2.2

2.2 CORAL REEF FISH ECOSYSTEM PARAMETERS

2.2.1 REGIONAL REEF FISH BIOMASS AND HABITAT CONDITION

Description: 'Reef fish biomass' is mean biomass of reef fishes per unit area derived from visual survey data between 2010 and 2023. 'Hard Coral Cover' is mean cover derived from benthic imagery (photoquadrats) collected by divers across the survey domain, including most sites where reef fish surveys occurred. In previous reports, this parameter stemmed from diver visual rapid assessments of coral cover. Note that no surveys were conducted in 2020 or 2021 in any region due to COVID-19.

Rationale: Reef fish biomass has been widely used as an indicator of relative ecosystem status and has repeatedly been shown to be sensitive to changes in fishing pressure, habitat quality, and oceanographic regime. Hard coral cover is an indicator of relative status of the organisms that build coral reef habitat and has been shown to be sensitive to changes in oceanographic regime, and a range of direct and indirect anthropogenic impacts. Most fundamentally, cover of hard corals has been increasingly impacted by temperature stress as a result of global heating.

Data Category: Fishery-independent

Timeframe: Triennial

Jurisdiction: American Samoa, Guam, Commonwealth of the Northern Mariana Islands (CNMI), Main Hawaiian Islands (MHI), Northwestern Hawaiian Islands (NWHI), and Pacific Remote Island Areas (PRIA)

Spatial Scale: Regional

Data Source: Data used to generate cover and biomass estimates come from surveys conducted by the National Marine Fisheries Service (NMFS) Pacific Island Fisheries Science Center (PIFSC) Ecosystem Sciences Division (ESD) and their partners as part of the Coral Reef Conservation Program's (CRCP) National Coral Reef Monitoring Program (NCRMP). Fish survey methods are described in detail in Ayotte et al. (2015). In brief, they involve teams of divers conducting stationary point count cylinder (SPC) surveys within a target domain of < 30 meter hard-bottom habitat at each island, stratified by depth zone and, for larger islands, by section of coastline. For consistency among islands, only data from forereef habitats are used. At each SPC, divers record the number, size, and species of all fishes within or passing through paired 15 meter-diameter cylinders over the course of a standard count procedure. Cover estimates are derived from photoquadrats collected by divers within the same survey domain, including at all the fish survey sites. Post-hoc annotation methods are described in detail in Lamirand et al. (2022).

Fish sizes and abundance are converted to biomass using standard length-to-weight conversion parameters, taken largely from FishBase and converted to biomass per unit area by dividing by the area sampled per survey. Site-level data were pooled into island-scale values by first calculating mean and variance within strata, and then calculating weighted island-scale mean and variance using the formulas given in Smith et al. (2011) with strata weighted by their respective sizes.

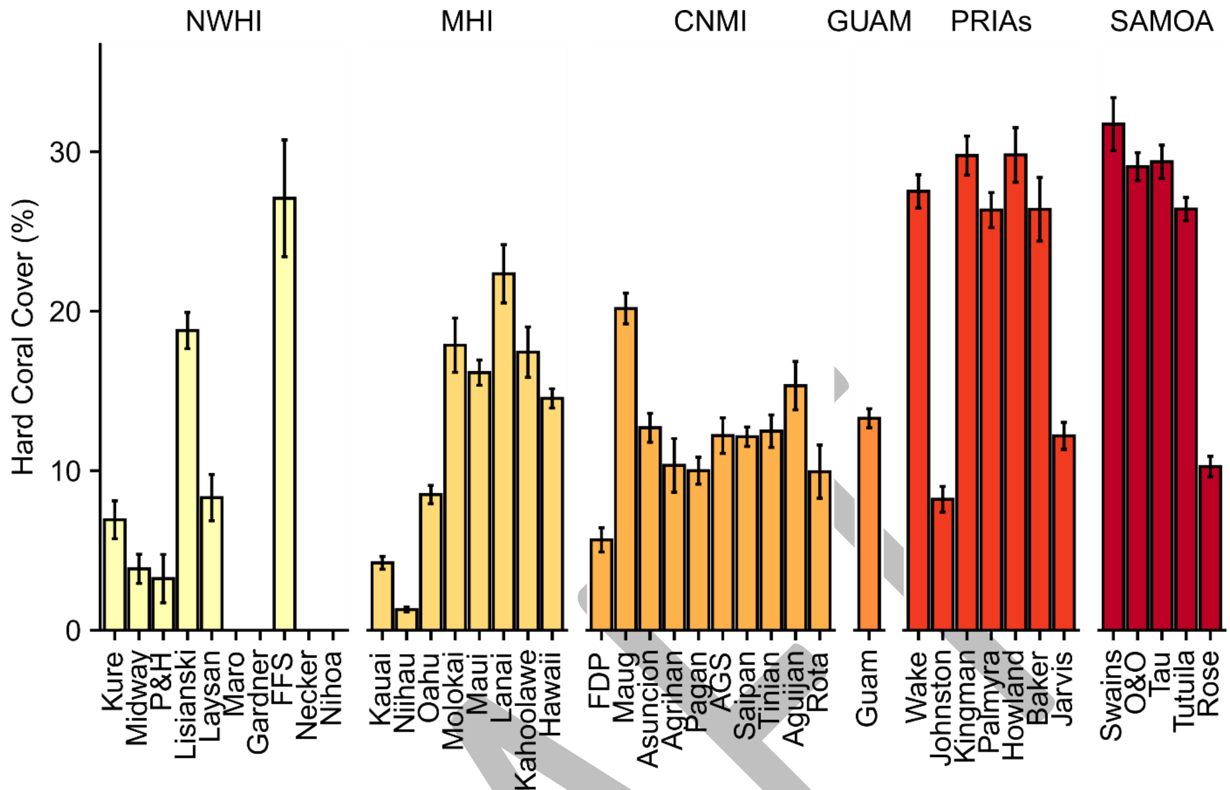

Figure 1. Mean coral cover (%± standard error of the mean, or SEM) per U.S. Pacific Island averaged from 2010-2023 by latitude

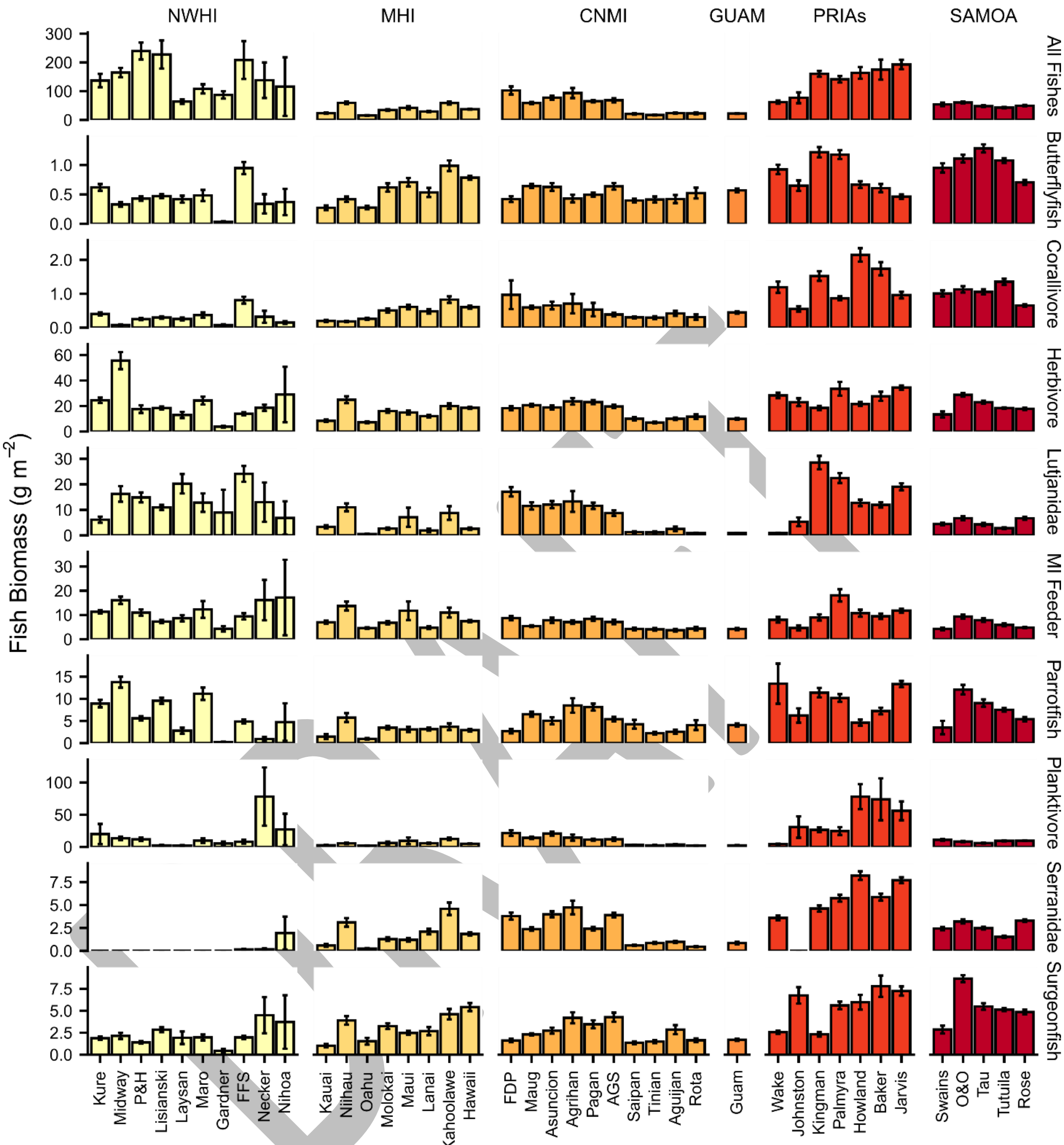

Figure 2. Mean fish biomass (g/m^2 ± SEM) per U.S. Pacific Island of functional, taxonomic, and trophic groups from 2010-2023 by latitude

Note: The group 'Serranidae' excludes planktivorous members of that family (i.e., anthias), which can be hyper-abundant in some regions. Similarly, the bumphead parrotfish, *Bolbometopon muricatum*, has been excluded from the corallivore group. The group 'MI Feeder' consists of fishes that primarily feed on mobile invertebrates; 'Butterflyfish' are non-planktivorous butterflyfish species; and 'Surgeonfish' are mid-large targeted surgeonfish species.

2.2.2 MAIN HAWAIIAN ISLANDS REEF FISH BIOMASS AND HABITAT CONDITION

Description: 'Reef fish biomass' is mean biomass of reef fishes per unit area derived from visual survey data between 2010 and 2023. 'Hard Coral Cover' is mean cover derived from benthic imagery (photoquadrats) collected by divers across the survey domain, including most sites where reef fish surveys occurred. In previous reports, this parameter stemmed from diver visual rapid assessments of coral cover. Note that no surveys were conducted in 2020 or 2021 in any region due to COVID-19.

Rationale: Reef fish biomass has been widely used as an indicator of relative ecosystem status and has repeatedly been shown to be sensitive to changes in fishing pressure, habitat quality, and oceanographic regime. Hard coral cover is an indicator of relative status of the organisms that build coral reef habitat and has been shown to be sensitive to changes in oceanographic regime, and a range of direct and indirect anthropogenic impacts. Most fundamentally, cover of hard corals has been increasingly impacted by temperature stress as a result of global heating.

Data Category: Fishery-independent

Timeframe: Triennial

Jurisdiction: MHI

Spatial Scale: Island

Data Source: Data are sourced from surveys conducted by NMFS PIFSC ESD and partners, as part of the Pacific NCRMP. Survey methods and sampling design, and methods to generate biomass and cover parameters are described in Section 2.2.1.

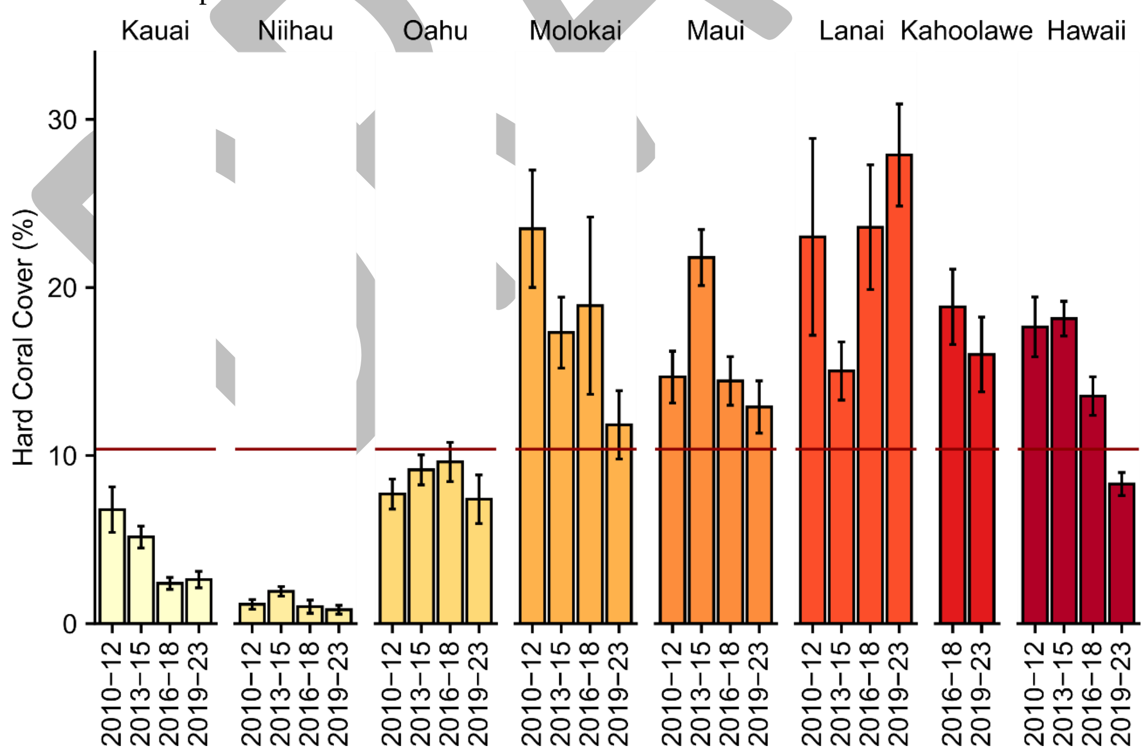

Figure 3. Mean coral cover (% ± SEM) per island of the MHI from 2010–2023 by latitude
Note: The red horizontal line is the region-wide mean estimate for the entire time period.

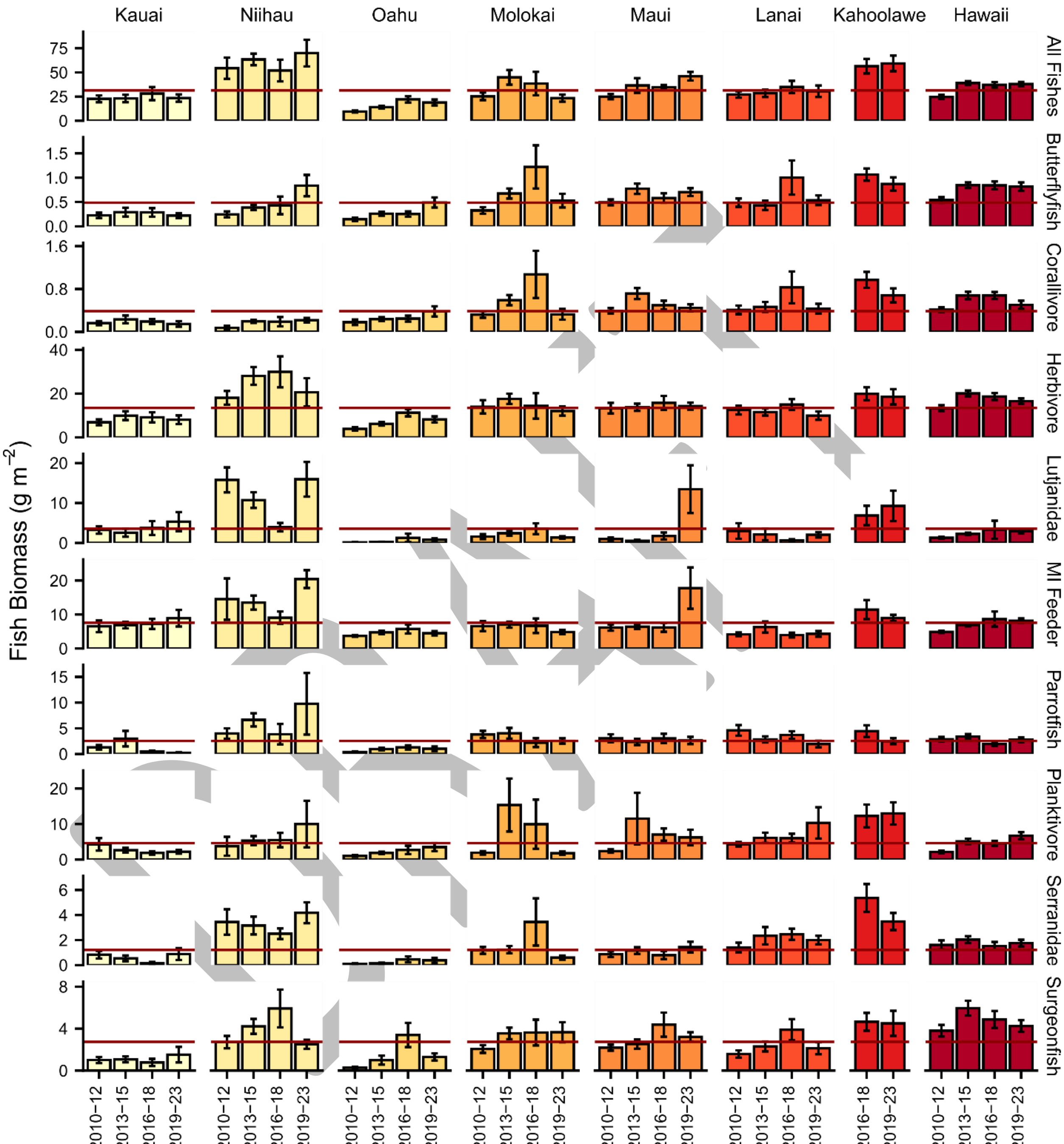

Figure 4. Mean fish biomass (g/m^2 ± SEM) of functional, taxonomic, and trophic groups per island of the MHI from 2010-2023

Note: The group 'Serranidae' excludes planktivorous members of that family (i.e., anthias), which can be hyper-abundant in some regions. Similarly, the bumphead parrotfish, *Bolbometopon muricatum*, has been excluded from the corallivore group. The group 'MI Feeder' consists of fishes that primarily feed on mobile invertebrates; 'Butterflyfish' are non-planktivorous butterflyfish species; and 'Surgeonfish' are mid-large targeted surgeonfish species. Red horizontal lines are the region-wide mean estimates for the entire time period.

2.2.3 NORTHWESTERN HAWAIIAN ISLANDS REEF FISH BIOMASS AND HABITAT CONDITION

Description: 'Reef fish biomass' is mean biomass of reef fishes per unit area derived from visual survey data between 2010 and 2023. 'Hard Coral Cover' is mean cover derived from benthic imagery (photoquadrats) collected by divers across the survey domain, including most sites where reef fish surveys occurred. In previous reports, this parameter stemmed from diver visual rapid assessments of coral cover. Note that no surveys were conducted in 2020 or 2021 in any region due to COVID-19.

Rationale: Reef fish biomass has been widely used as an indicator of relative ecosystem status and has repeatedly been shown to be sensitive to changes in fishing pressure, habitat quality, and oceanographic regime. Hard coral cover is an indicator of relative status of the organisms that build coral reef habitat and has been shown to be sensitive to changes in oceanographic regime, and a range of direct and indirect anthropogenic impacts. Most fundamentally, cover of hard corals has been increasingly impacted by temperature stress as a result of global heating.

Data Category: Fishery-independent

Timeframe: Triennial

Jurisdiction: NWHI

Spatial Scale: Island

Data Source: Data are sourced from surveys conducted by NMFS PIFSC ESD and partners, as part of the Pacific NCRMP. Survey methods and sampling design, and methods to generate biomass and cover parameters are described in Section 2.2.1.

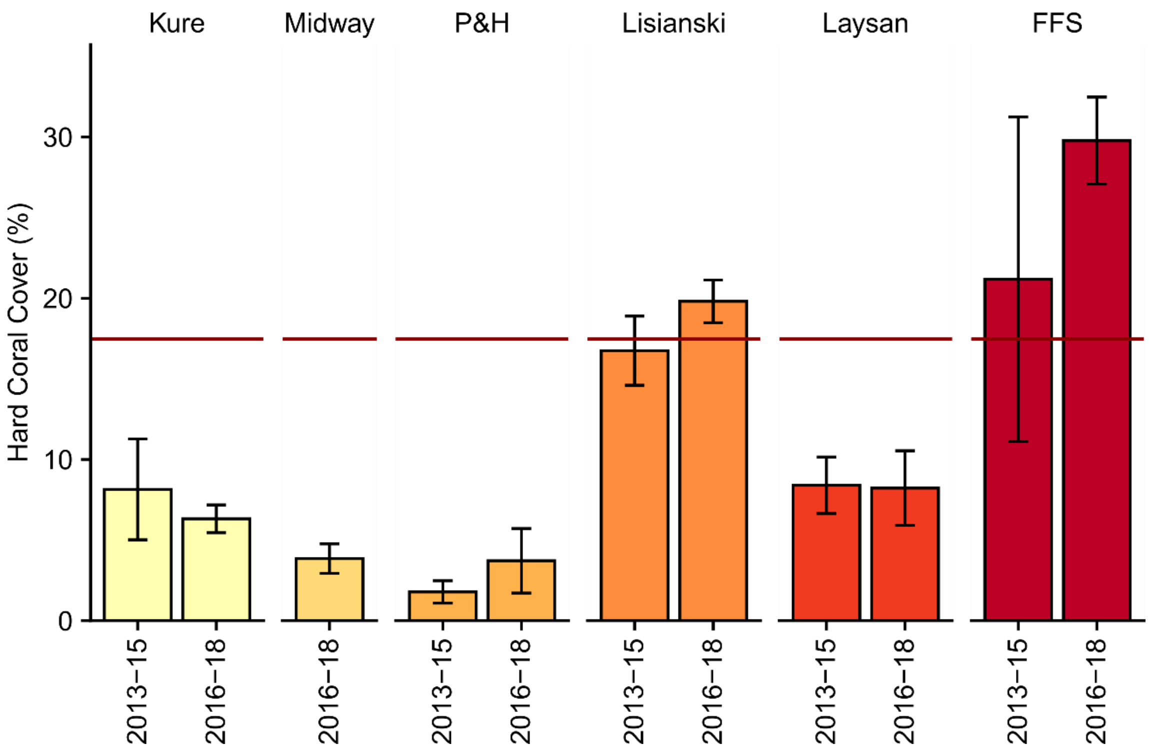

Figure 5. Mean coral cover (% ± SEM) per island of the NWHI from 2010–2023 by latitude
Note: The red horizontal line is the region-wide mean estimate for the entire time period.

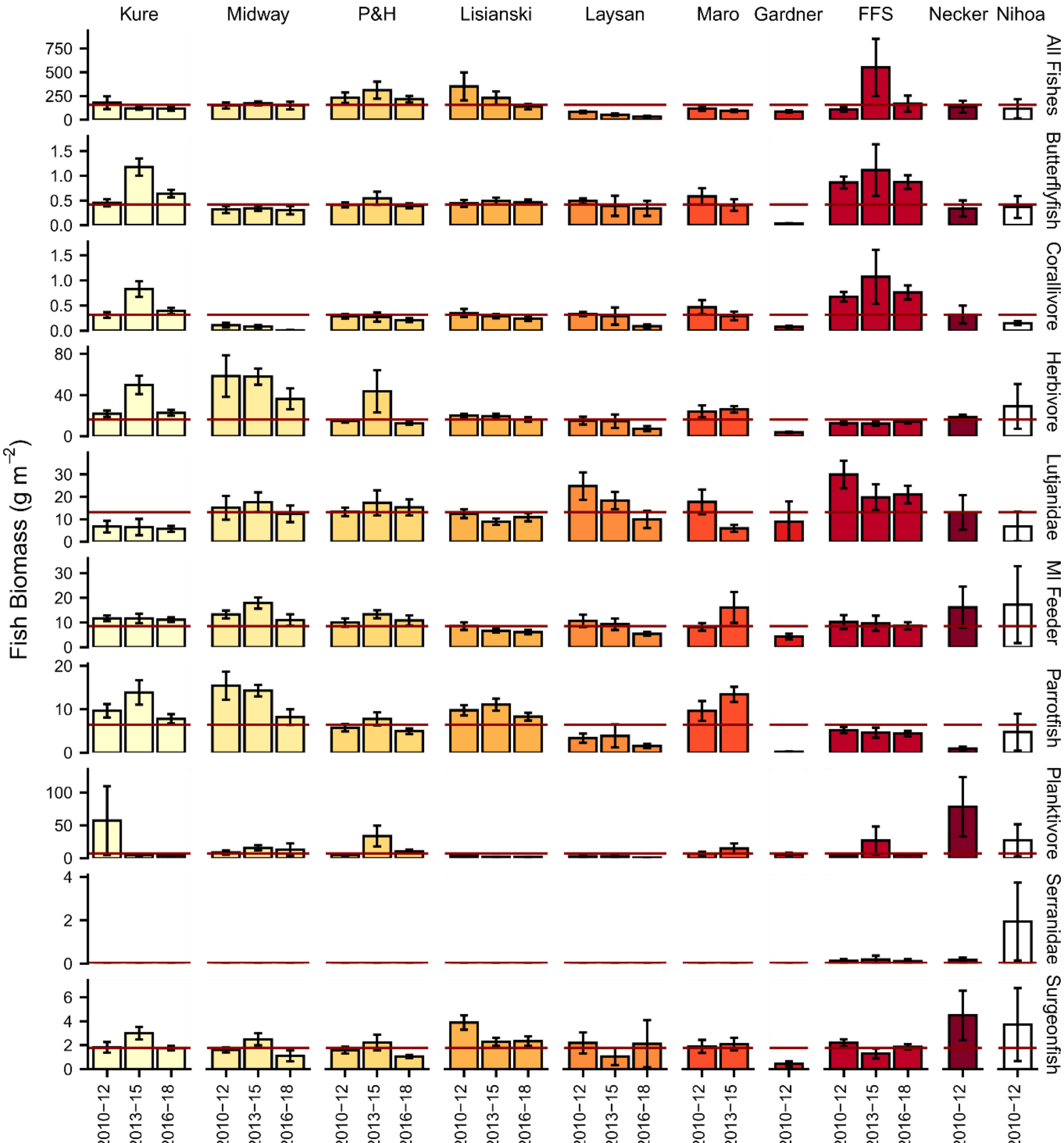

Figure 6. Mean fish biomass (g/m^2 ± SEM) of functional, taxonomic, and trophic groups per island of the NWHI from 2010-2023

Note: The group 'Serranidae' excludes planktivorous members of that family (i.e., anthias), which can be hyper-abundant in some regions. Similarly, the bumphead parrotfish, *Bolbometopon muricatum*, has been excluded from the corallivore group. The group 'MI Feeder' consists of fishes that primarily feed on mobile invertebrates; 'Butterflyfish' are non-planktivorous butterflyfish species; and 'Surgeonfish' are mid-large targeted surgeonfish species. Red horizontal lines are the region-wide mean estimates for the entire time period.

1.1 PROTECTED SPECIES

This section of the report summarizes information on protected species interactions in fisheries managed under the Hawaii FEP. Protected species covered in this report include sea turtles, seabirds, marine mammals, sharks, and corals. Most of these species are protected under the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), and/or the Migratory Bird Treaty Act (MBTA). A list of protected species found in or near Hawaii waters and a list of critical habitat designations in the Pacific Ocean are included in Appendix B.

1.1.1 INDICATORS FOR MONITORING PROTECTED SPECIES INTERACTIONS

This report monitors the status of protected species interactions in the Hawaii FEP fisheries using proxy indicators such as fishing effort and changes in gear types, as these fisheries do not have observer coverage. Creel surveys and logbook programs are not expected to provide reliable data about protected species interactions. Discussion of protected species interactions is focused on fishing operations in federal waters and associated transit through State waters.

1.1.1.1 FEP CONSERVATION MEASURES

No specific regulations are in place to mitigate protected species interactions in the bottomfish, precious coral, coral reef ecosystem and crustacean fisheries currently active and managed under this FEP. Destructive gear such as bottom trawls, bottom gillnets, explosives, and poisons are prohibited under this FEP, and these prohibitions benefit protected species by preventing potential interactions with non-selective fishing gear.

The original crustacean Fishery Management Plan (FMP) and subsequent amendments included measures to minimize potential impacts of the Northwestern Hawaiian Islands (NWHI) component of the spiny lobster fishery to Hawaiian monk seals, such as specification of trap gear design and prohibition of nets. The Bottomfish and Seamount Groundfish FMP began requiring protected species workshops for the NWHI bottomfish fishery participants in 1988. These fisheries are no longer active due to the issuance of Executive Orders 13178 and 13196 and the subsequent Presidential Proclamations 8031 and 8112, which closed the fisheries within 50 nm around the NWHI.

1.1.1.2 ESA CONSULTATIONS

Hawaii FEP fisheries are covered under the following consultations under section 7 of the ESA, through which NMFS has determined that these fisheries are not likely to jeopardize or adversely affect any ESA-listed species or critical habitat in the Hawaii Archipelago (Table 68).

Table 1. Summary of ESA consultations for Hawaii FEP Fisheries

Fishery	Consultation Date	Consultation Type[a]	Outcome[b]	Species
All Fisheries	3/1/2016	LOC	NLAA	Hawaiian monk seal critical habitat
Bottomfish	3/18/2008	BiOp	LAA, non-jeopardy	Green sea turtle
			NLAA	Loggerhead sea turtle, leatherback sea turtle, olive ridley sea turtle, hawksbill sea turtle, humpback whale, blue whale, fin whale, northern right whale, sei whale, sperm whale, Hawaiian monk seal
	8/7/2013	BiOp modification	NLAA	False killer whale (MHI insular DPS)
	8/26/2022	BiOp	LAA, non-jeopardy	Oceanic whitetip shark
			NLAA	Giant manta ray, chambered nautilus, MHI false killer whale critical habitat
Coral Reef Ecosystem	5/22/2002	LOC (USFWS)	NLAA	Green, hawksbill, leatherback, loggerhead, and olive ridley turtles, Newell's shearwater, short-tailed albatross, Laysan duck, Laysan finch, Nihoa finch, Nihoa millerbird, Micronesian megapode, 6 terrestrial plants
	12/5/2013	LOC	NLAA	Loggerhead sea turtle (North Pacific DPS), leatherback sea turtle, olive ridley sea turtle, green sea turtle, hawksbill sea turtle, humpback whale, blue whale, fin whale, North Pacific right whale, sei whale, sperm whale, Hawaiian monk seal, false killer whale (MHI insular DPS)
	9/18/2018	No effect memo	No effect	Oceanic whitetip shark, giant manta ray
Coral Reef Ecosystem (Kona Kampachi Special Coral Reef	9/19/2013	LOC (USFWS)	NLAA	Short-tailed albatross, Hawaiian petrel, Newell's shearwater

Fishery	Consultation Date	Consultation Type[a]	Outcome[b]	Species
Ecosystem Fishing Permit only)	9/25/2013	LOC	NLAA	Loggerhead sea turtle (North Pacific DPS), leatherback sea turtle, olive ridley sea turtle, green sea turtle, hawksbill sea turtle, humpback whale, blue whale, fin whale, North Pacific right whale, sei whale, sperm whale, Hawaiian monk seal, false killer whale (MHI insular DPS)
Crustacean	12/5/2013	LOC	NLAA	Loggerhead sea turtle (North Pacific DPS), leatherback sea turtle, olive ridley sea turtle, green sea turtle, hawksbill sea turtle, humpback whale, blue whale, fin whale, North Pacific right whale, sei whale, sperm whale, Hawaiian monk seal, false killer whale (MHI insular DPS)
	9/18/2018	No effect memo	No effect	Oceanic whitetip shark, giant manta ray, MHI false killer whale critical habitat
Precious Coral	12/5/2013	LOC	NLAA	Loggerhead sea turtle (North Pacific DPS), leatherback sea turtle, olive ridley sea turtle, green sea turtle, hawksbill sea turtle, humpback whale, blue whale, fin whale, North Pacific right whale, sei whale, sperm whale, Hawaiian monk seal, false killer whale (MHI insular DPS)
	9/18/2018	No effect memo	No effect	Oceanic whitetip shark, giant manta ray, MHI false killer whale critical habitat

[a] BiOp = Biological Opinion; LOC = Letter of Concurrence.
[b] LAA = likely to adversely affect; NLAA = not likely to adversely affect.

1.1.1.2.1 Bottomfish Fishery

In a March 18, 2008 Biological Opinion (BiOp) covering MHI bottomfish fishery, NMFS determined that the MHI bottomfish fishery is likely to adversely affect but not likely to jeopardize the green sea turtle and included an incidental take statement (ITS) of two animals killed per year from collisions with bottomfish vessels. In the 2008 BiOp, NMFS also concluded that the fishery is not likely to adversely affect any four other sea turtle species (loggerhead, leatherback, olive ridley, and hawksbill turtles) and seven marine mammal species (humpback, blue, fin, Northern right whale, sei and sperm whales, and the Hawaiian monk seal).

In 2013, NMFS re-initiated consultation under ESA in response to listing of the MHI insular false killer whale distinct population segment (DPS) under the ESA. In a modification to the 2008 BiOp dated August 7, 2013, NMFS determined that commercial and non-commercial bottomfish fisheries in the MHI are not likely to adversely affect MHI insular false killer whale because of the spatial separation between the species and bottomfish fishing activities, the low likelihood of collisions, and the lack of observed or reported fishery interactions were among other reasons. NMFS also concluded that all previous determinations in the 2008 BiOp for other ESA-listed species and critical habitat remained valid.

In August 2015, NMFS revised the Hawaiian monk seal critical habitat in the NWHI and designated new critical habitat in the MHI. In an informal consultation completed on March 1, 2016, NMFS concluded that the Hawaii bottomfish fishery is not likely to adversely affect monk seal critical habitat.

On August 26, 2022, NMFS completed a new BiOp that was initiated in response to the ESA listings of the oceanic whitetip shark, giant manta ray and chambered nautilus, and designation of MHI insular false killer whale critical habitat. This BiOp did not re-evaluate species previously consulted on because NMFS determined that reinitiation was not triggered for those species based on a Biological Evaluation dated February 1, 2019. NMFS determined that the MHI bottomfish fishery is not likely to adversely affect giant manta rays, chambered nautilus, or MHI insular false killer whale critical habitat. For oceanic whitetip sharks, NMFS determined that the continued operation of MHI bottomfish activities is likely to adversely affect the threatened sharks but are not likely to jeopardize their continued existence. The MHI bottomfish fishery does incidentally take oceanic whitetip sharks, and to monitor the amount of take, NMFS established an Incidental Take Statement (ITS) of two interactions over any five consecutive calendar years. If the ITS is exceeded, NMFS will reinitiate formal consultation.

1.1.1.2.2 Crustacean Fishery

In an informal consultation completed on December 5, 2013, NMFS concluded that the Hawaii crustacean fisheries are not likely to affect five sea turtle species (North Pacific loggerhead DPS, leatherback, olive ridley, green, and hawksbill turtles) and eight marine mammal species (humpback, blue, fin, North Pacific right whale, sei, and sperm whales, MHI insular false killer whale DPS and the Hawaiian monk seal). In an informal consultation completed on March 1, 2016, NMFS concluded that the Hawaii crustacean fishery is not likely to adversely affect monk seal critical habitat.

On September 18, 2018, NMFS concluded the Hawaii crustacean fishery will have no effect on the oceanic whitetip shark, giant manta ray, and MHI false killer whale critical habitat.

1.1.1.2.3 Coral Reef Ecosystem Fishery

On May 22, 2002, the USFWS concurred with the determination of NMFS that the activities conducted under the Coral Reef Ecosystems FMP are not likely to adversely affect ESA-listed species under USFWS's exclusive jurisdiction (i.e., seabirds) and ESA-listed species shared with NMFS (i.e., sea turtles).

In an informal consultation completed on December 5, 2013, NMFS concluded that the Hawaii coral reef ecosystem fisheries are not likely to affect five sea turtle species (North Pacific loggerhead DPS, leatherback, olive ridley, green, and hawksbill turtles) and eight marine mammal species (humpback, blue, fin, Northern right, sei, and sperm whales, MHI insular DPS false killer whales and the Hawaiian monk seal). In an informal consultation completed on March 1, 2016, NMFS concluded that the Hawaii coral reef ecosystem fishery is not likely to adversely affect monk seal critical habitat.

On September 18, 2018, NMFS concluded the Hawaii coral reef ecosystem fishery will have no effect on the oceanic whitetip shark and giant manta ray.

1.1.1.2.4 Precious Coral Fishery

In an informal consultation completed on December 5, 2013, NMFS concluded that the Hawaii precious coral fisheries are not likely to affect five sea turtle species (North Pacific loggerhead DPS, leatherback, olive ridley, green, and hawksbill turtles) and eight marine mammal species (humpback, blue, fin, North Pacific right, sei, and sperm whales, MHI insular false killer whale DPS and the Hawaiian monk seal). In an informal consultation completed on March 1, 2016, NMFS concluded that the Hawaii precious coral fishery is not likely to adversely affect monk seal critical habitat.

On September 18, 2018, NMFS concluded the Hawaii precious coral fishery will have no effect on the oceanic whitetip shark, giant manta ray, and MHI false killer whale critical habitat.

1.1.1.3 NON-ESA MARINE MAMMALS

The MMPA requires NMFS to annually publish a List of Fisheries (LOF) that classifies commercial fisheries in one of three categories based on the level of mortality and serious injury of marine mammals associated with that fishery. According to the 2024 LOF (89 FR 12257, February 16, 2024), the bottomfish (HI bottomfish handline), precious coral (HI black coral diving), coral fish (HI spearfishing), and crustacean (HI crab trap, lobster trap, shrimp trap, crab net, Kona crab loop net, lobster diving) fisheries are classified as Category III fisheries (i.e., a remote likelihood of or no known incidental mortality and serious injury of marine mammals).

1.1.2 STATUS OF PROTECTED SPECIES INTERACTIONS IN THE HAWAII FEP FISHERIES

1.1.2.1 BOTTOMFISH FISHERY

1.1.2.1.1 Sea Turtle, Marine Mammal, and Seabird Interactions

Fisheries operating under the Hawaii FEP currently do not have federal observers on board. The NWHI component of the bottomfish fishery had observer coverage from 1990 to 1993 and 2003 to 2005. The NWHI observer program reported several interactions with non-ESA-listed seabirds during that time, and no interactions with marine mammals or sea turtles (Nitta 1999; WPRFMC 2017).

To date, there have been no reported interactions between MHI bottomfish fisheries and ESA-listed species of sea turtles, marine mammals, and seabirds. Furthermore, the commercial and non-commercial bottomfish fisheries in the MHI are not known to have the potential for a large and adverse effect on non-ESA-listed marine mammals. Although these species of marine mammals occur in the Exclusive Economic Zone (EEZ) waters where the fisheries operate and depredation of bait or catch by dolphins (primarily bottlenose dolphins) occurs (Kobayashi and Kawamoto 1995), there have been no observed or reported takes of marine mammals by the bottomfish fishery.

The 2008 BiOp included an ITS of two green turtle mortalities per year from collisions with bottomfish vessels. There have not been any reported or observed collisions of bottomfish vessels with green turtles, and data are not available to attribute stranded turtle mortality to collisions with bottomfish vessels. However, the BiOp analysis to determine the estimated level of take from vessel collisions was based on an estimated 71,800 bottomfish fishing trips per year. The total annual number of commercial and non-commercial bottomfish fishing trips since 2008 has been less than 3,500 per year. Therefore, the potential for collisions with bottomfish vessels is substantially lower than was estimated in the 2008 BiOp.

Based on fishing effort and other characteristics described in Chapter 1 of this report, no notable changes have been observed in the fishery. There is no other information to indicate that impacts to sea turtle, marine mammal, and seabird species from this fishery have changed in recent years.

1.1.2.1.2 Elasmobranch Interactions

As described in Section 2.5.1.2, the 2022 Biological Opinion established an ITS for oceanic whitetip sharks of two interactions over any five consecutive calendar years in the MHI bottomfish fishery. Between 2000 and 2017, the Hawaii commercial catch database for bottomfish reported 23 sharks under the single “whitetip sharks” reporting code, thus interactions with “whitetip sharks” could be either oceanic whitetip sharks or whitetip reef sharks. Based on area fished, the catch composition associated with the captured sharks, and the size of the shark, it was determined that only four were likely oceanic whitetip sharks interactions with the MHI bottomfish fishery. Beginning in 2019, the Hawaii DAR CML began using a separate species code to differentiate between oceanic whitetip sharks and whitetip sharks. There have been no reported interactions with oceanic whitetip sharks in the CML data for the MHI bottomfish fishery in the last five years (since 2018).

Table 2. The number of oceanic whitetip shark interactions expected as calculated by the 2022 BiOp, representing the ITS, with the reported number of interactions based on the best scientific data as described above.

ITS	Reported number in the last five consecutive calendar years
2	0

Notwithstanding the sparsity of data and potential for species misidentification in self-reported data, available information indicates that oceanic whitetip shark captures in the MHI bottomfish fishery are rare. Sharks generally do not experience barotrauma when brought up from depth, and fishermen in Hawaii bottomfish fisheries tend to release hooked sharks alive by cutting their hook leaders (WPRFMC 2007). However, quantitative estimates of post-release mortality are not available.

A federal observer program monitored the Northwestern Hawaiian Islands (NWHI) bottomfish fishery from October 2003 to April 2006. Observer data from that period reported five interactions with oceanic whitetip sharks. However, a recent review of these data by the NMFS Observer Program indicated that species identification for these records is uncertain and some or all of these interactions could have been whitetip reef sharks (NMFS 2019). Additionally, the characteristics of the NWHI bottomfish fishery, which ceased operations in 2011 pursuant to the presidential proclamation establishing the Papahānaumokuākea Marine National Monument, differ from the MHI bottomfish fishery that operates today. The NWHI bottomfish fishery was comprised of larger vessels than those in the MHI due to the distance to the fishing grounds and was conducted solely by commercial fishermen using heavier gear than those used in the MHI.

Cooperative research fishing surveys conducted by Kendall Enterprise Incorporated and Pacific Islands Fisheries Group as part of the MHI Bottomfish Fishery-Independent Survey contract local Deep-7 commercial fishermen to collect data using a standardized traditional fishing method (Kendall Enterprise Inc. 2014). In the 2016 to 2017 surveys comprising 814 fishing samples (each sample being 30 minutes in duration) and 2,545 records of fish catch, three whitetip reef sharks and no oceanic whitetip sharks were recorded (PIFSC unpublished data, cited in NMFS 2019).

In addition to the bottomfish surveys, PIFSC researchers have conducted limited bottomfish fishing in the Pacific Islands region for life history research and fishery-independent survey purposes. Each research cruise may land a maximum of 1,200 kg of bottomfish. There have been seven such cruises in the Main Hawaiian Islands since 2007. However, there are no records of researchers catching oceanic whitetip sharks while conducting these activities (NMFS 2019).

There are no records of giant manta ray incidental captures or entanglements in the federally managed bottomfish fisheries in Hawaii.

1.1.2.2 CRUSTACEAN, CORAL REEF, AND PRECIOUS CORAL FISHERIES

There are no observer data available for the crustacean, coral reef, or precious coral fisheries operating under the Hawaii FEP. However, based on current ESA consultations, these fisheries are not expected to interact with any ESA-listed species in federal waters around the Hawaii Archipelago. NMFS has also concluded that the Hawaii crustacean, coral reef, and precious coral commercial fisheries will not affect marine mammals in any manner not considered or authorized under the MMPA.

In 1986, one Hawaiian monk seal died as a result of entanglement with a bridle rope from a lobster trap. There have been no other reports of protected species interactions with any of these fisheries since then (WPRFMC 2009; WPRFMC 2022d).

Based on fishing effort and other characteristics described in Chapter 1 of this report, no notable changes have been observed in these fisheries. There is no other information to indicate that impacts to protected species from this fishery have changed in recent years.

1.1.3 IDENTIFICATION OF EMERGING ISSUES

Table 70 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 3. Status of candidate ESA species, recent ESA listing processes, and post-listing activities

Species		Listing Process			Post-Listing Activity	
Common Name	Scientific Name	90-Day Finding	12-Month Finding / Proposed Rule	Final Rule	Critical Habitat	Recovery Plan

Species		Listing Process			Post-Listing Activity	
Common Name	**Scientific Name**	**90-Day Finding**	**12-Month Finding / Proposed Rule**	**Final Rule**	**Critical Habitat**	**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)	Designation not prudent; no areas within US jurisdiction that meet definition of critical habitat (85 FR 12898, 3/5/2020)	Draft Recovery Plan published January 25, 2023 (88 FR 4817)
Giant Manta Ray	*Manta birostris*	Positive (81 FR 8874, 2/23/2016)	Positive, threatened (82 FRN 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)	Recovery outline published 12/4/19 to serve as interim guidance until full recovery plan is developed; recovery planning workshop planned for 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

Species		**Listing Process**			**Post-Listing Activity**	
Common Name	**Scientific Name**	**90-Day Finding**	**12-Month Finding / Proposed Rule**	**Final Rule**	**Critical Habitat**	**Recovery Plan**
Giant Clams	*Hippopus hippopus, H. porcellanus, Tridacna costata, T. derasa, T. gigas, T. Squamosa, and T. tevoroa*	Positive (82 FR 28946, 06/26/2017)	TBA (status review ongoing)	TBA	N/A	N/A
Shortfin Mako Shark	*Isurus oxyrunchus*	Positive (86 FR 19863, 04/15/2021	Not warranted (87 FR 68236, 11/14/2022)	N/A	N/A	N/A

1.1.4 IDENTIFICATION OF RESEARCH, DATA, AND ASSESSMENT NEEDS

The following research, data, and assessment needs for insular fisheries were identified by the Council's Plan Team:

- Improve species identification of commercial and non-commercial fisheries data (e.g., outreach, use FAO species codes) to improve understanding of potential protected species impacts.
- Define and evaluate innovative approaches to derive robust estimates of protected species interactions in insular 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.

LIFE HISTORY AND LENGTH DERIVED PARAMETERS

2.1.1 MHI CORAL REEF ECOSYSTEM COMPONENTS LIFE HISTORY

2.1.1.1 AGE, GROWTH, AND REPRODUCTIVE MATURITY

Description: Age determination is based on counts of yearly growth marks (annuli) and/or daily growth increments (DGIs) internally visible within transversely cut, thin sections of sagittal otoliths. Validated age determination is based on several methods including an environmental signal (bomb radiocarbon ^{14}C) produced during previous atmospheric thermonuclear testing in the Pacific and incorporated into the core regions of sagittal otolith and other aragonite-based calcified structures such as hermatypic corals. This technique relies on developing a regionally based aged coral core reference series for which the rise, peak, and decline of ^{14}C values is available over the known age series of the coral core. Estimates of fish age are determined by projecting the ^{14}C otolith core values back in time from its capture date to where it intersects with the known age ^{14}C coral reference series. Fish growth is estimated by fitting the length-at-age data to a growth function, typically the von Bertalanffy growth function (VBGF). This function typically uses three coefficients (L_∞, k, and t_0), which together characterize the shape of the length-at-age growth relationship.

Length-at-reproductive maturity is based on the histological analyses of small tissue samples of gonad material that are typically collected along with otoliths when a fish is processed for life history studies. The gonad tissue sample is preserved, cut into five-micron sections, stained, and sealed onto a glass slide for subsequent examination. Based on standard cell structure features and developmental stages within ovaries and testes, the gender, developmental stage, and maturity status (immature or mature) is determined via microscopic evaluation. The percent of mature samples for a given length interval are assembled for each sex and these data are fitted to a three- or four-parameter logistic function to determine the best fit of these data based on statistical analyses. The mid-point of this fitted function provides an estimate of the length at which 50% of fish have achieved reproductive maturity (L_{50}). For species that undergo sex reversal (primarily female to male in the tropical Pacific region) - such as groupers and deeper-water emperors among the bottomfishes, and for parrotfish, shallow-water emperors, and wrasses among the coral reef fishes - standard histological criteria are used to determine gender and reproductive developmental stages that indicate the transitioning or completed transition from one sex to another. These data are similarly analyzed using a three or four-parameter logistic function to determine the best fit of the data based on statistical analyses. The mid-point of this fitted function provides an estimate of the length at which 50% of fish of a particular species have or are undergoing sex reversal ($L\Delta_{50}$).

Age at 50% maturity (A_{50}) and age at 50% sex reversal ($A\Delta_{50}$) can be derived by referencing the VBGF for that species and using the corresponding L_{50} and $L\Delta_{50}$ values to obtain the corresponding age value from this growth function. In studies where both age & growth and reproductive maturity are concurrently determined, estimates of A_{50} and $A\Delta_{50}$ are derived directly by fitting the percent of mature samples for each age (one-year) interval to a three- or four-parameter logistic function using statistical analyses. The mid-point of this fitted logistic function provides a direct estimate of the age at which 50% of fish of a particular species have achieved reproductive maturity (A_{50}) and sex reversal ($A\Delta_{50}$).

Data Category: Biological

Timeframe: N/A

Jurisdiction: MHI and NWHI

Spatial Scale: Archipelagic

Data Source: Sources of data are directly derived from research cruises sampling and market samples purchased from local fish vendors. Laboratory analyses and data generated from these analyses reside with the PIFSC Life History Program (LHP). Refer to the "Reference" column in Rationale: These nine life history parameters provide basic biological information at the species level to evaluate the productivity of a stock - an indication of the capacity of a stock to recover once it has been depleted. Currently, the assessment of coral reef ecosystem resources in Hawaii are data limited. Knowledge of these life history parameters support current efforts to characterize the resilience of these resources and also provide important biological inputs for future stock assessment efforts and enhance our understanding of the species-likely role and status as a component of the overall ecosystem. Furthermore, knowledge of life histories across species at the taxonomic level of families or among different species that are ecologically or functionally similar can provide important information on the diversity of life histories and the extent to which species can be grouped (based on similar life histories) for future multi-species assessments.

Table 1 for specific details on data sources by species.

Parameter definitions:

T_{max} (maximum age) – The maximum observed age revealed from an otolith-based age determination study. T_{max} values can be derived from ages determined by annuli counts of sagittal otolith sections and/or bomb radiocarbon (^{14}C) analysis of otolith core material. Units are years.

L_∞ (asymptotic length) – One of three coefficients of the VBGF that measures the mean maximum length at which the growth curve plateaus and no longer increases in length with increasing age. This coefficient reflects the estimated mean maximum length and not the observed maximum length. Units are centimeters.

k (growth coefficient) – One of three coefficients of the VBGF that measures the shape and steepness by which the initial portion of the growth function approaches its mean maximum length (L_∞).

t_0 (hypothetical age at length zero) – One of three coefficients of the VBGF whose measure is highly influenced by the other two VBGF coefficients (k and L_∞) and typically assumes a negative value when specimens representing early growth phases) are not available for age determination. This parameter can be fixed at 0. Units are years.

M (natural mortality) – This is a measure of the mortality rate for a fish stock and is considered to be directly related to stock productivity (i.e., high M indicates high productivity and low M indicates low stock productivity). M can be derived through use of various equations that link M to T_{max} and the VBGF coefficients (k and L_∞) or by calculating the value of the slope from a regression fit to a declining catch curve (regression of the natural logarithm of abundance versus age class) derived from fishing an unfished or lightly fished population.

A_{50} (age at 50% maturity) – Age at which 50% of the sampled stock under study has attained reproductive maturity. This parameter is best determined based on studies that concurrently determine both age (otolith-based age data) and reproductive maturity status (logistic function fitted to percent mature by age class with maturity determined via microscopic analyses of gonad histology preparations). A more approximate means of estimating A_{50} is to use an existing L_{50} estimate to find the corresponding age (A_{50}) from an existing VBGF curve. Units are years.

$A\Delta_{50}$ (age of sex switching) – Age at which 50% of the immature and adult females of the sampled stock under study is undergoing or has attained sex reversal. This parameter is best determined based on studies that concurrently determines both age (otolith-based age data) and reproductive sex reversal status (logistic function fitted to percent sex reversal by age class with sex reversal determined via microscopic analyses of gonad histology preparations). A more approximate means of estimating $A\Delta_{50}$ is to use an existing $L\Delta_{50}$ estimate to find the corresponding age ($A\Delta_{50}$) from the VBGF curve. Units are years.

L_{50} (length at which 50% of a fish population are capable of spawning) – Length at which 50% of the females of a sampled stock under study has attained reproductive maturity; this is the length associated with A_{50} estimates. This parameter is derived using a logistic function to fit the percent mature data by length class with maturity status best determined via microscopic analyses of gonad histology preparations. L_{50} information is typically more available than A_{50} since L_{50} estimates do not require knowledge of age and growth. Units are centimeters.

$L\Delta_{50}$ (length of sex switching) – Length at which 50% of the immature and adult females of the sampled stock under study is undergoing or has attained sex reversal; this is the length associated with $A\Delta_{50}$ estimates. This parameter is derived using a logistic function to fit the percent sex reversal data by length class with sex reversal status best determined via microscopic analyses of gonad histology preparations. $L\Delta_{50}$ information is typically more available than $A\Delta_{50}$ since $L\Delta_{50}$ estimates do not require knowledge of age and growth. Units are centimeters.

Rationale: These nine life history parameters provide basic biological information at the species level to evaluate the productivity of a stock - an indication of the capacity of a stock to recover once it has been depleted. Currently, the assessment of coral reef ecosystem resources in Hawaii are data limited. Knowledge of these life history parameters support current efforts to characterize the resilience of these resources and also provide important biological inputs for future stock assessment efforts and enhance our understanding of the species-likely role and status as a component of the overall ecosystem. Furthermore, knowledge of life histories across species at the taxonomic level of families or among different species that are ecologically or functionally similar can provide important information on the diversity of life histories and the extent to which species can be grouped (based on similar life histories) for future multi-species assessments.

Table 1. Available age, growth, and reproductive maturity information for coral reef ecosystem component species in the Hawaiian Archipelago

Species		Age, growth, and reproductive maturity parameters								Reference
	T_{max}	L_∞	k	t_0	M	A_{50}	$A\Delta_{50}$	L_{50}	$L\Delta_{50}$	
Acanthurus triostegus								f=16.7[d] m=16.3[d]		Schemmel and Friedlander (2016)
Calotomus carolinus	4[d]					1.3[d]	3.2 [d]	24[d]	37[d]	DeMartini et al. (2017); DeMartini

Species		**Age, growth, and reproductive maturity parameters**								**Reference**
	T_{max}	L_∞	k	t_0	M	A_{50}	$A\Delta_{50}$	L_{50}	$L\Delta_{50}$	
										and Howard (2016)
Caranx melampygus										
Cellana spp.										
Chlorurus perspicillatus	19[d]	53.2[d]	0.23[d]	-1.48[d]		3.1[d]	7[d]	34[d]	46[d]	DeMartini et al. (2017); DeMartini and Howard (2016)
Chlorurus spilurus	11[d]	34.4[d]	0.40[d]	-0.13[d]		1.5[d]	4[d]	17[d]	27[d]	DeMartini et al. (2017); DeMartini and Howard (2016)
Kyphosus bigibbus										
Lobster										
Lutjanus kasmira										
Naso annulatus										
Octopus cyanea										
Panulirus marginatus[1]		104.33-147.75[d]	0.05-0.58[d]					40.5[d]		O'Malley (2009); DeMartini et al. (2005)
Parupeneus porphyus										
Scaridae										
Scarus psittacus	6[d]	32.7[d]	0.49[d]	-0.01[d]		1[d]	2.4[d]	14[d]	23[d]	DeMartini et al. (2017); DeMartini and Howard (2016)
Scarus rubroviolaceus	19[d]	53.5[d]	0.41[d]	0.12[d]		2.5[d]	5[d]	35[d]	47[d]	DeMartini et al. (2017); DeMartini and Howard (2016)
Scyllarides squammosus[2]		X[a]	X[a]					51.1		O'Malley (2009); DeMartini et al. (2005)
Naso unicornis	54[d]	47.8[d]	0.44[d]	-0.12[d]				f=35.5[d] m=30.1[d]		Andrews et al. (2016); DeMartini et al. (2014)

[a] signifies estimate pending further evaluation in an initiated and ongoing study.
[b] signifies a preliminary estimate taken from ongoing analyses.
[c] signifies an estimate documented in an unpublished report or draft manuscript.
[d] signifies an estimate documented in a finalized report or published journal article (including in press).
[1] *Panulirus marginatus* growth rates (k and L_∞) are from a range of locations in the NWHI for both sexes.
[2] *Scyllarides squammosus* growth rates available for Schnute growth model but not from von Bertalannfy growth model (i.e., no k or L_∞).

Parameter estimates are for females unless otherwise noted (f=females, m=males). Parameters T_{max}, t_0, A_{50}, and $A\Delta_{50}$ are in units of years; L_∞, L_{50}, and $L\Delta_{50}$ are in units of mm fork length (FL); k is in units of year^{-1}; X=parameter estimate too preliminary or Y=published age and growth parameter estimates based on DGI numerical integration technique and likely to be inaccurate; NA=not applicable.

2.1.2 MHI BOTTOMFISH MANAGEMENT UNIT SPECIES LIFE HISTORY

2.1.2.1 AGE, GROWTH, AND REPRODUCTIVE MATURITY

Description: Age determination is based on counts of yearly growth marks (annuli) and/or DGIs internally visible within transversely cut, thin sections of sagittal otoliths. Validated age determination is based on several methods including an environmental signal (bomb radiocarbon ^{14}C) produced during previous atmospheric thermonuclear testing in the Pacific and incorporated into the core regions of sagittal otolith and other aragonite-based calcified structures such as hermatypic corals. This technique relies on developing a regionally based aged coral core reference series for which the rise, peak, and decline of ^{14}C values is available over the known age series of the coral core. Estimates of fish age are determined by projecting the ^{14}C otolith core values back in time from its capture date to where it intersects with the known age ^{14}C coral reference series. Fish growth is estimated by fitting the length-at-age data to a growth function, typically a VBGF. This function typically uses three coefficients (L_∞, k, and t_0), which together characterize the shape of the length-at-age growth relationship.

Length-at-reproductive maturity is based on the histological analyses of small tissue samples of gonad material that are typically collected along with otoliths when a fish is processed for life history studies. The gonad tissue sample is preserved, cut into five micron sections, stained, and sealed onto a glass slide for subsequent examination. Based on standard cell structure features and developmental stages within ovaries and testes, the gender, developmental stage, and maturity status (immature or mature) is determined via microscopic evaluation. The percent of mature samples for a given length interval are assembled for each sex and these data are fitted to a three- or four-parameter logistic function to determine the best fit of these data based on statistical analyses. The mid-point of this fitted function provides an estimate of the length at which 50% of fish have achieved reproductive maturity (L_{50}). For species that undergo sex reversal (primarily female to male in the tropical Pacific region) - such as groupers and deeper-water emperors among the bottomfishes, and for parrotfish, shallow-water emperors, and wrasses among the coral reef fishes - standard histological criteria are used to determine gender and reproductive developmental stages that indicate the transitioning or completed transition from one sex to another. These data are similarly analyzed using a three or four-parameter logistic function to determine the best fit of the data based on statistical analyses. The mid-point of this fitted function provides an estimate of the length at which 50% of fish of a particular species have or are undergoing sex reversal ($L\Delta_{50}$).

Age at 50% maturity (A_{50}) and age at 50% sex reversal ($A\Delta_{50}$) can be derived by referencing the VBGF for that species and using the corresponding L_{50} and $L\Delta_{50}$ values to obtain the corresponding age value from this growth function. In studies where both age & growth and reproductive maturity are concurrently determined, estimates of A_{50} and $A\Delta_{50}$ are derived directly by fitting the percent of mature samples for each age (one-year) interval to a three- or four-parameter logistic function using statistical analyses. The mid-point of this fitted logistic function provides a direct estimate of the age at which 50% of fish of a particular species have achieved reproductive maturity (A_{50}) and sex reversal ($A\Delta_{50}$).

Data Category: Biological

<u>Timeframe</u>: N/A

<u>Jurisdiction</u>: MHI and NWHI

<u>Spatial Scale</u>: Archipelagic

<u>Data Source</u>: Sources of data are directly derived from research cruises sampling and market samples purchased from local fish vendors. Laboratory analyses and data generated from these analyses reside with the PIFSC LHP. Refer to the "Reference" column in Table 2 for specific details on data sources by species.

<u>Parameter Definitions</u>: Identical to Section 2.1.2.1

Parameter estimates are for females unless otherwise noted (f=females, m=males). Parameters T_{max}, t_0, A_{50}, and $A\Delta_{50}$ are in units of years; L_∞, L_{50}, and $L\Delta_{50}$ are in units of mm FL; k is in units of year^{-1}; X=parameter estimate too preliminary or Y=published age and growth parameter estimates based on DGI numerical integration technique and likely to be inaccurate; NA=not applicable.

Table 2. Available age, growth, reproductive maturity, and natural mortality information for bottomfish MUS in the Hawaii Archipelago

Species	Age, growth, and reproductive maturity parameters									Reference
	T_{max}	L_{∞}	k	t_0	M	A_{50}	$A\Delta_{50}$	L_{50}	$L\Delta_{50}$	
Aphareus rutilans							NA		NA	
Aprion virescens	27[d]	72.78[d]	0.31[d]		0.24[d]		NA	42.5-47.5[d]	NA	Everson et al. (1989); O'Malley et al. (2021)
Etelis carbunculus	22[c]	50.3[c]	0.07[c]				NA	23.4[d]	NA	Nichols et al. (2019); DeMartini (2016)
Etelis coruscans	f=55[d] m=51[d]	f=87.6[d] m=82.7[d]	f=0.12[d] m=0.13[d]	f=-1.02[d] m=-1.37[d]		9-11[a]	NA	65.79[d]	NA	Reed et al. (in press); Andrews et al. (2020)
Hyporthodus quernus	76[d]	0.078[d]	95.8[d]					58.0[d]	89.5[d]	Andrews et al. (2019); DeMartini et al. (2010)
Pristipomoides filamentosus	42[d]	67.5[d]	0.24[d]	-0.29[d]			NA	f=40.7[d] m=43.3[d]	NA	Andrews et al. (2012); Luers et al. (2017)
Pristipomoides sieboldii							NA	23.8[d]	NA	DeMartini (2016)
Pristipomoides zonatus	Close to 30[d]	42.5[d]	0.38[d]	-1.2[d]			NA		NA	Andrews and Schofield (2021)

[a] signifies estimate pending further evaluation in an initiated and ongoing study.
[b] signifies a preliminary estimate taken from ongoing analyses.
[c] signifies an estimate documented in an unpublished report or draft manuscript.
[d] signifies an estimate documented in a finalized report or published journal article (including in press).

1.7 FEDERAL LOGBOOK DATA

1.7.1 NUMBER OF FEDERAL PERMIT HOLDERS

In Hawaii, the following federal permits are required for fishing in the exclusive economic zone (EEZ) under the Hawaii FEP. Regulations governing fisheries under this FEP are in the Code of Federal Regulations (CFR), Title 50, Part 665.

1.7.1.1 SPECIAL CORAL REEF ECOSYSTEM PERMIT

Regulations require the special coral reef ecosystem fishing permit for anyone fishing for coral reef ECS in a low-use marine protected area (MPA), fishing for species on the list of Potentially Harvested Coral Reef Taxa or using fishing gear not specifically allowed in the regulations. NMFS will make an exception to this permit requirement for any person issued a permit to fish under any FEP who incidentally catches Hawaii coral reef ECS while fishing for BMUS, crustacean MUS or ECS, western Pacific pelagic MUS, precious coral, or seamount groundfish. Regulations require a transshipment permit for any receiving vessel used to land or transship potentially harvested coral reef taxa, or any coral reef ECS caught in a low-use MPA.

1.7.1.2 MAIN HAWAIIAN ISLANDS NON-COMMERCIAL BOTTOMFISH

Regulations require this permit for any person, including vessel owners, fishing for bottomfish MUS or ECS in the EEZ around the MHI. If the participant possesses a current State of Hawaii CML, or is a charter fishing customer, he or she is not required to have this permit.

1.7.1.3 WESTERN PACIFIC PRECIOUS CORAL

Regulations require this permit for anyone harvesting or landing black, bamboo, pink, red, or gold corals in the EEZ in the western Pacific. The Papahānaumokuākea Marine National Monument prohibits precious coral harvests in the monument (71 FR 51134, August 29, 2006). Regulations governing this fishery are in the CFR, Title 50, Part 665, Subpart F, and Title 50, Part 404 (Papahānaumokuākea Marine National Monument).

1.7.1.4 WESTERN PACIFIC CRUSTACEANS PERMIT

Regulations require a permit for the owner of a U.S. fishing vessel used to fish for lobster or deepwater shrimp in the EEZ around American Samoa, Guam, Hawaii, and the Pacific Remote Islands Area (PRIA), and in the EEZ seaward of 3 nm of the shoreline of the CNMI.

Table 45 provides the number of permits issued to Hawaii FEP fisheries between 2014 and 2023. Data are from the PIRO Sustainable Fisheries Division (SFD) permits program.

Table 45. Number of federal permits in Hawaii FEP fisheries

Year	Special Coral Reef Ecosystem	MHI Non-Commercial Bottomfish	Precious Coral	Crustacean - Shrimp	Crustacean - Lobster
2014	0	3	1	7	1
2015	0	2	1	4	2
2016	1	0	1	4	1

Year	Special Coral Reef Ecosystem	MHI Non-Commercial Bottomfish	Precious Coral	Crustacean - Shrimp	Crustacean - Lobster
2017	1	1	1	6	2
2018	1	0	1	4	1
2019	0	2	1	3	1
2020	1	2	0	2	0
2021	1	0	0	3	0
2022	0	1	0	2	0
2023	0	1	0	3	0

Source: PIRO SFD unpublished data.

1.7.2 SUMMARY OF CATCH AND EFFORT FOR FEP FISHERIES

The Hawaii Archipelago FEP requires fishermen to obtain a federal permit to fish for certain MUS and ECS in federal waters and to report all catch and discards. While NMFS annually issues permits for various FEP fisheries, there is currently limited available data on the level of catch or effort made by federal non-longline permit holders. Determining the level of fishing activity through the required federal logbook reporting for each fishery helps establish the level of non-longline fishing occurring in federal waters to assess whether there is a continued need for active conservation and management measures (e.g., annual catch limits) for these fisheries. For each FEP fishery, the number of federal permits issued since the federal permit and logbook reporting requirements became effective as well as available catch and effort data are presented in Table 46 through Table 48.

1.7.2.1 PRECIOUS CORAL

There have been less than three permittees for the precious coral fishery in recent years, so any reports received are confidential.

1.7.2.2 NON-COMMERCIAL BOTTOMFISH

Table 46. Summary of federal logbook data for the Hawaii non-commercial bottomfish fishery

Year	No. of Federal Bottomfish Permits Issued[1]	No. of Federal Bottomfish Permits Reporting Catch	No. of Trips in MHI EEZ	Total Reported Logbook Catch (lb)		Total Reported Logbook Release/Discard (#)	
				Deep- 7 Bottomfish (MUS) from Sept 1-Aug. 31 the following year	*Non-Deep-7 Bottomfish (MUS & ECS)[2] from Jan. 1 to Dec. 31*	*Deep-7 Bottomfish (MUS) from Sept 1-Aug. 31 the following year*	*Non-Deep-7 Bottomfish (MUS & ECS)[2] from Jan. 1 to Dec. 31*
2008-09	80	4	9	182	32	0	0
2009-10	59	4	11	309	10	0	3
2010-11	22	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.

Year	No. of Federal Bottomfish Permits Issued[1]	No. of Federal Bottomfish Permits Reporting Catch	No. of Trips in MHI EEZ	Total Reported Logbook Catch (lb)		Total Reported Logbook Release/Discard (#)	
				Deep- 7 Bottomfish (MUS) from Sept 1-Aug. 31 the following year	*Non-Deep-7 Bottomfish (MUS & ECS)[2] from Jan. 1 to Dec. 31*	*Deep-7 Bottomfish (MUS) from Sept 1-Aug. 31 the following year*	*Non-Deep-7 Bottomfish (MUS & ECS)[2] from Jan. 1 to Dec. 31*
2011-12	18	0					
2012-13	10	0					
2013-14	3	0					
2014-15	2	0					
2015-16	0	-					
2016-17	1	0					
2017-18	0	-					
! 2018-19	2	0					
2019-20	2	0					
2020-21	0	-					
2021-22	1	0					
2022-23	1	0					

[1] Source: PIRO SFD unpublished data.
[2] On February 8, 2019, NMFS published a final rule (84 FR 2767) to reclassify certain MUS as ecosystem component species (ECS). This rule reclassified all of the non-Deep-7 bottomfish except uku as ECS.
Notes: Federal non-commercial bottomfish permit and reporting requirements became effective on August 8, 2008 (73 FR 41296, July 18, 2008). The fishing year for "Deep-7 bottomfish" begins September 1 and ends August 31 the following year. For example, data for 2008 should include information from September 1, 2008, through August 31, 2009. The fishing year for non-Deep-7 bottomfish is the calendar year. "n.d." = Not available due to confidentiality.

1.7.2.3 SPINY AND SLIPPER LOBSTER

Table 47. Summary of federal logbook data for Hawaii lobster fisheries

Year	No. of Federal Lobster Permits Issued[1]	No. of Federal Lobster Permits Reporting Catch in MHI	No. of Trips in MHI EEZ	Total Reported Logbook Catch (lb)		Total Reported Logbook Release/Discard (lb)	
				Spiny lobster	*Slipper lobster*	*Spiny lobster*	*Slipper lobster*
2004	0	-					
2005	0	-					
2006	0	-					
2007	2	0					
2008	2	0					
2009	3	0					
2010	0	-					

Year	No. of Federal Lobster Permits Issued[1]	No. of Federal Lobster Permits Reporting Catch in MHI	No. of Trips in MHI EEZ	Total Reported Logbook Catch (lb)		Total Reported Logbook Release/Discard (lb)	
				Spiny lobster	*Slipper lobster*	*Spiny lobster*	*Slipper lobster*
2011	0	-					
2012	0	-					
2013	2	0					
2014	1	0					
2015	2	0					
2016	1	0					
2017	2	0					
2018	1	0					
2019	1	0					
2020	0	-					
2021	0	-					
2022	0	-					
2023	0	-					

[1] Source: PIRO SFD unpublished data.

1.7.2.4 DEEPWATER SHRIMP

Table 48. Summary of federal logbook data for the Hawaii deepwater shrimp fishery

Year	No. of Federal Shrimp Permits Issued[1]	No. of Federal Shrimp Permits Reporting Catch[2]	No. of Trips in MHI EEZ	Total Reported Logbook Shrimp MUS Catch (lb)	Total Reported Logbook Shrimp MUS Release/Discard (lb)
2009	0				
2010	0				
2011	0				
2012	0	n.d.	n.d.	n.d.	n.d.
2013	3	6	80	10,520	113
2014	7	6	61	11,676	212
2015	4	3	24	13,020	261
2016	4	3	123	39,781	7,257
2017	6	4	27	5,529	74
2018	4	n.d.	n.d.	n.d.	n.d.
2019	3	3	192	23,939	0
2020	2	n.d.	n.d.	n.d.	n.d.
2021	3	n.d.	n.d.	n.d.	n.d.
2022	2	n.d.	n.d.	n.d.	n.d.
2023	3	n.d.	n.d.	n.d.	n.d.

[1] Source: PIRO SFD unpublished data.

[2] Permits are valid for one year from the date issued, so permits issued in 2021 may be valid for a part of 2022. The number of permits reporting catch can therefore be greater than the number issued that year.
Notes: Federal permit and reporting requirements for deepwater shrimp fisheries became effective on June 29, 2009 (74 FR 25650, May 29, 2009). "n.d." = Not available due to confidentiality. Shrimp MUS = *H. laevigatus* and *H. ensifer*. No. of trips in MHI EEZ used permit number, gear set date to determine unique trips. Total catch and discard include both within the MHI EEZ and outside of the EEZ.

1.12 ADMINISTRATIVE AND REGULATORY ACTIONS

This summary describes management actions NMFS implemented for insular fisheries in the Hawaiian Archipelago during calendar year 2023.

On March 7, 2023 NMFS published a final rule to implement annual catch limits (ACL) and accountability measures (AM) for main Hawaiian Islands (MHI) deepwater shrimp and precious coral for each fishing year in the time period between 2022 and 2025 (88 FR 88835). As a post-season AM, if NMFS determines that the average total catch from the most recent three fishing years exceeded an ACL in a fishing year, NMFS will reduce the ACL for the following fishing year by the amount of the overage. This final rule supports the long-term sustainability of MHI deepwater shrimp and precious coral, and established the following ACLs:

Table 1. ACLs (lb) for MHI Deepwater Shrimp and Precious Coral MUS for Each Fishing Year in the Time Period Between 2022 and 2025

Fishery	Management Unit Species	ACL
Crustacean	Deepwater shrimp	250,773
Precious Coral	‘Au‘au Channel - Black coral	5,512
Precious Coral	Makapu‘u Bed – Pink and red coral	2,205
Precious Coral	Makapu‘u Bed – Bamboo coral	551
Precious Coral	180 Fathom Bank – Pink and red coral	489
Precious Coral	180 Fathom Bank – Bamboo coral	123
Precious Coral	Brooks Bank – Pink and red coral	979
Precious Coral	Brooks Bank – Bamboo coral	245
Precious Coral	Ka‘ena Point Bed – Pink and red coral	148
Precious Coral	Ka‘ena Point Bed – Bamboo coral	37
Precious Coral	Keāhole Bed – Pink and red coral	148
Precious Coral	Keāhole Bed – Bamboo coral	37
Precious Coral	Hawaii Exploratory Area – precious coral	2,205

On October 6, 2023 NMFS published a final rule to implement the annual harvest guideline for the commercial lobster fishery in the Northwestern Hawaiian Islands (NWHI) for calendar year 2023 at zero lobsters (88 FR 69554). Harvest of NWHI lobster resources is not allowed because regulations governing the Papahānaumokuākea Marine National Monument in the NWHI prohibit the unpermitted removal of monument resources (50 CFR 404.7) and establish a zero annual harvest guideline for lobsters (50 CFR 404.10(a)).

On December 26, 2023, NMFS published the final rule to extend the region-wide moratorium on the harvest of gold corals in the U.S. Pacific Islands through June 30, 2028 (88 FR 88835). NMFS intends this rule to prevent overfishing and to stimulate research on gold corals.