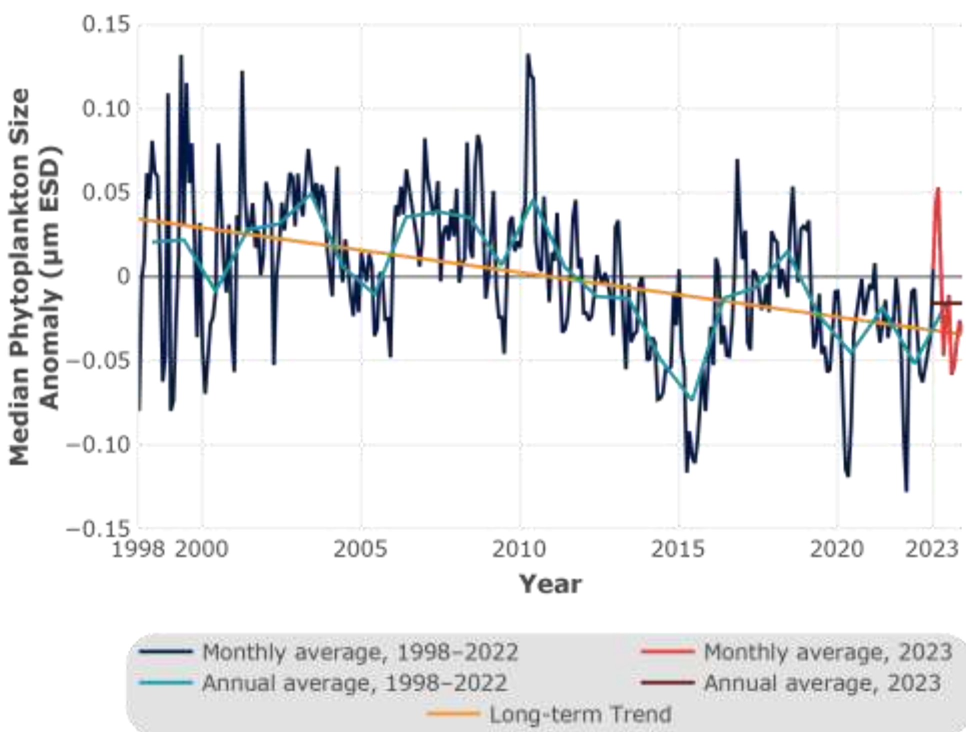


Figure 177. Time series of monthly median phytoplankton size anomaly over the longline fishing grounds shown in Figure 175

Rationale: Phytoplankton are the base of the food web and their abundance influences the food available to all higher trophic levels from zooplankton through tuna and billfish. Some studies project that climate change will result in both fewer and smaller phytoplankton. This would reduce the food available to all members of the food web. Understanding trends in phytoplankton abundance and size structure, how they are influenced by oceanographic conditions, and how they influence fish abundance and size structure are areas of active research.

Status: The mean monthly phytoplankton cell size was 1.54 μm Equivalent Spherical Diameter (ESD) in 2023. Monthly mean cell size ranged from 1.19–1.88 μm ESD during the year, within the range of values observed over the period of record (1.15–1.89 μm ESD). Over the period of record, there has been weakly significant decline in monthly median phytoplankton size. Over the time series, median phytoplankton size has declined by 0.084 μm ESD, or by 5.3%. The monthly anomaly has declined as well, by 0.069 μm ESD. Average estimated median phytoplankton size was below average across much of the fishing grounds.

Description: Median phytoplankton cell size can be estimated from satellite remotely sensed SST and ocean color (Barnes et al. 2011). A time series of monthly median phytoplankton cell size averaged over the Hawai‘i longline region is presented, as well as a time series of anomalies. NOAA CoralTemp (see SST indicator) and ESA CCI data (see ocean color indicator) are used to calculate median phytoplankton cell size.

Timeframe: Monthly

Region: Hawai‘i longline region: 15° – 45°N, 180° – 120°W

Measurement Platform: Satellite

Data available at: https://oceanwatch.pifsc.noaa.gov/erddap/griddap/md50_exp, https://oceanwatch.pifsc.noaa.gov/erddap/griddap/md50_exp-1998-2009-clim, and https://oceanwatch.pifsc.noaa.gov/erddap/griddap/md50_exp-2023-clim.

Sourced from: Barnes et al. (2011) and NOAA OceanWatch (2024c). Graphics produced in part using Stawitz (2023).

3.4.2.13 FISH COMMUNITY SIZE STRUCTURE

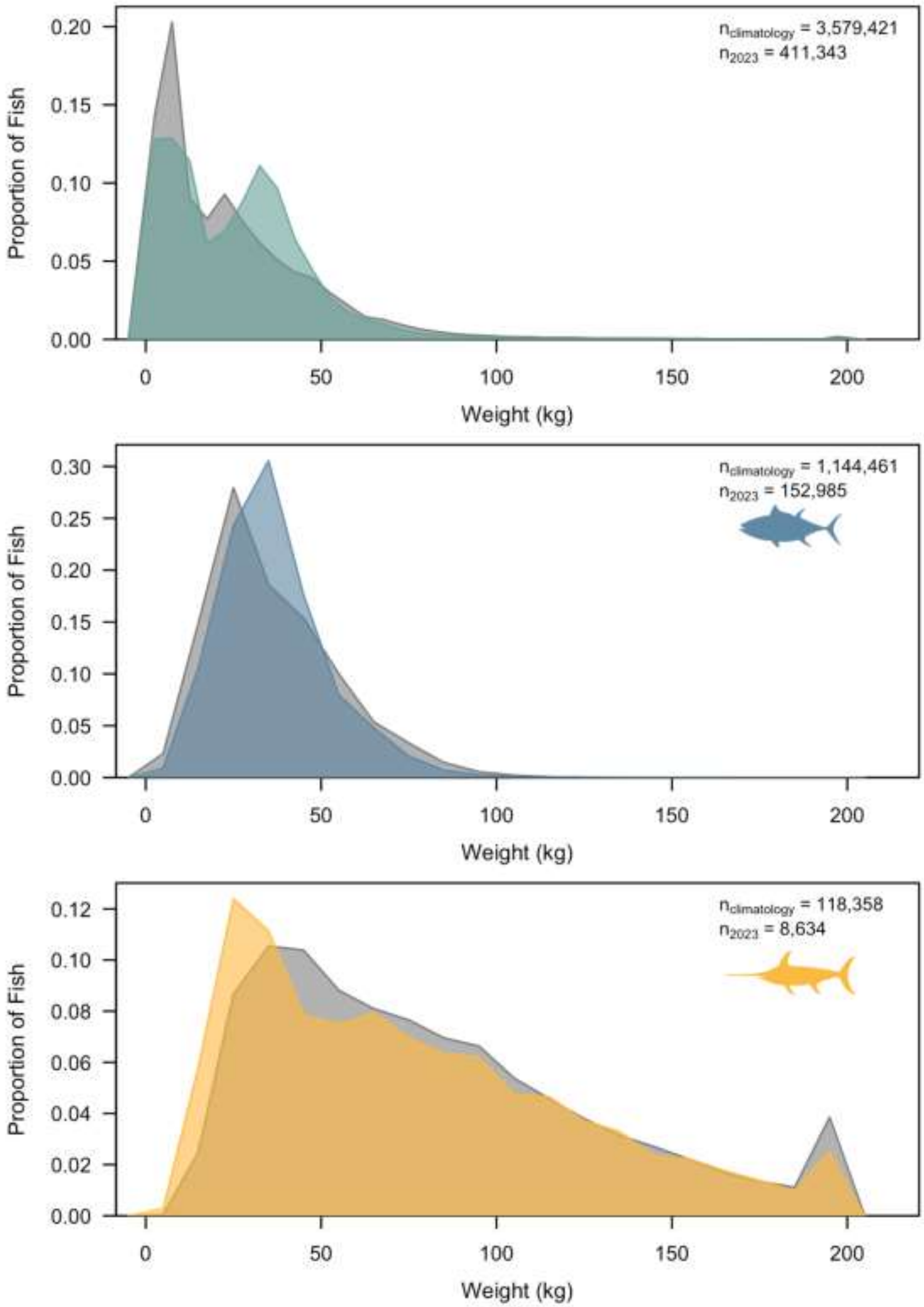


Figure 178. The climatological (2000 – 2009; grey) and 2023 (color) distribution of weights for all fish (top), bigeye tuna from deep sets (middle), and swordfish from shallow sets (bottom)

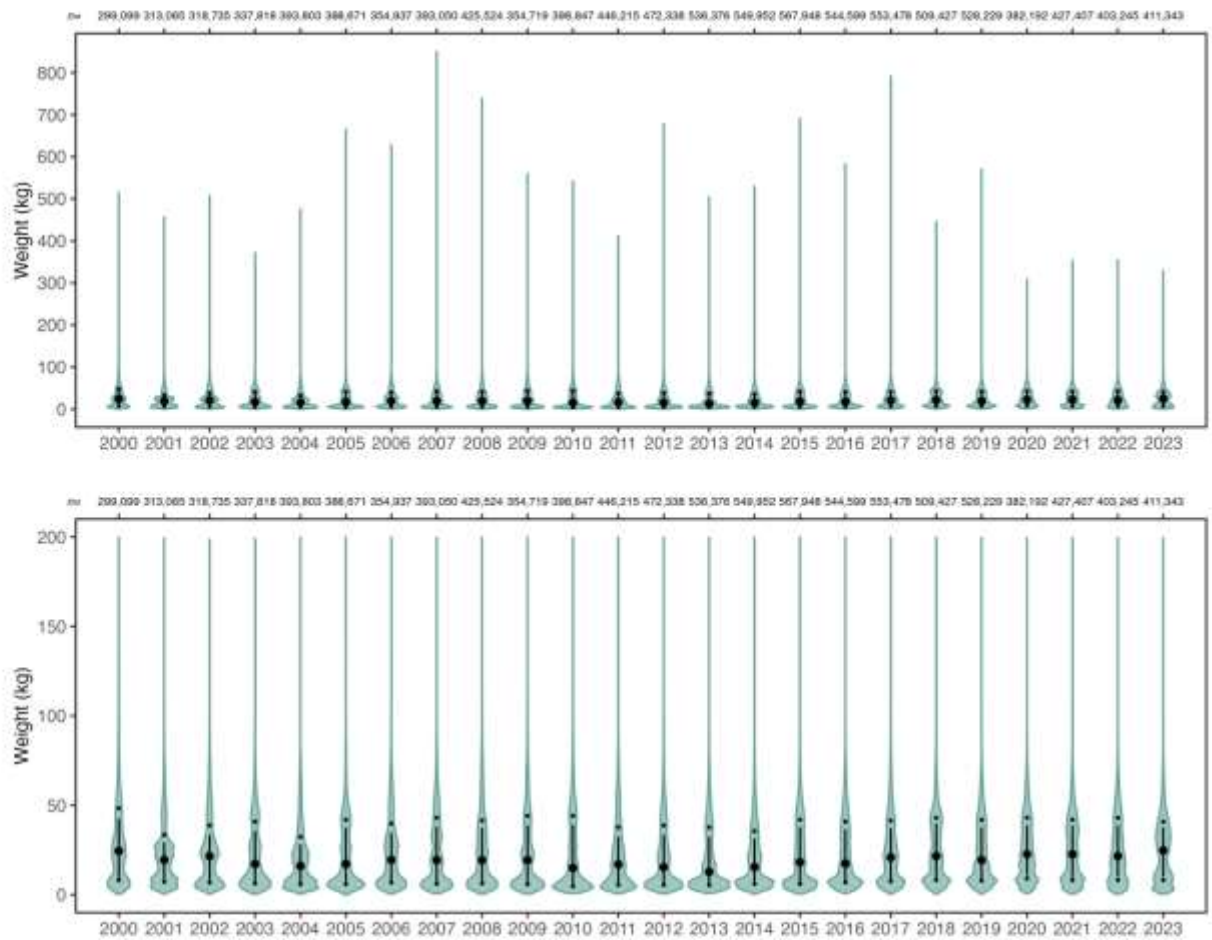


Figure 179. The annual distribution of weights of all fish, showing the full range of weights (top) and truncated to better demonstrate the distribution of the majority of weights (bottom) with large circles denoting median weight, black lines showing the range of the middle 50% of fish, small circles denoting the 20th and 80th percentiles of the weight distributions, and width of shading proportional to the number of fish of a given weight

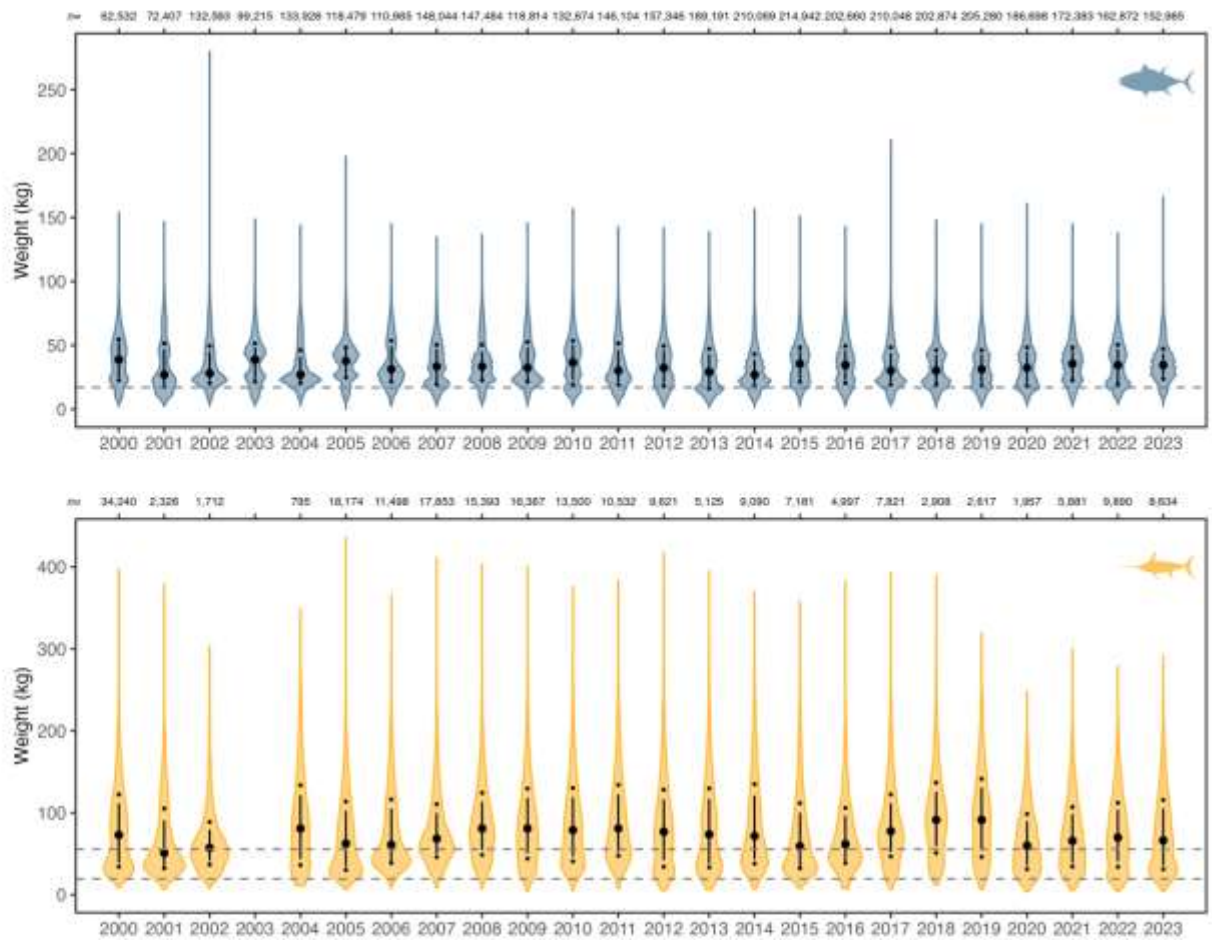


Figure 180. The annual distribution of weights of bigeye tuna from deep sets (top) and swordfish from shallow sets (bottom), with large circles denoting median weight, black lines showing the range of the middle 50% of fish, small circles denoting the 20th and 80th percentiles of the weight distributions, and width of shading proportional to the number of fish of a given weight. Horizontal dashed lines denote the weight corresponding to L_{50} for bigeye tuna (17 kg; Farley et al. 2018), female swordfish (55.5 kg; Kapur et al. 2017), and male swordfish (19.4 kg, Kapur et al. 2017)

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 scale 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. Understanding trends in fish size structure and how oceanographic conditions influence these trends is an area of active research.

Status: For the longline fishery as a whole, fish were slightly larger than average in 2023, with a lower proportion of fish smaller than about 15 kg. Bigeye tuna were a bit larger than average in 2023 and swordfish were slightly smaller than the previous year on average, with a greater proportion of small swordfish.

Description: The weight of individual fish moving through the Honolulu auction is available from 2000 through the present. Using these weights, community size structure is presented. A standardized pooled climatological distribution (2000–2009) is presented, as is the 2023 distribution. Similar distributions for target species (bigeye tuna and swordfish) are also presented. Annual time series of pooled target species weights are presented as violin plots. Bigeye weights are from deep sets (≥ 15 hooks per float) only. Swordfish weights are from shallow sets (< 15 hooks per float) only. The Honolulu auction reports weights for gilled and gutted fish. A conversion factor is used to calculate the whole fish weights used for this indicator (Langley et al. 2006).

Timeframe: Annual.

Region: Hawai‘i-based longline fishing grounds.

Measurement Platform: *In-situ* measurement.

Sourced from: PIFSC (2024a), PIFSC (2024b) and the Hawai‘i Division of Aquatic Resources, Farley et al. (2018), and Langley et al. (2006).

3.4.2.14 BIGEYE WEIGHT-PER-UNIT-EFFORT

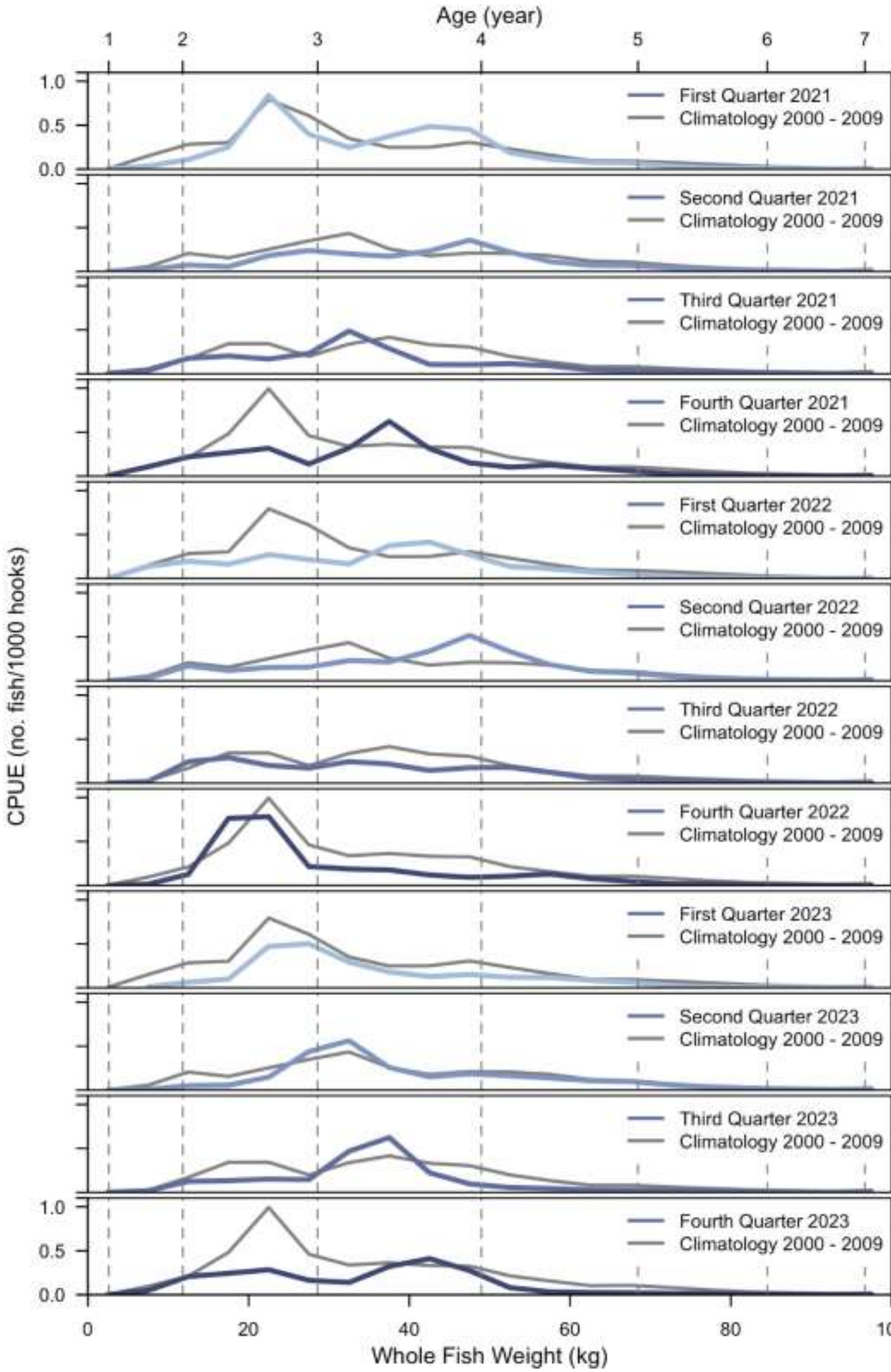


Figure 181. Quarterly deep-set bigeye tuna weight per unit effort for 2021–2023 (color) and the climatological average (2000–2009)

Rationale: Tracking the progression of growing size classes through time can provide a strong indication of recruitment pulses. The timing of these pulses is not yet well understood, particularly in terms of how they relate to climatic influences such as interannual variability. Improving this understanding could lead to the ability to project future yields and is an area of active research.

Status: No above-average peaks in two-year-old bigeye CPUE were observed in 2021–2023 , suggesting that there will not be a peak in the CPUE of four- and five-year-old bigeye in 2024 or 2025.

Description: Quarterly time series of bigeye weight-per-unit-effort (WPUE) in hooks set is presented for the previous two years. Fish weights are those of bigeye tuna received at the Honolulu auction. The Honolulu auction reports weights for gilled and gutted fish. A conversion factor is used to calculate the whole fish weights used for this indicator (Langley et al. 2006). Note the quarterly (colored) and climatological (grey) distributions of bigeye tuna weight-per-unit-effort in Figure 181. Bigeye weights are from sets using ≥ 15 hooks per float.

Timeframe: Quarterly.

Region: Hawai‘i-based longline fishing grounds.

Measurement Platform: *In-situ* measurement.

Sourced from: PIFSC (2024a), PIFSC (2024b) and the Hawai‘i Division of Aquatic Resources, and Langley et al. (2006).

3.4.2.15 BIGEYE RECRUITMENT INDEX

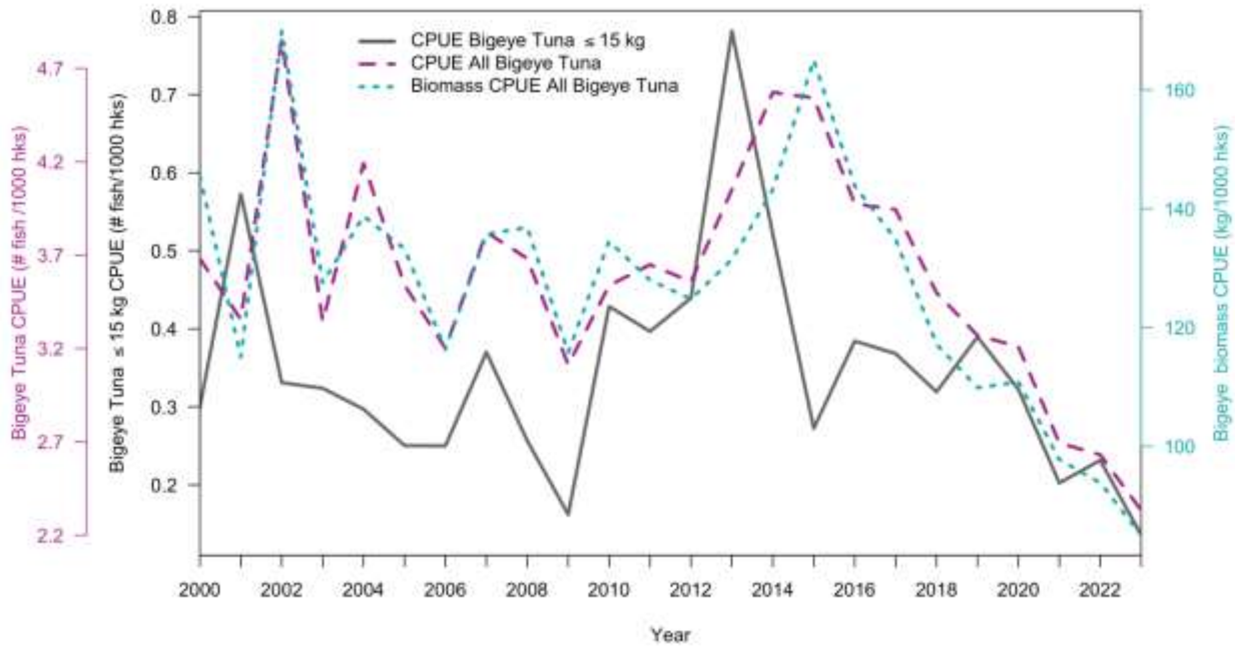


Figure 182. Annual CPUE of bigeye tuna ≤ 15 kg (grey solid line), CPUE of all bigeye tuna (pink dashed line), and biomass CPUE (blue dotted line) from 2000–2023, all from deep sets

Rationale: Catch rates of small bigeye tuna (≤ 15 kg) peak two years prior to peaks in catch rates (CPUE) and biomass (weight-per-unit-effort), indicating a recruitment pulse and allowing for predictions regarding increases in total catch rates of the fishery. The timing of these pulses is not yet well understood, particularly in terms of how they relate to climate impacts such as interannual variability. Improving this understanding could lead to the ability to project future yields and is an area of active research.

Status: In 2023, the CPUE of bigeye ≤ 15 kg was 0.14 fish per 1,000 hooks set. This is the lowest value observed over the past 22 years (previous minimum was 0.16 fish per 1,000 hooks set) and at this time does not appear indicative of a strong recruitment pulse such as was seen in 2001 or 2013.

Description: Time series of small (≤ 15 kg) and total bigeye tuna catch-per-unit-effort (hooks set) and weight-per-unit-effort (hooks set) for all bigeye tuna is presented. Fish weights are those of bigeye tuna received at the Honolulu auction. The Honolulu auction reports weights for gilled and gutted fish. A conversion factor is used to calculate the whole fish weights used for this indicator (Langley et al. 2006).

Timeframe: Annual.

Region: Hawai‘i-based longline fishing grounds.

Measurement Platform: Model-derived from *in situ* data.

Sourced from: PIFSC (2024a), PIFSC (2024b) and the Hawai‘i Division of Aquatic Resources, and Langley et al. (2006).

3.4.2.16 BIGEYE TUNA CATCH RATE FORECAST

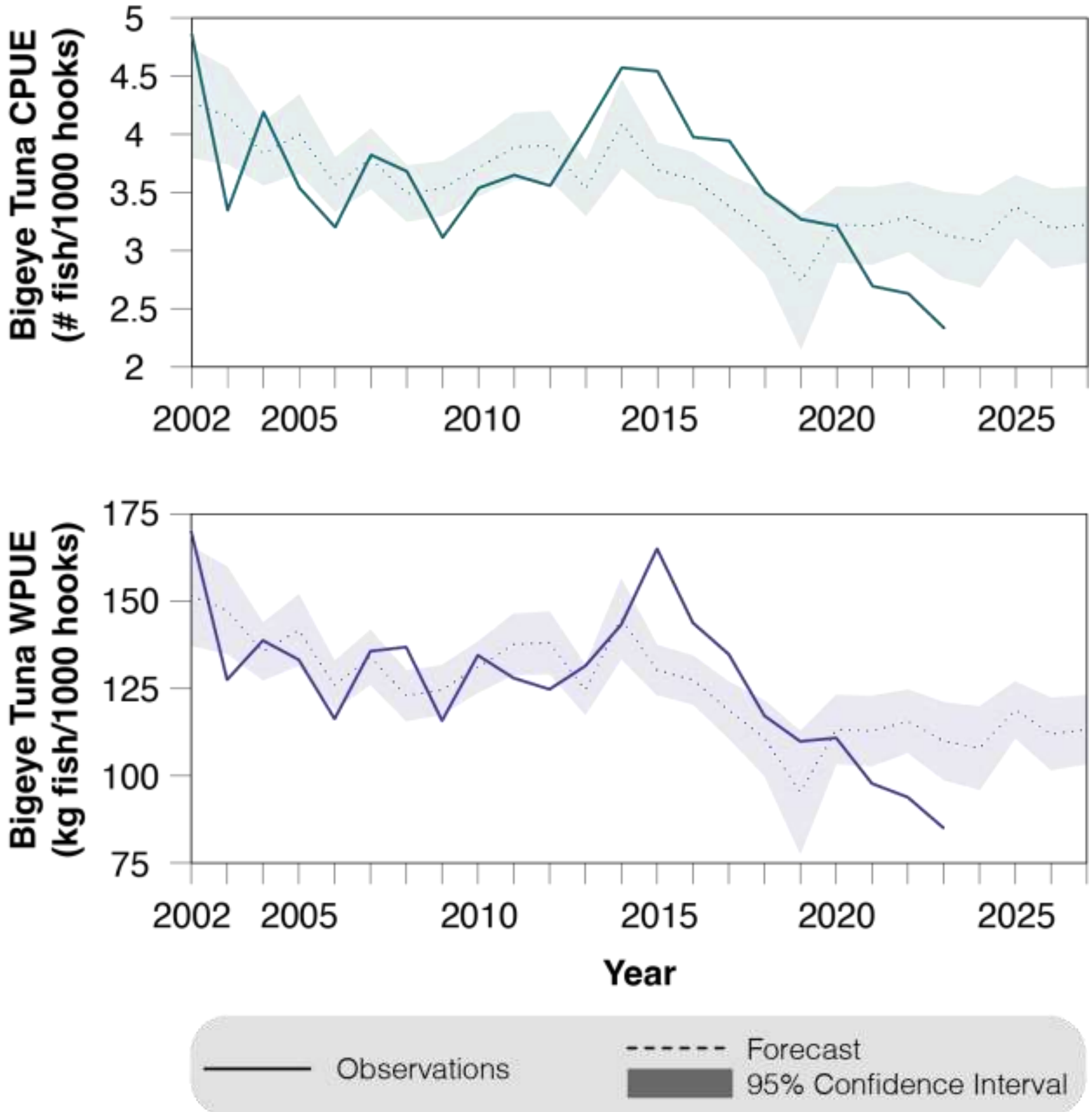


Figure 183. Annual observed (solid lines) and forecast (dotted lines) CPUE (upper panel; green) and WPUE (lower panel; purple) of bigeye tuna from deep sets. The forecasts' 95% confidence intervals are shaded

Rationale: Recent work has shown that average phytoplankton size can be used to predict bigeye tuna catch rates up to four years in advance (Woodworth-Jefcoats and Wren 2020). The hypothesized mechanism behind this relationship is that larger phytoplankton are indicative of higher quality food for the zooplankton upon which larval and juvenile bigeye tuna prey. With higher quality prey available, more bigeye tuna survive into adulthood and recruit to the fishery.

Status: The catch rate forecasts suggest that catch rates will be fairly steady over the next four years.

Description: Time series of observed bigeye tuna CPUE and WPUE are presented together with the annual forecast values and their associated 95% confidence interval. The forecast is based on a linear regression between four-year-lagged median phytoplankton size and both CPUE and WPUE (individual).

Timeframe: Annual.

Region: Hawai‘i-based longline fishing grounds (0° – 40°N, 180° – 150°W and 15° – 36°N, 150° – 125°W).

Measurement Platform: Model-derived from satellite remotely sensed and *in situ* data.

Sourced from: HDAR, Langley et al. (2006), NOAA OceanWatch (2024c), and Woodworth-Jefcoats and Wren (2020). Graphics produced in part using Stawitz (2023).

3.4.3 RESPONSE TO PREVIOUS COUNCIL RECOMMENDATIONS

At its 182nd meeting in June 2020, the Council requested the Pelagic Plan Team to look at South Pacific albacore indicators, provide more information on spatial catches within the region including American Samoa, and investigate ecosystem drivers for inclusion in the Annual SAFE Report. Preliminary information was presented at the Pelagic Plan Team meeting in May 2021.

At its 170th meeting from June 20-22, 2017, the Council directed staff to support the development of community training and outreach materials and activities on climate change. In addition, the Council directed staff to coordinate a “train-the-trainers” workshop that includes NOAA scientists who presented at the 6th Marine Planning and Climate Change Committee (MPCCC) meeting and the MPCCC committee members in preparation for community workshops on climate and fisheries. The Council and NOAA partnered to deliver the workshops in the fall of 2017 to the MPCCC members in Hawaii (with the Hawaii Regional Ecosystem Advisory Committee), as well as American Samoa, Guam, and the CNMI (with their respective Advisory Panel groups). Feedback from workshop participants has been incorporated into this year’s climate and oceanic indicator section. To prepare for community outreach, Guam-based MPCCC members conducted a climate change survey and shared the results with the MPCCC at its 7th meeting on April 10th and 11th, 2018. The Council also directed staff to explore funding avenues to support the development of additional oceanic and climate indicators, such as wind and extratropical storms. These indicators were added to this module by corresponding Plan Team members in 2018.

Prior to holding its 8th meeting, the MPCCC was disbanded in early 2019, re-allocating its responsibilities among its members on other advisory bodies, such as the Plan Teams.

3.4.4 OBSERVATIONAL AND RESEARCH NEEDS

Through preparation of this and previous pelagic annual SAFE reports, the Council has identified a number of observational and research needs that, if addressed, would improve the information content of future Climate and Oceanic Indicators section. This information would provide fishery managers, the fishing industry, and community stakeholders with better understanding and predictive capacity that is vital to sustaining a resilient and vibrant fishery in the Western Pacific. These observational and research needs are to:

- 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;
- Investigate the connections between climate variables and indicators to improve understanding of changes in physical, chemical, biological, 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 projections of climate and ocean change including changes in expected human benefits and their variability;
- Improve understanding of the connections between the PDO and fisheries ecosystems beyond the North Pacific;
- Improve understanding of mahimahi and swordfish size in relation to the location and orientation of the TZCF;
- Explore the connections between sea surface conditions, stratification, and mixing;
- Identify the biological implications of tropical cyclones;
- Research cultural knowledge and practices for adapting to past climate changes and investigate how they might contribute to future climate adaptation; and
- Explore additional and/or alternative climate and ocean indicators that may have important effects of pelagic fisheries systems including:
    - Ocean currents and anomalies;
    - Eddy kinetic energy (EKE);
    - Near-surface wind velocity and anomalies;
    - Wave forcing and anomalies;
    - Oceanic nutrient concentration;
    - South Pacific convergence zones targeted by swordfish;
    - Standardized fish community size structure data for gear types, including the troll fishery for yellowfin and blue marlin;
    - Additional spatial coverage for the international purse seine fishery and the American Samoa longline fishery;
    - Time series of species richness and diversity from catch data that could provide insight into how the ecosystem is responding to physical climate influences; and
    - Socioeconomic indicators of climate impacts on fishing communities and businesses.

3.4.5 ACKNOWLEDGEMENTS

Phoebe Woodworth-Jefcoats led the production and compilation of this chapter. Johanna Wren contributed figures, code, and text. Emily Conklin contributed code. Hui Daisy Shi contributed data products. The NOAA Fisheries Northeast Fisheries Science Center contributed the template used for the *Indicators at a Glance* figure.

3.5 ESSENTIAL FISH HABITAT

3.5.1 INTRODUCTION

Per requirements of the Magnuson-Stevens Fishery Conservation and Management Act (MSA; 50 CFR § 600.815), Essential Fish Habitat (EFH) information for all Pelagic Management Unit Species (MUS) is found in the Pelagic Fishery Ecosystem Plan (FEP). The EFH Final Rule requires that the Council review and revise EFH provisions periodically and report on this review as part of the annual Stock Assessment and Fishery Evaluation (SAFE) report, with a complete review conducted as recommended by the Secretary, but at least once every five years.
The habitat objective of the FEP is to refine EFH and minimize impacts to EFH, with the following sub-objectives:

- Review EFH and Habitat Areas of Particular Concern (HAPC) designations every five years and update such designations based on the best available scientific information, when available.
- 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.

Pelagic EFH information was not updated during preparation of 2022 SAFE report, except for Section 3.5.5. Non-fishing impacts to pelagic EFH were reviewed in the past as part of the Council's omnibus review of non-fishing effects on EFH. The Council's support of non-fishing activities research is monitored through the program plan and five-year research priorities, not the annual SAFE report.

3.5.2 RESPONSE TO PREVIOUS COUNCIL RECOMMENDATIONS

There were no Council recommendations for the EFH section of the Pelagic annual SAFE report in 2023.

3.5.3 HABITAT USE BY MUS AND TRENDS IN HABITAT CONDITION

The geographic extent of EFH for PMUS in the Western Pacific region is the shoreline to the edge of the exclusive economic zone (EEZ; 64 FR 19067, April 19, 1999). 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 2,000 m.

Because the habitat is the water column, the Climate and Oceanic Indicators section (Section 3.4) provides data and trends relevant to pelagic EFH, including oceanic pH, the ONI PDO, 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.

3.5.4 REPORT ON REVIEW OF EFH INFORMATION

No pelagic EFH reviews were completed in 2023.

3.5.5 RESEARCH NEEDS AND ONGOING PROJECTS

The Council previously identified pelagic scientific data needs to address the EFH provisions more effectively in the FEP. This section includes active research and data collection initiatives to address these needs. Many recent research cruises have been cancelled due to the COVID-19 pandemic, so data needed to move these projects forward have generally not been collected.

Research continues at PIFSC to enhance understanding of open-ocean habitats and ecosystem processes through improved utility of climate and oceanographic information. Specific research efforts continue on determining the distribution of feeding and spawning habitats and their response to anthropogenic climate change, as well as the influence of natural climate variability (e.g., ENSO) on the distribution of suitable habitat for bigeye tuna (BET).

The BET Initiative is a collection of projects that looks to utilize telemetry data to describe BET thermal and spatial habitat, identify imminent spawners among longline catch to shed light on where in the Hawaii longline fishery spawning occurs, explore the distribution of feeding and spawning habitat and responses to anthropogenic climate change, and examine the effect of large-scale climate variability to better understand shifts in catch rates and locations.

Currently, BET research almost exclusively uses satellite and/or modeled data (with much less frequent use of sparse *in situ* observations for environmental data). Additional telemetry data would improve the models, especially with respect to species distribution. At present, commercial catch data is used exclusively for fish distribution models. There is a need for better models, and the furtherance of dynamic habitat delineation is dependent on more *in situ* data and regular scientific sampling.

PIFSC is also researching the effect of large-scale variability on longline and purse seine tuna species CPUE in the Equatorial Pacific. Results of this research would tie into the BET Initiative, as it can provide information on possible links between the North Pacific and the Equatorial Pacific CPUE and BET population structure. One of the main management questions is whether the North Pacific stock is a separate stock or individuals that spawn in the equatorial region and migrate north.

At Cross Seamount, PIFSC scientists are looking at the distribution and relative abundance of micronekton (i.e., BET forage) in the seamount environment, and the distribution and relative biomass of juvenile BET in the seamount environment. This research can lead to an assessment of how juvenile BET abundance is reflected in the North Pacific pelagic environment (i.e., fishing grounds), possibly providing a route to fisheries independent data for stock assessments. PIFSC is also characterizing micronekton at the Transition Zone Chlorophyl Front (TZCF), a critical migratory route and foraging ground for top predators (e.g., tunas, billfish, and protected species) that feed on micronekton.

PIFSC has recently developed the Protected Species Ensemble Random Forest (PSERF) model, which is a habitat-based framework to describe Hawaii- and American Samoa-based longline interactions with protected species, utilizing olive ridley sea turtles (*Lepidochelys olivacea*) as a case study. Ongoing work includes updating Hawaii deep-set and shallow-set longline fishery data sets for the most recent years and adding oceanographic features derived from weekly products, including eddy kinetic energy, Okubo-Weiss parameters, and Ekman pumping to define mesoscale features. Distribution models are being developed for all species in the Hawaii deep-set, Hawaii shallow-set, and American Samoa longline fisheries, and will be rerun with more recent data and features. More robust habitat delineation and possible dynamic ocean management based on models using weekly products could facilitate timely updates for areas of high protected species encounter probabilities.

Similar work is ongoing focused on understanding environmental drivers of the catch rates of the full suite of species caught in the Hawaiʻi shallow- and deep-set longline fisheries. These models are made with the intent of climate projections and short term predictions covering the broadest area over which the fisheries operate. These differ from PSERF models in their generalizability for said predictions, identification of environmental sensitivities, and inclusion of catch rates for the species caught in these fisheries (compared to solely interaction probabilities).

PIFSC has collected fish larvae while piggybacking on other survey efforts throughout the Hawaiian Archipelago, totalling 112 stations ranging from west of Hōlanikū to Hawaiʻi Island. These data can be used to identify the spawning locations and timing for a range of management unit species, spanning from uku and *Pristipomoides* snappers (deep-7 members) to a large suite of pelagic management unit species (mahimahi, ono, marlins, and tunas). This information will be paired with the environmental characteristics during the individual tows to better refine larval and inferred spawning habitat for a number of these species.

PIFSC scientists have used recent developments in the understanding of uku early life history to parameterize a model simulating the larval dispersal of this species from Penguin Bank, their presumed primary spawning location within the main Hawaiian islands. Results have indicated that simulated uku larvae (treated as particles concentrated at the depth uku larvae have been observed in samples) released from Penguin Bank largely remain with the Maui Nui and Oʻahu area, with rare connections to Hawaiʻi Island, Kauaʻi, and Niʻihau. Wind patterns related both to the fraction of particles reaching potential settlement areas in the model runs and to the recruitment residuals from the 2020 benchmark stock assessment for uku. The results suggest wind-forced variability in larval dispersal may influence the recruitment of this stock.

PIFSC scientists have been identifying the environmental and operational associations of cookie cutter bite occurrences for both the shallow- and deep-set Hawaiʻi longline fisheries. Preliminary results indicate soak time, lunar phase, and temperature play notable roles in the occurrence of cookie cutter shark bites on fish caught on an individual set. Further work will assess if fishing effort in both fisheries is increasingly overlapping with predicted cookie cutter shark bite occurrence throughout the fishing domain.

3.6 MARINE PLANNING

3.6.1 INTRODUCTION

Marine planning is a science-based management 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 formalize incorporation of marine planning in its actions began in response to Executive Order 13547, Stewardship of the Ocean, Our Coasts, and the Great Lakes. Executive Order 13158, Marine Protected Areas (MPAs), proposes that agencies strengthen the management, protection, and conservation of existing MPAs, develop a national system of MPAs representing diverse ecosystems, and avoid causing harm to MPAs through federal activities. MPAs, or marine managed areas (MMAs) are one tool used in fisheries management and marine planning.

At its 165th meeting in March 2016, in Honolulu, Hawaii, 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 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.

To meet the EFH and National Environmental Policy Act (NEPA) mandates, this annual SAFE report tracks activities that occur in the ocean that are of interest to the Council and incidents or facilities 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.

3.6.2 RESPONSE TO PREVIOUS COUNCIL RECOMMENDATIONS

There are no standing Council recommendations indicating review deadlines for Pelagic MMAs.

At its 147th meeting in March 2010, the Council recommended a no-take area from 0–12 nm around Rose Atoll Marine National Monument (MNM) with the Council to review the no-take regulations after three years. The most recent review took place in 2013, with the subsequent review previously scheduled for 2016. PIRO received no requests for non-commercial permits to fish within the Rose Atoll MNM. Further, inquiries in American Samoa showed that there was no indication that the 12 nm closure around Rose Atoll MNM has been limiting fishing. The

Pelagic Plan Team deferred decision on Rose Atoll in May 2017. At its 172nd meeting in March 2018, the Council requested that NOAA and USFWS provide a report to the Council at its following meeting to review resultant benefits to fish populations, protected species, and coral reef, deep-slope, and pelagic ecosystems from the establishment of the Rose MNM. USFWS presented this report to the Council at its 173rd meeting in June 2018, from which no Council recommendations were generated.

At its 162nd meeting in March 2015, 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 50 ft in length. The Council would review the LVPA exemption on an annual basis. In 2016, NMFS published a final rule that allowed large, federally-permitted U.S. longline vessels to fish in specific areas of the LVPA (81 FR 5619, February 3, 2016). In July 2016, American Samoa sued NMFS and the Council in the Hawaii Federal District Court, claiming that NMFS did not consider the 1900 and 1904 Deeds of Cession with respect to the protection of the cultural fishing rights of the people of American Samoa. In 2017, the Hawaii Federal District Court deemed the final rule invalid and ordered NMFS to vacate the LVPA exemption rule (82 FR 43908, September 20, 2017).

At its 173rd meeting in June 2018, regarding the LVPA applicable to the American Samoa limited entry vessels, the Council recognized the LVPA rule has led to disagreement within the American Samoa fishing community and was the subject of litigation. The Council noted that the court decision requires the consideration and protection of American Samoa cultural fishing. To this end, the Council requested PIFSC conduct research on American Samoa cultural fishing practices to facilitate understanding and potential impacts of opening some restricted fishing areas within the U.S. EEZ for American Samoa vessels that primarily target albacore. PIFSC presented the results of this research at the Council's 172nd meeting in March 2018, which indicated that all fishing in American Samoa has cultural importance because catch from all locally-based fishing sectors flows into the American Samoa community for cultural purposes. The Council also recommended a regulatory amendment to provide a four-year exemption for vessels permitted under the American Samoa longline limited entry program to fish within the LVPA seaward of 12 nm around Tutuila, 12 nm around Manua, 12 nm around Swains, and 2 nm around the offshore banks, and recommended annual monitoring of the American Samoa longline and troll catch rates, small vessel participation, and local fisheries development.

NMFS appealed Hawaii Federal District Court's 2017 decision that invalidated the 2016 LVPA reduction to the U.S. Ninth Circuit Court of Appeals. Oral arguments were in February 2020 in Honolulu, Hawaii, and the decision was reversed in a September 2020 ruling.

At its 184th meeting in December 2020, the Council directed staff to monitor the fishing operation and fishery performance of the American Samoa longline and alia fisheries and report back to the Council at its September 2021 meeting. Council staff provided this presentation to the Council as scheduled. On July 9, 2021, NMFS published a final rule reimplementing the 2016 regulations that the Council submitted to NMFS (86 FR 36239).

At its 194th meeting in March 2023, regarding the process to designate a National Marine Sanctuary in the Pacific Remote Island Areas (PRIA), the Council requested NOAA and all other involved agencies to consult with the U.S. Pacific Territories beyond the public comment opportunity on the proposed sanctuary. The Council also directed staff to invite the National Ocean Service (NOS) to provide a presentation on the proposed Pacific Remote Island Sanctuary to get a better understanding of the Council's responsibilities and role in the process. At the same meeting, the Council also directed staff to raft a letter to NOAA requesting NMFS and NOS meet with the Governors and staff of the Territories of American Samoa, Guam, and the CNMI and that NOS describe in detail the process that will be followed for President Biden's request for a National Marine Sanctuary in the PRIA, and a review of the process with the Council as soon as possible.

At its 195th meeting in June 2023, the Council directed staff to review the Council's current fishing regulations for the PRIA and Pacific Pelagics FEPs and other applicable laws to provide the Council with a determination of whether existing regulations meet the goals and objectives, proclamations, and National Marine Sanctuaries Act. The Council further directed staff to develop a range of options for fishing regulations in the proposed sanctuary including extending existing Pacific Remote Islands Marine National Monument (PRIMNM) regulations to the full spatial extent of the EEZ for Council consideration at its next meeting.

The Council requested NOAA, in its evaluation of the proposed PRI sanctuary, evaluate the holistic impacts of prohibiting tuna fishing 50 to 200 nm of the island areas, that that sector of the U.S. purse seine fleet and possibly the Hawaii Longline fleet that has historically fished in the PRIA EEZ around Howland and Baker and Palmyra and Kingman reef be considered a "community of practice" and be given prominence as an "affected community" along with the whole larger fishing community of American Samoa, and that resuming sustainable fishing be made an objective in the designation.

The Council requested NOAA conduct an economic study that considers the individual and cumulative effects, including multiplier effects, to American Samoa-based fishery on the proposed ELAPS rulemaking, lack of acknowledgement of a distinct American Samoa fleet in international management, and effects of a proposed National Marine Sanctuary that may prohibit purse seine-based commercial fishing in the entire U.S. EEZ of the PRI.

The Council noted that, for the NWHI Monument Expansion Area (MEA), the ONMS' letter of May 31, 2023, rejecting the Council's cost-recovery provision in the permitting process simply referred to its February 22, 2023 letter for disapproval rationale. However, the latter is unclear on exactly how the Council's recommendation is inconsistent with Goal 4 and Objectives 3, 5, and 6 because sale can be denied by NMFS after consultation with monument management partners. The Council directed staff to respond to ONMS requesting they provide a more detailed explanation of how the recommendation is inconsistent with each goal and objective.

The Council directed staff to prepare a letter to the President of the United States of America (POTUS), conveying its concerns about the proposed sanctuary in the Pacific Remote Islands and potential negative consequences to U.S. Pacific Territories, and to request that ONMS and the Office of the White House respond to letters from U.S. Pacific Territorial governors on the matter.

At its 196th meeting in September 2023, regarding fishing regulations for the proposed PRIA Sanctuary, the Council recognized that a goal of the proposed sanctuary is to support cultural heritage and fishing is central to the culture of Pacific Island communities. Data presented to the Council by NMFS PIFSC showed that the impacts of the existing fisheries as managed under current fisheries regulations are well below measurable and objective thresholds established by NOAA pursuant to requirements set forth under the Magnuson Stevens Fishery Conservation and Management Act (MSA) (i.e., no fish stocks are overfished or subject to overfishing, and no essential fish habitats are being adversely affected), Endangered Species Act (ESA) (i.e., no fisheries are jeopardizing species or destroying/adversely modifying critical habitat listed under the ESA) and other applicable laws. Further, the data also showed the importance of fishing to the culture of American Samoa and a reduction of fishing would represent a disproportionate socioeconomic burden to the Territory of American Samoa and the US longline and purse seine fleets. Therefore, the Council preliminarily found that the existing fishing regulations under the current structure may already meet the goals and objectives of the proposed sanctuary and directs staff to continue discussing the issue with NMFS and Office of National Marine Sanctuaries (ONMS) to determine if additional regulations may be necessary. The Council requested ONMS provide an opportunity for the Council to review a pre-draft Environmental Impact Statement (EIS) for the proposed Pacific Remote Islands (PRI) National Marine Sanctuary to ensure that the alternatives are aligned with the Council's fishing regulations.

The Council also directed staff to send a letter to the President to request modifying the Pacific Remote Islands Marine National Monument to allow for US commercial longline and purse seine fishing around Jarvis Island and Johnston Atoll. The Council noted that Jarvis and Johnston have been historically more important for both US longline and US purse seine fisheries and can help the US mitigate climate change while providing equity and environmental justice to US fishing communities in the Western Pacific.

At its 197th meeting in December 2023, reiterated its findings in Appendix C of the options paper that show that the Council's existing regulations have established comprehensive protection since the 1980s and continues to provide for long-lasting conservation and management for the PRI fishery ecosystem and resources. The Council stressed the importance of the current pelagic fisheries in the PRI to the economy and culture of American Samoa and recognized that impacts to those fisheries would be devastating to *fa'a Samoa*. The fisheries provide for millions of dollars and thousands of jobs through direct and indirect contributions. The current pelagic fisheries in the PRI are conserved and managed pursuant to an adaptive, ecosystem-based approach both domestically and internationally and are neither overfished nor experiencing overfishing. Pelagic fishing occurs at or near the open ocean's surface and does not interact with benthic communities, so these activities do not jeopardize the benthic ecosystem or biodiversity. Should fishing for bottomfish, crustacean, precious coral or a coral reef ecosystem species be conducted in the PRI, Council regulations implementing the Pacific Remote Islands Fishery Ecosystem Plan would apply and continue to comprehensively conserve and manage these fisheries, the marine biodiversity, and ecosystem services they provide. This management plan has been in place for over 13 years to prevent negative impacts to fish stocks, habitat, bycatch, and protected species. Therefore, the Council determined that the existing fishing regulations under the current structure already meet the goals and objectives of the proposed sanctuary and recommends to ONMS that additional fishing regulations are not necessary to meet the proposed PRI National Marine Sanctuary goals and objectives. Further, the Council directed staff to provide the Council's recommendation to ONMS by December 20, 2023 and to include the rationale and justification for the Council's determination to ONMS by January 19, 2024.

3.6.3 MARINE MANAGED AREAS

Council-established MMAs are shown in Figure 184, and are compiled in Table 86.

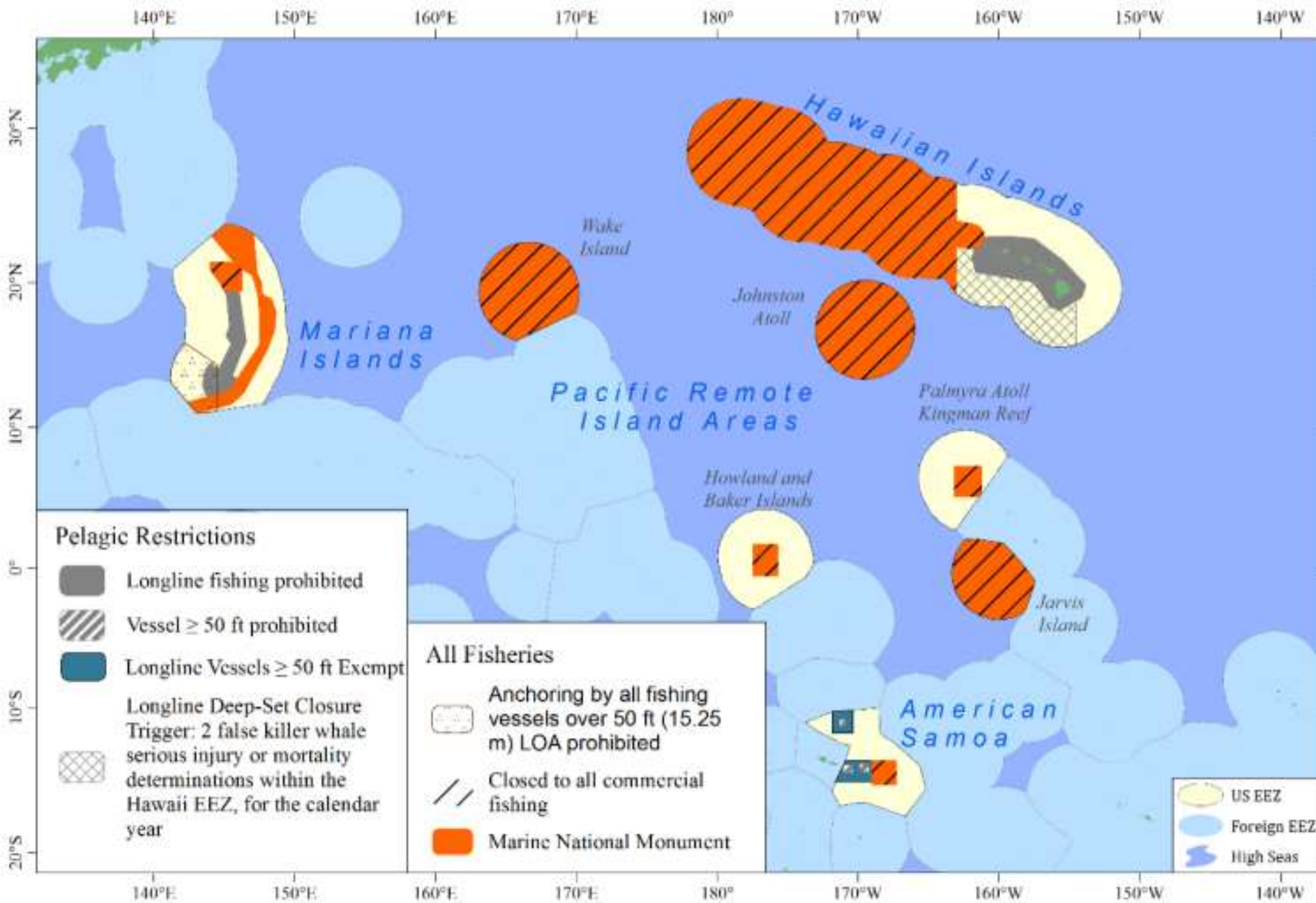


Figure 184. Regulated Fishing Areas of the Western Pacific Region

Table 86. MMAs established under FEPs from 50 CFR § 665

Name	FEP	Island(s)	50 CFR /FR /Amendment Reference	Marine Area (km^2)	Fishing Restriction	Goals	Most Recent Evaluation	Review Deadline
Pelagic Restrictions								
NWHI Longline Protected Species Zone	Pelagic (Hawaii)	NWHI	665.806(a)(1) 56 FR 52214 76 FR 37287 Pelagic FMP Am. 3	351,514.00	Longline fishing prohibited	Prevent longline interaction with monk seals.	1991	-
MHI Longline Prohibited Area	Pelagic (Hawaii)	MHI	665.806(a)(2) 57 FR 7661 77 FR 71286 Pelagic FMP Am. 5	248,682.38	Longline fishing prohibited	Prevent gear conflicts between longline vessels and troll/handline vessels.	1992	-
Guam Longline Prohibited Area	Pelagic (Marianas)	Guam	665.806(a)(3) 57 FR 7661 Pelagic FMP Am. 5	50,192.88	Longline fishing prohibited	Prevent gear conflicts between longline vessels and troll/handline vessels.	1992	-
CNMI Longline Prohibited Area	Pelagic (Marianas)	Mariana Archipelago	665.806(a)(4) 76 FR 37287 Pelagic FEP Am. 3	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	-

Name	FEP	Island(s)	50 CFR /FR /Amendment Reference	Marine Area (km²)	Fishing Restriction	Goals	Most Recent Evaluation	Review Deadline
Large Vessel Prohibited Area	Pelagic (American Samoa)	Tutuila, Manu'a, and Rose Atoll	665.806 (b)(1) 81 FR 5619 82 FR 43908	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	-
Large Vessel Prohibited Area	Pelagic (American Samoa)	Swains Island	665.806 (b)(1) 81 FR 5619 82 FR 43908 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	-
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 Fishery Management Plan (FMP) 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 (nm).	2013	-

Name	FEP	Island(s)	50 CFR /FR /Amendment Reference	Marine Area (km²)	Fishing Restriction	Goals	Most Recent Evaluation	Review Deadline
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 FMP 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 FMP 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	-
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 FMP 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
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 FMP 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	-

Name	FEP	Island(s)	50 CFR /FR /Amendment Reference	Marine Area (km²)	Fishing Restriction	Goals	Most Recent Evaluation	Review Deadline
Guam No Anchor Zone	Mariana Archipelago	Guam	665.399 69 FR 8336 Coral Reef Ecosystem FMP	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 FMP 78 FR 32996 PRIA FEP Am. 2	-	Special Permit Only	Minimize adverse human impacts on coral reef resources; superseded by prohibiting fishing within 12 nm in Am. 2.	2013	-
Palmyra Atoll Low-Use MPAs/PRI Marine National Monument	PRIA/ Pelagic	Palmyra Atoll	69 FR 8336 Coral Reef Ecosystem FMP 78 FR 32996 PRIA FEP Am. 2	-	Special Permit Only	Minimize adverse human impacts on coral reef resources; superseded by prohibiting fishing within 12 nm in Am. 2.	2013	-
Wake Island Low-Use MPA/PRI Marine National Monument	PRIA/Pelagic	Wake Island	69 FR 8336 Coral Reef Ecosystem FMP 78 FR 32996 PRIA FEP Am. 2	-	Special Permit Only	Minimize adverse human impacts on coral reef resources; superseded by prohibiting fishing within 12 nm in Am. 2.	2013	-

3.6.4 ACTIVITIES AND FACILITIES OCCURRING IN THE WESTERN PACIFIC REGION

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 (DOD) activities are assessed in environmental impact statements (EIS) 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. Activities which are no longer reasonably foreseeable or have been replaced with another planning activity are removed from the report, though they may occur in previous reports.

3.6.4.1 AQUACULTURE FACILITIES

Hawaii had one offshore aquaculture facility recently operating in federal waters that was owned by Kampachi Farms (now known as Ocean Era) in 2016, but the associated Special Coral Reef Ecosystem Fishing Permit (SCREFP) was transferred to Forever Oceans in 2017 (see Table 87). This permit is no longer active. Additionally, the Final Programmatic Environmental Impact Statement (PEIS) for an aquaculture management program in the Pacific Islands was published in 2022. Relatedly, the State of Hawaii is interested in developing a pre-permitted demonstration/pilot area for offshore aquaculture technologies at their NELHA facility.

Table 87. Offshore aquaculture facilities near Hawaii

Name	Size	Location	Species	Status
Forever Oceans, transferred from Kampachi Farms (now known as Ocean Era)	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 Hawaii Island (19°33' N, 156° 04' W). Mooring scope is 10,400-foot radius.	*Seriola rivoliana*	On July 6, 2016, NMFS authorized SCREFP for culture and harvest of 30,000 kampachi over two years on July 6, 2016. Array broke loose from mooring and empty net pen sank in 12,000 feet of water on Dec. 12, 2016. The mooring was redeployed under guidance from the U.S. Army Corps of Engineers (USACE) in late 2018 and stocked with the first cohort of 10,000 fish in early 2019. On March 30, 2017, NMFS authorized transfer of the two-year SCREFP from Ocean Era to Forever Oceans and the permit was renewed in 2019. Forever Oceans' most recent SCREFP expired in December 2021, and there are currently no ongoing, in-water operations.

3.6.4.2 ALTERNATIVE ENERGY FACILITIES

There are no alternative energy facilities in territorial or federal waters, proposed or existing, in American Samoa, Guam, the CNMI, or the PRIA.

Hawaii previously had four proposed wind energy facilities in federal waters through BOEM. On June 24, 2016, BOEM published a "Call for Information and Nominations" to seek additional nominations from companies interested in commercial wind energy leases within the Call Area offshore Hawaii, and pursued public comment on site conditions, resources, and existing uses of the area associated with BOEM's wind energy development authorization process (BOEM 2017). However, these projects were disengaged in 2018. In December 2020, BOEM put out a new call for recommendations on environmental studies regarding offshore wind facilities, and the Hawaii State Energy Office is facilitating and providing input on studies that could be conducted to mitigate impacts on various resources, including aquatic. In October 2021, the National Renewable Energy Laboratory published a study providing estimates of the Levelized Cost of Energy of offshore wind in the region surrounding Oahu and investigates related topics relevant to planning for offshore wind (Shields et al. 2021). In December 2022, the Pacific Northwest National Laboratory deployed a floating scientific research buoy stationed approximately 15 miles east of Oahu to collect accurate offshore wind resource, meteorological, and oceanographic data in Hawaii. There are several alternative energy projects also being tracked in this report (Table 88).

Table 88. Alternative Energy Facilities and Development in the Western Pacific region

Name	Type	Location	Impact to Fisheries	Stage of Development	Source
Makai Ocean Engineering, Inc., Natural Energy Laboratory of Hawaii Authority (NELHA)	120 kW Ocean Thermal Energy Conversion (OTEC) Test Site/ 1 MW OTEC Test Site	Ke'ahole, North Kona, West Hawaii	Intake	120 kW OTEC operational; Final EA for 1 MW OTEC Site using existing infrastructure submitted July 2012 and lease negotiations being finalized; HEPA Exemption List memo Dec. 27, 2016.	NELHA Energy Projects Final Environmental Assessment, NELHA, July 2012
Honolulu Sea Water Air Conditioning (SWAC)	SWAC	4 miles S of Kaka'ako, Oahu	Benthic impacts; intake	USACE Record of Decision (ROD) signed in 2015. In 2018, HSWAC and the State of Hawaii finalized an agreement to provide seawater air conditioning for eight State buildings. Construction was planned to start in late 2019 or, but the operation was shut down in late 2020 due to increasing costs.	Honolulu SWAC Press Room Final Environmental Assessment, June 2014
Marine Corps Base Hawaii Wave Energy Test Site (WETS)	Shallow- and Deep-Water Wave Energy	1, 2 and 2.5 km N of Mokapu, Oahu	Hazard to navigation	Shallow and deepwater wave energy units operational in mid-2015. In 2021, deployments were planned for the C-Power 2	Final Environmental Assessment, NAVFAC PAC, January 2014 Tethys

Name	Type	Location	Impact to Fisheries	Stage of Development	Source
				kW SeaRay, the Oscilla Triton-C, and the Ocean Energy 500 kW OE35.	The Maritime Executive

3.6.4.3 MILITARY TRAINING AND TESTING ACTIVITIES AND IMPACTS

Major activities occurring in waters of the Western Pacific region by the DOD are summarized in Table 89.

Table 89. DOD major activities in the Western Pacific region

Action	Description	Phase	Impacts
Guam and CNMI Military Relocation SEIS	Relocate Marines to Guam and build a cantonment/family housing unit on Finegayan/Andersen Air Force Base, a live-fire individual training range complex at the Ritidian Unit of the Guam National Wildlife Refuge.	Record of Decision (ROD) published August 29, 2015 after release of Final SEIS on July 18, 2015 (80 FR 55838). Lawsuit filed for segmentation and range of reasonable alternatives under NEPA. The case was lost in 2018 when a judge from the District Court of CNMI stated that the Guam buildup and proposed training in the CNMI are not connected actions. The case was appealed, and the US Court of Appeals for the Ninth Circuit affirmed the District Court's dismissal in 2020. Marine Corps Base Camp Blaz was activated on October 1, 2020. The US Army Corps of Engineers published a final rule on Oct. 8, 2021, amending regulations to establish a danger zone in the Pacific Ocean adjacent to the Mason Live-Fire Training Range Complex at Camp Blaz.	Surface danger zone established at Ritidian – access restricted during training. Northern District Wastewater Treatment Plant will significantly impact nearshore water quality until it is upgraded.
Mariana Islands Training and Testing – Supplemental	The supplement to the 2015 Final EIS/OEIS was prepared to support ongoing and future activities conducted at sea and on Farallon de Medinilla (FDM) beyond 2020. New information, including an updated acoustic effects model, updated marine mammal density data, and evolving and emergent BSIA, were used to update the MITT.	The MITT Final Supplemental EIS/OEIS was released in June 2020. ROD published on August 7, 2020 to continue training and testing activities in the study area (85 FR 47952). Meetings are ongoing to discuss FDM research activities and exercises. Meetings were previously held to discuss the Integrated Natural Resources Management Plan and plans for future surveys around FDM. In July 2020, NMFS implemented regulations regarding to the incidental take of marine mammals in the MITT area (85 FR 46302).	Access and habitat impact similar to previously analyzed activities in the 2015 EIS/OEIS (80 FR 46525).
Rim of the Pacific (RIMPAC) Exercise	Multinational, sea control/power projection fleet exercise that has been performed biennially for currently headquartered in Pearl Harbor, Hawaii. RIMPAC exercise locations are present throughout the State of Hawaii.	RIMPAC Programmatic EA developed in 2002 and a Supplemental Programmatic EA was finalized in 2006 (71 FR 31170). Biennial exercises continue through the present, with the most recent occurring in August 2020 as an at-sea-only event. RIMPAC occurred again in Summer 2022 more traditionally.	Programmatic Environmental Assessment, June 2002 U.S. Pacific Fleet
Hawaii-Southern California	Increase naval testing and training activities, including the use of active sonar and explosives.	Record of Decision available in December 2018 to conduct training and testing activities as identified in Alternative 1 of the HSTT	The 2018 HSTT EIS/OEIS predicts impacts to access and

Action	Description	Phase	Impacts
Training and Testing (HSTT)		Final EIS/OEIS published in October 2018 (83 FR 66255). NMFS implemented regulations regarding to the incidental take of marine mammals in the HSTT area in July 2020 (85 FR 41780).	habitat impact similar to previous analysis in the 2013 HSTT EIS/OEIS.
Long Range Strike Weapon Systems Evaluation Program (WSEP)	Conduct operational evaluations of Long Range Strike weapons and other munitions as part of Long Range Strike WSEP operations at the Pacific Missile Range Facility at Kauai, Hawaii.	Comment period closed Feb. 6, 2017, and final rule on Aug. 22, 2017, for NMFS authorization to take marine mammals incidental to conducting munitions testing for their Long-Range Strike Weapons Systems Evaluation Program (LRS WSEP) over the course of five years, from August 21, 2017 through August 22, 2022 (82 FR 1702; 82 FR 39684).	Access – closures during training. Final Environmental Assessment, October 2016 NMFS Biological Opinion, August 2017
Naval Special Operations Training in the State of Hawaii	Small-unit maritime training activities for naval special operations personnel.	Draft EA released in October 2018. Public comment period through Dec. 10, 2018 was extended to Jan. 7, 2019. Final EA released May 2021.	Access. Draft Environmental Assessment, 2018
CNMI Joint Military Training	Establish unit and combined level training ranges on Tinian and Pagan.	Revised Draft EIS was expected in late 2018 or early 2019, but there is no new information on the EIS status. Lawsuit filed for segmentation and range of reasonable alternatives under NEPA. DOJ asked U.S. District Court for the NMI to dismiss the plaintiff's complaint with prejudice to prevent refiling. The case was lost in 2018 after a judge from the district court of CNMI agreed with the military that the Guam buildup and proposed training in the CNMI are not connected actions. The case was appealed, and the U.S. Court of Appeals for the Ninth Circuit affirmed the District Court's dismissal in 2020. Several meetings have been held with DFW and military officials to discuss relevant natural resource, land use, and social concerns regarding the proposed activities and prompted the reconsideration of proposed alternatives.	Significant access and habitat impacts around Tinian and Pagan.
Garapan Anchorage	Military Pre-Positioned Ships anchor and transit.	Expired Memorandum of Understanding with the CNMI Government. As of 2021, a new MOU had not been signed.	Access, invasive species, unmitigated damage to reefs.
Farallon de Medinilla	Restricted airspace covering the island to 12 nm radius to conduct military training scenarios using air-to-ground ordnance delivery, naval gunfire, lasers, and special operations training.	Final rule published March 13, 2017, effective June 22, 2017, designating a new area, R-2701A, that surrounds existing R-2701, encompassing airspace between a 3 nm radius and 12 nm radius of FDM (82 FR 13389). Proposed surface danger zone to 12 nmi. Meetings with military officials established that the 12 nm radius is closed when exercises are being conducted, but a 3 nm closure would instead be in effect year-round when exercises are not being conducted.	Access – to fishing grounds and transit to fishing grounds – and damage to submerged lands.

Action	Description	Phase	Impacts
		Damage to submerged lands and fisheries to be included within consultation establishing continued US interest in the island and compensation to the CNMI (Report to the President on 902 Consultations 2017)	
Tinian Divert Infrastructure Improvements, Marianas	Improvements to airport and seaport (improving roads, installing fuel line) in CNMI for expanding mission requirements in Western Pacific.	ROD for Tinian Divert Infrastructure Improvements published in 2016 (81 FR 92791). The USAF has published a NOI to prepare a SEIS for the proposed Tinian Divert Infrastructure Improvements. The NOI began the public scoping process for the SEIS, which ended on May 31, 2018. Substantive comments received during the public scoping period were taken into consideration during preparation of the Draft SEIS. The USAF published a Notice of Availability (NOA) for the Draft SEIS on May 17, 2019. The NOA began the public review period for the Draft SEIS, which ended on July 1, 2019. Substantive comments received during the public review period were taken into consideration during preparation of the Final SEIS, which had an NOA published in July 2020 (85 FR 43580). Ground was broken on the Tinian Divert airfield on Feb. 22, 2022, which is expected to be completed by Oct. 9, 2025.	Adverse impacts to EFH minimal; access near Port of Tinian fuel transfer facility affected. Access and transit to fishing grounds.

In addition to the DOD activities detailed in Table 89, the U.S. military proposed the development of a small arms firing range near the shoreline in northwest Tinian. Several concerns were brought to the military regarding the proposed firing range, including issues with fishing access in the associated spatial closure area, issues with access to dive sites in the area, issues with the increased distance that boaters would have to travel to transit between Tinian and Saipan, and issues regarding boater safety due to having to travel further west from Tinian and losing access to the calmer waters nearshore (Tenorio, pers. comm., April 4, 2022).

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 an offshore area such as W-517 is in use for training or testing exercises by the U.S. military, a notice to mariners (NTM) 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. NTMs from the military regarding these exercises and the number of days affected for Guam and the CNMI are included in Table 90. The warning areas for which NTMs are issued are presented in Figure 185.

Table 90. Notices to mariners for military exercises in the Mariana Archipelago from 2013-2023

Year	Location	Number of Notices to Mariners Issued	Number of Days Affected
2013	FDM	45	159
	W-517	24	54
2014	FDM	38	145
	W-517	24	49
2015	FDM	37	164
	W-517	33	87
2016	FDM	35	142
	W-517	50	139
	W-11	N/A	N/A
	W-12	N/A	N/A
2017	FDM	56	191
	W-517	46	119
	W-12	2	5
	W-11	N/A	N/A
2018	FDM	38	150
	W-517	49	107
	W-12	6	13
	W-11	1	1
2019	FDM	39	165
	W-517	27	65
	W-12	3	22
	W-11	6	27
	W-13	15	37
2020	FDM	27	87
	W-517	26	60
	W-12	2	3
	W-11	4	5
	W-13	31	106
2021	FDM	22	76
	W-517	26	72
	W-12	9	16
	W-11	6	24
	W-13	28	109
2022	FDM	14	49
	W-517	31	71
	W-12	9	26

Year	Location	Number of Notices to Mariners Issued	Number of Days Affected
	W-11	4	14
	W-13	23	65
	OROTE	73	266
2023	FDM	33	134
	W-517	34	72
	W-12	13	26
	W-11	6	24
	W-13	35	105
	OROTE	74	301
	MASON	11	44
	FINEGAYAN	2	16

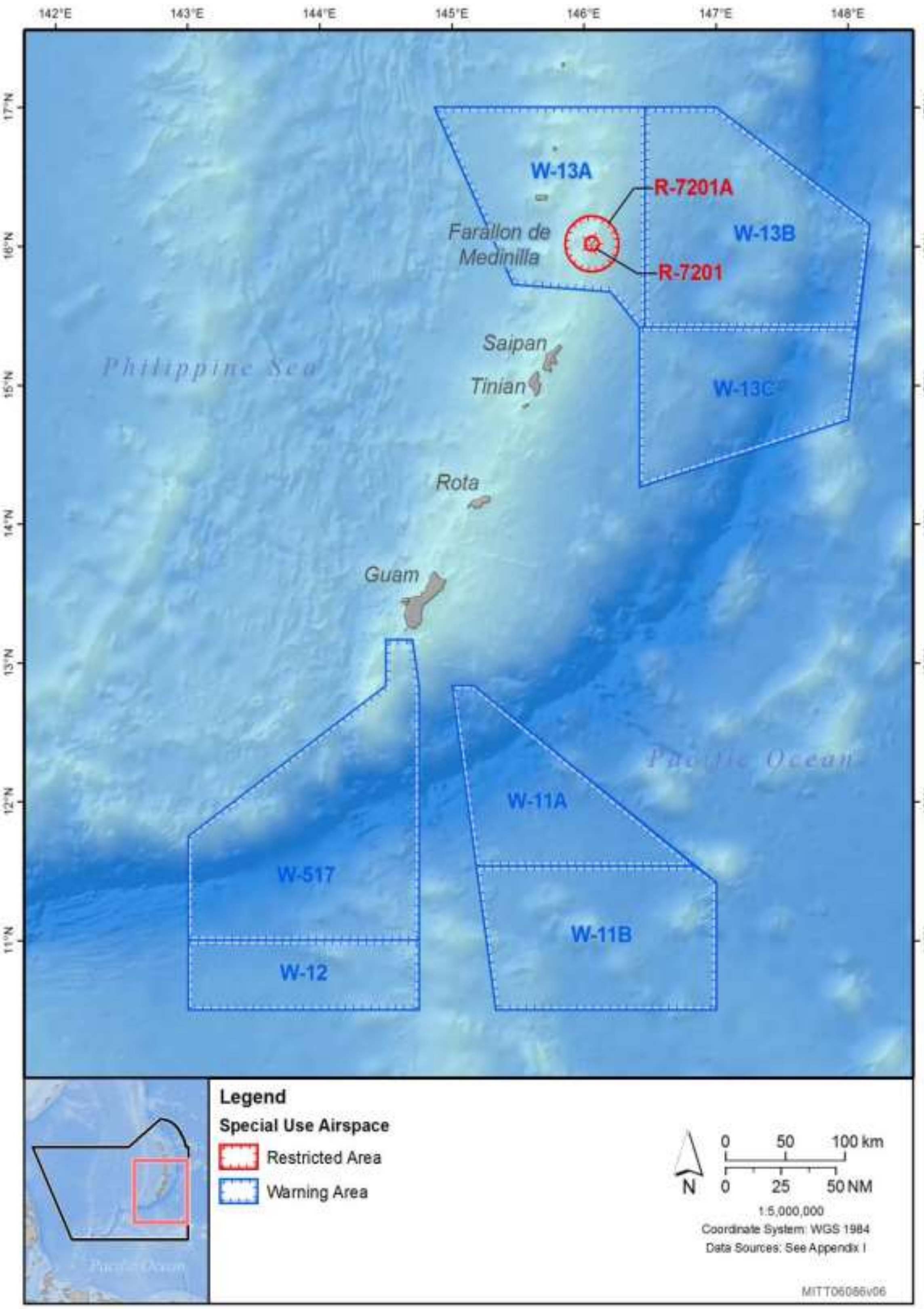


Figure 185. Map showing Warning Areas around the Mariana Archipelago

3.6.5 ADDITIONAL CONSIDERATIONS

3.6.5.1 AMERICAN SAMOA

3.6.5.1.1 Spatial planning Tools

In June 2018, President Trump signed the EO 13840 *Regarding the Ocean Policy to Advance Economic, Security, and Environmental Interests of the United States*, which established a policy focused on public access to marine data and information and requires federal agencies to 1) coordinate activities regarding ocean-related matters and 2) facilitate the coordination and collaboration of ocean-related matters with governments and ocean stakeholders. To that end, the American Samoa Coastal and Marine Spatial Planning Data Portal was created by Marine Cadastre to share information and data for coastal and marine spatial planning in American Samoa.

3.6.5.1.2 Fish Aggregating Devices (FADs)

There are usually five FADs active in the waters around American Samoa in recent years: four around Tutuila and one near Manua. In 2023, however, only two fish aggregating devices (FADs) were active, FADs B and E (Figure 186).

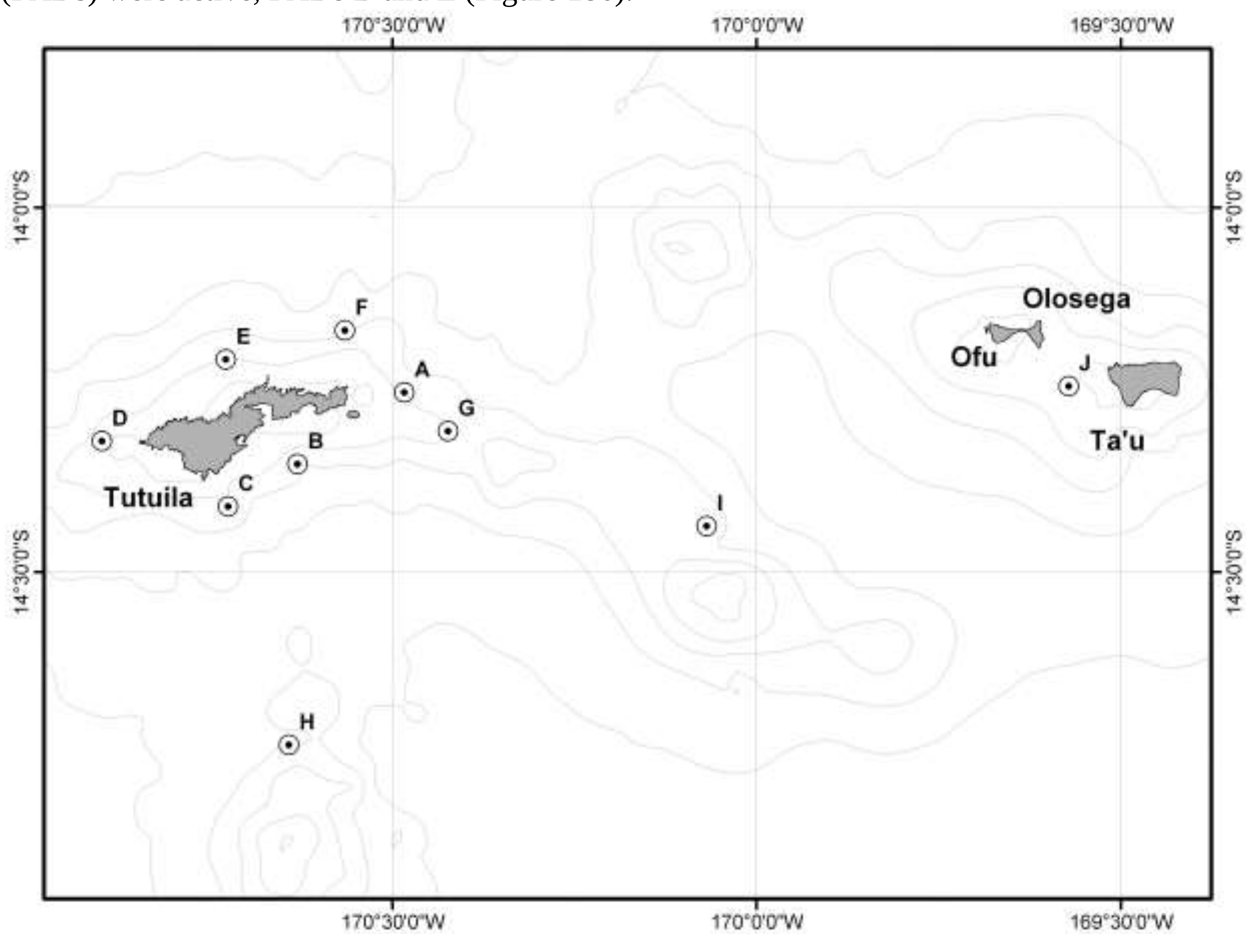


Figure 186. Present or planned locations of FADs in deep water around American Samoa in 2020 (Source: DMWR)

One FAD has been lost in recent years, FAD B; however, there are plans to deploy FADs C, G, and J in the near future. The American Samoa DMWR also resurveyed three potential FAD sites around Tutuila, noting some discrepancies in the depth.

3.6.5.2 CNMI

3.6.5.2.1 Spatial Planning Initiatives

Spatial planning has occurred in CNMI in Saipan Lagoon. CNMI Division of Coastal Resources Management developed the Saipan Lagoon Use Management Plan, which was updated in 2017 and has an associated mapping tool.

3.6.5.2.2 FADs

As of late 2023, there are two FAD systems active within waters of the CNMI:GG and DE. The CNMI DFW is planning on conducting another site assessment in the near future to verify reports from fishers of missing FADs. Additionally, DFW is currently acquiring materials to construct replacement FADs, including ropes, shackles, swivels, and anchors; procurement of solar navigational lights and buoys is ongoing. DFW plans to secure a FAD deployment contract once all the materials have been obtained and the systems have been prepared. Relatedly, DFW participated in a meeting with fishers to discuss the FAD program and consider options to reconfigure site locations around the islands of Saipan, Tinian, and Rota in the future (Tenorio, pers. comm. April 5, 2022). A map of the FADs is provided in Figure 187.

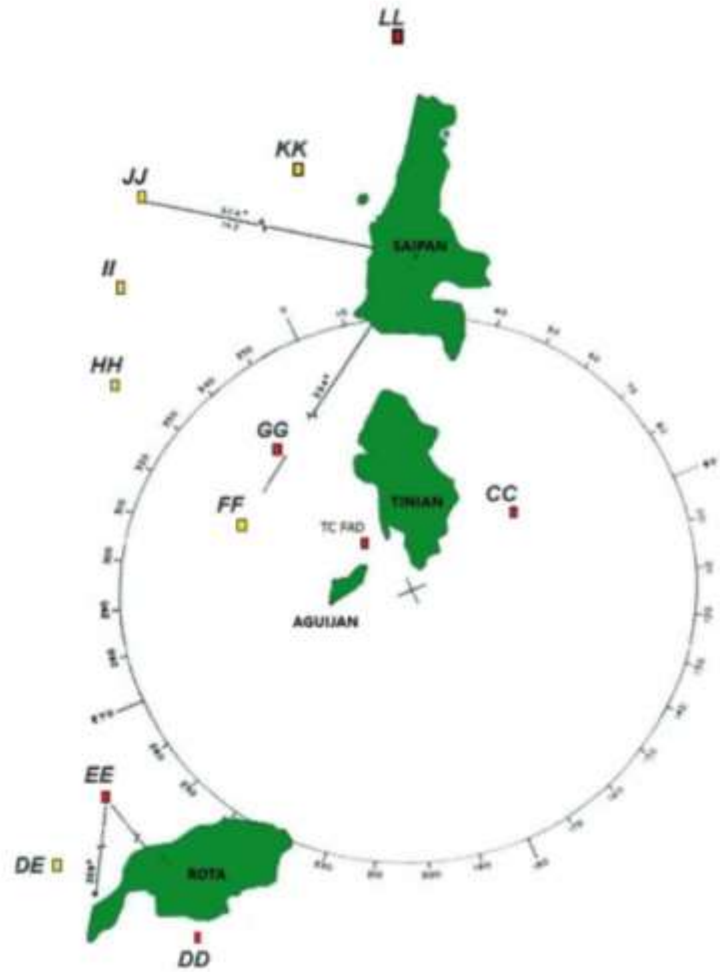


Figure 187. Map of FAD locations around the CNMI. Yellow depicts present FADs, and red depicts missing FADs as of the beginning of April 2022 (Source: DFW)

3.6.5.2.3 Mariana Trench National Marine Sanctuary Nomination – Five-Year Review

On January 21, 2022, the NOAA Office of National Marine Sanctuaries (ONMS) began facilitation of a review of the nomination for the Mariana Trench National Marine Sanctuary (NMS) at the five-year interval by requesting written and oral comments (87 FR 3284). On March 10, 2022, the NOAA OMNS extended the public comment period by an additional 45 days through April 25, 2022 (87 FR13709). ONMS will review information to its 11 evaluation criteria for inclusion in the inventory of nominations, emphasizing any new information about the significance of the area's natural or cultural resources, changes to any threats to these resources, and any updates to the management framework of the area. The original nominating parties for the NMS were Pew Charitable Trusts and Friends of the Marianas Trench, which will also have an opportunity to provide input on relevant information. Following information gathering and internal analysis, NOAA will make a final determination on whether or not the Mariana Trench NMS nomination will remain in the inventory for another five-year period.

The potential development of an NMS for the Mariana Trench is an issue of debate for residents of the Mariana Archipelago. The Marianas Trench Marine National Monument (MTMNM) already exists in the area, and the creation of an NMS would have the potential to further restrict fishing access or limit the potential for fisheries development within the EEZ around the CNMI. Regarding the nomination of the Mariana Trench NMS, concerns have been raised about the potential to expand the NMS beyond the boundaries of the MTMNM, the expansion of fishing restrictions to the water column within the Trench Unit of the MTMNM, and the current lack of community support and public confusion surrounding the nomination letter submitted by Friends of the Marianas Trench (Tenorio, pers. comm., April 4, 2022).

On August 21, 2023, the Friends of the Mariana Trench withdrew their nomination for a Mariana Trench national marine sanctuary and requested NOAA remove the Mariana Trench from the sanctuary inventory. Due to circumstances in their community, they have changed their stance and saw the need for more dialogue and education to protect ocean resources.

3.6.5.3 GUAM

3.6.5.3.1 FADs

In Guam, as of 2023, there were five active FADs: Number 2, Number 3, Ledge, Agat, Facpi 2, and Umatac (Figure 188). DAWR is also in possession of three other FADs to be deployed in the near future in addition to a community-based FAD via the GFCA. These FADs will be deployed once the deployment contract is finalized. DAWR is also planning to experiment with two new FAD designs as well as procure three FADs under the existing design pending a purchase order from the Guam Department of Agriculture.

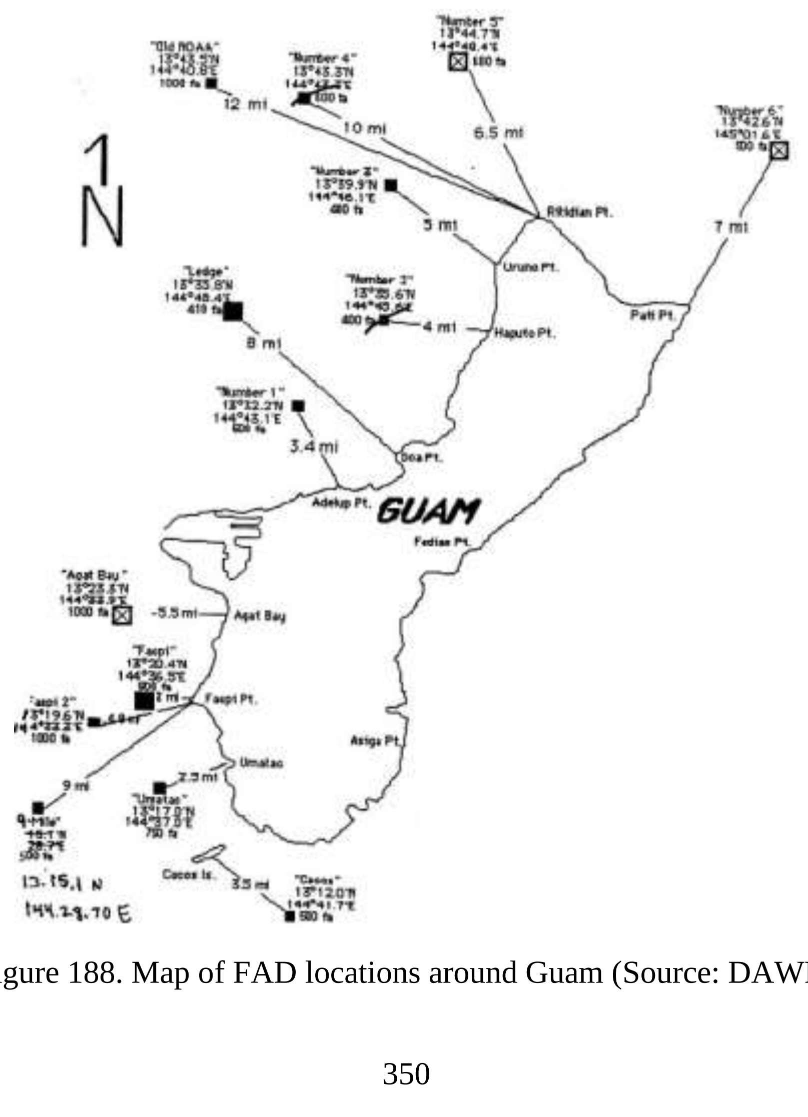


Figure 188. Map of FAD locations around Guam (Source: DAWR)

3.6.5.4 HAWAII

3.6.5.4.1 Spatial Planning Initiatives

The State of Hawaii has several initiatives ongoing, including its 30x30 Initiative and its Ocean Resource Management Plan, which was most recently updated in 2020 (Hawaii Office of Planning 2020). Interested parties are encouraged to provide input to and track the progress of these plans.

3.6.5.4.2 Bottomfish Restricted Fishing Areas (BRFAs)

In 1997, in response to a federal stock assessment indicating that certain species of the MHI bottomfish stock complex were in danger of being overfished, DAR developed a bottomfish management plan, which included the creation of 19 bottomfish restricted fishing areas (BRFAs) where bottomfish fishing was prohibited. These BRFAs were enacted in 1998. The MHI BRFAs are situated in both State and federal waters. Upon review in 2005, it was determined that the BRFA system did not protect an adequate amount of preferred habitat for bottomfish, so a new system was created in 2007 with 12 BRFAs (Figure 189) with the objective of reducing fishing mortality of MHI bottomfish stocks, rebuilding bottomfish populations on habitats within the BRFAs, and improving bottomfish populations in adjacent fishing areas (Drazen et al. 2014). In 2019, four of the 12 BRFAs were opened: BRFA C (Poipu, Kauai), BRFA F (Penguin Banks), BRFA J (Hana, Maui), and BRFA L (Leleiwi, Hawaii Island) (Figure 189).

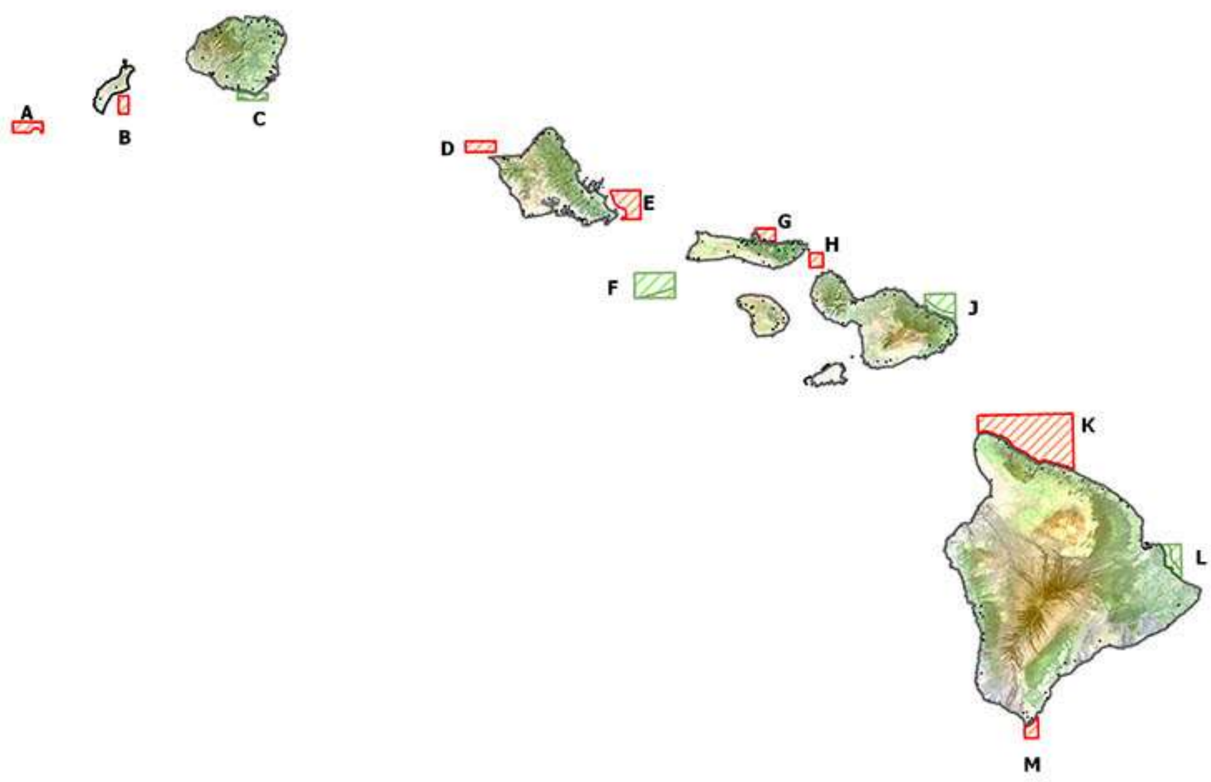


Figure 189. Map of the 12 BRFAs around the MHI; green boxes indicate those areas were opened to bottomfish fishing in 2019 and red boxes indicate areas that remained closed to bottomfish fishing at this time. All BRFAs are now open (from DAR 2021)

On February 25, 2022, the Hawaii Board of Land and Natural Resources (BLNR) approved the reopening of all BRFAs such that registered bottomfish vessels are now allowed to fish for Deep-7 bottomfish in all previously closed BRFAs. During deliberations, representatives from DAR suggested that, because the Deep-7 bottomfish complex is being fished at sustainable levels according to the 2021 stock assessment update (Syslo et al. 2021), DAR is comfortable in taking an adaptive management approach to co-management of the Hawaii bottomfish fishery by opening the BRFAs and relying on other existing conservation and management measures to sustain the fishery.

3.6.5.4.3 NWHI National Marine Sanctuary Nomination

On November 19, 2021, NOAA published a Notice of Intent (NOI) to initiate the sanctuary designation process for the Northwestern Hawaiian Island National Marine Sanctuary. On December 8, 2021, the State of Hawaii published its EIS preparation notice. In November 2022, the Council held public meetings on the islands of Kaua'i, Maui, Hawaii (Hilo and Kona), Moloka'i, and Oahu to solicit input from the community on alternatives for allowing non-commercial fishing and Native Hawaiian practices in the MEA, including a definition for subsistence fishing and options for including customary exchange. In general, participants commented that fishing should be allowed in the NWHI and that the opportunity for Native Hawaiians to fish should be provided. Participants commented that due to the distance and expense that fishing in the MEA would entail, the only persons likely to fish in that area would be rich people with large boards that could afford to go there. There was support to allow for commercial fishing, non-commercial fishing, and Native Hawaiian subsistence fishing. Cost recovery was also support by most participants as a means for providing the ability for fishermen to access the area.

At its March 2023 meeting, the Council finalized its recommended fishing regulations for the Monument Expansion Area from 50-200 miles around the NWHI. The regulations would allow for federal permitting and reporting of non-commercial fishing and Native Hawaiian subsistence fishing practices and prohibit commercial fishing. The Council stressed the importance of allowing limited cost recovery for Native Hawaiian subsistence fishing practices in the MEA in order for the community to participate in regulated fishing practices under Proclamation 9478.

3.6.5.4.4 FADs

The State of Hawaii FAD program is run by the Hawaii Institute of Marine Biology, SOEST, University of Hawaii in cooperation with DAR. FADs attract schools of tuna, mahimahi, ono, billfish, and other pelagic fishes so that fisher can easily locate and catch these species, as it is known that pelagic fish tend to aggregate around floating objects (Hawaii Sea Grant). The FADs utilized around the MHI are typically surface FADs anchored using a catenary mooring method and have an average life expectancy of three to four years (Figure 190; Hawaii Sea Grant). There are currently 54 FADs monitored and maintained throughout the MHI, with 17 around the Big Island (Figure 191), 14 around Maui (Figure 192), 14 around Oahu (Figure 193), and nine around Kauai (Figure 194). Over the course 2023, there were nine FADs reported as missing, six FADs recovered, and 13 deployed. As of March 7, 2024, one of the 17 FADs around the Big Island, five of the 14 FADs around Maui, five of the 14 FADs around Oahu, and four of the nine FADs around Kauai were not active (Figure 191 through Figure 194). Additionally, there were two FADs, one near Maui and the other near the Big Island, that were discontinued.

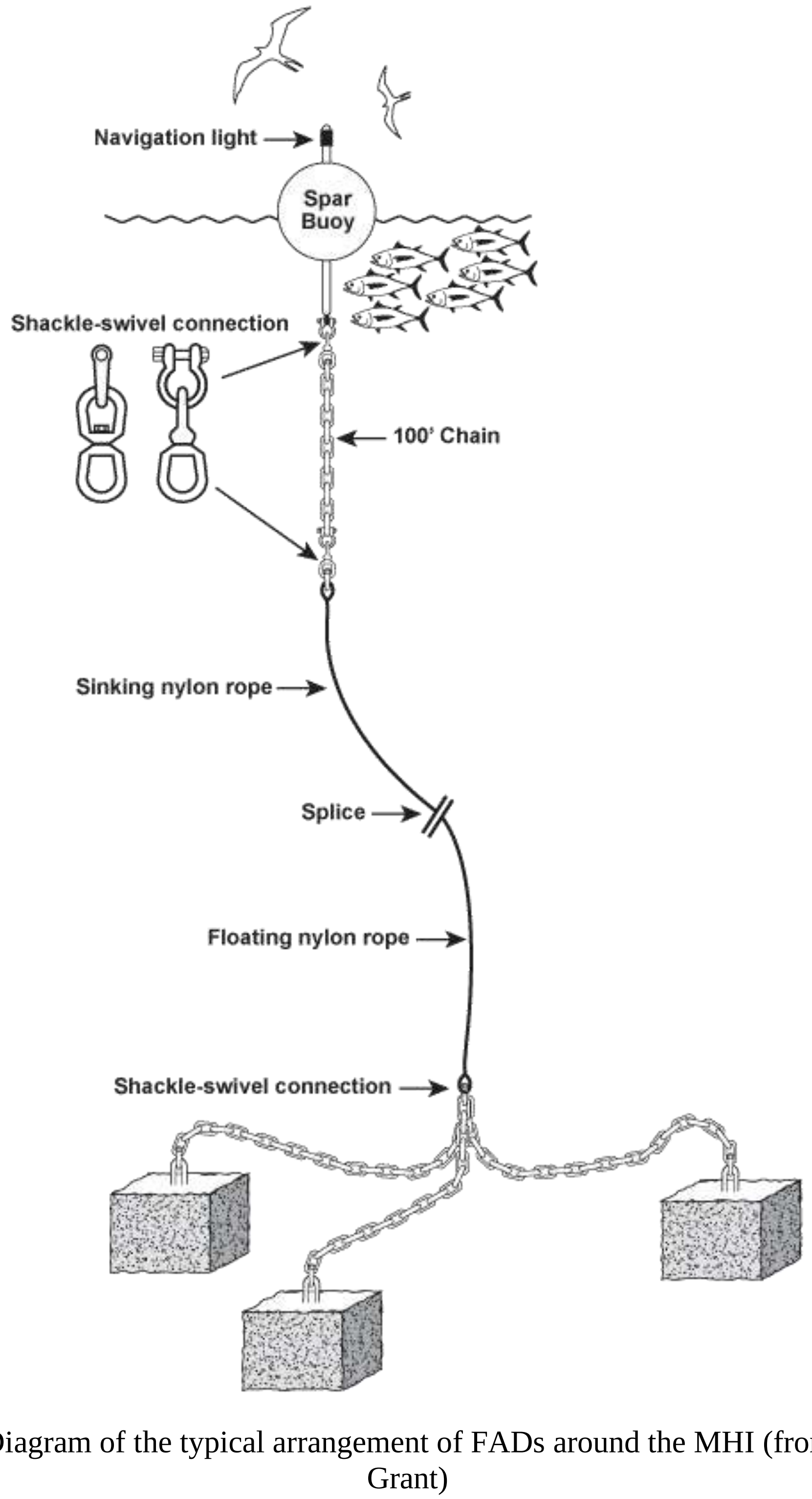


Figure 190. Diagram of the typical arrangement of FADs around the MHI (from Hawaii Sea Grant)

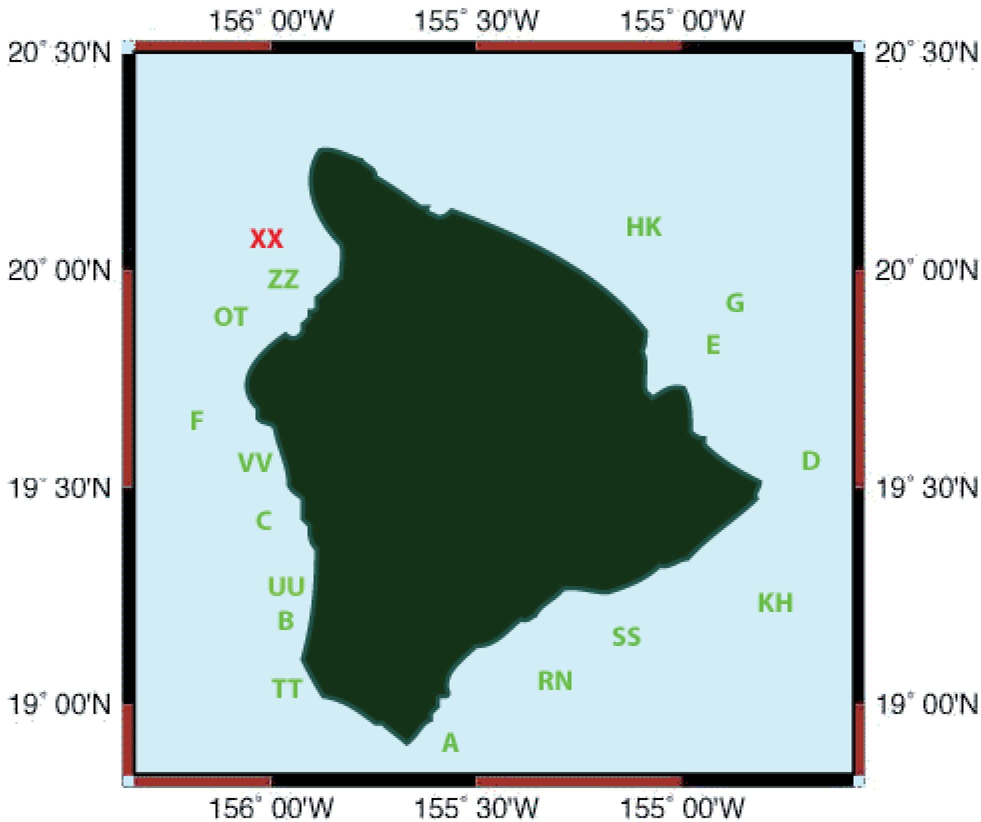


Figure 191. Map of FADs in the waters around the Big Island; red letters indicate a FAD that is known to be missing, and green letters indicate an active FAD (as of May 7, 2024, from Hawaii Sea Grant)

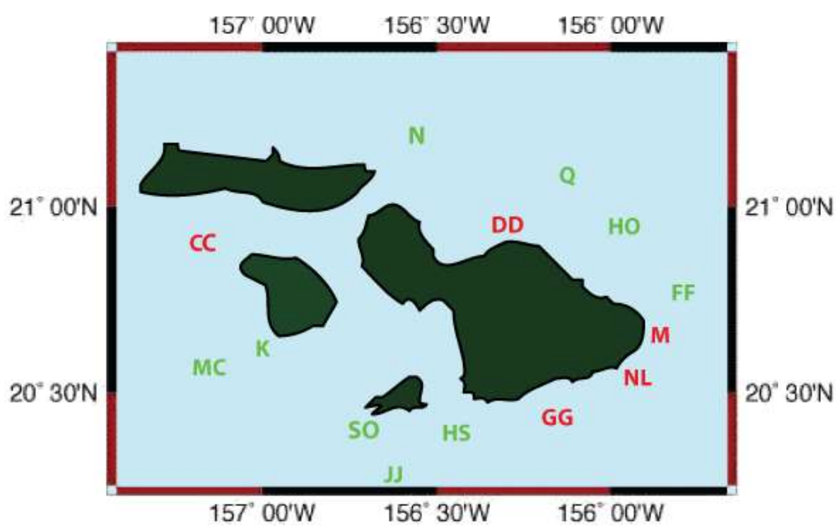


Figure 192. Map of FADs in the waters around Maui; red letters indicate a FAD that is known to be missing, and green letters indicate an active FAD (as of May 7, 2024, from Hawaii Sea Grant)

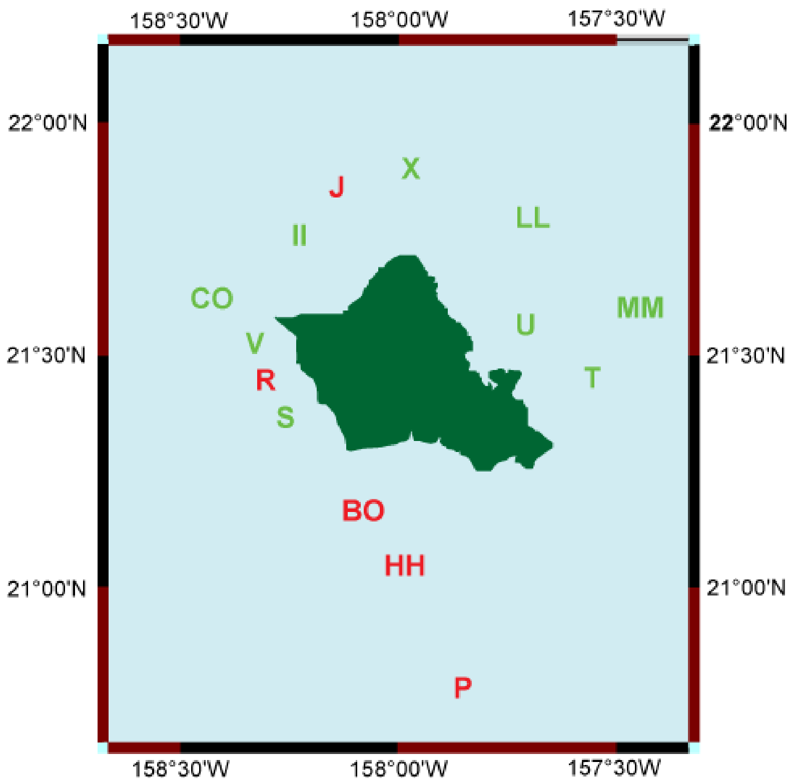


Figure 193. Map of FADs in the waters around Oahu; red letters indicate a FAD that is known to be missing, and green letters indicate an active FAD (as of May 4, 2024, from Hawaii Sea Grant)

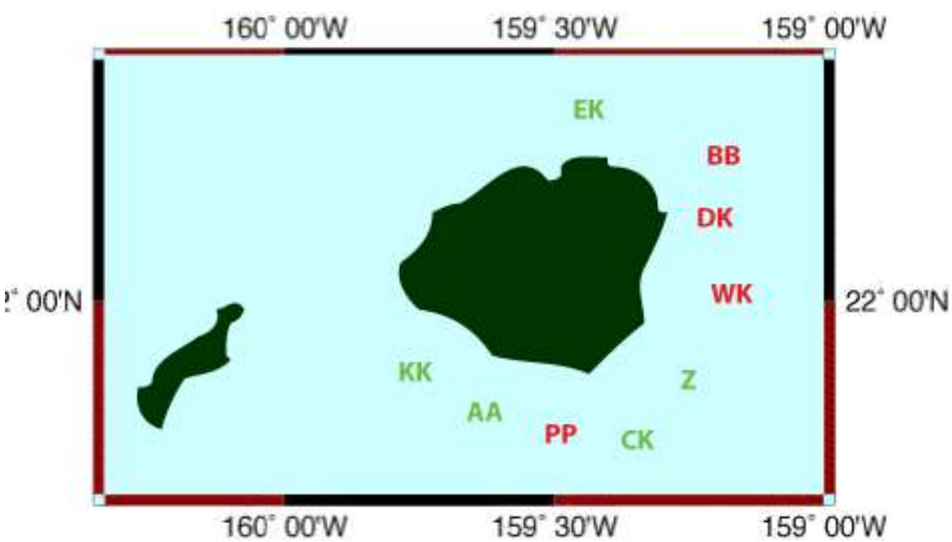


Figure 194. Map of FADs in the waters around Kauai; red letters indicate a FAD that is known to be missing, and green letters indicate an active FAD that has been recently deployed (as of May 4, 2024, from Hawaii Sea Grant)

4 DATA INTEGRATION

This chapter intends to advance ecosystem-based fishery management of Western Pacific pelagic fisheries by examining the fisheries in the context of marine ecosystems. The Council convened a two-day workshop on November 30 to December 1, 2016, to identify content for this chapter. The pelagic fisheries group suggested this chapter focus on three topical issues: 1) bycatch (with a focus on protected species factors that may influence interaction rates; 2) a socioeconomics section examining fishery performance in two areas: attrition in American Samoa longline fleet and the decline of shallow-set longline swordfish fishery; and 3) the projected decrease in oceanic productivity with implications for management issues, including a discussion of factors influencing significant changes in the CPUE of target species. The chapter used to include a section on influences of black-footed albatross interaction rates in the Hawaii longline fishery, but this has since been moved to the Protected Species section of the report and replaced with a summary of the Ecosystem-Based Fisheries Management project for impact assessments of protected species. As of the 2019 report, abstracts from recent publications relevant to data integration for pelagic fisheries are included in this chapter.

In 2019, the Pelagic Fishery Ecosystem Plan Team recommended work items for this chapter, such as directing Council staff and PIRO Sustainable Fisheries Division (SFD) to update the SAFE report data integration section with regularity and to include notable changes or issues pertinent to the FEP as a guide for adaptive management. The Plan Team also noted that Council staff should work with PIRO SFD to review thematic priorities that were previously identified in the Data Integration Workshop going forward. These work items were briefly discussed at the 2020 Pelagic Fishery Ecosystem Plan Team meeting to better determine a path forward, but at the 2021 Plan Team meeting, the efforts were discontinued. This section will continue to be updated by Council staff as resources and information allow.

4.1 ECOSYSTEM-BASED FISHERIES MANAGEMENT PROJECT FOR PORTECTED SPECIES IMPACTS ASSESSMENT FOR HAWAII AND AMERICAN SAMOA LONGLINE FISHERIES

In response to olive ridley turtle interaction trends observed in the Hawaii deep-set longline fishery (see Section 3.3.2.3) the Council's Protected Species Advisory Committee at its March 2017 meeting recommended evaluation of the increasing trend in conjunction with the previously recommended effort to evaluate ecosystem factors influencing bycatch in the longline fishery. Following this recommendation, the Council and NMFS implemented the ecosystem-based fisheries management (EBFM) project for protected species impacts assessment for the Hawaii and American Samoa longline fishery. The project is a collaboration between PIFSC, Council, PIRO and University of Florida.

In the first year of the initiative, the team developed methodologies to associate the spatiotemporal patterns of olive ridley turtle interactions with the Hawaii deep-set fishery primarily targeting bigeye tuna with static and dynamic environmental characteristics. However, the project quickly expanded looking not only across marine turtle species within the fisheries but across taxa as well. The project resulted in the development of a data compilation workflow linking the observer dataset with NOAA and other related oceanographic data products for the Hawaii deep-set observer data set as well as the shallow-set observer data. The resulting data sets were used to develop an Ensemble Random Forest model (Siders et al. 2020) to (i) predict the probability of fishery interactions with protected species including target and non-target catch; (ii) defining critical areas of interaction using quantile contouring over a range of temporal time frames; (iii) assessed the number of sets and interactions within the contours; and (iv) developing covariate response curves using Accumulated Local Effects.

The team summarized the first year's effort into a publication in the Endangered Species Research journal. The primary purposes of this publication were to test the model performance of the developed Ensemble Random Forests model against other existing approaches to handle rare events (e.g., bycatch), to demonstrate its performance on case studies of ESA-listed and protected species, and to Ensemble Random Forests as an intuitive extension of the Random Forest algorithm to handle rare event bias. Through simulation, the team showed Ensemble Random Forests outperforms Random Forest with and without down-sampling as well as the synthetic minority over-sampling technique from highly class imbalanced to balanced datasets. The team found spatial covariance greatly impacts Ensemble Random Forests perceived performance as shown through simulation and case studies. For cases studies from the Hawaii deep-set longline fishery, giant manta ray (*Mobula birostris* syn. *Manta birostris*) and scalloped hammerhead (*Sphyrna lewini*) had high spatial covariance in their presences and high model test performance while false killer whale (*Pseudorca crassidens*) had low spatial covariance and low model test performance. Overall, the team found Ensemble Random Forests have four advantages: 1) reduced successive partitioning effects; 2) prediction uncertainty propagation; 3) better accounting of interacting variables through balancing; and 4) minimization of false positives as the majority of Random Forest within the ensemble vote correctly. Regarding the ESA-listed and protected species case studies, the team found the giant manta ray's highest probability of interaction with the Hawaii deep-set fishery was concentrated around the main Hawaiian islands as well as between 170-160ºW and 10-15ºN, the scalloped hammerhead's probability of interaction was more diffuse but still concentrated around the main Hawaiian islands as well as throughout 170-155ºW and 10-17ºN, and the false killer whale's probability of interaction was the most diffuse but highest northeast of the main Hawaiian islands.

In 2020, the team conducted an evaluation of the experimental oceanographic TurtleWatch product (Siders et al. 2023). The team focused on the 1ºC band originally set by Howell et al. (2008) and five aspects of the TurtleWatch product: (i) does the TurtleWatch 17.5-18.5ºC band hold up with additional satellite telemetry information on loggerhead sea turtle locations; (ii) when are loggerhead sea turtles in the TurtleWatch 17.5-18.5ºC band over the course of a year; (iii) when do the Hawaii shallow-set longline fishery (SSLL) locations and the loggerhead sea turtle locations overlap; (iv) do fisher avoid the band as the hard cap of loggerhead sea turtle fishery interactions is approached. To answer these questions, the team used an expanded set of the satellite telemetry locations of tagged loggerhead sea turtles from the original analysis and PIRO Observer Program fisheries-dependent monitoring SSLL set locations. Using the oceanographic extraction subroutine developed in previous EBFM activities, the team matched sea surface temperature (SST) with the tag and fishery locations.

(i & ii) The team found that the original band holds up well with additional data for locations of fishery interactions in quarter 1 (January–March) and quarter 4 (October–December) (Figure 195). In quarter 1, tagged turtles were in colder water than the TurtleWatch band (SST < 17.5ºC). In quarter 2, tagged turtles were in the TurtleWatch band while quarter 3 they were warmer than the band (SST > 18.5ºC). In quarter 4, the tagged turtles, fishing locations, and interactions all strongly overlapped with the TurtleWatch band (Figure 195).

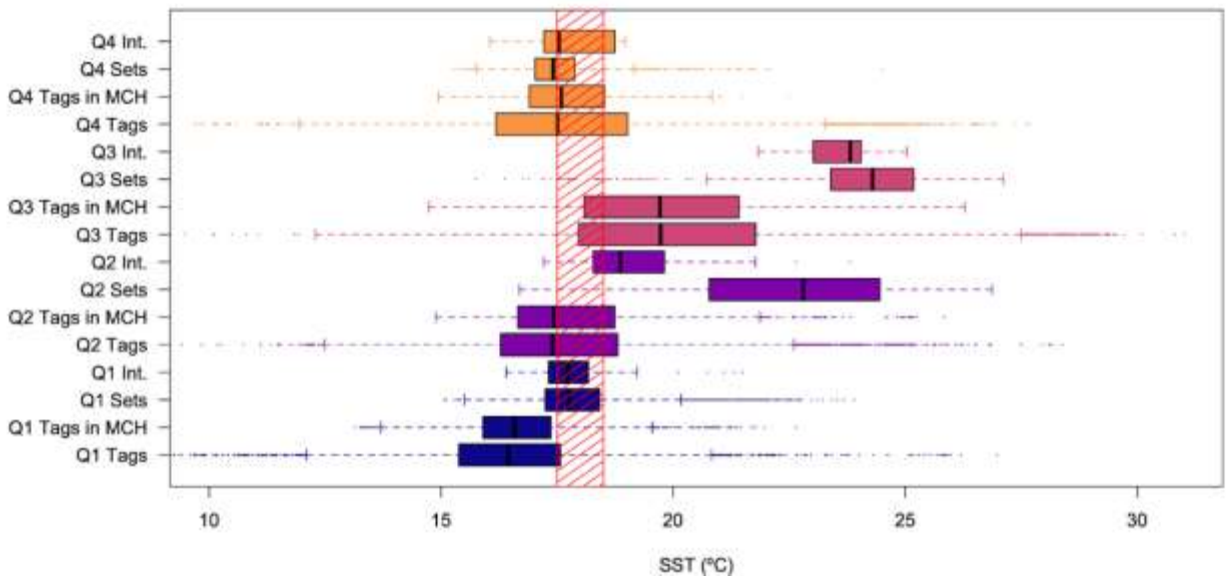


Figure 195. Quarterly sea surface temperature distribution of telemetered sea turtles (Tags), of telemetered sea turtles in the minimum convex hull of the Hawaii shallow-set longline sets (Tags in MCH), the shallow-set fishery sets (Sets), and the interactions between loggerheads and the shallow-set fishery (Interactions) relative to the 1º TurtleWatch band (17.5-18.5ºC), the red hash.

(iii) As the vast majority of these turtles were released in the western Pacific, the number of telemetry locations in the area of the shallow-set fishery peaked at about a third of all locations in a given quarter. For each quarter, we visualized and calculated the overlap between the turtle location for each quarter (Figure 195). The team showed that in the quarters with more loggerhead interactions (quarters 1 and 4), there is little avoidance of the TurtleWatch band and many of the interactions come from within the band. Interestingly, sets in quarter 4 are likely to get more turtles per set than quarter 1. Sets with interactions in quarter 2 come from early in the quarter before the fishery has pushed to warmer SST. Overall, the team found that the overlap between the fishery and the turtles is driven by changing in latitudes over the course of the year (Figure 196). In quarter 1 and quarter 4, both the turtles and the fishery are in the same latitudinal band. In quarter 2, the fishery moves farther south (lower latitudes) while the turtles move farther north over quarter 2 and 3. In quarter 3, the fishery pushes north again and by quarter 4 ends up overlapping with the turtle locations again.

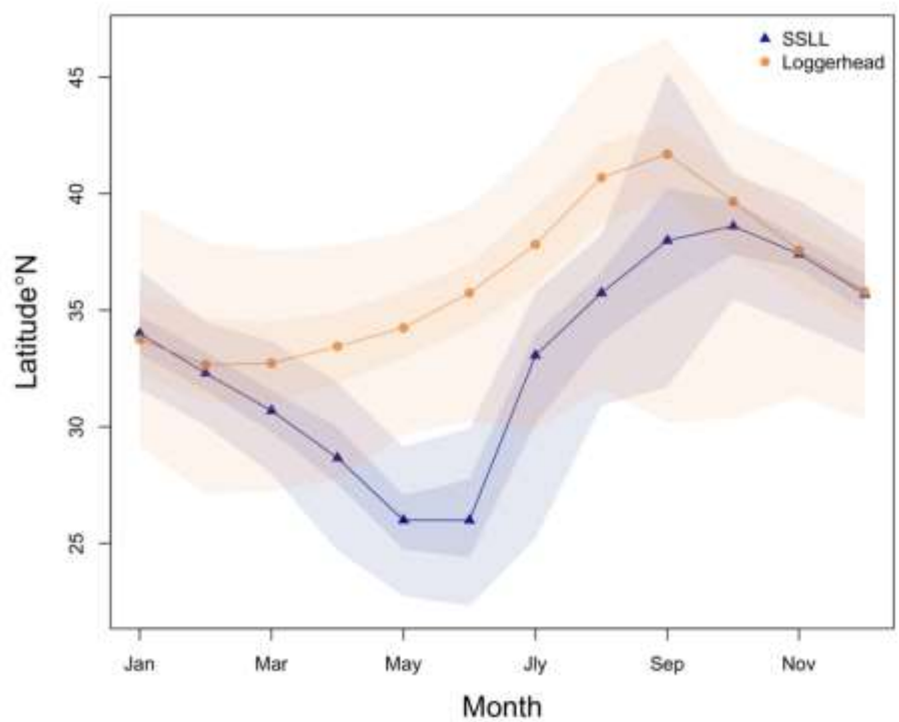


Figure 196. Latitudinal overlap between the Hawaii shallow-set longline fishery (blue triangles) and the loggerhead locations (orange circles). The line is the mean, the darker shading is the 50%, and the lighter shading is the 95%.

(iv) The team evaluated some aspects of fisher behavior garnered from the fishery locations only. The mean distance to the TurtleWatch band was calculated and whether fishers were avoiding the band as the percent of the loggerhead hard cap was filled was assessed. The team saw no indication of avoidance behavior except in 2018, when the hard cap was reached in early quarter 2, rather than in late quarter 1 as in other years, and the majority of the fishery had moved to warmer SSTs than the turtles frequent.

Overall, the team concluded that the TurtleWatch experimental product was still valid for quarters 1 and 4 for the location of shallow-set fishery interactions with loggerhead sea turtles. The location of tagged sea turtles in quarter 1 suggests that if fishers were to set in cooler waters than they do now, more interactions could occur as the overlap with the distribution of loggerhead sea turtles increases. Additionally, quarter 4 had the highest interaction rates but some of the lowest fishing effort. The team noted that if effort were to increase in quarter 4, there is likely to be an increase in loggerhead sea turtle interactions. Quarter 2 and 3 offer the least chance of encountering loggerhead sea turtles. From the historic fishing location information, fishers did not appear to use the TurtleWatch product to avoid loggerhead sea turtle interactions. Further analysis following the 2019 regulatory change from the fishery hard cap to trip interaction limits (see Section 3.3.1.3.2) will offer an opportunity to explore the change in fisher behavior.

In November 2022, the Council, PIFSC and the University of Florida convened a workshop with representatives from the Hawaii Longline Association (HLA), Hawaii SSLL fishery, and PIRO to discuss a case study evaluating the effects of spatial decision making by fishery participants on the protected species interactions and catch of target species.[9] The case study focused on scenarios of SSLL fishers avoiding loggerhead sea turtles in the first or fourth quarter of the year either by using the TurtleWatch product (based on 17.5–18.5ºC sea surface temperature band) or areas identified by the Protected Species Ensemble Random Forests (PSERF) model based on the probability of loggerhead interactions. The workshop provided an overview of the spatial tool developed to do the evaluation, highlighted where industry feedback from an initial session with HLA/SSLL participants was used in the model, and presented the evaluation results.

The spatial tool consisted of four submodels: 1) PSERF models of the probability of interactions with loggerhead and leatherback sea turtles with the SSLL fishery; 2) a spatiotemporal model of fishery effort; 3) a spatiotemporal model of fishery Swordfish catch-per-unit-effort (CPUE); 4) an avoidance area design model using the TurtleWatch product or the PSERF models' outputs. These were then used to predict the fishery effort, CPUE, protected species interaction distribution, and avoidance areas for the months in quarters 1 and 4 in 2019–2021. A fifth submodel redistributed fishing effort out of avoidance areas.

The model results were summarized as the amount of effort that would need to avoid one of the spatial avoidance areas, the percent change in swordfish catch, the change in the number of loggerhead sea turtle interactions, and the change in the number of leatherback sea turtle interactions from avoidance. The tool identified that no matter how the avoidance area was defined, there was a strong chance that avoiding loggerhead interactions by the SSLL fishery would result in increasing the leatherback interactions in at least one of the months in quarters 1 and 4. The TurtleWatch-defined avoidance area resulted in the highest increase in leatherback interactions per loggerhead interaction avoided.

Workshop participants discussed the results of the submodels of the spatial tool and concluded that most of the submodels did a decent job of capturing the environmental covariates important for determining where fishing effort, CPUE, and protected species interactions occurred. As the models did not account for size of swordfish in the catch and other market drivers (secondary species, spatial variation in catch quality, competition), participants discussed at length how market forces influence the decision making of SSLL fishers. As the spatial tool identified a strong inverse tradeoff between avoiding loggerhead interactions and increasing leatherback interactions, participants discussed alternative solutions to avoiding protected species interactions. These encompassed discussions on vessel-to-vessel communication and information sharing amongst the fleet on interaction hotspots, training of new fishery participants on best practices to avoid protected species, and dissemination of avoidance areas or model-generated protected species hotspots to vessels at sea. Further discussions centered on what incentivizes fishers with a focus on how the market and market forces interact with swordfish behavior to constrain fishers' spatial and temporal decision making. The rest of the discussions considered applications of the spatial tool to the Hawaii deep-set longline (DSLL) fishery, the time and information needed to apply the tool, and potential species or spatial scenarios to test.

[9] Report of the Ecosystem Based Fishery Management Workshop: Exploring the effect of spatial decision making by fishers in the Hawaii shallow-set longline fishery. Available online at: https://www.wpcouncil.org/wp-content/uploads/2021/10/09.A1-EBFM-SSLL-Turtle-Model-Workshop-Report.pdf.

4.2 ATTRITION IN LONGLINE FLEETS

4.2.1 AMERICAN SAMOA LONGLINE

A downward trend of economic returns to the American Samoa longline fishery for the period of 2007 to 2013 has been observed in a recent economic study (Pan et al. 2017). This decline continues based on results from ongoing Pacific Islands Fisheries Science Center (PIFSC) Socioeconomics Program economic data collection and performance indicator monitoring programs. Based on data from a 2009 cost-earnings study on the fishery researchers found that the economic performance of the American Samoa longline fleet is highly sensitive to changes in albacore price, fuel prices, and the CPUE of albacore (Pan et al. 2017). The fishery was hit hard in 2013, when all three of these elements trended in the wrong direction, resulting in negative impacts to profit (Pan 2015). In early 2014, the majority of vessels in the American Samoa longline fleet were tied up at the docks in Pago Pago, and according to the *Samoa News*, “For Sale” signs had been posted on close to 20 (of the 22) active vessels[10].

Based on the analyses, the situation in 2013 was clearly associated with poor economic performance resulting from: (a) a continuous decline in albacore CPUE, (b) increasing fuel price, (c) a sharp drop in market prices for albacore, and (d) a baseline of limited profit margins resulting from a long term downward trend of net return since 2007 (Pan 2015). The previous cost-earnings study indicated that the fleet in 2009 operations was barely profitable where the albacore CPUE was at 14.8 fish per 1,000 hooks, the fuel price was at $2.53 (adjusted to 2013 value), and the market price for the albacore species was $1.00/lb. ($2,200 per mt). However, in 2013, the CPUE for albacore fell to 11.9 fish per 1,000 hooks (versus 14.8 in 2009) and the fuel price increased to $3.20 per gallon (versus $2.53 in 2009, adjusted to 2013 value). The albacore price in 2013 was similar to the 2009 level but it was a sharp drop compared to the price of $1.47/lb. in the previous year (2012). Thus, these changes yielded extensive losses across the fleet in 2013.

It is worth noting that the continuing decline of the American Samoa longline fishery during this period was not an isolated event but was a part of a region-wide economic collapse of the South Pacific albacore fishery. According to a report of the SPC Fisheries Newsletter #142 (September to December 2013), domestic fishing fleets targeting primarily albacore in Pacific Island Countries and Territories (PICTs) had reported difficulties in maintaining profitability in recent years, probably facing the challenges in fuel price rise, and albacore CPUE and price decline[11]. Ongoing PIFSC Socioeconomics Program economic monitoring programs will allow researchers to provide timely updates on future changes in economic performance for the American Samoa longline fishery.

4.2.2 HAWAII LONGLINE: SHALLOW-SET FISHERY

Gear configuration for Hawaii longline vessels is rather flexible as operations can easily be adjusted to change target species between swordfish or tuna fishing trips. Tuna fishing (deep-set fishery) has shown steady increases in both effort (hooks) and catch over the past two decades, while swordfish fishing (shallow-set fishery) has experienced a steady downward trend during

[10] http://www.samoanews.com/tri-marine-says-local-longline-fleet-vital-economy

[11] http://www.spc.int/coastfish/publications/bulletins/419-spc-fisheries-newsletter-142.html

the same period (Pan 2014). Since its closure and reopening in the early 2000s, the shallow set fishery has yet to recover even halfway to levels during its historical peak in the early 1990s.

Diminishing economic performance of shallow-set fishing may have contributed to the overall decline of the shallow set fishery, in addition to regulatory measures in controlling sea turtle interactions within the fishery. The Pacific Islands Fisheries Science Center (PIFSC) Socioeconomics Program economic data collection has documented declining net returns to the fishery during the period of 2005-2016, while the average net revenue for tuna trips has generally increased over the same period of time (Pan 2018).

Trends in swordfish and tuna trip costs have been similar over the years; however, swordfish trip revenues have fluctuated widely over the years unlike the relatively steady increase in tuna trip revenue over time (see Chapter 2). As a result, the average net revenue of swordfish trips moved up and down during 2005 to 2014. Prior to 2008, the average net revenue of a tuna trip was less than 50% of the average net revenue of a swordfish trip. In 2014, the level of the average tuna trip net revenue, $32,100, was much closer to the level of the average swordfish trip net revenue, $33,446. Yet, a swordfish trip usually lasts longer than a tuna trip, so the average net returns per day at sea for a swordfish trip are lower than for a tuna trip. Thus, tuna fishing seems to have an increasing comparative advantage over swordfish fishing in terms of trip-level economic returns. Without improved economic performance for swordfish fishing, there may not be much economic incentive to increase fishing effort for swordfish in the future.

Economic performance of longline fishing is the combined effect of many factors, but the key factors that determine the net revenue of Hawaii longline fishing may include: a) prices of target species, b) CPUE of the target species, c) fuel prices, and d) regulatory effects.

4.2.2.1 WEAKENED SWORDFISH MARKET

The weakened swordfish market has been a disincentive for Hawaii fishermen to re-engage in the swordfish fishery in recent years. Unlike bigeye tuna, which is mainly consumed in Hawaii's local market, the majority of the swordfish landed in Hawaii and used to be exported to the U.S. mainland where it competed with imports from other nations and the Atlantic. Concern over mercury contamination could have possibly contributed to decreased demand as well. In early 1990, bigeye and swordfish ex-vessel prices in the Hawaii market were similar at around $4.50 per pound. From 1994 to 2009, swordfish prices declined while bigeye prices have held relatively stable. In recent years, the price differential between these two species has increased. For example, in 2008 the ex-vessel price of bigeye tuna was $4.12 per pound while the ex-vessel price of swordfish was only $2.08 per pound.

4.2.2.2 CPUE DECLINES FOR SWORDFISH TRIPS

Swordfish CPUE was high at the beginning of the time series, being above 15 fish per 1,000 hooks in the years of 2005, 2006, and 2007. It has decreased since 2007, dropping to its lowest in 2010 with only 10 fish per 1,000 hooks. The swordfish CPUE has slightly increased and then remained unchanged in recent years. Bigeye CPUE, on the other hand, shows a different trend; it was quite steady from 2005 to 2012, and has increased continuously in the last four years from 3.8 fish per 1,000 hooks in 2012 to approximately 4.5 fish per 1,000 hooks in 2015.

4.2.2.3 FUEL PRICES

While the two types of fisheries face the same fuel market, trip costs, revenues, and subsequent net revenues can vary across the deep-set and shallow-set fisheries. As previously stated, PIFSC

Socioeconomics Program economic data collection programs have documented declining net returns to the swordfish fishery during the period from 2005 to 2014, while the average net revenue for tuna trips has generally increased over the same period of time (Pan 2018).

4.2.2.4 SUDDEN CLOSURES DURING FISHING SEASON

Due to hitting the sea turtle caps, the fishery experienced closures in 2006 and 2011, respectively. The sudden closures had interrupted the normal fishing trip cycle and might have resulted in economic loss to the fishermen as a fishing trip had to be ended no matter if the catch was fully loaded as planned. In the case of 2006, the closure brought back all the swordfish fishing vessels to port, flooding the swordfish market, which in turn constrained air shipping capacity and limited local consumption.

4.2.3 FACTORS AFFECTING CPUE OF TARGET SPECIES

The work of PIFSC researchers in spatial and temporal changes in Hawaii longline fishery catch and their potential for forecasting future fishery performance are excerpted below from the briefing document provided for the 124th meeting of the Council's Scientific and Statistical Committee (SSC). Authors include Phoebe Woodworth-Jefcoats, Johanna Wren, Jeff Drazen and Jeff Polovina[12]. Additional explanatory text was provided by Phoebe Woodworth-Jefcoats (pers. comm.)

A comprehensive examination of the spatial and temporal trends in the Hawaii-based longline fishery over the past 20 years was conducted using three fisheries-dependent data sets: logbook (1995-2016), observer (2006-2016), and dealer (2000-2016) data. Logbook data completed by fishermen provides catch, effort, and catch location data of landed species for all vessels in the fleet, while observer data provides lengths of every third fish caught, including discards, but only ~20% of vessels have an observer on board. Dealer data provides weight of all fish sold at the Honolulu Fish Auction and can be matched with logbook data for each vessel trip.

[12] Factors behind the recent rise in bigeye CPUE in the Hawaii longline fishery. Documented submitted for Western Pacific Fishery Regional Management Council 124th Scientific and Statistical Committee Meeting, October 4 to October 6, 2016, Honolulu, Hawaii, 4 p.

Figure 197. Left: Map depicting the five regions by which the fishery is examined overlaid on the climatological (1995-2015) median depth of preferred thermal habitat

Note: (8 – 14 °C, shaded) and the depth of the 1 mL/L oxygen threshold (contoured every 100 m from 100 to 500 m, with stippling where the depth is less than 100 m). Right: The difference between the proportion of total annual effort set in each region and quarter from the beginning (1995 – 1997 mean) to the end (2013 – 2015 mean) of the time series is shaded. Total annual effort in each region and quarter is plotted in black. Note: nearly no effort is deployed in the SE region.

The deep-set longline fishery, which targets bigeye tuna, has expanded considerably over the past two decades. Not only has total effort increased from nearly 8.4 million hooks set in 1995 to over 47 million hooks set in 2015, but the spatial footprint of the fishery has expanded as well. At the beginning of the time series, nearly all (97%) of Hawaii's deep-set effort was set in the fishery's core operating area south of 26°N and west of 150°W, whereas in 2015 over 40% of the deep-set effort was set either north or east of these bounds. This expansion is most prominent in the third quarter of the year (Figure 197).

The marked northeastward expansion of the fishery appears to have several drivers. First, it is possible that waters closer to Hawaii were unable to support an increase in effort due to both Hawaii-based and international effort. Waters northeast of Hawaii had little to no international competition. Second, bigeye catch rates within the fishery's core operating area are lowest in the third quarter of the year. However, during this quarter catch rates are still high in waters to the northeast of Hawaii. Finally, preferred bigeye thermal habitat and oxygen levels overlap most completely with deep-set gear in waters to the northeast of Hawaii (Figure 197). This overlap could act to increase bigeye's catchability, and in turn catch rates, in northeastern waters. The fishery expanded spatially in the third quarter in response to low target catch rates. In waters to the northeast of Hawaii the fleet faced little competition and found a particularly efficient fishing ground due to its local oceanography.

One consequence of the fishery's spatiotemporal expansion has been an increase in the amount of lancetfish caught. Lancetfish have no commercial value and all catches are discarded. Lancetfish catch rates are highest north of 26°N and in the third quarter. Thus, the fishery is deploying more effort both in the region where lancetfish are most commonly caught and at the time when catch rates are highest. This has resulted in lancetfish catches exceeding bigeye catches for the past decade (Figure 198).

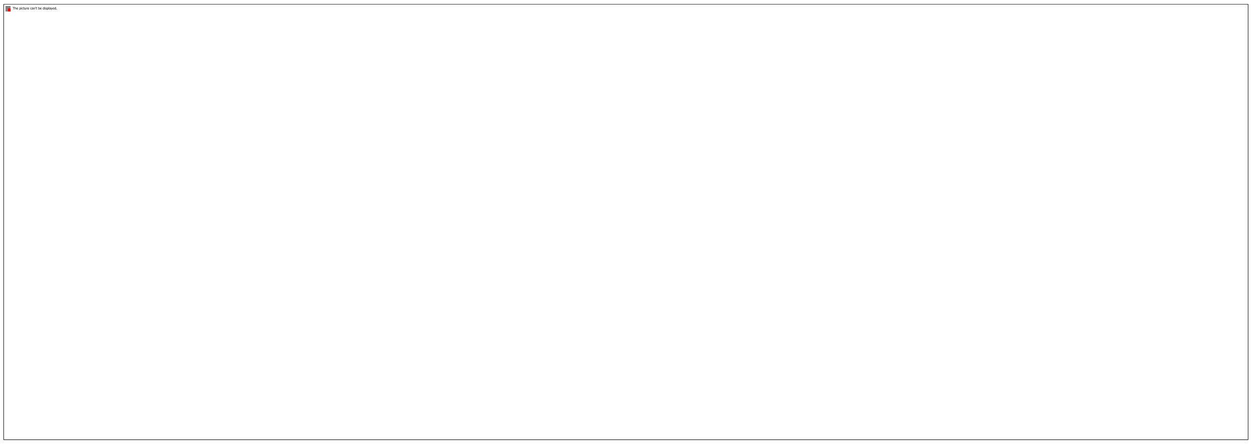


Figure 198. Annual deep-set bigeye tuna (black) and lancetfish (gray) CPUE

Trends in productivity and catch rates in the fishery over the past decades may be caused by spatiotemporal changes in the fishery itself, changes in the stock, or both. In order to better understand these trends A General Additive Models (GAM) was built to analyze time series of mean weight, catch per unit effort (CPUE, in number of fish caught per 1000 hooks) and weight per unit effort (WPUE, in kg caught per 1000 hooks). The GAM a llowed researchers to tease apart trends caused by changes in the stock from those caused by changes in seasonality and geographic location of the fishery. Over the past 16 years, mean weights of commercially important fish in the Hawaii- based longline fishery have declined 10%.

This is in part due to a decline in mean weight by five out of the eleven most commonly caught species, and partly due to a change in species composition of the catch. Smaller fishes, such as pomfrets and walu, are becoming more common while larger fishes, such as opah and striped marlin, make up a lesser proportion of the total catch (Figure 199A). Because more small fish, and more small fish species are caught, the productivity of the fishery (WPUE) declined by 53% since 2000, but the shift in area and seasonality of fishing effort helped maintain productivity in the fishery (Figure 199C).

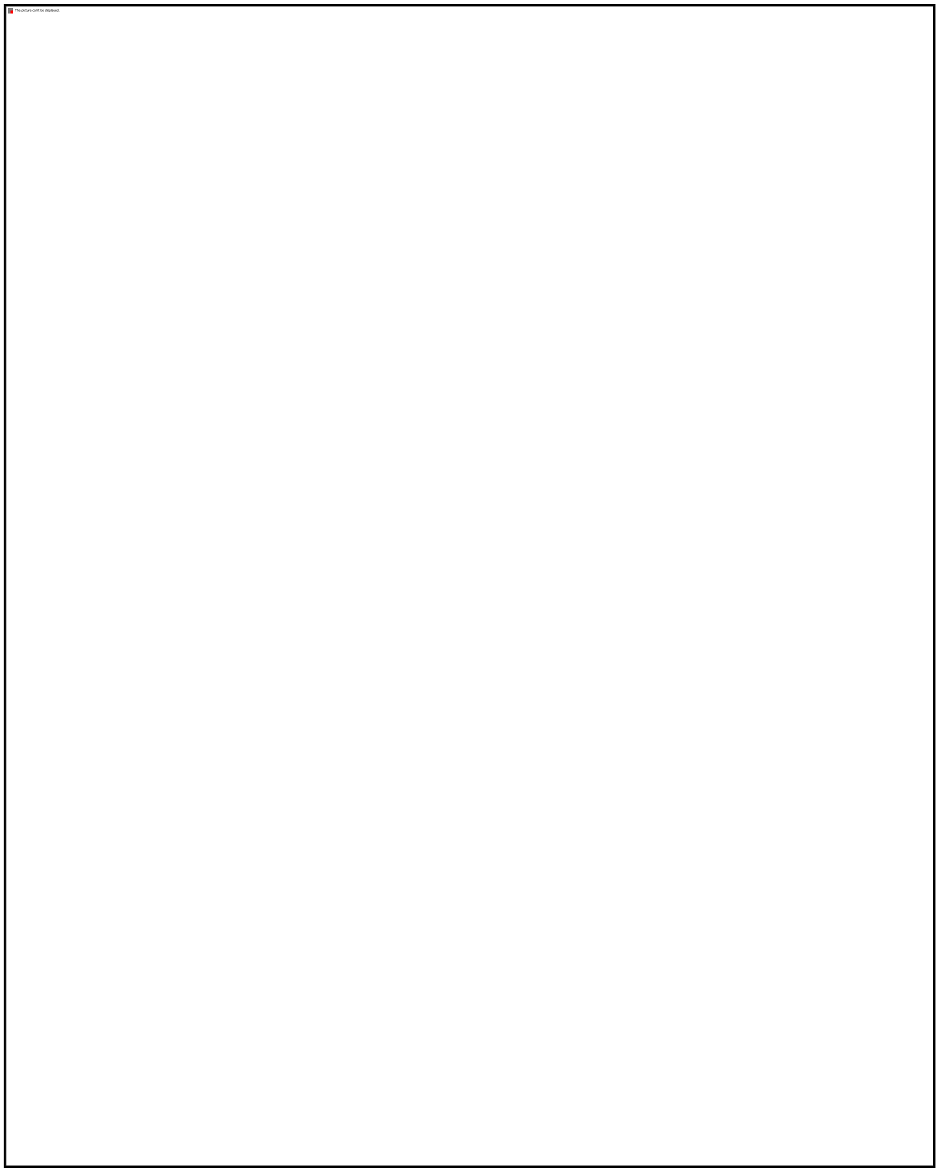


Figure 199. Mean weight (A), catch per unit effort (B), and weight per unit effort (WPUE) for all fish in the Hawaii-based longline fishery from dealer provided data.

Note: The dashed lines show the annual values from the dealer data with a linear trend line, and the solid line shows the GAM predicted annual values with linear trend lines.

CPUE has increased slowly since 2008, but when accounting for the increase in effort and geographic shift of the fishery, CPUE has remained stable. The recent peaks in both CPUE and WPUE are largely due to a strong recruitment pulse of bigeye tuna entering the fishery in the third quarter of 2013. This recruitment pulse in the fishery can be followed through 2016, where it provides an increase in first CPUE then WPUE. A recruitment index could be generated for bigeye tuna that provides a forecast of fishery performance. A peak in small bigeye tuna (<=15kg) is an indication that there will be an increase in CPUE and WPUE in the following two years (Figure 200).

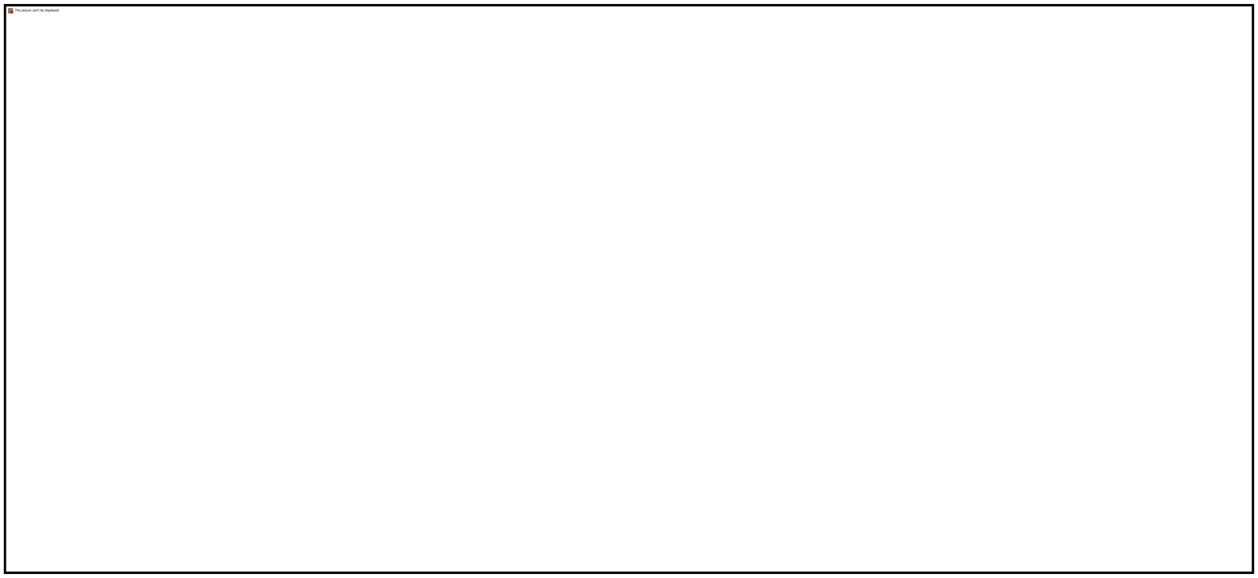


Figure 200. Temporally- and spatially-adjusted annual catch per 1000 hooks

Note: (CPUE; dashed line), and biomass per 1000 hooks (WPUE) for all bigeye tuna and bigeye tuna 15 kg or less (solid line) from the GAM from 2000-2016.

Additional reading on the influence of environmental impacts on tuna populations can be found in Lehodey et al. (2010) and Lehodey et al. (2013).

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APPENDIX A: SUPPORTING DATA TABLES FOR FIGURES IN CHAPTER 2 AND SECTION 3.1

Table **Page**

TABLES FOR SECTION 2.1: AMERICAN SAMOA

Table A-1. Summary of creel survey boat-based sampling effort

Year	Sample Days	Trolling Interviews	Troll Trips Sampled	Expanded # of Trips	Percent of Trolling Trips Surveyed
2014	237	97	111	124	89.5
2015	220	51	53	103	51.5
2016	196	44	44	77	57.1
2017	199	41	43	132	32.6
2018	207	59	59	162	36.4
2019	211	49	49	116	42.2
2020	228	43	43	79	54.4
2021	201	26	26	86	30.2
2022	167	15	15	49	30.6
2023	182	8	8	19	42.1

Table A-2. Supporting Data for Figure 2

Year	Boats Landing Pelagics (All Methods)	Boats Landing Pelagics (Longline)	Boats Landing Pelagics (Troll)
2014	52	23	22
2015	40	21	10
2016	38	20	12
2017	27	15	8
2018	25	14	7
2019	29	18	5
2020	22	11	8
2021	19	12	5
2022	20	11	9
2023	23	10	9
Average	**30**	**16**	**10**
Standard Deviation	**11**	**5**	**5**

Table A-3. Supporting Data for Figure 3

Year	Troll Trips	Longline Sets
2014	145	2,748
2015	162	2,786
2016	118	2,451
2017	159	2,488
2018	191	2,213
2019	137	1,882
2020	128	1,322
2021	101	1,552
2022	49	1,336
2023	277	1,224
Average	**147**	**2,000**
Standard Deviation	**60**	**613**

Table A-4. Supporting Data for Figure 4

Year	Total Pounds Landed - Tuna	Total Pounds Landed - Non-Tuna PMUS
2014	4,908,415	251,065
2015	5,401,420	231,205
2016	4,601,298	217,186
2017	4,851,383	269,547
2018	4,279,765	184,972
2019	2,965,845	134,906
2020	1,888,154	126,627
2021	2,505,322	133,021
2022	3,002,994	173,670
2023	2,559,672	131,268
Average	**3,696,427**	**185,347**
Standard Deviation	**1,241,160**	**54,075**

Table A-5. Supporting Data for Figure 5

Year	Commercial Landings (lb) - Tuna	Commercial Landings (lb) - Non-Tuna PMUS
2014	4,895,560	139,857
2015	5,380,023	116,355
2016	4,593,671	96,634
2017	4,842,676	104,657
2018	4,273,435	63,636
2019	2,962,737	38,776
2020	1,884,828	37,445
2021	2,502,327	33,518
2022	3,001,093	23,964
2023	2,556,126	23,132
Average	**3,689,248**	**67,797**
Standard Deviation	**1,236,196**	**42,964**

Table A-6. Supporting Data for Figure 6

Year	Estimated Yellowfin Longline Landings (lb)	Estimated Yellowfin Trolling Landings (lb)
2014	1,067,483	7,687
2015	1,003,907	4,189
2016	848,926	8,482
2017	1,233,124	14,367
2018	575,768	8,242
2019	417,204	2,476
2020	489,615	3,385
2021	470,671	4,097
2022	340,719	19
2023	460,134	145
Average	**690,755**	**5,309**
Standard Deviation	**318,299**	**4,416**

Table A-7. Supporting Data for Figure 7

Year	Estimated Skipjack Longline Landings (lb)	Estimated Skipjack Trolling Landings (lb)
2014	286,397	15,448
2015	250,832	7,610
2016	210,451	8,661
2017	155,788	6,842
2018	168,457	7,317
2019	151,376	10,189
2020	140,518	6,194
2021	116,410	12,853
2022	99,624	3,661
2023	100,759	3,394
Average	**168,061**	**8,217**
Standard Deviation	**62,999**	**3,787**

Table A-8. Supporting Data for Figure 8

Year	Estimated Wahoo Longline Landings (lb)	Estimated Wahoo Trolling Landings (lb)
2014	122,384	1,241
2015	121,750	567
2016	101,693	1,742
2017	110,322	981
2018	67,510	676
2019	40,225	447
2020	39,525	93
2021	35,291	271
2022	25,506	0
2023	25,414	143
Average	**68,962**	**616**
Standard Deviation	**40,873**	**560**

Table A-9. Supporting Data for Figure 9

Year	Estimated Mahimahi Longline Landings (lb)	Estimated Mahimahi Trolling Landings (lb)
2014	23,037	2,344
2015	11,822	430
2016	8,969	1,008
2017	30,883	1,678
2018	10,007	792
2019	4,163	557
2020	10,494	949
2021	1,819	521
2022	12,824	569
2023	3,023	56
Average	**11,704**	**890**
Standard Deviation	**9,063**	**668**

Table A-10. Supporting Data for Figure 10

Year	Blue Marlin Longline Landings (lb)	Blue Marlin Trolling Landings (lb)
2014	55,941	731
2015	55,836	1,561
2016	66,073	395
2017	87,684	847
2018	70,536	1,009
2019	64,672	657
2020	62,800	0
2021	76,001	0
2022	117,517	0
2023	86,555	0
Average	**74,362**	**520**
Standard Deviation	**18,811**	**536**

Table A-11. Supporting Data for Figure 11

Year	Sailfish Longline Landings (lb)	Sailfish Trolling Landings (lb)
2014	3,616	25
2015	5,106	57
2016	5,106	0
2017	3,262	0
2018	1,702	0
2019	4,184	143
2020	1,276	270
2021	1,915	0
2022	1,702	48
2023	3,049	290
Average	**3,092**	**83**
Standard Deviation	**1,420**	**113**

Table A-12. Supporting Data for Figure 13

Year	Longline Hooks Set
2014	7,667
2015	7,806
2016	6,909
2017	7,009
2018	6,010
2019	5,104
2020	3,646
2021	4,474
2022	3,997
2023	3,793
Average	**5,642**
Standard Deviation	**1,638**

Table A-13. Supporting Data for Figure 14

Year	Bigeye Tuna Longline Landings (lb)
2014	210,869
2015	183,849
2016	155,842
2017	139,424
2018	117,516
2019	68,311
2020	51,277
2021	66,147
2022	47,916
2023	81,664
Average	**112,282**
Standard Deviation	**58,087**

Table A-14. Supporting Data for Figure 15

Year	Albacore Longline Landings (lb)
2014	3,313,856
2015	3,937,366
2016	3,367,685
2017	3,296,463
2018	3,400,628
2019	2,315,569
2020	1,196,477
2021	1,834,637
2022	2,511,041
2023	1,913,266
Average	**2,708,699**
Standard Deviation	**882,639**

Table A-15. Supporting Data for Figure 16

Year	Swordfish Longline Landings (lb)
2014	17,736
2015	14,615
2016	12,194
2017	13,438
2018	13,561
2019	8,210
2020	5,529
2021	6,127
2022	7,062
2023	6,965
Average	**10,544**
Standard Deviation	**4,263**

Table A-16. Supporting Data for Figure 17

Year	Releases - Tunas	Releases - Non-Tuna PMUS	Releases - Other Pelagics	Releases - Sharks
2014	846	6,762	342	5,067
2015	1,722	8,025	156	6,043
2016	996	5,116	33	5,131
2017	767	3,170	49	4,282
2018	910	2,120	5	4,642
2019	962	1,893	16	3,234
2020	727	1,541	27	2,077
2021	577	1,544	4	2,718
2022	608	1,148	1	1,511
2023	2,567	2,338	83	2,112
Average	**1,068**	**3,366**	**72**	**3,682**
Standard Deviation	**617**	**2,420**	**106**	**1,555**

Table A-17. Supporting Data for Figure 18

Year	Alia Catch (Individuals) per 1,000 Hooks	Monohull Catch (Individuals) per 1,000 Hooks
2014	n.d.	10.6
2015	3.8	12.7
2016	n.d.	11.9
2017	n.d.	11.6
2018	n.d.	13.5
2019	8.1	11.3
2020	n.d.	8.5
2021	n.d.	9.3
2022	n.d.	14.6
2023	n.d.	12.6
Average	**1.2**	**11.7**
Standard Deviation	**2.7**	**1.9**

Table A-18. Supporting Data for Figure 19

Year	Troll Catch (lb) Per Hour	Effective Troll Hours
2014	32	930
2015	18	980
2016	45	553
2017	16	1,918
2018	19	1,104
2019	25	653
2020	22	574
2021	33	561
2022	22	201
2023	4	1,209
Average	**24**	**868**
Standard Deviation	**11**	**479**

Table A-19. Supporting Data for Figure 20

Year	Troll Catch Rate (lb/hr) - Skipjack	Troll Catch Rate (lb/hr) - Yellowfin
2014	17.97	8.72
2015	8.08	5.79
2016	17.90	17.58
2017	4.00	8.12
2018	6.75	8.11
2019	16.87	4.49
2020	12.46	6.65
2021	25.39	6.10
2022	18.14	0.09
2023	0.49	1.55
Average	**12.81**	**6.72**
Standard Deviation	**7.78**	**4.75**

Table A-20. Supporting Data for Figure 21

Year	Troll Catch Rate (lb/hr) – Blue Marlin	Troll Catch Rate (lb/hr) - Mahimahi	Troll Catch Rate (lb/hr) - Wahoo
2014	0.51	2.87	1.06
2015	2.52	0.47	0.39
2016	1.10	1.94	4.31
2017	0.53	0.91	0.28
2018	1.08	0.71	0.72
2019	1.19	0.94	0.51
2020		1.43	0.05
2021		0.16	0.56
2022		2.83	
2023		0.66	0.23
Average	**0.69**	**1.29**	**0.81**
Standard Deviation	**0.81**	**0.96**	**1.27**

TABLES FOR SECTION 2.2: COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS

Table A-21. Boat-based Survey Statistics (raw data), CNMI

Year	Survey Days	Trips in Boat Log	Charter Trips	Non-Charter Trips	Total Interviews	Charter Interviews	Non-Charter Interviews
2014	71	155	2	153	144	4	140
2015	57	110	1	109	102	1	101
2016	65	115	4	111	100	4	96
2017	66	121	7	114	109	3	106
2018	54	124	3	121	108	4	104
2019	33	65	1	64	58	4	54
2020	58	112	1	111	119	5	114
2021	71	138	0	138	129	0	129
2022	52	109	0	109	84	0	84
2023	43	80	0	80	63	0	63

Table A-22. Supporting Data for Figure 22

Year	Number of Fishers Landing Pelagic Species from Commercial Receipt Invoices
2014	21
2015	12
2016	74
2017	48
2018	56
2019	51
2020	76
2021	85
2022	95
2023	77
Average	**60**
Standard Deviation	**27**

Table A-23. Supporting Data for Figure 23

Year	Number of Trips Catching Pelagic Fish from Commercial Receipt Invoices
2014	1,229
2015	582
2016	1,205
2017	1,540
2018	2,204
2019	2,457
2020	1,332
2021	2,138
2022	1,780
2023	1,087
Average	**1,555**
Standard Deviation	**584**

Table A-24. Supporting Data for Figure 24

Year	Estimated Total Troll Trips	Estimated Troll Trips - Non-Charter	Estimated Troll Trips - Charter
2014	3,595	3,568	27
2015	2,654	2,654	
2016	3,563	3,556	7
2017	2,599	2,599	
2018	4,203	4,185	18
2019	3,202	3,161	41
2020	4,193	4,193	
2021	3,072	3,072	
2022	2,974	2,974	
2023	2,369	2,369	
Average	**3,242**	**3,233**	**9**
Standard Deviation	**639**	**635**	**15**

Table A-25. Supporting Data for Figure 25

Year	Estimated Troll Hours - Total	Estimated Troll Hours - Non-Charter	Estimated Troll Hours -Charter
2014	19,598	19,522	77
2015	14,084	14,084	
2016	19,158	19,125	33
2017	14,498	14,498	
2018	21,562	21,477	84
2019	16,841	16,667	175
2020	20,631	20,631	
2021	17,460	17,460	
2022	14,429	14,429	
2023	12,323	12,323	
Average	**17,058**	**17,022**	**37**
Standard Deviation	**3,142**	**3,121**	**59**

Table A-26. Supporting Data for Figure 26

Year	Estimated Troll Hours per Trip	Estimated Troll Hours per Trip - Non-Charter	Estimated Troll Hours per Trip - Charter
2014	5.5	5.5	2.9
2015	5.3	5.3	
2016	5.4	5.4	4.7
2017	5.6	5.6	
2018	5.1	5.1	4.7
2019	5.3	5.3	4.3
2020	4.9	4.9	
2021	5.7	5.7	
2022	4.9	4.9	
2023	5.2	5.2	
Average	**5.3**	**5.3**	**1.7**
Standard Deviation	**0.3**	**0.3**	**2.2**

Table A-27. Supporting Data for Figure 27

Year	Estimated Total Landings (lb) - All Pelagics	Estimated Total Landings (lb) - Tuna PMUS	Estimated Total Landings (lb) - Non-Tuna PMUS
2014	398,939	262,061	132,820
2015	397,551	303,201	93,167
2016	308,531	214,112	84,480
2017	340,871	280,241	57,876
2018	465,009	389,288	74,354
2019	466,269	381,645	78,218
2020	305,252	262,905	34,604
2021	388,492	336,427	39,606
2022	237,140	148,620	82,394
2023	126,493	98,329	25,302
Average	**343,455**	**267,683**	**70,282**
Standard Deviation	**104,856**	**94,105**	**32,065**

Table A-28. Supporting Data for Figure 28

Year	Estimated Total Landings (lb) - All Pelagics	Estimated Total Landings (lb) - Non-Charter	Estimated Total Landings (lb) - Charter
2014	398,939	398,418	521
2015	397,551	397,551	
2016	308,531	307,950	581
2017	340,871	340,871	
2018	465,009	463,410	1,598
2019	466,269	463,144	3,125
2020	305,252	305,252	
2021	388,492	388,492	
2022	237,140	237,140	
2023	126,493	126,493	
Average	**343,455**	**342,872**	**583**
Standard Deviation	**104,856**	**104,237**	**1,029**

Table A-29. Supporting Data for Figure 29

Year	Estimated Landings (lb) - Tuna PMUS	Estimated Landings (lb) - Non-Charter	Estimated Landings (lb) - Charter
2014	262,061	262,061	
2015	303,201	303,201	
2016	214,112	213,531	581
2017	280,241	280,241	
2018	389,288	388,105	1,182
2019	381,645	378,904	2,741
2020	262,905	262,905	
2021	336,427	336,427	
2022	148,620	148,620	
2023	98,329	98,329	
Average	**267,683**	**267,232**	**450**
Standard Deviation	**94,105**	**93,606**	**896**

Table A-30. Supporting Data for Figure 30

Year	Estimated Landings (lb) - Non-Tuna PMUS	Estimated Landings (lb) - Non-Charter	Estimated Landings (lb) - Charter
2014	132,820	132,308	512
2015	93,167	93,167	
2016	84,480	84,480	
2017	57,876	57,876	
2018	74,354	73,962	392
2019	78,218	78,218	
2020	34,604	34,604	
2021	39,606	39,606	
2022	82,394	82,394	
2023	25,302	25,302	
Average	**70,282**	**70,192**	**90**
Standard Deviation	**32,065**	**31,949**	**193**

Table A-31. Supporting Data for Figure 31

Year	Estimated Total Landings (lb) - Skipjack	Estimated Total Landings (lb) - Non-Charter	Estimated Total Landings (lb) - Charter
2014	233,474	233,474	
2015	287,173	287,173	
2016	193,697	193,116	581
2017	235,065	235,065	
2018	374,373	373,190	1,182
2019	345,172	342,431	2,741
2020	238,094	238,094	
2021	307,492	307,492	
2022	131,833	131,833	
2023	76,217	76,217	
Average	**242,259**	**241,809**	**450**
Standard Deviation	**92,247**	**91,756**	**896**

Table A-32. Supporting Data for Figure 32

Year	Estimated Total Landings (lb) - Yellowfin	Estimated Total Landings (lb) - Non-Charter	Estimated Total Landings (lb) - Charter
2014	23,149	23,149	
2015	15,760	15,760	
2016	18,535	18,535	
2017	16,968	16,968	
2018	11,787	11,787	
2019	36,473	36,473	
2020	24,756	24,756	
2021	26,144	26,144	
2022	14,186	14,186	
2023	19,368	19,368	
Average	**20,713**	**20,713**	**-**
Standard Deviation	**7,208**	**7,208**	**-**

Table A-33. Supporting Data for Figure 33

Year	Estimated Total Landings (lb) - Mahimahi	Estimated Total Landings (lb) - Non-Charter	Estimated Total Landings (lb) - Charter
2014	116,586	116,132	454
2015	88,799	88,799	
2016	80,072	80,072	
2017	45,099	45,099	
2018	65,266	65,070	196
2019	71,791	71,791	
2020	31,629	31,629	
2021	30,264	30,264	
2022	57,973	57,973	
2023	11,427	11,427	
Average	**59,891**	**59,826**	**65**
Standard Deviation	**31,403**	**31,309**	**150**

Table A-34. Supporting Data for Figure 34

Year	Estimated Total Landings (lb) - Wahoo	Estimated Total Landings (lb) - Non-Charter	Estimated Total Landings (lb) - Charter
2014	10,673	10,615	58
2015	4,264	4,264	
2016	4,351	4,351	
2017	9,811	9,811	
2018	6,400	6,204	196
2019	2,448	2,448	
2020	2,975	2,975	
2021	5,343	5,343	
2022	20,805	20,805	
2023	13,875	13,875	
Average	**8,095**	**8,069**	**25**
Standard Deviation	**5,791**	**5,795**	**63**

Table A-35. Supporting Data for Figure 35

Year	Estimated Total Landings (lb) - Blue Marlin	Estimated Total Landings (lb) - Non-Charter	Estimated Total Landings (lb) - Charter
2014	5,561	5,561	
2015			
2016			
2017	2,966	2,966	
2018	2,688	2,688	
2019	3,855	3,855	
2020			
2021	3,020	3,020	
2022			
2023			
Average	**1,809**	**1,809**	**-**
Standard Deviation	**2,060**	**2,060**	**-**

Table A-36. Supporting Data for Figure 36

Year	Estimated Total Landings (lb) - All Pelagics	Estimated Total Landings (lb) - Tuna PMUS	Estimated Total Landings (lb) - Non-Tuna PMUS
2014	235,104	178,712	48,467
2015	188,300	154,658	30,893
2016	223,004	199,620	17,387
2017	224,531	201,111	18,392
2018	221,714	193,130	18,294
2019	177,957	140,716	22,044
2020	153,606	134,259	14,841
2021	307,079	263,884	35,755
2022	234,086	185,992	42,802
2023	118,947	98,610	15,222
Average	**208,433**	**175,069**	**26,410**
Standard Deviation	**51,743**	**45,626**	**12,258**

Table A-37. Supporting Data for Figure 37

Year	Commercial Purchase Landings (lb) - Skipjack	Commercial Purchase Landings (lb) - Yellowfin
2014	161,798	15,102
2015	139,873	14,636
2016	178,815	18,725
2017	164,196	36,500
2018	171,856	16,345
2019	128,027	12,283
2020	119,710	14,534
2021	238,376	25,033
2022	172,059	11,217
2023	83,413	15,069
Average	**155,812**	**17,944**
Standard Deviation	**41,559**	**7,557**

Table A-38. Supporting Data for Figure 38

Year	Commercial Purchase Landings (lb) - Mahimahi	Commercial Purchase Landings (lb) - Wahoo	Commercial Purchase Landings (lb) - Blue Marlin
2014	38,095	7,262	2,547
2015	30,465	428	
2016	12,582	1,603	2,198
2017	14,715	2,894	440
2018	16,839	943	374
2019	20,724	336	604
2020	12,627	1,114	94
2021	26,526	2,869	4,071
2022	33,096	7,356	1,638
2023	10,922	2,998	774
Average	**21,659**	**2,780**	**1,274**
Standard Deviation	**9,740**	**2,585**	**1,319**

Table A-39. Supporting Data for Figure 39

Year	Troll Overall Average Catch Rate (lb/hr)	Troll Catch Rate (lb/hr) - Non-Charter	Troll Catch Rate (lb/hr) - Charter
2014	20.4	20.5	6.8
2015	28.0	28.0	
2016	16.1	16.1	17.6
2017	23.5	23.5	
2018	21.5	21.5	19.0
2019	27.9	28.0	17.9
2020	14.6	14.6	
2021	22.0	22.0	
2022	15.9	15.9	
2023	10.3	10.3	
Average	**20.0**	**20.0**	**6.1**
Standard Deviation	**5.8**	**5.8**	**8.6**

Table A-40. Supporting Data for Figure 40

Year	Troll Overall Average Catch Rate (lb/hr) - Skipjack	Troll Catch Rate (lb/hr) - Non-Charter	Troll Catch Rate (lb/hr) - Charter
2014	11.9	12.0	
2015	20.4	20.4	
2016	10.1	10.1	17.6
2017	16.2	16.2	
2018	17.3	17.3	14.1
2019	20.5	20.5	15.7
2020	11.5	11.5	
2021	17.6	17.6	
2022	9.1	9.1	
2023	6.2	6.2	
Average	**14.1**	**14.1**	**4.7**
Standard Deviation	**5.0**	**5.0**	**7.7**

Table A-41. Supporting Data for Figure 41

Year	Troll Overall Average Catch Rate (lb/hr) - Yellowfin	Troll Catch Rate (lb/hr) - Non-Charter	Troll Catch Rate (lb/hr) - Charter
2014	1.2	1.2	
2015	1.1	1.1	
2016	0.9	0.9	
2017	1.2	1.2	
2018	0.5	0.5	
2019	2.2	2.2	
2020	1.2	1.2	
2021	1.5	1.5	
2022	1.0	1.0	
2023	1.5	1.5	
Average	**1.2**	**1.2**	**-**
Standard Deviation	**0.4**	**0.4**	**-**

Table A-42. Supporting Data for Figure 42

Year	Troll Overall Average Catch Rate (lb/hr) - Mahimahi	Troll Catch Rate (lb/hr) - Non-Charter	Troll Catch Rate (lb/hr) - Charter
2014	5.9	5.9	5.9
2015	6.2	6.2	
2016	4.2	4.2	
2017	3.0	3.0	
2018	3.0	3.0	2.3
2019	4.2	4.3	
2020	1.5	1.5	
2021	1.7	1.7	
2022	3.9	3.9	
2023	0.9	0.9	
Average	**3.5**	**3.5**	**0.8**
Standard Deviation	**1.8**	**1.8**	**1.9**

Table A-43. Supporting Data for Figure 43

Year	Troll Overall Average Catch Rate (lb/hr) - Wahoo	Troll Catch Rate (lb/hr) - Non-Charter	Troll Catch Rate (lb/hr) - Charter
2014	0.5	0.5	0.8
2015	0.3	0.3	
2016	0.2	0.2	
2017	0.7	0.7	
2018	0.3	0.3	2.3
2019	0.1	0.1	
2020	0.1	0.1	
2021	0.3	0.3	
2022	1.2	1.2	
2023	1.1	1.1	
Average	**0.5**	**0.5**	**0.3**
Standard Deviation	**0.4**	**0.4**	**0.7**

Table A-44. Supporting Data for Figure 44

Year	Troll Overall Average Catch Rate (lb/hr) – Blue Marlin	Troll Catch Rate (lb/hr) - Non-Charter	Troll Catch Rate (lb/hr) - Charter
2014	0.3	0.3	
2015			
2016			
2017	0.2	0.2	
2018	0.1	0.1	
2019	0.2	0.2	
2020			
2021	0.2	0.2	
2022			
2023			
Average	**0.1**	**0.1**	**-**
Standard Deviation	**0.1**	**0.1**	**-**

Table A-45. Supporting Data for Figure 45

Year	Troll Catch Rate (lb/trip) - Mahimahi	Troll Catch Rate (lb/trip) - Wahoo	Troll Catch Rate (lb/trip) - Blue Marlin
2014	31.0	5.9	2.1
2015	52.4	0.7	
2016	10.4	1.3	1.8
2017	9.6	1.9	0.3
2018	7.6	0.4	0.2
2019	8.4	0.1	0.3
2020	9.5	0.8	0.1
2021	12.4	1.3	1.9
2022	18.6	4.1	0.9
2023	10.1	2.8	0.7
Average	**17.0**	**2.0**	**0.8**
Standard Deviation	**14.3**	**1.8**	**0.8**

Table A-46. Supporting Data for Figure 46

Year	Troll Catch Rate (lb/trip) - Skipjack	Troll Catch Rate (lb/trip) - Yellowfin	Troll Catch Rate (lb/trip) - Skipjack (Creel)
2014	132	12	74
2015	240	25	114
2016	148	16	52
2017	107	24	94
2018	78	7	89
2019	52	5	109
2020	90	11	54
2021	112	12	96
2022	97	6	47
2023	77	14	30
Average	**113**	**13**	**76**
Standard Deviation	**53**	**7**	**29**

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
2014	90	964	511
2015	97	904	540
2016	93	1,147	728
2017	92	1,018	643
2018	89	979	652
2019	93	930	620
2020	96	981	243
2021	96	1,101	676
2022	97	949	571
2023	96	837	457

Table A-48. Supporting Data for Figure 47

Year	Estimated Troll Boats	Upper 95 Percent	Lower 95 Percent
2014	447	537.0	395.0
2015	372	460.0	326.0
2016	428	505.0	386.0
2017	408	473.0	366.0
2018	398	495.0	349.0
2019	465	624.0	392.0
2020	459	685.0	382.0
2021	546	635.0	493.0
2022	449	513.0	410.0
2023	466	553.0	416.0
Average	**444**	**548**	**392**
Standard Deviation	**48**	**76**	**45**

Table A-49. Supporting Data for Figure 48

Year	Estimated Total Landings (lb) - All Pelagic	Estimated Total Landings (lb) - Tuna PMUS	Estimated Total Landings (lb) - Non-Tuna PMUS
2014	764,151	437,871	307,092
2015	959,906	709,521	228,207
2016	883,583	591,599	273,533
2017	600,826	469,153	117,938
2018	891,748	663,817	214,168
2019	759,653	537,064	211,095
2020	624,905	409,536	197,751
2021	858,509	758,782	88,542
2022	631,673	457,869	163,527
2023	718,342	589,551	115,442
Average	**769,330**	**562,476**	**191,730**
Standard Deviation	**126,154**	**120,750**	**70,674**

Table A-50. Supporting Data for Figure 49

Year	Estimated Total Landings (lb) - Pelagic	Estimated Total Landings (lb) - Non-Charter	Estimated Total Landings (lb) - Charter
2014	764,151	707,659	56,491
2015	959,906	898,827	61,081
2016	883,583	843,726	39,858
2017	600,826	577,287	23,539
2018	891,748	840,306	51,444
2019	759,653	721,615	38,034
2020	624,905	621,250	3,656
2021	858,509	837,545	20,963
2022	631,673	614,273	17,399
2023	718,342	704,579	13,765
Average	**769,330**	**736,707**	**32,623**
Standard Deviation	**126,154**	**112,781**	**19,608**

Table A-51. Supporting Data for Figure 50

Year	Estimated Landings (lb) - Tuna PMUS	Estimated Landings (lb) - Non-Charter	Estimated Landings (lb) - Charter
2014	437,871	427,658	10,213
2015	709,521	703,930	5,591
2016	591,599	582,607	8,992
2017	469,153	462,585	6,568
2018	663,817	655,356	8,461
2019	537,064	526,439	10,625
2020	409,536	408,794	742
2021	758,782	751,703	7,079
2022	457,869	453,231	4,637
2023	589,551	584,632	4,920
Average	**562,476**	**555,694**	**6,783**
Standard Deviation	**120,750**	**120,132**	**2,988**

Table A-52. Supporting Data for Figure 51

Year	Estimated Total Landings (lb) - Skipjack	Estimated Total Landings (lb) - Non-Charter	Estimated Total Landings (lb) - Charter
2014	403,139	393,270	9,868
2015	598,507	593,703	4,804
2016	458,312	452,579	5,733
2017	408,491	403,074	5,417
2018	610,751	603,412	7,339
2019	473,405	464,156	9,249
2020	351,371	350,930	441
2021	665,562	660,212	5,350
2022	423,646	419,150	4,496
2023	491,671	487,837	3,834
Average	**488,486**	**482,832**	**5,653**
Standard Deviation	**103,411**	**102,968**	**2,713**

Table A-53. Supporting Data for Figure 52

Year	Estimated Total Landings (lb) - Yellowfin	Estimated Total Landings (lb) - Non-Charter	Estimated Total Landings (lb) - Charter
2014	34,492	34,148	345
2015	110,459	109,672	787
2016	133,210	130,028	3,182
2017	60,541	59,390	1,151
2018	52,555	51,433	1,122
2019	63,621	62,245	1,376
2020	58,153	57,864	289
2021	93,130	91,401	1,729
2022	33,830	33,688	141
2023	97,424	96,339	1,086
Average	**73,742**	**72,621**	**1,121**
Standard Deviation	**33,206**	**32,539**	**885**

Table A-54. Supporting Data for Figure 53

Year	Estimated Total Landings Non-Tuna (lb) - PMUS	Estimated Total Landings (lb) - Non-Charter	Estimated Total Landings (lb) - Charter
2014	307,092	260,949	46,142
2015	228,207	173,272	54,936
2016	273,533	243,237	30,296
2017	117,938	101,582	16,356
2018	214,168	171,742	42,427
2019	211,095	183,877	27,215
2020	197,751	194,851	2,901
2021	88,542	74,929	13,612
2022	163,527	151,871	11,655
2023	115,442	106,764	8,679
Average	**191,730**	**166,307**	**25,422**
Standard Deviation	**70,674**	**59,972**	**17,686**

Table A-55. Supporting Data for Figure 54

Year	Estimated Total Landings (lb) - Mahimahi	Estimated Total Landings (lb) - Non-Charter	Estimated Total Landings (lb) - Charter
2014	189,444	158,333	31,110
2015	158,536	121,621	36,915
2016	191,940	175,089	16,851
2017	39,505	33,950	5,555
2018	88,817	77,314	11,503
2019	136,665	119,970	16,694
2020	97,021	94,924	2,098
2021	31,231	29,112	2,118
2022	95,115	87,275	7,840
2023	52,698	51,621	1,078
Average	**108,097**	**94,921**	**13,176**
Standard Deviation	**59,022**	**49,531**	**12,435**

Table A-56. Supporting Data for Figure 55

Year	Estimated Total Landings (lb) - Wahoo	Estimated Total Landings (lb) - Non-Charter	Estimated Total Landings (lb) - Charter
2014	88,394	80,074	8,320
2015	31,457	23,955	7,502
2016	34,240	28,860	5,380
2017	46,985	43,437	3,548
2018	96,035	81,248	14,787
2019	23,707	21,669	2,037
2020	45,982	45,179	803
2021	22,567	19,144	3,423
2022	57,466	55,897	1,569
2023	45,682	42,059	3,623
Average	**49,252**	**44,152**	**5,099**
Standard Deviation	**25,218**	**22,566**	**4,187**

Table A-57. Supporting Data for Figure 56

Year	Estimated Total Landings (lb) - Blue Marlin	Estimated Total Landings (lb) - Non-Charter	Estimated Total Landings (lb) - Charter
2014	29,241	22,529	6,712
2015	37,509	26,992	10,518
2016	44,954	36,889	8,065
2017	31,253	24,000	7,253
2018	24,516	12,754	11,763
2019	49,973	41,512	8,460
2020	51,192	51,192	
2021	30,968	22,897	8,071
2022	8,713	6,831	1,882
2023	14,199	11,007	3,192
Average	32,252	25,660	6,592
Standard Deviation	14,194	14,091	3,766

Table A-58. Supporting Data for Figure 57

Year	Estimated Commercial Landings (lb) - All Pelagic	Estimated Commercial Landings (lb) - Tuna PMUS	Estimated Commercial Landings (lb) - Non-Tuna PMUS
2014	121,632	48,148	68,668
2015	109,403	63,685	42,794
2016	100,551	37,560	58,031
2017	118,457	56,455	55,434
2018	97,019	54,112	38,655
2019	141,756	52,020	82,100
2020	74,756	23,355	46,382
2021	51,033	25,997	22,905
2022	n.d.	n.d.	n.d.
2023	n.d.	n.d.	n.d.
Average	**101,826**	**45,167**	**51,871**
Standard Deviation	**28,431**	**14,674**	**18,411**

Table A-59. Supporting Data for Figure 58

Year	Estimated Troll Trips	Estimated Troll Trips - Non-Charter	Estimated Troll Trips - Charter
2014	9,803	8,495	1,308
2015	9,223	8,000	1,223
2016	11,680	10,344	1,336
2017	10,302	9,083	1,219
2018	10,760	9,323	1,437
2019	9,249	8,016	1,233
2020	9,634	9,405	230
2021	10,719	10,106	614
2022	9,895	9,107	788
2023	8,347	7,804	543
Average	**9,961**	**8,968**	**993**
Standard Deviation	**947**	**879**	**414**

Table A-60. Supporting Data for Figure 59

Year	Estimated Troll Hours - Total	Estimated Troll Hours - Non-Charter	Estimated Troll Hours -Charter
2014	48,889	44,501	4,388
2015	62,568	55,600	6,968
2016	64,671	60,141	4,530
2017	53,390	49,092	4,298
2018	54,617	50,289	4,328
2019	47,101	43,135	3,966
2020	49,347	48,506	841
2021	56,373	54,125	2,248
2022	48,259	45,423	2,836
2023	38,270	36,755	1,515
Average	**52,349**	**48,757**	**3,592**
Standard Deviation	**7,761**	**6,771**	**1,775**

Table A-61. Supporting Data for Figure 60

Year	Estimated Troll Hours per Trip – Overall Average	Estimated Troll Hours per Trip - Non-Charter	Estimated Troll Hours per Trip - Charter
2014	5.0	5.2	3.4
2015	6.8	7.0	5.7
2016	5.5	5.8	3.4
2017	5.2	5.4	3.5
2018	5.1	5.4	3.0
2019	5.1	5.4	3.2
2020	5.1	5.2	3.7
2021	5.3	5.4	3.7
2022	4.9	5.0	3.6
2023	4.6	4.7	2.8
Average	**5.3**	**5.5**	**3.6**
Standard Deviation	**0.6**	**0.6**	**0.8**

Table A-62. Supporting Data for Figure 61

Year	Troll Catch Rate (lb/hr) - Overall Average	Troll Catch Rate (lb/hr) - Non-Charter	Troll Catch Rate (lb/hr) - Charter
2014	15.7	16.0	12.8
2015	15.4	16.2	8.8
2016	13.6	14.0	8.8
2017	11.2	11.7	5.5
2018	16.3	16.6	11.9
2019	16.0	16.6	9.6
2020	12.6	12.7	4.3
2021	15.1	15.3	9.0
2022	13.0	13.4	6.1
2023	18.6	19.0	9.1
Average	**14.8**	**15.2**	**8.6**
Standard Deviation	**2.2**	**2.2**	**2.7**

Table A-63. Supporting Data for Figure 62

Year	Troll Catch Rate (lb/hr) - Skipjack	Troll Catch Rate (lb/hr) - Non-Charter	Troll Catch Rate (lb/hr) - Charter
2014	8.2	8.8	2.2
2015	9.6	10.7	0.7
2016	7.1	7.5	1.3
2017	7.7	8.2	1.3
2018	11.2	12.0	1.7
2019	10.1	10.8	2.3
2020	7.1	7.2	0.5
2021	11.8	12.2	2.4
2022	8.8	9.2	1.6
2023	12.8	13.3	2.5
Average	**9.4**	**10.0**	**1.7**
Standard Deviation	**2.0**	**2.1**	**0.7**

Table A-64. Supporting Data for Figure 63

Year	Troll Catch Rate (lb/hr) - Yellowfin Tuna	Troll Catch Rate (lb/hr) - Non-Charter	Troll Catch Rate (lb/hr) - Charter
2014	0.7	0.8	0.1
2015	1.8	2.0	0.1
2016	2.1	2.2	0.7
2017	1.1	1.2	0.3
2018	1.0	1.0	0.3
2019	1.4	1.4	0.3
2020	1.2	1.2	0.3
2021	1.7	1.7	0.8
2022	0.7	0.7	
2023	2.5	2.6	0.7
Average	**1.4**	**1.5**	**0.4**
Standard Deviation	**0.6**	**0.6**	**0.3**

Table A-65. Supporting Data for Figure 64

Year	Troll Catch Rate (lb/hr) - Mahimahi	Troll Catch Rate (lb/hr) - Non-Charter	Troll Catch Rate (lb/hr) - Charter
2014	3.9	3.6	7.0
2015	2.5	2.2	5.3
2016	3.0	2.9	3.7
2017	0.7	0.7	1.3
2018	1.6	1.5	2.7
2019	2.9	2.8	4.2
2020	2.0	2.0	2.5
2021	0.6	0.5	0.9
2022	2.0	1.9	2.8
2023	1.4	1.4	0.7
Average	**2.1**	**2.0**	**3.1**
Standard Deviation	**1.0**	**1.0**	**2.0**

Table A-66. Supporting Data for Figure 65

Year	Troll Catch Rate (lb/hr) - Wahoo	Troll Catch Rate (lb/hr) - Non-Charter	Troll Catch Rate (lb/hr) - Charter
2014	1.8	1.8	1.9
2015	0.5	0.4	1.1
2016	0.5	0.5	1.2
2017	0.9	0.9	0.8
2018	1.7	1.6	3.4
2019	0.5	0.5	0.5
2020	0.9	0.9	0.9
2021	0.4	0.3	1.2
2022	1.2	1.2	0.6
2023	1.2	1.1	2.4
Average	**1.0**	**0.9**	**1.4**
Standard Deviation	**0.5**	**0.5**	**0.9**

Table A-67. Supporting Data for Figure 66

Year	Troll Catch Rate (lb/hr) - Blue Marlin	Troll Catch Rate (lb/hr) - Non-Charter	Troll Catch Rate (lb/hr) - Charter
2014	0.6	0.5	1.5
2015	0.6	0.5	1.5
2016	0.7	0.6	1.8
2017	0.6	0.5	1.7
2018	0.4	0.3	2.7
2019	1.1	1.0	2.1
2020	1.0	1.1	
2021	0.5	0.4	3.6
2022	0.2	0.2	0.7
2023	0.4	0.3	2.1
Average	**0.6**	**0.5**	**1.8**
Standard Deviation	**0.3**	**0.3**	**1.0**

TABLES FOR SECTION 2.4: HAWAII

Table A-68. Supporting Data for Figure 67

	Hawaii pelagic catch (1,000 pounds)					
Year	**Tunas**	**Billfish**	**Other PMUS**	**PMUS Sharks**	**non-PMUS**	**Total**
2014	21,317	6,721	6,932	129	18	35,116
2015	25,515	6,928	7,186	150	23	39,802
2016	25,038	5,687	6,167	168	24	37,083
2017	26,584	7,060	5,543	166	11	39,364
2018	25,439	5,732	6,515	139	12	37,838
2019	24,696	5,697	5,955	115	5	36,468
2020	23,005	3,624	3,757	43	5	30,433
2021	23,860	3,515	3,342	17	5	30,740
2022	22,897	4,260	2,570	10	4	29,741
2023	23,397	3,769	2,784	8	3	29,961
Average	**24,174.8**	**5,299.2**	**5,075.2**	**94.4**	**11.0**	**34,654.6**
SD	**1,566.6**	**1,401.5**	**1,777.4**	**67.0**	**8.1**	**4,048.7**

Table A-69. Supporting Data for Figure 68

	Hawaii pelagic total catch (1,000 pounds)						
Year	**Deep-set longline**	**Shallow-set longline**	**MHI troll**	**MHI handline**	**Offshore handline**	**Other gear**	**Total**
2014	26,615	3,255	3,486	1,161	416	182	35,116
2015	32,136	2,778	3,094	1,200	409	184	39,802
2016	31,434	1,849	2,582	785	366	67	37,083
2017	32,760	3,007	2,209	975	323	89	39,364
2018	32,410	1,438	2,743	778	366	104	37,838
2019	31,865	829	2,479	687	477	132	36,468
2020	27,035	875	1,498	582	328	113	30,433
2021	26,523	1,264	1,830	685	257	180	30,740
2022	24,256	1,874	1,774	957	571	311	29,741
2023	25,657	1,597	1,596	571	348	191	29,961
Average	**29,069.1**	**1,876.6**	**2,329.0**	**838.3**	**386.2**	**155.4**	**34,654.6**
SD	**3,317.5**	**865.1**	**665.1**	**225.6**	**88.2**	**70.5**	**4,048.7**

Table A-70. Supporting Data for Figure 69

	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
2014	17,898	101	1,743	1,026	403	145	21,317
2015	22,255	123	1,473	1,106	400	157	25,515
2016	22,450	106	1,368	703	362	48	25,038
2017	23,768	274	1,253	899	310	80	26,584
2018	22,588	188	1,494	717	358	94	25,439
2019	22,167	93	1,220	626	469	120	24,696
2020	21,012	151	864	552	324	102	23,005
2021	21,656	220	915	650	252	166	23,860
2022	19,869	236	1,021	924	564	283	22,897
2023	21,360	170	822	536	334	174	23,397
Average	**21,502.5**	**166.3**	**1,217.3**	**773.8**	**377.8**	**137.1**	**24,174.8**
SD	**1,638.5**	**62.5**	**307.9**	**201.1**	**88.2**	**65.3**	**1,566.6**

Table A-71. Supporting Data for Figure 70

	Hawaii tuna catch (1,000 pounds)						
Year	Bigeye tuna	Yellowfin tuna	Skipjack tuna	Albacore	Bluefin tuna	Other tunas	Total
2014	16,564	3,522	648	552	1	30	21,317
2015	20,009	4,068	722	679	0	36	25,515
2016	18,663	4,956	801	602	1	14	25,038
2017	17,955	7,596	732	287	3	11	26,584
2018	17,093	7,567	530	239	1	10	25,439
2019	17,612	5,982	832	255	4	10	24,696
2020	16,968	5,108	554	366	3	6	23,005
2021	15,914	6,931	499	511	2	5	23,860
2022	14,799	7,175	460	457	3	3	22,897
2023	14,520	7,351	393	1,125	4	4	23,397
Average	**17,009.6**	**6,025.6**	**617.1**	**507.2**	**2.3**	**12.9**	**24,174.8**
SD	**1,682.6**	**1,521.0**	**151.2**	**264.3**	**1.5**	**11.3**	**1,566.6**

Table A-72. Supporting Data for Figure 71

	Hawaii bigeye tuna catch (1,000 pounds)						
Year	**Deep-set longline**	**Shallow-set longline**	**MHI troll**	**MHI handline**	**Offshore handline**	**Other gear**	**Total**
2014	15,657	65	315	105	348	75	16,564
2015	19,248	99	129	74	373	87	20,009
2016	18,070	75	75	93	310	40	18,663
2017	17,498	126	81	48	185	17	17,955
2018	16,635	108	59	30	244	17	17,093
2019	16,916	60	77	63	435	62	17,612
2020	16,445	102	41	40	279	61	16,968
2021	15,438	88	28	31	240	89	15,914
2022	13,981	99	28	46	481	163	14,799
2023	14,054	61	10	18	273	105	14,520
Average	**16,394.0**	**88.3**	**84.2**	**54.9**	**316.7**	**71.5**	**17,009.6**
SD	**1,675.3**	**22.6**	**87.9**	**28.6**	**92.4**	**43.7**	**1,682.6**

Table A-73. Supporting Data for Figure 72

	Hawaii yellowfin tuna catch (1,000 pounds)						
Year	**Deep-set longline**	**Shallow-set longline**	**MHI troll**	**MHI handline**	**Offshore handline**	**Other gear**	**Total**
2014	1,407	24	1,224	795	53	21	3,522
2015	2,012	17	1,095	878	25	41	4,068
2016	3,304	29	1,024	542	51	5	4,956
2017	5,581	137	951	758	124	45	7,596
2018	5,437	75	1,240	628	114	73	7,567
2019	4,445	30	903	516	32	57	5,982
2020	3,845	39	647	492	44	41	5,108
2021	5,400	113	731	599	11	77	6,931
2022	5,253	97	768	856	82	119	7,175
2023	6,082	81	570	489	61	69	7,351
Average	**4,276.6**	**64.1**	**915.1**	**655.3**	**59.7**	**54.8**	**6,025.6**
SD	**1,600.3**	**42.3**	**234.0**	**152.9**	**37.0**	**32.0**	**1,521.0**

Table A-74. Supporting Data for Figure 73

	Hawaii skipjack tuna catch (1,000 pounds)						
Year	Deep-set longline	Shallow-set longline	MHI troll	MHI handline	Offshore handline	Other gear	Total
2014	411	0	172	15	3	48	648
2015	467	1	213	11	2	28	722
2016	529	0	258	11	0	3	801
2017	485	1	214	13	0	18	732
2018	329	0	185	12	0	4	530
2019	576	0	232	21	2	1	832
2020	369	0	172	11	1	0	554
2021	337	1	152	8	0	1	499
2022	226	1	222	9	1	0	460
2023	137	0	238	17	1	0	393
Average	**386.7**	**0.5**	**205.8**	**12.7**	**1.1**	**10.4**	**617.1**
SD	**136.3**	**0.4**	**34.1**	**3.8**	**0.8**	**16.3**	**151.2**

Table A-75. Supporting Data for Figure 74

	Hawaii albacore catch (1,000 pounds)						
Year	Deep-set longline	Shallow-set longline	MHI troll	MHI handline	Offshore handline	Other gear	Total
2014	423	12	7	108	0	1	552
2015	529	7	4	139	0	0	679
2016	546	2	2	52	0	0	602
2017	200	9	1	76	1	0	287
2018	187	5	3	44	0	0	239
2019	227	3	2	22	1	0	255
2020	350	9	1	7	0	0	366
2021	480	18	2	11	0	0	511
2022	406	38	2	11	0	0	457
2023	1,086	27	1	11	0	0	1,125
Average	**443.3**	**12.8**	**2.3**	**48.2**	**0.3**	**0.3**	**507.2**
SD	**261.3**	**11.6**	**2.0**	**46.3**	**0.4**	**0.4**	**264.3**

Table A-76. Supporting Data for Figure 75

	Hawaii billfish catch (1,000 lbs)						
Year	**Deep-set longline**	**Shallow-set longline**	**MHI troll**	**MHI handline**	**Offshore handline**	**Other gear**	**Total**
2014	3,282	3,033	373	21	6	6	6,721
2015	3,898	2,539	462	16	4	9	6,928
2016	3,608	1,677	382	15	1	3	5,687
2017	4,059	2,625	349	20	4	3	7,060
2018	4,106	1,216	392	13	1	4	5,732
2019	4,564	723	385	15	3	6	5,697
2020	2,720	665	224	9	2	4	3,624
2021	2,197	1,020	282	7	3	6	3,515
2022	2,340	1,617	284	8	2	9	4,260
2023	2,124	1,402	224	6	3	9	3,769
Average	**3,290.0**	**1,651.6**	**335.7**	**13.2**	**2.7**	**5.9**	**5,299.2**
SD	**890.2**	**825.4**	**78.6**	**5.1**	**1.5**	**2.3**	**1,401.5**

Table A-77. Supporting Data for Figure 76

	Hawaii billfish catch (1,000 lbs)					
Year	**Swordfish**	**Blue marlin**	**Striped marlin**	**Spearfish**	**Other marlins**	**Total**
2014	3,690	1,511	967	501	52	6,721
2015	3,356	1,804	1,112	605	50	6,928
2016	2,418	1,542	887	784	56	5,687
2017	3,582	1,833	910	688	46	7,060
2018	2,329	1,808	1,052	504	39	5,732
2019	1,626	2,337	1,231	453	50	5,697
2020	1,202	1,373	762	262	24	3,624
2021	1,513	1,100	563	304	35	3,515
2022	2,049	1,243	645	296	27	4,260
2023	1,892	949	445	441	42	3,769
Average	**2,365.8**	**1,550.0**	**857.5**	**483.8**	**42.1**	**5,299.2**

Table A-78. Supporting Data for Figure 77

	Swordfish catch (1,000 lbs)						
Year	**Deep-set longline**	**Shallow-set longline**	**MHI troll**	**MHI handline**	**Offshore handline**	**Other gear**	**Total**
2014	694	2,978	2	15	0	1	3,690
2015	843	2,500	2	11	0	1	3,356
2016	794	1,615	0	9	0	1	2,418
2017	998	2,570	1	13	1	0	3,582
2018	1,111	1,210	1	6	0	1	2,329
2019	898	720	1	7	0	1	1,626
2020	538	659	0	4	0	1	1,202
2021	520	989	1	3	0	1	1,513
2022	465	1,581	1	2	0	1	2,049
2023	504	1,384	0	2	0	1	1,892
Average	**736.3**	**1,620.4**	**0.9**	**7.2**	**0.3**	**0.8**	**2,365.8**
SD	**227.3**	**808.2**	**0.7**	**4.6**	**0.3**	**0.3**	**892.7**

Table A-79. Supporting Data for Figure 78

	Blue marlin catch (1,000 lbs)						
Year	**Deep-set longline**	**Shallow-set longline**	**MHI troll**	**MHI handline**	**Offshore handline**	**Other gear**	**Total**
2014	1,160	19	318	4	5	4	1,511
2015	1,380	12	399	5	3	6	1,804
2016	1,194	28	311	5	1	2	1,542
2017	1,502	14	306	6	2	2	1,833
2018	1,463	1	336	6	0	2	1,808
2019	1,987	0	334	8	2	5	2,337
2020	1,168	3	193	4	2	2	1,373
2021	827	15	247	5	2	4	1,100
2022	971	9	249	6	1	7	1,243
2023	740	5	192	3	2	7	949
Average	**1,239.3**	**10.6**	**288.6**	**5.3**	**2.2**	**4.1**	**1,550.0**
SD	**365.6**	**8.8**	**66.5**	**1.4**	**1.3**	**2.0**	**411.2**

Table A-80. Supporting Data for Figure 79

Year	Striped marlin catch (1,000 lbs) Deep-set longline	Shallow-set longline	MHI troll	MHI handline	Offshore handline	Other gear	Total
2014	908	31	27	1	0	0	967
2015	1,064	24	23	0	0	1	1,112
2016	831	29	27	1	0	0	887
2017	861	34	14	0	0	0	910
2018	1,021	4	26	0	0	1	1,052
2019	1,200	1	29	0	0	1	1,231
2020	738	2	21	0	0	1	762
2021	531	13	19	0	0	1	563
2022	599	25	20	0	0	1	645
2023	418	13	13	0	0	1	445
Average	**817.1**	**17.5**	**21.8**	**0.2**	**0.1**	**0.6**	**857.5**
SD	**248.3**	**12.6**	**5.5**	**0.3**	**0.1**	**0.3**	**251.3**

Table A-81. Supporting Data for Figure 80

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
2014	5,421	121	1,367	114	7	30	7,061
2015	5,964	116	1,155	78	4	18	7,336
2016	5,356	67	828	66	3	15	6,335
2017	4,926	108	603	56	10	7	5,709
2018	5,706	34	855	48	7	6	6,654
2019	5,129	12	872	46	5	5	6,070
2020	3,300	60	409	21	2	7	3,799
2021	2,665	24	632	27	2	8	3,359
2022	2,042	21	468	25	5	19	2,580
2023	2,170	25	550	29	11	8	2,792
Average	**4,268.0**	**58.6**	**774.0**	**51.0**	**5.7**	**12.3**	**5,169.6**
SD	**1,545.5**	**42.3**	**306.0**	**29.0**	**3.0**	**8.2**	**1,839.3**

Table A-82. Supporting Data for Figure 81

	Catch of other PMUS by species (1,000 lbs)						
Year	**Mahimahi**	**Moonfish**	**Oilfish**	**Ono**	**Pomfret**	**PMUS shark**	**Total**
2014	1,819	2,242	516	1,176	1,179	129	7,061
2015	1,495	2,662	528	1,223	1,278	150	7,336
2016	1,232	2,166	481	1,204	1,084	168	6,335
2017	1,003	2,293	338	984	925	166	5,709
2018	1,077	3,070	315	1,176	878	139	6,654
2019	1,005	2,292	308	1,599	751	115	6,070
2020	585	1,629	184	850	509	43	3,799
2021	748	848	164	1,173	408	17	3,359
2022	782	526	165	669	429	10	2,580
2023	895	492	131	900	366	8	2,792
Average	**1,064.2**	**1,822.1**	**312.9**	**1,095.3**	**780.7**	**94.4**	**5,169.6**
SD	**369.5**	**908.9**	**153.0**	**257.0**	**339.6**	**67.0**	**1,839.3**

Table A-83. Supporting Data for Figure 82

	Moonfish catch (1,000 lbs)			
Year	**Deep-set longline**	**Shallow-set longline**	**Other gear**	**Total**
2014	2,213	28	0	2,242
2015	2,622	39	1	2,661
2016	2,148	19	0	2,166
2017	2,261	32	0	2,293
2018	3,057	13	0	3,070
2019	2,289	3	0	2,292
2020	1,606	23	0	1,629
2021	846	2	0	848
2022	524	2	0	526
2023	491	1	0	492
Average	**1,805.7**	**16.2**	**0.1**	**1,822.0**
SD	**899.9**	**14.2**	**0.2**	**908.8**

Table A-84. Supporting Data for Figure 83

	Mahimahi catch (1,000 lbs)						
Year	Deep-set longline	Shallow-set longline	MHI troll	MHI handline	Offshore handline	Other gear	Total
2014	810	45	901	52	5	7	1,819
2015	692	30	734	27	2	9	1,495
2016	636	16	558	19	1	3	1,232
2017	548	15	416	18	1	3	1,003
2018	495	6	553	18	1	3	1,077
2019	434	2	549	17	2	1	1,005
2020	262	3	305	12	1	2	585
2021	354	12	365	14	1	3	748
2022	380	13	358	16	4	10	782
2023	472	21	369	19	9	4	895
Average	**508.3**	**16.4**	**510.8**	**21.2**	**2.9**	**4.6**	**1,064.2**
SD	**166.9**	**13.1**	**189.5**	**11.4**	**2.7**	**3.1**	**369.5**

Table A-85. Supporting Data for Figure 84

	Ono catch (1,000 lbs)						
Year	Deep-set longline	Shallow-set longline	MHI troll	MHI handline	Offshore handline	Other gear	Total
2014	684	2	465	20	1	5	1,176
2015	781	1	421	17	1	3	1,223
2016	920	1	269	11	0	2	1,204
2017	784	3	186	9	1	2	984
2018	859	1	301	13	0	1	1,176
2019	1,259	0	322	14	2	2	1,599
2020	738	0	104	7	1	1	850
2021	893	2	267	8	1	2	1,173
2022	550	1	110	5	0	1	669
2023	707	1	181	8	1	2	900
Average	**817.5**	**1.2**	**262.5**	**11.2**	**0.8**	**2.1**	**1,095.3**
SD	**189.4**	**0.7**	**121.1**	**4.7**	**0.5**	**1.1**	**257.0**

Table A-86. Supporting Data for Figure 85

	Pomfret catch (1,000 lbs)					
Year	**Deep-set longline**	**Shallow-set longline**	**MHI handline**	**Offshore handline**	**Other gear**	**Total**
2014	1,118	2	41	1	18	1,179
2015	1,242	1	31	1	4	1,278
2016	1,038	0	34	2	10	1,084
2017	888	0	28	7	1	925
2018	857	0	16	5	1	878
2019	732	0	15	2	2	751
2020	501	0	3	0	4	509
2021	400	1	5	0	3	408
2022	417	0	3	1	7	429
2023	362	0	2	1	2	366
Average	**755.5**	**0.5**	**17.7**	**1.9**	**5.1**	**780.7**
SD	**322.6**	**0.7**	**14.7**	**2.3**	**5.2**	**339.5**

Table A-87. Supporting Data for Figure 86

	PMUS shark catch (1,000 lbs)			
Year	**Deep-set longline**	**Shallow-set longline**	**Non-longline**	**Total**
2014	106	20	3	129
2015	120	25	4	150
2016	140	24	4	168
2017	116	49	2	166
2018	126	12	2	139
2019	108	6	1	115
2020	11	31	0	43
2021	12	5	0	17
2022	9	1	0	10
2023	8	0	0	8
Average	**75.5**	**17.3**	**1.6**	**94.4**
SD	**57.0**	**15.5**	**1.6**	**67.0**

Table A-88. Supporting Data for Figure 87

	Deep-set longline		
Year	Vessels	Trips	Sets
2014	140	1,355	17,831
2015	143	1,452	18,519
2016	142	1,480	19,391
2017	145	1,539	19,674
2018	143	1,643	21,012
2019	149	1,727	22,318
2020	146	1,643	20,766
2021	146	1,689	22,175
2022	147	1,534	21,327
2023	150	1,594	22,105
Average	**145.1**	**1,565.6**	**20,511.8**
SD	**3.1**	**115.6**	**1586.8**

Table A-89. Supporting Data for Figure 88

	Number of deep-set hooks by area (millions)			
Year	Outside EEZ	Hawaii EEZ	PRIA EEZ	Total
2014	34.2	10.8	0.8	45.8
2015	33.0	14.3	0.3	47.6
2016	38.6	12.5	0.1	51.1
2017	40.5	13.0	0.0	53.6
2018	43.1	15.4	0.0	58.6
2019	49.1	14.3	0.0	63.4
2020	44.8	14.9	0.0	59.7
2021	41.6	23.8	0.0	65.4
2022	46.8	16.6	0.0	63.4
2023	52.3	14.0	0.0	66.3
Average	**42.40**	**14.96**	**0.12**	**57.49**
SD	**6.17**	**3.50**	**0.26**	**7.50**

Table A-90. Supporting Data for Figure 89

Year	Catch (1,000 lbs)	Adjusted revenue ($1,000)	Nominal revenue ($1,000)	Honolulu CPI
2014	26,615	$99,483	$78,617	257.6
2015	32,136	$114,298	$91,229	260.2
2016	31,434	$121,875	$99,190	265.3
2017	32,760	$115,201	$96,137	272.0
2018	32,410	$119,207	$101,332	277.1
2019	31,865	$107,495	$92,862	281.6
2020	27,035	$80,711	$70,820	286.0
2021	26,523	$119,961	$109,238	296.8
2022	24,256	$109,686	$106,362	316.1
2023	25,657	$100,555	$100,555	326.0
Average	**29,069.1**	**$108,847.2**	**$94,634.3**	
SD	**3,317.5**	**$12,566.5**	**$11,982.1**	

Table A-91. Supporting Data for Figure 90

	Deep-set longline CPUE (fish per 1,000 hooks)		
Year	**Bigeye tuna**	**Yellowfin tuna**	**Albacore**
2014	4.8	0.4	0.2
2015	4.8	0.6	0.2
2016	4.3	0.9	0.2
2017	4.2	1.5	0.1
2018	3.7	1.1	0.1
2019	3.5	1.0	0.1
2020	3.5	0.9	0.1
2021	2.9	1.2	0.2
2022	2.7	1.3	0.2
2023	2.5	1.3	0.5
Average	**3.69**	**1.02**	**0.19**
SD	**0.83**	**0.34**	**0.12**

Table A-92. Supporting Data for Figure 91

	Deep-set longline CPUE (fish per 1,000 hooks)		
Year	**Swordfish**	**Striped marlin**	**Blue marlin**
2014	0.1	0.3	0.1
2015	0.1	0.3	0.2
2016	0.1	0.2	0.1
2017	0.1	0.2	0.1
2018	0.1	0.3	0.1
2019	0.1	0.3	0.2
2020	0.1	0.2	0.1
2021	0.1	0.1	0.1
2022	0.1	0.2	0.1
2023	0.1	0.1	0.1
Average	**0.10**	**0.22**	**0.12**
SD	**0.00**	**0.08**	**0.04**

Table A-93. Supporting Data for Figure 92

	Deep-set CPUE (fish per 1000 hooks)
Year	**Blue shark**
2014	1.2
2015	1.4
2016	1.4
2017	1.6
2018	1.6
2019	1.8
2020	1.7
2021	1.5
2022	1.2
2023	1.1
Average	1.45
SD	0.23

Table A-94. Supporting Data for Figure 93

	Shallow-set longline		
Year	**Vessels**	**Trips**	**Sets**
2014	20	81	1,338
2015	22	69	1,130
2016	13	46	727
2017	20	70	994
2018	11	30	420
2019	14	25	284
2020	14	36	461
2021	17	57	703
2022	22	69	857
2023	23	71	853
Average	**17.6**	**55.4**	**776.7**
SD	**4.4**	**19.8**	**329.5**

Table A-95. Supporting Data for Figure 94

	Number of hooks set by area (milions)			
Year	**Outside EEZ**	**Hawaii EEZ**	**PRIA EEZ**	**Total**
2014	1.3	0.0	0.1	1.5
2015	1.1	0.1	0.1	1.3
2016	0.7	0.0	0.1	0.8
2017	1.0	0.1	0.0	1.1
2018	0.5	0.0	0.0	0.5
2019	0.4	0.0	0.0	0.4
2020	0.5	0.0	0.0	0.6
2021	0.8	0.1	0.0	0.9
2022	1.0	0.0	0.0	1.1
2023	1.1	0.0	0.0	1.1
Average	**0.84**	**0.03**	**0.03**	**0.93**
SD	**0.31**	**0.05**	**0.05**	**0.36**

Table A-96. Supporting Data for Figure 95

Year	Catch (1,000 lbs)	Adjusted revenue ($1,000)	Nominal revenue ($1,000)	Honolulu CPI
2014	3,255	$5,156	$4,074	257.6
2015	2,778	$3,520	$2,810	260.2
2016	1,849	$3,054	$2,486	265.3
2017	3,007	$5,069	$4,230	272.0
2018	1,438	$1,809	$1,538	277.1
2019	829	$2,248	$1,942	281.6
2020	875	$1,473	$1,293	286.0
2021	1,264	$5,280	$4,808	296.8
2022	1,874	$9,982	$9,679	316.1
2023	1,597	$6,829	$6,829	326.0
Average	**1,876.6**	**$4,442.0**	**$3,968.9**	
SD	**865.1**	**$2,610.4**	**$2,630.9**	

Table A-97. Supporting Data for Figure 96

	Shallow-set longline CPUE (fish per 1,000 hooks)		
Year	Bigeye tuna	Yellowfin tuna	Albacore
2014	0.6	0.1	0.4
2015	1.1	0.1	0.2
2016	1.2	0.4	0.1
2017	1.4	1.4	0.3
2018	2.6	1.6	0.3
2019	2.5	0.9	0.2
2020	1.9	0.9	0.6
2021	1.1	1.3	0.7
2022	0.9	1.0	1.3
2023	0.6	0.8	0.8
Average	**1.39**	**0.85**	**0.49**
SD	**0.72**	**0.52**	**0.37**

Table A-98. Supporting Data for Figure 97

	Shallow-set longline CPUE (fish per 1,000 hooks)		
Year	**Swordfish**	**Striped marlin**	**Blue marlin**
2014	10.4	0.2	0.1
2015	11.9	0.2	0.0
2016	12.4	0.4	0.1
2017	12.9	0.4	0.1
2018	12.2	0.1	0.0
2019	9.8	0.0	0.0
2020	7.9	0.1	0.0
2021	7.1	0.2	0.1
2022	8.9	0.4	0.0
2023	7.9	0.2	0.0
Average	**10.14**	**0.22**	**0.04**
SD	**2.14**	**0.14**	**0.05**

Table A-99. Supporting Data for Figure 98

	Shallow-set CPUE (fish per 1000 hooks)
Year	**Blue shark**
2014	6.8
2015	10.0
2016	13.8
2017	9.0
2018	5.1
2019	8.5
2020	10.4
2021	5.9
2022	5.9
2023	6.3
Average	**8.16**
SD	**2.72**

Table A-100. Supporting Data for Figure 99

Year	Fishers	Days fished
2014	1,697	28,114
2015	1,624	26,070
2016	1,485	23,296
2017	1,418	21,502
2018	1,387	21,974
2019	1,294	20,479
2020	1,126	12,194
2021	1,187	16,409
2022	1,170	15,570
2023	1,151	14,500
Average	**1,353.9**	**20,010.8**
SD	**203.2**	**5,202.9**

Table A-101. Supporting Data for Figure 100

Year	Catch (1,000 lbs)	Adjusted revenue ($1,000)	Nominal revenue ($1,000)	Honolulu CPI
2014	3,486	$10,589	$8,368	257.6
2015	3,094	$9,727	$7,763	260.2
2016	2,582	$9,287	$7,558	265.3
2017	2,209	$7,638	$6,374	272.0
2018	2,743	$9,401	$7,991	277.1
2019	2,479	$8,355	$7,218	281.6
2020	1,498	$5,047	$4,429	286.0
2021	1,830	$7,275	$6,625	296.8
2022	1,774	$7,157	$6,941	316.1
2023	1,596	$5,988	$5,988	326.0
Average	**2,329.0**	**$8,046.5**	**$6,925.5**	
SD	**665.1**	**$1,749.3**	**$1,150.5**	

Table A-102. Supporting Data for Figure 101

MHI troll tuna CPUE (pounds per day fished)		
Year	**Yellowfin tuna**	**Skipjack tuna**
2014	43.7	6.1
2015	42.3	8.2
2016	44.4	11.1
2017	44.6	10.0
2018	56.6	8.4
2019	44.1	11.4
2020	53.2	14.1
2021	44.5	9.3
2022	49.3	14.3
2023	39.3	16.4
Average	**46.21**	**10.94**
SD	**5.25**	**3.21**

MHI troll tuna CPUE (pounds per hour fished)		
Year	**Yellowfin tuna**	**Skipjack tuna**
2014	6.6	0.91
2015	6.5	1.25
2016	6.8	1.71
2017	7.0	1.55
2018	8.6	1.27
2019	6.8	1.75
2020	7.9	2.10
2021	6.7	1.38
2022	7.3	2.11
2023	5.9	2.44
Average	**6.98**	**1.65**
SD	**0.77**	**0.47**

Table A-103. Supporting Data for Figure 102

MHI troll marlin CPUE (pounds per day fished)		
Year	**Blue marlin**	**Striped marlin**
2014	11.4	1.0
2015	15.1	0.9
2016	13.5	1.2
2017	14.3	0.6
2018	15.4	1.2
2019	16.3	1.4
2020	15.9	1.7
2021	15.1	1.1
2022	16.0	1.3
2023	13.2	0.9
Average	**14.62**	**1.13**
SD	**1.54**	**0.30**

MHI troll marlin CPUE (pounds per hour fished)		
Year	**Blue marlin**	**Striped marlin**
2014	1.7	0.2
2015	2.3	0.1
2016	2.1	0.2
2017	2.2	0.1
2018	2.3	0.2
2019	2.5	0.2
2020	2.4	0.3
2021	2.3	0.2
2022	2.4	0.2
2023	2.0	0.1
Average	**2.21**	**0.17**
SD	**0.23**	**0.04**

Table A-104. Supporting Data for Figure 103

MHI troll mahimahi and ono CPUE (pounds per day fished)		
Year	**Mahimahi**	**Ono (wahoo)**
2014	32.1	16.6
2015	28.2	16.1
2016	24.1	11.6
2017	19.6	8.8
2018	25.4	13.8
2019	26.8	15.8
2020	25.0	8.5
2021	22.2	16.3
2022	23.0	7.1
2023	25.5	12.5
Average	**25.17**	**12.68**
SD	**3.42**	**3.59**

MHI troll mahimahi and ono CPUE (pounds per hour fished)		
Year	**Mahimahi**	**Ono (wahoo)**
2014	4.8	2.5
2015	4.3	2.5
2016	3.7	1.8
2017	3.0	1.4
2018	3.8	2.1
2019	4.1	2.4
2020	3.7	1.3
2021	3.3	2.4
2022	3.4	1.0
2023	3.8	1.9
Average	**3.80**	**1.92**
SD	**0.51**	**0.55**

Table A-105. Supporting Data for Figure 104

Year	Fishers	Days fished
2014	556	5,094
2015	528	4,862
2016	470	3,996
2017	491	4,735
2018	426	4,047
2019	439	3,677
2020	396	3,053
2021	383	3,388
2022	430	3,779
2023	370	2,837
Average	**448.9**	**3,946.8**
SD	**61.7**	**762.4**

Table A-106. Supporting Data for Figure 105

Year	Catch (1,000 lbs)	Adjusted revenue ($1,000)	Nominal revenue ($1,000)	Honolulu CPI
2014	1,161	$3,721	$2,940	257.6
2015	1,200	$3,628	$2,896	260.2
2016	785	$2,905	$2,364	265.3
2017	975	$3,463	$2,890	272.0
2018	778	$2,809	$2,388	277.1
2019	687	$2,503	$2,162	281.6
2020	582	$2,285	$2,005	286.0
2021	685	$3,111	$2,833	296.8
2022	957	$4,184	$4,057	316.1
2023	571	$2,634	$2,634	326.0
Average	**838.3**	**$3,124.3**	**$2,717.0**	
SD	**225.6**	**$607.9**	**$575.1**	

Table A-107. Supporting Data for Figure 106

	MHI handline CPUE (pounds per day fished)			
Year	**Yellowfin tuna**	**Albacore**	**Bigeye tuna**	**Total**
2014	157.0	21.2	20.9	199.2
2015	180.4	28.7	15.3	224.3
2016	137.8	13.3	23.4	174.6
2017	162.6	16.3	10.3	189.2
2018	157.2	11.0	7.5	175.7
2019	140.4	6.0	17.2	163.6
2020	161.2	2.2	13.1	176.5
2021	176.7	3.3	9.0	189.1
2022	226.4	3.0	12.3	241.7
2023	172.3	3.8	6.4	182.5
Average	**167.21**	**10.88**	**13.53**	**191.62**
SD	**25.03**	**8.99**	**5.66**	**24.24**

	MHI handline CPUE (pounds per hour fished)			
Year	**Yellowfin tuna**	**Albacore**	**Bigeye tuna**	**Total**
2014	21.7	2.9	2.9	27.5
2015	26.4	4.2	2.2	32.9
2016	20.3	2.0	3.5	25.7
2017	22.3	2.2	1.4	25.9
2018	23.4	1.6	1.1	26.2
2019	21.5	0.9	2.6	25.0
2020	24.0	0.3	1.9	26.2
2021	26.3	0.5	1.3	28.1
2022	32.2	0.4	1.7	34.4
2023	24.0	0.5	0.9	25.5
Average	**24.21**	**1.57**	**1.97**	**27.74**
SD	**3.45**	**1.28**	**0.83**	**3.26**

Table A-108. Supporting Data for Figure 107

Year	Fishers	Days fished
2014	9	284
2015	9	255
2016	6	182
2017	6	230
2018	5	217
2019	7	274
2020	5	258
2021	7	196
2022	6	255
2023	6	252
Average	**6.6**	**240.3**
SD	**1.4**	**33.2**

Table A-109. Supporting Data for Figure 108

Year	Catch (1,000 lbs)	Adjusted revenue ($1,000)	Nominal revenue ($1,000)	Honolulu CPI
2014	416	$985	$778	257.6
2015	409	$1,018	$812	260.2
2016	366	$1,134	$923	265.3
2017	323	$1,071	$894	272.0
2018	366	$1,127	$958	277.1
2019	477	$1,182	$1,021	281.6
2020	328	$1,567	$1,375	286.0
2021	257	$914	$833	296.8
2022	571	$1,768	$1,714	316.1
2023	348	$1,310	$1,310	326.0
Average	**386.2**	**$1,207.7**	**$1,061.9**	
SD	**88.2**	**$270.1**	**$305.6**	

Table A-110. Supporting Data for Figure 109

	Offshore handline CPUE (pounds per day fished)			
Year	**Bigeye tuna**	**Yellowfin tuna**	**Mahimahi**	**Total**
2014	1,228	183	20	1,431
2015	1,457	99	9	1,564
2016	1,788	309	3	2,100
2017	805	540	6	1,351
2018	1,048	527	7	1,582
2019	1,586	116	6	1,708
2020	1,083	170	5	1,257
2021	1,225	57	4	1,286
2022	1,886	321	16	2,224
2023	1,082	241	36	1,360
Average	**1,318.7**	**256.3**	**11.3**	**1,586.3**
SD	**349.4**	**169.3**	**10.3**	**335.8**

TABLES FOR SECTION 3.3: SOCIOECONOMICS

Table A-111. Supporting Data for Figure 121

Labor force status	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Total Employment	14,806	16,089	17,565	17,853	17,930	16,408	16,472	16,783	16,399	17,018	16,925
Total Government	5,258	6,198	6,556	6,804	6,585	5,849	5,498	6,195	6,614	6,877	7,224
Canneries	1,827	2,108	2,500	2,759	2,843	2,312	2,573	2,533	2,361	2,631	2,275
Other/Private Sector	7,721	7,783	8,509	8,290	8,502	8,247	8,401	8,055	7,424	7,510	7,426

Table A-112. Data for Figure 122

Year	Total Landings	Revenue	Revenue Adj.	Fish Price ($/lb Nominal)	Fish Price ($/lb Adjusted)	CPI Adjuster
2004	8.94	8.84	16.83	0.99	1.88	1.905
2005	8.88	8.68	15.72	0.98	1.77	1.811
2006	12.53	11.96	21.03	0.95	1.68	1.758
2007	15.37	14.76	25.04	0.96	1.63	1.696
2008	9.84	9.41	14.45	0.96	1.47	1.535
2009	11.27	10.76	15.99	0.95	1.42	1.486
2010	11.28	10.95	15.53	0.97	1.38	1.418
2011	7.86	8.92	11.69	1.13	1.49	1.311
2012	9.69	10.14	12.86	1.05	1.33	1.269
2013	6.13	6.38	7.94	1.04	1.29	1.245
2014	5.14	5.21	6.44	1.01	1.25	1.236
2015	5.62	5.71	7.12	1.02	1.27	1.247
2016	4.80	4.78	5.97	1.00	1.24	1.248
2017	5.10	5.38	6.58	1.06	1.29	1.223
2018	4.45	5.58	6.71	1.25	1.51	1.203
2019	3.09	4.17	5.01	1.35	1.62	1.201
2020	2.00	2.28	2.74	1.14	1.37	1.203
2021	2.62	3.18	3.48	1.21	1.33	1.097
2022	3.17	4.16	4.16	1.31	1.31	1
2023	2.69	2.82	2.823	1.05	1.05	1

Data source: PIFSC Fishery Economic Performance Measures (Tier 1 indicators).

Table A-113. Supporting Data for Figure 123

Year	Albacore Price ($/MT)	Albacore Price ($/lb)	Yellowfin Price ($/lb)	Wahoo Price ($/lb)	Bigeye Price ($/lb)	Skipjack Price ($/lb)	Albacore Price ($/MT adj)	Albacore Price ($/lb adj)	CPI Adj.
2012	3,193	1.45	0.80	0.36	0.79	0.76	4,051	1.84	1.269
2013	2,254	1.02	0.88	0.43	0.74	0.81	2,806	1.27	1.245
2014	2,707	1.23	0.60	0.53	0.51	0.51	3,345	1.52	1.236
2015	2,651	1.20	0.62	0.54	0.57	0.53	3,306	1.50	1.247
2016	2,498	1.13	0.66	0.55	0.57	0.55	3,118	1.41	1.248
2017	2,559	1.16	0.88	0.80	0.79	0.79	3,130	1.42	1.223
2018	3,086	1.40	0.72	0.82	0.63	0.63	3,712	1.68	1.203
2019	3,542	1.61	0.61	0.53	0.52	1.09	4,254	1.93	1.201
2020	3,306	1.50	0.59	0.50	0.50	1.36	3,977	1.80	1.203

2021	3,212	1.46	0.64	0.54	0.54	1.36	3,524	1.60	1.097
2022	3,305	1.50	0.73	0.64	0.64	1.36	3,305	1.50	1
2023	3,057	1.39	0.80	0.71	0.71	1.36	3,057	1.39	1

Table A-114. Supporting Data for Figure 124, Figure 125, and Figure 126

Year	Total Cost per Trip ($)	Cost per Set ($)	Cost per Set ($ adj)	Rev. per set ($)	Rev. per set ($ adj)	Net rev. per set ($)	Net rev. per set ($ adj)	CPI Adjuster
2006	31,468	1,353	2,379	2,400	4,218	1,046	1,839	1.758
2007	45,253	963	1,633	2,506	4,250	1,543	2,617	1.696
2008	43,881	1,138	1,747	2,036	3,125	897	1,378	1.535
2009	32,942	848	1,260	2,288	3,399	1,440	2,139	1.486
2010	29,815	1,065	1,510	2,416	3,426	1,351	1,916	1.418
2011	30,916	1,189	1,559	2,378	3,117	1,189	1,558	1.311
2012	46,832	1,403	1,780	2,424	3,076	1,021	1,296	1.269
2013	50,792	1,448	1,801	1,993	2,480	546	679	1.244
2014	43,106	1,181	1,460	1,877	2,320	696	860	1.236
2015	42,468	1,034	1,289	2,143	2,672	1,109	1,384	1.247
2016	34,148	967	1,207	2,090	2,609	1,123	1,402	1.248
2017	34,223	913	1,116	2,195	2,684	1,282	1,568	1.223
2018	30,515	1,034	1,244	2,547	3,064	1,512	1,819	1.203
2019	44,728	1,246	1,496	2,481	2,979	1,235	1,483	1.201
2020	35,944	1,112	1,337	1,788	2,151	676	814	1.203
2021	38,803	964	1,058	2,092	2,295	1,128	1,237	1.097
2022	45,879	1,942	1,942	3,329	3,329	1,387	1,387	1
2023	45,341	1,719	1,719	2,778	2,778	1,059	1,059	1

Table A-115. Supporting Data for Figure 127 and Figure 128

Year	Total Revenue per Day at Sea ($/day)	Total Revenue per Day at Sea ($/day adj)	Total Revenue per Vessel ($/vessel)	Total Revenue per Vessel ($/vessel adj)	Gini Coefficient	CPI Adjuster
2004	1,155	2,200	220,885	420,786	0.51	1.905
2005	1,260	2,282	241,063	436,565	0.47	1.811
2006	1,737	3,054	427,137	750,907	0.29	1.758
2007	1,790	3,035	509,034	863,322	0.23	1.696
2008	1,306	2,005	324,571	498,217	0.35	1.535
2009	1,553	2,308	413,787	614,888	0.26	1.486
2010	1,682	2,385	421,250	597,332	0.28	1.418
2011	1,476	1,935	371,547	487,098	0.29	1.311

2012	1,658	2,104	389,816	494,677	0.34	1.269
2013	1,279	1,593	289,848	360,861	0.27	1.245
2014	1,279	1,581	226,442	279,882	0.42	1.236
2015	1,314	1,639	271,891	339,048	0.42	1.247
2016	1,309	1,634	239,035	298,316	0.49	1.248
2017	1,501	1,835	358,431	438,361	0.33	1.223
2018	1,749	2,104	398,418	479,297	0.33	1.203
2019	1,329	1,596	231,923	278,540	0.61	1.201
2020	1,042	1,254	206,894	248,893	0.43	1.203
2021	1,520	1,668	264,664	290,337	0.41	1.097
2022	2,179	2,179	378,151	378,151	0.37	1
2023	1,470	1,470	282,313	282,313	0.52	1

Table A-116. Supporting Data for Figure 129 and Figure 130

Year	Est. Pounds Caught (lb)	Est. Pounds Sold (lb)	% Sold	Est. Revenue ($)	Est. Revenue ($ adj)	Fish Price ($/lb)	Fish Price ($/lb adj)	CPI Adjuster
2004	58,689	864	1%	1,651	3,145	1.91	3.64	1.905
2005	39,558	850	2%	991	1,795	1.17	2.12	1.811
2006	56,065	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	1.758
2007	38,860	310	1%	531	901	1.71	2.90	1.696
2008	79,378	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	1.535
2009	24,854	3,044	12%	3,069	4,561	1.01	1.50	1.486
2010	17,044	4,648	27%	7,104	10,066	1.53	2.17	1.417
2011	71,797	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	1.311
2012	51,069	9,800	19%	13,294	16,870	1.36	1.73	1.269
2013	45,930	6,827	15%	9,936	12,360	1.46	1.82	1.244
2014	59,623	6,946	12%	10,128	12,518	1.46	1.80	1.236
2015	34,971	6,240	18%	12,577	15,684	2.02	2.52	1.247
2016	40,617	2,919	7%	6,670	8,324	2.29	2.86	1.248
2017	30,148	9,098	30%	25,047	30,632	2.75	3.36	1.223
2018	21,152	16,314	77%	49,597	59,665	3.04	3.66	1.203
2019	16,367	13,892	85%	38,246	45,933	2.75	3.30	1.201
2020	20,703	2,566	12%	8,204	9,869	3.20	3.85	1.203
2021	18,472	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	1.097
2022	8,930	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	1
2023	4,925	5010	102%	10,469	10,469	2.09	2.09	1

Table A-117. Supporting Data for Figure 131

Year	Total Trip Cost ($)	Total Trip Cost ($ adj)	Fuel Cost ($ adj)	Ice Cost ($ adj)	Bait Cost ($ adj)	Gear Lost ($ adj)	Fuel Price adj. ($/gal)	CPI Adjuster
2011	85	112	106	-	0.00	5.74	5.63	1.311
2012	91	116	88	15	0.00	13.05	5.43	1.269
2013	86	107	82	17	0.00	7.54	5.26	1.245
2014	68	84	73	6	2.35	2.75	2.65	1.236
2015	78	98	78	17	0.00	2.70	2.73	1.247
2016	75	94	60	23	0.83	9.95	2.88	1.248
2017	98	120	91	25	1.30	3.26	2.87	1.223
2018	115	138	113	19	0.86	5.82	3.64	1.203
2019	120	144	103	26	1.06	13.78	3.67	1.201
2020	99	120	98	18	0.00	4.14	3.77	1.203
2021	140	154	127	20	0.00	6.97	3.78	1.097
2022	84	84	73	11	0.00	0.00	4.15	1
2023	39	39	32	5	0.00	3.20	4.35	1

Table A-118. Supporting Data for Figure 132 and Figure 133

Year	Est. Pounds Caught (lb)	Est. Pounds Sold (lb)	Est. Revenue ($)	Est. Revenue ($ adj)	% of Pounds Sold	Fish Price ($)	Fish Price ($ adj)	CPI Adjuster
2004	609,526	239,007	476,543	678,120	39%	1.99	2.84	1.423
2005	576,576	372,375	678,773	963,179	65%	1.82	2.59	1.419
2006	611,151	356,706	568,872	712,228	58%	1.59	2.00	1.252
2007	615,271	312,554	439,953	533,664	51%	1.41	1.71	1.213
2008	604,672	219,187	359,427	414,778	36%	1.64	1.89	1.154
2009	378,230	190,796	323,778	354,537	50%	1.7	1.86	1.095
2010	535,875	188,906	335,518	348,268	35%	1.78	1.84	1.038
2011	349,389	121,118	234,444	237,727	35%	1.94	1.96	1.014
2012	481,069	160,883	324,934	325,909	33%	2.02	2.03	1.003
2013	341,891	263,556	555,803	571,921	77%	2.11	2.17	1.029
2014	398,939	235,104	542,205	551,964	59%	2.31	2.35	1.018
2015	397,551	188,299	431,039	457,332	47%	2.29	2.43	1.061
2016	308,531	223,004	497,524	517,425	72%	2.23	2.32	1.040
2017	340,870	224,531	524,317	529,560	66%	2.34	2.36	1.010
2018	465,007	221,714	535,533	531,248	48%	2.42	2.40	0.992

Year	Est. Pounds Caught (lb)	Est. Pounds Sold (lb)	Est. Revenue ($)	Est. Revenue ($ adj)	% of Pounds Sold	Fish Price ($)	Fish Price ($ adj)	CPI Adjuster
2019	466,269	177,957	464,101	465,029	38%	2.61	2.61	1.002
2020	305,251	153,547	354,815	358,718	50%	2.31	2.34	1.011
2021	388,492	306,952	748,886	749,635	79%	2.44	2.44	1.001
2022	237,139	234,050	721,392	694,700	99%	3.08	2.97	0.963
2023	126,492	118,931	365,865	365,865	94%	3.08	3.08	1

Table A-119. Supporting Data for Figure 134

Year	Total Trip Cost ($)	Total Trip Cost ($ adj)	Fuel Cost ($ adj)	Ice Cost ($ adj)	Bait Cost ($ adj)	Gear Lost ($ adj)	Fuel Price adj. ($/gal)	CPI Adjuster
2009	73	80	70	9	-	0.85	3.66	1.095
2010	73	76	67	9	0.00	0.00	3.99	1.038
2011	81	82	74	7	0.00	1.19	4.68	1.014
2012	91	92	82	8	0.00	2.32	5.03	1.003
2013	96	99	91	8	0.08	0.00	5.13	1.029
2014	94	95	86	10	0.06	0.00	5.04	1.018
2015	79	84	74	10	0.00	0.00	4.31	1.061
2016	69	72	63	9	0.00	0.00	3.71	1.040
2017	73	74	65	8	0.00	0.19	3.98	1.010
2018	77	77	67	10	0.00	0.00	4.11	0.992
2019	76	76	66	9	0.00	0.00	3.95	1.002
2020	73	74	67	8	0.00	0.00	3.70	1.011
2021	94	95	84	11	0.00	0.00	4.71	1.001
2022	101	97	88	9	0.00	0.00	5.29	0.963
2023	88	88	79	8	0.00	0.00	5.41	1

Table A-120. Supporting Data for Figure 135 and Figure 136

Year	Est. Pounds Caught (lb)	Est. Pounds Sold (lb)	Est. Revenue ($)	Est. Revenue ($ adj)	% of Pounds Sold	Fish Price ($)	Fish Price ($ adj)	CPI Adjuster
2004	698,610	283,395	427,504	912,294	41%	1.51	3.22	2.127
2005	300,643	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	1.975
2006	516,279	199,352	310,625	551,359	39%		2.77	1.771
2007	561,524	261,063	422,143	701,602	46%	1.62	2.69	1.659
2008	550,717	139,670	246,769	386,193	25%	1.77	2.77	1.562

Year	Est. Pounds Caught (lb)	Est. Pounds Sold (lb)	Est. Revenue ($)	Est. Revenue ($ adj)	% of Pounds Sold	Fish Price ($)	Fish Price ($ adj)	CPI Adjuster
2009	721,525	134,044	273,618	421,098	19%	2.04	3.14	1.535
2010	738,036	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	1.492
2011	591,947	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	1.444
2012	397,776	118,038	244,382	342,868	30%		2.90	1.401
2013	799,482	176,108	398,716	559,399	22%	2.26	3.18	1.401
2014	764,150	121,632	242,719	337,865	16%	2.00	2.78	1.39
2015	959,906	109,403	214,560	301,243	11%	1.96	2.75	1.403
2016	883,582	100,551	216,029	286,238	11%	2.15	2.85	1.324
2017	600,826	118,457	265,559	343,367	20%	2.24	2.90	1.292
2018	891,746	97,019	231,632	291,856	11%	2.39	3.01	1.26
2019	759,651	141,756	318,008	393,376	19%	2.24	2.78	1.238
2020	624,904	74,756	180,840	219,901	12%	2.42	2.94	1.217
2021	858,508	51,033	120,945	141,747	6%	2.37	2.78	1.172
2022	631,671	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	1.087
2023	718,341	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	1

Table A-121. Supporting Data for Figure 137

Year	Total Trip Cost ($)	Total Trip Cost ($ adj)	Fuel Cost ($ adj)	Ice Cost ($ adj)	Bait Cost ($ adj)	Gear Lost ($ adj)	Fuel Price adj. ($/gal)	CPI Adjuster
2011	96	138	103	15	6.00	14.22	6.60	1.444
2012	112	157	100	16	6.77	34.74	6.72	1.401
2013	92	130	88	16	1.22	23.85	6.69	1.401
2014	100	139	87	15	5.26	31.26	6.49	1.390
2015	91	128	66	15	9.61	37.05	5.36	1.403
2016	76	101	56	14	4.96	26.61	4.72	1.324
2017	99	128	60	26	12.15	30.40	4.94	1.292
2018	109	138	76	23	15.77	22.28	5.19	1.260
2019	94	117	65	20	1.85	29.16	5.06	1.238
2020	83	101	61	16	0.54	23.22	4.55	1.217
2021	101	118	77	20	0.52	21.53	5.13	1.172
2022	92	100	90	11	0.00	0.00	5.58	1.087
2023	77	77	67	7	0.00	3.13	5.20	1.000

Table A-122. Supporting Data for Figure 138

Year	Estimated total landings (million lb)	Estimated total value ($ million)	Pounds sold in Hawaii markets (million lb)	Revenue from Hawaii markets ($ million)	Revenue from Hawaii markets ($ million adj)	Price ($/lb)	Price adjusted ($/lb)	CPI Adjuster
2004	18.61	44.50	16.87	42.68	72.98	2.53	4.33	1.710
2005	23.37	60.62	18.96	58.37	96.20	3.08	5.07	1.648
2006	21.47	55.85	17.55	53.79	83.75	3.06	4.77	1.557
2007	24.75	65.84	20.27	64.11	95.20	3.16	4.70	1.485
2008	26.86	74.54	21.76	72.01	102.54	3.31	4.71	1.424
2009	22.14	59.10	18.38	58.08	82.30	3.16	4.48	1.417
2010	23.79	72.12	19.47	69.56	96.55	3.57	4.96	1.388
2011	26.51	83.34	21.17	78.54	105.09	3.71	4.96	1.338
2012	26.11	96.46	21.33	92.44	120.81	4.33	5.66	1.307
2013	27.28	92.60	22.66	88.45	113.57	3.90	5.01	1.284
2014	29.80	87.32	23.93	82.81	104.76	3.46	4.38	1.265
2015	34.40	102.44	27.12	94.01	117.79	3.47	4.34	1.253
2016	33.14	110.68	26.32	102.13	125.52	3.88	4.77	1.229
2017	35.60	108.49	28.37	101.03	121.03	3.56	4.27	1.198
2018	33.57	109.45	26.80	102.37	120.38	3.82	4.49	1.176
2019	32.13	99.05	26.03	93.22	107.95	3.58	4.15	1.158
2020	26.81	80.07	21.11	72.30	82.42	3.43	3.91	1.140
2021	27.10	119.77	22.82	114.75	125.99	5.03	5.52	1.098
2022	25.48	118.08	21.61	113.88	117.41	5.27	5.43	1.031
2023	26.48	109.58	22.43	107.07	107.07	4.77	4.77	1

Data source: PIFSC Fishery Economic Performance Measures (Tier 1 indicators).

Table A-123. Supporting Data for Figure 139

Year	Bigeye Price ($/lb)	Bigeye Price ($/lb adj)	Yellowfin Price ($/lb)	Yellowfin Price ($/lb adj)	Swordfish Price ($/lb)	Swordfish Price ($/lb adj)
2004	2.99	5.11	2.45	4.19	2.47	4.23
2005	3.36	5.53	2.58	4.25	2.24	3.68
2006	3.48	5.41	2.74	4.27	1.97	3.07
2007	3.32	4.94	2.28	3.39	2.17	3.22
2008	3.82	5.43	2.83	4.03	1.78	2.53
2009	3.75	5.31	2.85	4.04	1.95	2.76
2010	4.08	5.67	3.21	4.45	2.43	3.37

2011	4.26	5.70	3.03	4.05	2.63	3.52
2012	4.82	6.29	3.96	5.18	2.89	3.78
2013	4.43	5.68	4.25	5.46	3.07	3.94
2014	3.85	4.87	3.77	4.77	2.12	2.69
2015	3.85	4.82	2.99	3.75	2.46	3.08
2016	4.18	5.14	2.92	3.59	2.96	3.64
2017	3.86	4.63	2.79	3.34	2.38	2.85
2018	4.20	4.94	3.63	4.27	2.09	2.46
2019	3.91	4.53	3.45	3.99	2.64	3.05
2020	3.43	3.91	3.01	3.43	3.42	3.90
2021	5.07	5.57	4.10	4.50	4.16	4.57
2022	5.25	5.41	4.19	4.32	4.81	4.96
2023	4.95	4.95	3.77	3.77	4.16	4.16

Table A-124. Supporting Data for Figure 140

Year	Est. Kept Value ($)	Est. Bigeye Kept Value ($)	Est. Yellowfin Kept Value ($)	Est. Swordfish Kept Value ($)	Est. Others Kept Value ($)	% bigeye	% yellowfin	% swordfish	% others
2004	44,495,906	28,611,612	3,877,632	1,529,800	10,476,862	64%	9%	3%	24%
2005	60,624,791	37,166,905	4,120,645	7,877,437	11,459,803	61%	7%	13%	19%
2006	55,853,918	33,857,353	5,731,074	5,084,768	11,180,723	61%	10%	9%	20%
2007	65,836,130	42,208,056	4,272,917	8,298,317	11,056,840	64%	6%	13%	17%
2008	74,537,721	49,877,959	5,479,032	7,792,301	11,388,430	67%	7%	10%	15%
2009	59,096,705	38,515,167	3,001,797	7,840,792	9,738,949	65%	5%	13%	16%
2010	72,123,192	48,635,042	3,923,402	8,948,693	10,616,055	67%	5%	12%	15%
2011	83,338,402	53,366,379	6,271,548	9,265,500	14,434,976	64%	8%	11%	17%
2012	96,463,655	62,223,867	7,731,132	9,049,944	17,458,712	65%	8%	9%	18%
2013	92,601,166	62,979,020	6,793,581	8,574,965	14,253,599	68%	7%	9%	15%
2014	87,317,469	60,271,041	5,388,558	7,796,655	13,861,215	69%	6%	9%	16%
2015	102,444,851	73,242,543	5,850,355	8,216,373	15,135,580	71%	6%	8%	15%
2016	110,680,830	75,641,255	9,542,693	7,118,299	18,378,583	68%	9%	6%	17%
2017	108,485,204	67,678,779	15,901,494	8,476,775	16,428,156	62%	15%	8%	15%
2018	109,445,496	69,528,643	19,846,193	4,854,514	15,216,146	64%	18%	4%	14%
2019	99,051,971	65,067,355	15,282,634	4,239,370	14,462,612	66%	15%	4%	15%
2020	80,068,493	55,040,903	11,098,822	4,060,091	9,868,677	69%	14%	5%	12%
2021	119,771,635	76,807,755	22,240,926	6,253,326	14,469,629	64%	19%	5%	12%
2022	118,082,987	72,331,534	21,692,650	9,802,610	14,256,193	61%	18%	8%	12%
2023	109,578,453	67,466,755	22,638,797	7,840,273	11,632,628	62%	21%	7%	11%

Table A-125. Supporting Data for Figure 143

Year	Total Trip Cost ($ adj)	Fuel Cost ($ adj)	Other Costs ($ adj)	Trip Days	CPI Adjuster
2005	13,730	13,662	27,392	19	210
2006	15,045	13,815	28,860	20	189
2007	15,403	13,358	28,761	21	182
2008	22,631	13,876	36,507	22	174
2009	14,814	15,080	29,894	24	141
2010	17,342	14,953	32,295	24	134
2011	21,913	15,741	37,654	23	148
2012	22,863	16,325	39,188	23	148
2013	21,165	16,410	37,575	23	149
2014	21,084	16,674	37,758	23	162
2015	15,538	16,905	32,443	22	147
2016	13,234	16,648	29,881	22	141
2017	12,643	15,858	28,501	21	152
2018	15,127	15,240	30,367	21	165
2019	15,843	15,689	31,532	22	182
2020	12,240	16,452	28,692	21	120
2021	15,287	20,295	35,582	21	145
2022	20,356	15,480	35,836	23	144
2023	18,293	15,253	33,546	23	116

Table A-126. Supporting Data for Figure 144

Year	Total Trip Cost ($ adj)	Fuel Cost ($ adj)	Other Costs ($ adj)	Trip Days	CPI Adjuster
2005	56,970	27,428	29,542	28	1.648
2006	57,716	28,509	29,207	31	1.557
2007	59,371	31,110	28,261	33	1.485
2008	72,293	43,509	28,784	33	1.424
2009	53,832	26,226	27,606	32	1.417
2010	57,977	32,427	25,550	33	1.388
2011	75,622	47,535	28,087	33	1.338
2012	75,280	46,169	29,110	35	1.306
2013	63,865	37,005	26,860	31	1.284
2014	65,677	37,754	27,923	32	1.266
2015	52,605	25,968	26,637	33	1.253

2016	49,152	21,055	28,097	31	1.229
2017	45,229	20,677	24,552	27	1.198
2018	53,401	25,772	27,629	33	1.176
2019	41,800	20,949	20,852	27	1.158
2020	48,959	24,658	24,301	28	1.14
2021	40,406	19,775	20,631	25	1.098
2022	47,724	27,050	20,674	26	1.031
2023	49,385	27,444	21,941	28	1

Table A-127. Supporting Data for Figure 145

Year	Trip Cost ($)	Trip Revenue ($)	Trip Revenue ($ adj)	Trip Net Revenue ($)	Trip Net Revenue ($ adj)	CPI Adjuster
2005	16,621	38,162	62,891	21,540	35,499	1.648
2006	18,536	38,443	59,856	19,907	30,995	1.557
2007	19,368	41,099	61,032	21,732	32,271	1.485
2008	25,637	51,084	72,743	25,446	36,236	1.424
2009	21,097	43,216	61,237	22,119	31,343	1.417
2010	23,268	56,194	77,997	32,926	45,702	1.388
2011	28,142	58,598	78,404	30,455	40,749	1.338
2012	30,006	68,629	89,629	38,623	50,441	1.306
2013	29,264	64,165	82,388	34,901	44,813	1.284
2014	29,824	61,565	77,941	31,741	40,184	1.266
2015	25,892	67,022	83,979	41,130	51,536	1.253
2016	24,313	77,368	95,085	53,055	65,204	1.229
2017	23,790	67,065	80,343	43,274	51,843	1.198
2018	25,822	66,676	78,410	40,854	48,044	1.176
2019	27,230	59,779	69,224	32,549	37,692	1.158
2020	25,169	49,706	56,664	24,537	27,972	1.140
2021	32,406	71,322	78,311	38,915	42,729	1.098
2022	34,759	75,564	77,907	40,805	42,070	1.031
2023	33,546	69,299	69,299	35,753	35,753	1

Table A-128. Supporting Data for Figure 146

Year	Trip Cost ($)	Trip Revenue ($)	Trip Revenue ($ adj)	Trip Net Revenue ($)	Trip Net Revenue ($ adj)	CPI Adjuster
2005	34,569	76,272	125,696	41,703	68,727	1.648
2006	37,069	78,840	122,754	41,771	65,038	1.557
2007	39,980	88,847	131,938	48,867	72,567	1.485

Year	Trip Cost ($)	Trip Revenue ($)	Trip Revenue ($ adj)	Trip Net Revenue ($)	Trip Net Revenue ($ adj)	CPI Adjuster
2008	50,768	86,709	123,473	35,941	51,180	1.424
2009	37,990	69,182	98,031	31,192	44,199	1.417
2010	41,770	72,601	100,770	30,831	42,793	1.388
2011	56,519	103,466	138,438	46,947	62,815	1.338
2012	57,641	102,568	133,954	44,927	58,675	1.306
2013	49,739	106,305	136,495	56,566	72,631	1.284
2014	51,878	86,970	110,104	35,093	44,427	1.266
2015	41,983	78,048	97,794	36,064	45,188	1.253
2016	39,993	112,978	138,850	72,984	89,698	1.229
2017	37,754	108,788	130,328	71,034	85,099	1.198
2018	45,409	109,863	129,199	64,454	75,798	1.176
2019	36,097	107,887	124,933	71,790	83,133	1.158
2020	42,946	86,274	98,353	43,328	49,394	1.140
2021	36,799	96,413	105,862	59,614	65,456	1.098
2022	46,289	168,083	173,293	121,794	125,570	1.031
2023	49,385	106,945	106,945	57,560	57,560	1

Table A-129. Supporting Data for Figure 147 and Figure 148

Year	Revenue per Trip ($/trip)	Revenue per Trip ($/trip adj)	Revenue per Day ($/day)	Revenue per Day ($/day adj)	Annual Revenue per Vessel ($/vessel)	Annual revenue per vessel ($/vessel adj)
2004	31,988	54,700	1,704	2,914	353,142	603,873
2005	39,062	64,375	2,096	3,453	484,998	799,277
2006	38,680	60,225	1,964	3,058	439,795	684,760
2007	43,456	64,532	2,045	3,037	510,358	757,881
2008	50,568	72,009	2,313	3,294	577,812	822,804
2009	43,294	61,348	1,866	2,644	465,328	659,370
2010	54,597	75,781	2,287	3,174	581,639	807,314
2011	59,956	80,221	2,652	3,548	646,034	864,394
2012	66,849	87,372	2,943	3,847	747,780	977,349
2013	64,262	82,512	2,792	3,585	685,935	880,740
2014	61,018	77,188	2,624	3,319	623,696	788,976
2015	67,710	84,840	3,056	3,829	726,559	910,379
2016	72,721	89,374	3,269	4,018	784,970	964,729
2017	67,634	81,026	3,147	3,770	753,369	902,537
2018	65,694	77,256	3,092	3,636	770,743	906,394

2019	57,189	66,225	2,679	3,103	678,438	785,631
2020	48,438	55,220	2,320	2,645	556,031	633,876
2021	69,635	76,459	3,341	3,669	837,564	919,645
2022	74,878	77,199	3,390	3,495	820,021	845,441
2023	66,816	66,816	2,935	2,935	745,432	745,432

Table A-130. Supporting Data for Figure 149, Figure 150, Figure 154, Figure 155, Figure 156, and Figure 157

Year	Troll lb Kept	MHI Handline lb Kept	Offshore Handline lb Kept	Others lb Kept	Aku Boat lb Kept	Troll lb Sold	MHI Handline lb Sold	Offshore Handline lb Sold	Others lb Sold	Aku Boat lb Sold
2004	3,182,537	1,186,050	480,686	248,461	636,909	2,885,469	1,255,683	366,463	205,258	655,161
2005	2,605,780	1,223,122	423,736	189,906	904,729	2,042,131	1,122,523	222,082	115,363	921,759
2006	2,590,508	801,476	502,765	273,090	630,590	1,942,533	660,212	280,570	173,794	655,735
2007	2,838,518	949,837	598,687	279,449	643,029	2,003,353	740,916	331,025	179,696	640,107
2008	2,976,988	686,237	325,433	293,628	702,193	2,037,864	522,670	232,856	222,178	696,977
2009	2,967,253	1,063,594	306,922	156,145	506,695	2,032,363	800,740	221,450	114,801	509,769
2010	2,857,486	929,717	615,316	235,169	114,320	1,985,285	738,725	537,959	201,618	113,525
2011	2,984,978	1,119,883	614,733	247,663	347,897	2,017,973	841,634	461,697	187,089	369,687
2012	3,671,896	1,609,266	590,123	322,838	109,563	2,612,737	1,320,317	472,479	257,354	109,364
2013	3,201,290	1,309,552	835,410	308,294	233,275	2,395,280	1,081,399	743,874	272,190	233,292
2014	3,490,512	1,167,585	417,010	132,028	47,648	2,720,280	981,747	327,058	108,530	56,390
2015	3,094,132	1,198,983	407,075	151,028	31,517	2,394,041	1,004,449	328,964	122,208	25,607
2016	2,594,727	795,355	386,290	65,349	1,521	2,125,350	707,698	361,983	61,195	478
2017	2,230,479	989,701	323,700	74,969	16,434	1,799,828	858,984	286,686	64,174	15,593
2018	2,754,964	786,965	349,723	99,810	4,019	2,203,541	667,596	295,765	83,424	3,922
2019	2,480,164	685,164	476,898	130,650	NULL	1,982,594	587,139	375,390	106,198	NULL
2020	1,498,570	582,749	328,425	112,691	NULL	1,208,946	524,323	344,720	112,457	NULL
2021	1,829,638	684,962	256,969	179,848	NULL	1,495,448	638,816	267,868	176,518	NULL
2022	1,773,362	957,042	571,035	310,765	NULL	1,481,248	869,744	533,619	285,035	NULL
2023	1,595,503	571,192	347,945	191,211	NULL	1,263,916	512,071	338,250	178,903	NULL

Table A-131. Supporting Data for Figure 151, Figure 154, Figure 155, Figure 156, and Figure 157

Year	Troll Revenue	MHI Handline Revenue	Offshore Handline Revenue	Others Revenue	Aku Boat Revenue	Troll Adjusted Revenue	MHI Handline Adjusted Revenue	Offshore Handline Adjusted Revenue	Others Adjusted Revenue	Aku Boat Adjusted Revenue	CPI adjustor
2004	6,249,787	2,282,403	645,728	363,090	861,060	10,705,884	3,909,756	1,106,132	621,973	1,474,995	1.713
2005	4,942,867	2,112,004	479,726	250,138	1,073,828	8,195,274	3,501,703	795,386	414,729	1,780,408	1.658
2006	4,995,421	1,425,473	539,284	383,226	878,864	7,982,683	2,277,906	861,776	612,395	1,404,425	1.598
2007	5,310,730	1,506,553	630,916	371,466	671,832	8,013,892	2,273,388	952,052	560,542	1,013,795	1.509
2008	5,234,010	1,348,929	527,932	518,735	866,873	7,536,975	1,942,457	760,221	746,978	1,248,297	1.440

2009	5,024,316	1,713,658	424,543	241,195	681,289	6,938,581	2,366,561	586,294	333,090	940,860	1.381
2010	5,465,395	1,876,576	1,191,546	464,922	210,682	7,509,453	2,578,415	1,637,184	638,803	289,476	1.374
2011	6,063,878	2,189,553	1,167,044	493,311	607,295	8,161,980	2,947,139	1,570,842	663,997	817,419	1.346
2012	9,000,654	3,510,982	1,441,714	802,119	230,235	11,673,849	4,553,744	1,869,903	1,040,349	298,615	1.297
2013	7,423,961	3,241,943	1,816,264	692,705	456,267	9,406,158	4,107,542	2,301,207	877,657	578,090	1.267
2014	8,342,685	2,950,764	826,835	298,684	102,352	10,386,643	3,673,702	1,029,409	371,861	127,429	1.245
2015	7,700,797	2,905,434	791,461	329,319	71,569	9,448,878	3,564,967	971,123	404,075	87,815	1.227
2016	7,550,275	2,364,724	956,080	181,293	1,035	9,173,584	2,873,140	1,161,638	220,271	1,258	1.215
2017	6,369,541	2,893,301	873,230	215,332	32,035	7,586,124	3,445,921	1,040,016	256,460	38,154	1.191
2018	7,989,327	2,406,136	941,238	298,541	12,768	9,283,598	2,795,930	1,093,718	346,905	14,837	1.162
2019	7,223,669	2,158,940	1,021,691	342,598	NULL	8,242,206	2,463,351	1,165,749	390,904	NULL	1.141
2020	4,260,688	1,882,734	970,188	348,844	NULL	4,780,492	2,112,428	1,088,551	391,403	NULL	1.122
2021	6,624,976	2,832,688	832,703	657,549	NULL	7,320,598	3,130,120	920,137	726,592	NULL	1.105
2022	6,940,278	4,057,195	1,714,266	1,087,980	NULL	7,391,396	4,320,913	1,825,693	1,158,699	NULL	1.065
2023	5,987,158	2,634,204	1,310,273	756,036	NULL	5,987,158	2,634,204	1,310,273	756,036	NULL	1.000

Table A-132. Supporting Data for Figure 152

Year	MHI troll price ($/lb), adjusted	MHI handline price ($/lb), adjusted	Offshore price ($/lb), adjusted	Other gears price ($/lb), adjusted
2004	3.70	3.11	3.01	3.02
2005	3.99	3.10	3.56	3.57
2006	4.00	3.36	2.99	3.43
2007	3.94	3.02	2.83	3.07
2008	3.66	3.68	3.23	3.32
2009	3.50	3.03	2.72	2.98
2010	3.82	3.53	3.07	3.20
2011	4.02	3.48	3.38	3.53
2012	4.50	3.48	3.99	4.07
2013	3.98	3.85	3.14	3.27
2014	3.88	3.80	3.20	3.48
2015	4.03	3.62	3.01	3.38
2016	4.37	4.11	3.25	3.64
2017	4.24	4.04	3.65	4.02
2018	4.26	4.24	3.74	4.21
2019	4.22	4.26	3.15	3.74
2020	4.02	4.09	3.21	3.54
2021	4.86	4.87	3.41	4.09
2022	4.83	4.81	3.31	3.94
2023	4.74	5.14	3.87	4.23

APPENDIX B: LIST OF PROTECTED SPECIES AND DESIGNATED CRITICAL HABITAT

Table B-1. Protected species found or reasonably believed to be found near or in Hawaii shallow-set longline waters

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Seabirds					
Laysan Albatross	*Phoebastria immutabilis*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Black-Footed Albatross	*Phoebastria nigripes*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Short-Tailed Albatross	*Phoebastria albatrus*	Endangered	N/A	Breeding visitor in the NWHI	35 FR 8495, 65 FR 46643, Pyle & Pyle 2009
Northern Fulmar	*Fulmarus glacialis*	Not Listed	N/A	Winter resident	Pyle & Pyle 2009
Kermadec Petrel	*Pterodroma neglecta*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Herald Petrel	*Pterodroma arminjoniana*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Murphy's Petrel	*Pterodroma ultima*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Mottled Petrel	*Pterodroma inexpectata*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Juan Fernandez Petrel	*Pterodroma externa*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Hawaiian Petrel	*Pterodroma sandwichensis (Pterodroma phaeopygia sandwichensis)*	Endangered	N/A	Breeding visitor in the MHI	32 FR 4001, Pyle & Pyle 2009
White-Necked Petrel	*Pterodroma cervicalis*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Bonin Petrel	*Pterodroma hypoleuca*	Not Listed	N/A	Breeding visitor in the NWHI	Pyle & Pyle 2009
Black-Winged Petrel	*Pterodroma nigripennis*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Cook Petrel	*Pterodroma cookii*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Stejneger Petrel	*Pterodroma longirostris*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Pycroft Petrel	*Pterodroma pycrofti*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Bulwer Petrel	*Bulweria bulwerii*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Flesh-Footed Shearwater	*Ardenna carneipes*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Wedge-Tailed Shearwater	*Ardenna pacifica*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Buller's Shearwater	*Ardenna bulleri*	Not Listed	N/A	Migrant	Pyle & Pyle 2009

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Sooty Shearwater	*Ardenna grisea*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Short-Tailed Shearwater	*Ardenna tenuirostris*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Christmas Shearwater	*Puffinus nativitatis*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Newell's Shearwater	*Puffinus newelli (Puffinus auricularis newelli)*	Threatened	N/A	Breeding visitor	40 FR 44149, Pyle & Pyle 2009
Wilson's Storm-Petrel	*Oceanites oceanicus*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Leach's Storm-Petrel	*Oceanodroma leucorhoa*	Not Listed	N/A	Winter resident	Pyle & Pyle 2009
Band-Rumped Storm-Petrel	*Oceanodroma castro*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Tristram Storm-Petrel	*Oceanodroma tristrami*	Not Listed	N/A	Breeding visitor in the NWHI	Pyle & Pyle 2009
White-Tailed Tropicbird	*Phaethon lepturus*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Red-Tailed Tropicbird	*Phaethon rubricauda*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Masked Booby	*Sula dactylatra*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Brown Booby	*Sula leucogaster*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Red-Footed Booby	*Sula sula*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Great Frigatebird	*Fregata minor*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Lesser Frigatebird	*Fregata ariel*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Laughing Gull	*Leucophaeus atricilla*	Not Listed	N/A	Winter resident in the MHI	Pyle & Pyle 2009
Franklin Gull	*Leucophaeus pipixcan*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Ring-Billed Gull	*Larus delawarensis*	Not Listed	N/A	Winter resident in the MHI	Pyle & Pyle 2009
Herring Gull	*Larus argentatus*	Not Listed	N/A	Winter resident in the NWHI	Pyle & Pyle 2009
Slaty-Backed Gull	*Larus schistisagus*	Not Listed	N/A	Winter resident in the NWHI	Pyle & Pyle 2009
Glaucous-Winged Gull	*Larus glaucescens*	Not Listed	N/A	Winter resident	Pyle & Pyle 2009
Brown Noddy	*Anous stolidus*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Black Noddy	*Anous minutus*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Blue-Gray Noddy	*Procelsterna cerulea*	Not Listed	N/A	Breeding visitor in the NWHI	Pyle & Pyle 2009
White Tern	*Gygis alba*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Sooty Tern	*Onychoprion fuscatus*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Gray-Backed Tern	*Onychoprion lunatus*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Little Tern	*Sternula albifrons*	Not Listed	N/A	Breeding visitor in the NWHI	Pyle & Pyle 2009
Least Tern	*Sternula antillarum*	Not Listed	N/A	Breeding visitor in the NWHI	Pyle & Pyle 2009
Arctic Tern	*Sterna paradisaea*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
South Polar Skua	*Stercorarius maccormicki*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Pomarine Jaeger	*Stercorarius pomarinus*	Not Listed	N/A	Winter resident in the MHI	Pyle & Pyle 2009
Parasitic Jaeger	*Stercorarius parasiticus*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Long-Tailed Jaeger	*Stercorarius longicaudus*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Sea turtles					
Green Sea Turtle	*Chelonia mydas*	Threatened (Central North Pacific DPS)	N/A	Most common turtle in the Hawaiian Islands, much more common in nearshore State waters (foraging grounds) than offshore federal waters. Most nesting occurs on French Frigate Shoals in the NWHI. Foraging and haul out in the MHI.	43 FR 32800, 81 FR 20057, Balazs et al. 1992, Kolinski et al. 2001
Green Sea Turtle	*Chelonia mydas*	Threatened (East Pacific DPS)	N/A	Nest primarily in Mexico and the Galapagos Islands. Little known about their pelagic range west of 90°W but may range as far as the Marshall Islands. Genetic testing confirmed that they are incidentally taken in the HI DSLL fishery.	43 FR 32800, 81 FR 20057, WPRFMC 2009, Cliffton et al. 1982, Karl & Bowen 1999
Hawksbill Sea Turtle	*Eretmochelys imbricata*	Endangered[a]	N/A	Small population foraging around Hawaii and low level nesting on Maui and Hawaii Islands. Occur worldwide in tropical and subtropical waters.	35 FR 8491, NMFS & USFWS 2007, Balazs et al. 1992, Katahira et al. 1994
Leatherback Sea Turtle	*Dermochelys coriacea*	Endangered[a]	N/A	Regularly sighted in offshore waters, especially at the southeastern end of the archipelago.	35 FR 8491, NMFS & USFWS 1997

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Loggerhead Sea Turtle	*Caretta caretta*	Endangered (North Pacific DPS)	N/A	Rare in Hawaii. Found worldwide along continental shelves, bays, estuaries, and lagoons of tropical, subtropical, and temperate waters.	43 FR 32800, 76 FR 58868, Dodd 1990, Balazs 1979
Olive Ridley Sea Turtle	*Lepidochelys olivacea*	Threatened (Entire species, except for the breeding population on the Pacific coast of Mexico, which is listed as endangered)	N/A	Rare in Hawaii. Occurs worldwide in tropical and warm temperate ocean waters.	43 FR 32800, Pitman 1990, Balacz 1982
Marine mammals					
Blainville's Beaked Whale	*Mesoplodon densirostris*	Not Listed	Non-strategic	Found worldwide in tropical and temperate waters	Mead 1989
Blue Whale	*Balaenoptera musculus*	Endangered	Strategic	Acoustically recorded off of Oahu and Midway Atoll, small number of sightings around Hawaii. Considered extremely rare, generally occur in winter and summer.	35 FR 18319, Bradford et al. 2013, Northrop et al. 1971, Thompson & Friedl 1982, Stafford et al. 2001
Bottlenose Dolphin	*Tursiops truncatus*	Not Listed	Non-strategic	Distributed worldwide in tropical and warm-temperate waters. Pelagic stock distinct from island-associated stocks.	Perrin et al. 2009, Martien et al. 2012
Bryde's Whale	*Balaenoptera edeni*	Not Listed	Unknown	Distributed widely across tropical and warm-temperate Pacific Ocean.	Leatherwood et al. 1982
Common Dolphin	*Delphinus delphis*	Not Listed	N/A	Found worldwide in temperate and subtropical seas.	Perrin et al. 2009
Cuvier's Beaked Whale	*Ziphius cavirostris*	Not Listed	Non-strategic	Occur year round in Hawaiian waters.	McSweeney et al. 2007
Dall's Porpoise	*Phocoenoides dalli*	Not Listed	Non-strategic	Range across the entire north Pacific Ocean.	Hall 1979
Dwarf Sperm Whale	*Kogia sima*	Not Listed	Non-strategic	Most common in waters between 500 m and 1,000 m in depth. Found worldwide in tropical and warm-temperate waters.	Nagorsen 1985, Baird et al. 2013
False Killer Whale	*Pseudorca crassidens*	Not Listed	Non-strategic	Found worldwide in tropical and warm-temperate waters. Pelagic stock tracked to within 11 km of Hawaiian Islands.	Stacey et al. 1994, Baird et al. 2012, Bradford et al. 2015

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Fin Whale	*Balaenoptera physalus*	Endangered	Strategic	Infrequent sightings in Hawaii waters. Considered rare in Hawaii, though may migrate into Hawaiian waters during fall/winter based on acoustic recordings.	35 FR 18319, Hamilton et al. 2009, Thompson & Friedl 1982
Fraser's Dolphin	*Lagenodelphis hosei*	Not Listed	Non-strategic	Found worldwide in tropical waters.	Perrin et al. 2009
Guadalupe Fur Seal	*Arctocephalus townsendi*	Threatened	Strategic	Extremely rare sightings. Little known about their pelagic distribution. Breed mainly on Isla Guadalupe, Mexico.	50 FR 51252, Gallo-Reynoso et al. 2008, Fleischer 1987
Hawaiian Monk Seal	*Neomonachus schauinslandi*	Endangered[a]	Strategic	Endemic tropical seal. Occurs throughout the archipelago. MHI population spends some time foraging in federal waters during the day.	41 FR 51611, Baker at al. 2011
Humpback Whale	*Megaptera novaeangliae*	Delisted Due to Recovery (Hawaii DPS)	Strategic	Migrate through the archipelago and breed during the winter. Common during winter months when they are generally found within the 100 m isobath.	35 FR 18319, 81 FR 62259, Childerhouse et al. 2008, Wolman & Jurasz 1976, Herman & Antinoja 1977, Rice & Wolman 1978
Killer Whale	*Orcinus orca*	Not Listed	Non-strategic	Rare in Hawaii. Prefer colder waters within 800 km of continents.	Mitchell 1975, Baird et al. 2006
Longman's Beaked Whale	*Indopacetus pacificus*	Not Listed	Non-strategic	Found in tropical waters from the eastern Pacific westward through the Indian Ocean to the eastern coast of Africa. Rare in Hawaii.	Dalebout 2003, Baird et al. 2013
Melon-Headed Whale	*Peponocephala electra*	Not Listed	Non-strategic	Found in tropical and warm-temperate waters worldwide, found primarily in equatorial waters. Uncommon in Hawaii.	Perryman et al. 1994, Barlow 2006, Bradford et al. 2013
Minke Whale	*Balaenoptera acutorostrata*	Not Listed	Non-strategic	Occur seasonally around Hawaii	Barlow 2003, Rankin & Barlow 2005
North Pacific Right Whale	*Eubalaena japonica*	Endangered[a]	Strategic	Extremely rare in Hawaii waters	35 FR 18319, 73 FR 12024, Rowntree et al. 1980, Herman et al. 1980

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Northern Elephant Seal	*Mirounga angustirostris*	Not Listed	Non-strategic	Females migrate to central North Pacific to feed on pelagic prey.	Le Beouf et al. 2000
Northern Fur Seal	*Callorhinus ursinus*	Not Listed	Non-strategic	Occur throughout the North Pacific Ocean.	Gelatt et al. 2015
Pacific White-Sided Dolphin	*Lagenorhynchus obliquidens*	Not Listed	Non-strategic	Endemic to temperate waters of North Pacific Ocean. Occur both on the high seas and along continental margins.	Brownell et al. 1999
Pantropical Spotted Dolphin	*Stenella attenuata*	Not Listed	Non-strategic	Common and abundant throughout the Hawaiian archipelago. Pelagic stock occurs outside of insular stock areas (20 km for Oahu and 4-island stocks, 65 km for Hawaii Island stock).	Baird et al. 2013, Oleson et al. 2013
Pygmy Killer Whale	*Feresa attenuata*	Not Listed	Non-strategic	Small resident population in Hawaiian waters. Found worldwide in tropical and subtropical waters.	McSweeney et al. 2009, Ross & Leatherwood 1994
Pygmy Sperm Whale	*Kogia breviceps*	Not Listed	Non-strategic	Found worldwide in tropical and warm-temperate waters.	Caldwell & Caldwell 1989
Risso's Dolphin	*Grampus griseus*	Not Listed	Non-strategic	Found in tropical to warm-temperate waters worldwide.	Perrin et al. 2009
Rough-Toothed Dolphin	*Steno bredanensis*	Not Listed	Non-strategic	Found in tropical to warm-temperate waters worldwide. Occasionally found offshore of Hawaii.	Perrin et al. 2009, Baird et al. 2013, Barlow 2006, Bradford et al. 2013
Sei Whale	*Balaenoptera borealis*	Endangered	Strategic	Rare in Hawaii. Generally found in offshore temperate waters.	35 FR 18319, Barlow 2003, Bradford et al. 2013
Short-Finned Pilot Whale	*Globicephala macrorhynchus*	Not Listed	Non-strategic	Found in tropical to warm-temperate waters worldwide. Commonly observed around MHI and present around NWHI.	Shallenberger 1981, Baird et al. 2013, Bradford et al. 2013
Sperm Whale	*Physeter macrocephalus*	Endangered	Strategic	Found in tropical to polar waters worldwide, most abundant cetaceans in the region. Sighted off the NWHI and the MHI.	35 FR 18319, Rice 1960, Lee 1993, Barlow 2006, Mobley et al. 2000, Shallenberger 1981

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Spinner Dolphin	*Stenella longirostris*	Not Listed	Non-strategic	Found worldwide in tropical and warm-temperate waters. Pelagic stock found outside of island-associated boundaries (10 nm).	Perrin et al. 2009
Striped Dolphin	*Stenella coeruleoalba*	Not Listed	Non-strategic	Found in tropical to warm-temperate waters throughout the world.	Perrin et al. 2009
Elasmobranchs					
Giant manta ray	*Manta birostris*	Threatened	N/A	Found worldwide in tropical, subtropical, and temperate waters. Commonly found in upwelling zones, oceanic island groups, offshore pinnacles and seamounts, and on shallow reefs.	Dewar et al. 2008, Marshall et al. 2009, Marshall et al. 2011.
Oceanic whitetip shark	*Carcharhinus longimanus*	Threatened	N/A	Found worldwide in open ocean waters from the surface to 152 m depth. It is most commonly found in waters > 20°C	Bonfil et al. 2008, Backus et al, 1956, Strasburg 1958, Compagno 1984
Scalloped hammerhead shark	*Sphyrna lewini*	Endangered (Eastern Pacific DPS)	N/A	Found in coastal areas from southern California to Peru.	Compagno 1984, Baum et al. 2007, Bester 2011
Scalloped hammerhead	*Sphyrna lewini*	Threatened (Indo-West Pacific DPS)	N/A	Occur over continental and insular shelves, and adjacent deep waters, but rarely found in waters < 22°C. Range from the intertidal and surface to depths up to 450–512 m.	Compagno 1984, Schulze-Haugen & Kohler 2003, Sanches 1991, Klimley 1993
Corals					
N/A	*Acropora globiceps*	Threatened	N/A	Not confirmed in Hawaii waters. Occur on upper reef slopes, reef flats, and adjacent habitats in depths ranging from 0 to 8 m	Veron 2014
N/A	*Acropora jacquelineae*	Threatened	N/A	Not confirmed in Hawaii waters. Found in numerous subtidal reef slope and back-reef habitats, including but not limited to, lower reef slopes, walls and ledges, mid-slopes, and upper reef slopes protected from wave action, and depth range is 10 to 35 m.	Veron 2014

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
N/A	*Acropora retusa*	Threatened	N/A	Not confirmed in Hawaii waters. Occur in shallow reef slope and back-reef areas, such as upper reef slopes, reef flats, and shallow lagoons, and depth range is 1 to 5 m.	Veron 2014
N/A	*Acropora speciosa*	Threatened	N/A	Not confirmed in Hawaii waters. Found in protected environments with clear water and high diversity of *Acropora* and steep slopes or deep, shaded waters. Depth range is 12 to 40 meters and have been found in mesophotic habitat (40-150 m).	Veron 2014
N/A	*Euphyllia paradivisa*	Threatened	N/A	Not confirmed in Hawaii waters. Found in environments protected from wave action on at least upper reef slopes, mid-slope terraces, and lagoons in depths ranging from 2 to 25 m depth.	Veron 2014
N/A	*Isopora crateriformis*	Threatened	N/A	Not confirmed in Hawaii waters. Found in shallow, high-wave energy environments, from low tide to at least 12 meters deep, and have been reported from mesophotic depths (less than 50 m depth).	Veron 2014
N/A	*Seriatopora aculeata*	Threatened	N/A	Not confirmed in Hawaii waters. Found in broad range of habitats including, but not limited to, upper reef slopes, mid-slope terraces, lower reef slopes, reef flats, and lagoons, and depth ranges from 3 to 40 m.	Veron 2014
Invertebrates					
Chambered nautilus	*Nautilus pompilius*	Threatened	N/A	Found in small, isolated populations throughout the Indo-Pacific on steep-sloped forereefs with sandy, silty, or muddy bottom substrates from depths of 100 m to 500 m.	83 FR 48948, CITES 2016

[a] These species have critical habitat designated under the ESA. See Table B-4.

Table B-2. Protected species found or reasonably believed to be found near or in Hawaii deep-set longline waters

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Seabirds					
Laysan Albatross	*Phoebastria immutabilis*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Black-Footed Albatross	*Phoebastria nigripes*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Short-Tailed Albatross	*Phoebastria albatrus*	Endangered	N/A	Breeding visitor in the NWHI	35 FR 8495, 65 FR 46643, Pyle & Pyle 2009
Northern Fulmar	*Fulmarus glacialis*	Not Listed	N/A	Winter resident	Pyle & Pyle 2009
Kermadec Petrel	*Pterodroma neglecta*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Herald Petrel	*Pterodroma arminjoniana*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Murphy's Petrel	*Pterodroma ultima*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Mottled Petrel	*Pterodroma inexpectata*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Juan Fernandez Petrel	*Pterodroma externa*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Hawaiian Petrel	*Pterodroma sandwichensis (Pterodroma phaeopygia sandwichensis)*	Endangered	N/A	Breeding visitor in the MHI	32 FR 4001, Pyle & Pyle 2009
White-Necked Petrel	*Pterodroma cervicalis*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Bonin Petrel	*Pterodroma hypoleuca*	Not Listed	N/A	Breeding visitor in the NWHI	Pyle & Pyle 2009
Black-Winged Petrel	*Pterodroma nigripennis*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Cook Petrel	*Pterodroma cookii*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Stejneger Petrel	*Pterodroma longirostris*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Pycroft Petrel	*Pterodroma pycrofti*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Bulwer Petrel	*Bulweria bulwerii*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Wedge-Tailed Shearwater	*Ardenna pacifica*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Buller's Shearwater	*Ardenna bulleri*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Sooty Shearwater	*Ardenna grisea*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Short-Tailed Shearwater	*Ardenna tenuirostris*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Christmas Shearwater	*Puffinus nativitatis*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Newell's Shearwater	*Puffinus newelli (Puffinus auricularis newelli)*	Threatened	N/A	Breeding visitor	40 FR 44149, Pyle & Pyle 2009
Wilson's Storm-Petrel	*Oceanites oceanicus*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Leach's Storm-Petrel	*Oceanodroma leucorhoa*	Not Listed	N/A	Winter resident	Pyle & Pyle 2009
Band-Rumped Storm-Petrel	*Oceanodroma castro*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Tristram Storm-Petrel	*Oceanodroma tristrami*	Not Listed	N/A	Breeding visitor in the NWHI	Pyle & Pyle 2009
White-Tailed Tropicbird	*Phaethon lepturus*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Red-Tailed Tropicbird	*Phaethon rubricauda*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Masked Booby	*Sula dactylatra*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Nazca Booby	*Sula granti*	Not Listed	N/A	Vagrant	Pyle & Pyle 2009
Brown Booby	*Sula leucogaster*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Red-Footed Booby	*Sula*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Great Frigatebird	*Fregata minor*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Lesser Frigatebird	*Fregata ariel*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Laughing Gull	*Leucophaeus atricilla*	Not Listed	N/A	Winter resident in the MHI	Pyle & Pyle 2009
Franklin Gull	*Leucophaeus pipixcan*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Ring-Billed Gull	*Larus delawarensis*	Not Listed	N/A	Winter resident in the MHI	Pyle & Pyle 2009
Herring Gull	*Larus argentatus*	Not Listed	N/A	Winter resident in the NWHI	Pyle & Pyle 2009
Slaty-Backed Gull	*Larus schistisagus*	Not Listed	N/A	Winter resident in the NWHI	Pyle & Pyle 2009
Glaucous-Winged Gull	*Larus glaucescens*	Not Listed	N/A	Winter resident	Pyle & Pyle 2009
Brown Noddy	*Anous stolidus*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Black Noddy	*Anous minutus*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Blue-Gray Noddy	*Procelsterna cerulea*	Not Listed	N/A	Breeding visitor in the NWHI	Pyle & Pyle 2009
White Tern	*Gygis alba*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Sooty Tern	*Onychoprion fuscatus*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009
Gray-Backed Tern	*Onychoprion lunatus*	Not Listed	N/A	Breeding visitor	Pyle & Pyle 2009

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Little Tern	*Sternula albifrons*	Not Listed	N/A	Breeding visitor in the NWHI	Pyle & Pyle 2009
Least Tern	*Sternula antillarum*	Not Listed	N/A	Breeding visitor in the NWHI	Pyle & Pyle 2009
Arctic Tern	*Sterna paradisaea*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
South Polar Skua	*Stercorarius maccormicki*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Pomarine Jaeger	*Stercorarius pomarinus*	Not Listed	N/A	Winter resident in the MHI	Pyle & Pyle 2009
Parasitic Jaeger	*Stercorarius parasiticus*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Long-Tailed Jaeger	*Stercorarius longicaudus*	Not Listed	N/A	Migrant	Pyle & Pyle 2009
Sea turtles					
Green Sea Turtle	*Chelonia mydas*	Threatened (Central North Pacific DPS)	N/A	Most common turtle in the Hawaiian Islands, much more common in nearshore State waters (foraging grounds) than offshore federal waters. Most nesting occurs on French Frigate Shoals in the NWHI. Foraging and haulout in the MHI.	43 FR 32800, 81 FR 20057, Balazs et al. 1992, Kolinski et al. 2001
Green Sea Turtle	*Chelonia mydas*	Threatened (East Pacific DPS)	N/A	Nest primarily in Mexico and the Galapagos Islands. Little known about their pelagic range west of 90°W but may range as far as the Marshall Islands. Genetic testing confirmed that they are incidentally taken in the HI DSLL fishery.	43 FR 32800, 81 FR 20057, WPRFMC 2009, Cliffton et al. 1982, Karl & Bowen 1999
Hawksbill Sea Turtle	*Eretmochelys imbricata*	Endangered[a]	N/A	Small population foraging around Hawaii and low level nesting on Maui and Hawaii Islands. Occur worldwide in tropical and subtropical waters.	35 FR 8491, NMFS & USFWS 2007, Balazs et al. 1992, Katahira et al. 1994
Leatherback Sea Turtle	*Dermochelys coriacea*	Endangered[a]	N/A	Regularly sighted in offshore waters, especially at the southeastern end of the archipelago.	35 FR 8491, NMFS & USFWS 1997
Loggerhead Sea Turtle	*Caretta*	Endangered (North Pacific DPS)	N/A	Rare in Hawaii. Found worldwide along continental shelves, bays, estuaries, and lagoons of tropical, subtropical, and temperate waters.	43 FR 32800, 76 FR 58868, Dodd 1990, Balazs 1979

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Olive Ridley Sea Turtle	*Lepidochelys olivacea*	Threatened (Entire species, except for the breeding population on the Pacific coast of Mexico, which is listed as endangered)	N/A	Rare in Hawaii. Occurs worldwide in tropical and warm temperate ocean waters.	43 FR 32800, Pitman 1990, Balacz 1982
Marine mammals					
Blainville's Beaked Whale	*Mesoplodon densirostris*	Not Listed	Non-strategic	Found worldwide in tropical and temperate waters	Mead 1989
Blue Whale	*Balaenoptera musculus*	Endangered	Strategic	Acoustically recorded off of Oahu and Midway Atoll, small number of sightings around Hawaii. Considered extremely rare, generally occur in winter and summer.	35 FR 18319, Bradford et al. 2013, Northrop et al. 1971, Thompson & Friedl 1982, Stafford et al. 2001
Bottlenose Dolphin	*Tursiops truncatus*	Not Listed	Non-strategic	Distributed worldwide in tropical and warm-temperate waters. Pelagic stock distinct from island-associated stocks.	Perrin et al. 2009, Martien et al. 2012
Bryde's Whale	*Balaenoptera edeni*	Not Listed	Unknown	Distributed widely across tropical and warm-temperate Pacific Ocean.	Leatherwood et al. 1982
Common Dolphin	*Delphinus delphis*	Not Listed	N/A	Found worldwide in temperate and subtropical seas.	Perrin et al. 2009
Cuvier's Beaked Whale	*Ziphius cavirostris*	Not Listed	Non-strategic	Occur year round in Hawaiian waters.	McSweeney et al. 2007
Dall's Porpoise	*Phocoenoides dalli*	Not Listed	Non-strategic	Range across the entire north Pacific Ocean.	Hall 1979
Dwarf Sperm Whale	*Kogia sima*	Not Listed	Non-strategic	Most common in waters between 500 m and 1,000 m in depth. Found worldwide in tropical and warm-temperate waters.	Nagorsen 1985, Baird et al. 2013
False Killer Whale	*Pseudorca crassidens*	Not Listed	Non-strategic	Found worldwide in tropical and warm-temperate waters. Pelagic stock tracked to within 11 km of Hawaiian Islands.	Stacey et al. 1994, Baird et al. 2012, Bradford et al. 2015

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Fin Whale	*Balaenoptera physalus*	Endangered	Strategic	Infrequent sightings in Hawaii waters. Considered rare in Hawaii, though may migrate into Hawaiian waters during fall/winter based on acoustic recordings.	35 FR 18319, Hamilton et al. 2009, Thompson & Friedl 1982
Fraser's Dolphin	*Lagenodelphis hosei*	Not Listed	Non-strategic	Found worldwide in tropical waters.	Perrin et al. 2009
Guadalupe Fur Seal	*Arctocephalus townsendi*	Threatened	Strategic	Rare sightings. Little known about their pelagic distribution. Breed mainly on Isla Guadalupe, Mexico.	50 FR 51252, Gallo-Reynoso et al. 2008, Fleischer 1987
Hawaiian Monk Seal	*Neomonachus schauinslandi*	Endangered[a]	Strategic	Endemic tropical seal. Occurs throughout the archipelago. MHI population spends some time foraging in federal waters during the day.	41 FR 51611, Baker at al. 2011
Humpback Whale	*Megaptera novaeangliae*	Delisted Due to Recovery (Hawaii DPS)	Strategic	Migrate through the archipelago and breed during the winter. Common during winter months when they are generally found within the 100 m isobath.	35 FR 18319, 81 FR 62259, Childerhouse et al. 2008, Wolman & Jurasz 1976, Herman & Antinoja 1977, Rice & Wolman 1978
Killer Whale	*Orcinus orca*	Not Listed	Non-strategic	Rare in Hawaii. Prefer colder waters within 800 km of continents.	Mitchell 1975, Baird et al. 2006
Longman's Beaked Whale	*Indopacetus pacificus*	Not Listed	Non-strategic	Found in tropical waters from the eastern Pacific westward through the Indian Ocean to the eastern coast of Africa. Rare in Hawaii.	Dalebout 2003, Baird et al. 2013
Melon-Headed Whale	*Peponocephala electra*	Not Listed	Non-strategic	Found in tropical and warm-temperate waters worldwide, found primarily in equatorial waters. Uncommon in Hawaii.	Perryman et al. 1994, Barlow 2006, Bradford et al. 2013
Minke Whale	*Balaenoptera acutorostrata*	Not Listed	Non-strategic	Occur seasonally around Hawaii	Barlow 2003, Rankin & Barlow 2005
North Pacific Right Whale	*Eubalaena japonica*	Endangered[a]	Strategic	Extremely rare in Hawaii waters	35 FR 18319, 73 FR 12024, Rowntree et al. 1980, Herman et al. 1980

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Northern Elephant Seal	*Mirounga angustirostris*	Not Listed	Non-strategic	Females migrate to central North Pacific to feed on pelagic prey	Le Beouf et al. 2000
Northern Fur Seal	*Callorhinus ursinus*	Not Listed	Non-strategic	Range across the north Pacific Ocean.	Gelatt et al. 2015
Pacific White-Sided Dolphin	*Lagenorhynchus obliquidens*	Not Listed	Non-strategic	Endemic to temperate waters of North Pacific Ocean. Occur both on the high seas and along continental margins.	Brownell et al. 1999
Pantropical Spotted Dolphin	*Stenella attenuata*	Not Listed	Non-strategic	Common and abundant throughout the Hawaiian archipelago. Pelagic stock occurs outside of insular stock areas (20 km for Oahu and 4-island stocks, 65 km for Hawaii Island stock)	Baird et al. 2013, Oleson et al. 2013
Pygmy Killer Whale	*Feresa attenuata*	Not Listed	Non-strategic	Small resident population in Hawaiian waters. Found worldwide in tropical and subtropical waters.	McSweeney et al. 2009, Ross & Leatherwood 1994
Pygmy Sperm Whale	*Kogia breviceps*	Not Listed	Non-strategic	Found worldwide in tropical and warm-temperate waters.	Caldwell & Caldwell 1989
Risso's Dolphin	*Grampus griseus*	Not Listed	Non-strategic	Found in tropical to warm-temperate waters worldwide.	Perrin et al. 2009
Rough-Toothed Dolphin	*Steno bredanensis*	Not Listed	Non-strategic	Found in tropical to warm-temperate waters worldwide. Occasionally found offshore of Hawaii.	Perrin et al. 2009, Bradford et al. 2013, Barlow 2006, Baird et al. 2013
Sei Whale	*Balaenoptera borealis*	Endangered	Strategic	Rare in Hawaii. Generally found in offshore temperate waters.	35 FR 18319, Barlow 2003, Bradford et al. 2013
Short-Finned Pilot Whale	*Globicephala macrorhynchus*	Not Listed	Non-strategic	Found in tropical to warm-temperate waters worldwide. Commonly observed around MHI and present around NWHI.	Shallenberger 1981, Baird et al. 2013, Bradford et al. 2013
Sperm Whale	*Physeter macrocephalus*	Endangered	Strategic	Found in tropical to polar waters worldwide, most abundant cetaceans in the region. Sighted off the NWHI and the MHI.	35 FR 18319, Rice 1960, Lee 1993, Barlow 2006, Mobley et al. 2000, Shallenberger 1981

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Spinner Dolphin	*Stenella longirostris*	Not Listed	Non-strategic	Found worldwide in tropical and warm-temperate waters. Pelagic stock found outside of island-associated boundaries (10 nm)	Perrin et al. 2009
Striped Dolphin	*Stenella coeruleoalba*	Not Listed	Non-strategic	Found in tropical to warm-temperate waters throughout the world	Perrin et al. 2009
Elasmobranchs					
Giant manta ray	*Manta birostris*	Threatened	N/A	Found worldwide in tropical, subtropical, and temperate waters. Commonly found in upwelling zones, oceanic island groups, offshore pinnacles and seamounts, and on shallow reefs.	Dewar et al. 2008, Marshall et al. 2009, Marshall et al. 2011.
Oceanic whitetip shark	*Carcharhinus longimanus*	Threatened	N/A	Found worldwide in open ocean waters from the surface to 152 m depth. It is most commonly found in waters > 20°C	Bonfil et al. 2008, Backus et al, 1956, Strasburg 1958, Compagno 1984
Scalloped hammerhead shark	*Sphyrna lewini*	Endangered (Eastern Pacific DPS)	N/A	Found in coastal areas from southern California to Peru.	Compagno 1984, Baum et al. 2007, Bester 2011
Scalloped hammerhead shark	*Sphyrna lewini*	Threatened (Indo-West Pacific DPS)	N/A	Occur over continental and insular shelves, and adjacent deep waters, but rarely found in waters < 22°C. Range from the intertidal and surface to depths up to 450–512 m.	Compagno 1984, Schulze-Haugen & Kohler 2003, Sanches 1991, Klimley 1993
Corals					
N/A	*Acropora globiceps*	Threatened	N/A	Occur on upper reef slopes, reef flats, and adjacent habitats in depths ranging from 0 to 8 m.	Veron 2014
N/A	*Acropora jacquelineae*	Threatened	N/A	Found in numerous subtidal reef slope and back-reef habitats, including but not limited to, lower reef slopes, walls and ledges, mid-slopes, and upper reef slopes protected from wave action, and depth range is 10 to 35 m.	Veron 2014

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
N/A	*Acropora retusa*	Threatened	N/A	Occur in shallow reef slope and back-reef areas, such as upper reef slopes, reef flats, and shallow lagoons, and depth range is 1 to 5 m.	Veron 2014
N/A	*Acropora speciosa*	Threatened	N/A	Found in protected environments with clear water and high diversity of *Acropora* and steep slopes or deep, shaded waters. Depth range is 12 to 40 meters, and it has been found in mesophotic habitat (40-150 m).	Veron 2014
N/A	*Euphyllia paradivisa*	Threatened	N/A	Found in environments protected from wave action on at least upper reef slopes, mid-slope terraces, and lagoons in depths ranging from 2 to 25 m depth.	Veron 2014
N/A	*Isopora crateriformis*	Threatened	N/A	Found in shallow, high-wave energy environments, from low tide to at least 12 m deep, and have been reported from mesophotic depths (less than 50 m depth).	Veron 2014
N/A	*Seriatopora aculeata*	Threatened	N/A	Found in broad range of habitats including, but not limited to, upper reef slopes, mid-slope terraces, lower reef slopes, reef flats, and lagoons, and depth ranges from 3 to 40 m.	Veron 2014
Invertebrates					
Chambered nautilus	*Nautilus pompilius*	Threatened	N/A	Found in small, isolated populations throughout the Indo-Pacific on steep-sloped forereefs with sandy, silty, or muddy bottom substrates from depths of 100 m to 500 m.	83 FR 48948, CITES 2016

[a] These species have critical habitat designated under the ESA. See Table B-4.

Table B-3. Protected species found or reasonably believed to be found near or in American Samoa longline waters

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Seabirds					

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Audubon's Shearwater	*Puffinus lherminieri*	Not Listed	N/A	Resident	Craig 2005
Black Noddy	*Anous minutus*	Not Listed	N/A	Resident	Craig 2005
Black-Naped Tern	*Sterna sumatrana*	Not Listed	N/A	Visitor	Craig 2005
Blue-Gray Noddy	*Procelsterna cerulea*	Not Listed	N/A	Resident	Craig 2005
Bridled Tern	*Onychoprion anaethetus*	Not Listed	N/A	Visitor	Craig 2005
Brown Booby	*Sula leucogaster*	Not Listed	N/A	Resident	Craig 2005
Brown Noddy	*Anous stolidus*	Not Listed	N/A	Resident	Craig 2005
Christmas Shearwater	*Puffinus nativitatis*	Not Listed	N/A	Resident?	Craig 2005
Collared Petrel	*Pterodroma brevipes*	Not Listed	N/A	Resident?	Craig 2005
White Tern	*Gygis alba*	Not Listed	N/A	Resident	Craig 2005
Greater Crested Tern	*Thalasseus bergii*	Not Listed	N/A	Visitor	Craig 2005
Gray-Backed Tern	*Onychoprion lunatus*	Not Listed	N/A	Resident	Craig 2005
Great Frigatebird	*Fregata minor*	Not Listed	N/A	Resident	Craig 2005
Herald Petrel	*Pterodroma heraldica*	Not Listed	N/A	Resident	Craig 2005
Laughing Gull	*Leucophaeus atricilla*	Not Listed	N/A	Visitor	Craig 2005
Lesser Frigatebird	*Fregata ariel*	Not Listed	N/A	Resident	Craig 2005
Masked Booby	*Sula dactylatra*	Not Listed	N/A	Resident	Craig 2005
Newell's Shearwater	*Puffinus auricularis newelli*	Threatened	N/A	Visitor	40 FR 44149, Craig 2005
Red-Footed Booby	*Sula*	Not Listed	N/A	Resident	Craig 2005
Red-Tailed Tropicbird	*Phaethon rubricauda*	Not Listed	N/A	Resident	Craig 2005
Short-Tailed Shearwater	*Ardenna tenuirostris*	Not Listed	N/A	Visitor	Craig 2005
Sooty Shearwater	*Ardenna grisea*	Not Listed	N/A	Visitor	Craig 2005
Sooty Tern	*Sterna fuscata*	Not Listed	N/A	Resident	Craig 2005
Tahiti Petrel	*Pterodroma rostrata*	Not Listed	N/A	Resident	Craig 2005
Wedge-Tailed Shearwater	*Ardenna pacifica*	Not Listed	N/A	Resident?	Craig 2005
White-Necked Petrel	*Pterodroma cervicalis*	Not Listed	N/A	Visitor	Craig 2005
White-Faced Storm-Petrel	*Pelagodroma marina*	Not Listed	N/A	Visitor	Craig 2005
White-Tailed Tropicbird	*Phaethon lepturus*	Not Listed	N/A	Resident	Craig 2005
White-Throated Storm-Petrel	*Nesofregetta fuliginosa*	Not Listed	N/A	Resident?	Craig 2005

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Laysan Albatross	*Phoebastria immutabilis*	Not Listed	N/A	Breed mainly in Hawaii, and range across the North Pacific Ocean.	Causey 2008
Hawaiian Petrel	*Pterodroma sandwichensis (Pterodroma phaeopygia sandwichensis)*	Endangered	N/A	Breed in MHI, and range across the central Pacific Ocean.	32 FR 4001, Simons & Hodges 1998
Laysan Albatross	*Phoebastria immutabilis*	Not Listed	N/A	Breed mainly in Hawaii, and range across the North Pacific Ocean.	Causey 2009
Northern Fulmar	*Fulmarus glacialis*	Not Listed	N/A	Breed and range across North Pacific Ocean.	Hatch & Nettleship 2012
Short-Tailed Albatross	*Phoebastria albatrus*	Endangered	N/A	Breed in Japan and NWHI, and range across the North Pacific Ocean.	35 FR 8495, 65 FR 46643, BirdLife International 2017
Sea turtles					
Green Sea Turtle	*Chelonia mydas*	Endangered (Central South Pacific DPS)	N/A	Frequently seen. Nest at Rose Atoll in small numbers.	43 FR 32800, 81 FR 20057, Balacz 1994
Hawksbill Sea Turtle	*Eretmochelys imbricata*	Endangered[a]	N/A	Frequently seen. Nest at Rose Atoll, Swain's Island, and Tutuila.	35 FR 8491, NMFS & USFWS 2013, Tuato'o-Bartley et al. 1993
Leatherback Sea Turtle	*Dermochelys coriacea*	Endangered[a]	N/A	Very rare. One juvenile recovered dead in experimental longline fishing.	35 FR 8491, Grant 1994
Loggerhead Sea Turtle	*Caretta caretta*	Endangered (South Pacific DPS)	N/A	No known sightings. Found worldwide along continental shelves, bays, estuaries, and lagoons of tropical, subtropical, and temperate waters.	43 FR 32800, 76 FR 58868, Utzurrum 2002, Dodd 1990
Olive Ridley Sea Turtle	*Lepidochelys olivacea*	Threatened (Entire species, except for the endangered breeding population on the Pacific coast of Mexico)	N/A	Rare. Three known sightings.	43 FR 32800, Utzurrum 2002
Marine mammals					
Blainville's Beaked Whale	*Mesoplodon densirostris*	Not Listed	Non-strategic	Found worldwide in tropical and temperate waters	Mead 1989

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Blue Whale	*Balaenoptera musculus*	Endangered	Strategic	No known sightings. Occur worldwide and are known to be found in the western South Pacific.	35 FR 18319, Olson et al. 2015
Bottlenose Dolphin	*Tursiops truncatus*	Not Listed	Non-strategic	Distributed worldwide in tropical and warm-temperate waters. Pelagic stock distinct from island-associated stocks.	Perrin et al. 2009, Martien et al. 2012
Bryde's Whale	*Balaenoptera edeni*	Not Listed	Unknown	Distributed widely across tropical and warm-temperate Pacific Ocean.	Leatherwood et al. 1982
Common Dolphin	*Delphinus delphis*	Not Listed	N/A	Found worldwide in temperate and subtropical seas.	Perrin et al. 2009
Cuvier's Beaked Whale	*Ziphius cavirostris*	Not Listed	Non-strategic	Occur worldwide.	Heyning 1989
Dwarf Sperm Whale	*Kogia sima*	Not Listed	Non-strategic	Found worldwide in tropical and warm-temperate waters.	Nagorsen 1985
False Killer Whale	*Pseudorca crassidens*	Not Listed	Unknown	Found in waters within the U.S. EEZ of A. Samoa	Bradford et al. 2015
Fin Whale	*Balaenoptera physalus*	Endangered	Strategic	No known sightings but reasonably expected to occur in A. Samoa. Found worldwide.	35 FR 18319, Hamilton et al. 2009
Fraser's Dolphin	*Lagenodelphis hosei*	Not Listed	Non-strategic	Found worldwide in tropical waters.	Perrin et al. 2009
Guadalupe Fur Seal	*Arctocephalus townsendi*	Threatened	Strategic	No known sightings. Little known about their pelagic distribution. Breed mainly on Isla Guadalupe, Mexico.	50 FR 51252, Gallo-Reynoso et al. 2008, Fleischer 1987
Humpback Whale	*Megaptera novaeangliae*	Delisted Due to Recovery (Oceania DPS)	Strategic	Migrate through the archipelago and breed during the winter in American Samoan waters.	35 FR 18319, 81 FR 62259, Garrigue et al. 2007, SPWRC 2008
Killer Whale	*Orcinus orca*	Not Listed	Non-strategic	Found worldwide. Prefer colder waters within 800 km of continents.	Leatherwood & Dalheim 1978, Mitchell 1975, Baird et al. 2006
Longman's Beaked Whale	*Indopacetus pacificus*	Not Listed	Non-strategic	Found in tropical waters from the eastern Pacific westward through the Indian Ocean to the eastern coast of Africa.	Dalebout 2003
Melon-Headed Whale	*Peponocephala electra*	Not Listed	Non-strategic	Found in tropical and warm-temperate waters worldwide, primarily found in equatorial waters.	Perryman et al. 1994

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Minke Whale	*Balaenoptera acutorostrata*	Not Listed	Non-strategic	Uncommon in this region, usually seen over continental shelves in the Pacific Ocean.	Brueggeman et al. 1990
North Pacific Right Whale	*Eubalaena japonica*	Endangered[a]	Strategic	Extremely rare.	35 FR 18319, 73 FR 12024, Childerhouse et al. 2008, Wolman & Jurasz 1976, Herman & Antinoja 1977, Rice & Wolman 1978
Northern Elephant Seal	*Mirounga angustirostris*	Not Listed	Non-strategic	Females migrate to central North Pacific to feed on pelagic prey	Le Beouf et al. 2000
Pantropical Spotted Dolphin	*Stenella attenuata*	Not Listed	Non-strategic	Found in tropical and subtropical waters worldwide.	Perrin et al. 2009
Pygmy Killer Whale	*Feresa attenuata*	Not Listed	Non-strategic	Found in tropical and subtropical waters worldwide.	Ross & Leatherwood 1994
Pygmy Sperm Whale	*Kogia breviceps*	Not Listed	Non-strategic	Found worldwide in tropical and warm-temperate waters.	Caldwell & Caldwell 1989
Risso's Dolphin	*Grampus griseus*	Not Listed	Non-strategic	Found in tropical to warm-temperate waters worldwide.	Perrin et al. 2009
Rough-Toothed Dolphin	*Steno bredanensis*	Not Listed	Unknown	Found in tropical to warm-temperate waters worldwide. Common in A. Samoa waters.	Perrin et al. 2009, Craig 2005
Sei Whale	*Balaenoptera borealis*	Endangered	Strategic	Generally found in offshore temperate waters.	35 FR 18319, Barlow 2003, Bradford et al. 2013
Short-Finned Pilot Whale	*Globicephala macrorhynchus*	Not Listed	Non-strategic	Found in tropical to warm-temperate waters worldwide	Shallenberger 1981, Baird et al. 2013, Bradford et al. 2013
Sperm Whale	*Physeter macrocephalus*	Endangered	Strategic	Found in tropical to polar waters worldwide, most abundant cetaceans in the region.	35 FR 18319, Rice 1960, Barlow 2006, Lee 1993, Mobley et al. 2000, Shallenberger 1981
Spinner Dolphin	*Stenella longirostris*	Not Listed	Unknown	Common in American Samoa, found in waters with mean depth of 44 m.	Reeves et al. 1999, Johnston et al. 2008

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
Striped Dolphin	*Stenella coeruleoalba*	Not Listed	Non-strategic	Found in tropical to warm-temperate waters throughout the world	Perrin et al. 2009
Elasmobranchs					
Giant manta ray	*Manta birostris*	Threatened	N/A	Found worldwide in tropical, subtropical, and temperate waters. Commonly found in upwelling zones, oceanic island groups, offshore pinnacles and seamounts, and on shallow reefs.	Dewar et al. 2008, Marshall et al. 2009, Marshall et al. 2011.
Oceanic whitetip shark	*Carcharhinus longimanus*	Threatened	N/A	Found worldwide in open ocean waters from the surface to 152 m depth. It is most commonly found in waters > 20°C.	Bonfil et al. 2008, Backus et al, 1956, Strasburg 1958, Compagno 1984
Scalloped hammerhead shark	*Sphyrna lewini*	Threatened (Indo-West Pacific DPS)	N/A	Occur over continental and insular shelves, and adjacent deep waters, but rarely found in waters < 22°C. Range from the intertidal and surface to depths up to 450–512 m.	Compagno 1984, Schulze-Haugen & Kohler 2003, Sanches 1991, Klimley 1993
Corals					
N/A	*Acropora globiceps*	Threatened	N/A	Occur on upper reef slopes, reef flats, and adjacent habitats in depths from 0 to 8 m	Veron 2014
N/A	*Acropora jacquelineae*	Threatened	N/A	Found in numerous subtidal reef slope and back-reef habitats, including but not limited to, lower reef slopes, walls and ledges, mid-slopes, and upper reef slopes protected from wave action, and its depth range is 10 to 35 m.	Veron 2014
N/A	*Acropora retusa*	Threatened	N/A	Occur in shallow reef slope and back-reef areas, such as upper reef slopes, reef flats, and shallow lagoons. Depth range is 1 to 5 m.	Veron 2014
N/A	*Acropora speciosa*	Threatened	N/A	Found in protected environments with clear water and high diversity of Acropora and steep slopes or deep, shaded waters. Depth range is 12 to 40 meters and have been found in mesophotic habitat (40-150 m).	Veron 2014

Common Name	Scientific Name	ESA Listing Status	MMPA Status	Occurrence	References
N/A	*Euphyllia paradivisa*	Threatened	N/A	Found in environments protected from wave action on at least upper reef slopes, mid-slope terraces, and lagoons in depths ranging from 2 to 25 m depth.	Veron 2014
N/A	*Isopora crateriformis*	Threatened	N/A	Found in shallow, high-wave energy environments, from low tide to at least 12 meters deep, and have been reported from mesophotic depths (less than 50 m depth).	Veron 2014
Invertebrates					
Chambered nautilus	*Nautilus pompilius*	Threatened	N/A	Found in small, isolated populations throughout the Indo-Pacific on steep-sloped forereefs with sandy, silty, or muddy bottom substrates from depths of 100 m to 500 m.	83 FR 48948, CITES 2016

[a] These species have critical habitat designated under the ESA. See Table B-4.

Table B-4. ESA-listed species' critical habitat in the Pacific Ocean[a]

Common Name	Scientific Name	ESA Listing Status	Critical Habitat	References
Hawksbill Sea Turtle	*Eretmochelys imbricata*	Endangered	None in the Pacific Ocean.	63 FR 46693
Leatherback Sea Turtle	*Dermochelys coriacea*	Endangered	Approximately 16,910 square miles (43,798 square km) stretching along the California coast from Point Arena to Point Arguello east of the 3,000 meter depth contour; and 25,004 square miles (64,760 square km) stretching from Cape Flattery, Washington to Cape Blanco, Oregon east of the 2,000 meter depth contour.	77 FR 4170
Hawaiian Monk Seal	*Neomonachus schauinslandi*	Endangered	Ten areas in the Northwestern Hawaiian Islands (NWHI) and six in the main Hawaiian Islands (MHI). These areas contain one or a combination of habitat types: Preferred pupping and nursing areas, significant haul-out areas, and/or marine foraging areas, that will support conservation for the species.	53 FR 18988, 51 FR 16047, 80 FR 50925
North Pacific Right Whale	*Eubalaena japonica*	Endangered	Two specific areas are designated, one in the Gulf of Alaska and another in the Bering Sea, comprising a total of approximately 95,200 square kilometers (36,750 square miles) of marine habitat.	73 FR 19000, 71 FR 38277

[a] For maps of critical habitat, see https://www.fisheries.noaa.gov/national/endangered-species-conservation/critical-habitat.

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APPENDIX C: OBSERVER PROGRAM BYCATCH DATA

Table C-1. Total estimated bycatch in number of fish from the Pacific Islands Region Observer Program for the Hawaii deep-set longline fishery

Species	2016	2017	2018	2019	2020	2021
Lancetfish, Longnose	229,791	230,048	309,551	275,802	288,339	217,244
Lancetfish, Shortnose	5	0	16	9	9	5
Triggerfish, Rough	0	7	9	3	0	8
Triggerfish, Unidentified	0	0	0	0	0	0
Needle Fish, Gaping	0	0	0	0	0	0
Fanfishes	63	32	27	32	57	46
Pomfret, Bigtooth	0	0	0	0	0	0
Pomfret, Brama spp.	4,773	10,999	3,681	5,038	4,961	3,288
Pomfret, Dagger	6,464	7,443	8,188	8,929	5,667	9,450
Pomfret, Lustrous	62	92	131	115	66	225
Pomfret, Pacific	0	0	0	0	0	0
Pomfret, Rough	658	719	1,146	597	286	430
Pomfret, Sickle	2,284	1,845	1,488	1,510	1,337	1,525
Pomfret, Unidentified	290	258	306	294	113	165
Jack, Cottonmouth	5	10	0	0	14	5
Kahala, Unspecified (Amberjacks)	5	0	0	0	0	0
Pilotfish	NC	NC	NC	NC	6	0
Rainbow Runner	0	0	0	5	0	5
Yellowtail	0	0	0	0	0	0
Swallowers	122	115	288	336	258	67
Dolphinfish	5,277	4,428	5,177	4,896	2,505	3,092
Dolphinfish, Pompano	195	165	208	82	59	288
Flyingfish	0	0	4	0	0	0
Escolar	37,860	35,052	44,873	47,973	50,556	53,089
Escolar, Longfin	2,823	2,590	4,057	4,570	5,370	3,430
Escolar, Roudi's	414	338	301	510	253	268
Gemfish, Black	150	136	166	147	268	111
Oilfish	994	1,516	2,276	2,717	2,457	2,063
Snake Mackerel	110,655	120,432	79,308	49,481	43,862	67,877
Snake Mackerel, Unidentified	33	178	54	148	55	38
Billfish, Unidentified	499	498	628	1,298	454	275
Marlin, Black	0	0	0	0	0	0
Marlin, Blue	176	132	226	817	476	224
Marlin, Striped	878	772	1,243	2,781	1,186	536
Marlin, Unidentified	NC	NC	NC	NC	82	137
Sailfish	59	26	11	331	63	21
Spearfish, Shortbill	3,559	2,301	1,706	2,663	2,126	2,073

Species	2016	2017	2018	2019	2020	2021
Opah	963	721	1,885	1,315	932	144
Crestfish	184	130	133	82	72	45
Crestfish, Unicorn	NC	NC	NC	NC	8	8
Louvar	0	0	0	0	0	0
Mola, Common	148	86	151	183	114	165
Mola, Sharptail	91	133	51	59	55	33
Mola, Slender	1,480	692	630	196	226	19
Molas	NC	NC	NC	NC	16	0
Cigarfishes	49	58	48	80	48	54
Hammerjaw	415	255	290	468	420	71
Oarfish	0	0	0	0	6	0
Mackerel (incl. Chub, Spotted Chub)	0	0	0	0	0	0
Mackerel, Bullet	0	0	0	0	0	0
Tuna, Albacore	265	73	106	145	80	790
Tuna, Bigeye	20,723	20,800	24,053	19,481	20,596	12,360
Tuna, Bluefin	0	0	0	0	0	0
Tuna, Dogtooth	NC	NC	NC	NC	4	0
Tuna, Kawakawa	0	0	0	0	0	0
Tuna, Skipjack	5,502	5,559	2,585	4,366	2,833	3,074
Tuna, Southern Bluefin	NC	NC	NC	NC	0	0
Tuna, Unidentified	5,731	6,337	5,164	6,855	4,097	5,052
Tuna, Yellowfin	5,615	9,455	5,201	7,434	6,138	10,804
Wahoo	1,989	1,664	2,245	3,404	1,784	2,080
Barracuda, Great	271	197	210	204	433	233
Puffer, Pelagic	798	745	589	267	526	538
Puffer, Unidentified	42	32	48	51	101	63
Pufferfish, Porcupine	NC	NC	NC	NC	30	5
Ribbonfish, Scalloped	21	24	3	29	7	31
Ribbonfish, Tapertail	286	216	370	207	164	215
Ribbonfishes	NC	NC	NC	NC	0	8
Scabbardfish, Razorback	38	5	51	20	16	5
Scabbardfish, Unidentified	0	0	4	0	0	7
Bony Fish, Other Identified	37	35	58	54	29	27
Bony Fish, Unidentified	357	214	265	368	60	1,104
Swordfish	NA	4,282	3,851	2,228	2,495	1,485
Stingray, Pelagic	6,958	6,608	7,234	10,949	9,357	8,526
Manta Ray, Giant	22	0	3	0	7	11
Manta/Mobula	16	26	39	82	43	66
Mobula (Devil Ray)	120	121	86	218	76	251
Ray, Other Identified	0	0	0	0	0	0
Ray, Unidentified	4	7	14	0	6	26

Species	2016	2017	2018	2019	2020	2021
Shark, Bigeye Thresher	11,639	9,551	6,519	10,399	9,754	13,313
Shark, Common Thresher	0	6	0	6	23	29
Shark, Pelagic Thresher	1,403	47	135	212	132	158
Shark, Unid. Thresher	476	476	586	659	400	485
Shark, Bignose	0	5	5	0	0	0
Shark, Blacktip Reef	0	3	0	0	0	0
Shark, Blue	102,250	123,166	119,306	134,067	139,284	124,209
Shark, Galapagos	16	32	55	41	37	39
Shark, Oceanic White-Tip	2,188	1,257	1,092	2,125	1,959	3,084
Shark, Sandbar	20	50	26	28	17	39
Shark, Silky	2,538	1,417	1,071	1,831	959	1,419
Shark, Tiger	34	19	31	20	36	26
Shark, Cookie Cutter	24	3	31	5	21	15
Shark, Longfin Mako	228	124	251	212	340	193
Shark, Salmon	0	0	0	6	0	8
Shark, Shortfin Mako	6,205	8,184	8,834	7,362	7,052	4,678
Shark, Unid. Mako	42	79	95	171	82	36
Bigeye Sand Tiger Shark	0	24	21	22	31	18
Shark, Crocodile	2,132	3,449	2,009	3,206	1,994	1,704
Shark, Scalloped Hammerhead	0	5	0	0	0	0
Shark, Smooth Hammerhead	167	140	92	184	195	215
Shark, Unid. Hammerhead	44	14	49	32	43	49
Dogfish, Velvet	2,225	2,219	3,063	2,216	2,639	1,629
Shark, Other Identified	10	0	0	0	0	5
Shark, Unidentified	853	1,300	1,457	1,066	454	1,131

Note: Species that did not have a unique species code prior to 2020 are listed as “NC” for each year from 2016 to 2019.

Table C-2. Total estimated bycatch in number of fish from the Pacific Islands Region Observer Program for the Hawaii shallow-set longline fishery

Species	2016	2017	2018	2019	2020	2021
Lancetfish, Longnose	1,784	2,728	1,211	1,232	1,268	2,480
Lancetfish, Shortnose	0	0	0	0	0	0
Triggerfish, Rough	0	0	0	0	0	0
Triggerfish, Unidentified	0	0	0	0	0	0
Needle Fish, Gaping	0	0	0	0	0	0
Fanfishes	1	1	0	0	1	0
Pomfret, Bigtooth	0	0	0	0	0	0
Pomfret, Brama spp.	50	50	42	27	45	21
Pomfret, Dagger	11	13	5	2	3	21
Pomfret, Lustrous	0	1	0	0	1	0
Pomfret, Pacific	0	0	0	0	0	0
Pomfret, Rough	2	0	0	0	0	0

Species	2016	2017	2018	2019	2020	2021
Pomfret, Sickle	0	0	0	1	0	0
Pomfret, Unidentified	0	0	2	4	0	0
Jack, Cottonmouth	0	0	0	0	0	0
Kahala, Unspecified (Amberjacks)	0	0	0	0	0	0
Rainbow Runner	0	0	0	0	0	0
Yellowtail	0	0	0	0	0	0
Swallowers	0	0	0	0	0	0
Dolphinfish	83	107	34	18	20	75
Dolphinfish, Pompano	1	0	0	0	0	1
Flyingfish	0	0	0	0	0	0
Escolar	459	765	150	122	152	0
Escolar, Longfin	2	3	0	0	0	521
Escolar, Roudi's	0	0	0	0	0	2
Gemfish, Black	0	0	0	0	0	0
Oilfish	171	327	114	57	248	1
Snake Mackerel	315	638	62	16	31	219
Snake Mackerel, Unidentified	1	0	3	3	0	98
Billfish, Unidentified	6	4	2	2	3	0
Marlin, Black	0	0	0	0	0	10
Marlin, Blue	11	7	5	0	7	0
Marlin, Striped	55	81	44	6	31	7
Marlin, Unidentified	NC	NC	NC	NC	0	55
Sailfish	0	0	0	0	0	2
Spearfish, Shortbill	53	19	8	3	12	0
Opah	110	70	20	7	22	12
Crestfish	0	0	0	0	0	0
Crestfish, Unicorn	NC	NC	NC	NC	0	0
Louvar	0	0	0	0	0	0
Mola, Common	31	46	41	5	41	0
Mola, Sharptail	0	0	1	0	0	9
Mola, Slender	0	1	0	0	0	0
Molas	NC	NC	NC	NC	0	1
Cigarfishes	1	2	0	0	0	0
Hammerjaw	0	0	0	0	0	0
Mackerel (incl. Chub, Spotted Chub)	0	0	0	0	0	0
Mackerel, Bullet	0	0	0	0	0	0
Tuna, Albacore	5	28	6	1	51	0
Tuna, Bigeye	121	278	153	55	77	63
Tuna, Bluefin	0	0	0	0	0	79
Tuna, Dogtooth	NC	NC	NC	NC	0	0
Tuna, Kawakawa	0	0	0	0	0	0

Species	2016	2017	2018	2019	2020	2021
Tuna, Skipjack	3	2	1	4	0	0
Tuna, Unidentified	5	30	11	12	16	9
Tuna, Yellowfin	27	125	55	8	46	28
Wahoo	1	4	0	0	0	71
Barracuda, Great	0	0	0	0	0	2
Puffer, Pelagic	21	9	0	0	3	0
Puffer, Unidentified	0	0	0	0	0	9
Pufferfish, Porcupine	NC	NC	NC	NC	0	7
Ribbonfish, Scalloped	0	0	0	0	0	0
Ribbonfish, Tapertail	5	4	0	0	5	1
Ribbonfishes	NC	NC	NC	NC	0	0
Scabbardfish, Razorback	0	0	0	0	0	0
Scabbardfish, Unidentified	0	0	0	0	0	0
Bony Fish, Other Identified	2	0	1	1	0	0
Bony Fish, Unidentified	22	7	8	1	3	0
Swordfish	1,049	1,419	735	254	251	30
Stingray, Pelagic	245	284	440	82	328	499
Manta Ray, Giant	0	2	0	0	0	171
Manta/Mobula	3	4	0	0	1	0
Mobula (Devil Ray)	8	5	0	0	0	4
Ray, Other Identified	0	0	0	0	0	2
Ray, Unidentified	1	0	0	0	0	0
Shark, Bigeye Thresher	57	72	13	3	21	0
Shark, Common Thresher	3	3	0	2	2	58
Shark, Pelagic Thresher	0	0	0	0	0	0
Shark, Unid. Thresher	2	6	1	1	7	0
Shark, Gray Reef	0	0	0	0	0	7
Shark, Bignose	0	0	0	0	0	1
Shark, Blacktip Reef	0	0	0	0	0	0
Shark, Blue	11,853	10,102	4,115	4,225	6,949	0
Shark, Galapagos	0	0	0	0	1	6,446
Shark, Oceanic White-Tip	32	29	1	0	13	0
Shark, Sandbar	2	0	0	0	0	37
Shark, Silky	2	9	1	0	1	0
Shark, Tiger	0	1	0	0	0	8
Shark, Cookie Cutter	3	6	1	2	2	0
Shark, Longfin Mako	2	5	1	1	2	2
Shark, Salmon	6	2	1	5	3	1
Shark, Shortfin Mako	968	1,085	537	298	1,151	2
Shark, Unid. Mako	6	0	0	2	1	808
Bigeye Sand Tiger Shark	0	0	0	0	0	0
Shark, Crocodile	0	3	0	0	0	0

Species	2016	2017	2018	2019	2020	2021
Shark, Scalloped Hammerhead	0	0	0	0	0	2
Shark, Smooth Hammerhead	1	1	0	0	1	0
Shark, Unid. Hammerhead	1	0	0	0	0	3
Dogfish, Velvet	1	0	0	0	0	6
Shark, Other Identified	0	0	0	0	0	0
Shark, Unidentified	65	52	19	44	32	0

Note: Species that did not have a unique species code prior to 2020 are listed as "NC" for each year from 2016 to 2019.

Table C-3. Total estimated bycatch in number of fish from the Pacific Islands Region Observer Program for the American Samoa longline fishery

Species	2016	2017	2018	2019	2020	2021
Cardinalfish, Blackmouth	NC	NC	NC	NC	NA	NA
Lancetfish, Longnose	6,228	5,881	5,482	4,991	4,063	3,913
Lancetfish, Shortnose	9	11	3	13	3	4
Fanfishes	0	0	0	0	2	1
Pomfret, Dagger	141	203	151	344	85	85
Pomfret, Lustrous	27	22	23	20	28	27
Pomfret, Rough	4	6	16	24	8	8
Pomfret, Sickle	459	412	388	535	407	425
Pomfret, Brama spp.	193	191	112	232	145	135
Pomfret, Unidentified	4	3	0	0	1	0
Jack, Cottonmouth	5	16	13	0	5	5
Rainbow Runner	4	3	3	0	3	2
Yellowtail	0	3	3	0	1	1
Swallowers	3	0	0	0	1	0
Dolphinfish	64	100	106	18	163	147
Dolphinfish, Pompano	0	0	2	5	1	1
Soapfish, Goldenstripe	7	6	15	34	10	10
Escolar	7,756	7,773	5,567	5,094	5,540	5,517
Escolar, Longfin	8,820	9,652	5,605	6,609	5,037	4,788
Escolar, Roudi's	751	774	509	521	417	406
Gemfish, Black	82	41	23	31	57	54
Oilfish	516	586	567	718	485	498
Snake Mackerel	1,049	1,026	1,183	1,689	1,568	1,502
Snake Mackerel, Unidentified	18	15	0	0	3	2
Marlin, Blue	219	167	108	144	294	289
Marlin, Striped	167	160	44	279	131	121
Sailfish	204	124	93	163	98	97
Spearfish, Shortbill	262	316	210	447	423	390
Billfish, Unidentified	75	57	50	43	40	32
Opah	116	98	46	109	68	66
Crestfish	85	115	106	129	124	122

Species	2016	2017	2018	2019	2020	2021
Mola, Common	9	13	11	0	9	8
Mola, Sharptail	4	8	4	0	2	2
Mola, Slender	1,327	2,595	1,648	193	2,210	2,074
Cigarfishes	17	14	13	9	8	10
Hammerjaw	48	39	13	13	28	26
Tuna, Albacore	1,078	1,520	1,630	1,584	1,136	1,077
Tuna, Bigeye	656	476	736	564	830	778
Tuna, Skipjack	781	830	867	1,196	1,510	1,366
Tuna, Yellowfin	1,873	1,702	1,345	1,180	1,476	1,363
Wahoo	425	517	380	326	728	690
Tuna, Unidentified	1,340	1,595	1,326	824	1,473	1,313
Barracuda, Great	659	729	542	747	442	434
Puffer, Pelagic	4	15	23	27	12	11
Puffer, Unidentified	2	3	5	5	1	1
Ribbonfish, Tapertail	40	34	25	27	33	31
Scabbardfish, Razorback	13	16	20	16	14	13
Swordfish	367	257	199	706	211	260
Bony Fish, Other Identified	59	120	83	24	34	34
Bony Fish, Unidentified	104	10	15	58	31	34
Stingray, Pelagic	19,459	16,306	8,156	11,908	8,395	8,259
Manta Ray, Giant	0	0	0	0	3	3
Mobula (Devil Ray)	24	31	18	0	12	12
Manta/Mobula	7	6	8	24	4	5
Ray, Unidentified	9	4	0	0	2	2
Shark, Bigeye Thresher	196	254	253	148	159	158
Shark, Pelagic Thresher	4	11	12	0	3	3
Shark, Unid. Thresher	82	54	27	27	25	25
Shark, Blue	4,490	4,224	3,359	2,681	2,958	2,721
Shark, Galapagos	0	0	5	11	7	4
Shark, Oceanic White-Tip	788	484	513	870	469	467
Shark, Silky	1,874	1,695	1,212	1,840	1,227	1,238
Shark, Longfin Mako	21	20	19	47	24	20
Shark, Shortfin Mako	321	231	229	169	234	232
Shark, Unid. Mako	0	0	0	13	6	5
Shark, Crocodile	5	8	9	5	5	8
Shark, Scalloped Hammerhead	8	7	8	0	4	3
Shark, Smooth Hammerhead	0	0	5	9	2	2
Shark, Unid. Hammerhead	6	3	0	0	2	2
Dogfish, Velvet	2	0	0	0	4	4
Shark, Unidentified	56	35	133	96	62	57

Note: Species that did not have a unique species code prior to 2020 are listed as “NC” for each year from 2016 to 2019.

APPENDIX D: LIST OF PLAN TEAM MEMBERS

Member; Title	Plan Team Role
Donald Koybayashi; NMFS PIFSC	Chair; Habitat and Living Marine Resources
Réka Domokos; NMFS PIFSC	Ecosystems
Russell Ito; NMFS PIFSC	Pelagics
Ashley Tomita; NMFS PIFSC	Pelagics
Kirsten Leong; NMFS PIFSC	Human Dimensions
Emily Crigler; NMFS PIRO	Fisheries Policy
Michael Kinney; NMFS PIFSC	Life History
Minling Pan; NMFS PIFSC	Economics
T. Todd Jones; NMFS PIFSC	Protected Resources
Phoebe Woodworth-Jefcoats; NMFS PIFSC	Oceanography
Robert Ahrens; NMFS PIFSC	Management Strategy Evaluation
Valerie Post; NMFS PIRO	International Fisheries
Chelsea Young; NMFS PIRO	Protected Resources
Melissa Snover; NMFS PIRO	Protected Resources
Jenny Suter; NMFS PIFSC	Fisheries Research & Monitoring
Lynn Rassel, NMFS PIFSC	Observer Program
Jason Helyer; Hawaii DAR	Hawaii
Sean Felise; American Samoa DMWR	American Samoa
Domingo Ochavillo; American Samoa DMWR	American Samoa
Kelsey Lizama; CNMI DFW	CNMI
Nathan VanEe; CNMI DFW	CNMI
Brent Tibbatts; Guam DAWR	Guam
Frank Roberto; Guam DAWR	Guam
Bryan Ishida; Hawaii DAR	Ex-Officio
Felipe Carvalho; NMFS PIFSC	Ex-Officio

APPENDIX E: PELAGIC PLAN TEAM REPORT – MAY 2024

Consistent with direction from the Council's Pelagic Plan Team at its regular meeting in May 2024, the Pelagic Plan Team's meeting report is appended to this annual SAFE report to provide readers with important context regarding fishery performance trends that are not otherwise provided in the annual SAFE report. The Pelagic Plan Team report begins on the following page.

WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

Pelagic Fishery Ecosystem Plan Team Meeting
May 16-17, 2024
8:30 a.m. – 4:00 p.m. (Hawaii)
7:30 a.m. – 3:00 p.m. (American Samoa)
4:30 a.m. – 12:00 p.m. + 1 day (Guam and CNMI)

DRAFT Meeting Report

1. Report on Previous Pelagic Plan Team (PPT) Recommendations

Western Pacific Regional Fishery Management Council (Council) staff reviewed the statuses of Plan Team recommendations from the May 2023 meeting. Some status updates were provided later in the meeting associated with agenda items.

2. 2023 Pelagic Annual SAFE Reports

A. Fishery Data Modules

i. American Samoa

Domingo Ochavillo, American Samoa Department of Marine and Wildlife Resources (DMWR), presented updates for American Samoa pelagic fisheries in 2023 using data recently provided by the Pacific Islands Fisheries Science Center (PIFSC) Fisheries Research and Monitoring Division (FRMD). The number of vessels landing pelagic species has been experiencing a declining trend over the past decade despite a slight increase in 2023 considering all methods, but there was one fewer longline vessel in 2023 than in 2022. The number of active troll vessels was similar to last year. The longlining sets decreased and trolling trips increased in 2023 from the previous year in the midst of an overall declining trend for the longline fishery. Tied with decreasing effort, total landings for tuna and non-tuna pelagic management unit species (PMUS) decreased notably in 2023 from the previous year driven by decreases for albacore. Commercial landings also decreased for tuna, while non-tuna PMUS were relatively consistent from 2022 to 2023. Species-specific trends in catch and catch per unit effort (CPUE) were also presented, with the most notable trends being the increase in longline catch rates for yellowfin tuna despite nearly zero troll catch of the species in 2022 and a substantial decrease in catch rate for skipjack tuna. Trolling effort in 2023 increased from a relative low in 2022 but had similar levels of catch and low CPUE.

Plan Team discussion on the review of this section included the following:

- The Plan Team sought clarity on the increase in releases of bigeye and yellowfin tuna. PIFSC staff should discuss these trends with fishers when they visit American Samoa next week.
  - Increased electronic reporting may be related to the shift in trend.
- Species-specific trends in catch appear similar to Hawaii.
- The Plan Team noted an upcoming discussion on whether the current creel surveys are adequate to capture data from the American Samoa troll fishery.
- There was confusion about the association between creel survey data and the Fish Aggregating Device (FAD) Program funded by the Sport Fish Restoration Program under the

US Fish and Wildlife Service (USFWS).

  - The FAD Program is intended to collect participation data from every trip and is managed through DMWR.
  - There are dedicated interview protocols and staff for this program, and it is completely separate from alia trolling data collected through creel surveys.
  - Cross-checking participation between the two data streams could potentially help smooth variability.

ii. CNMI

Angela Dela Cruz, Commonwealth of the Northern Mariana Islands (CNMI) Division of Fish and Wildlife (DFW), presented updates for pelagic fisheries of the CNMI in 2023. Last year, expanded total pelagic catch decreased nearly 47% from 2022. However, there were multiple periods over the course of the year where boat-based creel survey data collection stopped due to a depletion in grant funding and a resulting lack of fuel for data collectors; many survey days were missed. The number of fishers and fishing trips landing pelagic species from commercial receipt invoices also decreased, as the DFW has not yet accounted for all 2023 invoices. Additionally, effort data may be misrepresented because each commercial invoice is counted as a single trip, but a fisher could sell fish from one trip to multiple vendors. Many data summaries indicated decreasing trends in the pelagic fisheries due to these complications. There was a very slight decrease in the number of trolling trips and hours in the CNMI pelagic fisheries, and the average length of fishing trips slightly decreased as well.

Plan Team discussion on the review of this section included the following:

- The number of reporting markets and hotels is high for the CNMI due to strong relationships between DFW and the commercial purchasers. There are complications with high turnover.
  - It was noted that fish sales direct to consumers do not need to be reported.
- Plan Team members observed similar downward trends for small boat fisheries in Hawaii, especially since the pandemic in 2020. The decline of charter fishing effort may be due to fewer tourists.
  - DFW operates a charter survey program where staff accompany the fishing trips.
- The Plan Team was concerned that catch is about one-fifth of what it has usually been.
  - This is not an issue with the expansion, but due to lack of data collection in some months associated with delays in financing and funding drawdown.
    - There were notably fewer survey days in 2023.
  - The Western Pacific Fisheries Information Network (WPacFIN) could implement a "borrowing" mechanism to assist the expansion for months where no data were collected, but this would increase variability in the data.
- With respect to issues stemming from each invoice being counted as a single trip, HDAR noted that their fishery data is reported by purchase report and can only be linked to fishing trips using unique identifiers.
- The Archipelagic Plan Team generated a work item to review 2023 data from the CNMI given the low values, and DFW should provide a few items on what PIFSC should look into regarding the low boat-based catch and high number vendors reporting associated with low commercial catch. Pelagic data should also be reviewed.

iii. Guam

Frank Roberto, Guam Division of Aquatic and Wildlife Resources (DAWR), presented updates for Guam pelagic fisheries in 2023. Last year, DAWR completed 93 of its 96 scheduled creel survey days, documenting 837 trips and conducting 457 interviews. Typhoon Mawar in May 2023 notably damaged the Guam Fisherman's Cooperative Association (GFCA) and hampered commercial reporting. Additionally, there were 144 days with Notices to Mariners by the US military in area W-517 due to military exercises, restricting fishing access to banks south of Guam. Access was further impacted by 110 small-craft advisory days, 142 high-surf advisory/warning days, and 14 typhoon warning days (seven in May for Typhoon Mawar and seven in October for Typhoon Bolaven) in 2023. There was a slight increase in the number of active troll vessels in Guam pelagic fisheries compared to 2022. The total estimated pelagic landings increased slightly from 2022, driven increases in landings for skipjack and yellowfin tuna. Decreases were observed for non-tuna PMUS, mostly driven by mahimahi. Commercial landings were not able to be reported due to data confidentiality rules regarding the presentation of data from less than three sources (i.e., dealers/vendors). Overall trolling catch rates increased 43% in 2023 from the previous year.

Plan Team discussion on the review of this section included the following:

- Information about inclement weather is useful, and the Plan Team suggested including considerations for fishing access associated with weather alongside the Archipelagic Plan Team work item to review the number of high surf/small-craft advisory warnings, military announcements, etc., to determine impact on fishery performance and survey days.
    - Weather data are provided by NOAA, though fishers generally use third party applications.
- DAWR requested information on temperature at 200-300 m depth around Guam and will work with PIFSC ESD to determine an appropriate grid in which to generate data.
- The Plan Team discussed whether there are any climate indicators that may help explain increases in yellowfin tuna catch seen across the region.
    - There may be utility in overlaying data summaries to see what indicators should be evaluated further for yellowfin tuna.
    - Yellowfin tuna could be a primary candidate on which to generate additional fishery-related indicators (i.e., similar to the bigeye tuna recruitment index).

iv. Hawaii

Russell Ito, PIFSC FRMD, presented updates for Hawaii pelagic fisheries in 2023. Overall, there was a decrease in Hawaii commercial marine licenses (CML) in 2023 from 2022 by 69 licenses. The 956 longline licenses in 2022 were an all-time high, and the number of trolling licenses increased slightly in 2023. Across all Hawaii pelagic fisheries in 2023, there were slightly more landings than 2022, but revenues decreased from just over $133 million to about $118 million due to a $0.50 decrease in average fish price. Tunas continue to dominate pelagic fisheries in Hawaii, followed by billfish and other PMUS. Total catch in 2023 was slightly higher than average due to an increase in tuna landings. While there has been a slight decrease in catch of bigeye tuna from 2015 to 2023, catches of yellowfin have increased over the same time period. Billfish catch has generally been decreasing from its peak in 2017. Total catch of other PMUS has been decreasing since 2015 but, in 2023, increased from the relative low observed in 2022. This slight uptick was driven increases for mahimahi and ono in 2023.

With respect to major gear types harvesting pelagic species in Hawaii, the deep-set longline fishery had a slight increase in vessels and trips from 2022 to 2023. The number of hooks set also increased. Revenue for the fishery decreased from the previous year but was in line with the decadal average. CPUE for the gear type continues to decline for the primary target species, bigeye tuna. In the shallow-set longline fishery, there was an increase in vessels, trips, and sets in 2023 representing levels comparable to 2017. Revenue for the shallow-set fishery decreased from the notable high in 2022 due to lower fish price. The main Hawaiian Islands (MHI) troll fishery had decreases in effort in both fishers and days fished from 2022 but remained above the lows of 2020. Commensurate with the slight decrease in catch, adjusted revenue also declined. The MHI handline fishery experienced decreases in both participants and days fished from 2022 to 2023; catch and revenue decreased alongside effort. The offshore handline fishery had relatively consistent participation and effort but catch and revenue both saw large decreases.

Plan Team discussion on the review of this section included the following:

- There has been a decline in the number of retained sharks associated with a new Convention on Trade of Endangered Species of Wild Fauna and Flora (CITES) rule in 2020 requiring a permit to land shark species that were caught on the high seas.
    - This information should be included in the narrative of the Hawaii module.
    - Fishers do not want to deal with documentation or the potential of getting in trouble, so the sharks are usually just released.
    - Sharks are less than 10,000 lbs of catch out of a total 30 million lbs; there is no market for the species, as the United Fishing Agency (UFA) will not sell any sharks.
    - There was disagreement among Plan Team members whether shark data summaries should be retained in the report or not.
- As discussed during the Joint Plan Team meeting, a working group will evaluate the feasibility and utility of incorporating economic data into fishery performance modules.
- With respect to changes in average size of longline catch over time, there may be connections to operational changes (i.e., gear behavior) in the fisheries emphasizing differences in catchability.
    - There was a cooperative research project in 2023 that worked with two deep-set longline vessels that were outfit with time-depth recorders (TDRs) that may be able to provide relevant information in a few years.
- There were questions about the decline in price for Hawaii longline and troll fisheries in 2023 relative to 2022, noting that the handline and offshore handline prices increased.
    - This may be because handline fisheries land most of their catch on the Big Island, a different market.
    - 2022 may have been a “dream scenario” for fishers with respect to price. People had to pay more for goods during the pandemic, but there is decreased demand more recently despite the quick recovery.

v. International

Council staff provided updates regarding trends in fishery performance through 2022 using data sourced from the Western and Central Pacific Fisheries Commission (WCPFC), the Inter-American Tropical Tuna Commission (IATTC), the International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean (ISC), and the Pacific Community (SPC). Total estimated catch of tuna species in the Pacific Ocean was more than 3 million mt in 2022, mostly comprised of skipjack and yellowfin tuna with smaller contributions from bigeye tuna and albacore. Consistent with previous years, purse seining contributed the largest component of the total catch of 2.7 million mt. While the trends in catch for historically dominant purse seine fleets in the Western and Central Pacific Convention Area (WCP-CA) have been relatively stable since 1996, the combined Pacific Islands fleet purse seine catch increased from 214,218 mt in 2002 to 874,580 mt in 2022. In contrast, over the past decade, the number of U.S. purse seine vessels has declined substantially as many reflag. Longline tuna catches in the Pacific Ocean have been relatively stable over the past decade at ~100,000 mt but experienced increases in 2022. Incidentally caught species (i.e., billfish) are dominated by swordfish at nearly 40,000 mt annually. The pole and line fishery harvesting skipjack and mostly comprised by the Japanese distant water fleet due to diminishing Pacific Island fleets has been on a slight declining trend since 2018. There were five stock assessments relevant to the Council's PMUS in 2023: North Pacific albacore, Western and Central Pacific Ocean (WCPO) bigeye tuna, North Pacific striped marlin, North Pacific swordfish, and WCPO yellowfin tuna. North Pacific striped marlin were the only species with assessment results indicating that overfishing was occurring.

Plan Team discussion on the review of this section included the following:

- Based on the target rebuilding reference point and maximum sustainable yield (MSY), the North Pacific striped marlin stock is overfished. However based on minimum stock sized threshold (MSST), it is not overfished.
    - There was an analysis to meet the rebuilding targets by 2034 that was approved at WCPFC16.
- The Pacific Islands purse seine fleet is at least in part comprised of flags of convenience. Many of the boats are owned by the Parties to the Nauru Agreement (PNA) countries.
- US bigeye tuna CPUE declined to a greater extent than CPUE for Japan and Korea. This likely is associated with operational characteristics of the fleet impacting fishing power.
    - The La Niña/El Niño regime may account for some impacts.
        - PIFSC is working to better understand how these environmental cycles impact longline fishery performance, but there has been no observed affect so far.
    - Areas in which the fleets operate are also different.
    - Distant water fleets are fishing closer to their home nations due to fuel prices, creating a paucity of data from the Eastern Pacific.
    - The transition from wire leaders to monofilament leaders is not likely impacting catch rates.
    - Declines in bigeye tuna may be offset but increases in yellowfin tuna.

Discussion on data modules

Regarding the fishery data modules generally, Plan Team members discussed including complete time series in the annual SAFE reports in lieu of the 10-year time series included currently. Plan Team members generally agreed that the additional context from including more data would be helpful, and it would not take much more effort to include additional years of data in a figure or data summary table. The starting year of the time series for each data stream or island area does not need to be standardized. Members also noted that, with Ito's forthcoming retirement, PIFSC needs to confer with HDAR regarding the future of the Hawaii pelagic fishery performance module; HDAR remains interested in supporting the development of sections presenting data on Hawaii pelagic small boat fisheries. The process may be more complicated than it appears on the surface since part of the Hawaii module looks at total landings from both longline and small boat fisheries.

The Plan Team ultimately suggested combining the efforts to include complete time series of fishery performance alongside the working group tasked with incorporating economic data into the fishery performance modules. The cross-Plan Team working group's goal would be to more broadly revamp the annual SAFE report data modules based on what makes sense for each island area rather than focusing on particular aspects. Revisions should be identified before the end of the year to allow WPacFIN sufficient time to ensure the code will allow for the changes. Additionally, interpretations and narrative descriptions of historical data will be needed alongside the longer time series, which is tangentially associated with a previous Plan Team work item to develop legacy timelines of regulatory and data collection changes in regional fisheries. Noting the large number of moving parts for this effort, the Plan Team shifted its recommendation to form a large working group with subgroups to address different areas and report back at the intersessional meeting. This will likely be a multi-year effort and should involve stakeholders to identify useful portions of the reports as well as an external review.

B. Ecosystem Considerations Modules

i. Protected Species

Council staff provided updates to the protected species section of the 2023 annual SAFE report as provided by the Protected Species Work Team. In 2023, the Hawaii shallow-set fishery had slightly decreased effort. There were 48 interactions with loggerhead, 11 interactions with leatherback, and 2 interactions with olive ridley sea turtle. Most sea turtle interactions in 2023 by the shallow-set fishery were below the incidental take statement (ITS) levels except for loggerheads, for which ESA consultation was reinitiated in 2023 and completed in March 2024. Further, only two trips reached the leatherback trip interaction limit of two before returning to port, while one trip exceeded the loggerhead trip interaction limit. There were no observed pinniped interactions in 2023. Oceanic whitetip shark (OWT) interactions in 2023 were relatively low.

In the Hawaii deep-set longline fishery in 2023, observer coverage decreased to 17.4%. A new Biological Opinion (BiOp) for the deep-set fishery was completed in May 2023, and interactions with ESA-listed species will be tracked in relation to the new ITS using a 5-year running sum. Olive ridley interactions have been reduced over the past four years relative to levels observed in 2015 through 2019. Marine mammal interactions in the fishery were relatively low in 2023 and there were six observed takes of false killer whales (FKW). The FKW Take Reduction Plan (FKWTRP), implemented in 2012, contains a trigger for the closure of the Southern Exclusion Zone (SEZ), which was not met and the area remained opened through 2022 and 2023. The trigger to close the SEZ was revised in February 2024 to three mortalities and serious injuries due to changes in observer coverage. Regarding seabird interactions in the deep-set fishery, interactions with black-footed albatrosses have continued declining since 2019, likely associated with prevailing La Niña and PDO conditions. Interactions with OWT remain relatively high but within expected levels, and the Work Team noted additional years of data is necessary to evaluate the effect of the wire leader prohibition.

The American Samoa longline fishery had observer coverage on 8.8% of trips in 2023. A new BiOp for the American Samoa longline fishery was released in May 2023, and interactions with ESA-listed species will be tracked in relation to the new ITS using a 5-year running sum. There were no observed takes of sea turtles, marine mammals, or seabirds in the fishery except for one olive ridley and two loggerhead sea turtles. The number of takes for OWT was relatively low. No substantive updates were made for non-longline pelagic fisheries sections of the report for 2023.

The Work Team proposed an addition to the section on the identification of research, data, and assessment needs for maintaining observer coverage in the longline fisheries to facilitate data collection to identify changes in ecosystem composition. Council staff requested the Plan Team to provide direction on including narrative updates for OWT interaction patterns.

Plan Team discussion on the review of this section included the following:

- The review of OWT interaction patterns in the Hawaii deep-set longline fishery includes examining variability and noting inverse similarities with olive ridley and black-footed albatross interaction patterns. There may also be linkages to oceanographic factors.
    - The increased OWT interactions may also be due to changes in population.
    - Because OWT age at maturity is eight years, WCPFC provisions on the non-retention of sharks should show results within that time..
        - The stock assessment accounts more for 0-8 year old OWT but there would not be an observable change until eight years later.
        - A new assessment will be completed in 2025.
    - Years with high CPUE were relatively warm.
- The Plan Team approved of the update to the module subsection on research, data, and assessment needs.

3. PPT Review: Working Group and Action Item Progress

A. SSLL Turtle Trip Interaction Limit Evaluation

Council staff, Ito, and Ahrens presented a report of a Plan Team working group review of Hawaii shallow-set longline fishery performance under the loggerhead and leatherback turtle trip interaction limits measure, consistent with a recommendation from the May 2023 Plan Team meeting. The working group reviewed data through 2023, which includes three years of data since the limits was implemented in September 2020. The measure has been successful in maintaining a year-round supply of swordfish given that the fishery has been able to operate without a closure. There have been a few cases of vessels reaching the loggerhead or leatherback trip limit, but the fishery has not reached the fleet-wide hard cap limit for leatherback turtles, and there is no fleet-wide limit for loggerhead turtles. Available data for loggerhead and leatherback turtle interactions in the fishery since the trip limit implementation are limited, and comparisons of pre- and post-measure implementation data are also confounded by the short seasons in the two years preceding the trip limit measure as well as the higher loggerhead turtle interaction rates starting around 2017 that limit the pre-measure comparison to the three years prior to implementation. The working group found that additional years of monitoring is warranted before the Council considers any revisions to the trip limits.

Plan Team discussion on the status update from this working group included the following:

- Loggerhead sea turtles are usually juveniles and are released alive with high survivorship. Even though interactions are now closer to 50 when they were around 30 previously, there is likely no large impact to the population.
- The Plan Team endorsed the working group report and agreed that there is no immediate need to revise the trip limits based on recommendations from the working group.
- The trip limits should be examined and potentially re-evaluated again in two to three years.
    - There will be a persistent problem with 2018 and 2019 being capped years.
    - There is ongoing research on nesting beach data for population trajectories over the next two to three years.
        - The working group discussed that the population assessment should be done a a regular interval of every seven to ten years.

        - There is a five to eight year lag from annual nesting levels to increased turtles coming into the area in which the Hawaii longline fleets operate.
        - Relationship need to be fostered with Japanese researchers to obtain nesting data.
    - If the number of interactions increases notably, the ITS will be triggered.
- The Plan Team also discussed whether the Council may need to consider alternative trip limit monitoring mechanisms in light of the reduced observer coverage levels in the Hawaii longline fishery. Trip limits in the shallow-set longline fishery are currently monitored through near-real-time reporting from observers, as the fishery has 100% observer coverage. The Plan Team noted that the observer coverage for the shallow-set fishery is expected to continue at 100% for the near future, despite reductions in the deep-set fishery, and thus consideration for alternative monitoring mechanisms was not an urgent need at this time.

B. Life History Module Development

Council staff briefly presented on ongoing efforts to develop a pelagic life history module for the annual SAFE report. Guidance was requested from the Plan Team regarding the purpose of the module, noting that stock assessments are performed internationally with a wide range of growth models for PMUS. The module could serve as a general knowledge database, or the information could be collated and simply exist as a summary table. Questions were posed regarding components the module would include and which Plan Team members should contribute.

Plan Team discussion on the status update for this action item included:

- Some Plan Team members felt that a pelagic life history module would be useful.
    - Some of these life history parameters are used in ecosystem models.
    - It would be beneficial to track pertinent information for regional PMUS.
- Plan Team members noted difficulties with creating a simple summary of life history.
    - Parameters are not often shared between stock assessments, as working groups development the assessments make decisions about whether to use parameters from new literature; sometimes, the groups revert to older growth models.
        - There can be pushback to new science despite improvements.
    - Parameters may differ based on area of the ocean from which the samples were collected; it is not clear which parameters should be included.
- There were varying perspectives on what the module would look like and whether the annual SAFE report would be the right place for this life history summary to exist.
    - A summary table may be sufficient.
    - A technical memorandum with contemporary information is another option.
    - A life history summary for WCPFC assessed stocks was presented at a WCPFC meeting last year.
- The Plan Team formed a working group to determine an approach for module development.

C. Discussion: Assessment of Creel Survey Design for AS Trolling

Crigler led the Plan Team in a discussion regarding the adequacy of the current design of the creel surveys to appropriately collect data from the troll fishery in American Samoa. An evaluation of the creel survey design as it pertains to American Samoa trolling has not been completed, but the Plan Team noted high interannual variability in the expanded data for the fishery. The Plan Team also continued its discussion on the intersection between creel survey data and any data available from the FAD Program, noting that the troll fishery operations around FADs on a near-daily basis. The vessels participating in this program have different fishing behavior (i.e., fishing far from shore on weekends) using bigger boats are fewer in number. Plan Team members emphasized the utility of having an additional data stream to review alongside creel survey expansions to better understand what is happening in the fishery. It was noted that, if the boat-based creel survey program does not have the potential to sample any fishing vessel and it is only sampling certain types of vessels, the Plan Team will need to re-evaluate what the data stream is indicating. If the troll fishery remains small, there whould be efforts to see if it can be censused. It was suggested that PIFSC staff interview fishers while visiting American Samoa to better understand their behavior.

D. Incorporating Additional BiOp Monitoring Requirements

Council staff indicated that there are no major updates to present to the Plan Team at the time of the meeting. Several incidental take statement (ITS) tables were updated, and there has been continuing active coordination between PIRO divisions to incorporate elements of monitoring requirements from the recent biological opinion. Other relevant information was presented under agenda item 2.B.i.

4. Public Comment

There was no public comment.

5. Discussion: Pelagic SAFE Report Matters

A. Removal of Stacked Bar Charts from Report

Remington provided the Plan Team with context for the work item developed at the May 2023 meeting. In his presentation on the Hawaii fishery performance module, Ito provided a comparison of stacked bar charts and line charts, noting his preference for stacked bar charts for consistency with regional fishery management organizations. The Plan Team suggested that this decision be included in the working group looking to revamp the fishery performance modules of the annual SAFE reports.

B. Other Items

There was no discussion under this agenda item.

6. BiOp RPM Implementation Report and Timeline for Council Action

A. Crew Training Program

David O'Brien presented a report of the Biological Opinion (BiOp) Reasonable and Prudent Measure (RPM) Implementation Working Group, which was established by the Council at the 197th meeting in December 2023 to facilitate coordination for implementing the RPM Terms and Conditions (T&C) from the Hawaii deep-set longline (DSLL) and American Samoa Longline (ASLL) BiOps, issued in May 2023. The presentation focused on the requirement to have at least one crew member on deck with training on protected species handling and release within two years. A pilot crew training program was initiated in April 2024 as a, collaboration between NOAA and the Hawaii Longline Association (HLA). The Working Group identified considerations for implementing a full crew training program, as well as a proposed timeline for Council action for implementing a regulatory requirement. The list of issues for further consideration included crew certification, certification duration, training frequency, methods to demonstrate compliance with the crew training requirement.

Plan Team discussion on the status update from this working group included the following:

- There was good turnout for the training sessions with translators available to overcome language barriers. The crews were engaged due to Jason Mehlinger's style.
- Monitoring of the effectiveness of crew training will be done through the observer program.
- Crew members that received training will receive a card that expires in one year. PIRO tracks this and will notify crew when their cards are about to expire.
- The Plan Team thought that the working group sufficiently identified considerations associated with the regulatory process for this training, including certifications, incentives, requirements, and expanding to other fisheries.

B. Insular False Killer Whale Overlap Area Observer Coverage

Council staff and Ahrens presented on the working group evaluation of level of observer coverage needed to reliably estimate the MHI IFKW interactions in the overlap area, potential pathways for implementing the RPM Terms and Conditions (T&C), and considerations for the Plan Team in recommending next steps to the Council at its June 2024 meeting. The BiOp RPM working group determined that 90% observer coverage would be needed to estimate interactions with a CV >30%, and the current coverage rate is below this level. The working group considered potential implementation pathways for increasing observer coverage either through human observers or electronic monitoring , as well as additional considerations for research needs and spatial management. The working group requested the Plan Team to review the report, provide input on the analysis as well as potential implementation pathways, and make recommendations to Council on next steps.

Plan Team discussion on the status update from this working group included the following:

- eDNA may be a viable method to determine if interactions occur with insular KFWs, as improvements are needed in photo quality by observers as well as the EM system to better identify species.
  - EM images are better to identify FKWs than observer photos.
  - In addition to eDNA, straightened hooks could theoretically provide a small genetic sample, but the observer would need to acquire the hook from the vessel and there have only been a handful of straightened hooks in the past decade.
    - There had been past exploration whether hooks could be submitted to NOAA after an interaction, but it was never done.
- The Plan Team suggested a potential recommendation to the Council supporting explorations into the use of EM coverage to address this T&C given the limitations of human observers.
  - Some members felt no recommendation was needed given that the idea had been elevated through multiple other bodies, but this recommendation would be specific to the RPM being discussed.
  - The Plan Team supporting the movement would be useful.
  - This approach would require a higher rate of reviewing of the EM footage.
- There is a need for a stop-gap measure for monitoring in the overlap area.
  - Some members expressed caution that these discussions have been had before.
  - Fishing trips are not required to declare intention to go into the overlap area, otherwise the data collection would be changing fishing behavior.
  - If the vessel has EM, perhaps it could be allowed to fish in the overlap area.
    - This would require a regulatory change, as the RPM is relevant to providing observer coverage.

- Some members were against putting excessive effort into a stop-gap measure when that effort could go into the regulatory framework necessary in the long run.
- PIRO can likely extend the timeline of the RPM if progress is being made.

7. Electronic Monitoring Pre-Implementation Program Update from Electronic Technologies Steering Committee

Council staff and Jennifer Stahl presented a status update on the Electronic Monitoring (EM) Pre-Implementation Program being developed by the Electronic Technologies Steering Committee (ETSC). At its 196th meeting, the Council directed staff to work with the ETSC to develop a Pre-Implementation Program for EM in Hawaii longline fisheries with a hybridized approach between the shallow-set and deep-set sectors, a primary objective for protected species monitoring and estimation, and a secondary objective for discard accounting. Moving toward EM implementation, observer coverage would decrease as EM covered increased, contingent on funding. Key questions include determining program structure, data governance structure, program protocols, necessary infrastructure, and program costs. Phase 1 of the plan includes determining video review capacity (with 20 volunteer vessels), outreach with existing voluntary operators and owners, assessing EM capacity, and continued voluntary development. Some potential funding sources have been identified through Inflation Reduction Act funds. Previous studies uphold the efficacy of EM, as it is able to collect most observer data and assess post-release mortality for protected species. Stahl asked the Plan Team how EM information can be used to complement observer coverage, what regulatory pathways should be explored, and the scope of associated monitoring and management. Next steps include performing EM video review and finding a way to address reductions in observer coverage through EM.

Plan Team discussion on the status update from the ETSC included the following:

- A recent court case with Chevon reinforced the idea that the government should support the costs for a program like EM if it is made mandatory.
- Members noted EM as the future of data collection, but questions remain regarding ownership of data as well as the use of the data by enforcement to ensure compliance.
- Questions remain regarding what would be needed to make EM a regulatory requirement.
    - RFMOs are examining EM under the WCPFC since some quotas are tied to observer coverage. Managers should consider how the RFMOs approach EM.
    - It is not clear if pre-implementation regulations would require triggers for management. While considering regulatory requirements for the phase-in period, managers need to start thinking about what long-term implementation looks like.
- Each step of the implementation process for EM is iterative and will likely take several years despite current urgencies.
    - The Council could develop an EM policy to guide the process.
    - The ETSC should work with Council staff to continue exploring regulatory aspects.
        - The Plan Team supported a recommendation to direct Council staff to work with the ETSC in this regard.

8. Characterizing Cookie Cutter Shark Interactions in Hawaii Longline Fishery

Don Kobayashi presented alongside Hing Ling Chan and Justin Suca on a new study characterizing interactions by the Hawaii longline fishery with cookie cutter sharks in response to nteraction rates rising over time. On July 28, 2023, 57% of daily sales at UFA had bites from cookie cutter sharks. PIFSC scientists modeled cookie cutter bite incidence, estimating the probability of at least one fish getting a cookie cutter bite on a given set for both fisheries by using ensemble boosted regression tree models. Cookie cutter sharks bites in the deep-set fishery have increased over time, with soak time at night being the likely culprit for continuing increases; there was no pattern noticed in the shallow-set fishery over time, likely due to less change in soak time over the years. Next steps include adding subsurface temperature to better isolate thermal responses near the equator, working on a fish price model that will evaluate the price and revenue impacts due to cookie cutter damage and other shark damage, and potentially recommending that observer program resume recording cookie cutter shark damage.

Plan Team discussion on this informational presentation included the following:

- Cookie cutter shark bites impact both quality of flesh and price of fish.
- The observer program stopped collecting data on these interactions in 2015 because there was not much interest in the sharks, but the industry became concerned in 2023.
  - EM could potentially identify these interactions.
  - Mangers could work more closely with the fishers to collect this data if observers are unable to do so.
- The study did not determine differences between fish that had bites and those that did not.
  - Auction data on the prevalence of bites exists, but there is less trip level information associated (e.g., environmental patters and lunar cycles).
- There are no available data about where bites occurred with respect to hook position because observers put interactions in the notes field.
- Cookie cutter shark interactions have a strong lunar signal (new moon) and tend to bite at night.
- The Plan Team suggested providing the study in a report to HLA and UFA for situational awareness by vessel captains. They will determine if they want to continue fishing at certain times.
  - Managers can ask the captains what additional information would be useful.
  - The presentation will also be given to the Council's SSC and Fishing Industry Advisory Committee.

9. Characterizing Hawaii Shortline Fisheries

Jason Heyler, HDAR, presented on the emergence of shortlining in Hawaii small boat fisheries. These fisheries utilize diverse gears, so grouping them much be done with care. As a gear type, shortlining does exist in the Hawaii reporting system but has no associated regulations or permits. Shortlining involves using a horizontal mainline, less than or equal to one nautical mile in length and suspended from the ocean surface with floats, from which leaders with baited hooks are suspended. Shortlining effort increased in recent years to about 15 CMLs making around 100 trips per year and catching around 200,000 lb annually. The top species caught are yellowfin tuna, bigeye tuna, and monchong.

Plan Team discussion on this informational presentation included the following:

- Tracking data for shortlining can be a consideration by the working group evaluating the revamp of the fishery performance modules for the annual SAFE reports.
  - This may include reapportioning the "other gear types" category.
  - Fishery definitions for Hawaii pelagic fisheries should be re-evaluated, as fisheries change over time. Shortlining may be able to be included in existing fisheries for monitoring purposes. The working group will investigate potential approaches.

- The territorial resource management agencies are interested in exploring shortlining for fishery development in their island areas.
    - On Guam, there has been conflicts with troll boats, but this is not apparent in Hawaii because there is not as much spatial overlap. Nearshore shortlining occurs 0-20 nm from shore, but shortlining can also occur much further offshore.

10. International Fisheries Updates

Jason Phillibotte, PIRO International Fisheries Division, provided a brief presentation on updates associated with outcomes from WCPFC20 that was held from December 4-8, 2023, in Rarotonga, Cook Islands. Four conservation and management measures (CMMs) were adopted, including for tropical tuna, compliance monitoring, Pacific bluefin tuna, and North Pacific swordfish. Harvest strategies for North Pacific albacore and Pacific bluefin tuna were revised, and the interim target reference point for South Pacific albacore was updated. Additionally, the US led two climate change proposals resulting in WCPFC20 agreement to develop a Commission workplan for addressing climate change on WCPFC fisheries in the Convention Area and undertake an assessment of the climate vulnerability of WCPFC CMMs in 2024.

Council staff requested Phillibotte speak on two relevant provisions currently going through rulemaking, a new bigeye tuna catch limit for the US as well as purse seine fish aggregating device (FAD) closure changes. Phillibotte noted that there is little that can be divulged because the rulemaking process is ongoing for these tropical tuna management measures. The hope is to amend FAD closure in time to ensure the US meets the newly adopted standards as well as implement the new bigeye tuna catch limit before the fleet reaches the threshold. While there are many procedural steps to take, the goal is to implement the rules to ensure that normal fishing operations continue.

11. Discussion

Agenda items 5.D, 5.E, and 6.A from the Joint Plan Team meeting day (May 15, 2024) were covered under this agenda item.

<u>Regulatory Timelines</u>

Remington provided a status update on progress made related to a Plan Team work item to develop legacy timelines of regulatory and data collection changes in regional fisheries over the decades. Remington had meaningful conversations with representatives from PIFSC, PIRO, and local resource management agencies in Hawaii and the territories and received many informative materials. However, the effort to develop these timelines may be too large for an individual, and Remington asked the Plan Team for guidance on potential paths forward. This initiative will ultimately be addressed through the working group evaluating and holistically revising the annual SAFE reports. The Plan Team also agreed that it would be worthwhile to perform a thorough revision of the framework and content of the annual SAFE reports at least every 10 years alongside review by the Council's advisory bodies as well as an external review; this was also done a decade ago through a workshop to ensure that requirements under the Magnuson-Stevens Act and FEPs had been addressed.

<u>Plan Team Style Guide</u>

Remington presented the draft Plan Team style guide he developed in response to a Plan Team work item from the May 2023 meeting. The guide includes direction on content and formatting for fishery performance and ecosystem consideration modules as well as for presentations to the Plan Teams at their annual meetings. Remington also noted the utility of developing a PowerPoint presentation template for Plan Team members to use each year in generating their presentations. The Plan Team generally approved of the style guide, and members were asked to review the guide and provide comments to discuss at the intersessional meeting later in 2024.

Uncertainty Values

Remington let a Plan Team discussion regarding whether it would be feasible to include uncertainty values in the annual SAFE repots alongside creel survey estimates. Plan Team members strongly felt that uncertainty values (i.e., standard error) should be provided in the reports, and the reports should acknowledge that creel survey estimates above a certain threshold should be treated with caution. The Plan Team working group evaluating holistic improvements to the annual SAFE report will determine the most appropriate approaches for implementation.

MSRA Research Priorities

Council staff encouraged Plan Team members to review the MSRA Research Priorities as presented to provide feedback to the Council and it's SSC prior to finalization at their June meetings.

12. Public Comment

There was no public comment.

13. Pelagic Plan Team Recommendations

Appended to report.

14. Other Business and PPT Closing

The Pelagic Plan Team officially closed their meeting at the end of the day.

Pelagic Plan Team Recommendations:

Regarding the SSLL Turtle Trip Interaction Limit Review, the Pelagic Plan Team:

- Endorses the Working Group report for review by the SSC, Council, and any other applicable Council advisory Groups.
- Concurs with the Working Group that revisions to the trip limits are not warranted at this time, and recommends the next review of the trip limit measure to be conducted in 2-3 years, pending update of the loggerhead turtle population model.

Regarding BiOp RPM Implementation Working Group Report, the Pelagic Plan Team:

- Recommends the Council initiate the process for developing a regulatory requirement for Hawaii and American Samoa longline crew training consistent with the BiOp RPM T&C. The Pelagic Plan Team further recommends that the Council consider methods for monitoring and evaluating effectiveness of the crew training program as part of the regulatory requirement development.
- Recommends the Council further explore the use of EM to address the BiOp RPM T&C to provide observer coverage for the insular false killer whale overlap area, considering the increasing cost of observer coverage, reduction in the DSLL observer coverage for the foreseeable future, and unintended consequences to characterizing the DSLL fishery as a whole if human observers are used to fulfill this T&C. The Pelagic Plan Team acknowledges that EM implementation will likely not meet the observer coverage implementation timeline specified in the T&C, and recommends Council and NMFS, through the Working Group, explore interim approaches, including continued monitoring of available observer and logbook data.

Regarding Electronic Monitoring, the Pelagic Plan Team:

- Recommends that the Council initiate exploration of regulatory processes for electronic monitoring (EM), including consideration of the pre-implementation plan and the phase-in period toward a fully implemented program. The Plan Team notes that regional fishery management organizations are developing standards for EM.
- Notes that current EM efforts are funded through temporary funding through Request for Proposal (RFP) responses and that future work is contingent on available funding.

Regarding Cookie Cutter Shark Depredation, the Pelagic Plan Team:

- Recommends that the Council request PIFSC compile information presented on cookie cutter shark depredation in Hawaii longline fisheries into a technical memorandum or report to share with Council advisory groups and stakeholders and to solicit feedback on what additional details would be useful to inform fishery operations.
- Recommends that PIFSC explore alternative approaches to continuing data collection on this issue, noting cessation in data collection through the Pacific Islands Region Observer Program (PIROP).

<u>Pelagic Plan Team Work Items</u>:

American Samoa Pelagic Fisheries

- American Samoa DMWR to communicate with longline fishers to better understand the increase in releases of tuna species in recent years.
- American Samoa DMWR to work with PIFSC FRMD to perform an exploration of small boat pelagic fishing in American Samoa, focusing on understanding available data from the FAD Program and how those data can be evaluated alongside creel survey estimates to develop more accurate depictions of troll catch and effort, also noting that there is additional ongoing work to assess data collection for the troll fishery.

CNMI Pelagic Fisheries

- Endorse the APT work item to review 2023 CNMI creel survey expansion and commercial landings data, noting that numbers for pelagic fisheries also seem relatively low for the year. Participation by Jenny Suter, Brad Gough, Toby Matthews, Angela Dela Cruz.

Guam Pelagic Fisheries

- Oceanic and Climate Indicators section author, Phoebe Woodworth-Jefcoats, to develop and include indicators for temperature at 200-300 m depth for areas around Guam and the CNMI using a grid to be defined through discussions with Guam DAWR.

Revising Annual SAFE Report Fishery Performance Modules

- Take stock of the current state of annual SAFE report fishery performance modules via a multi-year process, with several subgroups to stem from a larger working group comprised of Kirsten Leong, Minling Pan, Lynn Rassel, Jenny Suter (and WPacFIN team), Jason Helyer/Bryan Ishida, Brent Tibbats, Frank Roberto, Domingo Ochavillo, Angela Delacruz (and Jude Lizama), and Ashley Tomita (and Jenny Stahl). Thomas Remington and Council staff will act as overall coordinators for the larger group. The working group will report prioritized ideas and potential paths forward back to the Joint Plan Team at its intersessional meeting. Subgroup initiatives may include:
    - Ensuring a mechanism exists to trigger a holistic review of the annual SAFE reports' structure and content at least every 10 years. Determining what information is important/useful to members, partners, stakeholders, external groups, and the public.
    - Ensuring proposed revisions to the modules would be consistent with regulations and FEP provisions.
    - Including complete data time series in the fishery performance modules.
    - Developing narratives explaining historical context and changes in regulations, data collection, and fishery dynamics over time associated with the inclusion of longer time series.
    - Including relevant economic data in the fishery performance modules.
    - Including weather and ocean condition considerations in the fishery performance module, including analyses of the impact of high surf/small-craft advisory warnings (i.e., forecasted poor conditions), inclement weather conditions (i.e.,

observed poor conditions), military notices, etc., on fishery effort and survey days by data collectors - potentially to be completed by a Council intern.

  - Determining a path forward for the Hawaii pelagic fishery performance module, including a potential split of the longline (authored by PIFSC) and small boat fisheries (authored by DAR).
  - Determining the best way to present fishery performance data (e.g., stacked bar charts versus line charts).
  - Considering potential updates to fishery classifications in the pelagic SAFE report, for example:
    - Exploring possibilities to redefine fishery sectors of the Hawaii small boat fisheries.
    - Investigating the possibility to monitor a distinct pelagic handline fishery in Guam, noting its prevalence in the commercial fishery sector, and provide a report on the separate troll and available handline data streams at the Pelagic Plan Team intersessional meeting.
  - Incorporating measures of uncertainty for annual fishery performance values.
  - Determining the feasibility of including considerations for visitor arrivals (i.e., tourism) and associated licensing on fishery performance.
  - Facilitating a thorough review of the revised annual SAFE reports via an external group or existing Council advisory bodies.

Pelagic Life History

- Forms a working group to assess the utility and determine the feasibility of developing a life history module for the pelagic annual SAFE report. Participation by Mark Fitchett, Michael Kinney, T. Todd Jones, Don Kobayashi, Phoebe Woodworth-Jefcoats, and Michelle Sculley.

Territorial Non-Commercial Modules

- Supplement the APT Working Group to develop a non-commercial module for territorial pelagic MUS similar to the one recently developed for territorial archipelagic BMUS and ECS. Participation by Minling Pan, Ashley Tomita, Marc Nadon, Jenny Suter, Domingo Ochavillo, Brent Tibbats, Angela Dela Cruz, and Hongguang Ma.