2.1
2.1 CORAL REEF FISH ECOSYSTEM PARAMETERS

2.1.1 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, the Commonwealth of the Northern Mariana Islands (CNMI), Main Hawaiian Islands (MHI), Northwestern Hawaiian Islands (NWHI), and the 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.

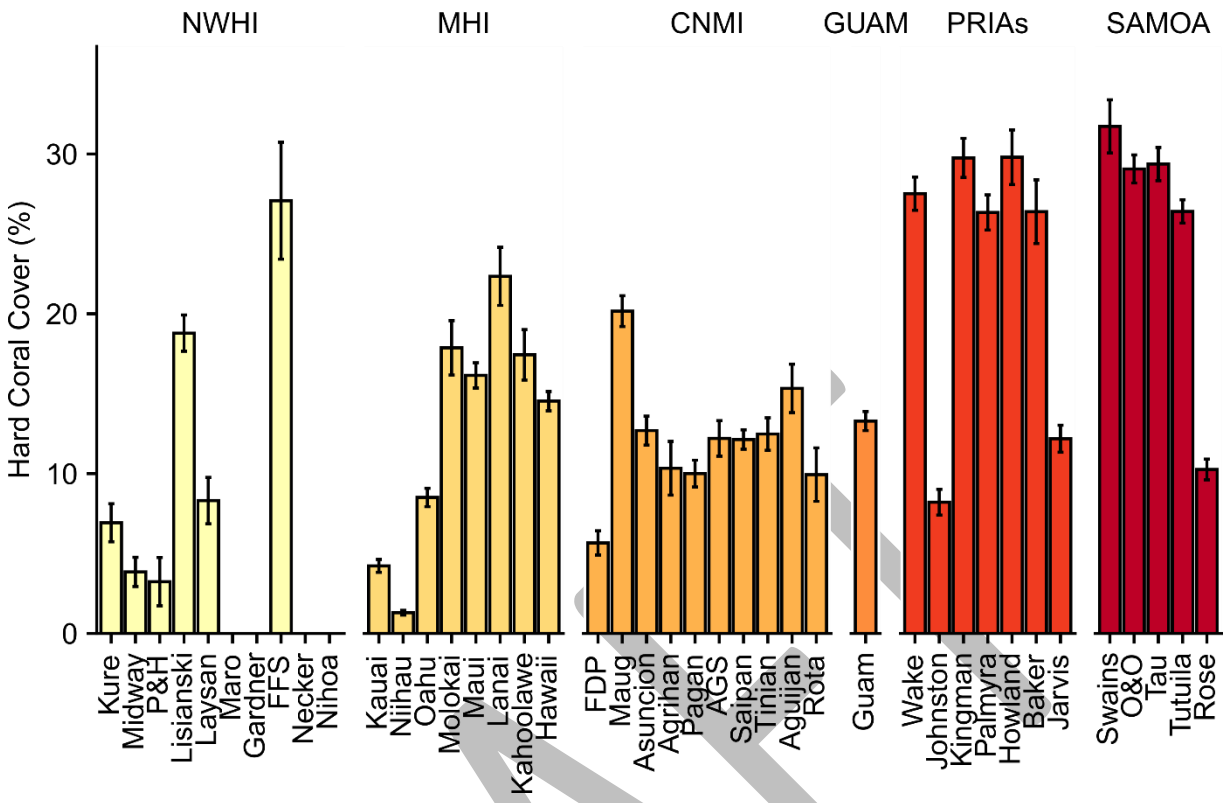

Figure 1. Mean coral cover (% ± standard error of the mean, or SEM) per U.S. Pacific Island from 2010–2023 by latitude

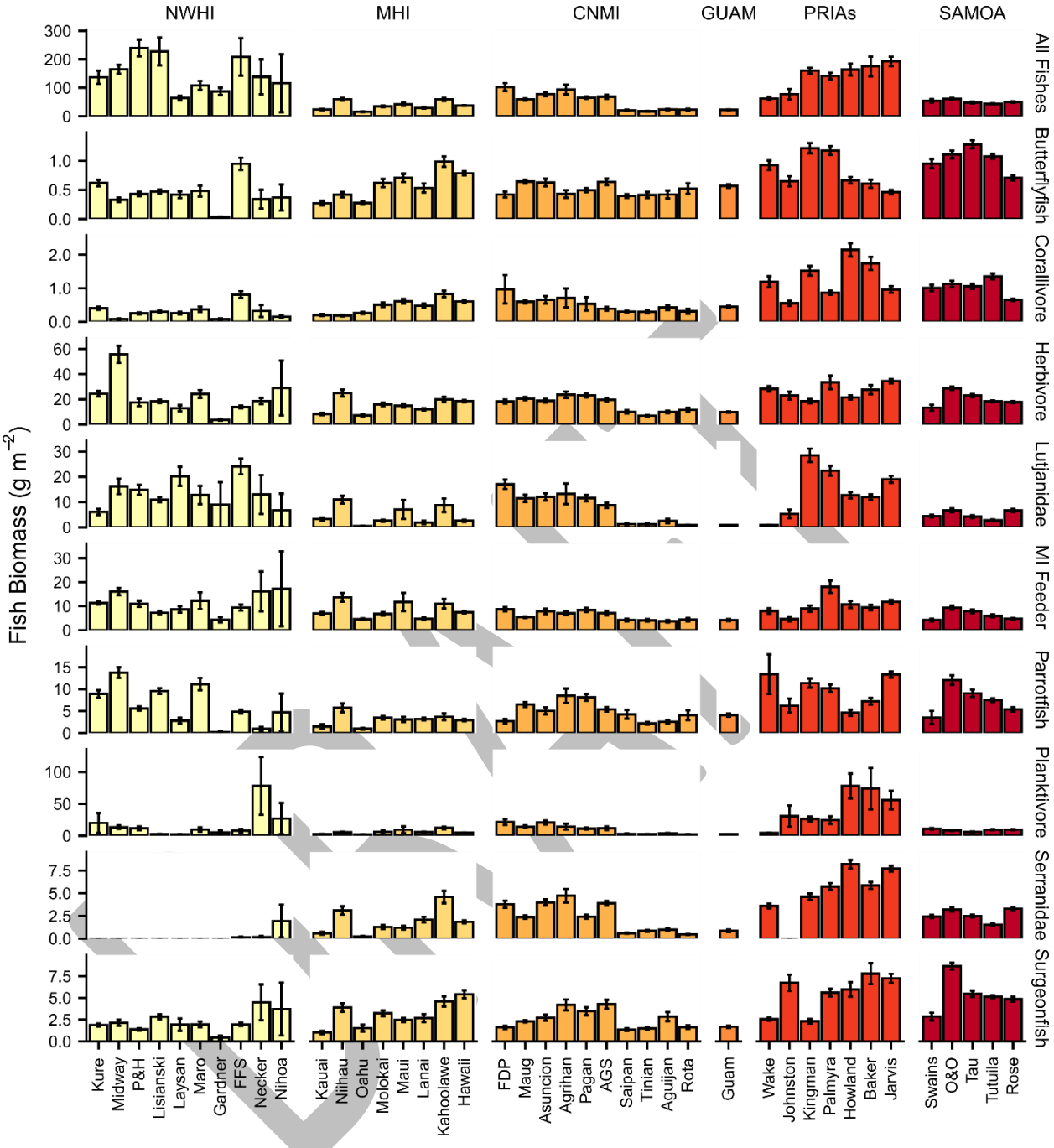

Figure 2. Mean fish biomass (g/m^2 ± SEM) of functional, taxonomic, and trophic groups by U.S. Pacific reef area from 2010-2023 by latitude

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

2.1.2 ARCHIPELAGIC 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: PRIA

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 2.1.1.

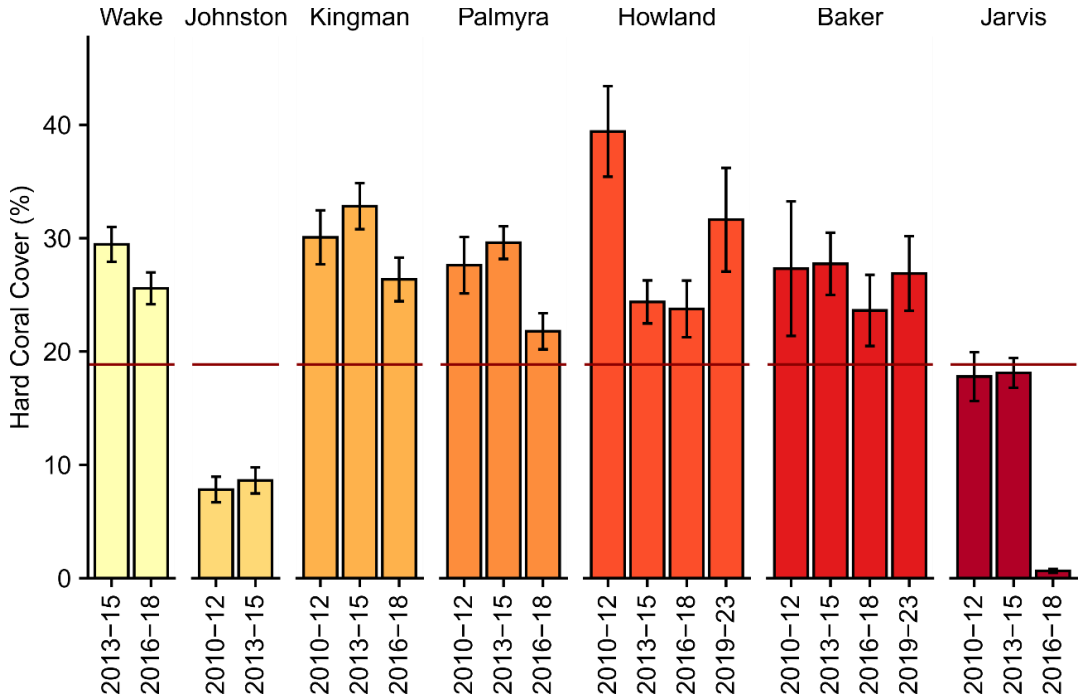

Figure 3. Mean coral cover (% ± SEM) per island of the PRIA from 2010–2023 by latitude
Note: The red horizontal line is the region-wide mean estimate for the entire time period.

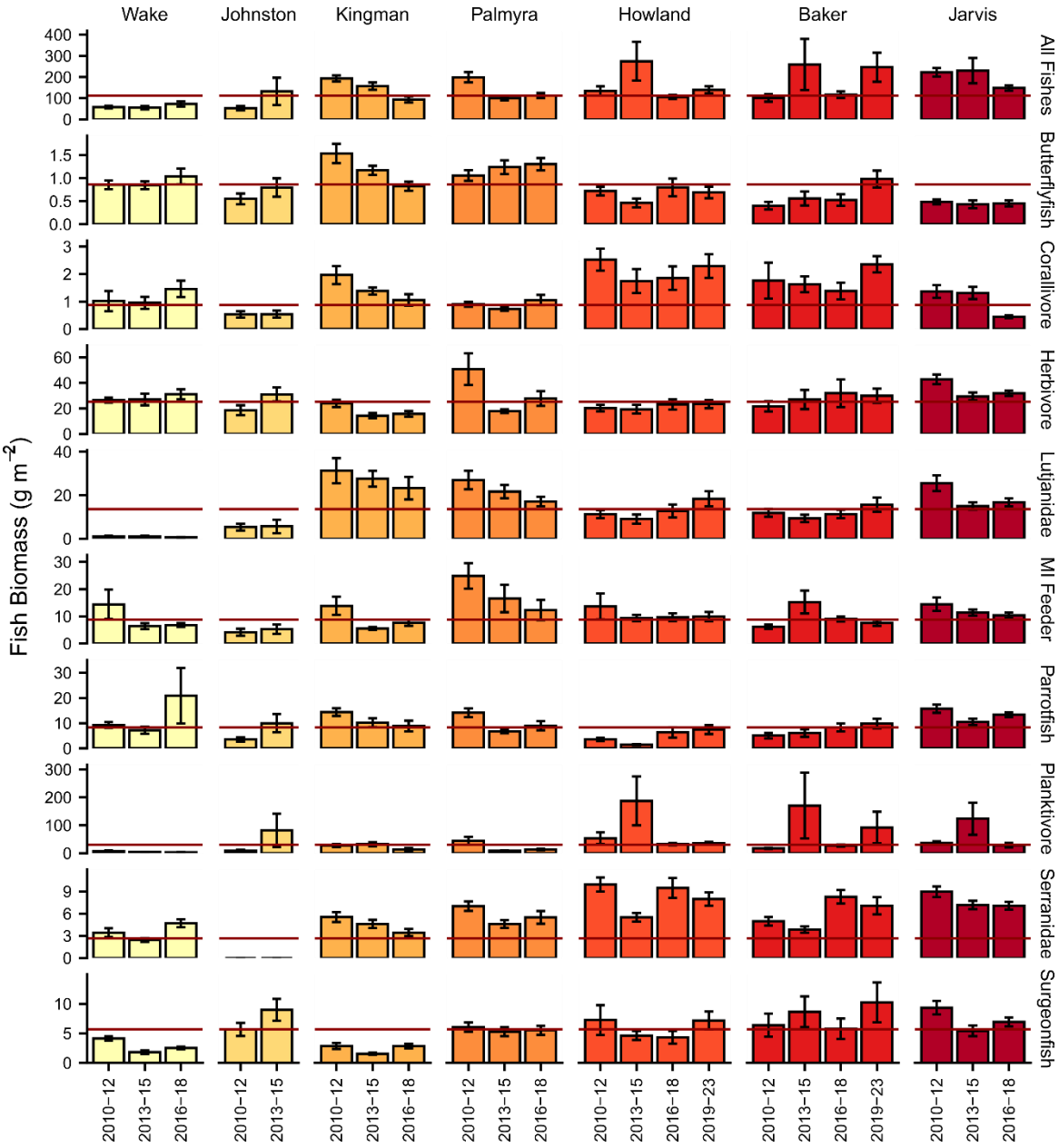

Figure 4. Mean fish biomass (g/m^2 ± SEM) of PRIA functional, taxonomic, and trophic groups from 2010-2023 by island

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 FEDERAL LOGBOOK DATA

1.1.1 NUMBER OF FEDERAL PERMIT HOLDERS

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

1.1.1.1 SPECIAL CORAL REEF ECOSYSTEM PERMIT

Regulations require the special coral reef ecosystem fishing permit for anyone fishing for coral reef ecosystem component species (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. The National Marine Fisheries Service (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 bottomfish management unit species (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.

1.1.1.2 WESTERN PACIFIC PRECIOUS CORALS PERMIT

Regulations require a Western Pacific Precious Corals permit for anyone harvesting or landing black, bamboo, pink, red, or gold corals in the EEZs of the U.S. Western Pacific.

1.1.1.3 WESTERN PACIFIC CRUSTACEANS PERMIT (LOBSTER OR DEEPWATER SHRIMP)

Regulations require a Western Pacific Crustaceans permit for any owner of a U.S. fishing vessel used to fish for lobster or deepwater shrimp in the EEZs around of the U.S. Western Pacific.

1.1.1.4 PRIA BOTTOMFISH PERMIT

Regulations require obtaining a PRIA Bottomfish permit for anyone using bottomfish gear to fish for bottomfish MUS in the EEZ around the PRIA. Commercial fishing is prohibited within the boundaries of the Pacific Remote Islands Marine National Monument (PRIMNM).

There is no record of permits issued for the EEZ around the PRIA for the coral reef or precious coral fisheries since 2008, for the lobster fishery since 2009, and for the shrimp fishery since 2010. Table 1 provides the number of permits issued for PRIA fisheries from 2014 to 2023. Data were accessed from the National Oceanic and Atmospheric Administration (NOAA) Pacific Islands Regional Office (PIRO) Sustainable Fisheries Division (SFD) permits program.

Table 1. Number of federal permit holders in the FEP fisheries of the PRIA

PRIA Fisheries	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Bottomfish	2	1	1	1	4	4	0	0	0	0
Lobster	0	0	0	0	0	0	0	0	0	0
Shrimp	0	0	0	0	0	0	0	0	0	0

Source: PIRO SFD unpublished data.

1.1.2 SUMMARY OF CATCH AND EFFORT FOR FEP FISHERIES

The PRIA FEP requires fishermen to obtain a federal permit to fish for certain MUS 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 implementation of the federal permit and logbook reporting requirement became effective as well as available catch and effort data are presented.

1.1.2.1 BOTTOMFISH

Table 2. Summary of available federal logbook data for bottomfish fisheries in the PRIA

Year	No. of Federal Permits Issued[1]	Federal Permits Reporting Catch	No. of Trips in PRIA EEZ	Total Reported Logbook Catch (lb)		Total Reported Logbook Release/Discard (lb)	
				BMUS	*ECS*	*BMUS*	*ECS*
2006	1	0					
2007	6	0					
2008	5	0					
2009	5	0					
2010	5	0					
2011	6	0					
2012	5	0					
2013	2	0					
2014	2	0					
2015	1	0					
2016	1	0					
2017	1	0					
2018	4	0					
2019	4	0					
2020	0	-					
2021	0	-					
2022	0	-					
2023	0	-					

[1] Source: PIRO SFD unpublished data.

Note: Federal permit and reporting requirements for PRIA bottomfish fisheries became effective on December 4, 2006 (71 FR 69496, December 1, 2006).

1.1.2.2 SPINY AND SLIPPER LOBSTER

Table 3. Summary of available federal logbook data for lobster fisheries in the PRIA

Year	Federal Permits	Federal Permits	No. of Trips in	Total Reported Logbook Catch (lb)	Total Reported Logbook Release/Discard (lb)

	Issued[1]	**Reporting Catch**	**PRIA EEZ**	*Spiny lobster*	*Slipper lobster*	*Spiny lobster*	*Slipper lobster*
2006	0	-					
2007	3	0					
2008	5	0					
2009	4	0					
2010	0	-					
2011	0	-					
2012	0	-					
2013	0	-					
2014	0	-					
2015	0	-					
2016	0	-					
2017	0	-					
2018	0	-					
2019	0	-					
2020	0	-					
2021	0	-					
2022	0	-					
2023	0	-					

[1] Source: PIRO SFD unpublished data.
Note: Federal permit and reporting requirements for PRIA lobster fisheries became effective on December 4, 2006 (71 FR 69496, December 1, 2006).

1.1.2.3 DEEPWATER SHRIMP

Table 4. Summary of available federal logbook data for deepwater shrimp fisheries in the PRIA

Year	**Federal Permits Issued[1]**	**Federal Permits Reporting Catch**	**No. of Trips in PRIA EEZ**	**Total Reported Logbook Catch (lb)**	**Total Reported Logbook Release/Discard (lb)**
2009	0				
2010	1	0			
2011	0				
2012	0				
2013	0				
2014	0				
2015	0				
2016	0				
2017	0				
2018	0				
2019	0				
2020	0				
2021	0				
2022	0				

Year	Federal Permits Issued[1]	Federal Permits Reporting Catch	No. of Trips in PRIA EEZ	Total Reported Logbook Catch (lb)	Total Reported Logbook Release/Discard (lb)
2023	0				

[1] Source: PIRO SFD unpublished data.

Note: Federal permit and reporting requirements for deepwater shrimp fisheries became effective on June 29, 2009 (74 FR 25650, May 29, 2009).

1.2 ADMINISTRATIVE AND REGULATORY ACTIONS

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

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.