



Pacific Islands Fishery

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Fishing Fleets and Fishery Profiles Management – Vessels – Gear – Economics

By Max Markrich and Christopher Hawkins



CONTENTS

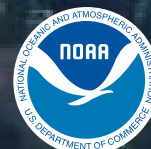
Foreword	i
Overview	1
Management	1
Vessels and Gear	2
Economics	3
Hawai'i Fleets and Fisheries.....	5
Hawai'i Pelagic Fisheries.....	5
Longline Fishery	5
Main Hawaiian Islands Handline and Troll Fisheries	6
Offshore Handline Fishery	7
Charter Sport Fishery	7
Pole-and-Line (Aku) Fishery.....	8
Hawai'i Nearshore Fisheries	9
Bottomfish Fishery	9
Crustacean Fishery	10
Coral Reef Fishery	11
Precious Coral Fishery.....	13
Pacific Remote Island Areas Fleets and Fisheries	15
PRIA Pelagic Fisheries	15
PRIA Nearshore Fisheries.....	18
American Samoa Fleets and Fisheries	21
American Samoa Pelagic Fisheries	21
Longline Fishery	21
Purse-Seine Fishery.....	22
Charter Sport Fishery	23
American Samoa Nearshore Fisheries	23
Bottomfish Fishery	23
Crustacean Fishery	24
Coral Reef Fishery	25
Mariana Archipelago Fleets and Fisheries	27
Mariana Archipelago Pelagic Fisheries	27
CNMI Pelagic Fisheries	27
Guam Pelagic Fisheries	28
Mariana Archipelago Nearshore Fisheries	29
CNMI Bottomfish Fishery	29
Guam Bottomfish Fishery	29
CNMI Crustacean Fishery	30
Guam Crustacean Fishery	31
CNMI Coral Reef Fishery	32
Guam Coral Reef Fishery.....	33
List of Acronyms.....	35



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Inside cover photo of Guam coral reef fish provided courtesy of Dave Burdick.



FOREWORD

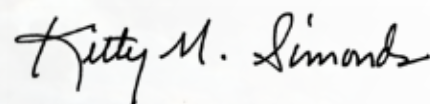
Aloha, Talofa, Hafa Adai and Tirow. Welcome to the fleets and fisheries of the Western Pacific Region. Our jurisdiction is more than 1.5 million square nautical miles, which comprises about half of the US exclusive economic zone and is about equal to the area of the continental United States.

The port of Honolulu consistently ranks in the top 10 in the nation in terms of total value of commercial landings and in the top 40 in terms of total pounds landed. This gap between value and tonnage indicates that commercial fishermen in the Western Pacific Region land high value catch. In recent years, the Western Pacific Region's seafood industry has, annually, generated more than three-quarters of a billion dollars in sales, more than \$250 million in income and approximately 11,000 full- and part-time jobs.

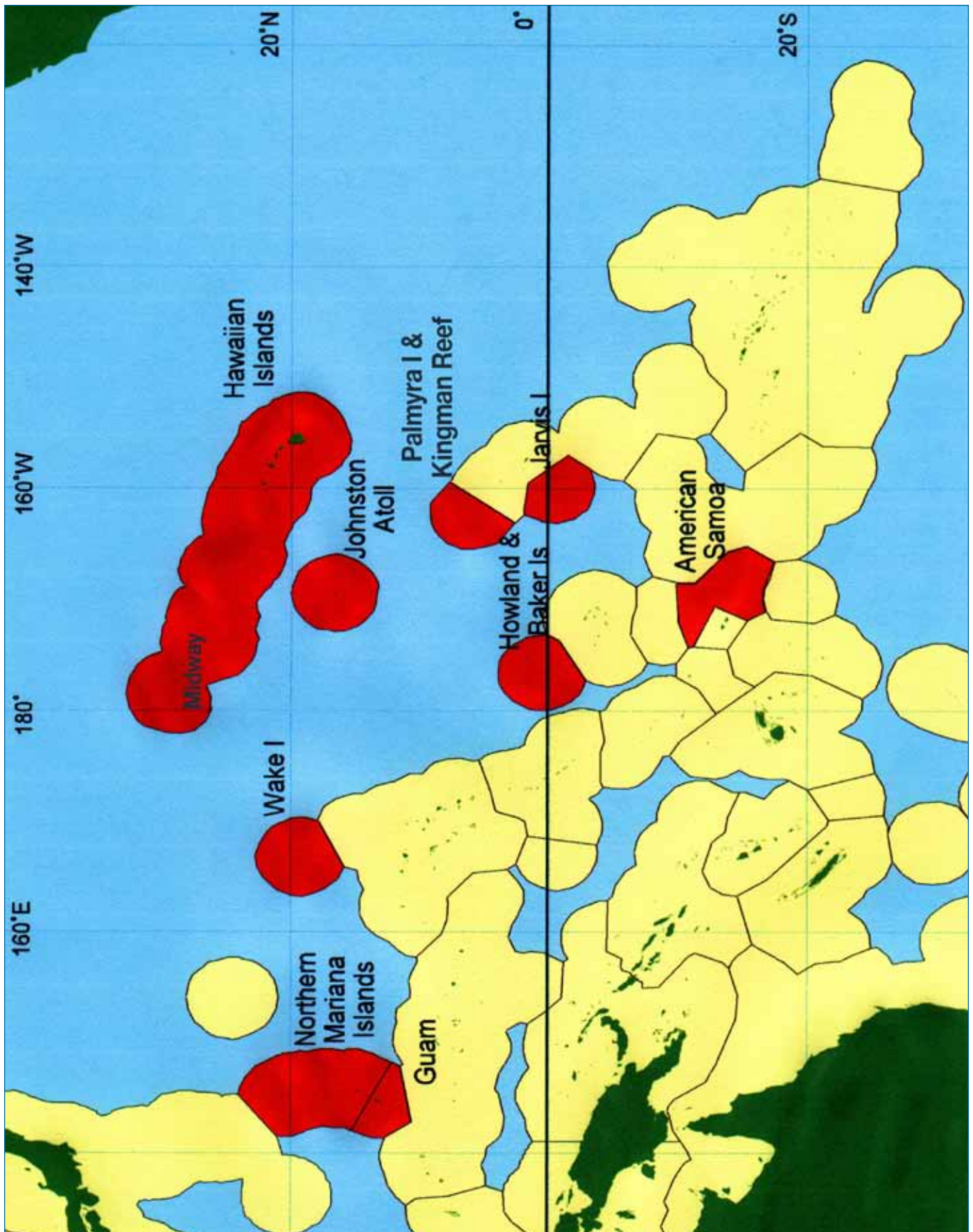
When one thinks about a fishing fleet, the highly commercialized fisheries of Alaska and New England likely come to mind. In the Western Pacific, however, small-scale, island-based fisheries dominate, and thus there are few large fleets. Much of our fishing activity is diffuse and conducted using a variety of gear. Our coral reef fisheries are good examples of this. In these fisheries, there is no standard vessel type, harvest method or even federal permit. Fishing activity is often split between state and federal waters, depending on time of the year and other factors. Excluding the purse-seine catch, our fish are mostly landed fresh in ice and consumed fresh near the point of landing. In addition, much of the fishing in our region is underpinned by mixed motivations: fishing trips are often conducted for both noncommercial (subsistence, sustenance, recreation, tradition) and commercial purposes. And when fish are sold, it is often to recoup trip expenses in support of noncommercial activity. Thus, it can be difficult to categorize trips and fishermen as commercial or noncommercial here in the islands.

With that said, our region does have several distinctive fleets. These are predominately pelagic fisheries and include the Hawai'i longline and charter fleets, the American Samoa longline fleet and the US purse-seine fleet. Together these fleets account for approximately 99 percent of the total US regional catch of highly migratory species in the Western and Central Pacific Ocean.

I hope you enjoy learning about our island fleets and fisheries, and I encourage you to visit us at www.wpcouncil.org and to see our latest annual fishery reports for up to date economic, catch and other information. Mahalo!



Executive Director
Western Pacific Regional
Fishery Management Council



Map showing the US exclusive economic zone in the Western Pacific Region in red.

OVERVIEW

Management

The Regional Fishery Management Council system was created in 1976 by the federal Fishery Conservation and Management Act, now known as the Magnuson-Stevens Act (MSA). The system includes eight councils and was designed to be a bottom-up approach to managing federal fisheries, where knowledgeable persons with a stake in the local fishery can guide federal policymaking. Each council's voting members include representatives from the National Marine Fisheries Service (NMFS), relevant state/territory and federal fishery-related agencies, qualified private citizens nominated by state/territory governors and approved by the Secretary of Commerce and, in some regions, a local tribal representative.

Fisheries in waters between 3 and 200 nautical miles (nm) from shore in American Samoa, the Commonwealth of the Northern Mariana Islands (CNMI), Guam, Hawai'i and the US Pacific Remote Island Areas (PRIAs) of Johnston, Midway, Palmyra and Wake Atolls; Baker, Howland and Jarvis Islands; and Kingman Reef are managed by the Western Pacific Regional Fishery Management Council. The Council develops fishery ecosystem plans (FEPs) and initiates a variety of management measures, such as fishing seasons, harvest quotas and fleet sizes.

The MSA now requires councils to establish annual catch limits (ACLs) and accountability measures (AMs) for all federally managed stocks and stock complexes, with some exceptions, such as internationally managed species. ACLs are harvest limits that aim to prevent overfishing. Typical ACL-based management starts with a stock assessment that estimates the maximum annual amount of fishing effort and harvest allowed without negatively impacting the fish stock. The assessment dictates the overfishing limit and maximum sustainable yield (MSY). Each council's Scientific and Statistical Committee (SSC) determines the acceptable biological catch (ABC) of the stocks, which is the reduction from the overfishing limit due to scientific uncertainty. Some councils then determine whether to reduce allowable harvest further, to account for social, economic and ecological considerations, as well as management uncertainty. If the annual harvest reaches the ACL, AMs are triggered. These could include, but are not limited to, closing the fishery or adjusting the next year's ACL.

Our Council is perhaps the most internationally engaged of the eight regional councils. We work closely with the Western and Central Pacific Fisheries Commission (WCPFC) and the Inter-American Tropical Tuna Commission (IATTC) to set quotas, effort limits and other measures in order to manage purse-seine and longline fishing Pacific-wide. We are also sensitive to the cultural importance of fisheries, as Hawaiian, Samoan, Chamorro and Refaulawach societies have depended upon the sea's bounty for millennia and have deeply ingrained cultural relationships to fish, fishing and sharing catch.

Over the years, the Council has developed a number of permit requirements to assist with the responsible stewardship of our fisheries in the modern era:

- Hawai'i deep-set and shallow-set longline
- American Samoa longline
- Western Pacific general longline
- Western Pacific pelagic squid
- American Samoa troll and handline
- Guam troll and handline
- CNMI troll and handline
- Main Hawaiian Islands (MHI) noncommercial bottomfish
- Western Pacific precious corals
- Western Pacific lobster
- Western Pacific deep-water shrimp
- Northern Mariana Islands bottomfish
- Western Pacific bottomfish

In addition to permits, which require reporting of catch and other aspects of effort and may, in some cases, require onboard observers, we also utilize various other management tools. For example, the Hawai'i and American Samoa longline fisheries both operate under a limited entry permit program. These programs cap the total number of vessels authorized to participate in the fishery. Permits are freely transferrable among holders, but they must be renewed annually. Commercial bottomfishing permits are required for vessels larger than 50 feet in Guam and 40 feet in the CNMI. Commercial handline and troll fishing or bottomfishing in the PRIAs also requires a permit, as does the harvest of precious corals or crustaceans in any area of the the US exclusive economic zone (EEZ) in the Western Pacific Region.

Noncommercial fishing is a major component of fishing in the region and sometimes also requires a federal permit. For example, we have a federal noncommercial bottomfish permit for the MHI, and fishermen who fish in federal waters around the Hawai'i archipelago must obtain a permit from the National Saltwater Angler Registry Program. Finally, certain approved fishing activities may take place in the region's marine national monuments, and these require a federal permit.

Federal and state/territorial fisheries managers share information on catch and sales data to understand catch and effort, especially for stocks that cross or live in more than one jurisdiction.

Protected species are an important management driver for several fisheries in the region. All Pacific sea turtles are designated under the Endangered Species Act (ESA) as either threatened or endangered. Humpback whales, blue whales, sperm whales, sei whales, fin whales, false killer whales and Hawaiian monk seals are found in our region and are protected under the ESA and Marine Mammal Protection Act (MMPA).

The short-tailed albatross, a migratory seabird that is known to be occasionally present in the Northwestern Hawaiian Islands (NWHI), is also listed as endangered under the ESA. To mitigate impacts to protected species, NMFS has placed limits on how many false killer whales and loggerhead and leatherback sea turtles the Hawai'i longline fishery may interact with per year and may move to halt the fishery if these are reached. Of course, fishing is just one challenge for protected species. Others include climate change, habitat degradation, poaching, vessel strikes and disease.

Vessels and Gear

US pelagic longline fisheries in the Western Pacific Region are based mainly out of Honolulu, Hawai'i, and Pago Pago, American Samoa. Longline fishing consists of a mainline with regularly spaced branch lines and hooks. Between 1,700 and 3,000 hooks are deployed in a single set of the line, which is held afloat by buoys and is often more than 30 miles in length. Float lines, the term for the mainline between these buoys, averages 72 feet in length. These segments typically contain around 30 hooks. Branch lines, the weighted hook lines that extend downward from the float line, average 43 feet in length. Approximately 66 floats are used during each set.

The purse-seine fishery for skipjack and yellowfin tuna is the largest US fishery in terms of total catch. It accounts for 95 percent of the total catch of highly migratory species by the US in the Western and Central Pacific Ocean. Purse-seine fishing involves a large net to surround a school of fish. A drawstring runs through a series of rings along the bottom of the net to close it while it is mechanically hauled upwards onto the vessel. Approximately one-third of US purse seiners in the Pacific operate out of American Samoa.

Troll fishing and, to a lesser extent, handline fishing for pelagic fish comprise the largest commercial fishery in terms of participation and the most common noncommercial pelagic fishing gear in the region. Charter, or for-hire, fishing



Longliner.



Troller.



Purse seiner.



Bottomfish vessel.



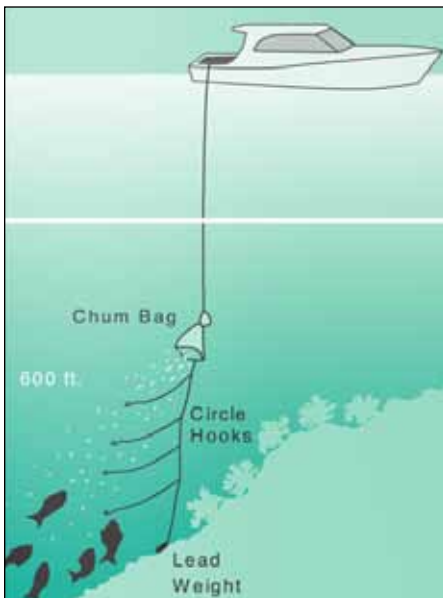
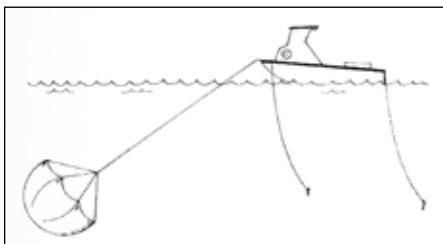
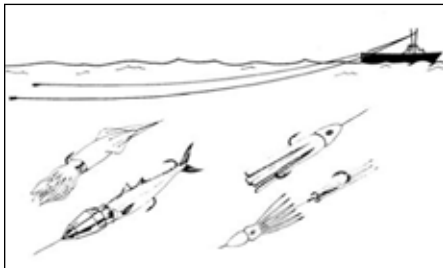
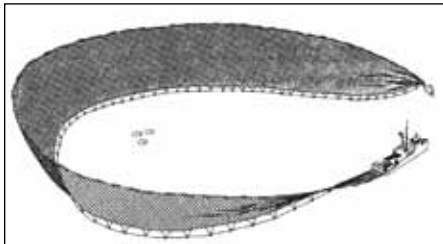
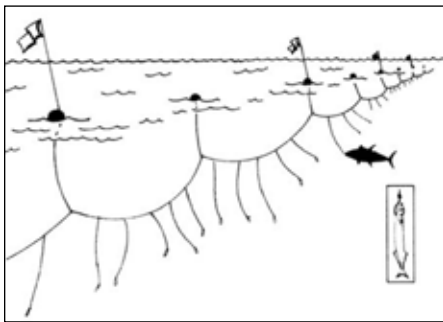
Alia.

is predominately a troll-based fishery. Approximately 1,000 troll vessels and 250 handline vessels operate in Hawai'i; 375 troll vessels in Guam; 10 troll vessels in CNMI; and 10 troll vessels in American Samoa. Troll and handline catches are dominated by yellowfin and skipjack tuna, mahimahi, wahoo and blue marlin.

Bottomfish fishermen target snappers and groupers that inhabit reef slopes, seamounts and banks at depths down to 1,200 feet. Bottomfish fishermen use mechanical line haulers from which individual handlines are deployed. The handlines are attached to terminal tackle that has several branch lines with circle hooks attached and a weight at the end. Chum bags are often used to attract the fish. Pre-contact native Hawaiians harvested the same deep-sea bottomfish species and used some of

the same specialized techniques as today's fishermen.

Nearshore fishermen targeting crustacean and coral reef fish utilize a variety of gear and methods, such as spears, traps, nets and rods and reels as well as gleaning by hand. Spearfishing may occur with SCUBA where this is allowed and takes place during the day and night. Fish traps and nets may vary from island area, reflecting traditional methods—such as the community hukilau, laulele and lau'apo'apo activities in Hawai'i, lau in American Samoa and talaya and chenchulu in the Mariana Islands—as well as modern monofilament cast, surround and lay nets where these are allowed. Deepwater precious coral are selectively collected by hand with the use of SCUBA/mixed gas/re-breathers or by underwater submersible vehicles.



Illustrations of pelagic and bottomfish fishing gear (from top): longline, purse seine, trolling, hand net, sea anchor and bottomfishing.



Illustrations of nearshore fishing gear (from top): fish trap, spearfishing, hand net, rod and reel, and gleaning.

Economics

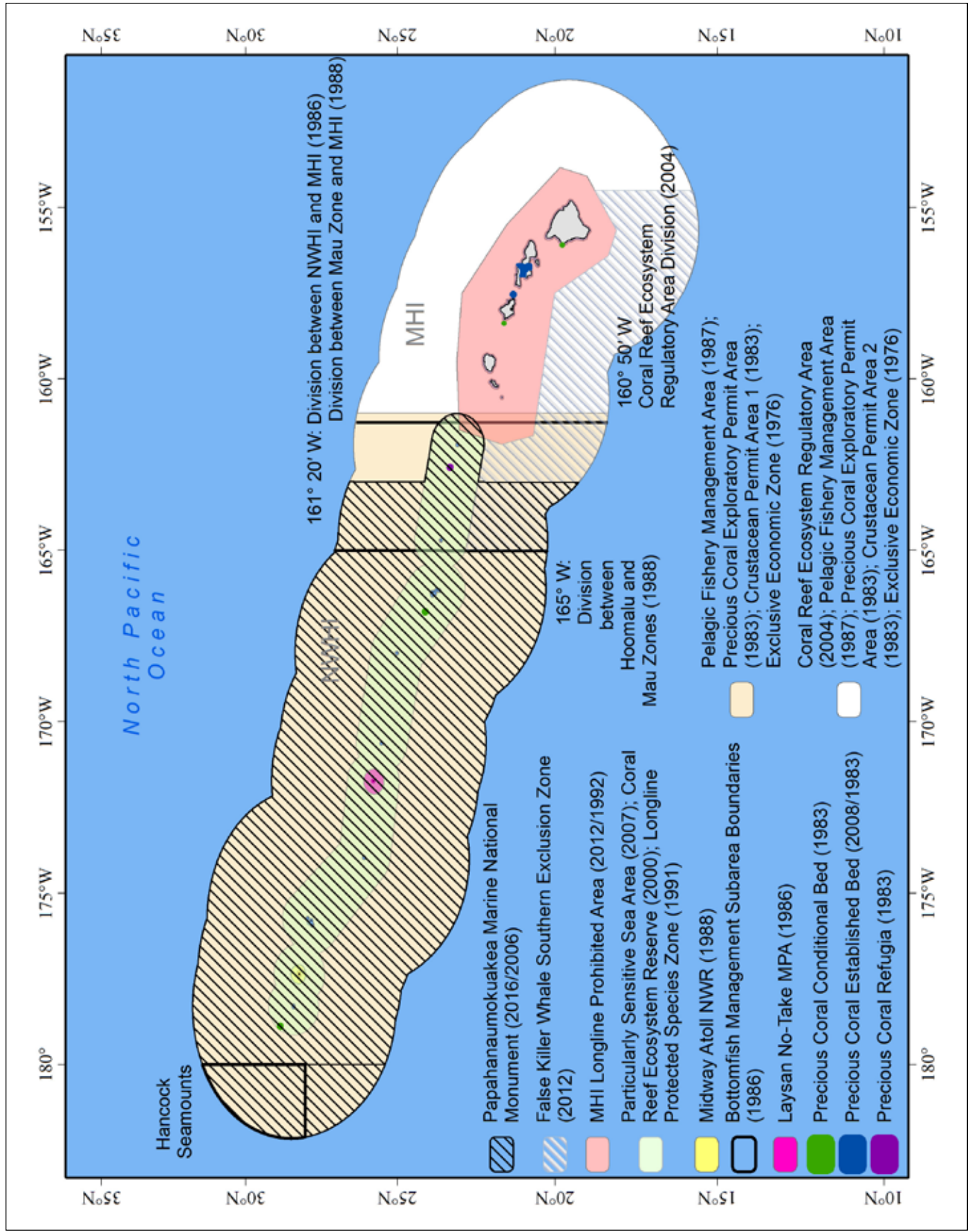
The value of pelagic catches in the Western Pacific Region (not including purse seining) amounted to \$113.5 million in 2015. The region's pelagic fishery is dominated by longline fishing, especially the Hawai'i longline fleet, which accounted for 83 percent of landed pelagic fish value in 2015. This rises to 87 percent when the American

Samoa longline fleet is added to the longline total. The largest contribution from non-longline fishing is troll fishing, which amounts to about 9 percent of the value of the regional pelagic catch, with the balance comprised of the Hawai'i handline fisheries and other gears.

Bottomfish and coral reef fisheries are considered low commercial value fisheries when compared to pelagic fisheries such as the Hawai'i and American Samoa longline fisheries. The economic value in the Western Pacific Region for bottomfish fisheries varies between jurisdictions, ranging from averages of \$29,000 annually in Guam to a high of \$1.4 million annually in Hawai'i, where the fishery is more developed, while the value of the coral reef fishery ranges from \$38,000 in American Samoa to a high of \$1.8 million in Hawai'i (Source: Hawai'i Archipelago, American Samoa Archipelago and Mariana Archipelago FEPs.) The region's crustacean fisheries have 10-year average revenues that range from approximately \$10,000 in American Samoa to \$196,000 in Hawai'i. The precious coral fishery occurs in Hawai'i only and lately targets black coral, amounting to about \$84,000 in 2001 and 2002. Current economic information is confidential as there is only one active precious coral permit in federal waters.

For the recreational (non-commercial) sector, about 1,200 jobs in the Western Pacific Region are generated and about \$108 million are spent by fishermen who fished in the region, according to the NMFS's most current study (2012). Most of these employment impacts were generated by industries servicing anglers who fished from shore or a private boat. Only 25 percent of the total trip-related expenditures came from non-resident fishermen. According to NMFS, more than 87,000 recreational fishermen took 1.5 million trips.

The importance of fisheries in the Western Pacific Region extends beyond monetary value alone. Per capita seafood consumption in the region is two to three times the national average. Fishing and sharing fish are also important in the islands for maintaining social ties and cultural continuity.



HAWAI‘I FLEETS AND FISHERIES

Hawai‘i Pelagic Fisheries

US pelagic fisheries in the Western Pacific Region include longline, purse-seine, troll, handline and pole-and-line. Hawai‘i pelagic longline, MHI troll and handline, offshore handline and aku boat (pole and line) fisheries landed approximately 39.6 million pounds with a total ex-vessel value of \$106 million in 2015.

Longline Fishery

Background

Hawai‘i’s longline fishery began around 1917 and was based on fishing techniques brought to Hawai‘i by Japanese immigrants. These early vessels were sampan-style “flagline” boats that targeted large yellowfin and bigeye tuna using basket gear and tarred rope mainline. Low profitability, an aging fleet and more modern gear largely spelled the end of this style of longlining by the early 1970s. During the 1980s, tuna longlining expanded to supply developing domestic and export markets with high quality fresh catch and sashimi grade tuna. In the late 1980s and early 1990s, the nature of the fishery changed completely with the arrival of swordfish and tuna longline fishermen from the US Atlantic and Gulf coasts. The influx of large, modern longline vessels and gear revitalized the fishery, and the fleet quickly adopted new technology to better target bigeye tuna at depth. The adoption of monofilament mainline longline reels further modernized the fleet and improved profitability.

Management

The fishery operates in two modes. A deep-set fishery targets tuna and catches other commercially valuable species, such as pomfrets and opah, while a shallow-set fishery targets swordfish and catches other commercially valuable species such as yellowfin tuna and mahimahi. The WCPFC set the retained bigeye catch limit for the US longline fishery at 3,554 metric tons (mt) for the 2015 calendar fishing year. Participants in this fishery are required to obtain federal permits and maintain logbooks. Deep-set and shallow-set trips have 20 percent and 100 percent observer coverage, respectively. The number of longline vessel permits is capped at 164, but these permits are transferable, allowing interested fishermen to purchase a permit from a current holder.

In 1991 the Council recommended and NMFS established a 50-nm longline exclusion zone around the NWHI to protect endangered Hawaiian monk seals. The following year, in March, a domestic longline vessel exclusion zone around the MHI ranging from 50- to 75-nm was created in order to mitigate growing gear conflicts between longline and small boat pelagic troll and handline fishermen. A seasonal reduction in the size of the closure was implemented later in



Hawai‘i longline vessels. Photo courtesy of John Kaneko

1992. Between October and January, longline vessels were able to fish seaward of 25-nm from the windward shores of all MHI. This reduction was in recognition of the fact that fewer small boat fishermen are operating during those typically rougher months. In 2012, NMFS enacted new regulations under the MMPA to protect MHI insular false killer whales. These regulations ended the seasonal boundary changes and established a Southern Exclusion Zone (SEZ) that NMFS will close to deep-set longlining for the remainder of the year if two officially-observed interactions occur within the EEZ in the fishery that result in serious injury or death of the whale.

The Council has developed a number of regulatory amendments to address fishing interactions with protected species such as leatherback turtles and short-tailed albatross. NMFS closed the shallow-set longline swordfish fishery between 2000 and 2004 due to interactions with sea turtles. When fishermen were allowed to resume fishing, they did so under a set of rules designed to reduce sea turtle bycatch. Fishermen are now required to use circle hooks and mackerel-type bait, and they must carry and use dip-nets, line clippers and bolt cutters. The Council and NMFS have also set a maximum annual limit on the number of fishery interactions for leatherback and loggerhead turtles. To prevent seabird interactions, longline fishermen are required to use blue-dyed bait and weighted branch lines, discard offal in specific ways, or deploy longline gear from the side of the boat rather than the stern. Deep-set longline fishermen are also required to use circle hooks with a maximum wire diameter of 4.5 millimeters. This measure was implemented to reduce impacts to false killer whale bycatch. In addition, all longline vessel owners and captains are required to attend protected species workshops once per year in order to stay updated on regulations and techniques.

Vessels and Gear

The average vessel size is in the 65- to 70-foot range, though a few do reach to nearly the allowable maximum of 101 feet. While some older wooden boats persist in the fishery, most of the vessels are of steel construction. Flake ice or mechanical chilling is used to keep catches in a fresh-chilled condition.

Swordfish sets are buoyed near the surface and have fewer hooks between floats. Tuna sets employ more hooks and configure floats further apart so that the mainline catenary arches more deeply into the water column. The line shooter allows control over the speed with which the mainline is set, thus determining the degree of catenary sag between floats and the depth of the hooks.

The average target depth is around 200 meters for tuna and 30 meters for swordfish. Deep-set gear remains in the water (soaks) during the day. Total fishing time is typically about 20 hours per set, including the setting and hauling of gear. Hauling begins in the late afternoon or around dusk. Tuna boats prefer saury, or sardine bait, and make relatively short trips within 500 miles of their home port. Swordfish vessels usually haul gear at dawn and are required to use mackerel-type fish bait only. Their trips are often beyond 700 miles from port.

Economics

The longline fishery is the largest of all commercial pelagic fisheries in Hawai'i, though on a Pacific-wide scale it accounts for a very small percent of the overall tuna harvest, which is in the millions of metric tons. In recent years, Hawai'i's pelagic fisheries have been valued at around \$100 million per year, with the longline fishery representing between 80 and 85 percent of that value.

Main Hawaiian Islands Handline and Troll Fisheries

Background

Handline and troll fisheries catch relatively small quantities of deep and shallow swimming tuna, billfish, mahimahi and wahoo. To a lesser or greater extent this type of fishing

is pursued throughout the Pacific islands and is the basis of an important commercial and noncommercial fishery in Hawai'i.

The Hawai'i handline and troll fisheries operate in pelagic waters but have a significant cultural and subsistence role in Hawai'i's fishing communities. Most troll and handline fishermen operate noncommercially. Catch is mostly shared among friends and families, but excess landings may be sold to cover trip and operating expenses.

Compared to longline operations, the handline fishery is relatively small – about 5 percent of Hawai'i's total commercial pelagic catch. However small, this fishery is undeniably significant to Hawai'i's small boat operators and as a source of fresh seafood, which is highly valued in both economic and sociocultural terms.

Management

While no federal permits are required, fishermen who take catch for commercial purposes are required to obtain a state commercial marine license and report their catch and sales. These data are shared with federal fishery managers. Troll and handline vessel operators are required, as of 2002, to obtain a federal permit and submit a logbook if they are targeting pelagic management species in

the PRIAs. This regulation was intended to monitor the catch and effort of troll and handline fishermen for bigeye tuna and other pelagic species.

Vessels and Gear

Three methods of pelagic handline fishing are practiced in Hawai'i: the *palu 'ahi* method, the *ika shibi* method, and seamount fishing (which combines both handline and troll methods). *Palu 'ahi* fishing is a modern evolution of the traditional Polynesian drop stone technique to target chum with a baited, single hook handline on sub-surface concentrations of tuna. The method usually targets medium-sized tuna found in natural aggregations near the main islands or near fish aggregation devices (FADs). The *ika shibi* fishery targets medium- and large-sized tuna attracted to drifting vessels using underwater bait-attracting lights and additional chum supplied by the fishermen.

Troll fishing is conducted by towing lures or baited hooks from a moving vessel, using big game type rods and reels as well as hydraulic haulers, outriggers and other gear. Six or so lines rigged with artificial lures or live bait may be trolled when outrigger poles are used to keep gear from tangling. When using live bait, trollers move at slower speeds to permit the bait to swim in a more natural



Honolulu fish auction. Photo courtesy of Jennifer Gilden



Striped marlin near a FAD. Photo courtesy of David Itano

manner. The majority of Hawai'i-based troll fishing is noncommercial; however, there are some full-time commercial trollers in the fishery.

Economics

The reported revenue from the Hawai'i troll fishery averaged \$6,923,500 per year between 2005 and 2015, with a high of \$8,963,000 (2012) and a low of \$5,456,000 (2009). Yellowfin is one of the more valuable components of the commercial troll catch, ranging from \$1,728,869 to \$3,231,460 with an average of \$2,567,830. The reported revenue from the MHI handline fishery averaged \$2,461,500 between 2005 and 2015, with a high of \$3,450,000 (2013) and a low of \$1,608,000 (2008). The unreported noncommercial catch in this fishery is significant and likely represents a social and monetary value that far exceeds that of the commercial sector.

Offshore Handline Fishery

Background

The offshore handline fishery is distinct from the MHI handline fishery, in its fishing grounds, trip characteristics, fishing methods and landings. Offshore handline boats are generally larger and better equipped than typical MHI

handline boats that use a variety of handline and troll methods. Crew sizes range from two to five people. Trips are multi-day, averaging about five days. The fishery targets sub-adult bigeye and yellowfin tuna in structure-associated aggregations that are highly vulnerable to simple hook and line gear. Larger handline vessels operate offshore to exploit tuna aggregations found on the Cross Seamount southwest of the Big Island and on anchored weather buoys, 100- to 200-nm from the MHI.

A recent development in Hawaiian pelagic fisheries has been the deployment of short longlines that are less than 1-nm in length on the Cross Seamount to target bigeye tuna and the lustrous pomfret. The method, referred to as "shortlining" is not regulated under current longline rules and improves targeting of baited branch lines at depth. The bigeye tuna landed by this gear type are larger and of a higher value than those caught by handline vessels operating on the same grounds.

Economics

Reported revenue from the Hawai'i offshore handline fishery averaged \$916,300 between 2005 and 2015, with a high of \$1,843,000 (2013) and a low of \$426,000 (2009).

Charter Sport Fishery

Background

Charter sport fishing and the Hawai'i charter fleet has been a distinct activity in the Hawaiian Islands for well over 100 years, and Kona is one of handful of places worldwide that has directly and demonstrably elevated the profile of sportfishing. Written accounts of sportfishing off Kona date back to late 19th century accounts of native Hawaiians taking Westerners fishing in traditional watercraft. While the history of Hawai'i charter fishing has not been well-documented, it is linked with the growth of commercial pelagic fishing industries and the rise of Hawai'i's tourism-based economy, both of which increased dramatically after World War II. An interesting aspect of charter fishing in Hawai'i is its confluence of cultural practices—Hawaiian, Japanese and Western methods all mixed to create a unique fishery.

Kona was the world's premier sport fishing destination in the 1960s and 1970s. The opening and subsequent expansion of the Honokohau Harbor in Kailua-Kona on the Big Island allowed the charter fishery to grow. Charter boats also began operating out of Kewalo Basin on O'ahu and Lahaina Harbor on Maui. Presently O'ahu hosts the second largest charter fishing operations in the state, followed by Maui.

In 1961, an estimated 83 charter vessels were operating in the state. That number rose to nearly 200 by the end of the 1990s. Since then, the number of charter fishing boats has declined. Today approximately 160 boats are operating in the fishery.

Blue marlin comprised 50 percent of the total annual charter vessel catch in 2004 but fell to only 30 percent in 2011. The majority of target species are yellowfin, mahimahi, wahoo and skipjack. Recent charter landings have hovered around 500,000 pounds.

Fishing tournaments attract fishermen from all over the state and have important cultural and economic impacts that overlap with commercial, recreational and subsistence fishing. These competitions also attract tourists. Some

tournaments are small-scale contests among members of local clubs while others are highly publicized international events such as the annual Hawaiian International Billfish Tournament in Kailua-Kona or the Lahaina Jackpot on Maui. The winning anglers in the bigger tournaments sometimes take home substantial cash prizes. Much of the catch is often retained by the boat for the captains and crew to sell or eat.

Vessels and Gear

Following World War II, fishermen began to convert former military vessels into charter fishing boats to market for-hire fishing trips to the increasing number of tourists. Most of the charter sports fleet engages predominately in troll fishing as described in the previous section on handline and troll gear.

Economics

NOAA's Pacific Islands Fisheries Science Center (PIFSC) conducted a survey in 2011 to better understand the economic contributions that charter fishing provides the state of Hawai'i and to establish a baseline for assessing the economic and social impacts of future ocean management plans, alternatives and actions. Surveys were distributed to all charter operations identified as being active during 2011. The cost for an operator to make a full day trip averaged just over \$200, not inclusive of crew salary. The median annual expenditure was \$35,565 per vessel. This suggests that a charter fleet of 160 vessels would contribute more than \$5 million per year to the state economy.

Pole-and-line (Aku) Fishery

Background

The Hawai'i-based skipjack tuna, or aku, fishery is sometimes called the pole-and-line or the bait boat fishery, based on its use of pole gear and live bait. Aku fishing is labor intensive but highly selective.

This fishery evolved from traditional Hawaiian canoes of the 1800s into the unique Hawaiian sampans of the 1900s. The design of these vessels was influenced by ideas introduced by Japanese



Historic sampan pole-and-line fishing in Hawai'i.

immigrants, and they employed live-bait-assisted poling techniques adopted from Okinawa. The pole-and-line fishery was formerly the most important of Hawai'i's domestic pelagic fisheries, supplying fresh and dried skipjack to domestic markets and a Honolulu cannery. Fleet size and maximum production peaked in 1948 and 1965 respectively. The fishery has been in steady decline since the mid-1970s, reflecting a decline in total effort as well as declining catch per unit effort (CPUE). Constraints to the fishery have included limitations on live baitfish supplies due to the closure of Pearl Harbor following the 9/11 attacks, increased market competition from purse-seining caught skipjack, reduced demand due to closure of the local cannery in 1984 and aging of the wooden boats.

Management

The fishery is managed under the Council's Pacific Pelagic FEP. There are few fishery-specific regulations. All non-longline pelagic fishermen must also abide by the sea turtle handling requirements for hooked or entangled turtles.

Vessels and Gear

The pole-and-line method uses live bait thrown from a fishing vessel to stimulate a surface school into a feeding frenzy. Fishing is then conducted

frantically to take advantage of the limited time the school remains at the surface and near the boat. The pole and the line attached to it are of equal length, about 3 meters. A barbless hook skirted with feathers is attached to the free end of the line. Fishermen standing on the aft deck of the sampan slap the hook against the water until a fish strikes. Then the fish is yanked (poled) into the vessel in one fluid motion. The fish unhooks when the line is slackened so that the process can be repeated. Sometimes, when fish are large, two fishermen will use poles both attached to the same hook.

Economics

Landings have declined from between 1 million and 3 million pounds per year in the 1980s and 1990s to just over 500,000 pounds in 2009. Over the 21-year time period from 1987 to 2009, ex-vessel fleet revenue declined from \$8.1 million to \$728,000. The number of vessels has also declined, from 13 vessels in 1988 to three in 2009.

The value of the aku boat landings between 2000 and 2009 averaged about \$1.2 million, with a range of \$0.6 million to \$1.8 million. Recent economic data for this fishery remain confidential because the number of active vessels is less than four.

Hawai'i Nearshore Fisheries

Bottomfish Fishery

Background

The deep-slope bottomfish fishery in Hawai'i targets snapper, jacks and a single species of grouper found at depths of 180 to 900 feet. Prized among these are the species known as the "Deep 7"—ehu, gindai, hapu'upu'u, kalekale, lehi, onaga and 'opakapaka. Descriptions of traditional fishing practices indicate that native Hawaiians harvested the same deep-sea bottomfish species and used some of the same specialized gear and techniques as those employed today.

In 1988, the Council designated the MHI and NWHI management zones. About a decade later, in response to concern about low spawning potential ratios for onaga and ehū, the State of Hawai'i implemented a number of bottomfish fishing restricted areas (BRFAs) in the MHI. The NWHI component of the fishery was closed when President George W. Bush proclaimed the NWHI Marine National



A NWHI bottomfish catch.

Monument (MNM) in 2006. In 2007, in response to a NMFS determination that overfishing was occurring on the Deep 7 stock, the Council instituted a total allowable catch (TAC) with a fishing season that opened on September 1 and closed on August 31 the following year or when the TAC is reached, whichever comes first.

The number of boats engaged in commercial bottomfish fishing in the MHI increased through the 1970s, peaking at nearly 600 vessels in 1985. Participation declined in the early 1990s but rebounded toward the end of the decade. However, by 2003 the number of vessels had reached its lowest since 1977, with only 325 known to be active in the fishery. Currently, the fishery has several active noncommercial federal bottomfish permittees and approximately 400 commercial marine licensees that report landing Deep 7 species to the State of Hawai'i.

Management

Beginning in September 2011, in accordance with the 2006 reauthorization of the MSA, the MHI Deep 7 bottomfish fishery came under an ACL, which effectively replaced the existing TAC system.

The fishery is managed under state and federal rules. It is unlawful to take or possess bottomfish while on a vessel that is not registered with the Department of Land and Natural Resources (DLNR) and does not have a bottomfish fishing vessel identification number. Bottomfish cannot be taken with trap, trawl, bottomfish longline or net (scoop nets excepted), and it is illegal to have any of these gears on board a vessel with bottomfish in possession. Commercial fishermen must report all Deep 7 bottomfish catches within five days of the end of a trip. The minimum size for sale of onaga and 'opakapaka is 1 pound, and fishermen cannot take or possess more than a combined total of five Deep 7 bottomfish per day without holding a current commercial marine license. Bottomfishing is prohibited in the state's BRFAs. Lastly, the use of bottom trawls, bottom gillnets, explosives and poisons are prohibited.



Lehi

Silverjaw snapper
Aphareus rutilans



Ehu

Squirrelfish snapper
Etelis carbunculus



Onaga

Longtail snapper
Etelis coruscans



Opakapaka

Pink snapper
Pristipomoides filamentosus



Kalekale

Von Siebold's snapper
Pristipomoides sieboldii



Gindai

Brigham's snapper
Pristipomoides zonatus



Hapu'upu'u

Brigham's snapper
Pristipomoides zonatus

Hawai'i Deep 7. Image courtesy of NMFS Pacific Islands Regional Office.

Vessels and Gear

Hawai'i bottomfish methods use a hook-and-line terminal gear in which weighted and baited lines are lowered and raised with electric, hydraulic or hand-powered reels. The main line is typically 400- to 450-pound test, with hook leaders of 80- to 120-pound test monofilament. The hooks are circle hooks, and a typical rig uses six to eight hooks branching off the mainline. The weight is typically 5 to 6 pounds. The hook leaders are typically two to three feet long and separated by about six feet along the main line. Squid is the bait most commonly used. It is sometimes supplemented with a chum bag containing chopped fish or squid suspended above the highest hook. The average MHI bottomfish vessel is approximately 23 feet long with about 200 horsepower propulsion. Many of these boats were built in the 1980s.

Economics

The 2004 to 2014 average annual commercial revenue from Hawai'i bottomfish management unit species (MUS) was \$1,462,008 with a high of \$1,968,285 (2004 before closure of the NWHI fishery) and a low of \$980,403 (2011). A 2010 PIFSC study found that the average cost of bottomfish trips was approximately \$212. Boat and truck fuel combined made up the majority of expenses (56 percent), followed by bait costs (15 percent). A majority of the fleet (82 percent) consists of two-person crews, a captain and a crewmember. The most common compensation awarded was a third each to captain, crew and vessel. Although bottomfish revenues often do not cover overall trip expenditures for the year, many MHI bottomfish participants report strong social and cultural motivations for fishing in addition to any economic motivation.

Crustacean Fishery

Background

The commercial crustacean fishery in Hawai'i is focused around lobster (ula), Kona crab and deep-water shrimp, with

ula comprising the highest percentage of crustacean catch.

Ula was a traditional source of food for native Hawaiians and was sometimes used in early religious ceremonies. For a time after the arrival of Europeans the lobster fishery was by far the most productive of Hawai'i's commercial shellfish fisheries. It was reported that the MHI commercial lobster catch in 1901 was 131,200 pounds. By the early 1950s, the commercial catch of spiny lobsters around the MHI had dropped by upwards of 85 percent.

In the late 1970s a survey indicated that Necker Island and Maro Reef had sufficiently large stocks of lobsters to support some commercial exploitation. Shortly thereafter, several commercial vessels began lobster trapping operations in the NWHI. A period of low catches was followed by a rapid increase in landings as more vessels entered the fishery and markets were developed. In the mid-1980s, the NWHI lobster fishery was Hawai'i's most lucrative fishery.

In 1990, NWHI lobster catch rates fell dramatically, although overfishing is not thought to be responsible for the decline. Rather, the decrease was found to be likely due to long-term natural fluctuations in oceanic productivity. In response, the Council established a limited access program and a fleet-wide seasonal harvest guideline or quota in 1991 that significantly altered fishing operations. The creation of the NWHI Coral Reef Ecosystem Reserve in 2000 by President Clinton permanently ended fishing for lobsters in the area. During the first years of the fishery, the turnover of participants was relatively high due to the profit seeking entry-exit behavior by vessel owners who were flexible in their choice of fishing activities. The high turnover continued after 1992, the first year of the limited access program and harvest quota. By 1997, less than half of the permits that were issued in 1991 were still held by the original recipients.

In terms of other crustaceans, there has been a small commercial fishery for Kona crab since 1948, most of which is caught on Penguin Bank. An intermittent deep-water shrimp fishery began in 1967. Activity varies from year to year with an

annual average of up to three vessels reporting the catch of deep-water shrimp to the State of Hawai'i.

Management

The crustacean fishery is subject to ACLs to prevent overfishing. The management area for the Hawaiian Islands crustacean fisheries is divided into two Permit Areas: Permit Area 1 is the EEZ around the NWHI, and Permit Area 2 is the EEZ around the MHI. A limited access permit is valid for fishing only in Permit Area 1. The owner of any vessel used to fish for lobster in Permit Area 2 must have a permit issued for that vessel. No vessel may hold permits



Slipper lobster.



Measuring a Kona crab.



Deep-water shrimp (*Heterocarpus ensifer*).
Photo courtesy of NOAA

simultaneously to harvest lobsters in Permit Areas 1 and 2.

For lobster fishing in either permit area, the fishing vessel's operator must maintain on board the vessel an accurate and complete record of catch, effort and other data on state report forms. All information specified on the forms must be recorded on the forms within 24 hours after the completion of each fishing day. The original logbook form for each day of the fishing trip must be submitted to the NMFS Regional Administrator within 72 hours of each landing of crustacean MUS. The operator must submit an accurate and complete sales report on a form provided by the NMFS Regional Administrator. The form must be signed and dated by the fishing vessel operator.

Vessel operators must report not less than 24 hours and not more than 36 hours before arriving at port, the approximate date and the approximate time at which spiny and slipper lobsters will be landed. They must also report not less than six hours and not more than 12 hours before offloading, the location and time that offloading of the lobster will begin.

In Permit Area 1 (the NWHI), the lobster catch was limited to a harvest guideline of 13 percent, which was associated with a 10 percent risk of overfishing. However, the NWHI fishery was impacted by a Presidential executive order creating the NWHI Coral Reef Ecosystem Reserve in 2000 and a Presidential proclamation creating the NWHI Marine National Monument (MNM) in 2006. Since that time, the annual harvest guideline for Permit Area 1 has been zero.

In Permit Area 2 (the MHI), only spiny lobsters with a carapace length of 8.26 cm or greater may be retained and any lobster with a punctured or mutilated body or with a separated carapace and tail may not be retained. In addition, a female lobster of any size may not be retained if it is carrying eggs externally and eggs may not be removed from female lobsters. Lobster fishing is prohibited during the months of May, June, July and August, and lobsters may be taken only with lobster traps or by

hand. They may not be taken by means of poisons, drugs, other chemicals, spears, nets, hooks or explosives.

In addition, the following activities are unlawful for any person fishing for lobster MUS in Permit Area 2:

- Fish for, take or retain lobsters by methods other than lobster traps or by hand.
- Take or retain lobsters during a closed season (months of May, June, July and August).
- Possess any lobster trap during the closed season on a fishing vessel that has a permit for Permit Area 2.
- Possess on a fishing vessel any lobster or lobster part taken in Permit Area 2 in a condition where the lobster is not whole and undamaged.
- Remove the eggs from any egg-bearing lobster.

Vessels fishing for deep-water shrimp in Permit Areas 1 or 2 must have a permit issued for that vessel. In both permit areas, the following actions by any person are unlawful:

- Fish for, take or retain deep-water shrimp without a permit.
- Falsify or fail to make, keep, maintain or submit federal reports and records of harvests of deep-water shrimp.

Kona crab regulations by the State of Hawai'i prohibit spearing, harvesting any females and taking any crab with a carapace length below four inches. The fishery is closed during the breeding season between May and August.

Vessels and Gear

Vessels in the crustacean fishery range in size from 24 to 130 feet in length, though the proportion of smaller vessels has increased over the years. In the lobster fishery, all traps are plastic, dome-shaped and single-chambered with two entrance funnels located on opposite sides. By federal regulation, all traps must have escape vents to allow non-target organisms to escape. The traps are typically fished in strings of several hundred that are set before sunset in depths from 20 to 70 meters and retrieved the next day. Both spiny

and slipper lobsters may be caught in the same trap, but fishermen can influence the proportion of each species by varying the trapping area and depth.

For Kona crab, the hoop net is the primary method of catch. This net is comprised of fine stranded netting stretched over a metal frame to form a flat net. Multiple baited nets set on sandy bottoms trap crabs when they get entangled in the mesh.

Several different types of shrimp trap have been tested or deployed. The square trap is typically a 2 x 2 x 4 feet frame constructed of $\frac{3}{8}$ -inch diameter steel bar and enclosed with $\frac{1}{2}$ -inch square mesh galvanized wire screen. The sides, top and bottom are covered with burlap. The tunnels at each end are also constructed with the screen and taper to an approximately 3-inch diameter. Flat traps are similar to square traps but measure 1 x 2 x 4 feet and are utilized more often at shallower depths. Collapsible round traps are 14 inches high and 24 inches in diameter at the top and 34 inches in diameter at the bottom. They have four tunnels leading to entrances, and the webbing consists of stretched nylon about 1 inch in diameter.

Economics

A recent 10-year average for direct revenue from Hawai'i crustaceans was about \$196,000 with a high of \$346,757 (2013) and a low of \$98,782 (2006). The price per pound across all species averaged \$7.24 for that period. Prior to its closure in 2000, the NWHI lobster fishery accounted for up to \$6 million (1985).

Coral Reef Fishery

Background

Archaeological evidence reveals that seafood, particularly coral reef species, was part of the customary diet of the earliest human inhabitants of the Hawaiian Islands. Coral reef fishing in the NWHI also has a long history; there is ample evidence of fishing by ancient Hawaiians as far north as Necker Island. Fishing and related activities in traditional Hawaiian culture are often highly



Shore casting on O'ahu.

ritualized and important in religious beliefs and practices. Native Hawaiians and other Pacific peoples imbued fish with symbolic meaning, extending their cultural significance beyond their value as a dietary staple. For example, certain species of fish are venerated as personal, family or professional gods called 'aumakua.

The majority of the total commercial catch of inshore fishes, invertebrates and seaweed comes from nearshore reef areas around the MHI; however, harvests of some coral reef species also occur in federal waters (e.g., around Penguin Bank).



Akule net fishing in Hawai'i. Photo courtesy of Leo Ohai

Management

The coral reef fishery is subject to ACLs to prevent overfishing. Coral reef taxa are currently harvested primarily in Hawai'i's state waters. Special permits are required for any directed fisheries on potentially harvested coral reef taxa within the regulatory area or to fish for any coral reef ecosystem MUS in the coral reef regulatory area with any gear not normally permitted. MUS may not be taken by means of poisons, explosives or intoxicating substances. On board possession and use of these materials are prohibited.

All fish and crab trap gear used by permit holders must be identified with the vessel number. Unmarked traps and

unattended surround nets or bait seine nets found deployed will be considered unclaimed property, and NMFS or other authorized officers may dispose of them.

Some reef fish in Hawai'i state waters are also subject to minimum size and weight restrictions for sale or for capture by spearfishing. These include species of parrotfish, goatfish, jacks, surgeonfish, mullet, milkfish and threadfins. In addition, the state has various other restrictions, including for certain nets, seasonal closures, MPAs and bag limits. Because of the characteristics of most gear and methods, coral reef fishing typically generates very little bycatch. Bycatch is further reduced because almost all reef fish taken are eaten.

Vessels and Gear

All gears used to catch coral reef MUS are essentially artisanal in nature. Catch rates are minimal, usually only a few pounds per man hour. Large catches depend on fishing methods employing a lot of people, such as hukilau where schools of fish are herded into shore using a wide arching net pulled by many people. Allowable gear types include (1) hand harvest; (2) spear; (3) slurp gun; (4) hand/dip net; (5) hoop net; (6) throw net; (7) barrier net; (8) surround/purse net that is attended at all times; (9) hook-and-line (powered and unpowered handlines, rod and reel, and trolling); (10) crab and fish traps with vessel identification number affixed; and (11)

remote operating vehicles/submersibles. Four fishing gears are predominant in the Hawaiian archipelago coral reefs and lagoons: hook and line (including handline), spears, fish traps and gillnets.

Economics

Most reef fish are caught for subsistence and recreation, and that catch often goes unreported. Based on assumptions about non-bottomfish and non-pelagic species represented in the State of Hawai'i data files, researchers have previously estimated the value of reef-associated commercial fisheries in Hawai'i at \$1.8 million/year, out of a total value of \$385 million/year for Hawai'i's coral reef ecosystem in general, which includes the value of tourism and other services.

Precious Coral Fishery

Background

The collection of black coral has continued in Hawai'i since black coral beds were discovered off Lahaina, Maui, in the late 1950s. Since 1980, virtually all of the black coral harvested around the Hawaiian Islands has been taken by hand from a bed located in the 'Au'au Channel. Most of the harvest has come from state waters; however, a portion of the black coral bed in the 'Au'au Channel is located in federal waters. Other precious corals are the pink, red, bamboo and gold corals. There is a history of past harvest and regulation but minimal current harvest.

Management

The precious coral fishery is subject to an ACL to prevent overfishing. The first federal management measures for precious coral in the Western Pacific Region were promulgated in 1983. The fishing year for precious corals begins on July 1 and ends on June 30 the following year, except at the Makapu'u and 'Au'au Channel Beds, which have a two-year fishing period that begins July 1 and ends June 30 two years later. There are minimum height and stem diameter rules for black and pink corals and a moratorium on the harvest of gold

coral in all waters of the US EEZ of the Western Pacific Region through June 2018. This moratorium recognizes the slow growth rate of gold coral.

The MHI precious coral fishery management areas include established beds, conditional beds and an exploratory area. Each bed is designated by a permit area code and assigned to one of the following four categories: Established, Conditional, Exploratory or Refugium. Any vessel fishing for, taking or retaining precious corals in any precious coral permit area must have a permit, and each permit will be valid for fishing only in the permit area. Logbooks are required, and information specified on the forms must be recorded on the forms within 24 hours after the completion of each fishing day and must be submitted to the Regional Administrator within 72 hours of each landing of precious corals.

Vessels and Gear

Only selective gear may be used to harvest coral from any precious coral permit area. Selective gear means any gear used for harvesting precious corals that

can discriminate or differentiate between type, size, quality or characteristics of living and dead corals.

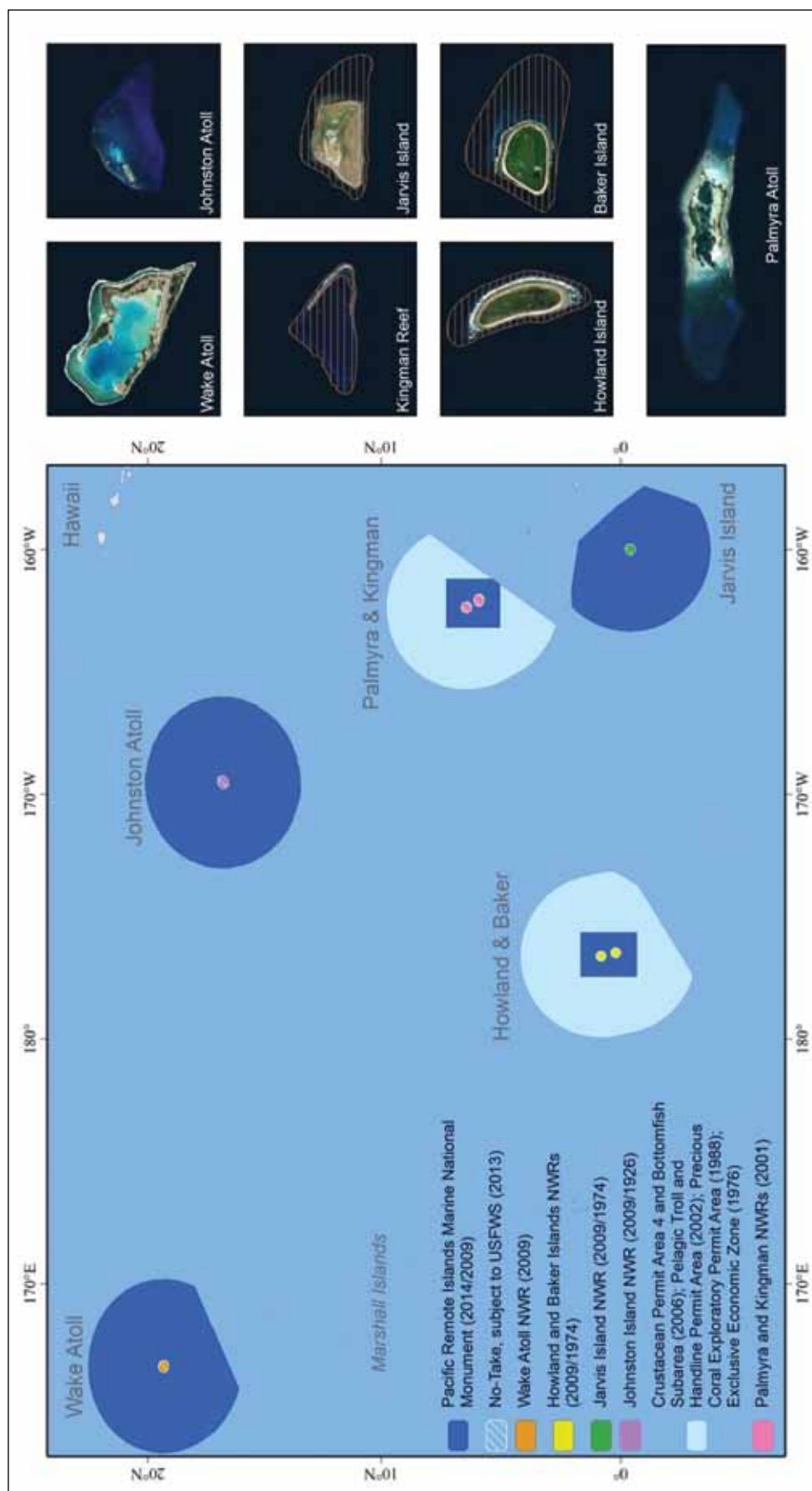
Precious corals are selectively harvested either by hand or submersibles. In 1988, a domestic fishing vessel used a now-prohibited tangle net dredge to harvest beds at Hancock Seamount in the NWHI. Its catch, however, consisted mostly of dead or low quality pink coral, and the operation was soon discontinued. Manned submersibles equipped with spotlights, cameras and a variety of maneuverable tools can harvest individual colonies, chosen by size and quality prior to cutting.

Economics

Current precious corals fishery revenue and landings data are confidential as only one permit for black coral is currently active in federal waters. However, between 2001 and 2002 an average of 13,523 pounds and 3,038 pounds of black coral were caught and sold, respectively. The average total value over the two years was \$83,559. The price per pound was \$27.50 in both years.



Collection of gold coral is under a moratorium due to the slow growth rate of the species.



PACIFIC REMOTE ISLANDS AREAS FLEETS AND FISHERIES

The PRIAs include the islands and atolls of Baker, Howland, Jarvis, Johnston, Kingman Reef, Midway, Palmyra and Wake. Federal jurisdiction in these US possessions extends from the shoreline seaward to 200 miles.

Substantial numbers of people, primarily military personnel, have populated Johnston, Midway, Palmyra and Wake. For example 5,000 military personnel were based at Midway and 6,000 military at Palmyra during World War II. Johnston and Wake Islands have housed up to 1,300 and 1,700 military and civilians, respectively, during the latter half of the 20th century, and Wake housed up to 8,000 Vietnamese refugees in 1975 following the fall of Saigon to North Vietnam. Currently, no one permanently resides on any of these islands, although temporary work forces remain on Johnston and Wake.

In 2006, President George W. Bush proclaimed the atoll and surrounding waters out to 50 nm around the NWHI, including Midway, as a marine national monument (MNM), later named the Papahānaumokuākea MNM. On Aug. 26, 2016, President Obama expanded the NWHI MNM, to include the waters west of 163° West longitude out to 200 nm, i.e., the extent of the US EEZ.

In 2009, Bush proclaimed the rest of the PRIAs as the Pacific Remote Islands MNM with boundaries extending 50 nm from shore. On Sept. 25, 2014, Obama expanded the monument to include the entire US EEZ waters and submerged lands of Jarvis, Johnston and Wake.

PRIA Pelagic Fisheries

Management

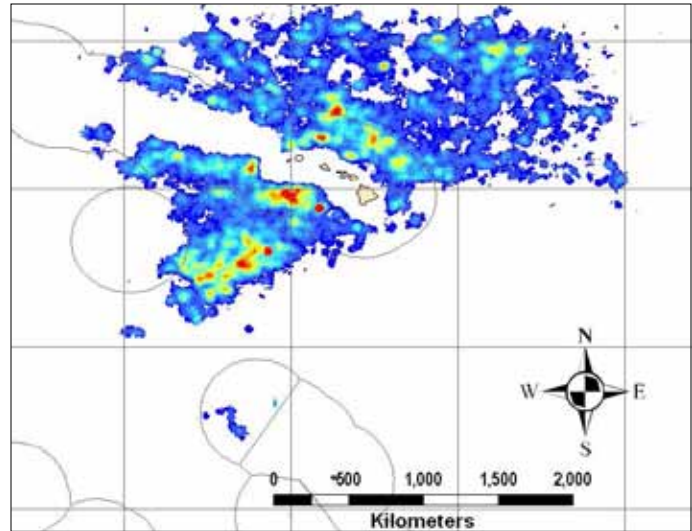
The Pelagic FEP developed by the Council include regulations establishing marine management zones, protected species provisions and permit and reporting requirements that foster data collection, monitoring and enforcement in these remote areas.

The Pacific Remote Islands MNM proclamations prohibit commercial fishing but allow for the possibility of recreational and non-commercial fishing. The Pelagic FEP implements fishery management measures consistent with Presidential Proclamations establishing the monument.

On Palmyra, offshore sport fishing allows visitors access to pelagic game-fish, including tuna, wahoo and mahimahi. Fishing is limited to eight persons per trip, two boats at a time and three trips daily. Fishing logs are required for each trip. Only pelagic species are permitted to be kept for on-island consumption. No sport fish of any kind are permitted to be shipped off the atoll for any reason.

Vessels and Gear

The largest volume of fish commercially harvested from the PRIAs in recent times is pelagic fish caught by longliners home ported in Hawai'i and tuna purse seiners home ported in American Samoa. Troll and handline vessels from Hawai'i



Hawai'i longline effort in US EEZ waters of the NWHI, Johnston and Palmyra/Kingman in 2011 prior to expansion of the NWHI and Pacific Remote Islands MNMs. Illustration courtesy of PIFSC Fisheries Research and Monitoring Division

have also made sporadic trips to the PRIAs, and, prior to the establishment of the Papahānaumokuākea MNM, Midway offered sport-fishing charters.

Prior to the expansion of the Papahānaumokuākea MNM, the offshore waters of the NWHI accounted for about 10.8 percent of the shallow-set (swordfish) and 6.7 percent of the deep-set (tuna) of the Hawai'i longline catch or about 2.48 million pounds (NMFS analysis for 2010 to 2015).

Prior to the Pacific Remote Islands MNM expansion in 2014, the US EEZ around Johnston comprised about 10 percent of the total fishing effort by the Hawai'i longline fishery, which is comprised of around 140 vessels. Palmyra Atoll from 50 to 200 nm remains open to Hawai'i longline fishing vessels, but the area represents less than 5 percent of total fishing effort for the fleet. In the early 2000s, as much as 15 percent of the annual Hawai'i longline catch was produced out of the US EEZ around Palmyra.

The US purse-seine fleet, which is comprised of 40 vessels, has historically fished in the US EEZ around Howland, Baker and Jarvis Islands, especially during El Niño episodes. This is because the western warm pool shifts several thousand kilometers eastward during El Niño, with skipjack following the movement of preferred habitat. In El Niño years (e.g., 1998), approximately 20 percent of US purse-seine fishing effort occurred in the US EEZ around the PRIAs, predominantly in the waters around Howland and Baker. With the expansion of the Pacific Remote Islands MNM, US waters around Jarvis were closed to fishing by the US fishing fleets. Fishing around Howland and Baker continues, generally accounting for less than 5 percent of the total US purse-seine effort.

In 1998, two Hawai'i-based troll and handline vessels and one demersal longline vessel targeting sharks fished in the EEZ around Palmyra and Kingman Reef. These vessels

Twenty Most Commonly Landed Fish

Pelagic



Albacore Tuna
Thunnus alalunga



Bigeye Tuna
Thunnus obesus



Blue Marlin
Makaira mazara



Dolphinfish
Coryphaena hippurus



Moonfish
Lampris guttatus



Oilfish
Ruvettus pretiosus



Pomfret
Taractichthys steindachneri



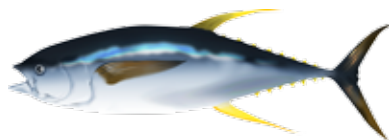
Skipjack Tuna
Katsuwonus pelamis



Swordfish
Xiphias gladius



Wahoo
Acanthocybium solandri



Yellowfin Tuna
Thunnus albacares

in the US Western Pacific Region

Bottomfish



Longtail Snapper
Etelis coruscans



Pink Snapper
Pristipomoides auricilla



Red Snapper
Etelis carbunculus

Coral Reef



Bigeye Scad
Selar crumenophthalmus



Mackerel Scad
Decapterus macarellus



Parrotfish
Scarus spp.



Rudderfish
Kyphosus bigibbus



Soldierfish
Myripristis berndti



Unicornfish
Naso spp.

Illustrations courtesy of NMFS.



targeted both pelagic and bottomfish species, including yellowfin and bigeye tuna, wahoo, mahimahi, deep slope snappers and sharks.

Commercial data held by the State of Hawai'i for the years 1988-2007 indicates that over this period 51,740 pounds of pelagic fish were caught by non-longline vessels at Johnston, Kingman Reef and Palmyra. This is equivalent to 1,293 pounds annually from non-longline pelagic fish. Currently, about 11 fishermen hold permits to harvest troll and handline pelagic fish in the PRIAs, though none have been active in recent years.

Economics

Fishing operations in the PRIAs is a challenge due to the remoteness of and distance to the fishing grounds. In addition, the expansion of the Pacific Remote Islands MNM has prohibited commercial fishing with the US EEZ around Jarvis, Wake and Johnston. Commercial fishing is prohibited from 0 and 50 nm around Palmyra, Howland and Baker.

PRIA Nearshore Fisheries

Management

The PRIA FEP developed by the Council includes regulations establishing marine management zones, protected species provisions and permit and reporting requirements that foster data collection, monitoring and enforcement in these remote areas.

The Pacific Remote Islands MNM proclamations prohibit commercial fishing but allows for the possibility of recreational fishing.

Recreational bonefishing is conducted at Palmyra on a catch-and-release basis with artificial flies and barbless hooks. A total of eight anglers are allowed in the lagoons at one time, with no more than two fishing outings permitted per day. Catch rates are monitored through daily logs and tagging studies in order to assure sustainable fishery conditions. No sportfish of any kind are permitted to be shipped off the atoll for any reason. No bottom fish or

reef fish are allowed to be targeted, and any that are accidentally caught are to be immediately released. Jacks can be fished on a catch-and-release basis, and none are permitted to be consumed or retained for any reason.

While Johnston is nearly uninhabited today, cooperative management between the US Fish and Wildlife Service (USFWS) and the military stopped the practice of shipping coolers of fish back to Hawai'i by workers stationed on the atolls. Likewise, the shipment of live coral collected by recreational divers was also stopped. In 2003, the USFWS assumed control of Johnston Atoll as a wildlife refuge, and fishing was prohibited out to 12 nm around the island.

Vessels and Gear

Bottomfish, crustacean and coral reef fisheries in the PRIAs occur at a relatively low level due to their remote isolation, jurisdictional status and existing federal regulations.

In 1998, two Hawai'i-based troll and handline vessels, and one demersal longline vessel targeting sharks, fished in the US EEZ around Palmyra and Kingman Reef. These vessels targeted both pelagic and bottomfish species, including deep slope snappers and sharks. Trips in 1999 targeted the two-spot snapper (*Lutjanus bohar*) at Kingman

Reef. Fishing stopped after results of a single specimen submitted for testing showed slight traces of ciguatera.

Hawai'i-based vessels have been reported to make sporadic commercial fishing trips to Palmyra and Kingman Reef to harvest bottomfish and coastal sharks for finning. Commercial data held by the State of Hawai'i for the years 1988-2007 indicates that over this period 19,095 pounds of bottomfish and reef fish were caught at Palmyra, Kingman Reef and Johnston Atoll. This is equivalent to 477 pounds annually of bottomfish and reef fish.

A few fishermen have expressed interest in fishing for lobsters in the PRIAs, and at least two have attempted it. However, tropical lobsters (green spiny, *Panulirus penicillatus*) do not enter traps readily. A lobster harvest exploration in 1999 in Palmyra and Kingman Reef waters was unsuccessful. This venture is also believed to have attempted to target the red crab (*Chaceon* spp.) and deep-water shrimp (*Heterocarpus* spp.).

Gear types for coral reef fisheries vary with the target species and include hook-and-line, spears and throw nets. Nearshore fishing has occurred at Johnston Atoll, Wake Island and Palmyra Atoll. The catch at these locations is primarily surgeonfish, goatfish, rudderfish, wrasses, parrotfish and soldierfish.



Council Executive Director Kitty Simonds bonefishing at Palmyra Atoll.

Johnston and Wake have a long history of recreational fishing and shell collecting. The fishery at Johnston Atoll was described over a six-year period (1985-1990), based on the results of a creel census. According to the survey, long-term “residents” (almost all employees of the prime contractor for Johnston Atoll operations) conducted most of the fishing and thus produced a large proportion of the catch. These residents fished for enjoyment, to add fresh fish to their diet and to accumulate fish to take home on leave. The remainder of the catch was harvested by “transients,” military personnel and contractors stationed on the atoll for one or two years. All of the more heavily fished areas at Johnston have been in nearshore waters. According to a 1990 report, soldierfish (*Myrispristis amaena*) composed the largest proportion of reef fish catch at Johnston. Several outbreaks of ciguatera reported on Johnston have been attributed to dredging operations. This has limited the take of fish for food, although catch and release is still common. Recreational fishing by military personnel and civilian contractors continues to occur at Wake but not at Johnston, which is virtually uninhabited.

Palmyra Atoll is surrounded by extensive reef flats on all sides in addition to the interior lagoon that are ideal for fly fishing for bonefish. Some recreational fishing continues at Palmyra, which was bought by The Nature Conservancy. The recent renovation of the airstrip and construction of vessel re-provisioning facilities by a fishing venture may



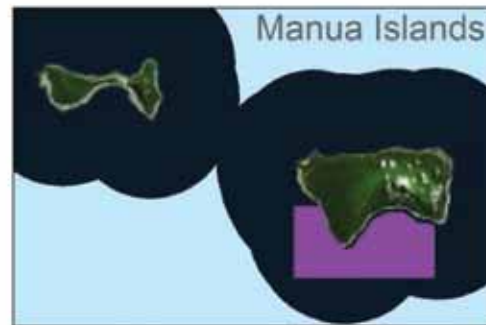
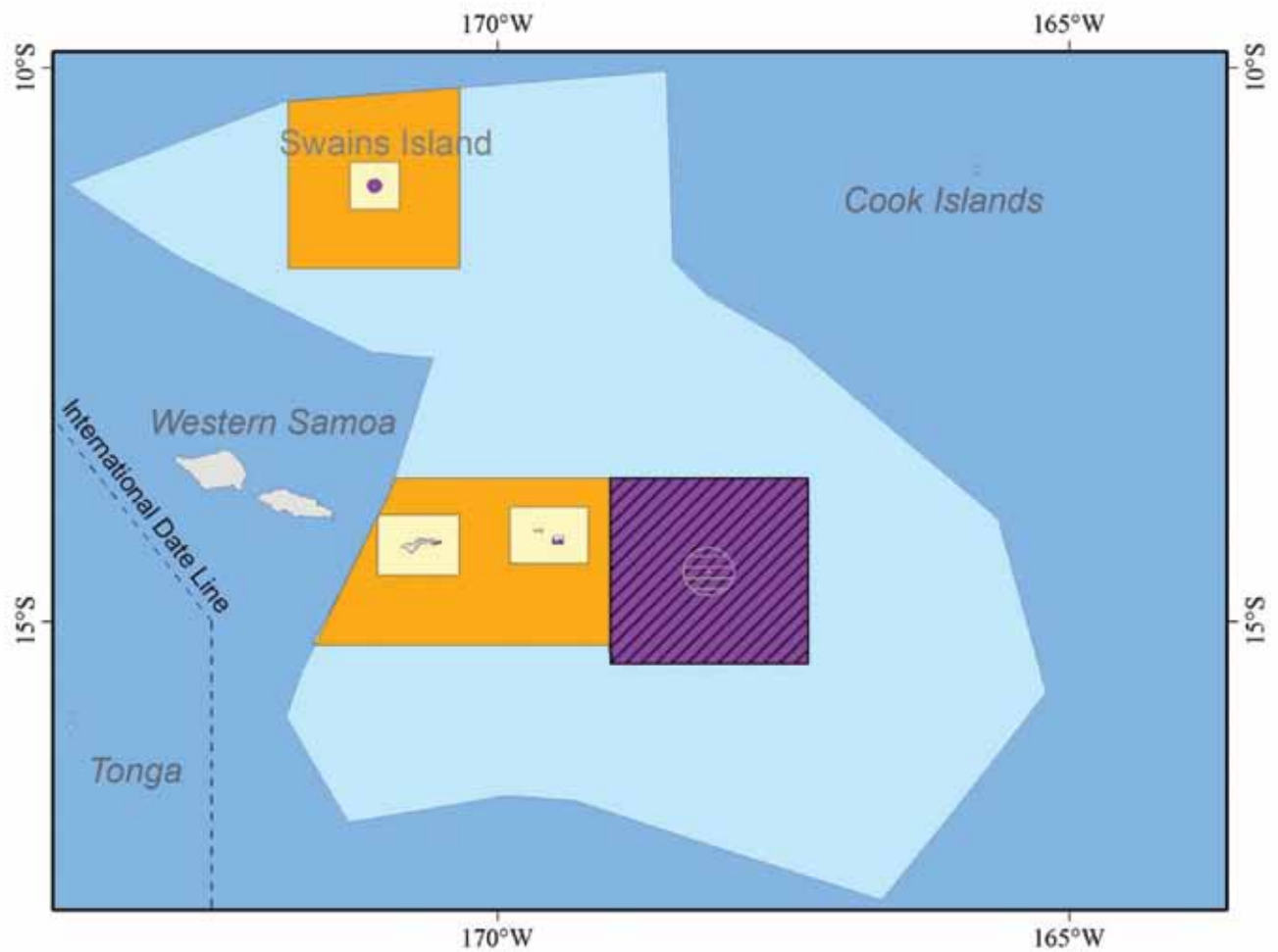
Midway Atoll.

promote increased fishing activity in and around Palmyra and Kingman Reef. A portion of the property (439 acres) was conveyed to the USFWS to be included as a wildlife refuge.

Economics

Fishing operations in the PRIAs is a challenge due to the remoteness of and distance to the fishing grounds. In addition, the expansion of the Pacific Remote Islands MNM has prohibited commercial fishing with the US EEZ around Jarvis, Wake and Johnston. Commercial fishing is prohibited from 0 and 50 nm around Palmyra, Howland and Baker.

Coral Gardens at Palmyra Atoll National Wildlife Refuge.
Photo courtesy of USFWS. Photographer Jim Maragos



-  12 nm No-Take MPA (2013)
-  Rose Atoll Marine National Monument (2009)
-  Large Vessel Prohibited Area Exemption (2015)
-  National Marine Sanctuary of American Samoa (2012/1986)

-  Large Vessel Prohibited Area (2002)
- Coral Reef Ecosystem Regulatory Area (2004); Pelagic Fishery Management Area (1987); Bottomfish Management Area (1987); Crustaceans Permit Area 2 (1983); Precious Corals Exploratory Permit Area (1983); Exclusive Economic Zone (1976)

AMERICAN SAMOA FLEETS AND FISHERIES

American Samoa Pelagic Fisheries

The harvest of pelagic fish has been a part of the way of life in the Samoan archipelago since the islands were first settled some 3,500 years ago. While subsistence fishing continues, pelagic commercial fishing is now a source of substantial income and employment in the territory. The contemporary fishery is based on supplying fresh or frozen albacore directly to the two large tuna canneries in Pago Pago. Commercial ventures are diverse, ranging from small-scale vessels with very limited range to large-scale longline and purse-seine vessels that catch tuna in the US EEZ and distant waters before returning to deliver their catches to the canneries.

Longline Fishery

Background

In the mid-1990s, fishermen in Independent Samoa (Samoa) experienced success using pelagic longline fishing gear attached to vessels called *alia*. The *alia* is a locally built, inexpensive aluminum catamaran. Shortly thereafter, American Samoa fishermen began to convert to *alia* from troll and handline gear to longline gear in order to fish for albacore.

In 1997, the first domestic monohulled longline vessel over 60 feet in length and capable of making multi-day trips began operating out of American Samoa. One year later there were 25 *alia* and monohulled vessels active in the fishery. Vessel numbers increased still further in 2001 due to the entry of several monohull vessels larger than 50 feet in length.

Domestic albacore jig vessels also supply tuna to the canneries in American Samoa. Since 1985, approximately 50 to 60 US vessels have participated in the high-seas troll fishery for albacore. This fishery occurs seasonally from December through April.

Management

In 2002 the Council recommended that waters 3- to 50-nm around American Samoa be closed to pelagic fishing vessels greater than 50 feet in length. This action was taken to prevent potential gear conflicts, and catch competition between large fishing vessels and locally based small vessels. In 2011 the boundaries of the Large Vessel Prohibited Area (LVPA) were modified, to align with the boundaries of the recently established Rose Atoll MNM. In 2015 in response to a contraction of the small vessel fleet, the LVPA boundaries were further modified to allow federally permitted American Samoa longline vessels greater than 50 feet in length overall to operate in waters seaward of 12 nm around the islands of Tutuila, Manu'a and Swains.

The Council also established a limited entry program in the American Samoa pelagic longline fishery in 2005. The program applies to the owners and operators of vessels that fish for pelagic MUS under Western Pacific Region general



Photo courtesy of Tom Coffman.

longline permits within the US EEZ and high seas. Currently, there are 60 pelagic longline fishing permits.

Fishermen who harvest fishery resources under a non-commercial fishing permit may engage in customary exchange in the Rose Atoll MNM waters, which helps to preserve traditional, indigenous and cultural fishing practices on a sustainable basis. However, customary exchange by fishermen fishing under a recreational charter permit is not allowed. Customary exchange means the non-market exchange of marine resources between fishermen and community residents, including family and friends of community residents, for goods and/or services for cultural, social or religious reasons. Customary exchange may include cost recovery through monetary reimbursements and other means for actual trip expenses, including but not limited to ice, bait, fuel or food, that may be necessary to participate in fisheries in the Western Pacific.

Vessels and Gear

In American Samoa, larger longline vessels (>50 feet) can set five to six times more hooks than the smaller boats and have a greater fishing range and capacity for storing fish (8 to 40 mt as compared with 0.5 to 2 mt on a small-scale vessel). Larger vessels are also outfitted with hydraulically powered reels to set and haul mainline and with modern electronic equipment for navigation, communications and fish finding. Most are currently freezing albacore onboard, rather than landing chilled fish.

Almost all of the small longline vessels have been *alias*, though this portion of the fleet is currently a fraction of what it once was. The *alia* typically are twin-hulled wood/fiberglass or aluminum boats about 30 feet long and are powered by self-contained, 40-horsepower, gasoline outboard engines, with gearbox and propellers mounted to the back of the vessel. Navigation on the *alia* is usually visual, though a few have a

global positioning system (GPS). Gear is stored on deck and is attached to a hand-crank reel that can hold as much as 10 miles of monofilament mainline. The gear is set by spooling the mainline off the reel and retrieved by hand pulling and cranking the mainline back onto the reel. Trips are typically about eight hours, with setting beginning in the early morning. Haul back is generally in the afternoon. The catch is stored in containers secured to the deck or in the hulls.

Economics

The longline fishery lands the vast majority of non-purse seine pelagic catch. The pelagic longline fishery is currently struggling due to rising fuel costs and relatively low CPUE for albacore, the primary target species. Furthermore, the average profit margin in recent years has declined more than 85 percent since the highs of the early 2000s. Between 2002 and 2012, the average adjusted direct revenue from American Samoa pelagic catch was \$13,719,139, of which 96 percent was tuna and 4 percent was non-tuna. During this period, the high year was 2002 (\$22,186,361) and the low year was 2012 (\$9,709,160).

Purse-Seine Fishery

Background

The global harvest of albacore, bigeye, skipjack and yellowfin is in the millions of metric tons. More than half of this catch, and about 80 percent of the tuna harvest in the Pacific, comes from the Western Pacific tuna purse-seine fishery, making it the single largest tuna fishery in the world. Purse seining largely takes place to the west of 170° East longitude during normal years, within the EEZs of the Federated States of Micronesia, the Republic of the Marshall Island, Nauru, Kiribati, Papua New Guinea, Solomons, Tuvalu and Palau. The Philippines and Indonesian fisheries are also significant. The US purse-seine fishery has shifted its base of operations from southern California and the Eastern Pacific to the Western Pacific in several phases, beginning in the early 1980s.

Interests from Japan, Korea, Taiwan, Philippines and the United States operate

the major purse-seine fleets. Of the 300 or so vessels in the region, approximately 40 are currently US flagged. Not all of these are fully US owned, however. For example, in recent years 10 were fully US owned and 30 were co-owned in conjunction with Taiwanese interests, which is allowed under US law administered by the US Coast Guard.

Historically, most of the US purse-seine catch was off-loaded to canneries in Pago Pago. However, the practice of setting around drifting FADs, starting in the late 1990s, resulted in about a 10 percent reduction in days per trip and an increase in CPUE, which produced significant unloading delays in Pago Pago. This, combined with smaller sized fish and lower tuna prices, caused some operators to divert landings to the Federated States of Micronesia, Marshall Islands, Philippines and Solomon Islands. Many vessels now transship their catches in the ports of various Pacific Island countries to be sent to canneries in Southeast Asia and Latin America.

The US fleet has endeavored to improve vessel efficiency by lengthening vessel size to increase hold capacity. Local tuna abundance and vulnerability can be highly variable in the Western Pacific, and vessel operators like the ability to accommodate large loads when fishing conditions become favorable. Larger loads can help mitigate low cannery

prices and maximize benefits of lost time for unloading and turnaround between trips.

The 2014 Pacific-wide purse-seine catch was just over 2 million mt, the highest catch on record.

Management

The Pacific US purse-seine fleet is managed through an international agreement known as the South Pacific Tuna Treaty and is regulated by NMFS through the High Seas Fishing Compliance Act. The Council has also developed management measures in its jurisdiction applicable to the purse-seine fishery.

The US purse-seine fishery is subject to fishing effort limits, restrictions on the use of FADs and required observer coverage. If the limits are reached the fishery closes for the rest of the year. From July to the end of October, US purse-seine vessels are prohibited from fishing around or within one nautical mile of a FAD, deploying a FAD or servicing a FAD. Finally, WCPFC observers are required on every purse-seine fishing trip.

Vessels and Gear

Purse seiners catch tuna by setting a net vertically in the water with floats attached to the top for flotation and weight on the lower edge. The nets



Purse-seine vessels in American Samoa.

are deployed by smaller skiffs, which encircle the school of target tuna. Once a school of fish is encircled, the lead line is drawn in, “pursing” the net closed on the bottom. The catch is harvested by either hauling the net aboard or bringing it alongside the vessel. Purse-seine nets can reach more than 6,500 feet in length and 650 feet in depth, varying in size according to the vessel, mesh size and target species.

Purse seiners typically set their nets on a variety of school types including schools associated with floating objects such as logs or other debris, with other species such as whales or dolphins, with FADs or with schools that are free-swimming or unassociated. Finding a school of fish is one of the most difficult aspects of this fishing technique. Fishermen look for congregating seabirds, ruffling of surface water and fast moving groups of dolphins. They also utilize helicopter-based spotting and sonar fish finder under FADs.

Economics

Purse-seine fishing accounts for a very high proportion of the approximately 300,000 mt of tuna landed annually in recent years by US tuna fishermen, and much of this comes from the Western Pacific. Sales of tuna from the Pacific made up two-thirds of the global end value, which in 2014 was estimated between \$30 and \$40 billion. Of that, \$6 billion is estimated to come from the Western Pacific. The 2014 ex-vessel value of Western Pacific purse-seined tuna was estimated to be just over \$3 billion, of which the US fleet accounted for between \$400 million and \$500 million. The fishery is also enormously important to the economy of American Samoa, where cannery operations have buoyed the Territory’s economy for many years, both in terms of jobs and helping to lower local fuel prices and shipping rates.

Charter Sport Fishery

Recreational fishing—defined in the MSA as fishing purely for sport or pleasure—is historically uncommon in American Samoa due to the few tourists and vessels, a small non-commercial

fishing supply sector and little in the way of supporting infrastructure, such as boat ramps and municipal dock space. Thus, most non-longline fishermen who harvest pelagic species do so for subsistence or to sell commercially (though fishermen often do make a profit on such sales after they cover the trip costs). However, tournament fishing for pelagic species has been around in American Samoa since the 1980s, and typically around 20 vessels participate. The I’a Lapo’a International Fishing Tournament is the most high profile of these tournaments and participants have traveled from Samoa and even New Zealand and Australia. Catch from tournaments is often sold, as most of the entrants are local small-scale commercial fishermen.

American Samoa Nearshore Fisheries

Bottomfish Fishery

Background

By the 1950s, many of the small boats in American Samoa were equipped with outboard engines, hooks were steel instead of pearl shell, and monofilament fishing lines had replaced hand woven sennit lines. However, bottomfish fishing remained largely a subsistence practice. It was not until the early 1970s that bottomfishing evolved into a commercial venture.

In 1972, a government subsidized boat building program was initiated to provide local fishermen with larger, more powerful wooden dories for bottomfishing. However, mechanical problems and other difficulties took their toll, leading to the demise of the dory fleet.

Total landings fluctuated in the 1990s and mostly declined through the 2000s, a trend helped by two consecutive hurricanes in 2004 and 2005. Catches were in somewhat of a rebound prior to the 2009 tsunami, which caused a commercial failure of the fishery, as revenue declined by about 80 percent following the disaster. Today there are fewer than 20 boats active in the bottomfish fishery. The number has

fluctuated over the last few years with an overall decline generally observed.

The demand for bottomfish varies depending on the need for fish at government and cultural events. The majority of the catch is composed of emperors and snappers.

The fishery has been in decline since the 1980s, with many skilled fishermen converting their vessels to troll or longline for pelagic fish, though *alia* fishermen do return to bottomfish fishing during periods when longline catches or prices are low. Increasing fuel prices have forced others out of the fishery.

Management

The bottomfish fishery is subject to an ACL to prevent overfishing. Fishing for bottomfish by means of bottom trawls and bottom set gillnets is prohibited, as is possession or use of any poisons, explosives or intoxicating substances to harvest bottomfish.

The fishery management area includes all US EEZ waters seaward of the Territory of American Samoa. There are no bottomfish management sub-areas. Rose Atoll in American Samoa is a designated no-take MPA with an outer boundary at the 50-fathom (approximately 90 meters) isobaths. Additionally, Rose Atoll and adjacent marine waters out to a distance of approximately 50 nm are also designated as a Marine National Monument jointly managed by the USFWS and NOAA. Bottomfishing is also restricted in a portion of the American Samoa National Marine Sanctuary near Aunu’u island.

The fishing year for American Samoa bottomfish begins on January 1 and ends December 31. There is no federal permit or reporting requirements for bottomfish fishery in American Samoa at this time. The fishery’s ACLs and accountability measures are specified by NMFS based on recommendations by the Council. There currently is no near-real-time monitoring for bottomfish fisheries in the American Samoa.

A variety of operational and management measures are used to minimize bycatch and bycatch mortality in the bottomfish fishery around American Samoa. Gear types and fishing



New species caught in American Samoa waters during a 2016 research cruise. Photo courtesy of NMFS PIFSC

strategies used tend to be relatively selective for desired species and sizes. Measures that serve to further reduce bycatch in the bottomfish fishery include prohibitions on the use of bottom trawls, bottom gillnets, explosives, and poisons.

Five types of non-regulatory measures aimed at reducing bycatch and bycatch mortality and improving bycatch reporting are being implemented. They include (1) outreach to fishermen and engagement of fishermen in management, including research and monitoring activities, to increase awareness of bycatch issues and to aid in development of bycatch reduction methods; (2) research into fishing gear and method modifications to reduce bycatch quantity and mortality; (3) research into the development of markets for discard species; (4) improvement of data collection and analysis systems to better quantify bycatch, and (5) outreach and training of fishermen in methods to reduce barotrauma in fish that are to be released.

Vessels and Gear

This is a hook and line fishery. One or several hooks are attached to a mainline weighted with a sinker and lowered to a desired depth to target one or several species of grouper, snappers

and emperors. Most fishermen who participate in the American Samoa bottomfish fishery use alia vessels—locally built, twin-hulled, wood/fiberglass or aluminum boats about 30 feet long, powered by self-contained 40-horsepower, gasoline outboard engines, with gearbox and propellers mounted to the back of the vessel. These boats typically have not been outfitted with depth sounders, electric/hydraulic reels, GPS or chilling capabilities, though the American Samoa government and the Council have both recently provided financial support to improve safety and efficiency. In addition, larger vessels with greater technological capabilities and fishing ranges have been entering the fishery in recent years. Fishermen still generally stay within 20 miles of land, though the better equipped and larger vessels do venture further.

Economics

Periodic hurricanes and tsunami have negatively impacted landing trends over time. The 1987 hurricane damaged or destroyed a large segment of American Samoa's small-boat fishing fleet. The 2009 tsunami significantly impacted the bottomfish fishery: 17 fishing vessels were likely damaged or destroyed. This may have been as much as 75 percent of the fleet. Of the vessels known to have sustained damage, approximately 35 percent were total losses and an additional 42 percent were in need of major repairs.

A recent 10-year total fleet revenue was reported at about \$80,000, with a high of \$211,166 (2009) and a low of \$19,975 (2006). During the same 10-year period, the average price per pound in the fishery was \$3.11 with a high of \$3.42 (2005) and a low of \$2.89 (2004). There have been no notable changes in per trip revenues since the 1990s with an average of approximately \$300 per trip.

Crustacean Fishery

Background

In American Samoa, spiny lobsters constitute the bulk of the crustacean fishery. No fishing for deep-water shrimp has been reported around American

Samoa. Lobsters are often present at important meals such as weddings, funerals and holidays. Formerly, they were harvested and consumed on the village/family level. Currently, they are primarily caught by commercial fishermen in territorial waters and purchased at the market. Crustaceans harvested in American Samoa are processed at sea on the vessel and marketed as fresh product or as frozen lobster tails. Therefore, the domestic processing capacity and processing levels are equal to or exceed the harvest.

Management

The crustacean fishery is subject to an ACL to prevent overfishing. Federal permit and logbook reporting is required when fishing for crustacean MUS in the US EEZ waters around American Samoa. A permit must be obtained from the NMFS Regional Administrator and will be issued to the owner of the vessel that is used to fish for the crustacean MUS. It is unlawful for any person to fish for, take or retain lobsters with explosives, poisons or electrical shocking devices.

Vessel operators must provide a report not less than 24 hours and not more than 36 hours before landing on the port, the approximate date and the approximate time at which spiny and slipper lobsters will be landed. They must also provide a report not less than six hours and not more than 12 hours before offloading on the location and time that offloading spiny and slipper lobsters will begin. The NMFS Regional Administrator will notify permit holders of any change in the reporting method and schedule required at least 30 days prior to the opening of the fishing season. All fishing vessels must carry an observer when requested to do so by the NMFS Regional Administrator.

No bycatch measures or actions are necessary at this time, since there is no known bycatch associated with this fishery.

Vessels and Gear

Fishing for lobster is labor intensive and not without some danger because they are typically taken by hand on the outer slope of the reef. Spiny lobsters are

usually speared at night by free divers who are hunting for finfish. Since 2006, boat-based fishermen have increasingly caught the majority of spiny lobsters.

Economics

The primary crustacean fishery in American Samoa is the spiny lobster fishery. A recent 10-year average for the commercial spiny lobster fishery was just under \$10,000 with a high of \$22,766 (2005) and a low of \$2,047 (2004). For the same time period, price per pound in the fishery averaged \$4.26 with a high of \$4.95 (2008) and a low of \$3.85 (2014).

Coral Reef Fishery

Background

Though some fishermen today sell their catch to small markets and by the side of the road, the coral reef fishery was historically a subsistence and traditional/cultural fishery. Harvest methods involve gleaning, spearfishing (snorkel or free dive from shore or using boat), rod and reel using nylon lines and metal hooks, bamboo pole, throw nets and gillnets. The use of SCUBA while spearfishing was restricted to indigenous American Samoans in the late 1990s and was banned altogether in 2002, following a recommendation from the American Samoa Department of Marine and Wildlife Resources.

There are traditional fisheries associated with seasonal run of certain species like atule (*Selar crumenophthalmus* or bigeye scad), juvenile surgeonfish and goatfish, and notably palolo worms (*Palola viridis*). Palolo usually appear in American Samoa waters in October. They are also known to appear in November, as well as during both months. Swarming occurs for two or three consecutive nights with the second night usually having the strongest showing. Samoans eagerly await this night and scoop up large amounts of this local delicacy along the shoreline with hand nets.

Management

The coral reef fishery is subject to an ACL to prevent overfishing. A majority of coral reef MUS catch is believed to



Shore fishing in Manu'a.

come from territorial waters. There are some reef areas in federal waters that are fished, though current reporting systems do not allow managers to parse out catch by federal versus territorial waters. Any person who harvests coral reef ecosystem MUS in a low-use MPA is required to have a federal special permit issued by NMFS. These are issued on a case-by-case basis after considering several factors including the potential for bycatch, the sensitivity of the area to proposed activity and the level of proposed fishing in relation to the level considered sustainable in a low-use MPA.

Special permits are also required for any directed fisheries on potentially harvested coral reef taxa within the regulatory area or to fish for any coral reef ecosystem MUS in the regulatory area with any gear not normally permitted.

Vessels and Gear

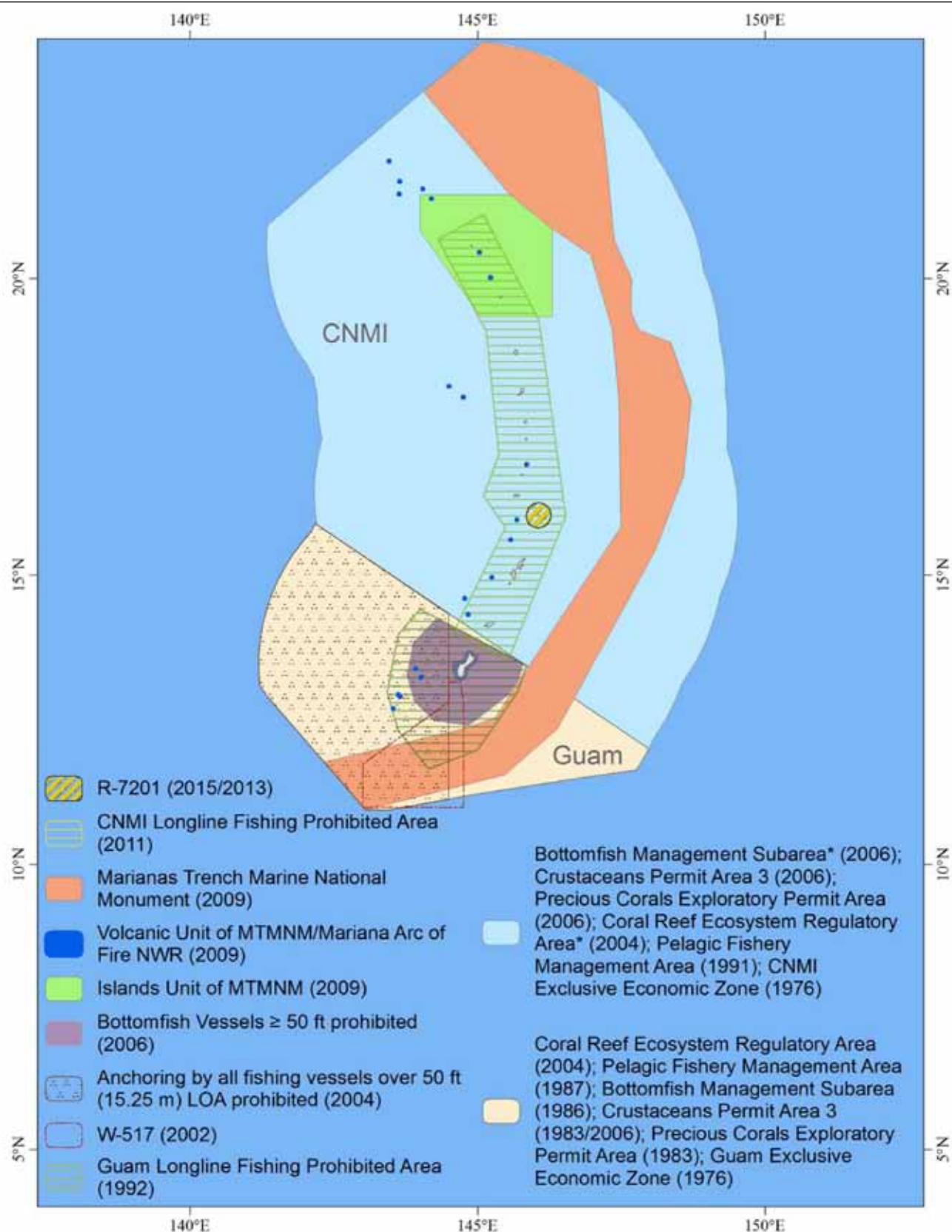
Allowable gear types include (1) hand harvest; (2) spear; (3) slurp gun; (4) hand/dip net; (5) hoop net; (6) throw net; (7) barrier net; (8) surround/purse net that is attended at all times; (9) hook-and-line (powered and unpowered handlines, rod and reel, and trolling); (10) crab and fish traps with vessel identification number affixed; and (11) remote operating vehicles/submersibles. Coral reef ecosystem MUS may not be taken by means of poisons, explosives or

intoxicating substances. Possession and use of these materials is prohibited. All fish and crab trap gear used by permit holders must be identified with the vessel number. Unmarked traps and unattended surround nets or bait seine nets found deployed will be considered unclaimed property and may be disposed of by NMFS or other authorized officers.

Coral reef fishermen use a variety of methods, including gleaning, bamboo and modern poles with line and bait, and multi-pronged spears attached to long bamboo poles in shallow lagoon and reef areas. The coral reef fishery has evolved from using traditional methods to using rod and reels with monofilament line and metal hooks. Throw and gill nets are also popular methods of harvesting reef fish. Most coral reef fishing in American Samoa occurs from shore or the reef flat, though some boats do fish for deeper reef species.

Economics

This fishery is largely noncommercial; fish are often harvested for subsistence and cultural events. The 2004 to 2014 average annual reported commercial revenue across the fishery was \$38,740 with a high of \$74,683 (2014) and a low of \$14,305 (2004).



*The Coral Reef Ecosystem Regulatory Area excluded the portion of EEZ waters 0-3 miles around the CNMI. The Bottomfish Management Subarea was divided in the CNMI Inshore Area, which was that portion of the EEZ shoreward of 3 nautical miles of the shoreline of CNMI, and the CNMI Offshore Area, which was that portion of the EEZ seaward of 3 nautical miles from the CNMI shoreline.

MARIANA ARCHIPELAGO FLEETS AND FISHERIES

Mariana Archipelago Pelagic Fisheries

Indigenous Chamorro and Carolinian fishermen catch pelagic species for subsistence and limited commercial purposes. The primary target and most marketable species is skipjack tuna. Yellowfin tuna and mahimahi are also easily marketable species but are seasonal like skipjack. During their runs, these fish are usually found close to shore and are fairly easy targets for local fishermen using trolling gear. In addition to the economic advantages of being near shore and their relative ease of capture, these species are widely accepted by all ethnic groups, thus ensuring that the stable market demand is high.

CNMI Pelagic Fisheries

Background

In the early 1980s, US purse-seine vessels established a transshipment operation at Tinian Harbor. The CNMI is exempt from the Jones Act, which requires the use of US-built and flagged vessels to carry cargo between US ports. Purse-seine operators took advantage of this exemption by offloading their catch at Tinian onto foreign vessels for shipment to tuna canneries in America Samoa; however, this operation closed in the 1990s.

A small longline fishery started operating in the CNMI in the early 2000s but ceased in 2012.

Management

There are few regulations specific to CNMI pelagic fisheries. Pelagic longlining in CNMI requires a Western Pacific General Longline Permit, and anyone receiving pelagic species transshipped from a permitted longline fishing vessel must obtain a Western Pacific Receiving Vessel Permit. Longline



Vessels used to troll, bottomfish and spearfish around CNMI's Northern Islands.

fishing within 30 nm of the islands of CNMI is prohibited. This measure was established to reduce the potential for localized fish depletion and to limit catch competition and gear conflicts between the CNMI-based longline and trolling fleets. All longline and non-longline pelagic fishermen must abide by the sea turtle handling requirements for hooked or entangled turtles.

Fishermen who harvest fishery resources under a non-commercial fishing permit may engage in customary exchange in the Marianas Trench MNM waters, which helps to preserve traditional, indigenous and cultural fishing practices on a sustainable basis. However, customary exchange by fishermen fishing under a recreational charter permit is not allowed. Customary exchange means the non-market exchange of marine resources between fishermen and community residents, including family and friends of community residents, for goods and/or services for cultural, social or religious reasons. Customary exchange may include cost recovery through monetary reimbursements and other means for actual trip expenses, including but not limited to ice, bait, fuel or food, that may be necessary to participate in fisheries in the Western Pacific.

Vessels and Gear

CNMI's pelagic fisheries consist mainly of small 12- to 24-foot outboard-powered noncommercial trolling boats that are either towed to boat launch sites or berthed in marinas. This limits most fishermen to approximately 20 miles, though some have the fuel capacity to go further.

CNMI tends to have fewer than 50 vessels engaged in commercial pelagic fishing. Most vessels are outfitted with only rod and reel gear and lack the capacity for longline gear or to chill large amounts of catch.



Mariana troll fishing.

Though many fishermen sell a portion of their catch at some point during the year, it is difficult to make a clear distinction among recreational, subsistence and commercial fishermen. Between 2005 and 2015, the average total annual CNMI pelagic fishery revenue was \$466,544 (tuna \$382,204 and non-tuna \$72,501). During this period the high year was 2005 (\$916,346), and the low year was 2015 (\$236,591).

Guam Pelagic Fisheries

Background

In the late 1980s, Guam was an important port for Japanese and Taiwanese longline fleets. Landed fish was packed and transshipped by air to Japan. In the early 1990s, an air transshipment operation was established whereby fresh tuna was flown from the Federated States of Micronesia via Guam to the Japanese market on passenger and cargo planes. A second air transshipment operation began in the mid-1990s, transporting some of the fish that did not meet

Japanese sashimi market standards to Europe, but this business has since ceased operating. Port calls and transshipment volume on Guam have steadily declined due in part to regulations imposed by some Pacific Island nations that require fish caught in their waters to be landed and shipped from their countries.

Today, the Guam pelagic fleet is predominantly a troll fishery operating primarily from the island of Rota south to Galvez, Santa Rosa and White Tuna banks. There is also a small charter fishery, which arose out of the growth of the tourism industry in the 1980s. Charter fishing operates primarily out of Agana and Agat, making multiple two- to four-hour trips daily and targeting both pelagic and bottomfish species. Typical charters involve three to six patrons, while the larger “party boats” can carry as many as 30 patrons on a single trip. These larger vessels consistently fish in the same general area and release most of their catch.

Management

There are few regulations specific to Guam pelagic fisheries. Pelagic longlining in Guam requires a Western Pacific General Longline Permit, and anyone receiving pelagic species transshipped from a permitted longline fishing vessel must obtain a Western Pacific Receiving Vessel Permit. All longline and non-longline pelagic fishermen must abide by the sea turtle handling requirements for hooked or entangled turtles.

In 1992, the Council created a 50-nm domestic longline vessel exclusion zone around Guam and its offshore banks. This was enacted in response to reported interactions between longline vessels and smaller fishing boats and aimed to prevent gear conflicts and potential safety issues.

Vessels and Gear

Guam’s pelagic fisheries consist mainly of small 12- to 24-foot outboard-powered noncommercial trolling boats that are either towed to boat launch sites or berthed in marinas. This limits most fishermen to approximately 20 miles, though some have the fuel capacity to go further.

Around 200 vessels are engaged in some aspect of commercial pelagic fishing. Most vessels are outfitted with only rod and reel gear and lack the capacity for longline gear or to chill large amounts of catch.

About 20 vessels comprise Guam’s charter fleet, with vessels ranging from 30 to 50 feet in length. Most charter fishermen engage in troll and bottomfish fishing. Between 2005 and 2015, the estimated total landings from charter vessels in Guam ranged from 5,500 pounds to 24,000 pounds—usually mahimahi, skipjack tuna and wahoo (pelagic MUS) and small triggerfish, small grouper and small goatfish (caught bottomfish fishing).

Economics

Though many fishermen sell a portion of their catch at some point during the year, it is difficult to make a clear distinction among recreational, subsistence and commercial fishermen.

Overall, commercial fishery revenues in Guam have gradually decreased since the early 1980s. A large drop that occurred after 2002 can partly be attributed to two typhoons striking Guam. Sales of locally caught pelagic fish compete with cheaper pelagic fish landed by foreign longliners and sold in supermarkets and roadside vendors. This competition has exerted downward pressure on ex-vessel prices received by local fishermen. The inflation-adjusted price of tuna and other non-tuna pelagic species has shown a steady decline since pelagic fishery data was first collected in 1980. In 2011, the adjusted prices for all tuna species and non-tuna pelagic species were well below their 30-year average. Between 2005 and 2015, the average total annual Guam pelagic revenue was \$341,252 (tuna \$91,044 and non-tuna \$207,613).

The charter crews act as both recreational and commercial fishermen, selling a large portion of their catch. Many of the charter captains and owners were once fulltime commercial fishermen who switched to the less physically demanding profession of sport fishing in order to maintain or increase income while reducing risk. Little is known



Transshipping tuna on Guam.

about the economics of this fishery, though NMFS PIFSC has examined the small boat fishery in Guam generally. During 2010 and 2011, the cost of a trolling trip average about \$250. The average bottomfish trip cost was about \$200. Fuel expenses accounted for a substantial portion of the total pelagic and bottomfish trip expenditures. NMFS estimated that the Guam small boat fishermen who responded to its survey provided direct trip-related sales impacts ranging from approximately \$0.98 million (using media trip costs) to \$1.23 million (using mean trip costs) to the island economy. These data are not specific to the charter fishery, but they give some sense of certain costs.

Mariana Archipelago Nearshore Fisheries

CNMI Bottomfish Fishery

Background

The CNMI bottomfish fishery can be segmented by depth into a shallow-water complex (100 to 500 feet) and a deep-water complex (greater than 500 feet). The shallow-water harvest comprises primarily reef-dwelling snappers, groupers and jacks, while the deep-water complex consists primarily of groupers and snappers. Most of the fishery is comprised of small boats engaged in small-scale commercial and subsistence fishing within a 50-mile radius of the island of Saipan, though some venture a bit further and there are a few Rota-based boats. A few larger vessels sporadically participate in the deep-water bottomfish fishery in the islands north of Saipan. The deep-water fishery targets snappers and groupers while the shallow-water fishery targets the redgill emperor.

Fishermen largely ceased deep-water bottomfishing in early 1990s, resulting in a drop in overall bottomfish landings. Consistent fishing activity resumed in 1994, and the number of bottomfish trips more than doubled from 2000 to 2001 to the highest levels in 18 years. The number of commercial bottomfish trips then declined until 2005, when troll fishermen began conducting more

bottomfishing as an alternate activity. In 2014, approximately 7,000 pounds of total bottomfish were landed.

Maintenance and repair costs, as well as challenges with crew retention, have apparently made it difficult to sustain a CNMI bottomfish operation for more than a few years. The participation of individual fishermen in the bottomfish fishery tends to be less than four years, with length of participation in the deep-water fishery slightly longer. This difference probably reflects the greater skill and investment required to participate in the deep-water fishery. Deep-water trips tend to be longer and usually depend on a skilled captain and experienced fisherman.

Management

The bottomfish fishery is subject to an ACL to prevent overfishing. Bottomfishing in the CNMI bottomfish subarea requires a permit for vessels greater than 40 feet. CNMI bottomfish vessels 40 feet and longer must also carry vessel monitoring systems onboard, which allow NMFS to track vessel location at all times and monitor compliance with bottomfish closed areas. The Council also developed management measures that prohibit certain destructive fishing techniques, such as explosives, poisons, trawl nets and bottom-set gillnets.

The Council developed measures in 2008 that prohibited commercial fishing vessels greater than 40 feet from fishing within 10-nm of Alamagan Island and within approximately 40-nm of the southern islands of the CNMI, i.e., Rota, Aguijan, Tinian, Saipan and FDM. The Council amended the Mariana Archipelago FEP in 2016 to reopen these areas after assessments of the multi-stock complex determined the bottomfish fishery was not achieving optimum yield and that the closure was discouraging fishermen from upgrading to larger vessels.

To gather additional information, all fishing vessels with bottomfish permits must carry an on-board observer when directed to do so by NMFS. Vessel owners or operators will be given at least 72 hours prior notice by NMFS of an observer requirement.

Vessels and Gear

These fishermen tend to make multi-purpose trips, trolling on their way to reefs where they fish for shallow-water bottomfish and reef fish and then trolling back to port. Larger sized vessels (30-foot and larger) have better chilling capacity and so tend to be more efficient. Bottomfish fishing generally requires more technical skill than pelagic trolling, including knowledge of the location of specific underwater features. Presently, bottomfish fishing can still be described as “hit or miss” for most of the smaller (12- to 29-foot) vessels, though this is changing as most vessels, large and small, now use GPS, sonar and other technology. However, CNMI bottomfish fishermen still can and do rely on land features to guide them to fishing areas.

Economics

Even full-time operators have reported selling only two-thirds of their bottomfish catch and giving the rest to relatives, friends and neighbors. As per the Pacific Island custom, catch is often shared, bartered and sold informally by street-side vendors. The 2004 to 2014 average annual fleet revenue for CNMI bottomfish was \$64,172, with a high of \$111,022 (2005) and a low of \$43,746 (2010). For the same time period, price per pound in the fishery averaged \$2.88, with a high of \$3.51 (2014) and a low of \$2.56 (2004).

Guam Bottomfish Fishery

Background

Bottomfishing on Guam is a combination of recreational, subsistence and small-scale commercial fishing. As in the CNMI, the fishery can be segmented by depth into a shallow-water complex and a deep-water complex. The shallow-water target species are primarily the reef-dwelling snappers, groupers and jacks, while the deep-water complex consists primarily of groupers and snappers. More people participate in shallow-water bottom fishing than deep-water fishing because the costs are lower and calm fishing grounds are more accessible. Shallow-water fishermen seldom sell

their catch because they fish mainly for recreational or subsistence purposes.

Participation in the Guam bottomfish fishery peaked in the early 2000s, with nearly 500 vessels participating. Since then, participation has fluctuated between 250 and 350 vessels.

Guam's bottomfish fishery can be highly seasonal. Most offshore banks have high shark densities and are deep, remote and subject to strong currents. Generally, these banks are accessible only during calm weather in the summer months (May to August/September).



Guam bottomfish.
Photo courtesy of James Borja



Guam bottomfish vessel. Photo courtesy of James Borja

During this time of year bottomfishing activity increases on the offshore banks that are in federal waters and in territorial waters on the east side of the island. Both these locations are productive fishing areas that are less accessible during most of the year due to rough seas.

Charter bottomfishing has been a substantial component of the fishery since 1995, accounting for about 15 to 20 percent of all bottomfish trips from 1995 through 2004. Charter vessels typically make multiple two- to four-hour trips on a daily basis. The charter fleet includes vessels that engage in trolling and bottomfish fishing. However, larger bottomfish-only vessels can accommodate as many as 35 patrons per trip. These vessels consistently fish in the same general area and release most of their catch, primarily small triggerfish, grouper and goatfish. They occasionally keep larger fish, and a portion of the catch may be prepared as sashimi for their guests.

Management

The bottomfish fishery is subject to an ACL to prevent overfishing. A permit is required for any vessel 50 feet or longer that fishes for, lands or transships bottomfish MUS in the EEZ 50-nm seaward of the Territory of Guam. Vessel operators must submit a logbook

to NMFS within 72 hours after landing. In addition to these federal permit and reporting requirements there are vessel identification and at-sea observer requirements. Vessel owners or operators will be given at least 72 hours prior notice by NMFS of an observer requirement. The use of poisons, explosives, intoxicating substances, bottom trawls and bottom set gillnets is prohibited.

Due to concerns over habitat impacts, vessels larger than 50 feet are prohibited from anchoring at Guam's Southern Banks. Anchoring by all fishing vessels over 50 feet is prohibited in the US EEZ seaward of Guam west of 144°30' East longitude, except in the event of an emergency caused by ocean conditions or by a vessel malfunction that can be documented.

Vessels and Gear

Handlines, home-fabricated hand reels and small electric reels are the commonly used gear for small-scale fishing operations, whereas electric reels and hydraulics are the commonly used gear for the larger operations in this fishery. Smaller vessels (<25 feet) target mostly the shallow-water bottomfish complex. Some vessels fishing the offshore banks, particularly the few relatively large vessels (>25 feet) that fish primarily for commercial purposes, target the deep-water bottomfish complex. The banks are fished using two methods: bottomfishing by hook-and-line and jigging at night for bigeye scad.

Economics

The 2004 to 2014 average annual fleet revenue from Guam bottomfish MUS was \$29,532 with a high of \$49,042 (2005) and a low of \$9,422 (2014).

CNMI Crustacean Fishery

Background

The CNMI crustacean fishery primarily targets spiny lobster and deep-water shrimp in nearshore waters with catches taken almost exclusively within 3 nm of the inhabited southern islands. Beyond this boundary, the topography in most locations drops off steeply and

lobster habitats become relatively small and difficult to access.

A deep-water trap-based fishery emerged in the 1990s to harvest shrimp mostly around Saipan and Tinian on flat areas near steep banks at depths greater than 350 meters. Two fishing companies began fishing for deep-water shrimp in May 1994. Between then and February 1996, a total of 26,808 pounds of deep-water shrimp was landed. Shortly thereafter both companies exited the fishery sighting excessive gear loss as the primary reason.

Deep-water shrimp fisheries in CNMI face a number of challenges. Gear loss is a common problem and makes many ventures unprofitable. A second difficulty is the short shelf life of catch and a history of inconsistent quality, leading to fluctuating market demand for the product. Lastly, these fisheries generally experience local depletion on known fishing grounds, which leads to a drop in catch rates. While other banks might have abundant stocks, fishermen are generally reluctant to explore these areas because unfamiliarity with them could lead to even greater rates of gear loss.

Management

The crustacean fishery is subject to an ACL to prevent overfishing. To date, CNMI's crustacean fisheries have not been determined to be overfished or subject to overfishing. The specificity of spiny lobster and deep-water shrimp targeting ensures there is no bycatch. A federal permit is required to harvest crustacean MUS in federal waters around the Mariana Archipelago and permit holders are required to participate in local reporting systems. It is unlawful for any person to fish for, take or retain lobsters with explosives, poisons or electrical shocking devices.

In order to identify participants and to collect catch and effort data, federal permit and logbook reporting are required when fishing for crustacean MUS in EEZ waters around Guam and CNMI. A permit application must be obtained from the NMFS Regional Administrator; permits are issued to the owner of the vessel used to fish for the



Spiny lobster.

crustacean MUS. Fishery participants have the option of using NMFS approved electronic logbooks in lieu of paper logbooks.

To support fishery monitoring, vessel operators must report not less than 24 hours but not more than 36 hours before landing, the port, the approximate date and the approximate time at which spiny and slipper lobsters will be landed. They must also report not less than six hours and not more than 12 hours before offloading, the location and time that offloading spiny and slipper lobsters will begin. The NMFS Regional Administrator will notify permit holders of any change in the reporting method and schedule required at least 30 days prior to the opening of the fishing season. To support fishery monitoring, all fishing vessels must carry an observer when requested to do so by the NMFS Regional Administrator.

Vessels and Gear

Local fishermen assert that lobsters around CNMI generally avoid traps. Anecdotal information suggests bottomfish fishermen anchor and dive at night occasionally for lobsters mostly for personal consumption.

The deep-water shrimp fishery uses traps at depths generally greater than 1,000 feet around Saipan and Tinian. One style of trap is ovular and made

of plastic, weighing about 15 pounds. The company using these traps reported a trap loss of less than 4 percent per set when using an average of about 13 traps per string. Another company used a lightweight trap (5.5 pounds) with nylon netting, which could tear away relatively easily and be recovered if it became ensnared on the bottom. Trap size was smaller, and catch per trap was on average 76 percent of the catch of plastic traps, but the company was able to deploy many more traps per string with less risk of gear loss.

Economics

Annual lobster catch has varied since 1980, with a peak in 1984 of 12,869 pounds. Catch of spiny lobster has fallen from 881 pounds in 2009 to 810 pounds in 2011. The 2003 to 2013 average annual fleet revenue from the CNMI crustacean fishery (spiny lobster, slipper lobster and shrimp) was \$14,261 with a high of \$53,825 (2005) and a low of \$38.00 (2010).

Guam Crustacean Fishery

Background

Little is known about Guam's crustacean fishery. Fishing for these species primarily occurs inshore with fishermen fishing recreationally or in a

subsistence context. In the 1970s, one small scale, deepwater shrimp fishery was attempted in Guam, but no known operations have occurred since.

Management

The crustacean fishery is subject to an ACL to prevent overfishing. To date, Guam's crustacean fisheries have not been determined to be overfished or subject to overfishing. The specificity of spiny lobster and deep-water shrimp targeting ensures there is no bycatch. A federal permit is required to harvest crustacean MUS in federal waters around the Mariana Archipelago, and permit holders are required to participate in local reporting systems. It is unlawful for any person to fish for, take or retain lobsters with explosives, poisons or electrical shocking devices. Spearing of spiny lobsters and the taking of lobsters or crabs with eggs are illegal on Guam.

In order to identify participants and to collect catch and effort data, federal permit and logbook reporting are required when fishing for crustacean MUS in EEZ waters around Guam. A permit application must be obtained from the NMFS Regional Administrator; permits are issued to the owner of the vessel used to fish for crustacean MUS. Fishery participants have the option of using NMFS approved electronic logbooks in lieu of paper logbooks.

To support fishery monitoring, vessel operators must report not less than 24 hours but not more than 36 hours before landing, the port, the approximate date and the approximate time at which spiny and slipper lobsters will be landed. They must also report not less than six hours and not more than 12 hours before offloading, the location and time that offloading spiny and slipper lobsters will begin. The NMFS Regional Administrator will notify permit holders of any change in the reporting method and schedule required at least 30 days prior to the opening of the fishing season. To support fishery monitoring, all fishing vessels must carry an observer when requested to do so by the NMFS Regional Administrator.

Vessels and Gear

Local fishermen assert that lobsters around Guam generally avoid traps. Thus, fishing for lobster is labor intensive and not without some danger because they typically have to be taken by hand on the outer slope of the reef. Spiny lobsters are usually speared at night by free divers who are hunting for finfish. Lobster can also be found in tidal pools along reef flats during low tides when there is a certain full moon.

Deepwater shrimping that might occur around Guam in the future would most likely use traps at depths generally greater than 1,000 feet.

Economics

The 2004 to 2014 average annual fleet revenue from the Guam crustacean fishery (primarily lobsters) was \$7,715 with a high of \$18,841 (2006) and a low of \$2,278 (2013).

CNMI Coral Reef Fishery

Background

Under Spanish colonization in the mid-1600s, large canoes that were capable of pelagic fishing and canoe houses were destroyed in punitive raids as part of the *Reducción* policy. As a

result, inshore fishing for invertebrates along with reef fishing and gleaning became the main means of obtaining marine protein. Under Japanese rule (1914 to 1944), the Northern Mariana Islands became a major fishing base for the harvest of skipjack tuna. However, the Chamorro and Carolinian people had little involvement in the industrial-scale fishing operations and presumably continued to rely heavily on subsistence use of inshore coral reef resources during this period.

Today the coral reef fisheries in the CNMI are mostly limited to nearshore areas, especially off the islands of Saipan, Rota and Tinian. Finfish and invertebrates are the primary targets, but small quantities of seaweed are also taken. This fishery is important for subsistence as well as social and cultural traditions.

Management

The coral reef fishery is subject to ACLs to prevent overfishing. There has been little need for substantial direct management of the CNMI coral reef fishery, as it has largely been a subsistence fishery through time. Some commercial sales occur and are tracked through sales receipts. CNMI's coral reef fisheries have not been determined to be overfished or subject to overfishing, and no



Man with talaya (Chamorro cast net).



Traditional division of chenchulu (surround net) catch as directed by the master fisherman.

interactions with protected species have been reported or observed.

In order to identify participants, collect harvest and effort data, and control harvests, special permits are required for any directed fisheries within the regulatory area or to fish for any coral reef ecosystem MUS in the coral reef regulatory area with any gear not normally permitted. Allowable gear types include (1) hand harvest; (2) spear; (3) slurp gun; (4) hand/dip net; (5) hoop net; (6) throw net; (7) barrier net; (8) surround/purse net that is attended at all times; (9) hook-and-line (powered and unpowered handlines, rod and reel, and trolling); (10) crab and fish traps with vessel identification number affixed; and (11) remote operating vehicles/submersibles. Coral reef ecosystem MUS may not be taken by means of poisons, explosives or intoxicating substances. Possession and use of these materials is prohibited. To support fishery monitoring, any special permit holder must contact the appropriate NMFS enforcement agent in Guam at least 24 hours before landing any coral reef ecosystem MUS harvested under a special permit. Special permit holders must also report the port and the approximate date and time at which the catch will be landed.

All fish and crab trap gear used by permit holders must be identified with



Reef fish catch.

the vessel number. Unmarked traps and unattended surround nets or bait seine nets found deployed will be considered unclaimed property and may be disposed of by NMFS or other authorized officers.

Currently, there are five MPAs in the waters around Saipan, three of which are no-take marine conservation areas. Two of these MPAs are species-based reserves. Additional non-Council management measures such as gillnet ban and scuba spear fishing ban, trochus

moratorium, sea cucumber moratorium, cast net restrictions, lobster size limits and others have been implemented in recent years. Special provisions have been established permitting the use of traditional surround net fishing “chenchulu” within coastal areas for community gatherings and fiestas.

Vessels and Gear

Cast-netting, spear-fishing, hook and line, gleaning, trolling and bottom fishing are common fishing techniques practiced in the CNMI. Most coral reef fishing occurs off the islands of Saipan, Rota and Tinian. Cast-netting, spear-fishing, hook and line, gleaning, trolling and bottomfish fishing are some of the common fishing techniques. Boat-based fishermen using hook-and-line gear to catch the majority of coral reef fish.

Economics

The 2004 to 2014 average annual fleet revenue for CNMI coral reef ecosystem MUS was \$216,267 with a high of \$370,003 (2006) and a low of \$80,361 (2013).

Guam Coral Reef Fishery

Background

The coral reef fishery includes more than 100 species of fish. The history of indigenous coral reef use on Guam largely mirrors that of the CNMI. Archaeological evidence suggests that, throughout history, native groups in the Mariana Archipelago have relied more heavily on inshore fish species than offshore ones. This pattern holds for immigrant groups as well, as recent migrants to Guam from the Freely Associated States report more intense use of nearshore fishery resources.

As in the CNMI, Spanish colonizers systematically destroyed large oceangoing canoes in Guam in order to concentrate the indigenous population into a few settlements, thereby facilitating colonial rule as well as religious conversion. Another far-reaching effect of European colonization of Guam and other areas of the Mariana Archipelago was a disastrous decline in the Chamorro population,

from an estimated 40,000 in the late seventeenth century to approximately 1,500 persons one hundred years later.

After the end of World War II, employment opportunities enabled some fishermen to acquire small boats with outboard engines and equipment for offshore fishing. In the late 1970s, a group of Vietnamese refugees living on Guam fished commercially on a large scale, verifying the market potential for locally caught reef fish, bottomfish, tuna and mackerel. The Guam Fishermen's Cooperative Association began operations during that time. In 1980, the Co-op acquired a chill box and ice machine and emphasized wholesaling. Today, the Co-op's membership includes over 160 full-time and part-time fishermen, and it processes and markets (retail and wholesale) an estimated 80 percent of the local commercial catch.

Management

The coral reef fishery is subject to an ACL to prevent overfishing. There has been little need for direct management of Guam coral reef fisheries, as they have historically been primarily small scale subsistence fisheries. Special permits are required for any directed fisheries on potentially harvested coral reef taxa within the regulatory area or to fish for any coral reef ecosystem MUS in the coral reef regulatory area with any gear not normally permitted. Allowable gear types include (1) hand harvest; (2) spear;

(3) slurp gun (4) hand/dip net; (5) hoop net; (6) throw net; (7) barrier net; (8) surround/purse net that is attended at all times; (9) hook-and-line (powered and unpowered handlines, rod and reel, and trolling); (10) crab and fish traps with vessel identification number affixed; and (11) remote operating vehicles/submersibles. To support fishery monitoring, any special permit holder must contact the appropriate NMFS enforcement agent in Guam at least 24 hours before landing any coral reef ecosystem MUS harvested under a special permit, and report the port and the approximate date and time at which the catch will be landed.

Coral reef ecosystem MUS may not be taken by means of poisons, explosives or intoxicating substances. Possession and use of these materials is prohibited. All fish and crab trap gear used by permit holders must be identified with the vessel number. Unmarked traps and unattended surround nets or bait seine nets found deployed will be considered unclaimed property and may be disposed of by NMFS or other authorized officers.

The harvest of live rock and living corals is prohibited throughout the federally managed US EEZ waters of the region; however, under special permits with conditions specified by NMFS following consultation with the Council, indigenous residents can be allowed to harvest live rock or coral for traditional uses, and aquaculture operations can be permitted to harvest seed stock.

Vessels and Gear

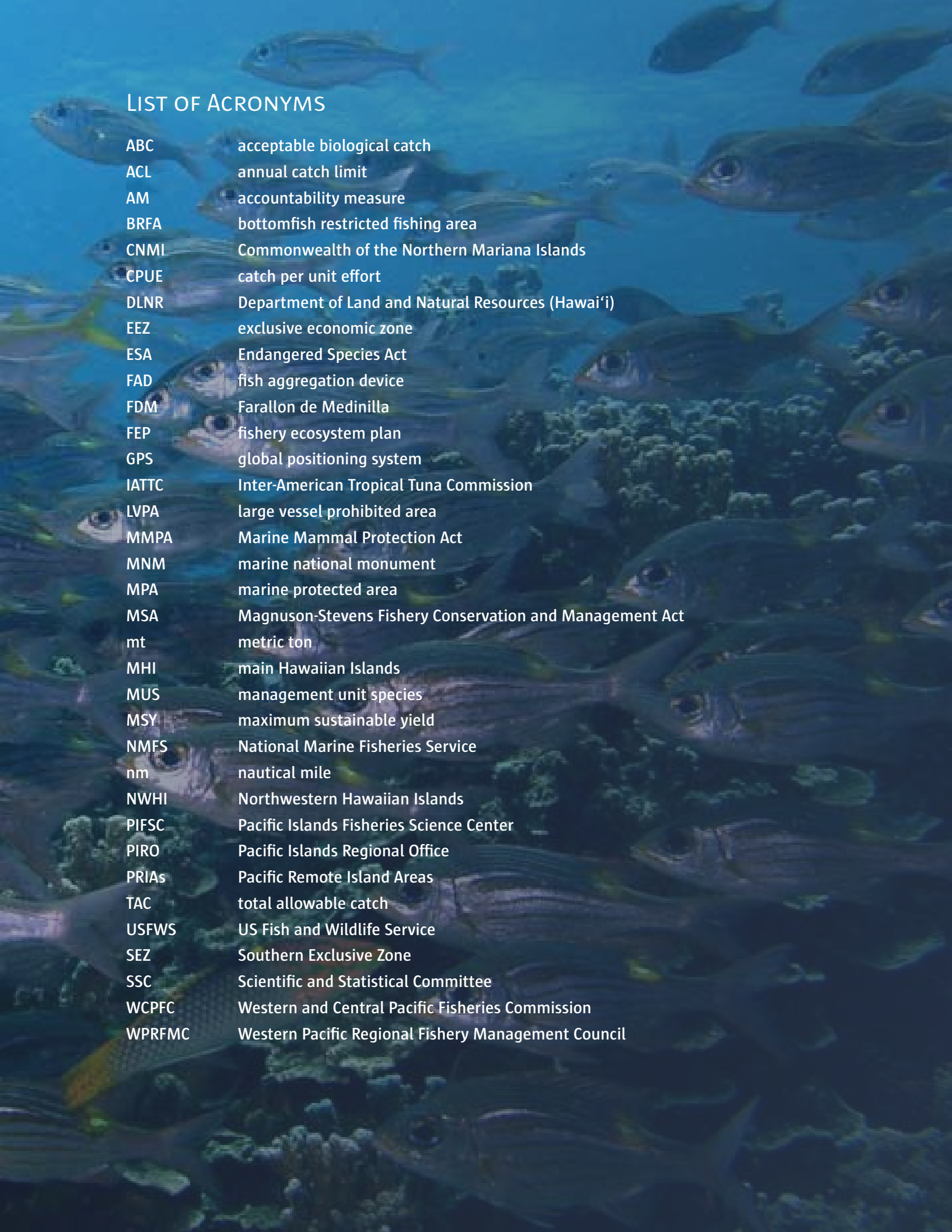
Cast-netting, spear-fishing, hook and line, gleaning, trolling and bottom fishing are common techniques practiced on Guam. Most coral reef fishing occurs in nearshore areas, and most of the fishing grounds for coral reef fishing are on the south-southwestern side of the island, where there are calm waters. The east side of the island of Guam is exposed to the northeast trade winds during most of the year, making it dangerous to fish 11 months of the year with a small boat or even from the shoreline.

Economics

Inflation adjusted prices for reef fish have shown a consistent decline over time. This may be due to an oversupply in some years, as well as competition with cheaper imported reef fish, primarily from the Federated States of Micronesia and the Philippines. The species composition of reef fish sales is difficult to assess since vendors often do not separate reef fish by species or family group but simply classify them as assorted reef fish. Parrotfish sell for a slightly higher amount than other reef fish and are more frequently separated on vendor receipts. The 2004 to 2014 average annual fleet revenue from Guam coral reef ecosystem MUS was \$259,487 with a high of \$410,266 (2006) and a low of \$109,983 (2013).

Giant trevally (*Caranx ignobilis*).

LIST OF ACRONYMS



ABC	acceptable biological catch
ACL	annual catch limit
AM	accountability measure
BRFA	bottomfish restricted fishing area
CNMI	Commonwealth of the Northern Mariana Islands
CPUE	catch per unit effort
DLNR	Department of Land and Natural Resources (Hawai'i)
EEZ	exclusive economic zone
ESA	Endangered Species Act
FAD	fish aggregation device
FDM	Farallon de Medinilla
FEP	fishery ecosystem plan
GPS	global positioning system
IATTC	Inter-American Tropical Tuna Commission
LVPA	large vessel prohibited area
MMPA	Marine Mammal Protection Act
MNM	marine national monument
MPA	marine protected area
MSA	Magnuson-Stevens Fishery Conservation and Management Act
mt	metric ton
MHI	main Hawaiian Islands
MUS	management unit species
MSY	maximum sustainable yield
NMFS	National Marine Fisheries Service
nm	nautical mile
NWHI	Northwestern Hawaiian Islands
PIFSC	Pacific Islands Fisheries Science Center
PIRO	Pacific Islands Regional Office
PRIAs	Pacific Remote Island Areas
TAC	total allowable catch
USFWS	US Fish and Wildlife Service
SEZ	Southern Exclusive Zone
SSC	Scientific and Statistical Committee
WCPFC	Western and Central Pacific Fisheries Commission
WPRFMC	Western Pacific Regional Fishery Management Council



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