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WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

Amendment to the Fishery Ecosystem Plan for Pelagic Fisheries of the Western Pacific Region

Measures to Implement a Shallow-set longline Fishery for Swordfish in American Samoa

Including an Environmental Assessment and Regulatory Impact Review

May 5, 2011

Western Pacific Regional Fishery Management Council
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Honolulu, Hawaii 96813

Photo of longline vessels at port in Pago Pago, American Samoa
Courtesy of Western Pacific Fishery Management Council

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to the
Fishery Ecosystem Plan for Pelagic Fisheries of the Western Pacific Region

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Including an Environmental Assessment and Regulatory Impact Review

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1.0 Abstract

Recent management actions for the American Samoa longline fishery, implemented in September 2011, require all hooks set by the fishery to be deeper than 100 m. This eliminates the possibility of shallow-set targeting of South Pacific swordfish, which was conducted on a limited scale in 2006 and 2007, prior to the management action. One of the main concerns about shallow-set longlining is its potential to interact with protected species of sea turtles and seabirds, resulting in bycatch and unintentional mortality. This amendment proposes several alternatives, which could be adopted by the Council to minimize sea turtle interactions by deploying the same gear modifications which were successful in the Hawaii swordfish longline fishery in reducing sea turtle interactions, and have been adopted as a 'global standard' for reducing sea turtle interactions. Measures to reduce potential seabird interactions are also included among the alternatives, thought there is less certainty about the applicability of seabird mitigation measures developed for the North Pacific Hawaii fishery being transferred to the South Pacific.

1.1 Document Overview and Preparers

This is a combined FEP Amendment and Environmental Assessment. The contents of this document comply with Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requirements for fishery management plan amendments, and with National Environmental Policy Act (NEPA) requirements. The document informs interested and affected parties about the Council's recommended fishery management measures, and serves as the basis for a determination by NMFS on whether or not to prepare an environmental impact statement. The document also informs NMFS in its development of regulations that would implement the selected action, if approved by the Secretary of Commerce.

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List of Acronyms/Abbreviations

ASG	American Samoa Government
CMM	Conservation and Management Measure
CNMI	Commonwealth of Northern Mariana Islands
CPUE	Catch per Unit of Effort
Council	Western Pacific Regional Fishery Management Council
DMWR	American Samoa's Department of Marine and Wildlife Resources
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EPO	Eastern Pacific Ocean
ESA	Endangered Species Act
F	Fishing Mortality
FAD	Fish Aggregating Device
FEP	Fishery Ecosystem Plan
FMP	Fishery Management Plan
FR	Federal Register
HAPC	Habitat Areas of Particular Concern
HBF	hooks between floats
IATTC	Inter-American Tropical Tuna Commission
ITS	Incidental Take Statement
lb	pound(s)
MMPA	Marine Mammal Protection Act
MSY	Maximum Sustainable Yield
mt	metric tons(s)
MUS	Management Unit Species
nm	nautical mile(s)
NMFS	National Marine Fisheries Service
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
PIFSC	Pacific Islands Fisheries Science Center
PIRO	Pacific Islands Regional Office
PMUS	Pelagic Management Unit Species
RFMO	Regional Fishery Management Organization
RFP	request for proposals
SSC	Scientific and Statistical Committee
SPC	Secretariat of the Pacific Community
TDR	temperature-depth recorder or time-depth recorder
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
VMS	vessel monitoring system
WCPFC	Western and Central Pacific Fisheries Commission
WCPO	Western and Central Pacific Ocean
WPRFMC	Western Pacific Regional Fishery Management Council

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3.0 Background Information

In September 2011, the American Samoa pelagic longline fishery, which targets primarily South Pacific albacore, was required to set all hooks deeper than 100 m to minimize interactions with protected sea turtles, primarily green sea turtles. Observers on American Samoa longline vessels were deployed in 2006 showed that though infrequent, the fishery was catching green sea turtles, the majority of which were discarded dead. Fishing in a manner consistent with the new regulations means that American Samoa longline vessels are unable to target swordfish, where the majority of hooks are set shallower than 100 m, typically, from just below the surface to about 30 m deep.

Currently, there is no indication that fishermen in American Samoa will target swordfish, however, a few vessels have made swordfish sets in the past, fishing in higher latitude waters (20-40 deg S) and targeting swordfish. The economic returns from the targeting swordfish, as opposed to albacore were discouraging and fishing for swordfish has not been conducted since. However, the American Samoa fishery may in the future wish to diversify and target swordfish, if economic circumstances improve. As such, the Council's Pelagic Fisheries Ecosystem Plan (PFEP), needs to be amended to permit shallow set swordfish fishing, while minimizing any threat to sea turtles and other protected or sensitive species, such as seabirds and cetaceans.

3.1 Magnuson-Stevens Fishery Conservation and Management Act

Enacted in 1976, and subsequently reauthorized in 1996 and 2006, the Magnuson-Stevens Act is the principal Federal statute regarding the management of U.S. marine fisheries. The purposes of the Magnuson-Stevens Act include the following: the conservation and management of the fishery resources of the United States; the protection of essential fish habitat (EFH); the establishment of regional fishery management councils; the preparation and implementation of fishery management plans (FMPs); the promotion of domestic, commercial, and recreational fishing; the support and encouragement of international fishery agreements; and the development of fisheries that are underutilized or not utilized.

The Magnuson-Stevens Act established both required and discretionary provisions of an FMP and created 10 National Standards to ensure that any FMP or FMP amendment is consistent with the Magnuson-Stevens Act. Each FMP and its amendments contain a suite of management measures that together characterize a fishery management regime.

The Magnuson-Stevens Act created eight regional fishery management councils to provide advice and recommendations to the Secretary of Commerce through the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), and National Marine Fisheries Service (NMFS). The fishery management councils are responsible for the preparation and transmittal to the Secretary of appropriate, science-based FMPs (and amendments to those plans) for fisheries under their jurisdiction. The Secretary may approve, disapprove, or partially approve each FMP or amendment and, if approved, implement them through Federal regulations which are enforced by the U.S. Coast Guard (USCG) and NMFS Office of Law Enforcement (OLE). NMFS OLE also provides funding to local government agencies through cooperative/joint enforcement agreements to enforce federal fisheries regulations.

3.1.1 Western Pacific Regional Fishery Management Council

Under the Magnuson-Stevens Act, the Western Pacific Regional Fishery Management Council has management responsibility for U.S. fisheries in the Pacific Ocean seaward of American Samoa, Commonwealth of Northern Mariana Islands (CNMI), Guam, Hawaii, and the Pacific Remote Island Areas (16 U.S.C. § 1852(a)(H)). The Council has 13 voting members, eight of whom are appointed by the Secretary, and five of whom are the principal Federal, and State, Territory or Commonwealth officials with fishery management responsibility. The Council also retains three non-voting members that include: U.S. Department of State, U.S. Fish and Wildlife Service, and U.S. Coast Guard. The Council's office is located in Honolulu, Hawaii.

Domestic fisheries that operate within the U.S Exclusive Economic Zone (EEZ) waters and high seas in the western Pacific region are currently managed under five FEPs (which replaced the FMPs) including: the American Samoa Archipelago, Hawaii Islands Archipelago, Mariana Islands Archipelago, Pacific Remote Islands Area, and the Pacific Pelagic Fisheries.

4.0 Purpose and Need

The need for this amendment is that rulemaking under Amendment 5 to the Pelagics PFEP has precluded the ability of American Samoa longline fishermen to legitimately target swordfish if they so desire, and diversify the American Samoa longline fishery. Longline fishing is the second largest tropical pelagic fishery in the Western and Central Pacific (Williams & Terawasi 2011) and the American Samoa longline fishery is the second largest pelagic longline fishery in the US Western Pacific Region WPRFMC 2011). The largest US longline fishery in the US Western Pacific Region is the Hawaii longline fishery which has a deep set segment targeting bigeye tuna and a shallow-set segment targeting swordfish. The inability of American Samoa longline fishermen to target swordfish if they so desired could be perceived as inequitable.
The purpose of this amendment is to consider various alternatives for the Pelagics FEP to permit shallow-set swordfish fishing by American Samoa longline vessels and thus achieve Optimum Yield (OY), something that is not currently possible under current shallow set restrictions. In particular, what requirements will be implemented to ensure that any American Samoa longline vessels making shallow sets will minimize the potential for interactions with sea turtles and seabirds.

5.0 Initial Actions

At the 150th Council Meeting in March 2011, the Council discussed the potential for shallow set longline fishing in American Samoa, following the forthcoming implementation of the requirement to set hooks no shallower than 100m. At that meeting, the Council directed staff to prepare a draft amendment to the Pelagics FEP that would specify regulations for an American Samoa shallow-set longline fishery, which would operate under the American Samoa longline limited entry program, to target swordfish and other pelagic species.

Among the options explored, other than a PFEP amendment, were the use of an exempted fishing permit or a Community Development Program to permit shallow set swordfish fishing. Nevertheless. The Council reiterated its recommendation that staff prepares a draft Pelagics FEP amendment to establish measures for an American Samoa shallow-set longline fishery at the 151st Council meeting in June 2011; and again at the 152nd Council in October 2011, which directed staff to continue to develop a draft FEP amendment that contains an appropriate range of management alternatives and associated impact analyses.

6.0 Description of the Alternatives

Alternative 1. No Action. The PFEP would not be amended to allow swordfish fishing south of the equator. However, other existing mechanisms are in place to permit certain fishing activity to be exempted from regulations.

Alternative 2. Amend the PFEP to permit the use of shallow-set longline fishing to target swordfish without any sea turtle or seabird mitigation measures.

Alternative 3. Amend the PFEP to permit the use of shallow-set longline fishing to target swordfish employing the full suite of mitigation measures required for sea turtle mitigation in the Hawaii shallow set fishery, but without specific seabird mitigation measures.

Alternative 4. Amend the PFEP to permit the use of shallow set longline fishing to target swordfish employing the full suite of mitigation measures required for sea turtle mitigation and including seabird mitigation measures required in Hawaii, though the effectiveness of seabird measures adopted in Hawaii have not been fully tested in the South Pacific on a different assemblages of marine bird species

Alternative 5. Amend the PFEP to permit the use of shallow set longline fishing to target swordfish employing sea turtles mitigation measures and seabird mitigation measures required in Hawaii, and include spatial restrictions on shallow set fishery, e.g., exclude fishing from within the U.S. EEZ around American Samoa and permit fishing south of 20 deg South. The addition of a spatial element in Alternative 5 is to minimize the potential for interactions with green sea turtles with any potential shallow-set longline fishery, which are generally more abundant closer to the South Pacific island archipelagos.

6.2 Alternatives Considered but Rejected from Detailed Consideration

No other alternatives were considered. However, the possibility still exists that a Community Development Program or Exempted Fishing Permit could be implemented without the need for an amendment. However, as noted in Section 5.0, the Council did not consider these further and recommended that the PFEP be amended to permit shallow set longline fishing.

7.0 Description of the Affected Environment

7.1 American Samoa

American Samoa has been a U.S. territory since 1899, in part, because of U.S. interests in Pago Pago harbor. New Zealand occupied Western Samoa in 1914, and in 1962 Western Samoa gained independence. In 1997, Western Samoa changed its name to Samoa (also referred to as Independent Samoa). The demarcation between Independent Samoa and American Samoa is political. Cultural and commercial exchange continues with families living and commuting between the two. American Samoa is more than 89 percent native Samoan. This population is descended from the aboriginal people who occupied and exercised sovereignty in Samoa before the arrival of outside people.

There is approximately 199 sq km (~ 77 sq mi) of land divided between five islands and two coral atolls (Rose and Swains Islands). EEZ waters around American Samoa comprise 390,000 square kilometers and are truncated by the EEZs around the other nearby island nations (). Under the Magnuson-Stevens Act, American Samoa is recognized as a fishing community.

American Samoa has a small developing economy, dependent mainly on two primary income sources: the American Samoa Government (ASG), which receives income and capital subsidies from the federal government, and the fish processing industry on Tutuila (BOH 1997). Prior to 2009, there had been two operating tuna canneries in American Samoa; however, one of two canneries, Chicken-of-the-Sea, closed in September 2009. However, in 2010, a new venture, Samoa Tuna Processors, Inc. took over the Chicken of the Sea facility and began exporting fresh and frozen fish in 2011.

American Samoan dependence on fishing undoubtedly goes back as far as the peopled history of the islands of the Samoan archipelago, which is about 3,500 years ago (Severance and Franco 1989). Many aspects of the culture have changed in contemporary times, but American Samoans have retained a traditional social system that continues to strongly influence and depend on the culture of fishing. Traditional American Samoan values still exert a strong influence on when and why people fish, how they distribute their catch, and the meaning of fish within the society. When distributed, fish and other resources move through a complex and culturally embedded exchange system that supports the food needs of `aiga (extended family system), as well as the status of both matai (talking chiefs) and village ministers (Severance et al. 1999).

The excellent harbor at Pago Pago and certain special provisions of U.S. law form the basis of American Samoa's largest private industry, fish processing, which is now more than 40 years old (BOH 1997). The territory is exempt from the Nicholson Act, which prohibits foreign ships from landing their catches in U.S. ports. American Samoan products with less than 50 percent market value from foreign sources enter the United States duty free (Headnote 3(a) of the U.S. Tariff Schedule). Currently, no foreign vessels may fish in the US EEZ around American Samoa and there are no foreign fishing access agreements at this time to provide access to foreign fleets.

In 1997, the ASG estimated the tuna processing industry directly and indirectly generated about 15 percent of money wages, 10 to 12 percent of aggregate household income, and 7 percent of government receipts in the territory (BOH 1997). Until 2009, the canneries provided 8,118 jobs – 45.6 percent of total employment (in American Samoa) including both directly (5,538 jobs) and indirectly (2,580 jobs) . On the other hand, both tuna canneries in American Samoa, until September 2009, were tied to multinational corporations that supplied virtually everything but unskilled labor, shipping services, and infrastructure facilities (Schug and Galeai 1987) including a substantial portion of the raw tuna processed by StarKist Samoa landed by vessels owned by the parent company. Furthermore, most of the unskilled labor of the cannery is imported. Up to 90 percent of cannery jobs have been filled by foreign nationals from Independent Samoa and Tonga. The result is that much of the cannery payroll is remitted overseas.

The closure of the Chicken of the Sea (COS) cannery in 2009, resulted in the loss of 2,000 jobs or just over one third of the direct employment at the canneries. The remaining StarKist cannery has reduced its workforce to 1,200, or about 22 percent of the direct cannery employment and 40 percent of the peak employment at this cannery of 3,000 jobs in 2008[1]. As noted above, Samoa Tuna Processors was opened by parent company Tri Marine, a fishing company supplying the canning industry, and which may include an association with another major fishing company, Luen Thai Fishing Venture, based in Hong Kong.

On September 29, 2009, a submarine earthquake of magnitude 8.0 triggered a tsunami which made landfall in several Pacific island locations including American Samoa, with a population around 65,000. Four tsunami waves 15 to 20 feet (4 to 6 meters) high arrived ashore on American Samoa about 15 minutes after the quake, reaching up to a mile (1.5 kilometers) inland, officials said. In Pago Pago, streets and fields filled with debris, mud, and overturned cars and boats. Several buildings in the city situated only a few feet above sea level were flattened. For a period following the disaster, there were an estimated 2,200 people being housed in seven shelters across the island. American Samoa suffered much damage including damage and destruction of the floating docks and boat ramps in Pago Pago, and likely elsewhere. Major boat docks were unusable because of the many derelict vessels around them and other boats left sitting on the dock.

The first floor of the American Samoa Department of Marine and Wildlife Resources (DMWR) office building was swamped by the rising sea waters and was without electricity for more than a week. Several DMWR vehicles, boats, equipment, and the floating docks were damaged. The Community Development Project Program-funded facility for the Pago Pago Commercial Fishermen Association project located in Pago Pago was destroyed and washed to sea, including some recently purchased equipment. The shipyard dry-docking facilities were damaged with the last purse seiner serviced and released the day before the tsunami. There were relatively minor damages to the cannery facilities. Inside Pago Pago bay area, huge amounts of trash and layers of oil pollution were observed. More than half of the alia vessels berthed at the docks behind DMWR were damaged, destroyed, or floated out to sea including the only one actively involved in longlining. Recreational boats were also damaged and destroyed (W. Sword, Council member, pers. comm.). Longline, foreign distant water fishing (DWF) and purse seine vessels supplying the cannery that were inside Pago Pago harbor may have sustained some damages. The ASG has received funds from the Federal Emergency Management Agency (FEMA) and is currently rebuilding damaged infrastructure around Tutuila.

[1] Recent information on cannery employment obtained from Agence France Presse news article dated May 13, 2010.

7.1.1 U.S. EEZ Waters around American Samoa

The EEZ waters around American Samoa comprise about 400,000 square kilometers and are truncated by the EEZs around the other nearby island nations (Figure 1). The islands of American Samoa are in an area of modest oceanic productivity relative to areas to the north and northwest. To the south of American Samoa, lie the subtropical frontal zones consisting of several convergent fronts located along latitudes 25° – 40° N and S often referred to as the Transition Zones. To the north of American Samoa, spanning latitudes 15° N – 15° S lies the equatorial current system consisting of alternating east and west zonal flows with adjacent fronts with the southern branch of the westward flowing South Equatorial Current (SEC) from June - October and the eastward-flowing South Equatorial Counter Current (SECC) from November through April.

Domokos et al. (2007) have investigated the oceanography of the waters surrounding American Samoa and noted the impact of the SEC and SECC on the productivity of the longline fishery for albacore. However, longliners making shallow sets to target swordfish will likely fish at latitudes between 20° – 40° S, where water temperatures are cooler, and warm tropical waters merge with cooler water flowing from the Southern Ocean.

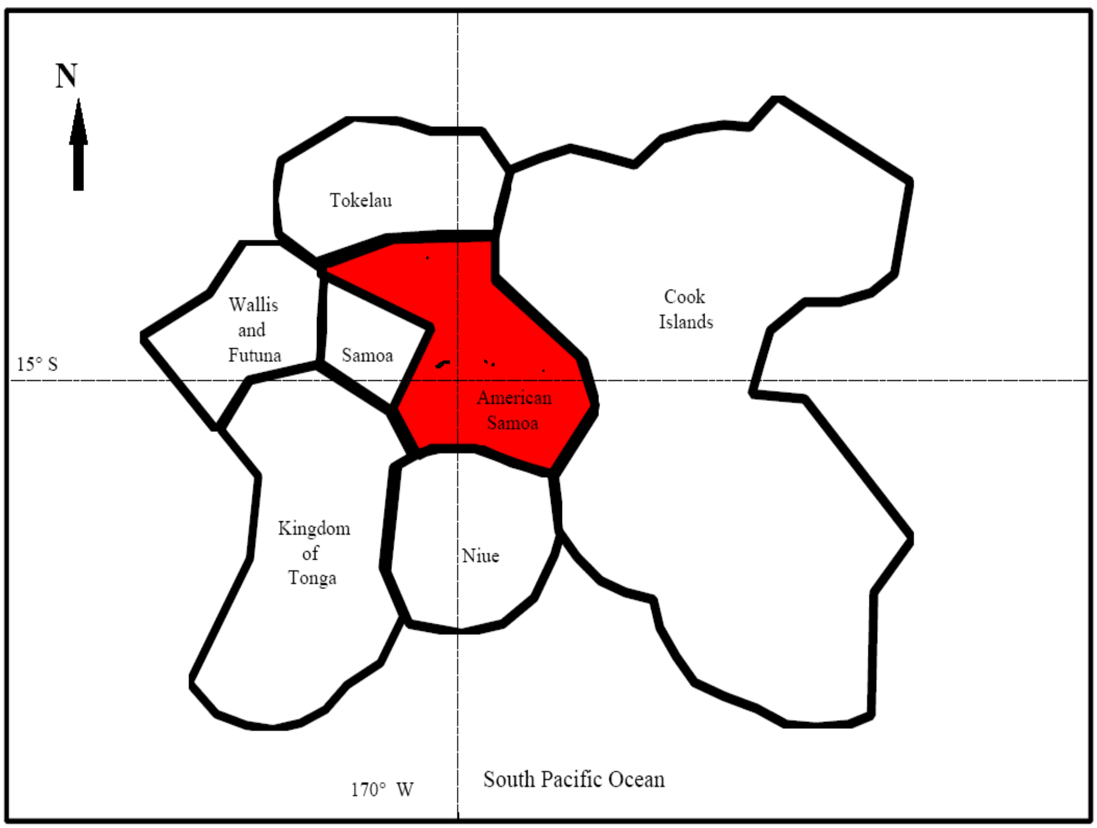

Figure 1. EEZ waters around American Samoa.
Source: NMFS and WPacFIN.

7.2 American Samoa-based 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 (Severance and Franco 1989). In 1995, small-scale longline fishing began in American Samoa following training initiated by the Secretariat of the Pacific Community (SPC; Chapman 1998). Commercial ventures are diverse, ranging from small-scale vessels having very limited range to large-scale vessels catching tuna in the EEZ and beyond, and distant high seas waters, then delivering their catches to the cannery based in American Samoa. Currently the commercial pelagic fisheries of American Samoa are based on supplying frozen albacore, and small amounts of other pelagic fish directly to the Pago Pago cannery. These fisheries include small and large-scale longlining; and a pelagic trolling fishery. All American Samoa limited access longline vessel owners and operators are required to obtain a federal permit and to submit logbooks containing detailed data on each of their sets and the resulting catch. Boat-based creel surveys, a Commercial Purchase System, and Cannery Sampling Forms also are used to collect fishery information for all fishing activity. Additional detailed statistical data can be found in the Council's 2009 Pelagic Fisheries Annual Report (WPRFMC 2011).

Small-Scale Longline and Troll

Historically, most participants in the small-scale domestic longline fishery had been indigenous American Samoans with vessels under 50 ft in length, most of which were alia; locally-built fiberglass or aluminum catamaran boats under 40 ft in length. In the mid-1990s American Samoa's commercial fishermen shifted from troll gear to longline gear largely based on the fishing success of 28' alia that engaged in longline fishing in the EEZ around Samoa. Following this example, the alia fishermen in American Samoa began deploying short monofilament longlines, with an average of 350 hooks per set from hand-operated reels. Their predominant catch was albacore tuna, which was marketed to the tuna cannery (DMWR 2001). By 1997, 33 alia vessels received general longline permits from NMFS to fish in federal waters around American Samoa, although only 21 were reported to have been actively fishing on a monthly basis at that time. In recent years, the alia longline fleet has been greatly reduced with only two vessels active in 2007, and one active since 2008 (Table 3).

Troll fishers land relatively small amounts of PMUS, such as skipjack and yellowfin tuna, with just over 5,300 lb reported in 2009. The average number of vessels participating in the troll fishery from 1982-2009 is 29 and only 10 in 2009 (WPacFIN data).

Large-Scale Longline

In 2000, the American Samoa longline fishery began to expand rapidly with the influx of large (>50 ft) conventional monohull vessels similar to the type used in the Hawaii-based longline fisheries, including some vessels from Hawaii. These vessels were larger, had a greater range, and were able to set more hooks per trip than the average alia vessel. The number of permitted longline vessels in this sector increased from three in 2000 to 30 in 2002 (DMWR, unpublished data). Of these 30 permitted vessels, 10 permits were believed to be held by indigenous American Samoans as of March 21, 2002 (P. Bartram, pers. comm., March 2002). Economic barriers, such as the large capital needed to purchase and operate a large vessel, have prevented more substantial indigenous participation in the large-scale sector of the longline fishery. During 2009 there were 25 large vessels engaged in the American Samoa longline fishery (Table 3).

Vessels over 50 feet can fish 2,000 to over 4,000 hooks per set (usually one set per day) and have a greater fishing range and capacity for storing fish (8–40 metric tons) as compared with (0.5–2 metric tons) small-scale vessels. During 2002-2007, WPacFIN[2] reports the fleet used about 2,700 hooks per set with a slight increase over this same time period. Based on 39 observed trips from April 2006 through December 2009 (Table 1) the fleet uses an average of 3,006 hooks per set. Typically one set is made per day. Large vessels are outfitted with hydraulically powered reels to set and haul mainline, and modern electronic equipment for navigation, communications, and fish finding. All are presently being operated to freeze albacore onboard, rather than to land chilled fish. It does not appear that large numbers of longliners from Hawaii are relocated in American Samoa, although several vessels have permits to fish in both locations. Instead, large vessels have participated in the American Samoa longline fishery from diverse ports and fisheries, including the U.S. West Coast (six), Gulf of Mexico (three), and foreign countries (four now under U.S. ownership; O'Malley and Pooley 2002).

Table 1: Average, and when available, standard deviation and range (in parentheses) of longline gear attributes from the American Samoa longline fishery.

Variable	Observed sets (n≈1,296) ~3.9 mil hooks	Observed sets (n=988) in Bigelow and Fletcher 2009	Observed sets with valid TDR data (n=320) ~988,160 hooks
Line shooter (nm/h) **Line shooter (m/s)**	**≈8** * **≈4.1** *	8.1±2.3 (4.2−16.5) 4.2±1.2 (2.1−8.5)	7.7±1.7 (4.4−14.4) 4.0±0.9 (2.3−7.4)
Hooks per set	**3,006** (391–4,126); Class C- 2,843; Class D- 3,072	3,058±446 (420–4,126)	3,088±414 (420−4,126)
Hooks between floats	**31.5** (25–36)	31.6±2.5 (25–36)	32.2±2.0 (28−36)
Floats per set	**≈100.3** *	100.7± 16.7 (16–138)	99.5±15.2 (16−137)
Float line length (m)	**25.99,** (18.4–36.5)	26.1± 4.0 (18.4–36.5)	25.8±3.4 (18.4−36.5)
Branch line length (m)	**10.3** (6.8–15.1)	10.4± 1.5 (6.8–15.1)	10.4±1.8 (6.8−15.1)

[2] Found at: http://www.pifsc.noaa.gov/wpacfin/index.php

Variable	Observed sets (n≈1,296) ~3.9 mil hooks	Observed sets (n=988) in Bigelow and Fletcher 2009	Observed sets with valid TDR data (n=320) ~988,160 hooks
Mainline length (km)	**≈75 (40.5 nm) ***	75.7± 18.4 (9.2–120.4)	73.7±16.2 (9.3−100.0)
Length (m) between floats	**≈759 ***	766± 202 (431–1,511)	744±145 (463−1,218)
Length (m) between hooks	**≈23.25 ***	23.6± 6.4 (13.6–48.7)	22.5±5.5 (13.6−32.9)

Sources: Bigelow and Fletcher 2009; NMFS unpublished. * = weighted mean
Note: Data are from 39 observed trips departing from April 2006 to October 2009, and from Bigelow and Fletcher (2009); 988 observed longline sets and a subset of 320 sets monitored with temperature-depth recorders (TDR) in the American Samoa-based fishery from 2006 to 2008.

In 2001-2002, American Samoa's active longline fleet increased from 21 mostly small alia to 75 vessels of a variety of sizes with American Samoans mostly owning small vessels and non-American Samoans mostly owning large vessels (WPRFMC 2011). The rapid expansion of longline fishing effort within the EEZ waters around American Samoa prompted the Council to develop a limited entry system for the American Samoa pelagic longline fishery. In developing the limited entry program, the Council identified 138 individuals who owned a longline vessel at any time prior to March 21, 2002 with 93 individuals owning Class A size vessels, nine owning Class B size vessels, 15 owning Class C size vessels and 21 owning Class D size vessels (WPRFMC 2011). However, upon initiation of the initial permit application and issuance process, only sixty initial permits were approved and issued by NMFS. Table 6 shows the number of permitted and active vessels in the fishery since 2000.

Since inception of the limited entry program in 2005, American Samoa's longline fishery continued to undergo changes, predominantly in fleet composition. The fleet composition has transformed into a fleet comprised mainly of large monohull longline vessels in Class D. Class A vessel participation has declined to one or two vessels in recent years, with no recent activity from Class B vessels.

The limited entry program regulations specify that a maximum number of permits for each class would be capped at the number of initial permits issued by NMFS. However, the program also allowed for a total of 26 permit upgrades to be made available for the exclusive use of permit holders in Class A, distributed over a four-year period. The permits are effective for three years after the date of issuance and most of the permits would have expired by the end of 2008.

When permits come close to expiring, NMFS PIRO mails letters to all permit holders reminding them of the expiration date of their permit and that there are minimum landings requirements to be met for renewal. Periodically when permits become available due to non-renewal or permit expiration, NMFS solicits applications for permits. In 2009, NMFS received 26 applications for 24 available permits. Most recently, on July 15, 2010 (75 FR 41142) NMFS advertised the availability of at least 10 permits of various class sizes (4 in Class A, 5 in Class B, and one in Class D), which were available for 2010. Completed applications were accepted until November 12, 2010. Persons with the earliest documented participation in the fishery on a Class A sized vessel received the highest priority for obtaining permits in any size class, followed by persons with the earliest documented participation in Classes B, C, and D, in that order. In the event of a tie in priority, the person with the second earliest documented participation will be ranked as higher priority.

Twelve of the American Samoa longline limited access permit holders also hold Hawaii longline limited access permits for the Hawaii-based fisheries (W. Ikehara, NMFS, pers. comm., Nov. 2010). When dual-permitted vessels are fishing outside of the historical action area fished by vessels registered under the American Samoa limited access permit, the gear modifications of this amendment will not apply. That is, if a dual-permitted vessel is fishing in the U.S. EEZ around Hawaii and on the high seas surrounding Hawaii, the vessel is required to adhere to Hawaii longline fishing regulations. Further, the Hawaii longline fisheries are currently subject to an annual catch limit of bigeye tuna of 3,763 mt stemming from a 2008 conservation and management measure from the Western and Central Pacific Fishery Commission (CMM 2008-01) for the years 2009-2011. In the administration of this catch limit (74 FR 68190, December 23, 2009), NMFS regulations provide that bigeye tuna caught by longline gear may be retained on board, transshipped, and landed if the fish are caught by a vessel registered for use under a valid NMFS-issued American Samoa longline limited access permit, if the bigeye tuna have not been caught in the EEZ around Hawaii (50 CFR 300, Subpart O). When NMFS has determined the 3,763 mt bigeye tuna catch limit is reached, all vessels holding a Hawaii limited entry longline permit will no longer be able to land bigeye tuna in Hawaii, regardless of whether it was caught on the high seas, except under authorized limited conditions. However, vessels with a valid American Samoa limited entry permit, as well as a valid Hawaii longline limited access permit (dual-permitted), would still be able to retain and land bigeye tuna into Hawaii and American Samoa as long as the fish was not caught in the EEZ around Hawaii (74 FR 63999, December 7, 2009).

Shallow set swordfish longline fishing by the American Samoa fleet has been limited to less than three vessels militating against detailed reporting of the fishing performance by these vessels. Several trips were made by these vessels during which the swordfish catches were higher than on the usual albacore targeting trips by the American Samoa fleet. Substantial numbers of light sticks were used on some sets and the numbers of hooks between floats was far fewer than the 25-36 hooks between typically deployed by the American Samoa fleet. The catch composition was primarily swordfish and other species caught included other billfish, albacore yellowfin tuna mahi mahi and wahoo. Shark catches did not appear to be as high as in the Hawaii longline fisheries. Fishing took place south of the US EEZ around American Samoa between latitudes 20 - 40 deg S and 159 - 174 deg W. As noted above, the catch rates for swordfish were substantially higher than typically experienced by American Samoa longline vessels, but were significantly lower than those experienced by Hawaii swordfish longliners in the North Pacific. Further attempts at swordfish fishing by American Samoa fishermen have not been made since the economic returns experienced during this brief period of swordfish fishing were discouraging.

The description of the American Samoa longline fishery up to this point has been concerned with vessels operating under the American Samoa longline limited entry permitting program. However, a few vessels have fished out of Pago Pago with a general longline permit, targeting albacore outside of the US EEZ around American Samoa. Moreover, the fishing grounds for swordfish accessible to the American Samoa vessel would be the high seas areas in the central

South Pacific and thus open to a vessel with either a general or limited entry permit, since both permit types allow landings into American Samoa. A generally permitted vessel would still need, however, to abide by the requirement of the Western and Central Pacific Fishery Commission's Conservation and Management Measures (CMMs) for sea turtle and seabird mitigation (see Section 8.2.2 for details).

U.S. Purse Seine Fishery

Prior to beginning purse seine fishing operations in the western Pacific, the U.S. fleet had been fishing out of California in areas of the eastern Pacific for decades. The main impetus for the transition from fishing in the eastern Pacific to the western Pacific was due to economic (overcapitalization) reasons, eroding relations with central America states over fishing access issues, increased management controls enacted by the Inter-American Tropical Tuna Commission (IATTC), and difficulties over environmental concerns associated with fishing on tuna associated with dolphins. During the years when the fleet transitioned from fishing in the eastern Pacific to western Pacific operations, U.S. vessels made several gear changes including deepening nets, installing larger power blocks and winches to accommodate larger seines, and using helicopters to spot schools of fish, among other changes (Gillett et al. 2002).

In 1988, the South Pacific Tuna Treaty (SPTT) entered into force and provided licensed U.S. vessels with access to most of the EEZ waters of the 16 member states of the Pacific Islands FFA, which together with the U.S. comprise the parties to the SPTT. Under the current terms of the Treaty, 45 licenses are available to the United States, five of which are reserved for joint venture arrangements with Pacific Island parties . The number of vessels licensed and active in the fleet had been steadily declining since the late 1990s. However, since 2007 this trend has reversed and the number of vessels increased to 36 by 2010 (USCG 2010). Many of these newer vessels have foreign built hulls constructed in Taiwan and 51 percent U.S. ownership. However, only U.S.-built hulls are permitted to fish in U.S. EEZ waters.

The U.S. purse seine fleet, in common with other tropical tuna purse seine fisheries in the WCPO, operates predominantly in equatorial latitudes, to the north and northwest of the U.S. EEZ around American Samoa. Most of the fishing activity by U.S. purse seine vessels occurs in areas between 5° N and 10° S latitude and 150° E and 170° W longitude in the EEZ waters of PNG, the Federated States of Micronesia and other Pacific island nations. During El Niño events, however, these vessels may shift their fishing activity to the equatorial central Pacific following tuna schools. A summary of the catch and fishing effort by the US purse seine fleet in the US EEZ around American Samoa is given in Table 2

Table 2. Reported U.S. Purse Seine Catches from American Samoa, 1997-2009.

YEAR	Trip days (n)	Vessels (n)	SKJ catch (mt)	YFT catch (mt)	SKJ + YFT catch (mt)
1997	6	6	0.00	0.00	0
1998	22.5	11	36.00	0.00	36
1999	24	10	43.90	20.80	64.7
2000	19	10	32.95	16.60	49.55
2001	33	15	152.19	9.93	162.12
2002	37.3	15	100.86	12.60	113.46

YEAR	Trip days (n)	Vessels (n)	SKJ catch (mt)	YFT catch (mt)	SKJ + YFT catch (mt)
2003	15	8	0.00	0.00	0
2004	9	8	5.40	10.00	15.4
2005	7	4	59.00	5.40	64.4
2006	6	5	2.70	6.30	9
2007	6	3	0.00	0.00	0
2008	13	7	150.2	12.1	162.3
2009	34	12	181.3	14.9	196.2

Source: NMFS SWFSC

Summary of American Samoa's Pelagic Fisheries

In summary, more than $10.3 million worth of pelagic species were landed in American Samoa during 2009 (WPRFMC 2011) from all pelagic fisheries, not including landings by the U.S. purse seine fleet to the Pago Pago canneries. Longline fishing dominated (99.6%) the value of pelagic landings during 2009. Over $8.6 million worth of albacore dominated (83%) the value of longline caught pelagic species during 2009 followed by yellowfin (~ $800,000), bigeye (~$378,000), and skipjack (~$206,400) tunas. Wahoo (~$181,000), blue marlin (~$52,800), mahimahi ($57,270), and swordfish (~$41,000) were the top-value non-tuna species during 2009.

Landings of skipjack, yellowfin, and bigeye tuna by the U.S. purse seine fleet at the Pago Pago canneries are substantial, especially since the U.S. purse seine recently rebuilt. However, although the canneries routinely report the landings to the American Samoa Government and the National Marine Fisheries Service, these figures are confidential since there are less than three entities (canneries) reporting.

7.2.1 Effort and Catch

Effort

Since 2001, the number of American Samoa troll and longline vessels landing pelagic species has decreased from a high of 80 vessels in 2001 to 36 in 2009 (Table 2). Effort is currently dominated by large longline vessels (Class C and D) as the troll fleet continues to decrease in numbers of vessels and trips (Table 3). Participation by alia vessels (Class A) in the longline fishery continues to decrease while participation by the largest vessels increases gradually. In 2008, 27 vessels larger than 50 ft were active while only one alia vessel less than 40 ft fished.

Table 3: Number of Vessels Using Different Fishing Methods, 2000-2009.

Year	Number of Boats		
	Longlining	Trolling	Total
2000	37	19	56
2001	62	18	80
2002	58	16	74
2003	50	20	70
2004	41	18	59

2005	36	9	45
2006	31	9	40
2007	29	19	48
2008	28	16	44
2009	26	10	36

Source: WPRFMC (2011)

In 2010, the active longline fleet consisted of one alia, and 26 conventional, monohull longline vessels 50 ft or longer in length (PIRO Sustainable Fisheries Division, pers. comm.). Fishing power[3] is clearly distinct between the different size classes of vessel and separate catch statistics are compiled. The alia vessels use manually powered mainline drums that hold about four miles of monofilament line. The boats make single day trips with a crew of three, setting around 300 – 350 hooks per set and keep their catch on ice. The large monohull vessels are similar and in some cases the same vessels that have engaged in the Hawaii longline fisheries. These boats are typically steel hulled vessels of around 20 – 27 m operating hydraulically driven mainline reels holding 30 – 50 miles of monofilament, setting around 3,000 hooks per day with crews of 5 – 6. They are also likely to be well equipped with marine electronics and have refrigeration systems to freeze catch onboard for extended trips. Therefore, the larger vessels can range out to the outer portions of the EEZ, and beyond to some high seas areas, and some have negotiated fishing access with neighboring states.

Recent fishing effort has occurred in EEZ waters surrounding American Samoa, excluding existing large vessel prohibited areas; some foreign EEZ waters surrounding American Samoa where vessels have fishing access agreements, including the Cook Islands, Samoa, Tokelau, and others, as well as all four high seas areas (NW, NE, E, and S) giving an operational area roughly 155° W to 180°, and from 3° to 32° S from 2000 through 2009 (NMFS 2010c) (Figure 2).

[3] Fishing power provides a measure of vessel efficiency. Full explanation may be found on FAO website at: http://www.fao.org/DOCREP/003/X2250E/x2250e0f.htm

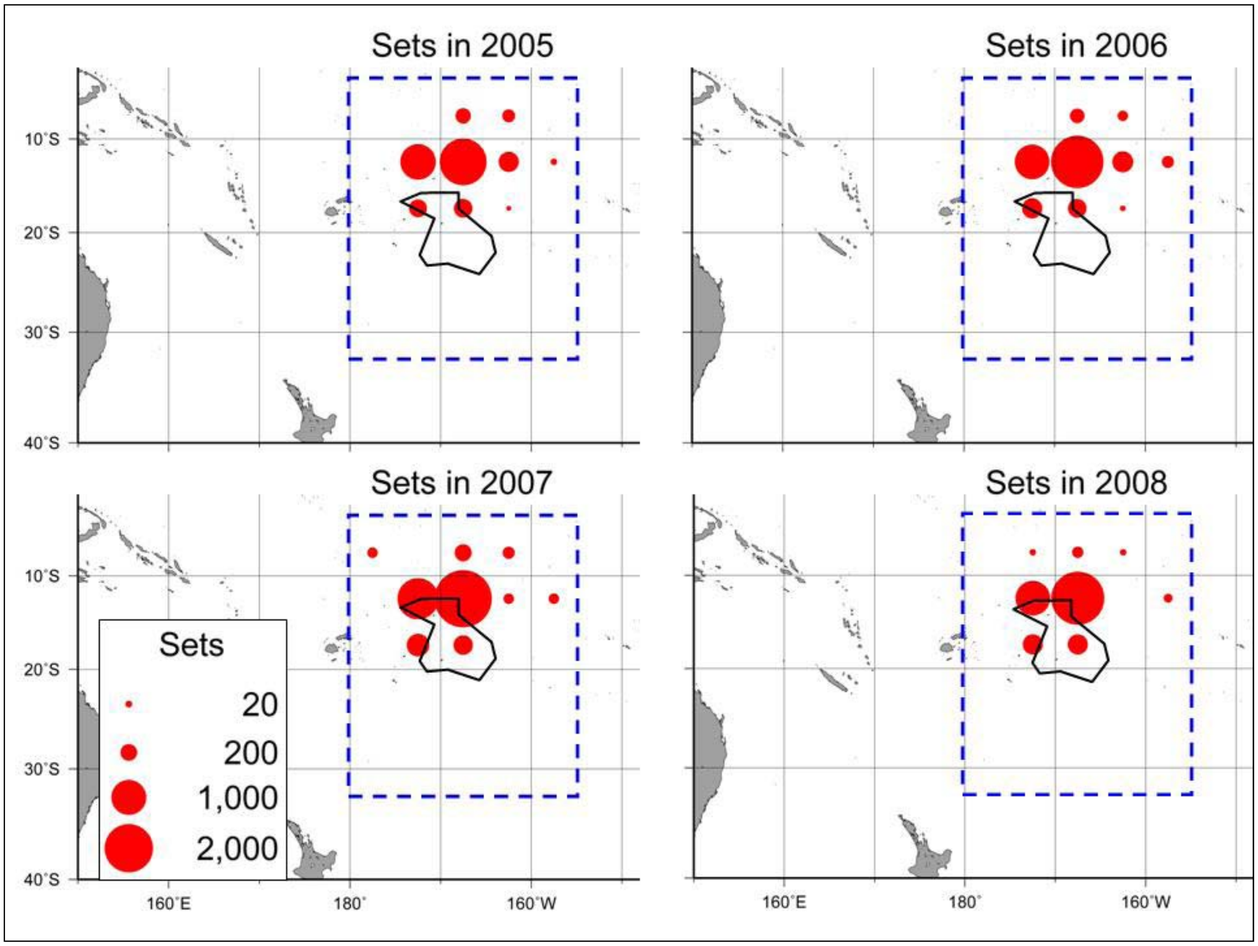

Figure 2. Area of operations of the American Samoa longline fleet within and beyond the EEZ around American Samoa.

Source: NMFS 2010c.

Note: The EEZ around American Samoa is outlined with a solid line. Fishing in 2009 also occurred within the area bounded by the dashed line. The fishery made fewer than 20 sets annually between 3° and 5° S and 20° and 32° S so confidentiality restrictions prevent their locations from being shown in the figure. The dashed line represents the Action Area considered in the 2010 Biological Opinion for the albacore targeting longline fishery in American Samoa (NMFS 2010). A potential swordfish fishery may fish to the south of the 32 degree line of latitude used as the southern boundary of this Action Area.

Individual vessels have negotiated access agreements with the neighboring countries surrounding American Samoa. Most agreements have been made with the Cook Islands, which has a special arrangement with the United States, whereby U.S. vessels fishing in the Cook's EEZ do not have to re-flag their vessels to the Cook Islands. A limited number of permits exist for these arrangements in the Cook Islands. Since 2001, American Samoa-based longline vessels have fished in several foreign EEZ waters surrounding American Samoa, such as Samoa, Tokelau, and others. Fishing effort in these countries ranges from a couple thousand hooks per year to over 2.7 million hooks set in the Cook Islands in 2006. By 2005, the fishery had transitioned to a limited access program developed by the Council and implemented by NMFS, with 60 permits allowed in the program (Table 4)

In 2006, only 28 vessels were active in American Samoa, most of which were large conventional monohull longline vessels. Recent operations information and landings from the American Samoa longline fleet are given in .

The number of hooks set by the American Samoa-based longline fleet has varied over time, but has recently held fairly steady (Figure 3, Table 5). Data for 2009 show about 15 million hooks were set by 26 American Samoa-based longline vessels during 2009, roughly the same as 2008, but down from a high of 17.5 million set in 2007 (WPacFIN data).

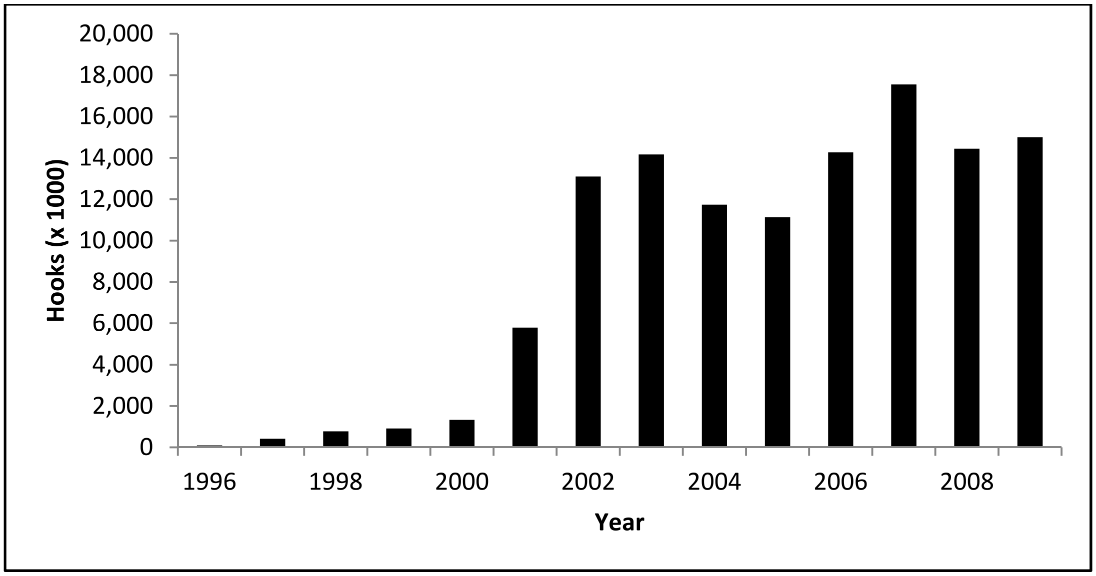

Figure 3: Longline Hooks Set by the American Samoa Fleet, 1996-2009.
Source: WPacFIN data

Table 4: Actual and Active Permits in American Samoa's Longline Fishery, 2000-2009

Year	Class A ≤ 40 feet		Class B 40.1 – 50 feet		Class C 50.1 – 70 feet		Class D > 70 feet	
	Permitted	Active	Permitted	Active	Permitted	Active	Permitted	Active
2000	45	37	2	2	5	3	2	2
2001	61	37	6	6	11	9	23	18
2002	55	32	6	6	14	6	24	17
2003	31	17	5	4	15	9	23	22
2004	11	9	2	2	13	8	22	21
2005	8	5	3	2	11	9	20	18
2006	21	3	5	0	12	6	24	19
2007	19	2	6	0	11	5	26	22
2008	19	1	6	0	11	5	26	22
2009	12	1	0	0	12	5	26	20

Source: NMFS PIRO and NMFS unpublished data[4].

[4] http://www.pifsc.noaa.gov/wpacfin/as/Pages/as_data_6.php Last updated June 30, 2010

Note: 2006-2008 permitted vessels add up to 62. Double-counting can occur if permits are transferred to different owners or vessels during the year. The total number of available permits is 60.

Table 5: American Samoa Longline Fishery Landings and other Statistics, 2002-2009.

Item	2002	2003	2004	2005	2006	2007	2008	2009
Active Vessels	60	52	40	36	28	29	28	26
Hooks set (millions)	13.1	14.2	11.7	11.1	14.3	17.5	14.4	15
Trips	NA	650/282*	430/193*	223/179*	331	377	287	177
Sets Made	6,872	6,221	4,853	4,359	5,069	5,919	4,754	4,689
Total Landings (mt)	7,146	5,085	4,101	4,003	5,482	6,491	4,359	4,835
Bigeye Tuna Landings (mt)	198	253	228	133	201	231	124	159
Yellowfin Tuna Landings (mt)	487	517	891	526	501	638	345	394
Albacore Tuna Landings (mt)	5,946	3,931	2,483	2,916	4,177	5,188	3,540	3,903
Catch Composition (in percent)								
Albacore Tuna	83%	77	61	73	76	80	81	81
BET, YFT tunas	10%	15	27	16	13	13	11	11
Miscellaneous Fish	7%	8	12	11	11	7	8	8
Total Ex-vessel Value (adjusted) ($ millions)	$13.7	$10.3	$8.9	$8.7	$11.7	$14.1	$9.5	$10.4

Source: WPacFIN data, WPRFMC (2011)
Notes: *The first number is trips by alia and the second is by larger monohull vessels. After 2005, data confidentiality rules prevent disaggregating the trip types. BET, bigeye tuna; YFT, yellowfin tuna.

Catch

More than 10.6 million lb of pelagic species were landed in American Samoa during 2009 (WPacFIN data). Tuna species account for about 95 percent of the total landings and albacore dominates (85%) tuna landings and accounts for 81 percent of the total pelagic landings. Albacore landings in 2009 increased (10%) to about 8.6 million pounds from about 7.8 million in 2008. Non-tuna PMUS totaled about 500,000 pounds in 2009. Wahoo dominated (61%) the non-tuna landings, and barracuda dominated the other pelagic fish species. Of the total landings, about 10.5 million pounds account for commercial landings, most of which were landed by the large Class D vessels.

In the future, the fleet may also diversify into other fish products in response to uncertainties about the long-term continuity of the Pago Pago-based fish processing industry (TEC, Inc. 2007); however, currently the fleet primarily targets albacore tuna using deep-set longline gear and is the major species landed. Yellowfin, skipjack, and bigeye tunas and wahoo contribute the bulk of the non-albacore landings (18%). The 2007 American Samoa tuna landings were the second highest recorded in the 28-year data record; 91.8 percent of the highest annual landings estimate from 2002. Estimated non-tuna pelagic management unit species (PMUS) landings had generally been increasing overtime with two peaks in 2002 and 2007 (Figure 4). Since 2007 total landings and tuna landings have both decreased from the recent 2007 peak. Albacore average weight-per-fish has been steadily increasing since 2005, the average size of bigeye has been increasing since 2004, average size of wahoo has been gradually declining since 2002, and yellowfin tuna average size appears to fluctuate on an inter-annual basis from samples taken by the cannery (WPRFMC 2011).

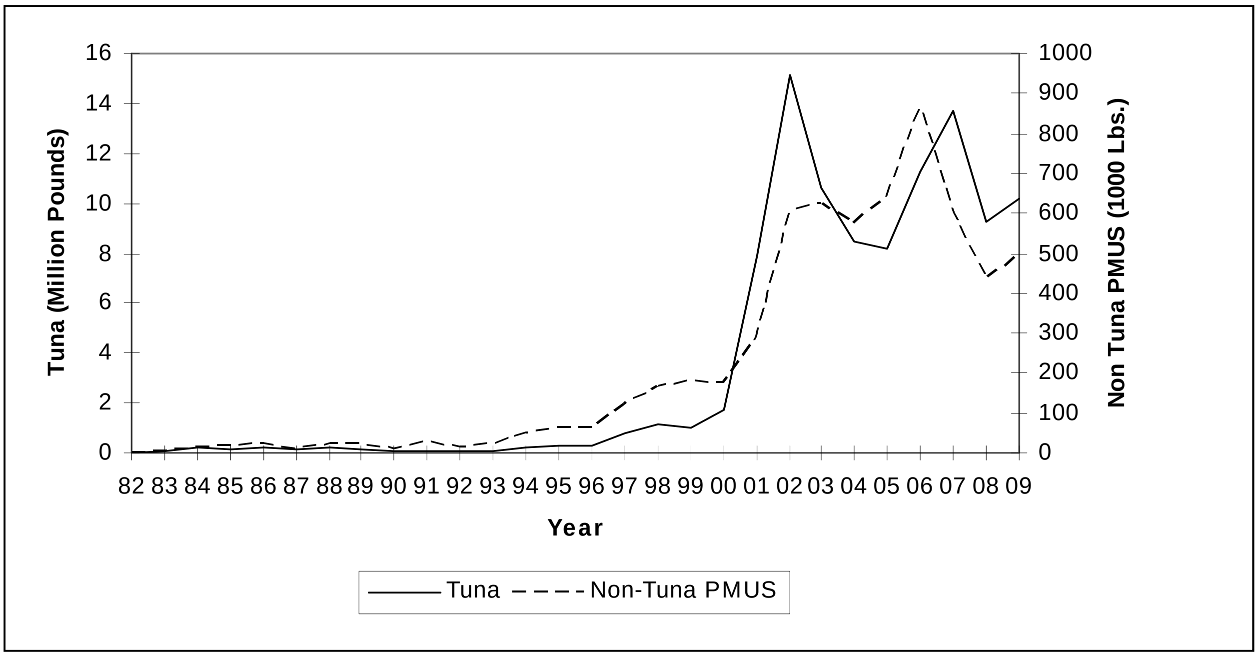

Figure 4. American Samoa Pelagic Landings, 1982–2009.
Source: WPRFMC (2011)

7.2.2 Catch-per-unit effort

The CPUE of albacore, the main target species, reached a peak in 2001 at 33 fish per 1,000 hooks and decreased to approximately 15 fish per 1,000 hooks in 2009. The CPUE for all important PMUS harvested by all longline vessels shows a downward trend from 2006 to the most recent catch data (2009, Table 6).

Table 6: CPUE (catch/1,000 hooks) for all American Samoa Longline Vessels, 2006-2009.

Species	2006 All Vessels	2007 All Vessels	2008 All Vessels	2009 All Vessels
Skipjack tuna	3.2	2.3	2.4	2.3
Albacore tuna	18.4	18.3	14.2	14.8
Yellowfin tuna	1.6	1.9	1.0	1.1
Bigeye tuna	0.9	0.9	0.5	0.6
TUNAS SUBTOTALS	24.2	23.5	18.2	18.8
Mahimahi	0.4	0.1	0.1	0.2
Blue marlin	0.2	0.2	0.2	0.2
Wahoo	1.5	1.0	0.7	1.0
Sharks (all)	0.5	0.4	0.4	0.4
Swordfish	0.1	0.0	0.0	0.0
Spearfish	0.1	0.0	0.1	0.1
Oilfish	0.5	0.5	0.4	0.5
Pomfret	0.0	0.1	0.1	0.1
NON-TUNA PMUS SUBTOTALS	3.3	2.4	2.0	2.5
Pelagic fishes (unknown)	0.0	0.2	0.1	0.2
OTHER PELAGICS SUBTOTALS	0.0	0.2	0.1	0.2
TOTAL PELAGICS	**27.5**	**26.0**	**20.3**	**21.5**

Source: WPRFMC (2011)

7.2.3 Bycatch

Table 7 shows the number of fish kept and released in the American Samoa longline fishery during 2009. Overall nearly 12 percent of the total catch was released with skipjack tuna having the highest number released. Nearly all sharks and approximately 96 percent of oilfish were also not retained. Fish are released for various reasons including quality, size, handling, and storage difficulties, and marketing problems. The relatively high rates of release of some PMUS in the American Samoa longline fishery may warrant further investigation. However, it is expected that catch rates and total catches of epipelagic MUS such as the billfishes and mahimahi would be reduced by fishing with gear deeper than 100 meters, as proposed in this amendment.

Table 7: Number of fish kept and released in the American Samoa Longline Fishery, 2009.

Species	Number Kept	Number Released	Percent Released
Skipjack tuna	26,866	7,517	21.9
Albacore tuna	221,315	673	0.3
Yellowfin tuna	15,585	911	5.5
Bigeye tuna	8,118	570	6.6
Tunas (unknown)	11	15	57.7
TUNAS SUBTOTALS	271,895	9,686	3.4
Mahimahi	1,629	1,602	49.6
Black marlin	2	26	92.9
Blue marlin	675	2,691	79.9
Striped marlin	116	224	65.9
Wahoo	10,776	3,670	25.4
Sharks (all)	37	5,926	99.4
Swordfish	215	90	29.5
Sailfish	64	612	90.5
Spearfish	145	1,210	89.3
Moonfish	128	584	82.0
Oilfish	326	7,014	95.6
Pomfret	141	1,249	89.9
NON-TUNA PMUS SUBTOTALS	14,254	24,898	63.6
Barracudas	48	360	88.2
Rainbow runner	8	1	11.1
Dogtooth tuna	0	10	100
Pelagic fishes (unknown)	11	2,909	99.6
OTHER PELAGICS SUBTOTALS	67	3,280	98.0
TOTAL PELAGICS	286,216	37,864	11.7

Source: WPRFMC (2011)
Note: Figure uses "haul-year" (when the haul commenced) annual summaries. This may cause minor differences if compared to when the set commenced at the start and end of a calendar year.

7.2.4 Observer Program

NMFS funds fishery observer recruitment, training, and support in the western Pacific region including its observer program in American Samoa. NMFS is in the process of increasing American Samoa longline observer coverage. By the end of 2010, annual coverage was 25.0 percent, with more than 40 percent coverage in the final quarter of the year. Prior to beginning the observer program in American Samoa, NMFS conducted a pilot program from August through October 2002. The pilot program observed 76 sets on one Class C and two Class D vessels, which set 197,617 hooks. There were no sightings of, or interactions with any protected species including sea turtles, marine mammals, or seabirds (NMFS 2003).

Mandatory observer placement to monitor protected interactions on American Samoa longline vessels first began in April 2006, to monitor protected species interactions. Since inception of the American Samoa Observer Program in April 2006 through December 2009, observers monitored

40 out of 550 trips (or approximately 7.2 percent), which included 1,382 sets. Although direct observation is the most accurate method, unless observer coverage of the fleet is complete, estimation of bycatch from observer data requires sampling of the fleet and then extrapolating from the samples (i.e., the observations) to the entire fleet using statistical estimators. This risk of overestimating interactions is proportionately increased as observer coverage is reduced (or set too low to reduce the standard error and account for the rareness of the event) as in this fishery. With a few years of observer coverage at less than 20 percent each year, caution must be taken in extrapolating to the entire fishery. As noted earlier, NMFS is in the process of increasing American Samoa longline observer coverage. In 2010, annual coverage reached 25.0 percent.

Between April 2006 and December 2009, eight green sea turtle interactions and a total observed effort in excess of 4.1 million hooks were reported in PIRO Observer Program status reports for American Samoa longline fishery for a mean interaction rate of approximately 0.002 turtles per 1,000 hooks. The sea turtle interaction rate in the American Samoa longline fishery from 2006-2009 ranged from 0.001-0.004 turtles per 1,000 hooks, with a mean of 0.002 turtles per 1,000 hooks. The Hawaii deep-set longline fishery, which fishes at the same or greater depths than the American Samoa fishery, had turtle interaction rates over the same period ranging from 0.0004-0.002 turtles per 1,000 hooks, with a mean of 0.001 turtles per 1,000 hooks or half the American Samoa longline fishery average. In 2010, seven additional green sea turtle interactions were observed and a further 11 in 2011 (see Table 8) as observer coverage increased from 6-8% between 2006-2009 to 25% and 33.3 % in 2010 and 2011 respectively.

Also, from April 2006-December 2010, three out of six years reported zero marine mammal interactions; only in 2008 and 2010 a total of five marine mammal interactions (two false killer whales, three rough-toothed dolphin) were observed and one seabird interaction (unidentified shearwater in 2007) was reported[5] by observers as shown in Table 8. Some gear configuration data as observed by the American Samoa Observer Program through 2009 is summarized in Table 9.

Table 8: Number of Longline Fishery Protected Species Interactions, 2006-2011.

Year	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Number of sets observed	287	410	379	306	798	1,257
Observer coverage (percent)	8.1	7.1	6.4	7.7	25.0	33.3
Green sea turtles, released dead	3	1	1	2	6	10
Green sea turtles, released injured	0	0	0	0	1	1
Marine mammals, released injured	0	0	2	0	1	10
Marine mammals, released dead	0	0	1	0	1	1
Seabirds, released dead	0	1	0	0	0	1

Source: NMFS PIRO American Samoa Observer Program 2006-2010 Status Reports
Note: Protected species interactions for Observer Program Quarterly and Annual Reports are based on vessel arrivals. The tally of an interaction may fall in a year other than the year when the interaction actually occurred.

[5] Found on NMFS PIRO website at: http://www.fpir.noaa.gov/OBS/obs_qrtrly_annual_rprts.html

Table 9: American Samoa Longline Fishery Gear Configuration, 2006-2009.

	Minimum	Average (mean)	Maximum
Hooks used	13/0 circle	14/0 circle	16/0 circle
Hooks between floats	25	31.5	36
Hooks per set	391	3,006	4,126
Float line length (meters)	18.4	26.0	36.5
Branch line length (meters)	6.8	10.3	15.1
Line shooter used	Yes	Yes	Yes

Source: NMFS PIRO Observer Program 2009
Note: Based on 39 observed trips departing from April 2006-October 2009, including approx. 3.9 million hooks observed

The ramping up of the observer coverage in 2010 and 2011 in the American Samoa longline fishery was in response to problems for NMFS PIFSC to statistically expand the observed sea turtle interaction rates to the entire fishery. In the Hawaiian shallow-set longline fishery, the problems of statistical uncertainty are obviated by having 100% observer coverage. The implementation of a 100% coverage for any potential shallow-set fishery in American Samoa would be an additional administrative burden for NMFS.

7.2.5 Recreational Fishing

Levine and Allen (2009) provide an overview of fisheries in American Samoa, including subsistence and recreational fisheries. Citing a survey conducted in American Samoa by Kilarski et al. 2006, Levine and Allen noted that approximately half of the respondents stated that they fished for recreation, with 71 percent of these individuals fishing once a week or less. Fishermen also fished infrequently for cultural purposes, although cultural, subsistence, and recreational fishing categories were difficult to distinguish as one fishing outing could be motivated by all three reasons.

Boat-based recreational fishing in American Samoa has been influenced primarily by the fortunes of fishing clubs and fishing tournaments. Tournament fishing for pelagic species began in American Samoa in the 1970s, and between 1974 and 1998, a total of 64 fishing tournaments were held in American Samoa (Tulafono 2001). Most of the boats that participated were alia catamarans and small skiffs. Catches from tournaments were often sold, as most of the entrants are local small-scale commercial fishermen. In 1996, three days of tournament fishing contributed about one percent of the total domestic landings. Typically, 7 to 14 local boats carrying a total of 55 to 70 fishermen participated in each tournament, which were held two to five times per year (Craig et al. 1993).

The majority of tournament participants operated 28-foot alia, the same vessels that engage in the small-scale longline fishery. With more emphasis on commercial longline fishing since 1996, interest in the tournaments waned (Tulafono 2001) and pelagic fishing effort shifted markedly from trolling to longlining. Catch-and-release recreational fishing is virtually unknown in American Samoa. Landing fish to meet cultural obligations is so important that releasing fish would generally be considered a failure to meet these obligations (Tulafono 2001). Nevertheless, some pelagic fishermen who fish for subsistence release fish that are surplus to their subsistence needs (S. Steffany, pers. comm. to P. Bartram, Akala Products Inc., September 15, 2001).

A summary of the species composition of fishery tournaments held between 1974 and 2010 is shown below in Table 10. The data do not document every tournament held in the four decades since records were kept, but cover 55 individual competitions. Of the nearly 136,000 lb of fish landed in the tournaments, almost two- thirds of the catch comprised equal amounts of skipjack and yellowfin tuna, while blue marlin, wahoo, mahimahi, and sailfish made up the majority of the remaining catch. There is no information on any protected species interactions associated with recreational fishing.

Table 10: Species composition of fishery tournaments held in American Samoa between 1974 and 2010.

Species	Weight (lb)	Percent
Skipjack tuna	40,655.85	29.93%
Yellowfin tuna	39,458.34	29.05%
Blue marlin	21,102.25	15.54%
Wahoo	11,807.25	8.69%
Mahimahi	11,035.20	8.13%
Sailfish	3,215.00	2.37%
Sharks (unknown)	2,805.75	2.07%
Dogtooth tuna	1,786.05	1.32%
Others	3,951.75	2.91%
Total	135,817.44	100.00%

Source: American Samoa Dept. of Marine and Wildlife Resources.

More recently, recreational fishing has undergone a renaissance in American Samoa through the establishment of the Pago Pago Game Fishing Association (PPGFA), which was founded by a group of recreational anglers in 2003[6]. The motivation to form the PPGFA was the desire to host regular fishing competitions. There are about 15 recreational fishing vessels ranging from 10 ft single engine dinghies to 35 ft twin diesel engine cabin cruisers. The PPGFA has annually hosted international tournaments in each of the past five years with fishermen from neighboring Samoa and Cook Islands attending. The recreational vessels use anchored fish aggregating devices (FADs) extensively, and on tournaments venture to the various outer banks which include the South Bank (35 miles), North East Bank (40 miles NE), South East bank (37 miles SE), 2% bank (40 miles), and East Bank (24 miles East). Several recreational fishermen have aspirations to become charter vessels and are in the process of obtaining captains (6 pack) licenses. In 2010, PPGFA played host to the 11th Steinlager I'a Lapo'a Game Fishing Tournament, which was a qualifying event for the International Game Fish Association's Offshore World Championship in Cabo San Lucas, Mexico.

[6] http://ppgfa.com/page/about-ppgfa

There is no full-time regular charter fishery in American Samoa similar to those in Hawaii or Guam. However, Pago Pago Marine Charters[7], which is concerned primarily with industrial work such as underwater welding, construction, and salvage, also includes for-hire fishing among the services it offers.

Estimation of the volume and value of recreational fishing in American Samoa is not known with any precision. A volume approximation of boat based recreational fishing is generated in the Council's Pelagics Annual Report, based on the annual sampling of catches conducted under the auspices of WPacFIN[8]. Boat-based recreational catches have ranged from 2,100 to 6,100 lb between 2006 and 2009, comprising primarily pelagic fish (WPRFMC 2011). These catches are unsold, but based on the 2009 average price for pelagic fish ($2.47/lb) (WPRFMC 2011) this would be worth $5,200 - $15,000. An additional volume of fish is caught recreationally by fishing tournaments mounted by the PPGFA, but these landings are not monitored by WPacFIN.

Swordfish is not targeted by recreational fisheries in American Samoa and is not even taken incidentally in recreational fishing in the territory (David Itano, pers. comm.)

7.2.6. Other Fisheries Catching Swordfish in the WCPFC Convention Area (WCPFC-CA) in the South Pacific

The following descriptions of other fleets catching swordfish in the WCPFC Convention Area (Figure 5) in the South Pacific were adapted from the 2011 Part 1 National Country Reports to the Seventh Meeting of the WCPFC Science Committee[9].

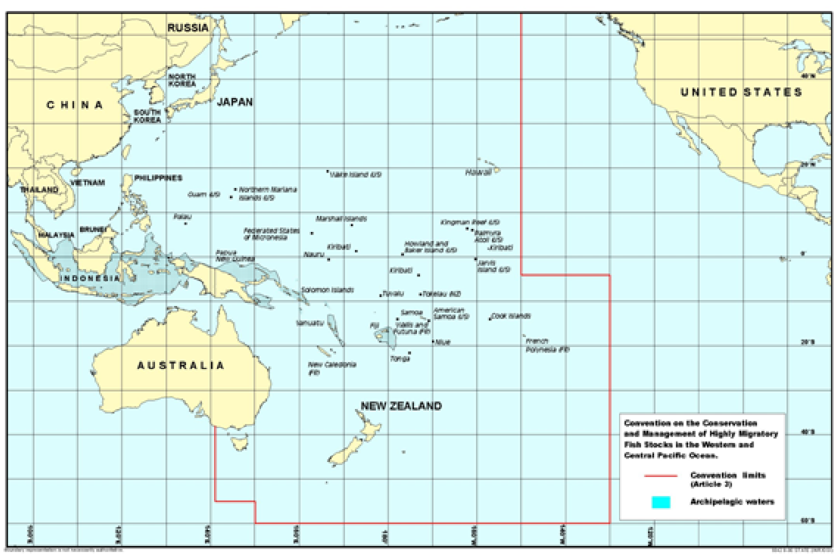

Figure 5. Map of the WCPFC Convention Area

[7] http://pagopagomarinecharters.com/
[8] http://www.pifsc.noaa.gov/wpacfin/).
[9] http://www.wcpfc.int/meetings/2011/7th-regular-session-scientific-committee

Australia

In the mid-1990s, improved access to swordfish markets in the United States of America prompted many East Coast Australian longline fishers to move to southern Queensland ports such as Mooloolaba to target swordfish (WCPFC 2011a). Longlining for swordfish has declined since early 2005 because of high fuel and bait costs, the introduction of a competitive total allowable catch (TAC) of 1400 t in 2006 and changes in the exchange rate. Increased operating costs and fluctuating market returns saw many longliners targeting lower-value albacore tuna during the first half of 2006. However, decreases in the price of albacore tuna and unfavorable export conditions over the past several years, such as a strengthening Australian dollar, have prompted some longliners to move back to targeting bigeye tuna and swordfish.

Historically, the vast majority of the catch and effort by Australian longliners has been taken within the Australian EEZ, with little effort on the adjacent high seas. Fifty four vessels reported longlining in the WCPFC-CA during 2010, down from a peak of 180 in 1997. Total longline fishing effort decreased from 8.82 million hooks in 2009 to 7.84 million hooks in 2010 consistent with an overall downward trend from the peak effort of 12.40 million deployed in 2003. Catches of swordfish decreased from have ranged from about 916 – 1,240 mt between 2006 and 2010 (Table 11).

Table 11. Annual catch and effort estimates in whole weight in metric tonnes of swordfish in the Eastern Australian longline fleet, 2006-2010

Year	Effort (hooks x 1000)	Swordfish (mt)
2006	8821	995
2007	8444	1,131
2008	8059	1,240
2009	8821	1,111
2010	7840	916.1

Japan

Japanese longline boats are classified into three categories (coastal, offshore and distant water longline fisheries) according to the operation area and boat size (WCPFC 2011b). Coastal longliners, whose size is 1-20 gross tones (GT), are allowed to fish only in the Japan's EEZ. Offshore longline boats are further divided into two size categories, small offshore (10-20 GT), and offshore (10-120 GT), longlines, both of which are able to go beyond the Japan's EEZ in the Pacific. Although the vessel size of two offshore categories is duplicated in the range 10-20 GT, most vessels of the latter category are larger than 50 GRT. Distant water longliners are over 120 GRT and basically can fish at all oceans, but need to follow the various domestic regulations that will ensure the management measures in place by the respective tuna RFMO.

Distribution of the catch by species for this fleet are classified into broad operational characteristic; swordfish targeting near Japan, albacore targeting in the middle latitudes between 15-30˚N and 25-40˚S, and tropical tuna (mostly bigeye and yellowfin) targeting in the equatorial waters. Catches of swordfish by the Japanese longline fleet in the WCPFC-CA south of the equator are taken incidentally when targeting tunas. The catch of swordfish in the WCPFC-CA south of the equator by Japanese longline vessels amounts to 371-508 mt or about a quarter of the total South Pacific swordfish catch by this fleet (Table 12).

Table 12. Catches of swordfish in the South Pacific and the WCPFC-CA by Japanese longline vessels

Year	Longliners operating in the WCPFC CA	Swordfish catch in the WCPFC area south of the equator (mt)	Swordfish catch south of the equator (mt)
2006	497	371	1437
2007	479	434	1679
2008	464	446	1993
2009	444	508	2049
2010	433	508	2049

Taiwan

Currently, there are two Taiwanese longline fishing fleets operating in WCPFC-CA: large scale tuna longliners (large scale tuna longliners) and small scale tuna longliners (small scale tuna longliners) (WCPFC 2011c). All large scale tuna longliners and operate outside the EEZ of Taiwan, while most of the small scale tuna longliners vessels operate in the EEZ of Taiwan, some of them operate in the high sea or in Pacific Island Country EEZs through access agreements.

As with the Japanese fleet, swordfish catches by the Taiwanese longliners operating in the WCPFC-CA south of the equator are taken incidentally by vessels targeting tunas. Unlike the Japan, which reports its catches both north and south of the equator, Taiwan only reports swordfish caught below 20 deg S as required by WCPFC Conservation and Management Measure 09-03 (WCPFC 2009). The number of Taiwanese longline vessels fishing for swordfish and the catch of swordfish in the convention area south of 20°s during the period 2000-2010 are shown in Table 14. In 2010, there were 42 fishing vessels, including 4 seasonal target and 15 non-target large scale tuna longliners vessels, and 23 non-target small scale tuna longliners vessels.

The total Taiwanese swordfish catch in the WCPFC-CA between 2006 and 2010 has ranged between 4,500 and 5,100 mt or about 6-9% of the total Taiwanese longline catch. Swordfish caught below 20 deg S in the WCPFC CA has amounted to 42-57 mt or about 1 to 4% of the total WCPFC-CA Taiwanese swordfish catch (Table 13).

Table 13. The annual catch of swordfish and the number of the fishing vessels in the WCPFC-CA by Taiwanese longline vessels south of 20°S during 2000-2010

Year	Catch (tonnes)	Vessel numbers
2006	198	57
2007	217	49
2008	61	53
2009	133	53
2010	103	42

New Zealand

Longlining in New Zealand has mostly targeted bigeye, southern bluefin and more recently swordfish, although the majority of the catch consists of albacore (WCPFC 2011d). Pacific bluefin and yellowfin tunas are also taken in small numbers in longline sets, with skipjack only rarely taken. Swordfish catches have ranged from 336 mt to almost 581 mt between 2006 and 2010, with most of the swordfish catch being taken below 20 deg S (Table 14).

Table 14. Number of New Zealand longline vessels catching swordfish, 2006-2010

Year	Vessel numbers	Total swordfish catch (mt)	Swordfish catch below 20 deg S
2006	56	581	429.9
2007	44	392	276.9
2008	35	346	254.9
2009	40	418	317.2
2010	44	535	396.9

European Union-Spain

A total of 5 Spanish longline vessels have operated in the WCPFC-CA in 2010 (WCPFC 2011e). Since this fleet commenced its activity with an experimental survey during the first quarter of 2004, it has been targeting swordfish with monofilament surface longline gear. The Spanish fleet operates across the EPO and WCPO and the catches shown in Table 15 refer to the total catch as opposed to catches in the WCPFC-CA alone. However, in 2010, 613 mt or about 62% of the total was taken to the west of 150 deg W within the WCPO. The Spanish fleet operates predominantly between 20 – 40 deg S.

Table 15. Number of Spanish longline vessels catching swordfish in 2006-2010

Year	Number of vessels	Swordfish catch (mt)
2006	15	3,107
2007	17	4,217
2008	15	3,409
2009	9	1,721
2010	5	994

New Caledonia

Longline vessels have been operating from New Caledonia, fishing primarily within the EEZ since the 1980s, but it has only recently become a fishery of some significance (WCPFC 2011f). The fishery targets mainly South Pacific albacore, which form about 64% of the catch. This fishery appears to be closer in characteristics to the American Samoa longline fishery , with limited swordfish catches ranging from 9-19 mt, comprising about 5% of the catch total (Table 16).

Table 16. Number of New Caledonia longline vessels catching swordfish in 2006-2010

Year	Number of longliners	Swordfish catch (mt)
2006	21	10
2007	23	19
2008	23	15
2009	21	7
2010	17	8

French Polynesia

The longliners fleet comprises fresh fish longliners similar to those operating from Hawaii, and freezer longliners, similar to those operating out of American Samoa (WCPFC 2011g). Fresh fish longliners, comprise boats 11-to-20 m in length which make 15 days trips within the EEZ, partly due to the limited time of conservation on ice as well as their limited range. The freezer longliners are mostly 21-26 m vessels. These boats have freezer capacity and can remain at sea for 1 1/2 up to 3 months. However, the last sets are often used to target fresh-fish that is kept on ice or in slurry. Like the Cook Islands and American Samoa longline fisheries, catches are dominated by albacore with swordfish cvatches ranging between about 67-83 mt and comprising between 1-2% of the catch (Table 17).

Table 17. Number of French Polynesian longline vessels catching swordfish in 2006-2010

Year	Number of longliners	Swordfish catch (mt)
2006	71	83
2007	64	67
2008	68	80
2009	68	71
2010	61	80

Samoa

The tuna longline fishery in Samoa targets South Pacific albacore tuna and all the catch landed is caught in Samoa's EEZ (WCPFC 2010). Mature yellowfin and bigeye tuna of over 30 kilograms are also important longline catch component and are marketed fresh in New Zealand and main land United States of America. The fishery continues to comprise alia catamarans and conventional monohull longliners of 12.5 to over 20.5 meters in length. As in neighboring American Samoa, swordfish is a minor component, typically amounting to between 1-6 mt (Table 18) or about 0.24% of the catch.

Table 18. Number of Samoa longline vessels catching swordfish in 2006-2010

Year	Number of longliners	Swordfish catch (mt)
2005	32	1
2006	54	3
2007	60	5
2008	43	6
2009	42	5

Cook Islands

The majority of Cook Islands longline vessel catches are taken within the Cook Islands EEZ, with under 4% taken beyond the EEZ in 2010 (WCPFC 2011h). The total effort for the WCPFC-CA is approximately 6 million hooks, with 5.5 million hooks of effort attributed to the CK EEZ. Total raised catch estimates for 2010, in the WCPF-CA is 3,156.6mt. Albacore remains the primary catch species accounting for 75% of the total 2010 catches. The majority of catches are taken in the northern Cook Islands by the fleet based out of Pago Pago, American Samoa. A total of forty-one longline fishing vessels were licensed to fish within the WCPFC-CA, in 2010 (Table 19). Thirty seven licenses were issued for vessels to fish within national waters, and three licenses issued solely authorization for fishing activity on the high seas within the WCPFC-CA. Swordfish remains a small fraction of the Cook islands longline catch, with annual totals varying between 19 and 80 mt, with an average of 38 mt.

Table 19. Number of Cook Islands longline vessels catching swordfish in 2006-2010

Year	Number of longliners	Swordfish catch (mt)
2006	26	80
2007	22	43
2008	23	21
2009	24	19
2010	41	29

7.3 Target Species:

The current target species for the American Samoa longline fishery is albacore and potentially swordfish in the future. The life histories of these two species are summarized below in Sections 7.3.1 and 7.3.2 respectively and and stock status in sections 7.4.1and 7.4.2. The stock status of of other tunas caught incidentally by the American Samoa longline vessels are summarized in Section 7.4.3

7.3.1 South Pacific Swordfish

Swordfish are quite different to tuna and to other billfish, such as blue marlin. Swordfish have a wider geographical distribution than those other species and they regularly move between surface waters down to great depths where they tolerate extreme cold. They move with prevailing currents and use their superior eyesight to locate prey. Male and female swordfish grow at different rates and have different distributions.

Swordfish with prevailing currents and use their acute sight to stalk prey, employ their superior acceleration to chase it and often use their rostrum to disable or stun the prey. Swordfish are unable to maintain an elevated body temperature. However, they have a unique muscle and brown tissue that warms blood flowing to the brain and eyes when the swordfish is in cold water. Swordfish are one of the most widely distributed pelagic fish species. In some areas they regularly descend from the sea surface down to depths of 1000 m or more. Their diurnal movements are related to changes in light intensity that depend on water transparency and the time of day. The movements follow the vertical migration of the 'deep sound-scattering layer', an assemblage of small shrimp, fish and squid that moves with the isolume in an attempt to avoid predators. Adult swordfish inhabit all tropical, subtropical and temperate oceans and seas. Their geographical distribution is roughly contained by the 13ºC sea surface isotherm Swordfish can tolerate a much broader range of water temperatures than other billfish and tuna. They have been reported from waters with temperatures ranging from 5 to 27ºC.

The distribution of swordfish depends on size and sex and it varies with seasonal fluctuations in water temperature and prey abundance. The geographical segregation of sexes implies a mechanism that synchronizes the migration of mature male and female swordfish to spawning areas. Juvenile swordfish are most abundant in tropical and subtropical waters. They migrate to lower latitudes as they mature .

Stock structure of swordfish in the Indian and Pacific oceans is unclear. Longline data indicate three or four centers of abundance in the Pacific. Based on longline data and the distribution of swordfish larvae, Sakagawa and Bell (1980) proposed two different stock hypotheses for Pacific swordfish: a single-stock hypothesis and a three-stock hypothesis which involves separate North Pacific, eastern Pacific and south-western Pacific stocks. Sosa-Nishikawa and Shimizu (1991) proposed four stocks (north-western and central Pacific, north-eastern Pacific, south-eastern Pacific and south-western Pacific) on the basis of the distribution of larvae, spawning swordfish and fishery catches.

Several genetics studies of swordfish have been unable to reject the hypothesis that swordfish comprise a single, homogenous population in the Pacific. From recent analyses of mtDNA, however, Reeb et al. (2000) concluded that swordfish are not homogenous in the Pacific. In the western Pacific, they found significantly different northern and southern populations. They suggest that several overlapping swordfish populations might occur in the eastern Pacific so that swordfish appear to be genetically continuous there. Gene flow between the populations occurred through a horseshoe-shaped corridor, running between the north-western Pacific, across to the eastern Pacific and back to the south-western Pacific.

7.3.2. Albacore Tuna Life History and Distribution

Separate northern and southern stocks of albacore (*Thunnus alalunga*), with separate spawning areas and seasons, exist in the Pacific. Growth rates and migration patterns differ between populations north and south of 40° N (Laurs and Wetherall 1981). In the North Pacific, they are absent from the equatorial eastern Pacific as Hawaii appears to be at the southern edge of their range. In the South Pacific from 150° E to 120° W, albacore are concentrated between 10° S and 30° S; in the west they may be found as far as 50º S. A 2006 stock assessment indicates the level of albacore biomass available to the Pacific Island nations' domestic fisheries is relatively modest; i.e., of the order of 300,000 mt distributed over an ocean area of approximately 14.5 million sq km (5.5 million sq mi) (10–28°S, 160°E to 140°W) including waters around American Samoa (Langley 2006).

The main albacore fisheries in the Pacific may be distinguished as either surface or deep water. The surface fisheries are trolling operations off the American coast from Baja Mexico to Canada, baitboat operations south of Japan at the Kuroshio Front and a fishery in New Zealand waters. A troll fishery has also developed south of Tahiti. Purse seine fishing is also considered a surface method but is currently of minor importance in the albacore fishery. Albacore are occasionally taken as bycatch in other tuna fisheries. Elsewhere, throughout the subtropical and temperate north and south Pacific including American Samoa, longline gear is used to capture deep-swimming fish. The longline fishery, targeting deep-swimming fish, occurs closer to the equator including waters around American Samoa.

Temperature is recognized as the major determinant of albacore distribution. Albacore are both surface dwelling and deep-swimming. Deep-swimming albacore tuna are generally more concentrated in the western Pacific but with eastward extensions along 30° N and 10° S (Foreman 1980). The 15.6° to 19.4° C sea surface temperature (SST) isotherms mark the limits of abundant distribution although deep-swimming albacore tuna have been found in waters between 13.5° and 25.2° C (Saito 1973).

The overall thermal structure of water masses, rather than just SST, has to be taken into account in describing total range because depth distribution is governed by vertical thermal structure. Albacore are found to a depth of at least 380 m and will move into water as cold as 9° C at depths of 200 m. They can move through temperature gradients of up to 10° C within 20 minutes. This reflects the many advanced adaptations of albacore; it is a thermoregulating endotherm with a high metabolic rate and advanced cardiovascular system. Generally, albacore have different temperature preferences according to size, with larger fish preferring cooler water, although the opposite is true in the northeast Pacific. They are considered epi- and mesopelagic in depth range.

7.4 Status of Pelagic Fish Stocks

7.4.1 South Pacific Swordfish

The catches of swordfish in the WCPFC Convention Area (WCPFC-CA) south of the equator are shown in Table 20. About 50% of the catch is taken by three countries, Spain, Taiwan and China, while these three countries plus Australia, Kiribati, Indonesia, Japan and New Zealand account for just over 90% of the catch. Current American Samoa swordfish catches are very modest, amounting in 2010 to 19 mt or 0.28% of the 2010 total catch in the WCPFC-CA south of the equator. Even if some elements of the American Samoa fleet were to target swordfish in the future, it is likely that catches would remain relatively modest.

Table 20. Catches of swordfish in the the WCPFC Convention Area south of the equator in 2010. Source: SPC-OFP pers. comm.

Fleet	Swordfish catch (mt)	Percent
Spain	2418	26.41%
Taiwan	1454	15.88%
China	1025	11.19%
Australia	942	10.29%
Kiribati	782	8.54%
Indonesia	644	7.03%
Japan	604	6.60%
New Zealand	535	5.84%
Vanuatu	238	2.60%
Fiji	141	1.54%
Papua New Guinea	93	1.02%
French Polynesia	80	0.87%
Cook Islands	78	0.85%
Solomon Islands	63	0.69%
Tonga	26	0.28%

Fleet	Swordfish catch (mt)	Percent
American	19	0.21%
New Caledonia	8	0.09%
Samoa	7	0.08%
Total	9157	100.00%

The most recent stock assessment of swordfish south of the equator in nthe WCPFC-CA was conducted by Kolkody et al (2006) and focused on the segment of the swordfish stock in the the South-West Pacific Ocean (0-50 deg S, 140 deg E-175 deg W) for the period 1952-2004.

Swordfish have been exploited in this region primarily as bycatch in the Japanese longline tuna fisheries since the 1950s. Total catches and catch rates remained fairly consistent from about 1970-1996, after which the Japanese fleets were no longer able to access Australian and New Zealand fishing zones, and catches from this fleet have declined steadily since then. Australian and New Zealand catches increased dramatically in the mid-1990s, such that total annual catches in 1997-2004 were roughly double the levels in the preceding period. Pacific Island, Korean, and Taiwanese catches also increased during this period, but remain a small proportion of the total. In the mid-1990s, the Australian fleet gradually expanded offshore with some of the fleet specifically targeting swordfish.

The assessment by Kolkody et al (2006) used both MUTIFAN-CL and CASAL stock assessment models to evaluate the status of the Southwest Pacific swordfish. The author concluded that the ratio current biomass to biomass at MSY (B-current/ B_MSY) = 1.7, and that the ratio of current spawning stock biomass to spawning stock biomass at MSY (SSB_current/SSB_MSY) = 3.4, with the ratio of current fishing mortality to fishing mortality at MSY (F_current/F_MSY) = 0.7. The authors cautioned, however, that the apparent optimism of the MSY-related reference points was countered by the stock projections (assuming constant future recruitment according to the estimated stock recruitment relationships, and constant effort at 2004 levels), which suggest that total biomass and spawning stock biomass may decline over the short term:

The authors also noted that there remained a number of assumptions which probably influenced their conclusions and which remained remain largely beyond the scope of the assessment. These included catchability of the fleets may be changing in ways that cannot be reliably estimated through the catch rate standardization methods employed; the link between the spatial definition of the Southwest Pacific model domain, and the connectivity with the broader Pacific (and possibly Indian Ocean) swordfish population;, and that the models employed ignored sex-specific population characteristics (natural mortality, growth and migration), which may contribute to potential biases in estimators.

7.4.2 South Pacific Albacore Tuna

The most recent stock assessment for albacore by Hoyle (2011) using data up to 2010 concluded that there is no indication that current levels of catch are causing recruitment overfishing, particularly given the age selectivity of the fisheries. This assessment uses the same underlying structural assumptions as the 2009 assessment. Due to improved understanding of the data inputs, the model structure of the 2009 alternate case was applied in the 2011 reference case.

Biological research indicates that male and female albacore have quite different growth curves, which are not included in the model. Growth curve errors can bias estimates of biomass and fishing mortality. Hoyle (2011) states therefore that estimated management parameters should therefore be viewed with caution. There was considerable uncertainty about the early biomass trend, but this has negligible effect on the management parameters, or advice to managers regarding the status of the stock. Estimates of F_2007-2009/FMSY (0.26) and SB_2009/SB_MSY (2.25) do not indicate overfishing above F_MSY, nor an overfished state below SB_MSY. Results from the 2009 assessment suggest that much variation in management parameters is attributable to the steepness of the stock-recruitment curve for which there is no information. This variation makes management advice based on MSY relatively uninformative. Alternative metrics such as the expected CPUE, relative to a target CPUE, may be less affected by uncertainty. They may also be more relevant to the management needs of the fishery. There is no indication that current levels of catch are causing recruitment overfishing, particularly given the age selectivity of the fisheries. Longline catch rates appear to be declining, and catches over the last 10 years have been at historically high levels. This CPUE trend may be significant for management.

7.4.3 Other Tunas

The most recent assessment of skipjack tuna in the WCPO was conducted in 2011 (Hoyle et al 2011) using data up to 2010 The principal conclusions are that skipjack is currently exploited at a moderate level relative to its biological potential. Furthermore, the estimates of current fishing mortality to fishing mortlity at MSY (F_current/F_MSY) indicate that overfishing of skipjack is not occurring in the WCPO, nor is the stock in an overfished state. These conclusions appear relatively robust, at least within the statistical uncertainty of the current assessment. Fishing pressure and recruitment variability, influenced by environmental conditions, will continue to be the primary influences on stock size and fishery performance.

The most recent stock assessment of yellowfin in the WCPO by Langley et al (2011) using data up to 2010 concluded that for the most plausible range of models, the fishing mortality based reference point **(**F_current/F_MSY) is estimated to be 0.56-0.90 and on that basis it is concluded that overfishing is not occurring. The corresponding biomass based reference points, current biomass to biomass at MSY (B_current/ B_MSY) and current spawning biomass to spawning biomass at MSY (SB_current/SB_MSY) were estimated to be above 1.0 (1.25-1.60 and 1.34-1.83 respectively) and, therefore, the stock is not in an overfished state. The stock status indicators are sensitive to the assumed value of steepness for the stock-recruitment relationship. A value of steepness greater than the default value (0.95) yields a more optimistic stock status and estimates considerably higher potential yields from the stock. Conversely, for a lower (0.65) value of steepness, the stock is estimated to be approaching the MSY based fishing mortality and biomass thresholds.

The 2011 WCPO stock assessment by Davies et al (2011) concluded that the ratio of fishing mortality at present to fishing mortality at MSY ((F_current/F_MSY) is estimated at 1.46 indicating that overfishing is occurring for the WCPO bigeye tuna stock. In order to reduce fishing mortality to FMSY the base case indicates that a 32% reduction in fishing mortality is required from the 2006–2009 level. The base case assessment indicates that the current total and spawning biomass are higher than the associated MSY levels (B_current/B_MSY = 1.25 and SB_current/SB_MSY = 1.19). However, two of the alternate models in the assessment found that SB_current/SB_MSY < 1.0 with a range across the six models considered of 0.86 – 1.49. Therefore, there is a possibility that bigeye tuna is currently in an overfished state. An analysis of historical patterns in the mix of fishing gears indicates that MSY has been reduced to less than half its levels prior to 1970 through increased harvest of juveniles. Recent overfishing could result in further losses in potential yields in the future.

7.5 Protected Species

The limited volume of swordfish fishing took place south of the US EEZ around American Samoa between latitudes 20 - 40 deg S and 159 - 174 deg W. These latitudinal and longitudinal bounds would likely encompass the action area for any Section 7 Endangered Species Act consultations. It is not expected that vessels would shallow set for swordfish within the US EEZ around American Samoa.

7.5.1 Sea Turtles

All Pacific sea turtles are designated under the Endangered Species Act (ESA) as either threatened or endangered. The breeding populations of Mexico's olive ridley sea turtles (*Lepidochelys olivacea*) are currently listed as endangered, while all other ridley populations are listed as threatened. Leatherback sea turtles (*Dermochelys coriacea*) and hawksbill turtles (*Eretmochelys imbricata*) are also classified as endangered. Loggerhead (*Caretta caretta*) and green sea turtles (*Chelonia mydas*) are listed as threatened (the green sea turtle is listed as threatened throughout its Pacific range, except for the endangered population nesting on the Pacific coast of Mexico). These five species of sea turtles are highly migratory, or have a highly migratory phase in their life history (NMFS 2001). For more detailed information on the life history of sea turtles, see the Council's Environmental Impact Statement on Amendment 18 to the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region (WPRFMC 2009a).

7.5.1.1 Green Sea Turtles

Green sea turtles are the primary species documented to interact with the American Samoa longline fishery, although other sea turtles are found in American Samoa's waters.

General Distribution

Green turtles are found throughout the world, occurring primarily in tropical, and to a lesser extent, subtropical waters. The species occurs in five major regions: the Pacific Ocean, Atlantic Ocean, Indian Ocean, Caribbean Sea, and Mediterranean Sea. These regions can be further divided into nesting aggregations within the eastern, central, and western Pacific Ocean; the western, northern, and eastern Indian Ocean; Mediterranean Sea; and eastern, southern, and western Atlantic Ocean, including the Caribbean Sea Green turtles appear to prefer waters that usually remain around 20° C in the coldest month; for example, during warm spells (e.g., El Niño), green turtles may be found considerably north of their normal distribution. Stinson (1984) found green turtles appear most frequently in U.S. coastal waters that have temperatures exceeding 18° C.

The genus *Chelonia* is composed of two taxonomic units at the population level; the eastern Pacific green turtle (referred to by some as "black turtle," *C. mydas agassizii*), which ranges (including nesting) from Baja California south to Peru and west to the Galapagos Islands, and the nominate *C. m. mydas* in the rest of the range (insular tropical Pacific, including Hawaii). The non-breeding range of green turtles is generally tropical, and can extend thousands of miles from shore in certain regions. Hawaiian green turtles monitored through satellite transmitters were found to travel more than 1,100 km from their nesting beach in the French Frigate Shoals, south and southwest against prevailing currents to numerous distant foraging grounds within the 2,400 km span of the archipelago (Balazs 1994, Balazs et al., 1994, Balazs and Ellis 1996).

Three green turtles outfitted with satellite tags on Rose Atoll (the easternmost island of the Samoan Archipelago) traveled on a southwesterly course to Fiji, a distance of approximately 1,500 km (Balazs et al. 1994). Tag returns of eastern Pacific green turtles establish that these turtles travel long distances between foraging and nesting grounds. In fact, 75 percent of tag recoveries from 1982-1990 were from turtles that had traveled more than 1,000 km from Michoacán, Mexico.

Pacific Ocean Nesting Distribution

Green turtles occur in the eastern, central, and western Pacific. Foraging areas are also found throughout the Pacific and along the southwestern U.S. coast (NMFS and USFWS 1998a). Nesting is known to occur at hundreds of sites throughout the Pacific, with major nesting occurring in Indonesia, Malaysia, the Philippines, Australia, Micronesia, Hawaii, New Caledonia, Mexico, the Galapagos Islands, and other sites (NMFS and USFWS 2007a). In Oceania (Polynesia, Micronesia, Melanesia, and eastern Australia) there are nearly 200 known nesting sites (NMFS 2010b). Conservation efforts over the past 25 years or more appear to have had some positive results. Chaloupka et al. (2008) report that green sea turtle index rookeries at the Ogasawara Islands (southern Japan), Raine Island (northern Great Barrier Reef), Hawaii, and Heron Island (southern Great Barrier Reef) have shown significant increases in nester or nest abundance (Figure 6).

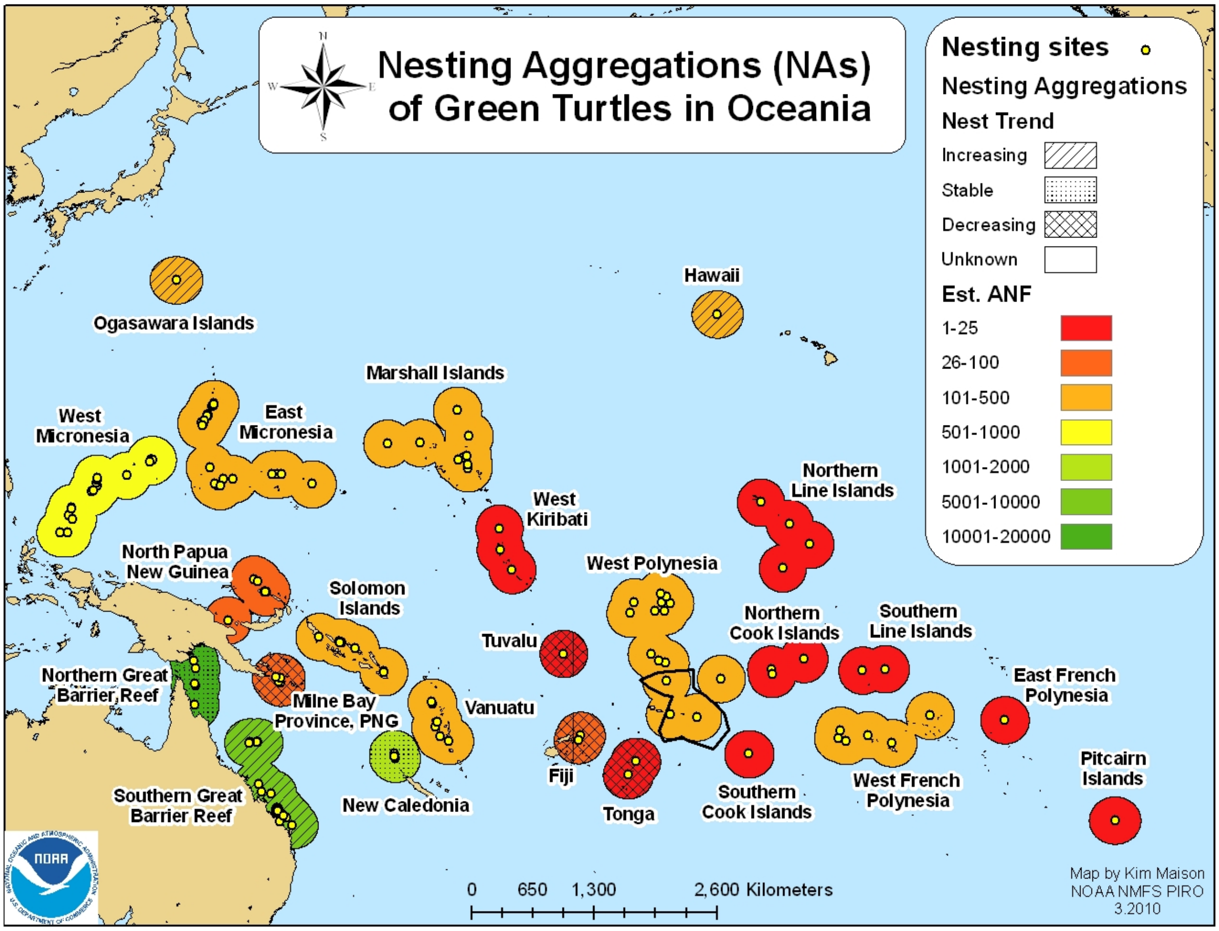

Figure 6: Green turtle nesting aggregations in Oceania.
Source: NMFS PIRO Protected Resources Division.
Note: EEZ around American Samoa shown in black outline; "Est. ANF" = estimated annual nesting females.

Based on the best information currently available, about 18,000 to 38,000 female green turtles nest annually in Oceania (NMFS 2010b). However, about 90 percent of nesting takes place among two Australian nesting aggregations (Northern GBR and Southern GBR which includes the Coral Sea Platform), with over half of all the nesting occurring on a single island; Raine Island in the Northern GBR (Chaloupka et al. 2008, Limpus 2009). Nesting trends appear stable at Raine Island, and are increasing at Heron Island in the Southern GBR, as well as at Chichi-jima in the Ogasawara Islands (Chaloupka et al. 2008). However, these trends do not necessarily correlate with a stable or increasing total number of turtles because of low nesting success and hatchling production at Raine Island, where the majority of nesting for Oceania occurs (Limpus et al. 2003; Limpus 2009; Hamann et al. 2009). Also, nesting aggregations with small numbers of nesting females, like those throughout the islands and atolls of central and south Pacific, may be of greater importance than their proportional numbers indicate. Many of these nesting aggregations are geographically isolated, and likely harbor unique genetic diversity, which may be lost if these small nesting aggregations or their components become extirpated (Avise and Bowen 1994).

Sub-adult and adult green turtles occur in low abundance in nearshore waters around the islands of American Samoa. No population trend data are available, but anecdotal information suggests major declines over the last 50 years (Tuato'o-Bartley et al 1993, Utzurrum 2002). Genetics samples have been collected from stranded or foraging green turtles around Tutuila. To date, four samples have been analyzed: two samples from stranded green turtles in Pago Pago Harbor had a haplotype known from nesting green turtles in American Samoa, Yap, and the Marshall Islands. However, since many green turtle nesting aggregations in the Pacific still have not been sampled, it is possible that this haplotype occurs at more than these three sites. In addition, two samples have been analyzed from foraging green turtles at Fagaalu, but the haplotype is of unknown nesting origin (Peter Dutton, NMFS SWFSC, pers. comm.).

Size and Identification
Green turtles are distinguished from other sea turtles by their smooth carapace with four pairs of lateral scutes, a single pair of prefrontal scutes, and a lower jaw-edge that is coarsely serrated. Adult green turtles have a light to dark brown carapace, sometimes shaded with olive, and can exceed one meter in carapace length and 100 kg in body mass. Females nesting in Hawaii averaged 92 cm in straight carapace length (SCL), while at the Olimarao Atoll in Yap, females averaged 104 cm in curved carapace length (CCL) and approximately 140 kg. In the rookeries of Michoacán, Mexico, females averaged 82 cm in CCL, while males averaged 77 cm CCL (in NMFS and USFWS 1998a).

Growth and Age at Maturity
Green turtles exhibit a slower growth rate than other sea turtles, and age to maturity appears to the longest. Based on age-specific growth rates, green turtles are estimated to attain sexual maturity beginning at age 25 to 50 years (Limpus and Chaloupka 1997, Bjorndal et al. 2000, Chaloupka et al. 2008, Seminoff 2002, Zug et al. 2002). The period of reproductivity has been estimated to range from 17 to 23 years (Carr 1978, Fitzsimmons et al. 1995 *in* Seminoff 2002).

Diet
Although most green turtles appear to have a nearly exclusive herbivorous diet, consisting primarily of sea grass and algae (Wetherall et al. 1993; Hirth 1997), those along the east Pacific coast seem to have a more carnivorous diet. Analysis of stomach contents of green turtles found off Peru revealed a large percentage of mollusks and polychaetes, while fish and fish eggs, and jellyfish and commensal amphipods comprised a lesser percentage (Bjorndal 1997). Foraging studies of 31 green sea turtles in Mexico found the turtles to have consumed primarily algae with small amounts of squid, sponges, tube worms, and other invertebrates in their diet (Seminoff et al. 1997). A later study, however, documented a number of deep water invertebrate prey in the diet of local green turtles in Bahia de los Angeles, Mexico, suggesting that green turtles forage in offshore regions as well (Seminoff et al. 2006). Seminoff and Jones (2006) suggest that green sea turtles also exhibit offshore resting activity and they cite studies in the Caribbean where greens showed predictable diel movement patterns with turtles feeding on grass flats in mid-morning and mid-afternoon and moving into deeper water during midday hours. In the Hawaiian Islands, green turtles are thought to be site-specific and consistently feed in the same areas on preferred substrates, which vary by location and between islands (Landsberg et al. 1999).

Global Status

Green turtles were listed as threatened under the ESA on July 28, 1978, except for breeding populations found in Florida and the Pacific coast of Mexico, which were listed as endangered. Using a conservative approach, Seminoff (2004) analyzed subpopulation changes at 32 index sites, and estimated that globally the number of nesting female green turtles has declined by 48 to 67 percent over the last three generations (approximately 107 to 149 years). Causes for this decline include harvest of eggs, subadults, and adults, incidental interaction by fisheries, loss of habitat, and disease. The degree of population change was not consistent among all index nesting beaches or among all regions. Some nesting populations are stable or increasing. A 2007 study looked at global green sea turtle seasonal nesting activity data from all reliable available long-term datasets and found that rates of nesting population increase in the six main rookeries ranged from 4-14 percent per year over the past 20 to 30 years (Chaloupka et al. 2007). In the Pacific, the only major (> 2,000 nesting females) populations of green turtles occur in Australia and Malaysia. Smaller colonies occur in the insular Pacific islands of Polynesia, Micronesia, and Melanesia (Wetherall 1993) and on six small, sand islands at French Frigate Shoals, a long atoll situated in the middle of the Hawaii Archipelago (Balazs et al. 1995).

Green Sea Turtles in American Samoa

In Samoan folklore, green sea turtles, known in Samoan as *I`a sa* (sacred fish). Other names include *laumei ena'ena, tualimu,* or *laumei meamata* and were believed to have the power to rescue fishermen lost at sea (Craig 2002). The life cycle of the green sea turtle involves a series of long-distance migrations back and forth between their feeding and nesting areas (Craig 2002). In American Samoa, their only known nesting area is at Rose Atoll[10]. When they finish laying their eggs there, green turtles leave Rose Atoll and migrate to their feeding grounds elsewhere in the South Pacific. After several years, the turtles will return to Rose Atoll to nest again. Every turtle returns to the same nesting and feeding areas throughout its life, but that does not necessarily mean that all turtles nesting at Rose Atoll will migrate to exactly the same feeding area.

Following hatching from their natal beaches, green turtle life history is characterized by early development in the pelagic zone followed by development in coastal areas where post-recruitment juveniles and adults forage in shallow coastal areas, primarily on algae and seagrasses. Upon maturation, adult greens typically undertake long migrations between their resident foraging grounds and their natal nesting areas (NMFS 2010a). From 1971-1996, 46 adult female turtles were flipper tagged at Rose Atoll with only three ever recaptured; two in Fiji and one in Vanuatu, all dead. A satellite tagging study, conducted in the mid-1990s tracked seven tagged green sea turtles by satellite telemetry from their nesting sites at Rose Atoll to Fiji (Balazs et al. 1994). Most of the recovered tagged turtles migrated westward to Fiji perhaps for better feeding opportunities in Fiji's abundant, shallow seagrass and algae habitats (Craig et al. 2004). Of 513 greens tagged in French Polynesia between 1972 and 1991, six were recovered in Fiji, three in Vanuatu, two in New Caledonia, and one each were recovered at Wallis Island, Tonga, and the Cook Islands (NMFS 2010a).

[10] See http://www.nps.gov/archive/npsa/5Atlas/partq.htm#top

Green Sea Turtle Interactions with the American Samoa-based Longline Fishery
Sea turtle interactions have occurred in waters around American Samoa with juvenile green sea turtles. Tissue samples for genetic analysis were obtained from several of the turtle specimens. The first sample was collected in 2006, and was identified as being a haplotype consistent with the northern Australian stock that include nesting populations in the Northern and Southern Great Barrier Reef and Coral Sea and in New Caledonia. This is quite different from the haplotypes of the few samples obtained from nesting females in American Samoa (NMFS PIRO, pers. comm.). The second sample collected in 2007, is a haplotype that researchers have only found in Micronesia, the Marshall Islands and in American Samoa (NMFS PIRO, pers. comm.).

NMFS and other regional partners including the Southwest Fisheries Science Center (SWFSC) are currently working together to obtain better information on the status and stock structure of the western and central Pacific populations including the following projects shown in Table 21.

Table 21: NMFS-Sponsored Green Sea Turtle Projects.

Project	Collaborators	Location	Target	Results to Date
Micronesian green turtle genetics study	SWFSC, Regional partners	CNMI, Guam, Palau, FSM, RMI	Nesting and foraging turtles	>600 samples collected for genetic analysis
Central Pacific green turtle genetics and migration studies	SWFSC, Regional partners	FSM, Palmyra, American Samoa	Nesting turtles	>100 samples collected for genetic analysis; ~1000 turtles tagged in FSM
American Samoa longline fishery observer program	PIFSC, SWFSC	American Samoa	Incidentally-caught turtles	3 samples collected from turtles caught in fishery from 2006-2008
Various PIRO-supported green turtle conservation projects	PIFSC, Regional partners	CNMI, Guam, Palau, FSM, RMI, Palmyra, American Samoa	Nesting turtles	>100 samples opportunistically collected for genetic analysis for genetic analysis during project implementation

7.5.1.2 Hawksbill Sea Turtles

The hawksbill turtle (*Eretmochelys imbricata*) is listed as endangered under the ESA throughout its range. The primary global threat to hawksbills is habitat loss of coral reef communities. In the Pacific, the primary threat is the harvesting of the species for its meat, eggs, and shell, as well as the destruction of nesting habitat by human occupation and disruption (NMFS and USFWS 1998b). Along the eastern Pacific Rim, hawksbill turtles were common to abundant in the 1930s, but by the 1990s, the hawksbill turtle was rare to absent in most localities where it was once abundant (Cliffton et al. 1982).

Hawksbills are circumtropical in distribution, generally occurring from latitudes 30° N to 30° S within the Atlantic, Pacific, and Indian Oceans and associated bodies of water (NMFS and USFWS 1998b). Within the Central Pacific, nesting is widely distributed, though scattered and in very low numbers with the largest concentrations of nesting hawksbills in the Pacific occurring on remote oceanic islands of Australia and in the Indian Ocean. Foraging hawksbills have been reported from virtually all of the island groups of Oceania and from the Galapagos Islands in the eastern Pacific to the Republic of Palau in the western Pacific (Witzell 1983, Pritchard 1982a, b)[11].

Research indicates adult hawksbill turtles are capable of migrating long distances between nesting beaches and foraging areas, which are comparable to migrations of green and loggerhead turtles. Hawksbills have a unique diet comprised primarily of sponges (Meylan 1985, 1988). While data are somewhat limited on their diet in the Pacific, it is well documented that in the Caribbean hawksbill turtles are selective spongivores, preferring particular sponge species over others (Van Dam and Diez 1997). Foraging dive durations are often a function of turtle size, with larger turtles diving deeper and longer. As a hawksbill turtle grows from a juvenile to an adult, data suggest that the turtle switches foraging behaviors from pelagic surface feeding to benthic reef feeding (Limpus 1992). Within the Great Barrier Reef of Australia, hawksbills move from a pelagic existence to a "neritic" life on the reef at a minimum CCL of 35 centimeters. The maturing turtle establishes foraging territory and will remain in this territory until it is displaced (Limpus 1992). As with other sea turtles, hawksbills will make long reproductive migrations between foraging and nesting areas (Meylan 1999), but otherwise they remain within coastal reef habitats. In Australia, juvenile turtles outnumber adults 100:1. These populations are also sex-biased, with females outnumbering males approximately 2.5:1 (Limpus 1992).

Throughout the far western and southeastern Pacific, hawksbill turtles nest on the islands and mainland of southeast Asia, from China to Japan, and throughout the Philippines, Malaysia, Indonesia, Papua New Guinea, the Solomon Islands (McKeown 1977), and Australia (Limpus 1982). The largest nesting population of hawksbills appears to occur in Australia. Approximately 2,000 hawksbills nest on the northwest coast of Australia and about 6,000 to 8,000 off the Great Barrier Reef each year (Spotila 2004). Additionally, about 2,000 hawksbills nest each year in Indonesia and 1,000 in the Republic of Seychelles (Spotila 2004)[12].

Hawksbill Sea Turtles in American Samoa

Hawksbill turtles are known in Samoan as *laumei uga or laumei ulumanu*. Hawksbills are solitary nesters, and are most commonly found at Tutuila and the Manu'a Islands, and are also known to nest at Rose Atoll and Swains Island (Utzurrum 2002). These turtles could be occasionally poisonous -- in the late 1950s, people in Aunu'u got very sick after eating one. In October, 2007, a nest was found containing a total of 167 shells, of which there were 142 live baby turtles, four of which died, and 25 unhatched eggs were located. Students from the village of Amanave where the nest was found assisted and kept the hatchlings safe overnight until DMWR staff arrived the next morning when they all let the hatchlings free at Amanave Beach. DMWR believes it is the largest group of hawksbill hatchlings to have been found in American Samoa[13]. In the Samoan Islands (Samoa and American Samoa), it is estimated fewer than 30 hawksbills nest annually, and the nesting trends are declining (NMFS and USFWS 2007b).

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[11] From NMFS website at: http://www.nmfs.noaa.gov/pr/species/turtles/hawksbill.htm
[12] http://www.nmfs.noaa.gov/pr/species/turtles/hawksbill.htm
[13] From an article by Tina Mata' afa in the Samoa News. October 2007.

7.5.1.3 Olive Ridley Sea Turtles

Olive ridleys (*Lepidochelys olivacea*) lead a highly pelagic existence (Plotkin 1994). These sea turtles appear to forage throughout the eastern tropical Pacific Ocean, often in large groups, or flotillas. Olive ridleys generally have a tropical range; however, individuals do occasionally venture north, some as far as the Gulf of Alaska (Hodge and Wing 2000). The post-nesting migration routes of olive ridleys, tracked via satellite from Costa Rica, traversed thousands of kilometers of deep oceanic waters ranging from Mexico to Peru and more than 3,000 km out into the central Pacific (Plotkin 1994). Stranding records from 1990-1999 indicate that olive ridleys are rarely found off the coast of California, averaging 1.3 strandings annually (J. Cordaro, NMFS, pers. comm., 2004). At least one olive ridley was reported in Yap, Micronesia in 1973 (Falanruw et al. 1975).

The olive ridley turtle is omnivorous, and identified prey include a variety of benthic and pelagic prey items such as shrimp, jellyfish, crabs, snails, and fish, as well as algae and seagrass (Marquez 1990). It is also not unusual for olive ridley turtles in reasonably good health to be found entangled in scraps of net or other floating synthetic debris. Small crabs, barnacles, and other marine life often reside on debris and are likely to attract the turtles. Olive ridley turtles also forage at great depths; a turtle has been sighted foraging for crabs at a depth of 300 m (Landis 1965 *in* Eckert et al. 1986).

Olive Ridley Sea Turtles in American Samoa

Olive ridley turtles are uncommon in American Samoa, although there have been at least three sightings. A necropsy of one recovered dead olive ridley found that it was injured by a shark, and may have recently laid eggs, indicating that there may be a nesting beach in American Samoa (Utzurrum 2002).

7.5.1.4 Leatherback Sea Turtles

Leatherback turtles (*Dermochelys coriacea*) are widely distributed throughout the oceans of the world, and are found in waters of the Atlantic, Pacific, and Indian Oceans; the Caribbean Sea; and the Gulf of Mexico (Dutton et al. 1999). Increases in the number of nesting females have been noted at some sites in the Atlantic (Dutton et al. 1999), but these are far outweighed by local extinctions, especially of island populations, and the demise of once-large populations throughout the Pacific, such as in Malaysia (Chan and Liew 1996) and Mexico (Sarti et al. 1996; Spotila et al. 1996). In other leatherback nesting areas, such as PNG, Indonesia, and the Solomon Islands, there have been no systematic, consistent nesting surveys, so it is difficult to assess the status and trends of leatherback turtles at these beaches. In all areas where leatherback nesting has been documented, current nesting populations are reported by scientists, government officials, and local observers to be well below abundance levels of several decades ago. The collapse of these nesting populations was most likely precipitated by a tremendous overharvest of eggs coupled with incidental mortality from fishing (Sarti et al. 1996).

Leatherback turtles lead a mostly pelagic existence, foraging widely in temperate waters, except during the nesting season when gravid females return to tropical beaches to lay eggs. Males are rarely observed near nesting areas, and it has been proposed that mating most likely takes place outside of tropical waters, before females move to their nesting beaches (Eckert and Eckert 1988). Leatherbacks are highly migratory, exploiting convergence zones and upwelling areas in the open ocean, along continental margins, and in archipelagic waters (Eckert 1998). In a single year, a leatherback may swim more than 10,000 kilometers (Eckert 1998).

Satellite telemetry studies indicate that adult leatherback turtles follow bathymetric contours over their long pelagic migrations and typically feed on cnidarians (jellyfish and siphonophores) and tunicates (pyrosomas and salps), and their commensals, parasites, and prey (NMFS 1998). Females are believed to migrate long distances between foraging and breeding grounds, at intervals of typically two or four years (Spotila et al. 2000). In the western Pacific, nesting peaks on Jamursba-Medi Beach (Papua, Indonesia) from May to August, on War-Mon Beach (Papua) from November to January (Starbird and Suarez 1994), in peninsular Malaysia during June and July (Chan and Liew 1989), and in Queensland, Australia in December and January (Limpus and Reimer1994).

The Secretariat of the Pacific Community observer database also has records of one leatherback incidentally caught in purse seine fisheries within the central region of theWCPFC area from 1990 – 2004 (Molony 2005 in NMFS 2010) however, these data are not reliable in a quantitative sense because of low and variable observer coverage and inconsistent logsheet recording. The US purse seine fishery has an overlapping action area with that of the American Samoa longline fishery and is authorized to interact with 11 leatherbacks annually with no mortalities (NMFS 2006).

Leatherback Sea Turtles in American Samoa

In 1993, the crew of an American Samoa government vessel engaged in experimental longline fishing, pulled up a small, freshly dead leatherback turtle about 5.6 kilometers south of Swains Island (Grant 1994). This was the first leatherback turtle seen by the vessel's captain in 32 years of fishing in the waters of American Samoa.

7.5.1.5 Loggerhead Sea Turtles

The loggerhead turtle (*Caretta caretta*) is listed as threatened under the ESA throughout its range, primarily due to direct take, incidental interaction in various fisheries, and the alteration and destruction of its habitat. In the South Pacific, Limpus (1982) reported an estimated 3,000 loggerheads nesting annually in Queensland, Australia during the late 1970s. However, long-term trend data from Queensland indicate a 50 percent decline in nesting by 1988–89 due to incidental mortality of turtles in the coastal trawl fishery. This decline is corroborated by studies of breeding females at adjacent feeding grounds (Limpus and Reimer 1994). Currently, approximately 300 females nest annually in Queensland, mainly on offshore islands (Capricorn-Bunker Islands, Sandy Cape, Swains Head; Dobbs 2001). In southern Great Barrier Reef waters, nesting loggerheads have declined approximately 8 percent per year since the mid-1980s (Heron Island), while the foraging ground population has declined 3 percent and comprised less than 40 adults by 1992. Researchers attribute the declines to recruitment failure due to fox predation of eggs in the 1960s and mortality of pelagic juveniles from incidental interaction in longline fisheries since the 1970s (Chaloupka and Limpus 2001).

Until recently, loggerhead sea turtles were listed under the ESA as a global populations. However a status review conducted by Conant eta al (2009) reconnedbed that Pacific loggerhead populations be split into discreet population segment (DPS) for North Pacific and South Pacific loggerhead populations. The final rule implementing this change was published on March 22, 2011.

Loggerhead Sea Turtles in American Samoa
There are no known reports of loggerhead turtles in waters around American Samoa (Tuato'o-Bartley et al. 1993).

7.5.2 Threatened and Endangered Marine Mammals

Cetaceans listed as threatened or endangered under the ESA and that have been observed in the waters around American Samoa include the humpback whale (*Megaptera novaeangliae*), sperm whale (*Physeter macrocephalus*), and sei whale (*Balaenoptera borealis*). To date, no humpback, sperm, blue, fin or sei whale interactions have been observed or reported in the American Samoa longline fishery.

7.5.2.1 Humpback Whales

The humpback whale is known in Samoan as *tafola*. These whales can attain lengths of 16 meters and winter in nearshore waters of usually 100 fathoms or less. Mature females are believed to conceive on the breeding grounds one winter and give birth the following winter. At least six well-defined breeding stocks of humpback whales occur in the Southern Hemisphere. Humpbacks arrive in American Samoa from the south as early as July and stay until as late as December (Reeves et al. 1999). They are most common around Samoa during September and October. They occur in small groups of adults or in mother-calf pairs. Humpbacks have been sighted around all seven of the islands in American Samoa, but it is unknown how many spend time in the area or the population size of this stock.

The appearance of humpbacks around American Samoa is an important segment of their migration north and south in the South Pacific Ocean[14]. During the warm months of the southern hemisphere, they feed in Antarctica's waters, about 3,200 miles to the south. When Antarctic's winter sets in, these whales seek warmer waters by migrating northward, with some going towards Australia and others migrating towards Tonga. According to the Natural History Guide to the National Park of American Samoa most of this latter group remains near Tonga, but at least some migrate onward to Samoa. One whale seen in Samoan waters was sighted near Tahiti, so their migration patterns are not entirely predictable.[15]

7.5.2.2 Sperm Whales

The sperm whale is the most easily recognizable whale with a darkish gray-brown body and a wrinkled appearance. The head of the sperm whale is very large, making up to 40 percent of its

[14] See http://www.nps.gov/archive/npsa/5Atlas/parts.htm#top
[15] Ibid

total body length. The current average size for male sperm whales is about 15 meters, with females reaching up to 12 meters.

Sperm whales are found in tropical to polar waters throughout the world (Rice 1989). They are among the most abundant large cetaceans in the region. Historical observations of sperm whales around Samoa occurred in all months except February and March (Reeves et al. 1999). Sperm whales are occasionally seen seaward of Fagatele Bay Sanctuary[16].

The world population of sperm whales had been estimated to be approximately two million. However, the methods used to make this estimate are in dispute, and there is considerable uncertainty over the remaining number of sperm whales. The world population is at least in the hundreds of thousands, if not millions.

7.5.2.3 Sei Whales

Sei whales are members of the baleen whale family. There are two subspecies of sei whales recognized, *B. b. borealis* in the Northern Hemisphere and *B. B. schlegellii* in the Southern Hemisphere. They can reach lengths of about 40-60 ft (12-18 m) and weigh 100,000 lbs (45,000 kg). Sei whales have a long, sleek body that is dark bluish-gray to black in color and pale underneath. The body is often covered in oval-shaped scars (probably caused from cookie-cutter shark and lamprey bites) and sometimes has some mottling, i.e., has spots or blotches of different color or shades of color[17].

Sei whales have a worldwide distribution but are found mainly in cold temperate to subpolar latitudes rather than in the tropics or near the poles (Horwood 1987). They are distributed far out to sea and do not appear to be associated with coastal features. Two sei whales were tagged in the vicinity of the Northern Mariana Islands (Reeves et al. 1999). The International Whaling Commission considers there to be one stock of sei whales in the North Pacific, but some evidence exists for multiple populations (Forney et al. 2000). In the southern Pacific most observations have been south of 30° (Reeves et al. 1999).

7.5.2.4 Fin Whales

Fin whales (*Balaenoptera physalus*) are found throughout all oceans and seas of the world from tropical to polar latitudes (Forney et al. 2000). Although it is generally believed that fin whales make poleward feeding migrations in summer and move toward the equator in winter, few actual observations of fin whales in tropical and subtropical waters have been documented, particularly in the Pacific Ocean away from continental coasts (Reeves et al. 1999).

7.5.2.5 Blue Whales

The blue whale (*Balaenoptera musculus*) is the largest animal ever known to have lived. The International Whaling Commission recognizes only one stock of blue whales in the North Pacific

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[16] See http://sanctuaries.noaa.gov/science/condition/fbnms/history.html
[17] From: http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/seiwhale.htm

(eastern North Pacific stock), but some evidence suggests that there may be as many as five separate stocks (Carretta et al. 2007). Blue whales are listed as endangered under the ESA. Increasing levels of anthropogenic noise in the world's oceans has been suggested to be a habitat concern for blue whales (Reeves et al. 1998). No estimate of abundance is available for the western Pacific blue whale stock.

7.5.3 Other Marine Mammals

Other marine mammals that occur in the Western Pacific region and have been recorded as being sighted or probable in waters between 20 and 40 deg S, the likeliest fishing grounds for shallow-set swordfish targeting vessels from American Samoa, are shown Table 23

Table 22. Cetacean species occurring between 20-40^{o} S:
Source: Erin Oleson, NMFS PIFSC (pers. comm.)

Common name	**Species name**
Southern right whale*	*Eubalaena australis*
Pygmy right whale*	*Caperea marginata*
Humpback whale	*Megaptera novaeangliae*
Dwarf minke whale	*Balænoptera acuto-rostrata*
Antarctic minke whale	*Balaenoptera bonaerensis*
Bryde's whale	*Balaenoptera edeni*
Sei whale	*Balaenoptera borealis*
Fin whale	*Balaenoptera physalus*
Blue whale	*Balaenoptera musculus*
Sperm whale†	*Physeter macrocephalus*
Kogia sp.	*Physeteroidea*
Cuvier's beaked whale	*Ziphius cavirostris*
Arnoux's beaked whale*	*Berardius arnuxii*
Hector's beaked whale	*Mesoplodon hectori*
Ginko-toothed beaked whale	*Mesoplodon ginkgodens)*
Strap-toothed beaked whale*	*Mesoplodon layardii*
Blainville's beaked whale	*Mesoplodon densirostris*
Rough-toothed dolphin*†	*Steno bredanensis*
Bottlenose dolphin	*Tursiops spp*
Pantropical spotted dolphin*	*Stenella attenuata*
Spinner dolphin*	*Stenella longirostris*
Striped dolphin	*Stenella coeruleoalba*
Fraser's dolphin*	*Lagenodelphis hosei*
Southern right whale dolphin*	*Lissodelphis peronii*
Risso's dolphin†	*Grampus griseus*
Melon-headed whale*	*Peponocephala electra*

Common name	Species name
Pygmy killer whale*	*Feresa attenuata*
False killer whale*†	*Pseudorca crassidens*
Killer whale†	*Orcinus orca*
Long-finned pilot whale*†	*Globicephala melas*
Short-finned pilot whale†	*Globicephala macrorhynchus*

* Partial range overlap with region of proposed shallow-set fishery
† Known to interact with (i.e. depredate) pelagic longline fisheries

7.5.4 ESA-listed Seabirds

Newell's Shearwater[18]

Newell's shearwater (*Puffinus auricularis newelli*) is listed as threatened under the Endangered Species Act. The Newell's shearwater, generally known with other shearwaters and petrels as ta`i`o in Samoan, has been identified as a 'seabird visitor' to Tutuila by the National Park Service (NPS) . The status given by the NPS is based on one documented case of a single bird. On January 26, 1993, a female Newell's shearwater was found alive but injured in a banana plantation near Pavaiai, Tutuila. The bird was in an emaciated condition and lacked any fat. It weighed only 291 g, well below the range of 353-439 g (n = 11) given by King and Gould (1967 in Grant et al. 1994) and may indicate that something was wrong with this bird. King and Gould (1967 in Grant et al. 1994) recorded a Newell's shearwater 34.5 nm south of the equator near Baker Island. The 1994 specimen is only the second recorded occurrence of this species in the Southern Hemisphere. Local biologists have not documented any other Newell's shearwater in American Samoa (J. Seamon, NPS, pers. comm. Nov. 2009). In addition, a recent publication prepared for the WCPFC 2009 Scientific Committee meeting presents distribution maps of seabirds in the WCPO and shows this seabird's distribution as being north of American Samoa (Waugh et al. 2009). Therefore, Newell's shearwater is very rare in the archipelago and should be considered an accidental visitor to American Samoa.

They are difficult to identify at sea, especially from other Manx-type shearwaters. The species is characterized by mostly dark plumage dorsally, mostly white plumage ventrally, including white central proximal under-tail coverts (as opposed to black), long, thin wings, and a black bill. (Ainley et al. 1997, USFWS 1983). They are notably present from about 18° to 25° N and from about 160° to 120° W (Ainley et al. 1997) and have been associated with the North Equatorial Counter Current (NECC) directly south of Hawaii, and from about 160° to 120° W with occasional sighting throughout the tropical Pacific (USFWS 1983; Spear et al. 1995; Ainley et al. 1997; N. Holmes, KESRP, pers. comm. June 2009).

The Newell's shearwater breeds only in colonies on the main Hawaiian Islands, especially Kauai, from April to October-November (Sincock and Swedberg 1969 in Grant et al. 1994). It is threatened by urban development and introduced predators like rats, cats, dogs, and mongooses

[18] The USFWS is the primary federal agency with authority and responsibility to manage ESA listed seabirds.

(Ainley et al. 1997). The Newell's shearwater has been listed as threatened because of its small population, approximately 14,600 breeding pairs, its isolated breeding colonies, and the numerous hazards affecting them at their breeding colonies (Ainley et al. 1997).

Petrel (*Pterodroma*) Species
In addition to the Newell's shearwater, three other seabirds were determined to be endangered under the ESA in 2009 that occur in the South Pacific, including the Chatham petrel (*Pterodroma axillaris*), Fiji petrel (*Pseudobulweria macgillivrayi*), and the magenta petrel (*Pterodroma magentae*) (74 FR 46914; Sep. 14, 2009). According to the final rule for these listings, factors affecting some or all of these birds include: breeding habitat degradation (magenta petrel), predation by introduced species, inadequacy of existing regulatory mechanisms, and other natural or manmade factors, such as small population size and restricted breeding range.

According to NMFS (Mecum, in litt. 2008) and BirdLife International (Small, in litt. 2008), the main seabirds killed in longline fisheries are albatrosses and other species of petrels (not *Pterodroma* species). The characteristics of a petrel species vulnerable to longline fishing (a seabird that is aggressive and good at seizing prey (or baited hooks) at the water's surface, or is a proficient diver) do not describe these three species. Threats other than fishing are mentioned as significant threats to the Chatham petrel, Fiji petrel, and magenta petrel. Waugh et al. (2009) illustrate the entire assumed range of these species within their annual cycles.

BirdLife International estimates the range of the Chatham petrel to be 168,300 mi^2 (436,000 km^2) and the species is currently only known to breed on South East Island in the Chatham Islands, New Zealand. During the non-breeding season, birds migrate far from their breeding range, where they remain at sea until returning to breed from November to June. It is believed that the species migrates to the North Pacific Ocean in the non-breeding season, based on the habits of closely related species; however, no sightings have been recorded in the Northern Hemisphere.

The range of the Fiji petrel is estimated to be 59,460 mi^2 (154,000 km2). During the non-breeding season, birds migrate far from their breeding range, where they remain at sea until returning to breed. The Fiji petrel's range at sea is poorly known; the species has been recorded once at sea near Gau Island and once at sea 124.3 mi (200 km) north of Gau Island. Its current breeding range, which according to the best available information is limited to Gau Island, where an estimated 27 mi^2 (70 km^2) of potential breeding habitat is available. However, based on what is known about the species, this is considered a relatively small amount of appropriate habitat for breeding.

The range of the magenta petrel is estimated to be 7,568,000 mi^2 (1,960,000 km^2) and changes intra-annually based on an established breeding cycle. During the non-breeding season, birds migrate far from their breeding range where they remain at sea until returning to breed (September to May). The magenta petrel's range at sea is poorly known; however, research has documented foraging behavior south and east of the Chatham Islands. In addition, because the original specimen of this species was shot at sea eastwards in the temperate South Pacific Ocean, it is believed birds disperse there during the non-breeding season. The magenta petrel breeds exclusively on Chatham Island, New Zealand, within relatively undisturbed inland forests.

None of these species are assumed to range within several hundred nautical miles of the EEZ around American Samoa and even farther in the cases of the Chatham and magenta petrels.

7.5.5 Other Seabirds

Other seabirds not listed under the ESA found in American Samoa are listed in Table 23.

Table 23: Seabirds Occurring in American Samoa.

Residents (i.e., breeding)		
Samoan name	**English name**	***Scientific name***
ta'i'o	Wedge-tailed shearwater	*Puffinus pacificus*
ta'i'o	Audubon’s shearwater	*Puffinus lherminieri*
ta'i'o	Christmas shearwater	*Puffinus nativitatis*
ta'i'o	Tahiti petrel	*Pterodroma rostrata*
ta'i'o	Herald petrel	*Pterodroma heraldica*
ta'i'o	Collared petrel	*Pterodroma brevipes*
fua'o	Red-footed booby	*Sula sula*
fua'o	Brown booby	*Sula leucogaster*
fua'o	Masked booby	*Sula dactylatra*
tava'esina	White-tailed tropicbird	*Phaethon lepturus*
tava'e'ula	Red-tailed tropicbird	*Phaethon rubricauda*
atafa	Great frigatebird	*Fregata minor*
atafa	Lesser frigatebird	*Fregata ariel*
gogouli	Sooty tern	*Sterna fuscata*
gogo	Brown noddy	*Anous stolidus*
gogo	Black noddy	*Anous minutus*
laia	Blue-gray noddy	*Procelsterna cerulea*
manu sina	Common fairy-tern (white tern)	*Gygis alba*
Visitors/vagrants		
ta'i'o	Short-tailed shearwater	*Puffinus tenuirostris*
ta'i'o	Mottled petrel	*Pterodroma inexpectata*
ta'i'o	Phoenix petrel	*Pterodroma alba*
ta'i'o	White-bellied storm petrel	*Fregetta grallaria*
ta'i'o	Polynesian storm petrel	*Nesofregetta fuliginosa*
-----	Laughing gull	*Larus atricilla*
gogosina	Black-naped tern	*Sterna sumatrana*

Source: WPRFMC 2003 (updated in 2009).

Filippi et al (2010) consider a total of 67 seabird species in their analyses of species at risk from longline fishing in the Western and Central Pacific, but note that the greatest species diversity occurs around New Zealand, Tasmania and eastern Australia. The diversity of sea bird species in the high seas to the south of American Samoa, where potentially Pago Pago-based longline vessels would target swordfish, suggests that between 15-25 seabirds are found in that location and may interact with longliners.

8.0 Impacts of the Alternatives

In conducting an analysis of the alternatives, the limited and confidential nature of the catch data for swordfish sets made by the American Samoa longline fleet means that evaluating impacts must rely on information from other fleets targeting South Pacific swordfish. These include longliners from Spain, New Zealand, Australia, New Caledonia, and fishing by Japanese and Taiwanese longliners south of the equator. This is far from ideal since the fleet operations, gear configurations and targeting by these fleets in not well described. Based on catch composition, the Spanish vessels may be fishing in a comparable manner to US swordfish longliners targeting swordfish .

8.1 Alternative 1: No action

8.1.1 Impacts on Target and Non-target Stocks

Under the No Action alternative there would be no additional impacts to target and non target stocks.

The PFEP Amendment 5 allows the retention of up to 10 swordfish per trip; more than is typically caught on a deep-set trip. The No Action alternative would continue to permit the retention of up to ten swordfish but would not allow specific targeting of swordfish by American Samoa longline vessels by the use of shallow sets. Impacts to stocks typically caught by the American Samoa longline fleet, i.e. albacore, other tunas, mahimahi, wahoo etc (Table 24) would not alter appreciably apart from the volume of fishing by the American Samoa longline fleet. The fleet size has typically comprised between 25 to 30 vessels, but in in the first quarter of 2011only 19 vessels were operating, and 22 in the second quarter (NMFS PIFSC 2011 a & b).

Table 24. American Samoa 2009 Estimated Total Landings by Pelagic Species by Gear

Species	Longline Pounds	Longline Value($)	Longline Price/LB	Troll/Non-Longline Pounds	Troll/Non-Longline Value($)	Troll/Non-Longline Price/LB
Skipjack tuna	341,829	$206,410	$0.60	2,379	$4,219	$1.77
Albacore tuna	8,604,024	$8,616,157	$1.00	0	$0	
Yellowfin tuna	853,036	$796,992	$0.93	2,560	$7,304	$2.85
Bigeye tuna	320,576	$378,821	$1.18	0	$0	
TUNAS SUBTOTALS	10,119,465	$9,998,380	$0.99	4,939	$11,523	$2.33
Mahimahi	24,417	$57,271	$2.35	171	$445	$2.61
Black marlin	187	$168	$0.90	0	$0	
Blue marlin	55,556	$52,778	$0.95	0	$0	
Striped marlin	1,785	$1,964	$1.10	0	$0	
Wahoo	299,404	$181,105	$0.60	0	$0	
Sharks (all)	0	$0		68	$34	$0.50
Swordfish	18,843	$40,996	$2.18	0	$0	
Sailfish	1,751	$4,359	$2.49	0	$0	
Spearfish	953	$1,096	$1.15	0	$0	
Moonfish	4,863	$7,294	$1.50	80	$120	$1.50
Oilfish	4,549	$4,549	$1.00	0	$0	
Pomfret	1,019	$2,293	$2.25	0	$0	
NON-TUNA PMUS SUBTOTALS	413,328	$353,875	$0.86	318	$599	$1.88
Barracudas	192	$516	$2.68	3,750	$10,012	$2.67
Rainbow runner	48	$128	$2.65	219	$581	$2.65
Dogtooth tuna	0	$0		641	$1,700	$2.65
OTHER PELAGICS SUBTOTALS	241	$644	$2.68	4,609	$12,293	$2.67
TOTAL PELAGICS	**10,533,034**	**$10,352,899**	**$0.98**	**9,867**	**$24,415**	**$2.47**

8.1.2 Impacts on Protected Species

Sea turtles

Under the no-action alternative the American Samoa longline fishery would continue operating under the regulations implemented in September 2011 requiring all hooks to be set at depths greater than 100m (WPRFMC 2011). The reason for implementing this regulation was the interaction between the American Samoa longline fleet and green sea turtles, most of which were killed when caught by longliners. A summary of the interactions and mortalities is given in the 2010 Biological Opinion (BiOp).From 2006 through 2009, the NMFS American Samoa Observer Program monitored 1,382 sets and 4,124,717 hooks, and documented eight green sea turtle interactions all resulting in mortalities (PIRO Observer Program Annual Reports). Direct extrapolation of the total number of hooks observed in the fishery during this period to the observed rate of sea turtle interactions would result in an estimate of approximately 31 interactions per year, with a range from zero to 36.

The current incidental take statement in the 2010 BiOp (NMFS 2010c) is shown below in Table 25

Table 25 The number of turtle interactions expected in the American Samoa longline fishery as a result of the proposed action

Species	Interactions	Mortalities	Adult female equivalents
Green turtles	45 every 3 years	41 every 3 years	10 every 3 years
Hawksbill turtles	1 every 3 years	1 every 3 years	1 every 3 years
Leatherback turtles	1 every 3 years	1 every 3 years	1 every 3 years
Olive ridley turtles	1 every 3 years	1 every 3 years	1 every 3 years

In 2010, there were observer interactions with 6 green sea turtles which were all retrieved dead. Between 2010 and 2011, the observer coverage increased and averaged 255 in 2010, and 43% in 2011. In 2011, observer coverage exceeded 40% of trips and as a consequence a larger number of turtle interactions was observed. By November of 2011, a total of 11 turtle interactions had been recorded with 8 green turtles, 2 leatherbacks and one olive ridley comprising the captured turtles. One of each species was returned alive and injured, while all other turtles were retrieved dead.

If the fishery interactions with green sea turtles exceed the anticipated take authorized by the NMFS 2010 BiOp, this will trigger a re-consultation under ESA, to determine the reasons why the anticipated take has been exceeded. A new BiOp may be issued containing a revised anticipated take and jeopardy finding. If it is concluded that the proposed action discussed in this amendment has failed to maintain the take rate at non-jeopardy levels then additional reasonable and prudent measures may need to be implemented for the fishery.

Loggerheads are unlikely to be captured in the regular American Samoa longline fishery because: (1) they are exceptionally rare in the areas fishing for albacore - there are no confirmed sightings despite their distinct appearance and tendency to remain at or near the surface, and there are no reports of bycatch in any American Samoa deep set longline fishery; and (2) loggerheads rarely dive deeper than 40 m, whereas the longline fishery operates at deeper depths. Thus, it was considered unlikely that this species will be hooked or entangled by the fishery. However, if shallow-set longline fishing was permitted and this occurred at higher latitudes on the high seas as described earlier, then there may ne a greater potential for interactions with loggerhead turtles.

Seabirds

American Samoa-based observers report seabird sightings limited to one or two birds at time. Seabirds sighted so far have included shearwaters (not Newell's), juvenile red-footed boobies, frigatebirds, tropicbirds, terns, and noddies (S. Kostelnik, American Samoa Observer Program, pers. comm. November 30, 2010). Since observers were regularly deployed in April 2006, there has been only one unidentified shearwater (not Newell's) interaction observed in 2007. This is expected as typically longline-seabird interactions are minimal in tropical latitudes, being more or less restricted to higher sub-tropical and temperate latitudes (Molony 2005). It is difficult to accurately extrapolate across the entire fleet with five years of data from relatively low coverage levels, four of which reported zero interactions. Alternative 1 would continue the fishery without change, and therefore, impacts to seabirds are expected to remain minimal and not anticipated to increase under this alternative. It is assumed that because the American Samoa longline observer data have recorded no sightings of or interactions with the Newell's shearwater, Chatham petrel, Fiji petrel, or magenta petrel, and their assumed ranges are well outside the EEZ around American Samoa, there will be insignificant or discountable effects on these ESA- listed seabird species under the alternative 1.

Marine Mammals
From observed trips from April 2006 through 2010, a total of five marine mammal interactions (two false killer whales, three rough-toothed dolphin) were observed in 2008 and 2010; the remaining years had zero observed interactions. It is difficult to accurately extrapolate interactions across the entire fleet with data from several years of relatively low coverage levels (and higher levels in 2010 notwithstanding), four of which had zero interactions. Under Alternative 1, the fishery would continue to operate without changes and would likely have occasional interactions with marine mammals but not affect marine mammals in any manner not previously considered or authorized by the commercial fishing incidental take authorization under section 118 of the MMPA.

8.1.3 Impacts on Marine Habitat

The no-action alternative would not be expected to impact marine habitat as it would be a continuation of the American Samoa longline fishery as it currently operates. Longline fishing occurs in pelagic waters within the upper portion of the water column and is not known to have any documented impacts on habitat during fishing operations. However, despite all efforts by fishermen to prevent it, gear loss does occur in longline fisheries and has the potential to impact reefs and other habitats by accumulating as marine debris. The current level of gear loss, and impact to the environment is not known, but it is not believed to be substantial in the American Samoa longline fishery, because the lines are attached to floats and can and are retrieved. Also, Federal fishery logbooks enable fishermen to report the number of hooks lost per fishing set.

All longliners lose hooks while fishing. Based on unpublished data from NMFS PIFSC, an average of 38,426 hooks (range: 14,215-49,370) were lost annually between 2001 and 2009 within the action area (), or an average of about 7.3 hooks per set. Lost hooks are unlikely to have a major impact to the physical marine environment being composed of steel. Depending on quality, the hooks will corrode, although hooks on the deep sea bed in water just above freezing will corrode more slowly, and stainless steel hooks will corrode at a slower rate than non-stainless steel hooks.

8.1.4 Impacts on Fishery Participants and Fishing Communities

The American Samoa longline fishery would be unable to immediately target South Pacific swordfish were interest to develop in such a fishery and circumstances to change such that swordfish could be marketed and transported economically from Pago Pago. Moreover, under current regulations longline vessels may retain up to ten swordfish per trip. It may be argued that Foregoing an opportunity to fish for swordfish would likely not achieve optimum yield (OY) for this fishery, but prior 2011, there had been little interest in developing a swordfish fishery in American Samoa. Apart from the actual catching of swordfish, American Samoa lacks the infrastructure and airline connections that are essential to developing a fresh swordfish fishery with markets in the US or elsewhere.

This also applies to other commercially marketable species currently caught by the albacore longline fishery that are under-utilized. However, the advent of the Samoa Tuna Processors facility and its fresh and frozen fish to overseas markets may be part of the solution to developing a swordfish fishery Further, as noted previously, there are other mechanisms under the MSA by which a swordfish fishery could be established, such as a Community Development Program or an Exempted Fishing Permit, which would allow for the development of a swordfish fishery while the FEP was being amended.

8.1.5 Impacts on Biodiversity and Ecosystem Function

None of the alternatives are expected to adversely impact biodiversity or ecosystem function. The longline fishery around American Samoa targets primarily albacore tuna to supply the cannery. The removal of top predators such as tunas likely has some ecosystem impacts, however, there is no indication of negative ecological impacts from this fishery. At this time the stock assessment of the South Pacific albacore stock indicate it to be sustainable, as described in Section 7.4.1. Similarly, although swordfish catches have increased within the South Pacific and in the WCPFC-CA there is no indication that these are unsustainable. However, Kolkody et al (2006) indicate the uncertainty associated with a stock assessment on the southwest Pacific segment of the South Pacific swordfish stock.

8.1.6 Impacts on Enforcement and Administration

Under the No Action alternative there would be no additional enforcement and monitoring costs. Maintaining a shallow-set fishery only would incur additional monitoring and enforcement burdens, but NMFS has experience of managing a deep and shallow set longline fishery in the North Pacific.

8.1.7 Impacts on Public Health and Safety

Under the No Action Alternative there would be no additional impacts to public health and safety.

Typically the American Samoa longline fleet operates in predominantly equatorial latitudes. Near the equator is a region called the inter-tropical convergence where the trade winds of both hemispheres meet. It is known for its extremely low pressure, frequent thunderstorms, and very calm wind. At about 30 degrees latitude is a high pressure area where the trade winds and westerly winds diverge and go toward the equator and pole, respectively. Further, swordfish fishing operations set at night and haul in the day, as opposed to daytime setting and nighttime hauling of tuna sets, which may incur some health and safety issues for fishermen.

8.2 Alternative 2: Permit the use of shallow-set longline fishing to target swordfish without any sea turtle or seabird mitigation measures.

8.2.1 Impacts on Target and Non-target Stocks

Compared to the No Action Alternative, there would be a higher swordfish catch, with swordfish comprising the majority of the retained PMUS. Other species that would comprise the balance of the catch include other billfish albacore, bigeye tuna, yellowfin tuna, skipjack, mahimahi, opah and wahoo. There is no indication that any of these species are being exploited unsustainably in the WCPFC-CA south of the equator, other than bigeye tuna for which the most recent stock assessment indicates that overfishing is occurring, and that biomass may be lower than biomass at MSY. Catches of bigeye by American Samoa targeting swordfish would be relatively minor, based on the limited volume of fishing activity, and amount to less than 10% of the catch.

The Spanish longline fleet is probably the fleet that would most resemble American Samoa longliners targeting swordfish, since its principal target is swordfish and it fishes in the same latitudes as those fished by American Samoa vessels making swordfish sets. The Spanish fleet has ranged from a low of 5 vessels in 2010 to a high of 17 vessels in 2007. This fleet operates between 25 and 40 degrees S, fishing to the northeast of New Zealand and south of French Polynesia. Catches have ranged from annual totals of about 1800 mt to nearly 10,000 mt. The Spanish fleet also has a high shark incidental catch, most of which is retained. Swordfish made up nearly 50% of the catch in 2010, with sharks comprising almost all the remaining catch (46%) with minor contributions from other pelagic fishes such as tunas, escolar and mahimahi. It is likely, based on the limited data from the American Samoa fishery that directed swordfish catches by this fleet would have a similar species composition.

Of the shark catch, about 76% was formed by blue shark in 2010. The stock status of blue shark in the South Pacific is currently unknown but Clarke (2011) indicated that In the southern hemisphere, catch rate trends declined until 2003 and then increased to mid 1990s levels. Trends in median sizes were decreasing in some areas but increasing in others.

The Cook Islands, French Polynesian and New Caledonian longline fisheries are similar in characteristics to the American Samoa deep set fishery targeting albacore. In the Cook Islands fishery, albacore forms about 75% of the catch with swordfish making up only 1.4% of landings, and with balance of the catch comprised mainly of yellowfin tuna, bigeye tuna, skipjack and wahoo. Most of this catch comes from within the Cook Islands EEZ. The French Polynesian and New Caledonia longline fleets are both similar to the American Samoa longline fleet, catching predominantly albacore, between 60-65% of catches, and with the principal incidentally caught species including yellowfin and bigeye tunas, and swordfish comprising 1.35% of catches in the French Polynesian fishery, and 0.5% in New Caledonia.

The Australian and New Zealand longline fleets appear to be similar to an element of the Hawaii fleet which no longer operates, known as the ‘mixed’ longline fishery. This fishery operated to maximize catches of both swordfish and tunas, and was primarily an element of the swordfish fishery that fished at intermediate depths between deep (> 100 m) and shallow (<30 m). After 1999, this element of the fleet was forced through litigation driven management changes to fish deep for bigeye tuna and, when able to fish for swordfish after 2004, had to either choose between shallow setting for swordfish or deep setting for bigeye.

The Australian longline fishery targets swordfish and tunas, with swordfish comprising about 22% of the landed catch, with balance formed primarily of albacore, yellowfin and bigeye tunas. The principle bycatch species are sharks which form about 70% of the discards, and are comprised mainly of blue sharks, with smaller contributions to the bycatch from makos, threshers and oceanic white-tips. The New Zealand longline fishery, operates in sub-tropical and temperate waters, and also targets tunas and swordfish, with swordfish forming about 13% of the landed total and the principal catches comprising southern bluefin, bigeye albacore tunas. Of the bycatch species in the longline fishery, about 43% is comprised of blue shark, with lancet fish comprising a further 21% of the bycatch and pelagic rays 15%. The remaining bycatch species include a mix of other sharks tunas and miscellaneous pelagic species.

Taiwan's large scale tuna longliners and small scale tuna longliners fleet catch reports in their national country report to the WCPFC Science Committee do not distinguish between north and south of the equator in the WCPFC-CA, only catches of swordfish from below 20 deg S. The total swordfish catch south of the equator in 2010 was 1,014 mt (Peter Williams SPC-OFP pers comm.) or about 25% of the total swordfish catch in the WCPFC-CA. In the large scale tuna longliners fishery, the predominant species in the catch is bigeye tuna, followed by albacore, yellowfin tunas and sword fish (approx 5%). In the small scale tuna longliners fishery, yellowfin, bigeye and albacore dominate the catches, with swordfish forming about 9% of catches. It should be remembered that these are catches from north and south of the equator in the WCPFC-CA. As noted above, 1014 mt of swordfish was caught south of the equator in 2010, and of this, 103 mt or about 10% of the catch was taken below 20 deg S.
Little information is available on non-target and bycatch by the Taiwanese fleet, although the incidental shark catch is reported. For the large scale tuna longliners and small scale tuna longliners fisheries combined about 20% of the total catch volume is blue shark, most of which, about 64% of the shark catch, is comprised of blue sharks, with silky, mako and other sharks forming the balance.

The Japanese distant water and offshore longline vessels operate both north and south of the equator in the WCPFC-CA, but only selected species are reported from the WCPFC-CA south of the equator. Swordfish form about 14% of the total catch from the distant water and offshore longline vessels, with most of the remainder of the catch comprising bigeye, yellowfin and albacore tuna. Catches of swordfish from south of the equator in the WCPFC-CA averaged about 450 mt or about 9% of an annual average of 5000 mt from the convention area.

8.2.2 Impacts on Protected Species

Under this alternative no domestic measures would be implemented to minimize interactions between shallow set longline gear targeting swordfish by the American Samoa longline vessels. However, each year, owners and operators of longline vessels registered to an American Samoa limited access longline permit must attend and be certified in a Protected Species Workshop

(PSW) conducted by PIRO on identification, mitigation, handling, and release techniques for sea turtles, seabirds and marine mammals.

- The PSW is offered in person and, if available, online.
- NMFS PIRO will issue a PSW certificate, valid for one year. The certificate can be renewed before it expires.
- The owner of an American Samoa longline vessel must maintain and have on file a valid PSW certificate to maintain or renew their permit.
- The captain must have a valid PSW certificate (or a readable copy) in his/her name, on board the vessel.
- Owners and captains who have never been certified must attend a classroom first before taking the online course, if available. After the initial classroom session, owners may take the online course indefinitely. Captains may take the online course two years in a row before being required to re-take the classroom course, as a review, to show they understand protected species handling techniques. In other words, captains must attend a classroom workshop every three years.

Moreover, all longline vessels fishing within the WCPFC-CA which are members or cooperating non-members of the WCPFC are required to under Conservation and Management Measure 2007-04 to require their longline vessels to use at least two of the mitigation measures in Table 26, including at least one from Column A in areas south of 30 degrees South and north of 23 degrees North.

Table 26. Mitigation measures required for all longline vessels fishing within the WCPFC-CA be south of 30 degrees South and north of 23 degrees North

Column A	Column B
Side setting with a bird curtain and weighted branch lines	*Tori line*
Night setting with minimum deck lighting	*Weighted branch lines*
Tori line	*Blue-dyed bait*
Weighted branch lines	*Deep setting line shooter*
	Underwater setting chute

Similarly, all longline vessels fishing within the WCPFC-CA which are members and cooperating non-members of the WCPFC are required to under Conservation and Management Measure 2008-03 shall ensure that the operators of all such longline vessels carry and use line cutters and de-hookers to handle and promptly release sea turtles caught or entangled, and that they do so in accordance with WCPFC guidelines that. Further members or cooperating non-members shall also ensure that operators of such vessels are, where appropriate, required to carry and use dip-nets in accordance with WCPFC guidelines.

Moreover from 1 January 2010 onwards, members and cooperating non-members with longline vessels that fish for swordfish in a shallow set manner (where majority of hooks fish at a depth shallower than 100 meters) shall:

a) Ensure that the operators of such vessels, while in the Convention Area, are required to employ or implement at least one of the following three methods to mitigate the capture of sea turtles:
    i. Use only large circle hooks, which are fishing hooks that are generally circular or oval in shape and originally designed and manufactured so that the point is turned perpendicularly back to the shank. These hooks shall have an offset not to exceed 10 degrees.
    ii. Use only whole finfish for bait.
    iii. Use any other measure, mitigation plan2 or activity that has been reviewed by the Scientific Committee (SC) and the Technical and Compliance Committee (TCC)

These requirements of need not be applied to those shallow-set swordfish longline fisheries determined by the Science C, based on information provided by the relevant CCM, to have minimal observed interaction rates of sea turtles over a three-year period and a level of observer coverage of at least 10% during each of those three years.

As such, any American Samoa longline vessel making shallow sets would be required to employ 'large' circle hooks and fish bait, and observe the other requirement of CCM 2008-03, and if fishing below 30 deg S the requirements of CMM 2007-04. None of the limited number of trips by the American Samoa longline fleet targeting swordfish carried an observer so interactions with turtles, seabirds or marine mammals are unknown. Shallow set longline fishing at higher latitudes may interact with other sea turtle species, especially loggerhead turtles which migrate from nesting beaches in Australia across the pacific to foraging grounds in South America. The implementation of large circle hooks (18/0) and mackerel-like fish bait combinations in Hawaii have greatly reduced sea turtle interactions with all species of turtle while allowing a successful swordfish fishery (Gilman et al 2007).

Limited observer data for the Spanish longline fleet in 2010 recorded no interactions with sea turtles and a very low interaction rate with seabirds (0.025 seabirds/1000 hooks). The Cook Islands reports no interactions with seabirds or marine mammals but there are indications that there are some interactions with sea turtles, although the observer coverage rate is not known. In 2009, there was a report of a hawksbill turtle was hooked in the mouth, and one leatherback was entangled in the line. Both animals were released alive by a fisheries observer. Although no marine mammal interactions are reported for the Cook Islands fishery there are reports of whale depredation of the catch in the northern part of the EEZ by are common but more prominent in the northern fishery, and short finned pilot whales.

No interactions with seabirds or sea turtles have been reported for the French Polynesian longline fishery with a 6.5% observer coverage rate. No turtles were reported interacting with New Caledonian longliners but four birds, two of which were petrels, were incidentally captured. Observer coverage is about 9% in this fishery. The Australian longline fishery has an observer coverage rate averaging about 6.3 % and documented four turtle interactions in 2010 including one loggerhead and one leatherback turtle, with two unidentified hardshell turtles.

Since 2001 only 17 sea turtles have been reported by fishers and observers within New Zealand fisheries waters. Of these, 13 were leatherback turtles, one was a loggerhead turtle, two were reported as green turtles, and one was unidentified. The observer coverage rate has varied from 5-25 % over the past ten years. Sea turtles interactions have occurred throughout the year with a slight increase observed during the austral summer (November to March). All but one of the turtles were released alive.

Four cruises of offshore longline boats targeting tuna were observed by Japan in 2010 which observed 6 hard-shell turtles, five of which were olive-ridley turtles, Twenty five observers were deployed on Taiwan's large scale tuna longliners vessels in 2010, but no information is given on what protected species interactions were observed. Both the Japanese and Taiwanese fisheries were conducting deep sets to target tuna so would likely have lower interaction rates that shallow set swordfish targeting longlining.

Molony (2005) analyzed observer data from a range of longline fisheries within the WCPFC notes that the highest turtle catch rates occur in the longline fisheries between latitudes 15 deg N and 31 deg S. Most turtles were reported for what was defined in Molony's (2005) paper as western tropical shallow longline fishery, which operates with less than 10 hooks between floats and between 15 deg N and 10 deg S. The temperate albacore longline fishery, as defined by Molony(2005) operates between 10-30 deg S and includes the island nations and territories in the south of the equator in the WCPFC-CA with the exception of Australia and New Zealand. This fishery was found to have very low interaction rates with turtles.

Seabird interactions are virtually unknown in the American Samoa longline fishery; a total of 73 trips and 2,180 sets at an average coverage rate of 10.9% over five years have one observed seabird interaction[19]. Seabirds are caught in the New Zealand longline fisheries, both during setting and hauling. Scaled estimates based on observer coverage are highly uncertain but suggest expanded catches of 2000-3000 seabirds initially, dropping to less than 500 seabirds captured after longline vessels fishing for tuna or swordfish in New Zealand fishery waters were required to use tori lines, and may only set their lines at night unless using approved line weighting. The Japanese observers deployed in 2010 recorded three interactions with unidentified albatrosses.

Molony (2005) reports that both the western tropical shallow longline fishery and the temperate albacore longline fisheries had low interaction rates with seabirds. Filippi et al (2010) review the distribution of over 70 species of petrels, fulmars, prions, shearwaters and albatrosses . Based on their analyses they concluded that southern greater albatrosses are among the species the most at risk during the whole year which also includes northern royal albatross, wandering albatross, antipodean albatross and Salvin's albatross).

Depending on the season southern or northern species can be at risk. During Autumn and Winter northern albatrosses are the most at risk as are Laysan Albatross and black-footed albatross followed by Parkinson's petrel, Buller's shearwater antipodean albatrosses from both sub-species. During Spring and Summer, southern greater albatrosses are most at risk, as are wandering, antipodean and southern royal albatrosses. Parkinson's petrel is also ranked highly

[19] http://www.fpir.noaa.gov/OBS/obs_qrtrly_annual_rprts.html

among the most at risk species in this season. Depending on the season, some smaller albatrosses become more likely to incur adverse effects, particularly Salvin's, Buller's and Chatham albatrosses.

The areas with highest likelihood of species-level population effects occur in the Tasman Sea, and around the coasts of New Zealand during Spring and Summer seasons. Medium risk areas surround the high risk areas, mostly in the northern and southern temperate latitudes, and in addition, some area show medium risk in the central-Pacific, around Fiji and French Polynesia in Autumn and Winter.

Six fleets contribute over 98% of the combined risk to seabirds in the WCPFC. Of these, only 2 contribute over 50% of the total risk. These are New Zealand (39%) and Japan (32%). In the case of New Zealand, this outcome is due to the distribution of a moderate fishing effort in the breeding areas of numerous vulnerable sub-Antarctic species during all the year, specially albatrosses which have the lowest productivity of the species studied. Japan has a significantly higher effort, more widely distributed across Convention area, which overlaps locally with several vulnerable species, for example in the Tasman sea, New Zealand and North-West Pacific areas. Southern species most at risk (large albatrosses and Parkinson's petrel) are mostly linked to New Zealand and Japan flags. Based on Filippi's et al (2010) analysis the American Samoa longline fleet does not present much of a threat to seabirds, although this refers to the deep set fishery targeting albacore mostly within the US EEZ around American Samoa (Figure 7). Nevertheless, the areas where American Samoa shallow set fishing would likely occur are in low risk areas based on Filippi et al (2010) (Figure 7).

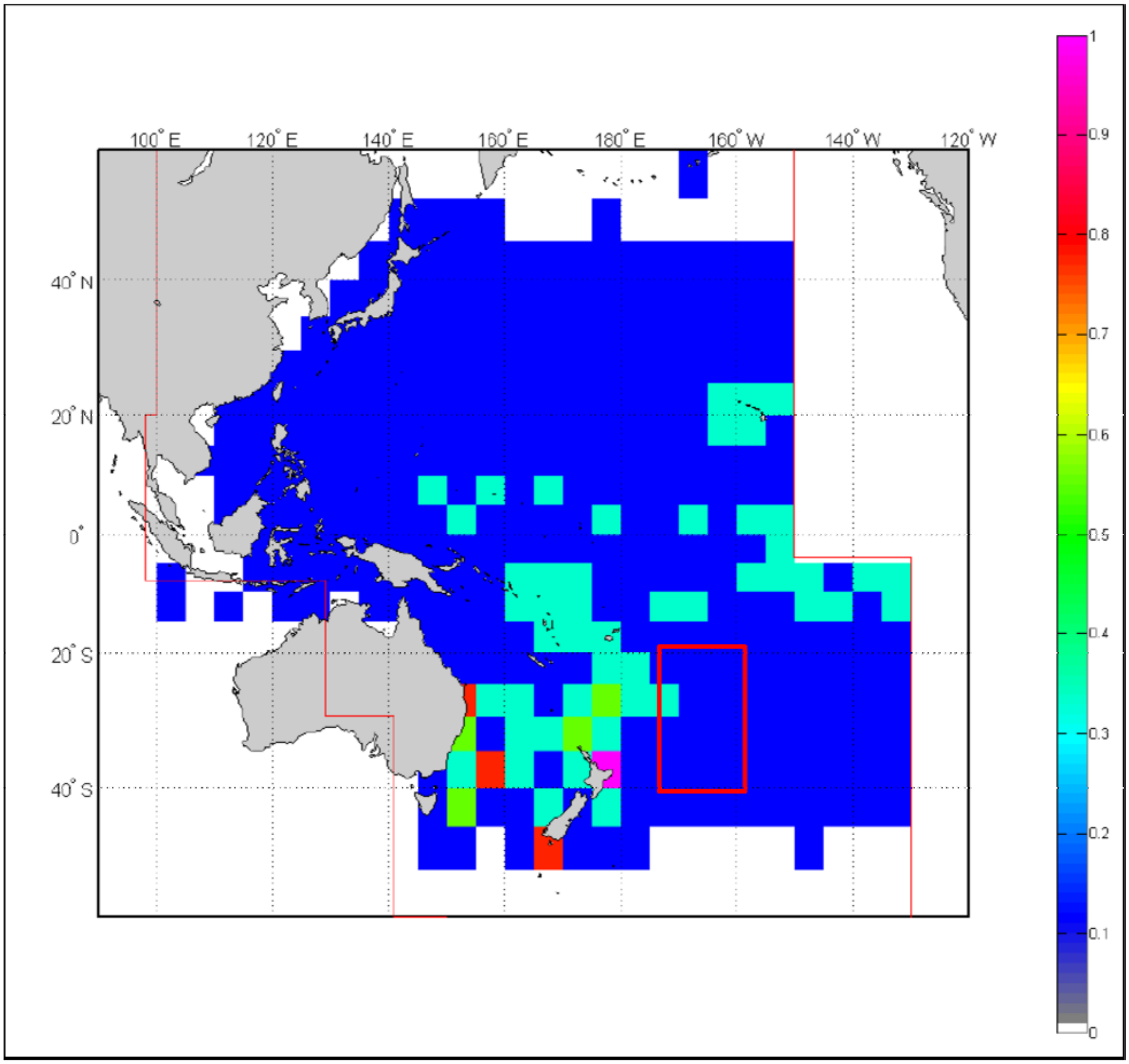

Figure 7. Annual and seasonal zones of greatest likelihood of capture of vulnerable seabirds, based on distributions of fishing effort, seabird numbers and species vulnerability.
Highest risk areas: pink; Medium to high: orange; Medium: green; Medium to low: pale blue; Low: dark blue; Negligible: white. The red box outlines the approximate ocean area fishged by American Samoa longliners targeting swordfish, and the likely fishing grounds for any future directed swordfish fishing.
Source: Filippi's et al (2010)

Marine mammal interactions in the American Samoa longline fishery appear to be rare occurrences. Between 2006 and 2009, when observer coverage ranged from 6.4-8.1 %, the deep set fishery targeting albacore and fishing primarily within the US EZZ had three marine mammal interactions, two with false killer whales, and one rough toothed dolphin. One of the false killer whale interactions resulted in a mortality. In 2010, observer coverage rose to 25% and zero marine mammal interactions were observed. In 2011, observer coverage rose again and in the first half of the year, with a 42.6%

coverage rate, there were nine observed interactions with three false killer whales, five rough toothed dolphins and an unidentified cetacean, with no mortalities.

A biological opinion issued by NMFS in 2010 indicated that the deep set albacore targeting longline fishery in American Samoa was unlikely to have any impacts to blue, fin, sei and humpback whales. The shallow set swordfish fishery is likely to operate south of 20 degrees south in sub-tropical and temperate waters. Regardless of no domestic management measures to minimize seabird and sea turtle interactions, the fishery would be subject to the requirements of the WCPFC CMM 2008-03 and 2007-04, which may have an influence on how this fishery interacts with marine mammals. For example, squid baits would be prohibited and only fish baits used.

None of the national country reports to WCPFC and cited in this amendment contain details of marine mammal interactions. As noted in Section 7.5.3, the species diversity of cetaceans between 20-40 deg S latitude appears to be higher than for the waters around American Samoa, implying empirically that the potential for any American Samoa swordfish fishery to interact with a greater number of cetacean species. Between 28-33 vessels fish annually for swordfish in the Hawaii shallow set fishery with 100% observer coverage. The number of cetacean interactions in theis fishery has ranged from a low of 3 in 2005 to 12 in 2010, which includes, Risso's dolphins (20), Bryde's whale (1), humpback whale (2), bottlenose dolphin (6), false killer whale (2) pygmy sperm whale (1), striped dolphin (2), plus several unidentified cetaceans. The Hawaii longline fishery operates typically between 20 and 40 deg N, although this is a different ecosystem to the sub-tropical and temperate South Pacific, it provides some perspective on the likely range of species and potential level of interactions should a swordfish fishery develop in American Samoa comparable in size to the Hawaii fishery.

8.2.3 Impacts on Marine Habitat

The no-action alternative would not be expected to impact marine habitat as it would be a continuation of the American Samoa longline fishery as it currently operates. Longline fishing occurs in pelagic waters within the upper portion of the water column and is not known to have any documented impacts on habitat during fishing operations. However, despite all efforts by fishermen to prevent it, gear loss does occur in longline fisheries and has the potential to impact reefs and other habitats by accumulating as marine debris. The current level of gear loss, and impact to the environment is not known, but it is not believed to be substantial in the American Samoa longline fishery, because the lines are attached to floats and can and are retrieved. Also, Federal fishery logbooks enable fishermen to report the number of hooks lost per fishing set.

All longliners lose hooks while fishing. Based on unpublished data from NMFS PIFSC, an average of 38,426 hooks (range: 14,215-49,370) were lost annually between 2001 and 2009 within the action area, or an average of about 7.3 hooks per set. Lost hooks are unlikely to have a major impact to the physical marine environment being composed of steel. Depending on quality, the hooks will corrode, although hooks on the deep sea bed in water just above freezing will corrode more slowly, and stainless steel hooks will corrode at a slower rate than non-stainless steel hooks.

8.2.4 Impacts on Fishery Participants and Fishing Communities

Apart from some limited fishing activity in the past, a swordfish fishery has not developed in American Samoa in a minimally regulated environment. There appears to be little interest in developing such a fishery due to longstanding marketing and transportation barriers.

8.2.5 Impacts on Biodiversity and Ecosystem Function

None of the alternatives are expected to adversely impact biodiversity or ecosystem function. The longline fishery around American Samoa targets primarily albacore tuna to supply the cannery. The removal of top predators such as tunas likely has some ecosystem impacts, however, there is no indication of negative ecological impacts from this fishery. At this time the stock assessment of the South Pacific albacore stock indicate it to be sustainable, as described in Section 7.4.1 Similarly, although swordfish catches have increased within the South Pacific and in the WCPFC-CA there is no indication that these are unsustainable. However, Kolkody et al (2006) indicate the uncertainty associated with a stock assessment on the southwest Pacific segment of the South Pacific swordfish stock.

8.2.6 Impacts on Enforcement and Administration

Implementing a shallow-set fishery incurs additional monitoring and enforcement burdens. NMFS would have to monitor two different fisheries, a deep set fishery in in the US EEZ around American Samoa and the shallow-set longline fishery in waters to the south of American Samoa. NMFS already monitors and deploys observers on vessels making deep sets and shallow sets in the Hawaii longline fishery and manages observer programs on both fleets as well as producing logbook summaries from the different fisheries. The American Samoa fishery appears to have stabilized at between 20- 30 longline vessels, and NMFS currently monitors this fishery through a logbook program and an observer program that has grown to about 40% coverage rate.

8.2.7 Impacts on Public Health and Safety

Implementing a shallow set longline fishery would require a change in gear configuration, but would not result in a large change in the general operation of the American Samoa longline fishery so as to have an impact on public health and safety. Vessels would, however, fish at significant distances to the south of American Samoa in latitudes most likely in latitudes 20 to 40 deg S. It is likely that at these higher latitudes vessels would encounter stronger winds and hence rougher seas. Typically the American Samoa longline fleet operates in predominantly equatorial latitudes. Near the equator is a region called the inter-tropical convergence where the trade winds of both hemispheres meet. It is known for its extremely low pressure, frequent thunderstorms, and very calm wind. At about 30 degrees latitude is a high pressure area where the trade winds and westerly winds diverge and go toward the equator and pole, respectively.

Further, swordfish fishing operations set at night and haul in the day, as opposed to daytime setting and nighttime hauling of tuna sets, which may incur some health and safety issues for fishermen.

8.3 Alternative 3: Amend the PFEP to permit the use of shallow-set longline fishing to target swordfish employing the full suite of mitigation measures required for sea turtle in the Hawaii shallow set fishery, but without specific seabird mitigation measures.

8.3.1 Impacts on Target and Non-target Stocks

Compared to the No Action Alternative, there would be a higher swordfish catch, with swordfish comprising the majority of the retained PMUS. Other species that would comprise the balance of the catch include other billfish albacore, bigeye tuna, yellowfin tuna, skipjack, mahimahi, opah and wahoo. There is no indication that any of these species are being exploited unsustainably in the WCPFC-CA south of the equator, other than bigeye tuna for which the most recent stock assessment indicates that overfishing is occurring, and that biomass may be lower than biomass at MSY. Catches of bigeye by American Samoa targeting swordfish would be relatively minor, based on the limited volume of fishing activity, and amount to less than 10% of the catch.

Imposition of large 18/0 circle hooks and mackerel-like bait on a fishery that uses smaller 14/0-16/0 circle hooks may have an influence on the catch rates of the fishery. However, there is no opportunity to make a before and after comparison as there was with the Hawaii longline fishery, where J-hooks and squid bait were substituted by 18/0 circle hooks and mackerel-like bait. In the Hawaii fishery, Gilman et al 2007 found changes in CPUE of retained fish for the periods before and after the sea turtle regulations came into effect. Swordfish CPUE significantly increased by 16.0% while combined tuna species CPUE and combined mahimahi, opah, and wahoo CPUE was significantly lower by 50.0% and 34.1%, respectively, in the period after the regulations. The CPUE of combined species of retained fish for the two periods was not significantly different, dropping by 2.6% from the first to second period.

8.3.2 Impacts on Protected Species

A summary of the protected species interactions is given under 8.2.2. Implementing the Hawaii large (18/0) circle-hook and fish bait measures for the American Samoa fishery is likely to minimize impacts to sea turtles from shallow set swordfish longline fishing in the South Pacific (Gilman et al 2007; Gilman 2011). Although no specific seabird measures would be implemented under this Alternative, the American Samoa longline fishery would still have to comply with the WCPFC seabird mitigation conservation and management measure.

Molony (2005) reports that both the western tropical shallow longline fishery and the temperate albacore longline fisheries had low interaction rates with seabirds. Filippi et al (2010) review the distribution of over 70 species of petrels, fulmars, prions, shearwaters and albatrosses . Based on their analyses they concluded that southern greater albatrosses are among the species the most at risk during the whole year which also includes northern royal albatross, wandering albatross, antipodean albatross and Salvin's albatross).

Depending on the season southern or northern species can be at risk. During Autumn and Winter northern albatrosses are the most at risk as are Laysan Albatross and black-footed albatross followed by Parkinson's petrel, Buller's shearwater antipodean albatrosses from both sub-species. During Spring and Summer, southern greater albatrosses are most at risk, as are

wandering, antipodean and southern royal albatrosses. Parkinson's petrel is also ranked highly among the most at risk species in this season.
Depending on the season, some smaller albatrosses become more likely to incur adverse effects, particularly Salvin's, Buller's and Chatham albatrosses.

The areas with highest likelihood of species-level population effects occur in the Tasman Sea, and around the coasts of New Zealand during Spring and Summer seasons. Medium risk areas surround the high risk areas, mostly in the northern and southern temperate latitudes, and in addition, some area show medium risk in the central-Pacific, around Fiji and French Polynesia in Autumn and Winter.

Six fleets contribute over 98% of the combined risk to seabirds in the WCPFC. Of these, only 2 contribute over 50% of the total risk. These are New Zealand (39%) and Japan (32%). In the case of New Zealand, this outcome is due to the distribution of a moderate fishing effort in the breeding areas of numerous vulnerable sub-Antarctic species during all the year, specially albatrosses which have the lowest productivity of the species studied. Japan has a significantly higher effort, more widely distributed across Convention area, which overlaps locally with several vulnerable species, for example in the Tasman sea, New Zealand and North-West Pacific areas. Southern species most at risk (large albatrosses and Parkinson's petrel) are mostly linked to New Zealand and Japan flags. Based on Filippi's et al (2010) analysis the American Samoa longline fleet does not present much of a threat to seabirds, although this refers to the deep set fishery targeting albacore mostly within the US EEZ around American Samoa. Nevertheless, the areas where American Samoa shallow set fishing would likely occur are in low risk areas based on Filippi et al (2010).

Marine mammal interactions in the American Samoa longline fishery appear to be rare occurrences. Between 2006 and 2009, when observer coverage ranged from 6.4-8.1 %, the deep set fishery targeting albacore and fishing primarily within the US EZZ had three marine mammal interactions, two with false killer whales, and one rough toothed dolphin. One of the false killer whale interactions resulted in a mortality. In 2010, observer coverage rose to 25% and zero marine mammal interactions were observed. In 2011, observer coverage rose again and in the first half of the year, with a 42.6% coverage rate, there we nine observed interactions with three false killer whales, five rough toothed dolphins and an unidentified cetacean, with no mortalities.

A biological opinion issued by NMFS in 2010 indicated that the deep set albacore targeting longline fishery in American Samoa was unlikely to have any impacts to blue, fin, sei and humpback whales. The shallow set swordfish fishery is likely to operate south of 20 degrees south in sub-tropical and temperate waters. Regardless of no domestic management measures to minimize seabird and sea turtle interactions, the fishery would be subject to the requirements of the WCPFC CMM 2008-03 and 2007-04, which may have an influence on how this fishery interacts with marine mammals. For example, squid baits would be prohibited and only fish baits used.

None of the national country reports to WCPFC and cited in this amendment contain details of marine mammal interactions. As noted in Section 7.5.3, the species diversity of cetaceans between 20-40 deg S latitude appears to be higher than for the waters around American Samoa, implying empirically that the potential for any American Samoa swordfish fishery to interact with a greater number of cetacean species. Between 28-33 vessels fish annually for swordfish in the Hawaii shallow set fishery with 100% observer coverage. The number of certacean interactions in theis fishery has ranged from a low of 3 in 2005 to 12 in 2010, which includes, Risso's dolphins (20), Bryde's whale (1), humpback whale (2), bottlenose dolphin (6), false killer whale (2) pygmy sperm whale (1), striped dolphin (2), plus several unidentified cetaceans. The Hawaii longline fishery operates typically between 20 and 40 deg N, although this is a different ecosystem to the sub-tropical and temperate South Pacific, it provides some perspective on the likely range of species and potential level of interactions should a swordfish fishery develop in American Samoa comparable in size to the Hawaii fishery.

8.3.3 Impacts on Marine Habitat

The no-action alternative would not be expected to impact marine habitat as it would be a continuation of the American Samoa longline fishery as it currently operates. Longline fishing occurs in pelagic waters within the upper portion of the water column and is not known to have any documented impacts on habitat during fishing operations. However, despite all efforts by fishermen to prevent it, gear loss does occur in longline fisheries and has the potential to impact reefs and other habitats by accumulating as marine debris. The current level of gear loss, and impact to the environment is not known, but it is not believed to be substantial in the American Samoa longline fishery, because the lines are attached to floats and can and are retrieved. Also, Federal fishery logbooks enable fishermen to report the number of hooks lost per fishing set.

All longliners lose hooks while fishing. Based on unpublished data from NMFS PIFSC, an average of 38,426 hooks (range: 14,215-49,370) were lost annually between 2001 and 2009 within the action area (), or an average of about 7.3 hooks per set. Lost hooks are unlikely to have a major impact to the physical marine environment being composed of steel. Depending on quality, the hooks will corrode, although hooks on the deep sea bed in water just above freezing will corrode more slowly, and stainless steel hooks will corrode at a slower rate than non-stainless steel hooks.

8.3.4 Impacts on Fishery Participants and Fishing Communities

Apart from some limited fishing activity in the past, a swordfish fishery has not developed in American Samoa in a minimally regulated environment. There appears to be little interest in developing such a fishery due to longstanding marketing and transportation barriers.

8.3.5 Impacts on Biodiversity and Ecosystem Function

None of the alternatives are expected to adversely impact biodiversity or ecosystem function. The longline fishery around American Samoa targets primarily albacore tuna to supply the cannery. The removal of top predators such as tunas likely has some ecosystem impacts, however, there is no indication of negative ecological impacts from this fishery. At this time the stock assessment of the South Pacific albacore stock indicate it to be sustainable, as described in Section 7.4.1 Similarly, although swordfish catches have increased within the South Pacific and in the WCPFC-CA there is no indication that these are unsustainable. However, Kolkody et al (2006) indicate the uncertainty associated with a stock assessment on the southwest Pacific segment of the South Pacific swordfish stock.

8.3.6 Impacts on Enforcement and Administration

Implementing a shallow-set fishery incurs additional monitoring and enforcement burdens. NMFS would have to monitor two different fisheries, a deep set fishery in in the US EEZ around

American Samoa and the shallow-set longline fishery in waters to the south of American Samoa. NMFS already monitors and deploys observers on vessels making deep sets and shallow sets in the Hawaii longline fishery and manages observer programs on both fleets as well as producing logbook summaries from the different fisheries. The American Samoa fishery appears to have stabilized at between 20- 30 longline vessels, and NMFS currently monitors this fishery through a logbook program and an observer program that has grown to about 40% coverage rate. If observers are required on all shallow set vessels as in Hawaii, this would add to the enforcement and administration burden on both fishermen and NMFS, although this system has been operating smoothly in Hawaii since 2004.

8.3.7 Impacts on Public Health and Safety

Implementing a shallow set longline fishery would require a change in gear configuration, but would not result in a large change in the general operation of the American Samoa longline fishery so as to have an impact on public health and safety. Vessels would, however, fish at significant distances to the south of American Samoa in latitudes most likely in latitudes 20 to 40 deg S. It is likely that at these higher latitudes vessels would encounter stronger winds and hence rougher seas. Typically the American Samoa longline fleet operates in predominantly equatorial latitudes. Near the equator is a region called the inter-tropical convergence where the trade winds of both hemispheres meet. It is known for its extremely low pressure, frequent thunderstorms, and very calm wind. At about 30 degrees latitude is a high pressure area where the trade winds and westerly winds diverge and go toward the equator and pole, respectively.

Further, swordfish fishing operations set at night and haul in the day, as opposed to daytime setting and nighttime hauling of tuna sets, which may incur some health and safety issues for fishermen.

8.4 Alternative 4: Permit the use of shallow set longline fishing to target swordfish employing the full suite of mitigation measures required for sea turtle mitigation and including seabird mitigation measures required in Hawaii.

8.4.1 Impacts on Target and Non-target Stocks

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Compared to the No Action Alternative, there would be a higher swordfish catch, with swordfish comprising the majority of the retained PMUS. Other species that would comprise the balance of the catch include other billfish albacore, bigeye tuna, yellowfin tuna, skipjack, mahimahi, opah and wahoo. There is no indication that any of these species are being exploited unsustainably in the WCPFC-CA south of the equator, other than bigeye tuna for which the most recent stock assessment indicates that overfishing is occurring, and that biomass may be lower than biomass at MSY. Catches of bigeye by American Samoa targeting swordfish would be relatively minor, based on the limited volume of fishing activity, and amount to less than 10% of the catch.

Imposition of large 18/0 circle hooks and mackerel-like bait on a fishery that uses smaller 14/0-16/0 circle hooks may have an influence on the catch rates of the fishery. However, there is no opportunity to make a before and after comparison as there was with the Hawaii longline fishery, where J-hooks and squid bait were substituted by 18/0 circle hooks and mackerel-like bait. In the Hawaii fishery, Gilman et al 2007 found changes in CPUE of retained fish for the periods before and after the sea turtle regulations came into effect. Swordfish CPUE significantly increased by 16.0% while combined tuna species CPUE and combined mahimahi, opah, and wahoo CPUE was significantly lower by 50.0% and 34.1%, respectively, in the period after the regulations. The CPUE of combined species of retained fish for the two periods was not significantly different, dropping by 2.6% from the first to second period.

8.4.2 Impacts on Protected Species

A summary of the protected species interactions is given under 8.2.2. Implementing the Hawaii circle-hook and fish bait measures for the American Samoa fishery is likely to minimize impacts to sea turtles from shallow set swordfish longline fishing in the South Pacific (Gilman et al 2007; Gilman 2011) Based on observations for the Hawaii fishery, the interactions rates between sea turtles and shallow setting longline vessels are likely to be 80-90% less likely with the circle hook-fish bait combination than with J-hooks and squid bait (Gilman 2007). Although no specific seabird measures would be implemented under this Alternative, the American Samoa longline fishery would still have to comply with the WCPFC seabird mitigation conservation and management measure.

Implementing the seabird measures used in Hawaii may be inappropriate for American Samoa, especially since these were designed primarily to minimize impacts between longlines being deployed in the North Pacific and Laysan and Black footed albatrosses. Although interactions with seabirds are extremely rare in the fishery as conducted at present, fishing at higher latitudes with shallow sets may present more of a risk to seabirds. Longline vessels targeting swordfish in the Hawaii fishery are required to fish in the following manner to minimize interactions with seabirds:

- **Side-set**
    - Mainline deployed as far forward as possible from port or starboard side, at least 1 m (3 ft 3 in) from stern
    - If line shooter used, mount as far forward as possible, at least 1 m from stern
    - Branch lines must have 45 g (1.6 oz) weight within 1m of each hook
    - When seabirds present, deploy gear so hooks remain submerged
    - Deploy a bird curtain

- **Alternative to side-setting (i.e., stern-setting) 4) Alternative to side-setting (i.e., stern-setting)**
    - Strategic Offal Discharge - *When birds are present*, discharge fish, fish parts, or spent bait while setting or hauling, on the opposite side of the vessel
    - Retain sufficient quantities of fish, fish parts, or spent bait between the setting of longline gear for strategic offal discharge per i) above
    - Remove all hooks from fish, fish parts, or spent bait prior to strategic offal discharge per i) above
    - Remove bill and liver from any swordfish, sever head from trunk and split in half vertically, and periodically discharge butchered heads and livers for strategic offal discharge per i) above

- Remove bill and liver from any swordfish, sever head from trunk and split in half vertically, and periodically discharge butchered heads and livers for strategic offal discharge per i) above
- Use completely thawed bait and dye all bait to match NOAA Fisheries-issued color control card
- Maintain a minimum of two cans of blue dye on board vessel
- **In addition to (1) or (2), longliners must also do the following:**
- Deploy set at least 1 hour after sunset and complete deployment before sunrise, using minimum vessel lights necessary for navigation and safety

Employing these mitigation measures has reduce seabird interactions in the Hawaii fishery, primarily with Laysan and blackfooted albatrosses by about 90 % (NMFS 2011). However, implementing the seabird measures used in Hawaii may be inappropriate for American Samoa, especially since these were designed primarily to minimize impacts between longlines being deployed in the North Pacific and Laysan and Black footed albatrosses. Although interactions with seabirds are extremely rare in the fishery as conducted at present, fishing at higher latitudes with shallow sets may present more of a risk to seabirds.

Molony (2005) reports that both the western tropical shallow longline fishery and the temperate albacore longline fisheries had low interaction rates with seabirds. Filippi et al (2010) review the distribution of over 70 species of petrels, fulmars, prions, shearwaters and albatrosses . Based on their analyses they concluded that southern greater albatrosses are among the species the most at risk during the whole year which also includes northern royal albatross, wandering albatross, antipodean albatross and Salvin's albatross).

Depending on the season southern or northern species can be at risk. During Autumn and Winter northern albatrosses are the most at risk as are Laysan Albatross and black-footed albatross followed by Parkinson's petrel, Buller's shearwater antipodean albatrosses from both sub-species. During Spring and Summer, southern greater albatrosses are most at risk, as are wandering, antipodean and southern royal albatrosses. Parkinson's petrel is also ranked highly among the most at risk species in this season.
Depending on the season, some smaller albatrosses become more likely to incur adverse effects, particularly Salvin's, Buller's and Chatham albatrosses.

The areas with highest likelihood of species-level population effects occur in the Tasman Sea, and around the coasts of New Zealand during Spring and Summer seasons. Medium risk areas surround the high risk areas, mostly in the northern and southern temperate latitudes, and in addition, some area show medium risk in the central-Pacific, around Fiji and French Polynesia in Autumn and Winter.

Six fleets contribute over 98% of the combined risk to seabirds in the WCPFC. Of these, only 2 contribute over 50% of the total risk. These are New Zealand (39%) and Japan (32%). In the case of New Zealand, this outcome is due to the distribution of a moderate fishing effort in the breeding areas of numerous vulnerable sub-Antarctic species during all the year, specially albatrosses which have the lowest productivity of the species studied. Japan has a significantly higher effort, more widely distributed across Convention area, which overlaps locally with several vulnerable species, for example in the Tasman sea, New Zealand and North-West Pacific areas.

Southern species most at risk (large albatrosses and Parkinson's petrel) are mostly linked to New Zealand and Japan flags. Based on Filippi's et al (2010) analysis the American Samoa longline fleet does not present much of a threat to seabirds, although this refers to the deep set fishery targeting albacore mostly within the US EEZ around American Samoa.

Nevertheless, the areas where American Samoa shallow set fishing would likely occur are in low risk areas based on Filippi et al (2010) (Figure 6). Probably one of the most effective measures would be the requirement to set one hour after local dusk and complete setting one hour before local dawn, which has been very successful in minimizing seabird interactions in the shallow set fishery in Hawaii.

Marine mammal interactions in the American Samoa longline fishery appear to be rare occurrences. Between 2006 and 2009, when observer coverage ranged from 6.4-8.1 %, the deep set fishery targeting albacore and fishing primarily within the US EZZ had three marine mammal interactions, two with false killer whales, and one rough toothed dolphin. One of the false killer whale interactions resulted in a mortality. In 2010, observer coverage rose to 25% and zero marine mammal interactions were observed. In 2011, observer coverage rose again and in the first half of the year, with a 42.6% coverage rate, there we nine observed interactions with three false killer whales, five rough toothed dolphins and an unidentified cetacean, with no mortalities.

A biological opinion issued by NMFS in 2010 indicated that the deep set albacore targeting longline fishery in American Samoa was unlikely to have any impacts to blue, fin, sei and humpback whales. The shallow set swordfish fishery is likely to operate south of 20 degrees south in sub-tropical and temperate waters. Regardless of no domestic management measures to minimize seabird and sea turtle interactions, the fishery would be subject to the requirements of the WCPFC CMM 2008-03 and 2007-04, which may have an influence on how this fishery interacts with marine mammals. For example, squid baits would be prohibited and only fish baits used.

None of the national country reports to WCPFC and cited in this amendment contain details of marine mammal interactions. As noted in Section 7.5.3, the species diversity of cetaceans between 20-40 deg S latitude appears to be higher than for the waters around American Samoa, implying empirically that the potential for any American Samoa swordfish fishery to interact with a greater number of cetacean species. Between 28-33 vessels fish annually for swordfish in the Hawaii shallow set fishery with 100% observer coverage. The number of certacean interactions in theis fishery has ranged from a low of 3 in 2005 to 12 in 2010, which includes, Risso's dolphins (20), Bryde's whale (1), humpback whale (2), bottlenose dolphin (6), false killer whale (2) pygmy sperm whale (1), striped dolphin (2), plus several unidentified cetaceans. The Hawaii longline fishery operates typically between 20 and 40 deg N, although this is a different ecosystem to the sub-tropical and temperate South Pacific, it provides some perspective on the likely range of species and potential level of interactions should a swordfish fishery develop in American Samoa comparable in size to the Hawaii fishery.

8.4.3 Impacts on Marine Habitat

The no-action alternative would not be expected to impact marine habitat as it would be a continuation of the American Samoa longline fishery as it currently operates. Longline fishing occurs in pelagic waters within the upper portion of the water column and is not known to have any documented impacts on habitat during fishing operations. However, despite all efforts by fishermen to prevent it, gear loss does occur in longline fisheries and has the potential to impact reefs and other habitats by accumulating as marine debris. The current level of gear loss, and impact to the environment is not known, but it is not believed to be substantial in the American Samoa longline fishery, because the lines are attached to floats and can and are retrieved. Also, Federal fishery logbooks enable fishermen to report the number of hooks lost per fishing set.

All longliners lose hooks while fishing. Based on unpublished data from NMFS PIFSC, an average of 38,426 hooks (range: 14,215-49,370) were lost annually between 2001 and 2009 within the action area, or an average of about 7.3 hooks per set. Lost hooks are unlikely to have a major impact to the physical marine environment being composed of steel. Depending on quality, the hooks will corrode, although hooks on the deep sea bed in water just above freezing will corrode more slowly, and stainless steel hooks will corrode at a slower rate than non-stainless steel hooks.

8.4.4 Impacts on Fishery Participants and Fishing Communities

Apart from some limited fishing activity in the past, a swordfish fishery has not developed in American Samoa in a minimally regulated environment. There appears to be little interest in developing such a fishery due to longstanding marketing and transportation barriers.

8.4.5 Impacts on Biodiversity and Ecosystem Function

None of the alternatives are expected to adversely impact biodiversity or ecosystem function. The longline fishery around American Samoa targets primarily albacore tuna to supply the cannery. The removal of top predators such as tunas likely has some ecosystem impacts, however, there is no indication of negative ecological impacts from this fishery. At this time the stock assessment of the South Pacific albacore stock indicate it to be sustainable, as described in Section 7.4.1 Similarly, although swordfish catches have increased within the South Pacific and in the WCPFC-CA there is no indication that these are unsustainable. However, Kolkody et al (2006) indicate the uncertainty associated with a stock assessment on the southwest Pacific segment of the South Pacific swordfish stock.

8.4.6 Impacts on Enforcement and Administration

Implementing a shallow-set fishery incurs additional monitoring and enforcement burdens. NMFS would have to monitor two different fisheries, a deep set fishery in in the US EEZ around American Samoa and the shallow-set longline fishery in waters to the south of American Samoa. NMFS already monitors and deploys observers on vessels making deep sets and shallow sets in the Hawaii longline fishery and manages observer programs on both fleets as well as producing logbook summaries from the different fisheries. The American Samoa fishery appears to have stabilized at between 20- 30 longline vessels, and NMFS currently monitors this fishery through a logbook program and an observer program that has grown to about 40% coverage rate. If observers are required on all shallow set vessels as in Hawaii, this would add to the enforcement and administration burden on both fishermen and NMFS, although this system has been operating smoothly in Hawaii since 2004.

8.4.7 Impacts on Public Health and Safety

Implementing a shallow set longline fishery would require a change in gear configuration, but would not result in a large change in the general operation of the American Samoa longline fishery so as to have an impact on public health and safety. Vessels would, however, fish at significant distances to the south of American Samoa in latitudes most likely in latitudes 20 to 40 deg S. It is likely that at these higher latitudes vessels would encounter stronger winds and hence rougher seas. Typically the American Samoa longline fleet operates in predominantly equatorial latitudes. Near the equator is a region called the inter-tropical convergence where the trade winds of both hemispheres meet. It is known for its extremely low pressure, frequent thunderstorms, and very calm wind. At about 30 degrees latitude is a high pressure area where the trade winds and westerly winds diverge and go toward the equator and pole, respectively.

Further, swordfish fishing operations set at night and haul in the day, as opposed to daytime setting and nighttime hauling of tuna sets, which may incur some health and safety issues for fishermen.

8.5 Alternative 5. Permit the use of shallow set longline fishing to target swordfish employing sea turtles mitigation measures and seabird mitigation measures required in Hawaii, and include spatial restrictions on shallow set fishery, e.g., exclude fishing from within the U.S. EEZ around American Samoa and permit fishing south of 20 deg South.

8.5.1 Impacts on Target and Non-target Stocks

Compared to the No Action Alternative, there would be a higher swordfish catch, with swordfish comprising the majority of the retained PMUS. Other species that would comprise the balance of the catch include other billfish albacore, bigeye tuna, yellowfin tuna, skipjack, mahimahi, opah and wahoo. There is no indication that any of these species are being exploited unsustainably in the WCPFC-CA south of the equator, other than bigeye tuna for which the most recent stock assessment indicates that overfishing is occurring, and that biomass may be lower than biomass at MSY. Catches of bigeye by American Samoa targeting swordfish would be relatively minor, based on the limited volume of fishing activity, and amount to less than 10% of the catch.

Imposition of large 18/0 circle hooks and mackerel-like bait on a fishery that uses smaller 14/0-16/0 circle hooks may have an influence on the catch rates of the fishery. However, there is no opportunity to make a before and after comparison as there was with the Hawaii longline fishery, where J-hooks and squid bait were substituted by 18/0 circle hooks and mackerel-like bait. In the Hawaii fishery, Gilman et al 2007 found changes in CPUE of retained fish for the periods before and after the sea turtle regulations came into effect. Swordfish CPUE significantly increased by 16.0% while combined tuna species CPUE and combined mahimahi, opah, and wahoo CPUE was significantly lower by 50.0% and 34.1%, respectively, in the period after the regulations. The CPUE of combined species of retained fish for the two periods was not significantly different, dropping by 2.6% from the first to second period.

8.5.2 Impacts on Protected Species

A summary of the protected species interactions is given under 8.2.2. Implementing the Hawaii circle-hook and fish bait measures for the American Samoa fishery is likely to minimize impacts to sea turtles from shallow set swordfish longline fishing in the South Pacific (Gilman et al 2007;

Gilman 2011) Based on observations for the Hawaii fishery, the interactions rates between sea turtles and shallow setting longline vessels are likely to be 80-90% less likely with the circle hook-fish bait combination than with J-hooks and squid bait (Gilman 2007). Although no specific seabird measures would be implemented under this Alternative, the American Samoa longline fishery would still have to comply with the WCPFC seabird mitigation conservation and management measure.

Implementing the seabird measures used in Hawaii may be inappropriate for American Samoa, especially since these were designed primarily to minimize impacts between longlines being deployed in the North Pacific and Laysan and Black footed albatrosses. Although interactions with seabirds are extremely rare in the fishery as conducted at present, fishing at higher latitudes with shallow sets may present more of a risk to seabirds. Longline vessels targeting swordfish in the Hawaii fishery are required to fish in the following manner to minimize interactions with seabirds:

- **Side-set**
    - Mainline deployed as far forward as possible from port or starboard side, at least 1 m (3 ft 3 in) from stern
    - If line shooter used, mount as far forward as possible, at least 1 m from stern
    - Branch lines must have 45 g (1.6 oz) weight within 1m of each hook
    - When seabirds present, deploy gear so hooks remain submerged
    - Deploy a bird curtain

- **Alternative to side-setting (i.e., stern-setting) 4) Alternative to side-setting (i.e., stern-setting)**
    - Strategic Offal Discharge - *When birds are present*, discharge fish, fish parts, or spent bait while setting or hauling, on the opposite side of the vessel
    - Retain sufficient quantities of fish, fish parts, or spent bait between the setting of longline gear for strategic offal discharge per i) above
    - Remove all hooks from fish, fish parts, or spent bait prior to strategic offal discharge per i) above
    - Remove bill and liver from any swordfish, sever head from trunk and split in half vertically, and periodically discharge butchered heads and livers for strategic offal discharge per i) above
    - Remove bill and liver from any swordfish, sever head from trunk and split in half vertically, and periodically discharge butchered heads and livers for strategic offal discharge per i) above
    - Use completely thawed bait and dye all bait to match NOAA Fisheries-issued color control card
    - Maintain a minimum of two cans of blue dye on board vessel
    - **In addition to (1) or (2), longliners must also do the following:**
    - Deploy set at least 1 hour after sunset and complete deployment before sunrise, using minimum vessel lights necessary for navigation and safety

Employing these mitigation measures has reduce seabird interactions in the Hawaii fishery, primarily with Laysan and blackfooted albatrosses by about 90 % (NMFS 2011). However, implementing the seabird measures used in Hawaii may be inappropriate for American Samoa, especially since these were designed primarily to minimize impacts between longlines being deployed in the North Pacific and Laysan and Black footed albatrosses. Although interactions with seabirds are extremely rare in the fishery as conducted at present, fishing at higher latitudes with shallow sets may present more of a risk to seabirds.

Molony (2005) reports that both the western tropical shallow longline fishery and the temperate albacore longline fisheries had low interaction rates with seabirds. Filippi et al (2010) review the distribution of over 70 species of petrels, fulmars, prions, shearwaters and albatrosses . Based on their analyses they concluded that southern greater albatrosses are among the species the most at risk during the whole year which also includes northern royal albatross, wandering albatross, antipodean albatross and Salvin's albatross).

Depending on the season southern or northern species can be at risk. During Autumn and Winter northern albatrosses are the most at risk as are Laysan Albatross and black-footed albatross followed by Parkinson's petrel, Buller's shearwater antipodean albatrosses from both sub-species. During Spring and Summer, southern greater albatrosses are most at risk, as are wandering, antipodean and southern royal albatrosses. Parkinson's petrel is also ranked highly among the most at risk species in this season. Depending on the season, some smaller albatrosses become more likely to incur adverse effects, particularly Salvin's, Buller's and Chatham albatrosses.

The areas with highest likelihood of species-level population effects occur in the Tasman Sea, and around the coasts of New Zealand during Spring and Summer seasons. Medium risk areas surround the high risk areas, mostly in the northern and southern temperate latitudes, and in addition, some area show medium risk in the central-Pacific, around Fiji and French Polynesia in Autumn and Winter.

Six fleets contribute over 98% of the combined risk to seabirds in the WCPFC. Of these, only 2 contribute over 50% of the total risk. These are New Zealand (39%) and Japan (32%). In the case of New Zealand, this outcome is due to the distribution of a moderate fishing effort in the breeding areas of numerous vulnerable sub-Antarctic species during all the year, specially albatrosses which have the lowest productivity of the species studied. Japan has a significantly higher effort, more widely distributed across Convention area, which overlaps locally with several vulnerable species, for example in the Tasman sea, New Zealand and North-West Pacific areas. Southern species most at risk (large albatrosses and Parkinson's petrel) are mostly linked to New Zealand and Japan flags. Based on Filippi's et al (2010) analysis the American Samoa longline fleet does not present much of a threat to seabirds, although this refers to the deep set fishery targeting albacore mostly within the US EEZ around American Samoa.

Nevertheless, the areas where American Samoa shallow set fishing would likely occur are in low risk areas based on Filippi et al (2010) (Figure 6). Probably one of the most effective measures would be the requirement to set one hour after local dusk and complete setting one hour before local dawn, which has been very successful in minimizing seabird interactions in the shallow set fishery in Hawaii.

Marine mammal interactions in the American Samoa longline fishery appear to be rare occurrences. Between 2006 and 2009, when observer coverage ranged from 6.4-8.1 %, the deep set fishery targeting albacore and fishing primarily within the US EZZ had three marine mammal interactions, two with false killer whales, and one rough toothed dolphin. One of the false killer whale interactions resulted in a mortality. In 2010, observer coverage rose to 25% and zero marine mammal interactions were observed. In 2011, observer coverage rose again and in the first half of the year, with a 42.6% coverage rate, there we nine observed interactions with three false killer whales, five rough toothed dolphins and an unidentified cetacean, with no mortalities.

A biological opinion issued by NMFS in 2010 indicated that the deep set albacore targeting longline fishery in American Samoa was unlikely to have any impacts to blue, fin, sei and humpback whales. The shallow set swordfish fishery is likely to operate south of 20 degrees south in sub-tropical and temperate waters. Regardless of no domestic management measures to minimize seabird and sea turtle interactions, the fishery would be subject to the requirements of the WCPFC CMM 2008-03 and 2007-04, which may have an influence on how this fishery interacts with marine mammals. For example, squid baits would be prohibited and only fish baits used.

None of the national country reports to WCPFC and cited in this amendment contain details of marine mammal interactions. As noted in Section 7.5.3, the species diversity of cetaceans between 20-40 deg S latitude appears to be higher than for the waters around American Samoa, implying empirically that the potential for any American Samoa swordfish fishery to interact with a greater number of cetacean species. Between 28-33 vessels fish annually for swordfish in the Hawaii shallow set fishery with 100% observer coverage. The number of certacean interactions in theis fishery has ranged from a low of 3 in 2005 to 12 in 2010, which includes, Risso's dolphins (20), Bryde's whale (1), humpback whale (2), bottlenose dolphin (6), false killer whale (2) pygmy sperm whale (1), striped dolphin (2), plus several unidentified cetaceans. The Hawaii longline fishery operates typically between 20 and 40 deg N, although this is a different ecosystem to the sub-tropical and temperate South Pacific, it provides some perspective on the likely range of species and potential level of interactions should a swordfish fishery develop in American Samoa comparable in size to the Hawaii fishery.

8.5.3 Impacts on Marine Habitat

The no-action alternative would not be expected to impact marine habitat as it would be a continuation of the American Samoa longline fishery as it currently operates. Longline fishing occurs in pelagic waters within the upper portion of the water column and is not known to have any documented impacts on habitat during fishing operations. However, despite all efforts by fishermen to prevent it, gear loss does occur in longline fisheries and has the potential to impact reefs and other habitats by accumulating as marine debris. The current level of gear loss, and impact to the environment is not known, but it is not believed to be substantial in the American Samoa longline fishery, because the lines are attached to floats and can and are retrieved. Also, Federal fishery logbooks enable fishermen to report the number of hooks lost per fishing set.

All longliners lose hooks while fishing. Based on unpublished data from NMFS PIFSC, an average of 38,426 hooks (range: 14,215-49,370) were lost annually between 2001 and 2009 within the action area (), or an average of about 7.3 hooks per set. Lost hooks are unlikely to have a major impact to the physical marine environment being composed of steel. Depending on quality, the hooks will corrode, although hooks on the deep sea bed in water just above freezing will corrode more slowly, and stainless steel hooks will corrode at a slower rate than non-stainless steel hooks.

8.5.4 Impacts on Fishery Participants and Fishing Communities

Apart from some limited fishing activity in the past, a swordfish fishery has not developed in American Samoa in a minimally regulated environment. There appears to be little interest in developing such a fishery due to longstanding marketing and transportation barriers.

Spatial imitation of fishing may restrict the fishery if swordfish abundance increases seasonally within lower latitudes including the U.S. EEZ around American Samoa.

8.5.5 Impacts on Biodiversity and Ecosystem Function

None of the alternatives are expected to adversely impact biodiversity or ecosystem function. The longline fishery around American Samoa targets primarily albacore tuna to supply the cannery. The removal of top predators such as tunas likely has some ecosystem impacts, however, there is no indication of negative ecological impacts from this fishery. At this time the stock assessment of the South Pacific albacore stock indicate it to be sustainable, as described in Section 7.4.1. Similarly, although swordfish catches have increased within the South Pacific and in the WCPFC-CA there is no indication that these are unsustainable. However, Kolkody et al (2006) indicate the uncertainty associated with a stock assessment on the southwest Pacific segment of the South Pacific swordfish stock.

8.5.6 Impacts on Enforcement and Administration

Implementing a shallow-set fishery incurs additional monitoring and enforcement burdens. NMFS would have to monitor two different fisheries, a deep set fishery in in the US EEZ around American Samoa and the shallow-set longline fishery in waters to the south of American Samoa. NMFS already monitors and deploys observers on vessels making deep sets and shallow sets in the Hawaii longline fishery and manages observer programs on both fleets as well as producing logbook summaries from the different fisheries. The American Samoa fishery appears to have stabilized at between 20- 30 longline vessels, and NMFS currently monitors this fishery through a logbook program and an observer program that has grown to about 40% coverage rate. If observers are required on all shallow set vessels as in Hawaii, this would add to the enforcement and administration burden on both fishermen and NMFS, although this system has been operating smoothly in Hawaii since 2004.

Adding a spatial element under this Alternative should not present a major challenge to NMFS or the US Coast Guard which already use vessel monitoring systems to monitor the movements of longline vessels in American Samoa.

8.5.7 Impacts on Public Health and Safety

Implementing a shallow set longline fishery would require a change in gear configuration, but would not result in a large change in the general operation of the American Samoa longline fishery so as to have an impact on public health and safety. Vessels would, however, fish at significant distances to the south of American Samoa in latitudes most likely in latitudes 20 to 40 deg S. It is likely that at these higher latitudes vessels would encounter stronger winds and hence rougher seas. Typically the American Samoa longline fleet operates in predominantly equatorial latitudes. Near the equator is a region called the inter-tropical convergence where the trade winds of both hemispheres meet. It is known for its extremely low pressure, frequent thunderstorms, and very calm wind. At about 30 degrees latitude is a high pressure area where the trade winds and westerly winds diverge and go toward the equator and pole, respectively.

Further, swordfish fishing operations set at night and haul in the day, as opposed to daytime setting and nighttime hauling of tuna sets, which may incur some health and safety issues for fishermen.

8.6 Other Impacts

8.6.1 Cumulative Impacts

In its 2007 report, the Intergovernmental Panel on Climate Change (IPCC) state that: "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level (IPCC 2007)." Climate change and potential sea level rise may human communities, target or non-target stocks, marine ecosystems, EFH, and other habitats found in and around American Samoa. Climate change would not, however, affect the effectiveness of the alternatives or the impacts of the alternatives.

Fish stocks and sea turtle populations would continue to be monitored through logbook reports and observer coverage, as well as through international efforts to monitor populations. None of the alternatives would result in a change to the fishery that would affect climate change by changing the consumption of energy or release of greenhouse gases by the fishery participants. Climate change may have an influence on the distribution of South Pacific swordfish and its availability to any potential American Samoa longline fishery. However, it may not be possible to distinguish climate change impacts on South Pacific swordfish; but any changes in swordfish environment that affect population trends may cause the Council to make adjustments in fishery management in the future.

8.6.2 Future Federal Actions

Other related Council actions expected to occur in the foreseeable future in fisheries occurring in waters around American Samoa include amendments to the Pelagics FEP including those to: manage American Samoa longline vessels within the bigeye tuna catch limits for Pacific Islands Territories; modify the American Samoa longline limited entry permit system and modify the large pelagic vessels area closure around the southern islands of the archipelago. There are alternatives under consideration to combine vessel class sizes, however, none of the proposed actions in and of themselves would enable the longline fishery in American Samoa to expand beyond the maximum number of permits (60) delineated in the limited entry program. These actions may result in impacts to the human environment or to communities, which will be analyzed in the respective amendment documents.

In addition, there is a proposal to enlarge sanctuary waters around American Samoa through expansion of Fagatele Bay National Marine Sanctuary. These areas may add further protection to green sea turtles through restricting human activities. With regards to impacts to protected species, if needed, separate consultations pursuant to section 7 of the ESA will be conducted on these future management actions.

9.0 Consistency with the Magnuson-Stevens Act and Other Laws

9.1 Consistency with National Standards

Section 301 of the Magnuson-Stevens Act requires that regulations implementing any FMP or FMP amendment be consistent with the 10 national standards listed below.

National Standard 1 states that conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

Target and non-target species in the American Samoa longline fishery are neither overfished nor approaching an overfished condition, apart from bigeye tuna. If the preferred alternative is one of the options for swordfish fishing, it would be consistent with NS1 because swordfish catches are likely to be modest in this fishery and unlikely to lead to overfishing of South Pacific swordfish. Moreover, bigeye tuna is likely to comprise less than 10% of the catch and the level of fishing such that it is unlikely to exacerbate the overfishing condition of WCPO bigeye tuna. Further, diversifying the fishery beyond targeting cannery albacore may contribute to achieving the optimum yield of albacore tuna. See Sections 8.5 for further information on the status of the target stock and other tuna stocks.

National Standard 2 states that conservation and management measures shall be based upon the best scientific information available.

The alternatives considered in this amendment are consistent with NS2 because the best available information, such as observer data, and fishery logbook data was used in developing and analyzing the alternatives.

National Standard 3 states that, to the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

The alternatives considered in this amendment is consistent with NS3 in that it does not directly affect management of South Pacific swordfish which would be the target stock in this fishery. Some of the alternatives propose to implement gear changes to reduce unwanted bycatch of protected species. This action does not interfere with the existing management measures, which manage the target stock. The target stock's range extends throughout the western and central South Pacific, and thus, it is managed on a domestic and an international basis through participation in regional tuna fishery management organizations.

National Standard 4 states that conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable *to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.*

The alternatives considered in this amendment are consistent with NS4 because they do not discriminate between residents of different states, nor does it allocate or assign fishing privileges.

National Standard 5 states that conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.

The alternatives considered in this amendment are consistent with NS5 in that they intend to consider efficiency in the fishery as any unintentional protected species bycatch would be reduced by implementation of the least burdensome, most economically effective measures with minimal effect on the target species. The preferred alternative does not have economic allocation as its sole purpose.

National Standard 6 states that conservation and management action shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources and catches.

The alternatives considered in this amendment are consistent with NS6 in that consideration was given to variations and contingencies in fishery resources and catches. This limited entry fishery is largely targeting the same resource; therefore, implementing measures to make it possible for fishery participants to target South Pacific swordfish would benefit all participants. The fishery is monitored and will continue, which would allow for responses to changes in the fishery, including future management actions.

National Standard 7 states that conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

The alternatives considered in this amendment are consistent with NS7 by proposing measures to best achieve the objective of permitting shallow set longline fishing for South Pacific swordfish, while maintaining low protected species bycatch through gear modifications which have been shown to be effective in other longline fisheries, and which are relatively low cost. These measures would not duplicate any other existing management measures in this fishery.

National Standard 8 states that conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

The objective of this amendment is to maintain a viable longline fishery in American Samoa by proactively and cooperatively instituting measures to allow diversification of the fishery through targeting South Pacific swordfish. The longline fishery provides the people of American Samoa various economic benefits; ensuring that the continuity of fishery is therefore consistent with

NS8. Apart from No Action, the remaining alternatives could lead to a two separate longline fisheries in American Samoa, as there are currently in Hawaii

National Standard 9 states that conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided minimize the mortality of such bycatch.

The alternatives considered in this amendment are consistent with NS9 because their objective is to provide for diversification of the American Samoa longline fishery through allowing shallow-set targeting of South Pacific swordfish. Further the alternatives consider ways to maintain a low protected species bycatch of sea turtles and seabirds to the maximum extent possible. The advent of the new company Samoa Tuna Processors has led to the development of markets for pelagic fish other than albacore and this would likely include swordfish should a fishery develop in American Samoa.

National Standard 10 states that conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

The preferred alternative considered in this amendment is consistent with NS10 because it would not pose additional safety risks to fishery participants in the American Samoa longline fishery. Safety of participants was given consideration in determining how to best meet the purpose and need while continuing the fishery safely.

9.2 National Environmental Policy Act

This amendment has been written and organized to meet the requirements of the National Environmental Policy Act and thus is a consolidated document including an Environmental Assessment, as described in NOAA Administrative Order 216-6, Section 603.a.2.

NEPA considers the effects of proposed Federal actions and alternatives on the environment and allows for involvement of interested and affected members of the public before a decision is made. The NMFS Regional Administrator will determine whether or not the action is significant causing the need for an Environmental Impact Statement to be prepared.

9.3 Executive Order 12866

To meet the requirements of Executive Order 12866 (E.O. 12866), NMFS requires that a Regulatory Impact Review (RIR) be prepared for all regulatory actions that are of public interest. This review provides an overview of the problem, policy objectives, and anticipated impacts of regulatory actions, and ensures that management alternatives are systematically and comprehensively evaluated such that the public welfare can be enhanced in the most efficient and cost effective way.

In accordance with E.O. 12866, the following is set forth: (1) This action is not expected to have an annual effect on the economy of more than $100 million or to adversely affect in a material way the economy, a sector of the economy, productivity, jobs, the environment, public health or safety; or state, local or tribal governments or communities; (2) This action is not likely to create any serious inconsistencies or otherwise interfere with any actions taken or planned by another agency; (3) This action is not likely to materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights or obligations of recipients thereof; (4) This action is not likely to raise novel or policy issues arising out of legal mandates, or the principles set forth in the Executive Order. Based on the information contained in this Pelagics FEP amendment, the initial findings of this action are determined to not be significant under E.O. 12866.

9.4 Administrative Procedures Act

All federal rulemaking is governed under the provisions of the Administrative Procedures Act (APA) (5 U.S.C. Subchapter II) which establishes a "notice and comment" procedure to enable public participation in the rulemaking process. Under the APA, NMFS is required to publish notification of proposed rules in the Federal Register and to solicit, consider and respond to public comment on those rules before they are finalized. The APA also establishes a 30-day waiting period from the time of a final rule is published until the rule become effective, unless an exemption is applicable. This amendment complies with the provisions of the APA through the Council's use of public meetings, requests for comments, and consideration of comments. To implement this amendment, NMFS will publish a proposed rule and request public comments.

9.5 Coastal Zone Management Act

The Coastal Zone Management Act requires a determination that a recommended management measure will have no effect on the land, water uses, or natural resources of the coastal zone, or is consistent to the maximum extent practicable with an affected state's enforceable coastal zone management program.

9.6 Environmental Justice

On February 11, 1994, President William Clinton issued Executive Order 12898 (E.O. 12898), "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." E.O. 12898 provides that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." E.O. 12898 also provides for agencies to collect, maintain, and analyze information on patterns of subsistence consumption of fish, vegetation, or wildlife. That agency action may also affect subsistence patterns of consumption and indicate the potential for disproportionately high and adverse human health or environmental effects on low-income populations, and minority populations. A memorandum by President Clinton, which accompanied E.O. 12898, made it clear that environmental justice should be considered when conducting NEPA analyses by stating the following: "Each Federal agency should analyze the environmental effects, including human health, economic, and social effects of Federal actions, including effects on minority populations, low-income populations, and Indian tribes, when such analysis is required by NEPA[20].

The alternatives other than No Action, and Alterantive 2 would require fishery participants with valid American Samoa longline limited entry permits to make some changes to their fishing gear

[20] Memorandum from the president to the Heads of Departments and Agencies. Comprehensive Presidential Documents No. 279 (February 11, 1994).

if they wished to target South Pacific swordfish. The proposed gear modifications would not result in large and adverse impacts to the environment and there were no environmental effects found that could result in disproportionately high and adverse effects to members of minority populations, low-income populations, or Indian tribes. The proposed action would not affect sustenance fishing by members of minority and low-income fishing.

9.7 Information Quality Act

The information in this document complies with the Information Quality Act and NOAA standards (NOAA Information Quality Guidelines, September 30, 2002) that recognize information quality is composed of three elements: utility, integrity, and objectivity. National Standard 2 of the Magnuson-Stevens Act states that an FMP's conservation and management measures shall be based upon the best scientific information available. In accordance with this national standard, the information product (amendment document and proposed rule) incorporates the best biological, social, and economic information available to date, including the most recent biological information on, and assessment of, the pelagic fishery resources and protected resources, and the most recent information available on fishing communities, including their dependence on pelagic longline fisheries, and up-to-date economic information (landings, revenues, etc.). The policy choices, i.e., proposed management measures, contained in the information product are supported by the available scientific information. The management measures of this Pelagics FEP Amendment are designed to meet the conservation goals and objectives of the Pelagics FEP and the Magnuson-Stevens Act. The data and analyses used to develop and analyze the measures contained in the information product are presented in this amendment. Furthermore, all reference materials utilized in the discussion and analyses are properly referenced within the appropriate sections of the environmental assessment. The information product was prepared by Council and NMFS staff based on information provided by NMFS PIFSC, NMFS PIRO, and other sources. The information product was reviewed by PIRO and PIFSC staff, and NMFS Headquarters (including the Office of Sustainable Fisheries). Legal review was performed by NOAA General Counsel Pacific Islands and General Counsel for Enforcement and Litigation for consistency with applicable laws, including but not limited to the Magnuson-Stevens Act, National Environmental Policy Act, Administrative Procedure Act, Paperwork Reduction Act, Coastal Zone Management Act, Endangered Species Act, Marine Mammal Protection Act, and Executive Orders 13132 and 12866.

9.8 Paperwork Reduction Act

The purpose of the Paperwork Reduction Act (PRA) is to minimize the paperwork burden on the public resulting from the collection of information by or for the Federal government. The PRA is intended to ensure the information collected under the proposed action is needed and is collected in an efficient manner (44 U.S.C. 3501(1)). None of the alternatives establish any new permitting or reporting requirements, and is therefore not subject to the provisions of the PRA.

9.9 Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) (5 U.S.C. 601 et seq.) requires government agencies to assess and present the impact of their regulatory actions on small entities including small businesses, small organizations, and small governmental jurisdictions. The assessment is done by preparing a Regulatory Flexibility Analysis. An Initial Regulatory Flexibility Analysis will be included in the proposed rule. This action has been certified as not having significant impacts to small entities.

9.10 Endangered Species Act

NMFS PIRO issued a BiOp for the American Samoa longline fishery on September 16, 2010. That BiOp concluded that the annual numbers of interactions and mortalities expected to result from implementation of the proposed action for a 3-year period is incidental take of up to 45 green sea turtles over three years (average of 15 interactions per year with 41 mortalities). The occasional hooking and entanglement (no more than 1 every 3 years per species) of hawksbill, leatherback, and olive ridley turtles is also expected (NMFS 2010c). If the total number of authorized sea turtle interactions included in the incidental take statement (ITS) during any consecutive 3-year period is exceeded, re-initiation of consultation will be required (50 CFR 402.16). After implementation of the proposed action and the period of years 1 through 3 has ended, a new 3-year ITS period will begin with years 2 through 4, and so on.

The actions under the proposed FEP Amendment, i.e. a shallow set longline fishery for swordfish, are not covered by the existing BiOp. It is likely, therefore, that a new biological opinion would be required to address the potential impacts and the development of a separate incidental take statement.

9.11 Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) prohibits, with certain exceptions, the take of marine mammals in the U.S. and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the United States. The MMPA gives the Secretary of Commerce authority and duties for all cetaceans (whales, dolphins, and porpoises) and pinnipeds (seals and sea lions, except walruses). The MMPA requires NMFS to prepare and periodically review stock assessments of marine mammal stocks.

Under section 118 of the MMPA, NMFS must publish, at least annually, a List of Fisheries that classifies U.S. commercial fisheries into one of three categories. These categories are based on the level of serious injury and mortality of marine mammals that occurs incidental to each fishery. Specifically, the MMPA mandates that each fishery be classified according to whether it has frequent, occasional, or a remote likelihood of or no known incidental mortality or serious injury of marine mammals. The American Samoa longline fishery is a Category II fishery (occasional serious injury and mortality) in the 2011 List of Fisheries (75 FR 68468; Nov. 8, 2010) and this amendment makes no changes to allowable amount of fishing except to require deep-setting only in the American Samoa longline fishery which may deter marine mammal interactions which typically occur in the upper waters, therefore, it does not require a MMPA category re-designation or other action.

Vessel owners and crew that are engaged in Category II fisheries may incidentally take marine mammals after registering or receiving an Authorization Certificate under the MMPA, but they are required to: 1) report all incidental mortality and injury of marine mammals to NMFS, 2) immediately return to the sea with minimum of further injury any incidentally taken marine mammal, 3) allow vessel observers if requested by NMFS, and 4) comply with guidelines and prohibitions under the MMPA when deterring marine mammals from gear, catch, and private property (50 CFR 229.4, 229.6, 229.7). The MMPA registration process is integrated with existing state and Federal licensing, permitting, and registration programs. Therefore, individuals who have a state or Federal fishing permit or landing license, such as the American Samoa limited entry longline permit, are currently not required to register separately under the MMPA.

In addition, fishers participating in a Category I or II fishery are required to accommodate an observer onboard their vessel(s) upon request (50 CFR 229.7); and fishers participating in a Category I or II fishery are required to comply with any applicable take reduction plans. NMFS may develop and implement take reduction plans for any Category I or II fishery that interacts with a strategic stock.

See Sections 7.5.2 and 7.5.3 of this document for descriptions of marine mammals found around American Samoa. Section 8.0 provides an analysis of the anticipated impacts on these species under each of the alternatives considered by the Council. The Council expects that the alternatives would not adversely affect any marine mammal populations or habitat; however, at this time there are very little data on the few marine mammal interactions in this fishery from which to assess potential impacts and regarding marine mammal habitat in waters around American Samoa.

9.12 Executive Order 13132 – Federalism (E.O. 13132)

This action does not contain policies with federalism implications under E.O. 13132.

9.13 Essential Fish Habitat and Habitat Areas of Particular Concern

The proposed gear modification is a relatively minor change in the gear configuration that would disallow fishing from hooks between the surface and 100 m. The proposed measures would not result in increased gear loss, or large changes to fishery operations. Therefore, there would be no large or adverse effects of the proposal on essential fish habitat or habitat areas of particular concern for species managed under all the Western Pacific Fishery Ecosystem Plans. EFH and Habitat Areas of Particular Concern (HAPC) for these species groups has been defined as presented in Table 26.

The alternatives will not adversely affect EFH or HAPC for any managed species as they are not likely to lead to substantial physical, chemical, or biological alterations to the habitat, or result in loss of, or injury to, these species or their prey. The alternatives are not anticipated to cause damage to the ocean or coastal habitats. The alternative is expected to beneficially impact protected species while having no affects of any kind on habitat. The measures required in this amendment would have fishing gear in the water column fishing at depths deeper than 100 meters but this occurs in the pelagic habitat far from the bottom or any submarine features.

Table 27: EFH and HAPC for species managed under the Fishery Ecosystem Plans.

SPECIES GROUP	EFH (juveniles and adults)	EFH (eggs and larvae)	HAPC
Pelagics	Water column down to 1,000 m	Water column down to 200 m	Water column down to 1,000 m that lies above seamounts and banks
Bottomfish	Water column and bottom habitat down to 400 m	Water column down to 400 m	All escarpments and slopes between 40-280 m, and three known areas of juvenile opakapaka habitat
Seamount Groundfish	(Adults only): water column and bottom from 80 to 600 m, bounded by 29°-35°N and 171°E -179°W	(Including juveniles): epipelagic zone (0-200 nm) bounded by 29°-35°N and 171°E -179°W	Not identified
Precious Corals	Keahole, Makapuu, Kaena, Wespac, Brooks, and 180 Fathom gold/red coral beds, and Milolii, S. Kauai and Auau Channel black coral beds	Not applicable	Makapuu, Wespac, and Brooks Bank beds, and the Au`au Channel
Crustaceans	**Lobsters** Bottom habitat from shoreline to a depth of 100 m **Deepwater shrimp** The outer reef slopes at depths between 300-700 m	Water column down to 150 m Water column and associated outer reef slopes between 550 and 700 m	All banks with summits less than 30 m No HAPC designated for deepwater shrimp
Coral Reef Ecosystems	Water column and benthic substrate to a depth of 100 m	Water column and benthic substrate to a depth of 100 m	All Marine Protected Areas identified in FEPs, all PRIA, many specific areas of coral reef habitat (see FEPs)

Note: All areas are bounded by the shoreline, and the outward boundary of the EEZ, unless otherwise indicated.

10.0 Draft Proposed Regulations

To be completed

11.0 References

Ainley, D.G., T.C. Telfer, and M.H. Reynolds. 1997. Townsends' and Newell's shearwater (*Puffinus auricularis*). The Birds of North America, No. 297 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologist's Union. 18 pp.

Avise, J.C. and B.W. Bowen. 1994. Investigating Sea Turtle Migration Using DNA Markers. Current Opinion in Genetics and Development, 4 (1994): University of Georgia, Athens and University of Florida, Gainesville, USA. pp. 882-886.

Baker, C.S. 1985. The behavioral ecology and populations structure of the Humpback Whale (*Megaptera novaeangliae*) in the central and eastern Pacific. Dissertation for the University of Hawaii at Manoa.

Baker, C.S. and L.M. Herman. 1981. Migration and local movement of humpback whales through Hawaiian waters. Can. J. Zool. 59:460-469.

Balazs, G.H. 1994. Homeward bound: satellite tracking of Hawaiian green turtles from nesting beaches to foraging pastures. p.205 *In:* 13th Ann. Symposium on Sea Turtle Biol. and Conserv., Feb. 23-27, 1993, Jekyll Island, GA.

Balazs, G.H. and D. Ellis. 1996. Satellite telemetry of migrant male and female green Turtles breeding in the Hawaiian Islands. p. 19 *In:* Abstr. 16th Ann. Symp. on Sea Turtle Conser. Biol. Feb.28-Mar.2, 1996; Hilton Head, S.C.

Balazs, G.H., P. Craig, B.R.Winton, and R.K Miya. 1994. Satellite telemetry of green turtles nesting at French Frigate Shoals, Hawaii, and Rose Atoll, American Samoa. *In*: Bjorndal, K.A., Bolten, A.B., Johnson, D.A. and Eliazar, P.J. (Eds), Proc. 14th Ann. Symp. on Sea Turtle Biology and Conservation. NOAA Tech Memo NMFS SEFSC-351, p. 184–187.

Balazs, G.H., P. Siu, and J. Landret. 1995. Ecological aspects of green turtles nesting at Scilli Atoll in French Polynesia. *In:* Twelfth Annual Sea Turtle Symposium. NOAA Technical memorandum NMFS-SEFSC-361; p. 7-10

Balazs G.H. and M. Chaloupka. 2004. Thirty-year recovery trend in the once depleted Hawaiian green sea turtle stock. Biological Conservation. 117: 491–498.

Bartram, P. and J. Kaneko, 2004. Catch to bycatch ratios: comparing Hawaii's longline fisheries with others. SOEST Publication 04-05. JIMAR Contribution 04-352. 40 pp.

Beverly, S. 2004. New deep setting longline technique for bycatch mitigation. Secretariat of the Pacific Community. Report Number R03/1398. August 2004. 30 pp.

Beverly, S., E. Robinson, and D. Itano, D. 2004. Trial setting of deep longline techniques to reduce bycatch and increase targeting of deep-swimming tunas. 17th Meeting of the Standing Committee on Tuna and Billfish, SCTB17, Majuro, Marshall Islands, 9-18 August 2004. FTWG-7a, 1-28.

Beverly, S. and L. Chapman. 2007. Interactions between sea turtles and pelagic longline fisheries. WCPFC-SC3-EB SWG/IP-01. Scientific Committee, Third Regular Session of the Western and Central Pacific Fisheries Commission meeting, August 13-25; Honolulu, Hawaii.

Beverly, S., D. Curran, M. Musyl, and B. Molony. 2009. Effects of eliminating shallow hooks from tuna longline sets on target and non-target species in the Hawaii-based pelagic tuna fishery. Fish. Res. 96: 281-288.

Beverly, S., D. Curran, and M. Musyl. 2009. Deep setting longlines to avoid bycatch. Status of Sea Turtle Bycatch Initiatives. Proceedings of the Fourth International Fishers Forum, Western Pacific regional Fisheries Management Council, Honolulu, Hawaii.

Beverly, S., D. Curran, C.R. Donovan, and S. Harley. 2011. Comparison of fishing efficiency of two sizes of circle hooks in the American Samoa-based longline fishery. Final Report, Western Pacific Regional Fishery Management Council, Honolulu, Hawaii. 17 pp.

Bigelow, K.A. and E. Fletcher. 2009. Gear depth in the American Samoa-based Longline Fishery and Mitigation to Minimize Turtle Interactions with Corresponding Effects on Fish Catches. NOAA Pacific Islands Fisheries Science Center Internal Report IR-09-008. Issued 4 March 2009. 22 pp.

Bjorndal, K.A. 1997. Foraging ecology and nutrition of sea turtles. In P. L. Lutz and J. A. Musick (Eds.), The biology of sea turtles. Boca Raton, FL: CRC Press.

Bjorndal, K.A., A.B. Bolten, and M.Y. Chaloupka. 2000. Green turtle somatic growth model: Evidence for density dependence. Ecological Applications 10:269–282.
Bolten, A.B. and K.A. Bjorndal. 2002. Experiment to Evaluate Gear Modification on Rates of Sea Turtle Bycatch in the Swordfish Longline Fishery in the Azores. NOAA Award Number NA96FE0393. Final Project Report, March 2002. 14 pp.

BOH (Bank of Hawaii). 1997. American Samoa economic report. Bank of Hawaii, Honolulu.

Bromhead, D., S. Hoyle, A. Williams, S. Wang, and S. Chang. 2009. Factors influencing the size of albacore tuna sampled from the South Pacific albacore longline Fisheries. WCPFC Scientific Committee Fifth Regular Session, 10-21 August 2009, Port Vila, Vanuatu. WCPFC-SC5-2005/SA-IP-05.

Calambokidis J., E. Falcone, T. Quinn, A. Burdin, P. Clapham, J. Ford, C. Gabriele, R. DeLuc, D. Mattila, L. Rojas-Bracho, J. Straley, B. Taylor, J. Urban, D. Weller, B. Witteveen, M. Yamaguchi, A. Bendlin, D. Camacho, K. Flynn, A. Havron, J. Huggins, and N. Maloney. 2008. SPLASH: Structure of Populations, Levels of Abundance and Status of Humpback Whales in the North Pacific (Final Report). Cascadia Research. Contract Report #50AB133F-03-RP-00078. 57 pp.

Carr, A. 1978. The ecology and migrations of sea turtles. The west Caribbean green turtle colony. Bull. Am. Mus. Nat. Hist. 162(1): 1-46.

Chaloupka, M, P. Dutton and H. Nakano. 2004. Status of sea turtle stocks in the Pacific. FAO Fisheries Report No. 738 Suppl., p.135-164.

Chaloupka, M., and C. Limpus. 2001. Trends in the abundance of sea turtles resident in southern Great Barrier Reef waters. Biological Conservation. 102: 235–249.

Chaloupka, M., K.A. Bjorndal, G.H. Balazs, A.B. Bolten, L.M. Ehrhart, C.J. Limpus, H. Suganuma, S. Troeng, and M. Yamaguchi. 2008. Encouraging outlook for recovery of a once severely exploited marine mega-herbivore. Global Ecology and Biogeography 17: 297-304.

Chan, E., and H. Liew. 1996. Decline of the leatherback population in Terengganu, Malaysia, 1956–1995. Chelonian Conservation Biology 2(2): 196–203.

Chapman, L. 1998. The rapidly expanding and changing tuna longline fishery in Samoa. SPC Fisheries Newsletter #84 (January – March 1998). Secretariat of the Pacific Community, Noumea, New Caledonia. 10 pp.

Clarke, S. 2011. A Status Snapshot of Key Shark Species in the Western and Central Pacific and Potential Management Options. Western and Central Pacific Fisheries Commission, Scientific Committee Seventh Regular Session, 9-17 August 2011, Pohnpei, Federated States Of Micronesia, WCPFC-SC7-2011/EB-WP-04.

Cliffton, K., D. Cornejo, and R. Felger. 1982. Sea turtles of the Pacific coast of Mexico. In K. Bjorndal (Ed.), Biology and conservation of sea turtles (pp. 199–209). Washington, DC: Smithsonian Institution Press.

Collette, B.B., J.R. McDowell, and J.E. Grave. 2006. Phylogeny of Recent Billfishes (Xiphioidei), Bulletin of Marine Science, 79(3): 455–468, 2006.

Conant, T.A., P.H. Dutton, T. Eguchi, S.P. Epperly, C.C. Fahy, M.H. Godfrey, S.L. MacPherson, E.E. Possardt, B.A. Schroeder, J.A. Seminoff, M.L. Snover, C.M. Upite, and B.E. Witherington. 2009. Loggerhead sea turtle *(Caretta caretta)* 2009 status review under the U.S. Endangered Species Act. Report of the Loggerhead Biological Review Team to the National Marine Fisheries Service, August 2009.

Cortez-Zaragosa, E., P. Dalzell, and D. Pauly. 1989. Hook selectivity of yellowfin tuna (Thunnus albacares) caught off la Union, Philippines. J. Appl. Ichthyol. 1: 12-17.

Craig, P., D. Parker, R. Brainard, M. Rice, and G. Balazs. 2004. Migrations of green turtles in the central South Pacific. Biological Conservation 116: 433-438.

Craig, P. (ed.). 2002. Natural history guide to American Samoa. National Park of American Samoan and Department of Marine and Wildlife Resources. 78 pp.

Curran D. and K. Bigelow. 2010. Catch and bycatch effects of large circle hooks in a tuna longline fishery. Proceedings of the 61st Annual Tuna Conference, May 17-20. Lake Arrowhead, California, p 26 (abstract only).

Department of Marine and Wildlife Resources (DMWR). 2001. Report on the NMFS logbook program for the American Samoa longline fishery, 1st, 2nd, 3rd and 4th quarters 2001. American Samoa Government.

Dobbs, K. 2001. Marine turtles in the Great Barrier Reef World Heritage Area: A compendium of information and basis for the development of policies and strategies for the conservation of marine turtles (1st ed.). Townsville, Queensland, Australia: Great Barrier Reef Park Authority.

Domokos, R., M. Seki, J. Polovina, and D. Hawn. 2007. Oceanographic investigation of the American Samoa albacore (*Thunnus alalunga*) habitat and longline fishing grounds. Fish. Oceanogr. 16:6, 555–572.

Dutton, P., B. Bowen, D. Owens, A. Barragán, and S. Davis. 1999. Global phylogeography of the leatherback turtle (*Dermochelys coriacea*). Journal of Zoology 248:397–409.

Eckert, K.L. 1993. The biology and population status of marine turtles in the North Pacific Ocean (NOAA Tech. Memo, NOAA-TM-NMFS-SWFSC-186, 156 pp.). La Jolla, CA: National Marine Fisheries Service, Southwest Region.

Eckert, S.A. 1998. Perspectives on the use of satellite telemetry and other electronic technologies for the study of marine turtles, with reference to the first year-long tracking of leatherback sea turtles, p. 294. *In*: Proceedings of the Seventeenth 21 Annual Sea Turtle Symposium. S.P. Epperly and J. Braun (Eds.). NOAA Technical Memorandum NMFS-SEFC-415, Miami, FL.

Eckert, K.L. and S.A. Eckert. 1988. Pre-reproductive movements of leatherback turtles (*Dermochelys coriacea*) nesting in the Caribbean. Copeia 1988(2):400-406.

Falanruw, M.V.C., M. McCoy, and Namlug. 1975. Occurrence of ridley sea turtles in the Western Caroline Islands. Micronesica (11)a: 151-152.

Filippi, D., S. Waugh and S. Nicol. 2010. Revised spatial risk indicators for seabird interactions with longline fisheries in the Western And Central Pacific. Scientific Committee, Sixth Regular Session 10-19 August Nukualofa, Tonga WCPFC-SC6-2010/EB- IP 01.

Fitzsimmons, N.N., C. Moritz, and S.S. Moore. 1995. Conservation and dynamics of microsatellite loci over 300 million years of marine turtle evolution. Mol. Biol. Evol. 12:432-440.

Foreman, T. 1980. Synopsis of biological data on the albacore tuna, *Thunnus alalunga* (Bonnaterre, 1788), in the Pacific Ocean. *In:* W. Bayliff (Ed.) Synopses of biological data on eight species of Scombrids. Inter-American Tropical Tuna Commission: La Jolla, CA. 21-70. Special Report No. 2.

Forney K., J. Barlow, M. Muto, M. Lowry, J. Baker, G. Cameron, J. Mobley, C. Stinchcomb, J. Carretta. 2000. Draft U.S. Pacific Marine Mammal Stock Assessments: 2000. NMFS Southwest Fisheries Science Center: La Jolla.

Gillett, R., M.A. McCoy, and D.G. Itano. 2002. Status of the United States Western Pacific tuna purse seine fleet and factors affecting its future. SOEST Publication 02-01, JIMAR Contribution 02-344. 64 pp.

Gilman, E. and D. Kobayashi. 2007. Sea turtle interactions in the Hawaii-based swordfish fishery first quarter 2007 and comparison to previous periods. Update to Gilman, E., D. Kobayashi, T. Swenarton, N. Brothers, P. Dalzell, and I. Kelly. 2007. Reducing sea turtle interactions in the Hawaii-based longline swordfish fishery. Biological Conservation 139:19-28.

Gilman, E., D. Kobayashi, T. Swenarton, N. Brothers, P. Dalzell, and I. Kelly. 2007a. Reducing sea turtle interactions in the Hawaii-based longline swordfish fishery. Biological Conservation 139: 19-28.

Gilman, E., T. Moth-Poulsen, and G. Bianchi. 2007b. Review of measures taken by intergovernmental organizations to address sea turtle and seabird interactions in marine capture fisheries. FAO Fisheries Circular No. 1025. Food and Agricultural Organization of the United Nations, Rome.

Gilman, E. , J. Gearhart, B. Price, S. Eckert, H. Milliken, J. Wang, Y. Swimmer, D. Shiode, O. Abe, S.H. Peckham, M. Chaloupka, M. Hall, J. Mangel, J. Alfaro-Shigueto, P. Dalzell and A. Ishizaki. 2009. Mitigating sea turtle by-catch in coastal passive net fisheries. Fish and Fisheries. DOI: 10.1111/j.1467-2979.2009.00342.

Grant, G.S., P.W. Trail, and R.B. Clapp. 1994. First specimens of Sooty Shearwater, Newell's Shearwater, and White-faced Storm Petrel from American Samoa. Notornis: 41 215-217.

Grant, G.S., P. Craig and G.H. Balazs. 1997. Notes on juvenile hawksbill and green turtles in American Samoa. Pacific Science 51(1): 48-53.

Hampton, W.J., A. Langley, P. Kleiber, and K. Hiramatsu. 2004. Stock assessment of bigeye tuna in the Western and Central Pacific Ocean. 17th Meeting of the Standing Committee on Tuna and Billfish, 9-18 August 2004, Majuro, Marshall Islands. Working Paper SA-2.

Hampton, J., P. Kleiber, A. Langley, Y. Takeuchi, and M. Ichinokawa. 2005. Stock assessment of yellowfin tuna in the western and central Pacific Ocean. 1st Meeting of the Scientific Committee of the Western and Central Pacific Fisheries Commission. WCPFC-SC1, Noumea, New Caledonia, 8 – 19 August 2005. SA WP-1. 105 pp.

Harley, S., S. Hoyle, P. Williams, J. Hampton, and P. Kleiber. 2010. Stock Assessment of Bigeye Tuna in The Western and Central Pacific Ocean. Western and Central Pacific Fisheries Commission, Scientific Committee, Sixth Regular Session, 10-19 August 2010 Nuku'alofa, Tonga. WCPFC-SC6-2010/SA-WP-04. 98 pp.

Harrison, C. 1990. Seabirds of Hawaii: natural history and conservation. Cornell University Press, Ithaca, New York. 249 pp.

Hill, P. and D. DeMaster. 1999. Alaska Marine Mammal Stock Assessments 1999. National Marine Mammal Laboratory, NMFS Alaska Fisheries Science Center. Seattle.

Hill P., D. DeMaster, R. Small. 1997. Alaska Marine Mammal Stock Assessments, 1996. U.S. Pacific Marine Mammal Stock Assessments: 1996. U.S. Dept. of Commerce, NOAA, Tech. Memo., NMFS, NOAA-0TM-NMFS-AFSC-78. 149pp.

Hirth, H. 1997. Synopsis of Biological data on the green turtle *Chelonia mydas* (Linnaeus 1758). U.S. Fish and Wildlife Service, Washington D.C. 120p.

Hodge R. and B. Wing. 2000. Occurrence of marine turtles in Alaska Waters: 1960-1998. Herpetological Review 31:148-151.

Horwood, J. 1987. The Sei Whale: Population Biology, Ecology and Management. Croom Helm. London.

Hoyle, S.D. and M.N. Maunder. 2005. Status of yellowfin tuna in the Eastern Pacific Ocean in 2004 and outlook for 2005. IATTC Stock Assessment Report 6. Inter-American Tropical Tuna Commission. La Jolla, California. 102 pp.

Hoyle, S., A. Langley and J. Hampton. 2008. Stock assessment of albacore tuna in the South Pacific Ocean. WCPFC Scientific Committee Fourth Regular Session, 11-22 August, 2008, Port Moresby, Papua New Guinea. WCPFC-SC4-2008/SA-WP-8. 126 pp.

Hoyle, S. and N. Davies. 2009. WCPFC Scientific Committee Fifth Regular Session, 10-21 August, 2009, Port Vila, Vanuatu. WCPFC-SC5-2009/SA-WP-6. 133 pp.

Hoyle, S. P. Kleiber, N. Davies, S. Harley, and J. Hampton. 2010. Stock Assessment of Skipjack Tuna in the Western and Central Pacific Ocean. Western and Central Pacific Fishery Commission, Sixth Scientific Committee, Nuku'alofa, Tonga WCPFC-SC6-2010/SA-WP-10.

IPCC (Intergovernmental Panel on Climate Change). 2007: Summary for Policymakers. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

ISC (International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean). 2007. Annex 5: Report of the albacore working group workshop (November 28-December 5, 2006, Shimizu, Japan) in Report of the Seventh Meeting of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean, Plenary Session. Busan, S. Korea, July 25-30, 2007. 53 p.

Kaneko, J. and P. Bartram. 2005. Operational profile of a highliner in the American Samoa small-scale (alia) longline albacore fishery. SOEST Publication 05-03. JIMAR Contribution 05-357. 34 pp.

Kilarski, S., D. Klaus, J. Lipscomb, K. Matsoukas, R. Newton, and A. Nugent. 2006. Decision Support for Coral Reef Fisheries Management: Community Input as a Means of Informing Policy in American Samoa. A Group Project submitted in partial satisfaction of the requirements of the degree of Master's in Environmental Science and Management for the Donald Bren School of Environmental Management. University of California, Santa Barbara.

Kiyota, M., Yokota, K., Nobetsu, T., Minami, H., and Nakano, H. 2005. Assessment of mitigation measures to reduce interactions between sea turtles and longline fishery. Proc. 5th SEASTAR2000 Workshop, 24-29.

Kolody, D., N. Davies,and R. Campbell. 2006. South-West Pacific Swordfish stock status summary from multiple approaches. WCPFC Science Committee Sixth Regular Session, 7-18 August 2006, Manila, Philippines, WCPFC-SC2-2006/SA WP-7

Landsberg, J.H., G.H. Balazs, K.A. Steidinger, D.G. Baden, T.M. Work, and D.J. Russell. 1999. The potential role of natural tumor promoters in marine turtle fibropapillomatosis. Journal of Aquatic Animal Health 11:199-210.

Langley, A. 2006. The South Pacific Albacore Fishery: A Summary of the Status of the Stock and Fishery Management Issues of Relevance to Pacific Island Countries and Territories. Technical Report 37. Noumea, New Caledonia: Secretariat of the Pacific Community. 26 pp.

Langley, A., M. Ogura, and J. Hampton. 2003. Stock assessment of skipjack tuna in the western and central Pacific Ocean. 16th Meeting of the Standing Committee on Tuna and Billfish. SCTB16 Working Paper, June 2003. 43 pp.

Langley, A., S. Harley, S. Hoyle, N. Davies, J. Hampton, and P. Kleiber. 2009. Stock assessment of yellowfin tuna in the western and central Pacific Ocean, WCPFC Scientific Committee Fifth Regular Session, 10-21 August 2009, Port Vila, Vanuatu, WCPFC-SC5-2005/SA-WP-03. 125 pp.

Laurs, R. and J. Wetherall. 1981. Growth rates of North Pacific albacore, *Thunnus alalunga*, based on tag returns. Fish. Bull. 79 (2): 293-302.

Levine, A. and S. Allen. 2009. American Samoa as a fishing community. U.S. Dept. of Commerce, NOAA Tech. Memo., NOAA-TM-NMFS-PIFSC-19, 74 pp.

Limpus, C.J. 1982. The status of Australian sea turtle populations. In K.A. Bjorndal (Ed.), Biology and conservation of sea turtles. Washington, DC: Smithsonian Institution Press.

Limpus, C. 1992. The hawksbill turtle, *Eretmochelys imbricata*, in Queensland: Population structure within a southern Great Barrier Reef feeding ground. Wildlife Research 19: 489–506.

Limpus, C.J. 2009. A Biological Review of Australian Marine Turtles: 2. Green Turtle *Chelonia mydas* (Linnaeus); 3. Hawksbill Turtle, *Eretmochelys imbricata* (Linnaeus).The State of Queensland, Environmental Protection Agency. September 2008.

Limpus, C.J. and M.Y. Chaloupka. 1997. Nonparametric regression modeling of green sea turtle growth rates (southern Great Barrier Reef). Marine Ecology Progress Series 149:23-34.

Limpus, C.J. and D. Reimer. 1994. The loggerhead turtle, *Caretta caretta*, in Queensland: A population in decline. *In* R. James (Compiler). Proceedings of the Australian Marine Turtle Conservation Workshop: November 14–17, 1990 Canberra, Australia: Australian Nature Conservation Agency.

Lopez-Mendilaharsu, M., S. Gardner, J. Seminoff, and R. Riosmena-Rodriguez. 2005. Identifying critical foraging habitats of the green turtle (*Chelonia mydas*) along the Pacific coast of the Baja California peninsula, Mexico. Aquatic Conservation: Marine and Freshwater Ecosystems, 15: 259-269.

Marquez, M. 1990. Sea turtles of the world. An annotated and illustrated catalogue of sea turtle species known to date. FAO species Catalog. FAO Fisheries Synopsis 11 (125). 81pp.

Maunder M.N. and S.D. Hoyle. 2005. Status of Bigeye Tuna in the Eastern Pacific Ocean in 2004 and Outlook for 2005. IATTC Working Group on Stock Assessment Document SAR-06-07B.

McKeown, A. 1977. Marine turtles of the Solomon Islands. Honiara: Solomon Islands: Ministry of Natural Resources, Fisheries Division.

Meylan, A. 1985. The role of sponge collagens in the diet of the Hawksbill turtle, *Eretmochelys imbricata*. In A. Bairati and R. Garrone, (Eds.), Biology of invertebrate and lower vertebrate collagens. New York: Plenum Press.

Meylan, A. 1988. Spongivory in hawksbill turtles: A diet of glass. Science 239: 393–395.

Meylan, A. 1999. International movements of immature and adult hawksbill turtles (*Eretmochelys imbricata*) in the Caribbean Region. Chelonian Conservation and Biology 3: 189-194.

NMFS (National Marine Fisheries Service). 1998. Biological Opinion on the fishery management plan for the pelagic fisheries of the Western Pacific Region: Hawaii Central North Pacific Longline Fishery. National Marine Fisheries Service, Southwest Region.

NMFS 2001. Final Environmental Impact Statement for the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region.

NMFS. 2003. American Samoa Pilot Observer Program Status Report. PIRO, NMFS. February 21, 2003.

NMFS. 2004. Endangered Species Act Section 7 Consultation Biological Opinion on Proposed Regulatory Amendments to the Fisheries Management Plan for Pelagic Fisheries of the Western Pacific Region, National Marine Fisheries Service, Issued February 23, 2004.

NMFS. 2005. Biological Opinion on Continued authorization of the Hawaii-based Pelagic, Deep-Set, Tuna Longline Fishery based on the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region. Pacific Islands Region, 168 pp.

NMFS. 2006. The U.S. Western and Central Pacific Purse Seine Fishery as authorized by the South Pacific Tuna Act and the High Seas Fishing Compliance Act. Pacific Islands Region, 185 pp.

NMFS. 2008a. Biological Evaluation: Effects of continued operation of the American Samoa pelagic longline fishery on ESA-listed sea turtles and marine mammals (attachment to July 31,2008, memo requesting ESA consultation). NMFS Pacific Islands Regional Office, Honolulu.

NMFS. 2008b. Endangered Species Act Section 7 Consultation Biological Opinion on Management Modifications for the Hawaii-based Shallow-set Longline Swordfish Fishery—Implementation of Amendment 18 to the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region. Issued October 15, 2008. Pacific Islands Regional Office. 91 pp.

NMFS. 2010. Endangered Species Act Section 7 Consultation Biological Opinion on FEMA funding, under Section 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, for projects to repair infrastructure damage on Tutuila, American Samoa that resulted from the Presidentially-declared Earthquake, Tsunami, and Flooding disaster (FEMA-1859-DR-AS) of September 2009. I/PIR/2010/00153. Issued March 18, 2010. 32 pp.

NMFS. 2010b. Summary of Green Turtle Nesting in Oceania. National Marine Fisheries Service Pacific Islands Region, Honolulu, HI. Prepared by K. Maison, I. Kelly, and K. Frutchey. March 2010.

NMFS. 2010c. Endangered Species Act Section 7 Consultation Biological Opinion on Measures to Reduce Interactions Between green sea turtles and the American Samoa-based Longline Fishery-Implementation of an Amendment to the Fishery Ecosystem Plan for Pelagic Fisheries of the Western Pacific Region. September 16, 2010. 91 pp.

NMFS. 2010d. Social assessment for Amendment 5 to the Fishery Ecosystem Plan for Pelagic Fisheries of the Western Pacific Region: Measures to Reduce Interactions between the American Samoa Longline Fishery and Green Sea Turtles. National Marine Fisheries Service Pacific Islands Region, Honolulu, Division of Sustainable Fisheries, 10 pp.

NMFS 2011. Annual Report on Seabird Interactions and Mitigation Efforts in the Hawaii Longline Fisheries – 2010. Sustainable Fisheries Division, Pacific Islands Regional Office, National Marine Fisheries Service, Honolulu, 14 pp.

NMFS and USFWS. 2007a. (National Marine Fisheries Service and U.S. Fish and Wildlife Service). Green Sea Turtle (*Chelonia mydas*). 5-Year Review: Summary and Evaluation. 105 p. Available at: http://www.nmfs.noaa.gov/pr/pdfs/species/greenturtle_5yearreview.pdf

NMFS and USFWS. 2007b. Olive Ridley Sea Turtle (*Lepidochelys olivacea*). 5-Year Review: Summary and Evaluation. 67 p. Available at: http://www.nmfs.noaa.gov/pr/pdfs/species/oliveridley_5yearreview.pdf

NMFS and USFWS. 1998a. (National Marine Fisheries Service and U.S. Fish and Wildlife Service) Recovery Plan for U.S. Pacific Populations of the green turtle (*Chelonia mydas*). National Marine Fisheries Service. Silver Spring, MD. 84 pp.

NMFS and USFWS. 1998b. Recovery Plan for U.S. Populations of the hawksbill turtle (*Eretmochelys imbricata*). National Marine Fisheries Service. Silver Spring, MD. 82 pp.

NMFS and USFWS. 1998c. Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle (Dermochelys Coriacea). National Marine Fisheries Service: Silver Spring, MD

O'Malley, J.M. and S.G. Pooley. 2002. A description and economic analysis of large American Samoa longline vessels. SOEST (University of Hawaii) Report 02-345.

PIFSC (NMFS Pacific Islands Fisheries Science Center). 2008. PIFSC Report on the logbook program for the American Samoa longline fishery July-September 2008. PIFSC Data Report DR-08-012. Issued December 2008.

Plotkin, P.T. 1994. The migratory and reproductive behavior of the olive ridley*, Lepidochelys olivacea* (Eschscholtz, 1829), in the Eastern Pacific Ocean. Ph.D. Thesis, Texas A&M Univ., College Station.

Polovina, J.J., G.H. Balazs, E.A. Howell, D.M. Parker, Michael P. Seki, and P.H. Dutton. 2003. Forage and migration habitat of loggerhead (*Caretta caretta*) and olive ridley (*Lepidochelys olivacea*) sea turtles in the central North Pacific Ocean. Fisheries Oceanography, 13 (1) 36–51.

Polovina, J.J., E. Howell, D.M. Parker, and G.H. Balazs. 2003. Dive-depth distribution of loggerhead (*Caretta caretta*) and olive ridley (*Lepidochelys olivacea*) sea turtles in the central North Pacific: Might deep longline sets catch fewer turtles? Fishery Bulletin 101(1): 189-193.

POP (Pacific Ocean Producers). 2011. POP Fishing and Marine. Honolulu, Hawaii. Price list, April 2011. http://pop-hawaii.com/fileadmin/pdf/Commercial_Pricelist.pdf

Pritchard, P.C.H. 1982a. Marine turtles of the South Pacific. Pages 253-262 In K.A. Bjorndal (ed.), Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington, DC. 583 pp.

Pritchard, P.C.H. 1982b. Nesting of the leatherback turtle (*Dermochelys coriacea*) in Pacific Mexico, with a new estimate of the world population status. Copeia 1982:741-747.

Reeb, C.A., L. Arcangeli & B.A. Block. 2000. Structure and migration corridors in Pacific populations of the swordfish, Xiphius gladius, as inferred through analyses of mitochondrial DNA. Marin Biology 136, 1123-1131.

Reeves R., S. Leatherwood, G. Stone, and L. Eldridge. 1999. Marine mammals in the area served by the South Pacific Regional Environment Programme (SPREP). South Pacific Regional Environment Programme: Apia, Samoa. 48 pp.

Rice, D. 1989. Sperm whale *Physeter macrocephalus*. Academic Press. 442 pp.

Sakagawa, G.T. and R.R. Bell 1980 Swordfish, Xiphias gladius. p. 40- 50. In R.S. Shomura (ed.) Summary report of the billfish stock assessment workshop Pacific resources, Honolulu Laboratory, Southwest Fisheries Center, 5-14 December 1977. NOAA Tech. Mem. NMFS.

Saito, S. 1973. Studies on fishing of albacore (*Thunnus alalunga* Bonnaterre) by experimental deep-sea tuna longline. Hokkaido Univ. Mem. Fac. Fish. 21(2):107-184.

Sarti L., S. Eckert, N. Garcia, and A. Barragan. 1996. Decline of the world's largest nesting assemblage of leatherback turtles. Marine Turtle Newsletter 74: 2–5.

Schug, D. and A.Galea'i.1987. American Samoa: the tuna industry and the economy. *In* Tuna Issues and Perspectives in the Pacific Islands Region, East-West Center, Honolulu.

Secretariat of the Pacific Community (SPC). 2004. Western and Central Pacific Fisheries Commission Tuna Fishery Yearbook 2003. Oceanic Fisheries Programme. Noumea, New Caledonia.

Seminoff, J., T.T. Jones, and G.J. Marshall. 2006. Underwater behavior of Green Turtles monitored with video-time-depth recorders: what's missing from dive profiles? Marine Ecology Progress Series 322:269-280.

Seminoff, J. and T. Jones. 2006. Diel movements and activity ranges of green turtle (*Chelonia mydas*) at a temperate foraging area in the Gulf of California, Mexico. Herpetological Conservation and Biology 1(2): 81-86.

Seminoff, J. 2004. Marine Turtle Specialist Group Review. 2004 Global Assessment. Green turtle (*Chelonia mydas*). Marine Turtle Specialist Group, The World Conservation Union (IUCN) Species Survival Commission Red List Programme.

Seminoff, J. 2002. Global status of the green sea turtle (*Chelonia mydas)*: A summary of the 2001 status assessment for the IUCN Red List Programme. Pp: 197-211 *In*: I. Kinan (Ed.), Proc. Western Pacific Sea Turtle Cooperative Research and Management Workshop. February 5-8, 2002, Honolulu, Hawaii, USA. Western Pacific Regional Fishery Management Council: Honolulu, HI.

Seminoff, J.A., A.R.S. Hidalgo, T.W. Smith, and L.A. Yarnell. 2001. Diving patterns of green turtles (*Chelonia mydas agassizii*) in the Gulf of California. Proceedings of the Twenty-first Symposium on Sea Turtle Biology and Conservation. Philadelphia, PA.

Seminoff, J.A., A.R.S. Hidalgo, and W.J. Nichols. 2000. Movement and Home Range of the East- Pacific Green Turtle at a Gulf of California (Mexico) feeding Area. Proceedings of the Twentieth Symposium on Sea Turtle Biology and Conservation. Orlando, FL. 29 February – 4 March 2000.

Seminoff, J.A., W.J. Nichols, and A. Resendiz. 1997. Diet composition of the black sea turtle, (*Chelonia mydas agassizii*) in the central Gulf of California, Mexico. Proceedings of the 17th Annual Sea Turtle Symposium, 4-8 March 1997, Orlando, FL.

Severance, C. and R. Franco. 1989. Justification and design of limited entry alternatives for the offshore fisheries of American Samoa, and an examination of preferential fishing rights for native people of American Samoa within a limited entry context. Western Pacific Fishery Management Council, Honolulu.

Severance, C., R. Franco, M. Hamnett, C. Anderson, and F. Aitaoto. 1999. Effort comes from the cultural side: coordinated investigation of pelagic fishermen in American Samoa. Draft report for Pelagic Fisheries Research Program. JIMAR/SOEST, Univ. Hawaii - Manoa, Honolulu, HI.

Sokimi, W. and L. Chapman. 2000. Report of sea and fishing trials on board the Samoan Fisheries Division's New 12.2 m super alia, 26 April – 4 September 2000. Fisheries Development Section, Secretariat of the Pacific Community. 64 p.

Sosa O & M Shimizu. 1991. Stock unit of the Pacific swordfish inferred from spatial and temporal CPUE trends in the Japanese tuna longline fishery. Bulletin of the National Research Institute of Far Seas Fisheries 28: 75-90.

Spear, L.B., D.G. Ainley, N. Nur, and S.N.G. Howell. 1995. Population Size and Factors Affecting At-Sea Distributions of Four Endangered Procellariids in the Tropical Pacific. The Condor 97 (3): 613-638.

Spotila J., A. Dunham, A. Leslie, A. Steyermark, P. Plotkin, and F. Paladino. 1996. Worldwide population decline of *Dermochelys coriacea*: Are leatherback turtles going extinct? Chelonian Conservation Biology 2(2): 209–222.

Spotila, J.R., R.D. Reina, A.C. Steyermark, P.T. Plotkin, and F.V. Paladino. 2000. Pacific leatherback turtles face extinction. Nature 405: 529-530.

Starbird, C.H. and M.M. Suarez. 1994. Leatherback sea turtle nesting on the north Vogelkop coast of Irian Jaya and the discovery of a leatherback sea turtle fishery on Kei Kecil Island. Fourteenth Annual Symposium on Sea Turtle Biology and Conservation (p. 143). March 1–5, 1994, Hilton Head, South Carolina.

Stinson, M. 1984. Biology of sea turtles in San Diego Bay, California and the Northeastern Pacific Ocean. Master's Thesis, San Diego State University.

Swimmer, Y., R. Arauz, B. Higgins, L. McNaughton, M. McCracken, J. Ballestero and R. Brill. 2005. Food color and marine turtle feeding behavior: Can blue bait reduce turtle bycatch in commercial fisheries? Marine Ecology Progress Series. 295: 273-278.

Swimmer, Y., R. Arauz, J. Wang, J. Suter, M. Musyl, A. Bolanos, and A. Lopez. 2010. Comparing the effects of offset and non-offset circle hooks on catch rates of fish and sea turtles in a shallow-set longline fishery. Aquatic Conservation: Marine and Freshwater Ecosystems, 20: 445-451.

TEC, Inc. 2007. Review of fishery and seafood marketing development potentials for American Samoa. Prepared for the WPRFMC, Honolulu, HI.

TPC (Territorial Planning Commission) and Department of Commerce. 2000. American Samoa's comprehensive economic development strategy year 2000. American Samoa Government. 49 p.

Troeng, S. and E. Rankin. 2005. Long-term conservation efforts contribute to positive green turtle (*Chelonia mydas*) nesting trend at Tortuguero, Costa Rica. Biological Conservation 121: 111–116.

Tuato'o-Bartley N., T. Morrell, P. Craig. 1993. Status of sea turtles in American Samoa in 1991. Pacific Science 47 (3). 215-221.

USFWS (U.S. Fish and Wildlife Service). 1983. Hawaiian Dark-Rumped Petrel and Newell's Shearwater Recovery Plan. Portland, OR. pp.57

USCG (United States Coast Guard) and NMFS (National Marine Fisheries Service). 2010. Distant Water Tuna Fleet (aka U.S. Purse Seine Fleet) Annual report to Congress. April 30, 2010. 14 pp.

Utzurrum, R. 2002. Sea turtle conservation in American Samoa. P. 30-31 *In*: I. Kinan (Ed.). Proc. of the Western Pacific Sea Turtle Cooperative Research and Management Workshop, Feb. 5-8, 2002. Western Pacific Regional Fishery Management Council. Honolulu, Hawaii.

Van Dam, R. and C. Diez. 1997. Diving behavior on immature hawksbill turtle (*Eretmochelys imbricata*) in a Caribbean reef habitat. Coral Reefs 16:133–138.

Warham, J. 1990. The shearwater, *Fenus puffinus*. *In:* The petrels: Their ecology and breeding system (pp. 157–170). San Diego, CA: Academic Press.

Watson, J, D. Foster, S. Epperly, and A. Shah. 2004. Experiments in the western Atlantic northeast distant waters to evaluate sea turtle mitigation measures in the pelagic longline fishery. Report on experiments conducted in 2001–2003. US National Marine Fisheries Service, Pascagoula, MS, USA.

Waugh, S., B. Lascelles, P. Taylor, I. May, M. Balman, and S. Cranwell. 2009. Appendix to EB-SWG-WP-6: Range distributions of seabirds at risk of interactions with longline fisheries in the western and central Pacific Ocean. WCPFC-SC5-2009/EB-WP-06-Appendix. WCPFC Scientific Committee Fifth Regular Session. 10-21 August 2009. 74 pp.

WCPFC. 2010. Western and Central Pacific Fisheries Commission Tuna Fishery Yearbook 2009. Western and Central Pacific Fisheries Commission, Pohnpei, Federated States of Micronesia.

Werner, T., S. Kraus, A. Read, and E. Zollett. 2006. Fishing techniques to reduce the bycatch of threatened marine animals. Marine Technology Society Journal 40(3): 50-68.

Wetherall, J.A. 1993. Pelagic distribution and size composition of turtles in the Hawaii longline fishing area. *In*: G. H. Balazs and S. G. Pooley (Eds.). Research plan to assess marine turtle hooking mortality: Results of an expert workshop held in Honolulu, Hawaii, November 16–18, 1993. SWFSC Administrative Report H-93-18.

Witzell, W.N. 1984. The incidental capture of sea turtles in the Atlantic U.S. fishery conservation zone by the Japanese tuna longline fleet, 1978-81. Marine Fisheries Review 46(3): 56-58.

WCPFC. 2010. Annual Report To The Commission Part 1: Information On Fisheries, Research, And Statistics: Samoa. Western and Central Pacific Fisheries Commission, Scientific Committee Sixth Regular Session, 10-19 August 2010, Nuku'alofa, Tonga, WCPFC-SC6-AR/CCM-20.

WCPFC. 2011a. Annual Report To The Commission Part 1: Information On Fisheries, Research, And Statistics: Australia. Western and Central Pacific Fisheries Commission, Scientific Committee Seventh Regular Session, 9-17 August 2011, Pohnpei, Federated States Of Micronesia, WCPFC-SC7-AR/CCM-01.

WCPFC. 2011b. Annual Report To The Commission Part 1: Information On Fisheries, Research, And Statistics: Japan. Western and Central Pacific Fisheries Commission, Scientific Committee Seventh Regular Session, 9-17 August 2011, Pohnpei, Federated States Of Micronesia, WCPFC-SC7-AR/CCM-09.

WCPFC. 2011c. Annual Report To The Commission Part 1: Information On Fisheries, Research, And Statistics: Chinese Taipei. Scientific Committee Seventh Regular Session, 9-17 August 2011, Pohnpei, Federated States Of Micronesia, WCPFC-SC7-AR/CCM-22.

WCPFC. 2011d. Annual Report To The Commission Part 1: Information On Fisheries, Research, And Statistics: New Zealand. Scientific Committee Seventh Regular Session, 9-17 August 2011, Pohnpei, Federated States Of Micronesia, WCPFC-SC7-AR/CCM-15.

WCPFC. 2011e. Annual Report To The Commission Part 1: Information On Fisheries, Research, And Statistics: European Union. Scientific Committee Seventh Regular Session, 9-17 August 2011, Pohnpei, Federated States Of Micronesia, WCPFC-SC7-AR/CCM-15.

WCPFC. 2011f. Annual Report To The Commission Part 1: Information On Fisheries, Research, And Statistics: New Caledonia. Scientific Committee Seventh Regular Session, 9-17 August 2011, Pohnpei, Federated States Of Micronesia, WCPFC-SC7-AR/CCM-14.

WCPFC. 2011g. Annual Report To The Commission Part 1: Information On Fisheries, Research, And Statistics: French Polynesia. Scientific Committee Seventh Regular Session, 9-17 August 2011, Pohnpei, Federated States Of Micronesia, WCPFC-SC7-AR/CCM-08.

WCPFC. 2011h. Annual Report To The Commission Part 1: Information On Fisheries, Research, And Statistics: Cook Islands. Scientific Committee Seventh Regular Session, 9-17 August 2011, Pohnpei, Federated States Of Micronesia, WCPFC-SC7-AR/CCM-04

Williams, P. and P. Terawasi. 2011. Overview of tuna fisheries in the western and central Pacific Ocean, including economic conditions – 2010. Western and Central Pacific Fisheries Commission, Scientific Committee Seventh Regular Session, 9-17 August 2011, Pohnpei, Federated States Of Micronesia, WCPFC-SC7-2011/GN WP-1.

WPRFMC. 2009. Amendment 18 to the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region Including a Final Supplemental Environmental Impact Statement. March 2009. 331 pp.

WPRFMC. 2011. Pelagic Fisheries of the Western Pacific Region 2009 Annual Report. Western Pacific Regional Fishery Management Council. Honolulu, Hawaii.

Yokota, K., H. Minami, and T. Nobetsu. 2006. Research on mitigation of the interaction of sea turtle with pelagic longline fishery in the western North Pacific. Proc. 3rd Int. Symp. SEASTAR and Asian Bio-logging Science, 3-8.

Zug, G.R., G.H. Balazs, J.A. Wetherall, D.M. Parker and S.K. Murakawa. 2002. Age and growth of Hawaiian sea turtles (*Chelonia mydas*): an analysis based on skeletochronology. Fish. Bull. 100:117-127.