# Our Voyage Continues...

Managing Marine Fisheries of Hawai'i and the US Pacific Islands -Past, Present and Future



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### 200 Mile Exclusive Economic Zones (EEZ) of the Pacific Islands

## Managing Marine Fisheries of Hawaii and the U.S. Pacific Islands – Past, Present, and Future <sup>1</sup>

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In 1976 the United States Congress passed the Magnuson Fishery Conservation and Management Act, which established eight quasi-federal regional councils to manage fisheries in the exclusive economic zone (EEZ) surrounding the United States. Under this Act, subsequently reauthorized as the Magnuson-Stevens Fishery Conservation and Management Act, the Western Pacific Regional Fishery Management Council (Western Pacific Council or Council) is the policy-making organization for the management of fisheries in the EEZ adjacent to the Territory of American Samoa, Territory of Guam, State of Hawaii, the Commonwealth of the Northern Mariana Islands and the US Pacific island possessions of Jarvis, Johnston, Wake, Howland and Baker Islands, Kingman Reef and Palmyra and Midway Atolls (Figure 1). This area of 1.5 million nm2 is the largest management area of the US regional fishery management councils and comprises about half of the total EEZ waters under US jurisdiction. This tremendous area is spread across the Pacific dateline and the equator.

The main task of the Council is to protect fishery resources while maintaining opportunities for domestic fishing at sustainable levels of effort and yield. The Council monitors fisheries within its region and prepares and modifies fishery management plans. It develops policies and management plans following the management principles and scientific requirements of the Magnuson-Stevens Act, with consideration of the social, cultural and economic values and realities of its island communities. The Council strongly encourages cooperative fishery management among the islands and distant-water fishing nations throughout the Pacific region.

The fisheries under the Council's jurisdiction range from small-scale artisanal fisheries within the US waters to large-scale industrial fisheries in international waters. The fish caught in these fisheries are marketed worldwide as high quality fresh fish and as canned, dried and frozen products. Within the region there is a particularly high demand for high quality fresh fish as well as a demand for a wide range of fishery products by a culturally diverse population. The Council plays an integral role in multilateral management of highly migratory Pacific stocks. It works with the other nations and territories in the Western Pacific through participation in the South Pacific Conference and the Western and Central Pacific Fisheries Convention. It also provides assistance to US territories negotiating Pacific Insular Area Fishery Agreements to permit foreign fleets regulated access to EEZ waters. Future management of pelagic fisheries will require the Council to maintain a high degree of participation at the international level.

Through exemplary collaborative studies with environmental organizations and industry, the Council has made significant strides towards identifying effective and practicable methods to minimize the incidental take of seabirds in longline fisheries. Plans are now being developed, again employing this collaborative approach, to find similarly effective and practical methods to minimize the incidental take of sea turtles in longline fisheries. The Hawaii pelagic longline fleet comprises roughly 3% of the total pelagic longline vessels operating in the western and central Pacific Ocean region and roughly 5% of the total effort in terms of number of hooks set per year in this area. To ensure the sustainability of longline fisheries, the Council must focus on identifying the best sea turtle and seabird mitigation methods and mainstreaming their use by both domestic and international fleets. The Council will also focus on incorporating principles of ecosystem-based management into all of its existing Fishery Management Plans (FMPs), continuing its efforts to provide indigenous communities access to marine resources and conducting stock assessments to implement new biomass-based overfishing control rules.

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Figure 1. EEZ waters managed by the Western Pacific Council.

The US Pacific islands are politically and culturally diverse, comprising one state, two territories, a commonwealth and seven small islands and atolls of various jurisdictions. Fishing is of social and cultural significance to island communities. Pre-colonization Polynesian and Micronesian societies were heavily dependant on fish as a source of animal protein. Fish and fishing have unique socio-cultural significance for the indigenous peoples of the Western Pacific Region, and it was primarily with this in mind that the interests of island indigenous peoples were embodied in the Magnuson-Stevens Act during its 1996 reauthorization.

Today, US Pacific island populations include East and Southeast Asian immigrants, who share with the original Polynesian and Micronesian societies a strong fishing tradition and a strong dependence on fish for a large portion of the annual protein intake. Fish consumption in Micronesia and Polynesia typically averages about 130 lb/person/yr and even in more culturally diverse Hawaii, fish consumption is twice the US national average at about 90 lb/person/yr. Further, although most people do not need to fish to obtain food, recreational fishing is still an extremely popular pastime and is a cultural link with the activities of pre-contact societies. This also includes Hawaii, where at least one quarter of the population participates in some form of fishing activity at least once per year and the level of community involvement in fishing is higher than in many other US States. Recreational fishing in Hawaii involves not only residents but also a significant number of the annual 6.6 million tourists who want to experience game fishing in the tropical Pacific. This high level of recreational fishing

activity is economically important for the State and also of concern to the Council since much of it occurs in waters over which the Council has jurisdiction.

Unlike the other US Fishery Management Regions, the Western Pacific Region has little coastal shelf area and so the greatest volume of commercial fisheries production comes from highly migratory pelagic fishes, particularly tunas and swordfish. Demersal fisheries are of additional economic importance in Hawaii where there are limited fisheries for large snappers that live on the deep outer reef slopes, banks and seamounts. These species are also culturally important to elements of the Asian population in Hawaii, as large red fish are components of holiday feasts. An economically important trap fishery targeting lobsters on reefs and banks of the Northwestern Hawaiian Islands (NWHI) is now inactive pending research results. The balance of fishery production comes from fishing in the coastal zone, primarily from coral reefs and associated environments, and on small pelagic fish in the coastal zone.

These islands have unique political relationships with the United States. The State of Hawaii has four voting members of Congress and its citizens participate in the election of the President. The Territories of American Samoa and Guam and the Commonwealth of the Northern Mariana Islands have non-voting representatives in Congress. Nevertheless, the Council process affords these territories and commonwealth the ability to participate in the management of regional fishery resources.

#### 3. FISHERIES OF THE US PACIFIC ISLANDS - HISTORICAL OVERVIEW

Fishing in the Pacific islands has traditionally focused on the coastal zone, but island fishermen were able to range beyond the lagoon to fish the outer reef slope for bottomfish and oilfish and the offshore waters for large pelagics such as tuna, rainbow runners and wahoo. Many different traditional fishing techniques have been documented from the various islands that now constitute the Western Pacific Region. These include traps, weirs, snares, hooks, gorges, nooses, nets and spears manufactured from locally available materials and developed through the accumulation of many centuries of experience. Along with the development of exceptional fishing skills, Pacific islanders were also highly skilled seamen navigating long distances over the open ocean, with systems based not on mathematical concepts, but an intuitive navigational system that integrated observations of the physical environment, behavior of marine fauna and astronomical observations.

The traditional paddle and sail powered canoes, typical of the region, have not entirely disappeared in the Pacific but have been largely replaced by fiberglass and aluminum skiffs powered by outboard motors. Similarly, urbanization and economic development have tended to focus fishing activity on variations of seine or gill netting, spearfishing (surface and diving) and hook-and-line fishing (handlining and trolling). Although the range of fishing activities has narrowed, the relative fishing power of individual fishermen has increased with the introduction of monofilament nets and lines, metal hooks, diving gear such as fins and masks, and steel spears propelled by spear guns and surgical rubber bands. The acquisition of outboard motors and diesel engines has also meant that fishermen are able to reach coastal and offshore locations that in the past might have been inaccessible or visited only infrequently. In the last 20 years, the development of sonar and satellite technology has made fisheries more efficient and fishermen more effective at finding target fish.

The adoption of modern gears and vessels has often been accompanied by loss of the traditional body of knowledge concerning the natural history and life cycles of fish and other marine organisms. Pacific island fishermen also developed systems of tenure over reef and lagoon areas and systems to regulate these fishery resources based on natural cycles. Traditional ownership of nearshore reef and lagoon areas is still strongly maintained in parts of the region, but such systems break down with increasing urbanization and more contemporary management systems often fail to replace these older systems in their ability to regulate fishing. Most of the domestic commercial fishing activities in federal waters surrounding the US Pacific islands are variations of fishing with hooks and lines (Tables 1 and 2). Longline fisheries established in Hawaii and American Samoa dominate the fishing industries in both locations. Domestic commercial fishing activity in each region also includes handlining for large snappers and groupers on the outer reef slope and trolling, handlining and longlining for pelagic fish. The now dormant trap fishery for spiny and slipper lobsters based in the remote Northwestern Hawaiian Islands (NWHI) was the only lobster fishery of any significance in the US Pacific islands. Mention should also be made of precious coral harvests, which have taken place in the past in federal waters in Hawaii, but are currently restricted to state waters. Harvesting of precious corals in Hawaii is conducted with SCUBA gear in shallow waters and was conducted by submersibles in deeper water.

Bottomfishing is conducted in Hawaii and the three US territories but is only of major significance in Hawaii and represents a fraction of total landed value of all catches. Most bottomfish grounds in American Samoa, Guam, the Northern Mariana Islands and the Main Hawaiian Islands (MHI) are within the 0-3 nm zone and thus fall under State or Territorial jurisdiction. However, the NWHI represents a substantial area of bottomfishing grounds within Council jurisdiction and there are significant bottomfish banks and seamounts in the MHI, such as Penguin Bank, that lie within or extend into federal waters. These four island groups also have a wide variety of small-scale inshore fisheries for reef fish, mostly within the 0-3 nm zone. The Council's newly developed Coral Reef Ecosystem Fishery Management Plan provides the Council with jurisdiction over any reef fishing conducted in federal waters.

#### Table 1.

Domestic commercial fisheries of the U.S. Pacific islands

Location	Pelagic	Bottomfish/Reef-fish	Crustaceans
Hawaii	Longlining for swordfish and tunas Ika-shibi handlining for yellowfin	Deep slope handline fishery for large snappers, jacks and grouper	Trap fishery for spiny and slipper lobster
	Palua-ahi handlining for yellowfin and big eye tunas	Various fisheries for coral reef associated species	
	Trolling for tunas and other pelagics		
	Pole-and-line fishing for skipjack		
American	Longlining for tunas	Bottomfish handline	
Samoa	Trolling for tunas and other pelagics	jacks and grouper	
		Various fisheries for coral reef associated species	
Guam	Trolling for tunas and other pelagics	Shallow (100—500 ft) handline fishery for reef-dwelling snappers, groupers & jacks. Various fisheries for coral reef associated species	
		Deep-slope (500—700 ft) handline fishery for large snappers, jacks and grouper	
Northern Mariana Islands	Trolling for tunas and other pelagics	Deep slope handline fishery for large snappers, groupers	
		Various fisheries for coral reef associated species	

Prior to 1999, commercial finfish fisheries in the EEZ waters of US Pacific islands landed about 32 million pounds of fish worth an estimated \$56 million. At that time 89% of landings were from Hawaii-based fisheries, and most of this volume (97%) was from pelagic fisheries, principally from Hawaii-based longline fishing. After stringent management constraints were implemented in the Hawaii longline fishery, total fishery landings declined dramatically and amounted to just over 40 million pounds, worth about \$68 million, in 2002. The contribution from Hawaii-based fisheries has declined to about 60% of the total, due to a ban on swordfish fishing and the expansion of the American Samoa longline fishery.

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#### Landings in lbs of domestic commercial fisheries in the U.S. Pacific islands, 2002.

Location	Hawaii	Am Samoa	Guam	CNMI	Total
Pelagic Fish	21,576,000	15,328,000	319,800	253,270	37,477,070
Bottomfish	615,000	37,350	13,920	46,980	713,250
Reef-fish	339,000	15,120	139,100	152,150	645,370
Other Fish	1,310,000	8,700	9,520	26,790	1,355,010
Total	23,840,000	15,389,170	482,340	479,190	40,190,700

In Guam and the Northern Mariana Islands, domestic tuna fisheries are limited, but landings, transshipment and processing of tuna catches from distant water fishing nation (DWFN) fleets in Guam are extremely important (Table 3). Tuna fishing in American Samoa was also limited until the late 1990s when domestic longline fishing expanded, growing by 2002 to rival Hawaii in terms of pounds of fish landed. American Samoa also has two canneries, which process tuna caught throughout the Pacific and provide the main source of private sector employment for American Samoa and a significant employment of labor from independent Samoa. Re-provisioning of fishing vessels also adds to the revenues generated by tuna processing in this territory. The same is true in Guam where large numbers of DWFN longliners are based and transship their catches. Guam and neighboring Saipan have also seen the increasing development of airfreighting foreign-caught fresh tuna for the sashimi market in Japan and increasingly to a growing tuna and swordfish market in Europe. The development of air transshipment hubs in Guam and Saipan has also had a positive effect on the development of tuna fisheries in the neighboring Micronesian states of Palau, the Federated States of Micronesia (FSM) and the Marshall Islands, with both domestic and DWFN vessels home-porting in these islands. Pago Pago, American Samoa, and Agana, Guam, are ranked first and sixth, respectively, of all major US ports for value of commercial landings in 2002 (Table 3). Honolulu, Hawaii, was ranked 12th of US ports in 2002 for value of commercial landings, a decline from recent years due to recent restriction on the swordfish component of the Hawaii longline fleet.

#### Table 3.

Landings and value from distant water fishing nations in American Samoa and Guam, 2002.

	Landings		Value	
Port	x 1,000 lb	No. U.S. port	Million \$	No. U.S. port
Pago Pago,				
American Samoa				
canneries and	423,324	2	251.7	1
transshipment				
Agana, Guam				
transshipment,	16,940	43	60	6

#### 4.1. Pelagic Fisheries

The Western Pacific Council was the first of the regional councils to develop a Pelagics Fishery Management Plan (FMP), promulgated in 1987, through which US pelagic fisheries under federal jurisdiction are regulated. The Pelagics FMP initially addressed the regulation of foreign fishing vessels in EEZ waters surrounding the US Pacific islands through fishing permits, area closures, the prohibition of drift gill net fishing except for experimental purposes, definition of pelagic management unit species, observer requirements and catch reporting. The plan also created a framework for the future management of pelagic fisheries within the EEZ waters of the US Pacific islands.

Domestic commercial pelagic fisheries in Hawaii and American Samoa are the most developed of commercial pelagic fisheries of the US Pacific islands (Table 2). Until the latter quarter of this century, much of the commercial pelagic catch was skipjack taken by Hawaii live bait pole-and-line vessels, which supplied a local cannery. This method of fishing has largely declined following the closure of the tuna cannery in 1984 although a small amount of skipjack is still landed for fresh consumption. The predominant pelagic fisheries in Hawaii are two handline fisheries (palu-ahi and ika-shibi), trolling and longline fishing. Of these methods, by far the most important in terms of volume and value is the longline fishery (Table 4). Less than 15 longline fishing vessels were active in the early 1980s in Hawaii, but this fishery targeting swordfish and tunas expanded to about 150 vessels by the early 1990s. Prior to a recent closure of the swordfish component of the Hawaii longline fishery, Hawaii-based longliners accounted for about two thirds of US swordfish production and 15 percent of all Pacific swordfish landings.

Table 4.		
Volume and value of finf	ish landings from Hawaii-based	l fisheries, 2001.
Fishery	Landings (x 1,000 pounds)	Gross revenues (\$)
Longline	15,600,000	33,000,000
Pole-and line (aku boat)	1,200,000	1,600,000
Troll	2,600,000	3,800,000
Handline	1,320,000	2,300,000
Other gear	600,000	900,000

Handline fishing is an ancient technique developed by Pacific islanders living on atolls and small islands. It is used to catch yellowfin and bigeye tunas with simple gear and small boats. Today, there is a substantial amount of variation in fishing methods and gear employed by the Hawaii handline fleet. Handline gear is set below the surface to catch relatively small quantities of large, deep-swimming tuna suitable for sashimi markets. There are two types of pelagic handline fishing methods employed in Hawaii. The ika shibi (squid small ahi) handline fishery is generally conducted at nighttime and most fishers use a parachute sea anchor to slow the vessel's drift while fishing. Three to four handlines are set at a time. Mackerel scad is the typical bait, and the baited hook is lowered with a lead weight. A light bulb is placed in the water to attract baitfish and tuna, and the surface is chummed with chopped squid and anchovies. The palu-ahi (chum tuna) handline method adds a weighted, retrievable "bag" stuffed with chum that is released at a depth of approximately 130 meters to attract tuna to the baited hooks. When a fish is caught, it is hauled aboard either manually or with hydraulics. The Hawaii offshore handline fishing grounds are primarily at seamounts and weather buoys 30-200 miles from shore. In 2001 the State of Hawaii issued 163 Commercial Marine Licenses to fishermen who identified on their license that their primary fishing method was ika shibi or palu ahi handline. There is no federal permit requirement for commercial handline fishing off Hawaii. Total Hawaii handline catch in 2001 was about 1.3 million pounds.

Troll fishing, which may catch a variety of pelagic species, is predominantly a recreational fishery; however, there are a few fulltime commercial troll fishermen in Hawaii and pelagic handline and bottomfish fishermen may also set trolling lines en-route to and from fishing grounds to augment their catch. Trolling is conducted by towing lures or baited hooks from a moving vessel using big-game rods and reels or hydraulic haulers and outriggers. Some troll vessels will also use a handline especially to target ono (wahoo) and tunas. Commercial troll fisheries target ono, mahimahi, and large yellowfin tuna. Trollers fish at grounds where water masses converge, and where underwater features create dramatic bathymetric changes, and may target fish aggregation devices and foraging seabirds. Many "recreational" troll fishermen in Hawaii sell surplus catch to cover trip expenses and are thus referred to as "expense" fishers. This makes the definition of "commercial" and "recreational" fishermen difficult. A 1995-1996 statewide survey of small boat fishers classified 41 percent of respondents as expense fishers, 28 percent as recreational fishers who did not sell any portion of their catch, and the remainder as full-time or part-time commercial fisheries who fish to generate personal income. Trolling is the most popular pelagic fishing method in Hawaii and has a long tradition of use by small boat recreational and commercial fishers using simple gear. Hawaii also has been the site of important innovations in big-game trolling techniques. For instance, Hawaii is known as the blue marlin trolling capital of the world, and the annual Hawaii International Billfish Tournament has been held for the past 45 years in Kona, Hawaii. Commercial trollers landed about 2.6 million lbs of pelagic fish in 2001.

The pelagic pole-and-line fishery in Hawaii targets primarily skipjack and juvenile yellowfin tuna. This fishery is also called the baitboat fishery because it uses live bait to entice tuna to bite on barbless hooks with feathered skirts. Okinawan fishermen introduced the fishery after the turn of the century, and even today several Hawaii skippers are of Okinawan descent and several original Okinawan "sampan" style wooden boats are active today in this fishery. A steel-hulled sampan-style vessel was built in the late 1990s and has shown to be profitable despite pessimistic predictions. The major historic baiting areas used by the fishery, such as Pearl Harbor, are now closed to bait fishing, making it difficult for the remaining fleet to obtain bait in less productive Kaneohe Bay. Historically skipjack landed in the pole-and-line fishery were primarily canned, but there was and still remains an important domestic market for fresh caught skipjack in Hawaii. Currently most Hawaii catch is sold on the fresh fish market. The Hawaii-based pole-and-line fishery now has only about three active boats. In 2001, the pole-and-line fishery landed 1.2 million pounds of fish, 99% of which was skipjack tuna, generating \$1.6 million in ex-vessel revenue.

Longline fishing in Hawaii had been conducted for many decades prior to the expansion of the fishery in the late 1980s. Hawaii longline vessels evolved from wooden pole-and-line tuna sampans, employing longlines made from rope and fishing mainly within 2-20 nm of the coast. At this time, this fishing style was called "flag line." By the 1930s this fishery was second only to the poleand-line fishery in landed volume of fish and accounted for most of the yellowfin, bigeye and albacore tuna landed in Hawaii. The fishery peaked in the mid-1950s with landings exceeding 2000 t and then declined steadily through lack of investment in boats and gear until the late 1980s.

The Hawaii-based longline fishery was revitalized with the development of local markets and exports for fresh tuna on the US mainland and in Japan and expansion of fishing for swordfish around the Hawaiian Islands. Participation in the longline fishery increased from 37 vessels in 1987 to 75 in 1989 and then doubled again to 156 vessels in 1991 (Figure 2). Further entry to the longline fishery was halted through a moratorium in 1991 under

Amendment 3 to the Pelagics FMP, followed by a limited entry program to restrict effort. Landings increased rapidly, reaching 9,000 t, of which 4,400 t was broadbill swordfish (Xiphias gladius), by 1991. The new entrants in the longline fishery were mostly steel hulled vessels up to 110 ft in length operated by former participants in the US East Coast tuna and swordfish fisheries. These newer vessels in the fishery were also characterized by a greater reliance on sophisticated electronic gear to navigate, mark deployed longline gear and find fish. The revitalized fleet also adopted more modern longline gear, using continuous nylon monofilament main lines stored on spools, with snap-on monofilament branch lines.





Monofilament longline gear is more flexible in configuration and can be used to target various depths more easily than traditional rope longlines. Both daytime and nighttime fishing are practiced using the same monofilament system. When targeting deepswimming bigeye tuna, 12-25 hooks are deployed between floats with lots of sag to reach as deep as 1,300 ft. When targeting swordfish, only a few hooks are deployed between floats and the line is kept relatively taut so that it stays within the first 100–300 ft of the water column. Luminescent light sticks are employed at night to attract swordfish and bigeye tuna or their prey. The longlines are baited with large imported squid. However, the swordfish segment of the longline fishery has been closed since 2001 due to concerns about the fishery's interactions with sea turtles.

In early 1991 longline fishing was prohibited within 50 nm of the NWHI to prevent interactions with endangered Hawaiian monk seals. Additional longline exclusion zones were established in mid-1991 through Amendment 5 of the Pelagics FMP, i.e., 50-75 nm around the MHI and within 50 nm of Guam. These closures around the MHI and Guam were adopted to prevent gear conflicts between longliners and smaller fishing boats targeting pelagic stocks.

Enforcement of the longline exclusion zones around the MHI and the NWHI is accomplished through the Council's mandatory Vessel Monitoring System (VMS) policy, where local longline boats must be equipped with a satellite transponder that provides 'real-time' position updates and the track of the vessel movements. Working closely with industry, the National Marine Fisheries Service (NMFS) and the US Coast Guard, the Council implemented this mandatory VMS scheme for the Hawaii longline fishery in December 1994. This was the first mandatory scheme in US waters. Hawaii-based longline vessels are also required to carry onboard observers when requested by NMFS, in part, to record interactions with sea turtles, seabirds and marine mammals. Table 5 describes the catch composition by volume and value for the Hawaii longline fishery.

#### Table 5.

Catch composition of Hawaii longline fishery, by volume and value, 2001.

Species	Catch (x 1,000 lb)	Revenue (x \$1,000)
Blue marlin	879	730
Striped marlin	775	845
Swordfish (round weight	t) 485	1,193
Other billfishes	299	242
Mahimahi	530	662
Ono (wahoo)	388	563
Opah (moonfish)	756	930
Sharks (round weight)	327	119
Other	395	529
Subtotal non-tuna PN	AUS 4,834	5,813
Albacore	2,802	3,222
Bigeye	5,217	18,208
Bluefin	2	10
Skipjack	466	238
Yellowfin	2,233	5,516
Subtotal tuna PMUS	10,720	27,194
TOTAL	15,554	33,007

Most recently, an August 31, 2003, judgment (as amended on October 6, 2003) by the federal district court for the District of Columbia vacated regulations promulgated in 2002, implementing a 2001 NMFS Biological Opinion, designed to reduce interactions between Hawaii pelagic longline fishing gear and sea turtles. However, the 2002 regulations will remain in effect until NOAA Fisheries develops replacement regulations by April 1, 2004. It is expected that NMFS, working with the Council, will develop and implement new regulations by that date. The current (through April 21, 2004) regulations prohibit swordfish longline fishing north of the equator, all Hawaii-based longlining in an area south of the Hawaiian Islands during April and May, and the possession or landing of more than 10 swordfish per fishing trip by longline vessels fishing north of the equator, among other measures. The new management regime for the fishery will be designed to allow a sustainable fishery while not jeopardizing the continued existence of affected sea turtles or other threatened or endangered species.

Another recent regulation that has had a major impact on the Hawaii-based longline fishery was the prohibition of shark finning. The US Congress and the State of Hawaii adopted legislation in 2000 banning shark finning because of concerns that the practice was wasteful, and that the increasing market demand for fins may endanger pelagic shark populations. Prior to the ban, up to 60,000 sharks, primarily blue shark, were finned and the carcasses discarded by the Hawaii-based longline fleet. However, a stock assessment conducted jointly between NMFS and Japanese colleagues showed that North blue sharks stocks were healthy, and fished well below the maximum sustainable yield.

Troll fishing continues to be the most commonly practiced method for commercially fishing large pelagics in Guam and the Northern Marianas, while longline fishing, principally for albacore, has dramatically increased in American Samoa since 1995. In mid-1995 four vessels began longlining in American Samoa. By 1997, a total of 33 vessels had longline permits, and the fishery grew rapidly until 2001. In 2001, a total of 62 American Samoa permitted longline vessels were active and reported total landings of over 8.1 million pounds. In 2002, a total of 60 active longline vessels in American Samoa reported landings of over 15.7 million pounds. The total landings of all pelagic species in American Samoa in 2001 was an increase of 339% from 2000, and the total landings of all pelagic species in 2002 was an increase of over 93% from 2001. Of the 2002 domestic total landings of pelagic species in American Samoa, longlining comprised 99.8% while trolling took less than 0.2% (Table 6).

#### Table 6.

American Samoa total landings by longline and troll fisheries, 2002.

	Landings by fishing sector (lb)		
Species	Longline	Troll	
Tunas			
Skipjack tuna	509,213	10,803	
Albacore	13,103,961	0	
Yellowfin tuna	1,067,481	11,781	
Kawakawa	0	93	
Bigeye tuna	431,713	0	
Misc. tunas	396	0	
Mahimahi	85,831	654	
Black marlin	2,248	0	
Blue marlin	74,216	0	
Striped marlin	3,850	0	
Wahoo	357,886	351	
Sharks	6,019	215	
Swordfish	37,101	0	
Sailfish	7,060	0	
Spearfish	3,033	0	
Moonfish	6,759	0	
Oilfish	731	0	
Pomfret	2,682	0	
Other ssp	4,739	770	
TOTAL	15,704,919	24,667	

A unique feature of the American Samoa fishery is the bimodal fleet, split between large (>50ft) conventional monohull longline vessels and small outboard powered locally built aluminum *alia* catamarans, from which longline gear is set and hauled manually. The fishery began based on *alias*, but the recent expansion was a result of the entry of large conventional longline vessels into the fishery. The Council developed two management measures to ensure the productivity of the *alia* pioneer fleet in the face of entry from larger monohull vessels. The first of these was the development of 50 nautical mile area closures to all pelagic fishing vessels > 50 ft around the American Samoa islands, which minimized competition between the two fleet segments and allocated nearshore areas to the less mobile *alias*. The second was a limited entry program, which caps effort, but allows American Samoa fishermen to upgrade *alias* to larger monohulls.

Pelagic fisheries of the Territory of Guam include primarily US distant-water purse seiners and foreign longliners that fish outside of the US EEZ and transship through Guam and small primarily recreational trolling boats that fish only in local waters around Guam and the Commonwealth of the Northern Mariana Islands. In 2001 there were a total of 375 troll and charter vessels in Guam landing approximately 757,000 pounds sold for \$670,000. The catch was comprised primarily of skipjack tuna, mahimahi, and wahoo. The number of troll vessels operating in Guam has steadily increased from 119 in 1980 to 438 in 1998 and has slightly decreased thereafter to 375 troll vessels in 2001.

Trolling is the most common fishery in the Commonwealth of the Northern Mariana Islands, with bottomfishing and reef fishing also conducted. The main product is skipjack tuna. Yellowfin and mahimahi are targeted to a lesser degree. All production from this domestic commercial fishery is consumed locally. In 2001 there were 148 active troll and charter vessels in the Northern Mariana Islands landing about 143,114 pounds of pelagic species of which 70% was skipjack tuna and 30% was mahimahi and dogtooth and yellowfin tuna. The fish generated an estimated \$286,488 in exvessel revenue. No large-scale longline or purse seine activity occurs around the Northern Mariana Islands.

Most pelagic stocks and landings are significantly greater than demersal fisheries in all parts of the Western Pacific Region, especially in Hawaii (Table 2). The tropical tunas (skipjack, yellowfin, bigeye) represent a substantial resource for the entire Western Pacific Region. Total catches of skipjack alone in the Western Pacific (including Eastern Indonesia and the Philippines) amount to almost 1,000,000 mt/yr of which most is taken by fleets of purse seiners from the United States, Japan and the Philippines. Results of studies on the biology of the various pelagic stocks suggest that the tropical tunas are extremely productive populations, with rapid growth rates and more or less constant recruitment to the population over a wide range of their distribution. It is thought that present effort levels are still below those that would generate maximum sustainable yields.

#### 4.2. CORAL REEF ECOSYSTEMS

The Western Pacific Council's 2001 Fishery Management Plan for Coral Reef Ecosystems of the Western Pacific Region is the first ever ecosystem-based plan for fisheries developed in the United States. It incorporates many of the principles and policies recommended by the National Marine Fisheries Service's Ecosystem Principles Advisory Panel. The goal of the FMP is to establish a management regime for the entire Western Pacific Region that will maintain sustainable coral reef fisheries while preventing adverse impacts to stocks, habitat, protected species or the ecosystem. To achieve this goal, the FMP implements several management measures, including (a) the designation of zoned Marine Protected Areas (MPAs) for coral; (b) permit and reporting requirements to fish in designated low-use MPAs (reporting of fisheries information in non-MPA areas will continue to be collected through locally administered monitoring systems), and if needed, a general permit program for all EEZ reef fisheries and; (c) a prohibition on non-selective/destructive fishing gears and conditions on the types and uses of allowable gears.

The central feature of the Coral Reef Ecosystems FMP is adaptive management, which recognizes the uncertainty, changing conditions and resilience associated with coral reef ecosystems. Pacific island management systems for coral reef ecosystems have allowed Pacific islanders to survive for millennia by coexisting with coral reef resources and are best viewed as adaptive responses that have evolved over time, not as mere traditions.

Coral reef habitat covers an estimated 6,120 sq. miles of the shallow ocean bottom around US Pacific Island areas served by the Council. Nearshore fisheries of the Western Pacific Region include a wide variety of reef and lagoon species and large and small pelagics fishes found within lagoons or near reef margins. A variety of methods are employed in coral reef fisheries including hand harvesting, hook-and-line, spears and a variety of nets and traps. The monitoring and regulation of nearshore fisheries is mainly the responsibility of State or territorial fisheries administration, although there are some 4,200 sq. miles of lightly fished coral reef habitat that lies within the federal waters of the Council's jurisdiction. Table 7 lists the 2002 volume of estimated domestic coral reef fish landings in the US Pacific islands by area.

Nearshore resources are caught for recreation and subsistence purposes and for commercial sales. Categorizing fishing activity into one of these different activities is extremely difficult in the Western Pacific Region, where people may have regular employment but increase their earnings by occasional sales of fish when recreational or subsistence catches are more than required. In the Pacific islands, nearly every person is a potential fisherman and every village is a potential landing site. Even in Hawaii, a significant volume of the recreational catch is sold to the public along the roadside. This is another essential difference between the Western Pacific Region and other US locations, where commercial and recreational fishermen are strongly polarized and the commercial fishing community actively discourages fish sales by recreational fishermen.

Table 7.	
Estimated Western Pacific coral reef fish landings, 2002	
Island Area	Landings (pounds)
American Samoa	19,750
Guam	177,030
Hawaii	866,860
Northern Marina Islands	179,090
TOTAL	1,242,730

Throughout the Western Pacific Region, fishery administrators at the State, territorial and commonwealth level are actively developing management strategies to minimize the potential for resource depletion and habitat degradation. The Territory of Guam recently established over 20% of its nearshore waters as no-take MPAs. The Territory of American Samoa has now banned the use of fishing with SCUBA, while the Commonwealth of the Northern Mariana Islands has banned the use of all types of lay gill nets. The State of Hawaii has increased the minimum size for many reef fish and is also developing new conditions for the use of lay gill nets. However, recent attempts to establish expanded MPAs were unsuccessful.

With the assistance of federal partners, local fisheries administrations are also increasing fisheries research and monitoring programs to evaluate the effectiveness of existing regulations and management decisions. Fisheries administrations in the Western Pacific Region possess some of the longest coral reef fisheries data sets and continue to improve the collection of fisheries information, including catch and effort data from recreational and subsistence sectors. MPA effectiveness studies are now being conducted throughout the region, and ecosystem assessment programs have recently been initiated to monitor the long-term health of coral reefs and reef associated communities. Collectively, these new programs aim to evaluate the effectiveness of existing fisheries management measures and provide scientific data to support and establish new management initiatives.

#### 4.3. CRUSTACEAN FISHERIES

Lobster was a traditional source of food for Native Hawaiians and was sometimes used in early religious ceremonies. After the arrival of Europeans in Hawaii, the lobster fishery became the most productive of Hawaii's commercial shellfish fisheries. The commercial lobster catch in 1901 was reported to be 131,200 lbs. The majority of catch at that time was probably composed of the green spiny lobster (*Panulirus penicillatus*), a nearshore species. Lobster was taken with nets set around rocks, snared with a pole to which a noose was attached or captured by hand. A rapid and substantial increase in Hawaii's population during the first decades of the twentieth century resulted in heavy fishing pressure and depletion of lobster resources adjacent to the more populated areas of the MHI. By the early 1950s the commercial catch of green spiny lobsters around the MHI had dropped by 75% to 85%. The depletion of the fishery resources in nearshore areas of the MHI encouraged Hawaii's fishermen to search for alternative grounds.

A NWHI lobster fishery was developed in the late 1970s. By then several commercial vessels, relocated from areas such as the US Pacific Northwest where crustacean overfishing was occurring, began full-scale lobster trapping in the NWHI. A number of smaller, multi-purpose boats also began fishing for spiny lobsters in the NWHI, combining that operation with bottomfish fishing. By the mid-1980s the NWHI lobster fishery was Hawaii's most lucrative fishery. Changing gear from wire to plastic traps led to significant catches of slipper lobster and an increase in fishing efficiency. From 1985 to 1987 the fishery targeted and largely depleted the population of slipper lobsters. In 1990 lobster catch rates dramatically declined, likely due to a climate-induced change in oceanic productivity throughout the NWHI, which also affected the abundance of reef fish, seabirds and Hawaiian monk seals. The decrease in lobster catch prompted the Western Pacific Council to establish a limited access program and fleet wide seasonal harvest quotas that significantly altered fishing operations. Vessels concentrated on trapping lobsters on the banks around Necker Island, Gardner Pinnacles and Maro Reef during the derby-style fishing season. From 1992 to 1997 Necker Island accounted for 48% to 64% of the total effort. In 1998 the quota was allocated among four fishing areas to prevent localized depletion of the lobster population at the most heavily fished banks and to encourage fishers to broaden the geographical distribution of their effort.

The NWHI lobster trap fishery is unique in the Western Pacific Region where other common spiny lobster species normally will not readily enter fish traps. Under the Western Pacific Council's Crustacean Fishery Management Plan, implemented in 1983, traps deployed in the NWHI lobster fishery must have escapement panels to allow the exit of juvenile lobsters. In the same year, the Council also amended the Crustacean FMP to specify the maximum dimensions of the trap funnel entrance, to minimize the risk the traps posed to protected monk seals in the NWHI. There were concerns that the traps may elicit the curiosity of monks seals, especially the pups, who might place their heads in the trap funnel, become trapped and drown.

The lobster harvest guideline is an example of implementation of the precautionary approach to fisheries management, as it uses an accepted level of overfishing risk to set the total exploitable population and then allocates 13% of that as the harvest guideline. Initially a minimum size limit of 5 cm tail width for spiny lobsters and 5.6 cm for slipper lobsters was established for the lobster fishery, along with a ban on the retention of berried females. However, observations on the gross mortality of discarded lobsters, both on deck and through predation, led to a Council decision in 1996 to permit a "take all" fishery in which all lobsters retained are counted against the annual quota. The Hawaii lobster fishery landed 261,000 pounds with an ex-vessel revenue of \$1.2 million in 1999, which was the last year the fishery was active (Table 2).

The majority of the vessels participating in this fishery voluntarily deployed satellite VMS through which their location could be tracked and their daily catches reported. This allowed managers to monitor the progress of the fishery through "real time" reporting of catches and give immediate notice when the annual quota was reached.

While calculating the year 2000 estimates of exploitable population of lobsters in the NWHI, using the same analytical procedures used to estimate exploitable populations in 1998 and 1999, NMFS scientists expressed alarm at the increasing level of uncertainty in their computations. The scientists also noted a lack of appreciable rebuilding of lobster populations despite significant reductions in fishing effort throughout the NWHI. Given the shortcomings in understanding the dynamics of the NWHI lobster populations, the increasing uncertainty in model parameter estimates and the lack of appreciable rebuilding of the lobster population, in 2000 the Council recommended that NMFS close the NWHI lobster fishery as a precautionary measure.

The NWHI Coral Reef Ecosystem Reserve was established by Executive Order 13178 of December 4, 2000, and Executive Order 13196 of January 18, 2001. The NWHI Reserve boundary extends 3-50 nm around the NWHI except at Midway Atoll where the NWHI Reserve boundary starts at the outer boundary of the Midway Atoll National Wildlife Refuge and extends to 50 nm. The process to establish a proposed NWHI Sanctuary is underway and will consider a range of reasonable management alternatives related to the crustacean fishery.

#### 4.4. Bottomfish and Seamount Fisheries

Bottomfishing is conducted in Hawaii and the three U.S. territories but is only of major significance in Hawaii, where it represents a fraction of total landed value of all catches (Table 2). Most bottomfish grounds in American Samoa, Guam, the Northern Mariana Islands and the MHI are within the 0-3 nm zone, although there are banks and seamounts such as Penguin Bank in the MHI that lie within or extend into federal waters. In addition, the NWHI represents a substantial area of bottomfishing grounds within Council's jurisdiction.

The Hawaii bottomfish fishery is a hook-and-line fishery that targets a range of snappers and groupers that live on the outer reef slopes, seamounts and banks of the MHI and NWHI at depths of between 50 to 200 fm. Bottomfish fishing was a part of the economy and culture of Native Hawaiians long before European visitors arrived. Native Hawaiians harvested the same deep-sea bottomfish species as the modern fishery and used some of the same specialized gear and techniques employed today. European colonization of the Hawaiian Islands during the early 19th century and the introduction of a cash economy led to the development of a local commercial fishery. By the turn of the century Japanese immigrants to Hawaii dominated the bottomfish fishery using wooden-hulled sampans propelled by sails or oars. The bottomfish fishing gear and techniques employed by the Japanese immigrants imitated, with slight modifications, those traditionally used by Native Hawaiians. During the early years of the commercial bottomfish fishery, vessels fished at grounds around the MHI. The fishing range of the sampan fleet increased substantially after the introduction of motor powered vessels in 1905. Fishing activity was occurring around the NWHI as early as 1913. Within a few years more than a dozen sampans were fishing for bottomfish around the NWHI. During World War II the bottomfish fishery in Hawaii virtually ceased operations but recommenced shortly after the war ended. The late 1940s saw as many as nine vessels fishing around the NWHI, but by the mid-1950s vessel losses and lower fish prices reduced the number of fishery participants. During the 1960s only one or two vessels were operating around the NWHI. There was renewed interest in bottomfish fishing in the NWHI in the late 1970s following a collaborative study of the marine resources of the region by state and federal agencies. By 1987, a total of 28 vessels actively fished for NWHI bottomfish, with a dozen fishing full time.

Bottomfish are caught both by commercial and recreational fishermen around the MHI and by commercial fishermen in the NWHI. The size of the recreational catch around the MHI is unknown and is confounded not only by non-reporting but also by the blurring of the distinction between commercial and recreational fishermen.

The Bottomfish and Seamount Groundfish FMP was implemented in 1983. It prohibits destructive fishing techniques, including explosives, poisons, trawl nets and bottom-set gillnets; establishes a moratorium on the commercial harvest of seamount groundfish stocks at Hancock Seamount; and implements a permit system for fishing for bottomfish around the NWHI.

A limited entry scheme is in effect for bottomfishing in the NWHI whereas bottomfish stocks in the MHI are open to all fishermen. In the MHI approximately 80% of the bottomfish habitat lies in state waters. The State of Hawaii has implemented a series of area closures around the MHI and recreational bag limits to address the problem of local depletion of bottomfish. In 1989 the Council developed regulations that divided the NWHI into two fishing grounds: the Mau and Hoomalu Zones (Figure 3). Access to the Mau Zone is limited to 10 permit holders, two of which are reserved for indigenous communities through a Community Development Program. Available permits are issued to fishermen based on past participation in the MHI and/or NWHI bottomfish fisheries. Access to the more distant and lightly exploited Hoomalu Zone is limited to seven vessels. Entry to the Hoomalu Zone is through accumulation of points through fishing in the MHI or Mau Zone. Fishermen who have permits to fish in the Hoomalu zone are then restricted to fishing in this zone and must meet minimum landing requirements to remain in the fishery. The limited access programs for the Hoomalu and Mau Zones were established in 1988 and 1999 respectively.





The NWHI Coral Reef Ecosystem Reserve was established by Executive Orders in 2000 and 2001. The process to establish a proposed NWHI Sanctuary is underway and will consider a range of reasonable management alternatives related to the bottomfish fishery.

In addition to the deep-slope fisheries in the MHI and NWHI, a trawl and bottom longline fishery targeting alfonsin at the southeast Hancock Seamount in the NWHI and in the Emperor Seamount Chain was started by Russian and Japanese fishing vessels in the late 1960s. After 10 years of large catches, overfishing caused the fishery to collapse. A moratorium on the harvest of alfonsin on the Hancock Seamounts has been in effect since 1986 in an effort to rebuild the stock. The moratorium is in effect until 2004 and may be extended. Periodic reviews of the stock indicate that no recovery has occurred.

A Guam bottomfish closure was recently recommended by the Council and is being reviewed. Vessels over 50 feet will be prohibited from targeting bottomfish within 50 miles around Guam. The closure will help control fishing effort at offshore seamounts and allow the traditional small vessel fishery to continue to use resources. The measure also requires federal permits and reporting for larger vessels.

The Council is now considering management options for bottomfish resources in the Northern Mariana Islands.

#### 4.5. PRECIOUS CORAL FISHERIES

The Western Pacific Council's Precious Corals FMP was approved in 1980 and regulations for the fishery were promulgated in 1983. The plan established a permit requirement, harvest quotas for separate beds, a minimum size limit for pink coral, gear restrictions, area restrictions and fishing seasons. In 1991 an amendment to the FMP defined a bed as overfished with respect to recruitment when the total spawning biomass (all species combined) has been reduced to 20 percent of its unfished condition. Figure 4 shows the location of Hawaii's precious coral beds.





In 1965 Japanese coral fishermen discovered a large pink coral bed (Corallium spp.) near the northwestern end of the Hawaiian Archipelago. Intermittently over the next two decades, dozens of foreign vessels employed tangle-net dredges to extract precious corals in waters around the NWHI. During the 1980s, Japanese and Taiwanese coral vessels frequently fished illegally in the US EEZ around the NWHI. Poaching stopped in these areas in the late 1980s because the remaining precious corals could not sustain an economically viable fishery.

The Hawaii precious coral fishery includes two distinct sectors. One sector extracts deep-water (400-1,500m) pink, gold and bamboo corals. This fishery historically employed dredges and tangle nets to extract the precious coral, but the Council now requires selective methods such as remotely operated vehicles and submersibles. In 1966 researchers located a small pink coral bed off Makapuu, Oahu, in the MHI. Over the next three years, a small group of fishermen harvested this bed using tangle net dredges. By 1969 Hawaii's precious corals industry was producing about \$2 million in retails sales, partly from the sales of pink coral jewelry imported from Taiwan and Japan. Starting in 1973, Maui Divers of Hawaii, Inc., adopted the use of a manned submersible to commercially extract pink, gold and bamboo coral at the Makapuu bed. These operations were discontinued in 1978 due to high operating costs. In 1988 the domestic fishing vessel Kilauea received a federal experimental fishing permit to collect precious corals at Hancock Seamount in excess of extraction quotas established

by the Council in 1980, but the operation was soon discontinued. American Deepwater Engineering received a federal permit to collect precious corals in waters around Hawaii, using two one-person submersibles. In 2000, American Deepwater Engineering collected precious corals at the Makapuu bed and in the Exploratory Area of the EEZ around the MHI. New precious coral beds continue to be discovered in the Hawaiian Islands archipelago, with new beds identified in both the MHI and NWHI during 2002 and 2003.

The second sector of the Hawaii precious coral fishery, which occurs predominantly in state waters, involves hand-collecting black coral using SCUBA divers at depths of 30-100m. Black coral has been collected for centuries as a charm and a medicine. Native Hawaiians used black coral medicinally to treat various respiratory and childhood diseases and may have collected the coral with hook-andline. The commercial extraction of black coral began in the late 1950s when sport divers discovered beds of Antipathes dicomata and A. gradis nearshore off Maui. A cottage industry producing curios and black coral jewelry developed. Since the inception of the black coral fishery in Hawaii in the late 1950s fewer than 10 individuals have been active in the fishery at any one time. Harvest levels of black coral in Hawaii have fluctuated widely over the past four decades reflecting changes in demand. Table 8 lists the volume and value of black coral landings in Hawaii. During the 1970s the State of Hawaii drafted a regulation requiring a minimum height of 48 inches, the estimated minimum size for maintaining maximum sustainable yield. In the 1990s the state promulgated regulations to implement the size restriction. Between 1990 and 1997 the annual harvest of black coral in Hawaii ranged between 846 - 6,017 lb, with an annual average of 3,084lb.

#### Table 8

Volume and value of black coral landings in Hawaii.

Year	Extracted (lb)	Sold (lb)	Value (\$)
1990	2,349	2,169	31,575
1991	2,305	2,250	35,080
1992	2,398	2,328	46,560
1993	864	769	15,380
1994	4,354	4,209	84,180
1995	6,017	5,912	122,765
1996	4,865	1,703	41,325
1997	1,520	415	10,394
1996	4,865	415	

The recently established NWHI Coral Reef Ecosystem Reserve prohibits precious coral fishing within the Reserve boundary. The process to establish a proposed NWHI Coral Reef Ecosystem Sanctuary is underway and will consider a range of reasonable management alternatives related to precious coral fishing.

For all species of deep-water precious corals, particularly gold coral, the basic biology is poorly understood and their distribution

within the EEZ is also poorly understood. Furthermore, there is controversy over the unknown degree of adverse effect a NWHI precious coral fishery would have on populations of endangered Hawaiian monk seal. Monk seals have been observed preying on eels found among precious coral colonies. The importance of eels found among precious coral colonies in the monk seal diet is poorly understood

#### 4.6. INDIGENOUS PROGRAMS

Indigenous cultures in the Western Pacific developed in isolation over long periods of time. The earliest evidence of settlement in Samoa dates to 3,600 years ago, in Guam and the Mariana Islands to 3,100 years ago, and in Hawaii 1,700 years ago. These earliest travelers brought a suite of traditions and beliefs that supported an island lifestyle—an oceanic culture dependent on the oceanic environment to meet their nutritional and other needs. Wise natural resource management ensured survival of the culture. These values continue to be nurtured and encouraged by the Council through its indigenous program, which seeks to address the right of the aboriginal people of the US Western Pacific to demonstrate and exercise their traditional and customary practices.

The 1996 re-authorization of the Magnuson-Stevens Act confirms these unique characteristics by stating, "Pacific Island Areas contain

unique historical, cultural, legal, political, and geographical circumstances which make fisheries resources important in sustaining their economic growth. "New provisions contained within the Act allow for establishment of Western Pacific Community Demonstration Projects, Community Development Programs and Pacific Islands Area (foreign) Fishery Agreements (PIAFA).

The goals of the Demonstration and Development Programs are to provide greater access for native communities to their fishery resources. In addition to providing greater access, capacity is now being developed in native communities to use federal programs effectively and efficiently to advance their customary, traditional and cultural practices. Grant writing, project planning and monitoring, and community organizing and mobilization are skills now being fostered.

The Magnuson-Stevens Act recognizes that the US territories and commonwealth in the Western Pacific Region have little in the way of economic opportunities, compared to the mainland. Consequently, the Act permits territorial and commonwealth governments to request that the Department of State enter into negotiations with DWFNs wishing to fish in EEZ waters around American Samoa, Guam and the Northern Mariana Islands to develop PIAFAs. A unique feature of the PIAFA arrangement is that all the revenues from the fishing agreement, including fines and penalties, accrue to the territorial government.

#### 5. PRIORITIES FOR THE FUTURE

#### 5.1. INTERNATIONAL MANAGEMENT

The Western Pacific Council's role in the multilateral management of the highly migratory pelagic stocks in the EEZ and adjacent high seas of the Western Pacific Region has been significant and is likely to increase in the future.

The Western Pacific Council assisted in hosting four of the Multilateral High-Level Conferences (MHLCs) in Honolulu, which led towards the establishment of the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Central and Western Pacific Region (Western and Central Pacific Fisheries Convention). Developed to be consistent with the 1982 United Nations Convention on the Law of the Sea and follow the framework of the United Nations Implementing Agreement, this Convention was adopted on September 4, 2000, to establish a regional mechanism for the conservation and management of highly migratory fish stocks in the central and western Pacific Ocean. The Convention provides for the establishment of an international fishery commission to implement the provisions of the Convention. The Council participates in Preparatory Conference meetings, convened to lay the groundwork to establish the Commission. Specifically the Preparatory Conference is to establish the organizational and financial framework for the new Commission and its subsidiary

bodies, as well as facilitate the future work of the Commission. It is to begin the process of collecting and analyzing data on the status of the fish stocks and, if necessary, recommend conservation and management measures. The Preparatory Conference will continue until the Convention enters into force in late 2004. The Convention applies to all species of highly migratory fish stocks within the Convention Area (defined as all fish stocks of the species listed in Annex I of the 1982 Convention occurring in the Convention Area and such other species of fish as the Commission may determine). Conservation and management measures under the Convention are to be applied throughout the range of the stocks or to specific areas within the Convention Area, as determined by the Commission. The

Apart from Hawaii, Guam, the Northern Mariana Islands and American Samoa there are a further 18 nations and territories in the western Pacific, each with an EEZ and with different political affiliations.

The 14 independent Pacific Island nations are members of the South Pacific Forum, which also includes Australia and New Zealand. The secretariat for the Forum is based in Fiji, with its fisheries administration, the Forum Fisheries Agency (FFA) in the Solomon Islands. The FFA was established to negotiate access agreements by foreign fleets for the Forum member countries, to administer the revenues accruing from these agreements, and to provide a platform for managing tuna fisheries in the EEZs of member countries. Forum member countries and other Pacific Islands may also negotiate bilateral agreements for access to their EEZ waters.

The FFA countries plus the US flag territories, French territories and the UK territory of the Pitcairn Islands, together with membership by Australia, New Zealand, France and the US, form the South Pacific Conference. The Conference secretariat is the Secretariat of the Pacific Community (SPC), a technical, research and development assistance organization based in New Caledonia. The SPC's Oceanic Fisheries Programme (OFP) conducts research and monitoring of highly migratory pelagic fisheries and publishes regular summaries of the catches of different domestic and DWFN tuna fishing fleets the western Pacific. The OFP has also been the lead agency for tuna stock assessment and biological research in the western Pacific region for the past 20 years, conducting major tagging projects on the three tropical tunas and on albacore. Recent developments within the OFP include an observer project to monitor catches and deployment of in-country port samplers throughout the Pacific. The Standing Committee on Tuna and Billfish was originally established by the OFP to direct its work program, but was decoupled from the OFP in 1996, so it could provide advice to the emerging management commission being developed by the MHLC process. The OFP continues to provide the secretariat for the meeting with the chair rotating between member countries. The OFP has several research groups; the Western Pacific Council's senior scientist chairs the Billfish and Bycatch Research Group.

Pelagic fisheries management requires the Council to interact frequently with both the FFA and SPC, and staff members from both organizations have been or are currently members of the Western Pacific Council's Scientific and Statistical Committee and Plan Teams.

There are several tuna fishing fleets in the western Pacific, such as pole-and-line boats in the Solomon Islands and Fiji, and a number of small but expanding longline fleets in countries such as Tonga, Fiji and the FSM. Most of the commercial landings of tuna in the western Pacific, however, are currently taken by purse seine and longline fleets from metropolitan countries on the Pacific rim, namely the United States, Japan, Korea, Taiwan, Philippines and the Republic of China, i.e., the DWFNs (Figure 5).





DWFNs such as Japan, Taiwan and the Philippines also conduct their own research and monitoring on tuna catches with the western Pacific and contiguous Southeast Asian and East Asian waters. The management of Pacific tuna and other highly migratory species is complex at the international level and involves a number of different agencies within the region. The complexity becomes more labyrinthine since the Melanesian Island of Vanuatu is also a member of the body that manages tuna in the Eastern Pacific, the Inter-American Tropical Tuna Commission, due to flagof-convenience registration of Eastern Pacific purse seiners. The Western Pacific Council is, however, in a prime position to lead US pelagic fisheries management in the western and central Pacific through regular interaction with the various countries and organizations involved in the region's pelagic fisheries.

The Council has also been active in a broader ecological sense in the international arena, because of its interest in protected species management. It hosted a major international workshop on blackfooted albatross population dynamics in 1998 and a major regional research and management workshop for turtles in the central and western Pacific in 2002. The Council has also entered into a formal arrangement with the South Pacific Regional Environment Programme (SPREP) to build in-house capacity for sea turtle conservation activities. SPREP is a regional organization established under the auspices of the United Nations Environmental Program. It draws its membership from the governments and administrations of the Pacific region and is based in Apia, Samoa. The Council is also developing similar linkages with the Southeast Asian Fisheries Development Center (SEAFDEC) and its turtle conservation program. SEAFDEC is one of the agencies serving Southeast Asia under the umbrella of the Association of Southeast Asian Nations.

The Western Pacific Council has assisted in hosting several international meetings, including the Second International Fishers Forum in 2002, an international series of meeting for longline fishermen on minimizing seabird and sea turtle bycatch in longline fisheries, and in 2000, an international conference on marine debris, a large volume of which originates from fishing activity by domestic and foreign trawlers in the North Pacific

#### 5.2. Bycatch of Protected Species – Longline Fisheries

The monk seal (*Monachus schauinslandi*) is a tropical seal in the Hawaiian Islands. About 1,200– 1,450 seals are confined mostly to the NWHI, but a population of seals in the MHI is growing. The species was designated as depleted under the Marine Mammal Protection Act in 1976, following a 50% decline in beach counts from the late 1950s and mid 1970s. This species was also listed as endangered under the Endangered Species Act in 1976. Critical habitat for monk seals was designated in 1988 from beaches to a depth of 20 fathoms (121 ft, 37m) around breeding islands and at Maro Reef.

Evidence of interactions between seals and the longline fishery began to accumulate in 1990, including three hooked seals and 13 unusual seal wounds thought to have resulted from interactions. In October 1991, the Council established a permanent Protected Species Zone, where pelagic and demersal longline fishing is prohibited, extending 50 nm around the NWHI and including a 100-mile-wide corridor connecting the islands. Subsequent shore-based observations of seals and observer records suggest that interactions ceased after establishment of the Protected Species Zone.

Available estimates for total albatross mortality in North Pacific pelagic longline fisheries, along with population modeling experiments on the black-footed albatross, highlight the concern that mortality in longline fisheries threatens the existence of black-footed albatrosses and may pose a significant threat to the other North Pacific albatross species. In the past, Hawaii pelagic longline fisheries resulted in the annual mortality of approximately 3,000 Laysan (Phoebastria immutabilis) and black-footed (P. nigripes) albatrosses. However, changes in regulations have significantly reduced the fleet's albatross bycatch. As a result of these changes to the Hawaii longline fleet, the annual seabird mortality in the Hawaii longline fishery is currently estimated to be an order of magnitude lower than previous levels. However, the mortality of albatrosses in the North may not have been fully resolved because much of the former Hawaii-based swordfish fleet relocated to ports based in California where there is relatively low observer coverage, no seabird mitigation requirements and possibly higher rates of black-footed albatrosses mortality due to the higher abundance of this species at the fishing grounds where the fleet relocated, further to the east.

Since the adoption of regulations designed to reduce seabird interactions in the Hawaii longline fleet, new cooperative research has been conducted in Hawaii longline fisheries on methods designed to minimize seabird capture, and some of the tested seabird mitigation methods show significant promise for both nearly eliminating seabird mortality and being commercially viable.

Available but limited information implies that cumulative sea turtle mortality in pelagic longline fisheries is a significant source of mortality of some Pacific and Atlantic populations of loggerhead and leatherback sea turtles. As is the case for seabirds and is expected for long-lived species with low adult mortality rates and delayed maturity, sea turtles are not expected to be able to sustain significant increases in adult or juvenile mortality above natural levels. Only limited quantitative information on interactions between sea turtles and longline fisheries is available, and there is insufficient information to enable modeling of most sea turtle populations due to large gaps in understanding of the biology and ecology of sea turtles.

In the Pacific, loggerheads (*Caretta caretta*), leatherbacks (*Dermochelys coriacea*) and olive ridleys (*Lepidochelys olivacea*) are taken by pelagic longline vessels, potentially contributing to declines in some populations. Green turtles are also caught in Pacific Ocean pelagic longline fisheries, but in relatively low numbers.

Between 1994 and 1999 in the Hawaii-based longline fishery, there were 0.069 turtle interactions per 1,000 hooks. These estimates, however, were based on low onboard observer coverage averaging 4.3% of trips. Recent changes in regulations due to concerns over mortality of sea turtles closed the Hawaii swordfish fishery, placed restrictions on the tuna fleet, increased observer coverage to 20% and have significantly changed the Hawaii fleet's effort, spatial distribution of effort and amount of turtle bycatch. Turtle bycatch has decreased to 0.002 turtles captures per 1,000 hooks, which is an approximately 90% reduction from previous levels in the Hawaii longline fleet. As noted previously, however, an August 31, 2003, judgment (as amended on October 6, 2003) by the federal district court for the District of Columbia vacated regulations promulgated in 2002, implementing a 2001 NMFS Biological Opinion, designed to reduce interactions between Hawaii pelagic longline fishing gear and sea turtles, but stays its mandate by leaving these regulations in effect until NOAA Fisheries develops replacement regulations by April 1, 2004.

Genetic evidence suggests that sea turtle populations most likely to be affected by the Hawaii longline fishery include juvenile loggerheads originating from nesting aggregations in Japan; adult leatherbacks originating primarily from western Pacific nesting aggregation from Indonesia, the Solomon Islands and Papua New Guinea, with a minor component from the eastern Pacific (Mexico and Costa Rica); olive ridleys originating primarily from the eastern Pacific, with a smaller component from the western Pacific; and green turtles from the eastern Pacific with a smaller component from Hawaii.

The Hawaii longline fleet is a small component of total pelagic and demersal longline fishing effort in the North Pacific and represents about 2.7% of the longline hooks deployed in the entire Pacific Ocean each year. The US pelagic longline fleet contributed 13%-21% of the hooks deployed during 1994-2000 within areas of occurrence of the Laysan and black-footed albatrosses and accounted for 10% of the total catch of Pacific pelagic species. In 2001 the number of active pelagic longline vessels in the western and central Pacific Ocean included 104 from China; 1,386 from Japan (combined coastal, distant-water and offshore fleets); 176 from Korea: 1,797 from Taiwan (distant-water and offshore); and 90 from Hawaii. Most of the catch and effort in terms of number of hooks set by pelagic longline vessels in the western and central Pacific region is by the large-vessel, distant-water fleets of Japan, Korea and Taiwan. Distant-water vessels from China have recently entered the fishery, a longline fishery in Vietnam has been developing rapidly. The Hawaii pelagic longline fleet comprises roughly 3% of the total pelagic longline vessels operating in the western and central Pacific

Ocean region (where fishing grounds overlap sea turtles) and roughly 5% of the total effort in terms of number of hooks set per year in this area.

Research on Hawaii-based longliners by the Council, NMFS and the fishing industry has developed an array of methods for mitigating longline-seabird interactions. Recent trials with a new side-setting longline technique have shown that seabird interactions can be reduced to almost zero. The Council has recently recommended the establishment of a model swordfish longline fishery to conduct trials with sea turtle mitigation technology developed by NMFS in the Atlantic. This new method of fishing employs 18.0 circle hooks and mackerel bait, which in the Atlantic reduced loggerhead turtle interactions by 92% and with leatherback turtles by 97%. The model fishery will also offer further opportunities to test turtle mitigation technology, and to serve as a demonstration of environmentally responsible longline fishing for foreign longline fleets that fish in the Pacific.

#### 5.3. ECOSYSTEM-BASED MANAGEMENT

In 1996, NMFS convened the Ecosystem Principles Advisory Panel (EPAP) to assess the extent to which ecosystem principles are used in fisheries management and research and to recommend how such principles can be further implemented to improve management of US living marine resources. Based on the recommendations from the EPAP, the Western Pacific Council integrated many of the basic principles and policies of ecosystem-based fisheries management into its Fishery Management Plan for Coral Reef Ecosystems. The Council recognizes that the Coral Reef Ecosystem Plans as recommended by the EPAP. The Council also acknowledges that the complexities involved in ecosystem-based management will require years of research, development and understanding of ecological systems that produce and support fishery resources.

To begin working toward incorporating ecosystem-based management principles into all FMPs and development of true Fishery Ecosystem Plans, the Council will convene an Ecosystem-based Management Workshop next year to explore this complex approach to fisheries management. Of immediate importance is gaining an understanding of the relationship between managing fisheries on an ecosystem and trophic interaction levels rather than managing fisheries by traditional single species management approaches. An initial approach will be to consider the fishery resources managed by the Council broadly split between those confined to the island archipelagoes that comprise the Western Pacific Region and the highly migratory species that range across the pelagic ecosystem of the Pacific Ocean. It is also of equal importance to understand the implications of ecosystem-based management in light of the National Standards required by the Magnuson-Stevens Fishery Conservation and Management Act. Recognizing that ecosystem-based management must be founded on an adaptive management approach.

#### 5.4. Access by Indigenous Communities

The Western Pacific Council will continue to focus on providing adequate access to marine resources by indigenous communities in the US Pacific islands. The Council's Indigenous Program seeks to establish the legal, scientific and historical bases to justify preference rights for Native Hawaiians, Samoans, Chamorros and Carolinians in the Council's geographic area of authority. The Council will continue to develop and strengthen support for preference rights of the indigenous people of the US Pacific islands to provide opportunity and access for the native people in fisheries. In addition, there is growing interest in investigating contemporary applications of traditional conservation methods used by indigenous Pacific islanders. The Council sees an opportunity to accommodate this growing interest through the Council process and will continue to work with Congress to recognize indigenous fishing rights and increase the benefits that indigenous peoples derive from fisheries.

#### 5.5. STOCK ASSESSMENTS

The Western Pacific Council has placed a major focus on conducting stock assessments to implement the new biomass-based overfishing control rules. The Council will hold a Bottomfish Stock Assessment Workshop in January 2004 and a Coral Reef Stock Assessment Workshop in February 2004 to initiate this new priority. A stock assessment for striped marlin is expected by early 2004, and regionwide stock assessments of mahimahi, wahoo, opah and pomfret species are priorities for the future.

#### 6. CONCLUSIONS

The fisheries in the Western Pacific Region are unique compared to other US fisheries. The physical differences are striking, as the Region comprises a scattering of small islands across the tropical Pacific with an immense collective EEZ, little coastal shelf and an economic reliance on fisheries for highly migratory pelagic species. Fish and fishing have unique socio-cultural significance for the indigenous peoples of the Western Pacific Region, and it was primarily with this in mind that the interests of island indigenous peoples were embodied in the Magnuson-Stevens Act. NMFS also recognized the unique characteristics of the US Flag Pacific Islands which lay behind the decision which led in 2003 to the creation of the Pacific Islands Region, with a new regional office and science center in Honolulu.

The challenge for the Western Pacific Council is to manage fisheries within its jurisdiction for the benefit of the people of the area and to participate at the international level in the management of highly migratory stocks. This will require mainstreaming best practices for minimizing bycatch of species such as sea turtles and seabirds and incorporating principles of ecosystem-based management into all existing FMPs. Equally essential is the Council's continued work to provide indigenous communities access to marine resources so that this rich cultural tradition may persist for future generations.

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## Our Voyage Continues...







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