WESTERN
PACIFIC
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FISHERY
MANAGEMENT
COUNCIL

# Measures to Reduce the Incidental Catch of Sea Turtles in the Pelagic Fisheries of the Western Pacific Region

A regulatory amendment under the
Pelagics Fishery Management Plan of the Western Pacific Region

Including a Draft Regulatory Impact Review/Initial Regulatory Flexibility Analysis

Implementing the Reasonable and Prudent Alternative in the
Biological Opinion of the National Marine Fisheries Service
for the Pelagic Fisheries of the Western Pacific Region
Issued March 29, 2001

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## 2.0 Summary

This framework measure is intended to implement the reasonable and prudent alternative (RPA) of a March 29th 2001 biological opinion (BiOp) (as clarified regarding the use of long handled line clippers and dip nets) on sea turtles issued by the National Marine Fisheries Service (NMFS), via an amendment to the regulations under the Fishery Management Plan for the Pelagics Fisheries of the Western Pacific. The fleet of fishing vessels holding 164 Hawaii longline limited access permits and operating with longline gear, inadvertently hook or entangle, and kill Pacific marine turtles, namely leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), olive ridley (*Lepidochelys olivacea*) and green turtles *(Chelonia mydas*), as do other pelagic fisheries. These species of marine turtles are all listed under the US Endangered Species Act as either "threatened" or "endangered". The BiOp, published on March 29th 2001 by NMFS, concluded that the actions of the region's pelagic fisheries are likely to adversely affect sea turtles and jeopardize Eastern Pacific green turtles, leatherback turtles and loggerhead turtles. NMFS based this conclusion on previous patterns of turtles that have been captured, injured, or killed through interactions with the gear used in the fisheries. This document's preferred alternative, comprised of the reasonable and prudent alternative contained in the March 29th 2001 BiOp, implements various measures to reduce the likelihood of jeopardy to these turtle populations by all FMP pelagic fisheries. These include a complete ban on targeting of swordfish anywhere in the Pacific Ocean north of the equator, and a time/area closure for vessels targeting tunas during April and May each year, extending from the equator to 15° N lat., and from 145° W. long. to 180° long, by all longline fisheries under Council jurisdiction . The ban on swordfish targeting contains gear specifications to ensure that the longline gear is set deep to target tunas and not swordfish, and a ban on the use of lightsticks. Hawaii-based longline permit holders who de-register their vessels from their Hawaii limited access permits throughout the year are also prohibited from re-registering their vessels, except in the month of October. Longline and other vessels targeting pelagic fish, such as trollers and handliners, must also carry line-clippers to free hooked turtles that cannot be retrieved, and bolt or wire cutters to cut hooks and remove them if embedded in turtles. All longline vessels under Council jurisdiction must also carry a dip net to retrieve captured turtles where feasible for line and hook removal. Finally, all longline vessel operators must annually complete a protected species educational workshop conducted by NMFS. Unless noted otherwise, the text and analyses of the alternatives are drawn largely from March 29th 2001 BiOp and a Final Environmental Impact Statement (FEIS) for Pelagic Fisheries of the Western Pacific Region, which included the March 29th BiOp RPA as the preferred alternative. The Council has chosen not to undertake further analyses of these measures at this time.

## 3.0 Table of Contents

## 4.0 Introduction

### 4.1 Responsible agencies

The Western Pacific Regional Fishery Management Council (Council or WPRFMC) was established by the Magnuson Fishery Conservation and Management Act of 1976 (Public Law 94-265; 16 U.C.S. 1801 et. seq.) to develop fishery management plans (FMPs) for fisheries operating in the US Exclusive Economic Zone (EEZ) around American Samoa, Guam, Hawaii, the Northern Mariana Islands and the remote US Pacific Island possessions.[1] Once an FMP is approved by the Secretary of Commerce (Secretary), it is implemented by Federal regulations which are enforced by the National Marine Fisheries Service (NMFS) and the US Coast Guard, in cooperation with state agencies.

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### 4.2 Public review process and schedule

The National Marine Fisheries Service prepared and filed a Final Environmental Impact Statement on March 30, 2001 for the Pelagics Fishery Management Plan of the Western Pacific Region. The Final EIS (FEIS) contained a preferred alternative which included a series of actions (including a new time/area closure) to mitigate the fishery's adverse impacts on sea turtles. These measures were based on a new biological opinion written as a part of a section 7 consultation under the Endangered Species Act and issued on March 29, 2001. At the 110th Council Meeting held between the18-21 June 2001, the Council staff to prepare a regulatory amendment recommending implementation of the Reasonable and Prudent Alternative of the NMFS Turtle Biological Opinion published on 29 March 2001. At the 111th Council Meeting between 23-26 October 2001, the Council approved the regulatory amendment implementing the turtle BiOp and directed staff to send the document for review and implementation by the Department of Commerce.

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[1] Howland Island, Baker Island, Jarvis Island, Johnston Atoll, Midway Island, Kingman Reef, Palmyra Atoll, and Wake Island.

### 4.3 List of preparers

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## 5.0 Purpose and Need for Action

### 5.1 March 29th, 2001 Biological Opinion

To comply with the requirements of the Endangered Species Act of 1973, the National Marine Fisheries Service (NMFS) prepared a biological opinion (BiOp) on its proposal to continue prosecuting various fisheries (as they existed prior to December 27, 1999) that are managed under the Western Pacific Pelagics Fishery Management Plan. The BiOp considered the effects of longline, troll, handline, and pole-and-line fisheries based in Hawaii, American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands (CNMI) on threatened and endangered species and their critical habitat.

Based on previous patterns of interactions between the fisheries and endangered marine mammals, the BiOp concluded that the proposed fisheries are not likely to adversely affect these marine mammals or critical habitat that has been designated for them (blue whale, *Balaenoptera musculus*; fin whale, *Balaenoptera physalus*; Hawaiian monk seal, *Monachus schauinslandi*; humpback whale, *Megaptera novaeangliae*; northern right whale, *Eubalaena glacialis;* sei whale, *Balaenoptera borealis*; and sperm whale, *Physeter macrocephalus*).

Based on previous patterns of interactions between the fisheries and endangered sea turtles, the BiOp concluded that the proposed fisheries are not likely to adversely affect hawksbill sea turtles, (*Eretmochelys imbricata*), but are likely to adversely affect green turtles *(Chelonia mydas*), leatherback turtles (*Dermochelys coriacea*), loggerhead turtles (*Caretta caretta*) and olive ridley turtles (*Lepidochelys olivacea*). NMFS based this conclusion on previous patterns of turtles that have been captured, injured, or killed through interactions with the gear used in the fisheries.

Limited quantitative information on all of the turtle species was available for NMFS' analysis. To conduct its jeopardy analyses in the absence of definitive, quantitative information, NMFS used a conceptual model that considered the information available on the numbers of sea turtles captured, injured, or killed in the US Pacific pelagic fisheries to determine if these injuries or deaths could be expected to reduce a species' reproduction, numbers, or distribution. As part of these analyses, NMFS made assumptions about the number of adult, female sea turtles that might be captured, injured, or killed in the pelagic fisheries. NMFS also projected the effects of the proposed fisheries on the turtles' survival and fecundity over the time it would take the 2001 cohort of hatchlings to recruit into the adult, breeding population. NMFS then considered the probable effects on turtle mortalities in the fisheries on the species' population structure, the status and trends of the various populations, the vital rates, and the relationship between vital rates and the population's status and trend (that is, the population's rate of increase). Specifically, NMFS considered whether mortalities associated with the fisheries are a significant or chronic source of (a) reduced fecundity in the breeding population of these turtles or (b) decreased rates of survival in one or more life history stages of these sea turtles.

Based on these qualitative analyses, NMFS concluded that the numbers of green, leatherback and loggerhead turtles captured, injured, or killed in the proposed fisheries would reduce the numbers and reproduction of those species in a way that would be expected to appreciably reduce their likelihood of surviving and recovering in the wild. NMFS concluded that the numbers of olive ridley captured, injured, or killed in the proposed fisheries would not reduce the numbers and reproduction of that species in a way that would reduce its likelihood of surviving and recovering in the wild. The BiOp includes a reasonable and prudent alternative that is expected to avoid the likelihood of jeopardizing green, leatherback, and loggerhead turtles. The BiOp also provides an incidental take statement that includes measures to minimize the impact of residual captures and deaths on all four sea turtle species.

NMFS anticipates that the following numbers of takes and mortalities will occur after implementation of the reasonable and prudent measures (Table 1). NMFS has determined that these take levels are not likely to jeopardize green, leatherback, loggerhead, or olive ridley turtles. NMFS anticipates that the mortality levels in this fishery will be much lower than the worst case numbers provided below. NMFS anticipates that up to five loggerheads may be taken by the tuna fishery annually. This estimate of total loggerhead interactions by the fishery for any given year would be the result of one observed interaction in a fishery with 20% observer coverage.

**Table 1. Estimated annual sea turtle takes in the Hawaii-based longline fishery[2].**

| Species | Annual estimated incidental take | Annual estimated incidental mortality |
|---|---|---|
| **Green** | 11 (0-28) | 7 (0-18) |
| **Leatherback** | 29 (0-59) | 16 (0-32) |
| **Loggerhead** | 0-5 | 0-2 |
| **Olive ridley** | 98 (7-185) | 87 (7-163) |

The numbers estimated for all other fisheries are "possible minimums" that must be re-evaluated after one year of data has been gathered on these fisheries (Tables 2 & 3). Subsequent years' information will be used to further refine expected levels of incidental take and evaluate their impacts on listed species.

[2] Corrected numbers provided by personal communication from P.Ruevelas, Office of Protected Resources, Southwest Region, NMFS.

**Table 2. Estimated annual sea turtle takes in longline fisheries other than Hawaii.**

| Fishery[1] | Annual estimated incidental take | Annual estimated incidental mortality |
|---|---|---|
| **American Samoa** | 3 hardshells, 1 leatherback | 1 hardshell |
| **Guam** | 3 hardshells, 1 leatherback | 1 hardshell |
| **Northern Mariana** | 3 hardshells, 1 leatherback | 1 hardshell |

**Table 3. Estimated annual sea turtle takes in non-longline fisheries in the Western Pacific Region (numbers are for all species combined).**

| Fishery | Annual estimated incidental take | Annual estimated incidental mortality |
|---|---|---|
| **All handline fisheries** | 1 | 0 |
| **All troll fisheries** | 1 | 0 |
| **Hawaii pole-and-line fishery** | 1 | 0 |

### 5.2 Chronology of events leading to this regulatory amendment

In February of 1999, EarthJustice Legal Defense Fund filed a complaint on behalf of the Center for Marine Conservation and the Turtle Island Restoration Network, alleging NMFS failed to follow the proper National Environmental Policy Act (NEPA) process and challenging NMFS' determinations under the Endangered Species Act (ESA) that continued conduct of the Hawaii-based longline fishery (defined as those pelagic longline vessels registered for use under Hawaii longline limited access permits) is not likely to jeopardize the continued existence of leatherback, loggerhead, olive ridley, hawksbill, or green sea turtles, (Center for Marine Conservation v. NMFS (D. Haw.) Civ. No. 99-00152 DAE (CMC v. NMFS).

The ESA and its implementing regulations set out a detailed consultation process for determining the biological impact of a proposed activity. That consultation process results in the issuance of a biological opinion in which NMFS states whether it believes that the activity is likely to jeopardize the continued existence of a listed species. If so, then NMFS must suggest reasonable and prudent alternatives to mitigate the effects of the activity (16 U.S.C. 1536(b)(3)(a)). If the proposed action complies with ESA Section 7(a)(2)(16 U.S.C. 1536(a)(2)), the ESA authorizes NMFS to issue an incidental take statement that sets levels for incidental take of the species (as

long as the activity is not likely to jeopardize the continued existence of the species). The EarthJustice legal action challenged NMFS' November 1998 Biological Opinion and incidental take statement for the Hawaii-based longline fishery, as well as NMFS' compliance with The National Environmental Policy Act (NEPA)

The U.S. District Court upheld NMFS' analyses and findings under the ESA that the fishery was not jeopardizing the existence of any protected species. However, the Court determined that the agency had failed to prepare a comprehensive EIS for the fishery as required by NEPA. Subsequently, on November 23, 1999, the Court issued an injunction (entered on November 26, 1999, and amended by an order filed January 11, 2000) setting terms to apply during the period while NMFS prepared the EIS. This first injunction led to the temporary closing of certain waters north of Hawaii to fishing by Hawaii-based pelagic longline vessels (64 FR 72290 December 27, 1999, and 65 FR 37917 June 19,2000).

On June 23, 2000, the Court issued a second injunction (amended on June 26, July 21, and August 4, 2000) ordering that NMFS implement a year-round area closure between 28° N. and 44° N. between 137° W. and 173° W. (with an allowance of 601 sets in a portion of that closed area with 100% observer coverage), a minimum 20% observer coverage in the remaining area, a total fishery closure in the months of April and May, mandatory 100% observer coverage, and a prohibition on targeting swordfish. The Court also ordered that NMFS complete its comprehensive EIS by April 1, 2001 in order to lessen the duration of this injunction's impacts on fishery participants (CV. No. 99-00152 DAE 8/4/2000).

NMFS prepared and filed this EIS on March 30, 2001. The Final EIS (FEIS) contains a preferred alternative which includes a series of actions (including a new time/area closure) to mitigate the fishery's adverse impacts on sea turtles. These measures are based on a new biological opinion written as a part of a section 7 consultation under the Endangered Species Act and issued on March 29, 2001. Upon receiving this FEIS, the Court issued an Order Modifying [its previous] Injunction which made immediately effective those aspects of the preferred alternative which are intended to mitigate Hawaii longline fishery interactions with sea turtles. The Court further ordered NMFS to immediately codify these requirements into Federal regulations. NMFS did so, and on June 12, 2001, an interim emergency rule implementing those measures was published.

At this time, the Western Pacific Regional Fishery Management Council has recommended that the BiOp's reasonable and prudent alternative, intended to mitigate other pelagic fishery interactions with sea turtles, be permanently implemented via a regulatory amendment to the Pelagics Fishery Management Plan. Thus, the complete reasonable and prudent alternative of the BiOp comprises this document's preferred alternative.

## 6.0 Initial Actions

*Description of the FMP Baseline (fishery regulations in place as of December 27, 1999)*
The management measures in place as of December 27, 1999 for Western Pacific pelagic fisheries under the authority of the Pelagics FMP, together with applicable state and local regulations constitute the FMP baseline. Although the regulatory structure has changed since 1999, fishery data (including turtle takes) from 1994 through 1998, comprise the basis for the BiOp as well as a common reference point to which various alternatives may be compared. To date, the Pelagics FMP has not regulated non-longline pelagic fisheries in the western Pacific, including domestic troll, handline, pole-and-line or purse seine fishing activities.

The FMP for the Pelagic Fisheries of the Western Pacific Region was published in 1987 (52 FR 5987, March 23, 1987). The FMP includes initial estimates of maximum sustainable yields (MSY) for the stocks and sets optimum yields for these fisheries in the EEZs. The management unit species at the time the FMP was published were billfish, wahoo, mahimahi, and oceanic sharks. Tuna species were later designated as fish under U.S. management authority and included in the FMP's management unit species (57 FR 48564, November 1992). Regulatory measures in place as of December 1999 provide that:

- Fishing for pelagic species in the western Pacific EEZs with drift gillnets is prohibited (52 FR 5987, March 23, 1987).
- Each vessel using longline gear to fish for pelagic species in the EEZs around American Samoa, Guam, the Commonwealth of Northern Mariana Islands (CNMI), or other U.S. islands of the western Pacific, and vessels used to transport or land longline-harvested pelagic species shoreward of the outer boundary of these same EEZs, must be registered for use with a general longline permit (CFR 660.16) and must keep daily logbooks (CFR 660.14) detailing species harvested, area of harvest, time of sets, and other information. Also, longline gear used in the western Pacific EEZs must be marked with the official number of the permitted vessel (CFR 660.16) that deploys the gear (56 FR 24731, May 1991).
- Longline vessels must carry a NMFS observer if requested to do so (55 FR 49285, November 1990; 58 FR 67699, December 1993).
- Each vessel that uses longline gear to fish for pelagic species in the EEZ around Hawaii, or is used to transport or land longline-harvested pelagic species shoreward of the outer boundary of the EEZ around Hawaii, must be registered for use with one of 164 Hawaii-based longline limited entry permits (59 FR 26979, June 1994).
- As requested by NMFS, all vessels registered for use with a Hawaii-based longline limited access permit must carry a NMFS-owned "vessel monitoring system" (VMS) transmitter (59 FR 58789, November 1994).
- Longline fishing for pelagic species is prohibited in circular areas (known as "protected species zones") 50 nm around the center points of each of the Northwestern Hawaiian Islands (NWHI), plus a 100 nm wide corridor connecting those circular closed areas that are non-contiguous (56 FR 52214, October 1991). To

avoid gear conflicts with troll and handline fisheries near the Main Hawaiian Islands (MHI), longline fishing is prohibited in areas approximately 75 nm around the islands of Kaua'i, Ni'ihau, Ka'ula, and O'ahu, and approximately 50 nm off the islands of Hawaii, Maui, Kaho'olawe, Lana'i, and Moloka'i. This prohibition is lessened from October 1 through January 30, when the longline closed areas decrease on the windward sides to approximately 25 nm off Hawaii, Maui, Kaho'olawe, Lana'i, Moloka'i, Kaua'i, Ni'ihau, and Ka'ula, and approximately 50 nm off O'ahu (56 FR 28116, June 1991)[3]. Longline fishing is also prohibited in an area approximately 50 nm off Guam (57 FR 7661, March 1992).

**Other Pelagic Fishery Management in the State of Hawaii and the Western Pacific Territories**

The territories of American Samoa and Guam and the CNMI have no regulations that affect pelagic fishing activities in territorial waters, although fishing vessel registration is required. In American Samoa, some villages impose fishing curfews on Sundays (R. Tulafono, Director DMWR, pers. comm.). The State of Hawaii prohibits the sale of yellowfin and bigeye tuna (both known in Hawaii as *ahi*) smaller than three pounds landed by all domestic fisheries. The State also requires fishers who sell any portion of their catch to hold a commercial marine license and file catch reports.

**Pelagic Fishery Management in the EEZs Around U.S. Pacific Remote Island Areas**

Longline vessels registered for Hawaii-based longline limited access permits are subject to the management requirements of the FMP throughout the Western Pacific Region, including the EEZs around remote U.S. Pacific island possessions (Jarvis, Howland, Baker, Wake and Midway Islands, Kingman Reef, Johnston and Palmyra Atolls). There are no other NMFS regulations specifically applicable to domestic pelagic fishing activities in those areas, however, the National Wildlife Refuge Administration Act of 1966, as amended, prohibits fishing activities without a special use permit within the seaward boundaries of National Wildlife Refuges (NWRs) in the Northwestern Hawaiian Islands, at Midway Atoll, Baker Island, Howland Island, Jarvis Island, Johnston Atoll and Rose Atoll and in new NWRs established at Kingman Reef and Palmyra Atoll in January 2001.

*Description of the Current Status Quo (fishery regulations in place as of September, 2001)*

On March 28, 2000, NMFS published a final rule which requires operators of Hawaii-based longline vessels to carry and use dip nets and line-clippers which meet NMFS design standards to disengage sea turtles hooked or entangled by longline fishing gear (see AppendixIII). This rule also includes requirements concerning the handling, resuscitation, and release of sea turtles.

[3]A few longline vessel owners qualify for exemptions to fish in portions of longline closed areas around the MHI where they can document historical longline fishing activity prior to 1970.

Specifically, all incidentally taken sea turtles brought aboard for dehooking and/or disentanglement must be handled in a manner to minimize injury and promote post-hooking survival. If a sea turtle is too large or hooked in such a manner to preclude safe boarding without causing further damage/injury to the turtle, line-clippers must be used to clip the line and remove as much line as possible prior to releasing the turtle. When practicable, comatose sea turtles must be brought on board immediately, with a minimum of injury, and handled as follows: if the sea turtle brought aboard appears dead or comatose, the sea turtle must be placed on its belly (on the bottom shell or "plastron") so that the turtle is right side up and its hindquarters elevated at least six inches (15.24 cm) for a period of no less than four hours and no more than 24 hours. The amount of the elevation depends on the size of the turtle; greater elevations are needed for larger turtles. A reflex test, performed by gently touching the eye and pinching the tail of a sea turtle, must be administered by a vessel operator, at least every three hours, to determine if the turtle is responsive. Sea turtles being resuscitated must be shaded and kept damp or moist but under no circumstances may be placed into a container holding water. A water-soaked towel placed over the eyes, carapace, and flippers is the most effective method in keeping a turtle moist. Those that revive and become active, as well as those that do not revive within 24 hours must be returned to the sea by first putting the vessel engine in neutral gear so that the propeller is disengaged and the vessel is stopped. The turtle must then be released away from any deployed gear and, if alive, observed to be safely away from the vessel before the propeller is engaged and fishing operations are continued.

This rule was initiated and implemented by NMFS and has no expiration date. On June 12, 2001, NMFS additionally finalized an emergency interim rule, which implemented those aspects of the April, 2001, FEIS' preferred alternative which are designed to reduce interactions between sea turtles and the Hawaii-based longline fleet. Also included in that emergency rule were measures to reduce interactions between the Hawaii-based longline fleet and seabirds. That emergency rule was also initiated by NMFS, and remains effective through December 10, 2001 (with the possibility of an extension by NMFS of no more than an additional 180 days).The turtle mitigation components of this emergency rule: (a) prohibit Hawaii-based longline vessels from using longline gear to target swordfish north of the equator; (b) require Hawaii-based longline vessels to deploy longline gear such that the "sag" (deepest point) between any two floats is at least 100 m (328.1 ft) below the sea surface and the float line suspending the mainline beneath a float is at least 20 m (65.6 ft) long, with a minimum of 15 branch lines deployed between any two floats; (c) prohibit possession of light sticks on board a Hawaii-based longline vessel during fishing trips; (d) prohibit Hawaii-based longline vessels from fishing with longline gear during the months of April and May in the area bounded on the south by the equator, on the west by 180° longitude, on the east by 145° W. longitude, on the north by 15° N. latitude; (e) prohibit the transshippment of pelagic fish caught by longline gear within the closed area during April and May to any vessel registered for use under a Western Pacific receiving vessel permit; (f) allow the re-registration of a Hawaii-based longline vessel that has been de-registered from a Hawaii longline limited access permit after March 29, 2001, only during the month of October; (g) require Hawaii-based longline vessel operators to annually attend a protected species workshop conducted by NMFS; (h) require Hawaii-based longline vessel operators to cease gear retrieval if

a sea turtle is discovered hooked or entangled on a longline until the turtle has been removed from the gear or brought onto the vessel's deck; (i) require that hooks be removed from sea turtles as quickly and carefully as possible; however, if a hook cannot be removed, that the line be cut as close to the hook as possible; (j) require that wire or bolt cutters capable of cutting through a longline hook be on board Hawaii-based longline vessels to facilitate cutting of hooks imbedded in sea turtles; (k) require that the additional resuscitation technique of placing the turtle on its back and pumping its breastplate (or "plastron") with hand or foot be used as appropriate and; (l) require that no turtle taken incidentally during the course of fishing or scientific research activities be consumed, sold, landed, offloaded, transshipped, or kept below unless requested by NMFS. All of the regulations contained in this emergency rule are in addition to those described in the FMP baseline and those implemented by the March 28, 2000 rule.

The second aspect of this emergency rule implemented the terms and conditions of a recent Biological Opinion concerning fishery interactions with seabirds, issued by the Fish and Wildlife Service (FWS) on November 28, 2000. The terms and conditions in that Biological Opinion are based on a suite of seabird mitigation measures developed by the Western Pacific Fishery Management Council. Because they are not directed at reducing interactions with sea turtles, those measures are not a part of the preferred alternative contained in this document.

An act adopted by the Hawaii State Legislature (SB 2712, Hawaii State Legislature 2000 session) to require sharks to be landed whole in Hawaii with the fins still attached became law in August 2000. The new State law applies only to vessels actually landing fish in the State of Hawaii and does not penalize foreign vessels re-provisioning in Hawaii with shark fins onboard. Nor does the State law halt the transshipment of shark fins through the State as bonded cargo that does not enter U.S. commerce and is exported to foreign destinations (WPRFMC, 2001). The new State law does not limit the entry (as cargo) into Hawaii of shark fins or cartilage shipped from foreign sources.

In addition, the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve was established by Presidential Executive Orders 13178 (December 4, 2000) and 13196 (January 18, 2001) in late 2000 and early 2001. The Executive Orders prohibit commercial pelagic fishing within the boundaries of the reserve except for pelagic trolling by fishers who had Federal NWHI bottomfish permits on December 4, 2000. Recreational fishing for pelagic fish in the reserve is capped at historical levels to be determined by the National Ocean Service.

## 7.0 Description of the Proposed Action and Alternatives

Two alternatives are examined in this document, and unless noted otherwise, the text and analyses of the alternatives are drawn from the March 29th 2001 BiOp and the NMFS FEIS for Pelagic Fisheries of the Western Pacific Region, which included the March 29th BiOp RPA as the preferred alternative, as well as a range of other alternatives. To provide a common reference point, each alternative is compared to the management measures and associated levels of protection to sea turtles offered under the Western Pacific Fishery Pelagics Management Plan

(FMP baseline) This baseline was described above but is not regarded as a feasible alternative because the reasonable and prudent alternative of the BiOp requires certain changes under the authority of the ESA in order for the fishery to continue operating. However, the baseline represents the only long term data available to compare with the impacts of feasible alternatives. Similarly, the current status quo described above (fishery regulations in place as of September, 2001 including an emergency rule to protect sea turtles) is not a feasible alternative as emergency rules cannot be extended beyond 360 days. At this time, the only feasible alternatives available to the Council are the no action alternative (which would likely result in additional actions by NMFS), or the implementation of the reasonable and prudent alternative of the March 29, 2001 Biological Opinion via a regulatory amendment to the fishery regulations under the Western Pacific Pelagics Fishery Management Plan. Please see the complete FEIS for a discussion of further range of alternatives.

**Alternative A:** *No action*

Under this alternative, the Council would not implement the reasonable and prudent alternative of the sea turtle BiOp and the Western Pacific pelagic fisheries would continue to be regulated by the measures currently contained in the Pelagics FMP, as well as those measures implemented by NMFS on March 28, 2000. The additional measures implemented by NMFS' June 12, 2001 emergency rule would likely be extended by NMFS for an additional 180 days (through June 7, 2002). It is likely that at the end of that extension, NMFS would either implement the reasonable and prudent alternative of the BiOp via a unilateral Secretarial amendment to the FMP's regulations, or would close one or more FMP fisheries until it reached a decision on how to proceed.

**Alternative B:** *Implement the reasonable and prudent alternative of the March 29, 2001, Biological Opinion (as clarified regarding the use of long handled line clippers and dip nets) via Council action (Preferred)*

For the sake of clarity the measures contained in this alternative are split between those that apply only to longline vessels and those which apply to all vessels (including commercial, recreational, and subsistence operations) using hooks to target Pacific pelagic management unit species (PMUS) within the Exclusive Economic Zone (EEZ) around Hawaii, American Samoa, Guam, the Commonwealth of the Northern Mariana Islands or the Pacific remote island areas.

Under this alternative, the regulations under the Pelagics FMP for longline fishing vessels would be amended to: (a) prohibit the operators of all US longline vessels permitted under the Pelagics FMP (including vessels based in American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands (CNMI) from using any longline gear to target swordfish north of the equator; (b) require the operators of all US longline vessels permitted under the Pelagics FMP and fishing north of the equator to deploy all longline gear such that the "sag" (deepest point) between any two floats is at least 100 m (328.1 ft) below the sea surface and the float line suspending the mainline beneath a float is at least 20 m (65.6 ft) long, with a minimum of 15

branch lines deployed between any two floats when fishing with monofilament gear and a minimum of 10 branch lines deployed between any two floats when fishing with tarred-rope basket gear; (c) prohibit possession of light sticks on board all US longline vessels permitted under the Pelagics FMP during fishing trips north of the equator; (d) prohibit the operators of all US longline vessels permitted under the Pelagics FMP from fishing with longline gear during the months of April and May in the area bounded on the south by the equator, on the west by 180° longitude, on the east by 145° W. longitude, on the north by 15° N. latitude (the closed area); (e) prohibit the transhipment of pelagic fish caught by longline gear within the closed area during April and May to any vessel registered for use under a Western Pacific receiving vessel permit; (f) require the operators of all US longline vessels permitted under the Pelagics FMP to cease gear retrieval if a sea turtle is discovered hooked or entangled on a longline until the turtle has been removed from the gear or brought onto the vessel's deck; (g) require the operators of all "large" US longline vessels (those with a working platform 3' or more above the sea surface) to, if practicable, use a dip net meeting NMFS' specifications to hoist a sea turtle onto the deck to facilitate the removal of the hook or to revive a comatose sea turtle. Operators of all "small" US longline vessels (those with a working platform less than 3' above the sea surface) would be required to, if practicable, ease a sea turtle onto the deck by grasping its carapace (shell) or flippers; (h) allow the re-registration of a Hawaii-based longline vessel that has been de-registered from a Hawaii longline limited access permit after March 29, 2001, only during the month of October; (i) prohibit the landing or possession of more than 10 swordfish per trip by any US longline vessel permitted under the Pelagics FMP; (j) require the operators of all US longline vessels permitted under the Pelagics FMP to annually attend a protected species workshop conducted by NMFS on sea turtle resuscitation requirements and on gear and hook removal or disentangling techniques. NMFS shall also provide to the maximum extent possible, similar training and educational materials to operators of all other vessels using hooks under the Pelagics FMP.

In addition, this alternative would amend the Pelagic FMP regulations to require operators of all pelagic fishing vessels fishing with hooks for PMUS within EEZ waters of the western Pacific region to adhere to the following regulations: (k) carry and use line-clippers to cut fishing line from hooked or entangled sea turtles. Operators of "large" vessels (those with working platforms more than 3' above the sea surface) would be required to use line clippers meeting NMFS' performance standard (see the summary of regulatory text for these standards). Operators of "small" vessels (those with working platforms 3' or less above the sea surface) would be required to carry and use either a line cutter that meets NMFS' performance standard, or one that is more appropriate to the size and configuration of the fishing vessel, but in either case this line clipper must be capable of cutting the vessel's fishing line or leader within approximately 1' of the eye of an embedded hook; (l) carry and use wire or bolt cutters capable of cutting through fishing hooks to facilitate cutting of hooks embedded in sea turtles; (m) remove all hooks from sea turtles as quickly and carefully as possible; however, if a hook cannot be removed, cut the line as close to the hook as possible (e.g. within approximately 1' of the eye of the hook); (n) handle all incidentally taken sea turtles brought aboard for dehooking and/or disentanglement in a manner to minimize injury and promote post-hooking survival. If a sea turtle is too large or hooked in

such a manner to preclude safe boarding without causing further damage/injury to the turtle, line-clippers must be used to clip the line and remove as much line as possible prior to releasing the turtle. When practicable, comatose sea turtles must be brought on board immediately, with a minimum of injury, and handled as follows: if the sea turtle brought aboard appears dead or comatose, the sea turtle must be placed on its belly (on the bottom shell or "plastron") so that the turtle is right side up and its hindquarters elevated at least 6 inches (15.24 cm) for a period of no less than four hours and no more than 24 hours. The amount of the elevation depends on the size of the turtle; greater elevations are needed for larger turtles. A reflex test, performed by gently touching the eye and pinching the tail of a sea turtle, must be administered by a vessel operator, at least every three hours, to determine if the turtle is responsive. Sea turtles being resuscitated must be shaded and kept damp or moist but under no circumstances may be placed into a container holding water. A water-soaked towel placed over the eyes, carapace, and flippers is the most effective method in keeping a turtle moist. Those that revive and become active, as well as those that do not revive within 24 hours must be returned to the sea by first putting the vessel engine in neutral gear so that the propeller is disengaged and the vessel is stopped. The turtle must then be released away from any deployed gear and, if alive, observed to be safely away from the vessel before the propeller is engaged and fishing operations are continued. In addition; (o) the resuscitation technique of placing the turtle on its back and pumping its breastplate (plastron) with hand or foot must be used as appropriate and; (p) no turtle taken incidentally during the course of fishing or scientific research activities may be consumed, sold, landed, offloaded, transshipped, or kept below deck unless requested by NMFS.

This alternative is intended to replace the emergency regulations that NMFS published in the Federal Register on June 12, 2001 and instead amend the regulations according to the framework process of the Pelagics FMP. All measures contained in this alternative are required under the reasonable and prudent alternative contained in the March 29, 2001, Biological Opinion.

**8.0 Pelagic Fisheries in the Central and Western Pacific**

The Western Pacific Pelagics Fishery Management Plan has the authority to regulate pelagic fishing activities in the EEZ around Hawaii, American Samoa, Guam, the CNMI, and the Pacific Remote Island Areas of Howland, Baker and Jarvis Islands, Midway, Johnston, Palmyra and Wake Atolls, and Kingman Reef (PRIAs). US purse seine and albacore fleets, which operate primarily outside the US EEZ, are not currently regulated under the Pelagics FMP but are also discussed in this document.

The FMP manages unique and diverse fisheries. Hawaii-based longline vessels are capable of traveling long distances to high-seas fishing grounds, with trips typically ranging from 14 to 44 days, while the smaller handline, troll, charter, and pole-and-line fisheries, which may be commercial, recreational, or subsistence generally occur within 25 miles of land, with trips generally lasting only one day. These fisheries are discussed below, first by gear type and then by geographic area. These descriptions are extracted from a Final Environmental Impact Statement

on the Pelagic Fisheries of the Western Pacific Region (NMFS 2001a). Please see that document for a complete description of these fisheries (http://swr.nmfs.noaa.gov/piao/eisdocs.htm).

**Commercial Fisheries**

The Hawaii-based longline fleet has historically operated in two distinct modes based on gear deployment: deep-set longlines by vessels that target primarily tuna and shallow-set longlines by those that target swordfish or have mixed target trips including swordfish, albacore and yellowfin tuna. Swordfish and mixed target sets are buoyed to the surface, have few hooks between floats, and are relatively shallow. These sets use a large number of lightsticks since swordfish are primarily targeted at night. Tuna sets use a different type of float placed much further apart, have more hooks per foot between the floats, and the hooks are set much deeper in the water column. These sets must be placed by use of a line-shooter to provide slack in the line which allows it to sink. The fleet includes a few wood and fiberglass vessels, and many newer steel longliners that were previously engaged in fisheries off the U.S. mainland. There is a maximum vessel length of 101 feet for this fleet.

Apart from a few larger (> 40 ft) inboards, longlining out of American Samoa generally takes place on alias, twin-hulled (wood with fiberglass or aluminum) boats about 30 feet long, and powered by small gasoline outboard engines. Navigation on the alias is visual using landmarks. The gear is stored on deck attached to a hand crank reel which can hold as much as 10 miles of monofilament mainline. Participants set between 100 and 300 hooks on a typical eight-hour trip. The gear is set by spooling the mainline off the reel and retrieved by hand cranking back onto the reel. Currently most fishing is done within 25 miles of shore, but with better equipped vessels, fishing activity may extend further. Generally, gear setting begins in early morning; with retrieval in the mid-morning to afternoon. The fish are stored in containers secured to the decks or in the hulls. Albacore tuna is the primary species landed followed by skipjack tuna and yellowfin tuna.

The Hawaii-based skipjack tuna or *aku* fishery is also known as the pole-and-line fishery, or the bait boat fishery because of its use of live bait to target aku (skipjact tuna). The *aku* fishery is a labor-intensive, and highly selective operation. Live bait is broadcast to entice the primary targets of skipjack and juvenile yellowfin tuna to bite on lures made from barbless hooks with feather skirts. During the fast and furious catching activity, tuna are hooked on lines and in one motion swung onto the boat deck by crew members.

Handline fishing is an ancient technique used to catch yellowfin and bigeye tunas with simple gear and small boats. Handline gear is set below the surface to catch relatively small quantities of large, deep-swimming tuna that are suitable for *sashimi* markets. This fishery continues in isolated areas of the Pacific, and is the basis of an important commercial fishery in Hawaii. Three methods of pelagic handline fishing are practiced in Hawaii, the *ika-shibi* (nighttime) method, the *palu-ahi* (daytime) method, and seamount fishing (which combines both handline and troll methods).

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

**Charter and Recreational Fisheries**

The region's charter fisheries primarily troll for billfish. Big game sportfishing rods and reels are used, with four to six lines trolled at any time with outriggers. Both artificial and natural baits are used. In addition to lures, trollers occasionally use freshly caught skipjack tuna and small yellowfin tuna as live bait to attract marlin, the favored landings for charter vessels, as well as yellowfin tuna.

The recreational fleet primarily employs troll gear to target pelagic species. Although their motivation for fishing is recreational, some of these vessel operators sell a portion of their landings to cover fishing expenses and have been termed "expense" fishermen (Hamilton, 1999). While some of the fishing methods and other characteristics of this fleet are similar to those described for the commercial troll fleet, a survey of recreational and expense fishermen showed substantial differences in equipment, avidity, and catch rates compared to commercial operations. Vessel operators engaged in subsistence fishing are included in this recreational category.

**Hawaii Fisheries**

Hawaii's pelagic fisheries are small in comparison with other Pacific pelagic fisheries such as distant-water purse seine fisheries and other foreign pelagic longline fisheries (NMFS, 1991), but they comprise the largest fishery sector in the state of Hawaii (Pooley, 1993). Tuna, billfish and other tropical pelagic species supply most of the fresh pelagic fish consumed by Hawaii residents and support popular recreational fisheries (Boggs and Kikawa, 1993).

Of all Pelagics FMP fisheries, the Hawaii-based limited access longline fishery is the largest. This fishery accounted for 85 percent of Hawaii's commercial pelagic landings (28.6 million lb) in 1998 (Ito and Machado, 1999). The fleet operates under a limited entry regime with a total of 164 transferable permits (119 of which were active in 1999, the last full year prior to Court-required restrictions) and a maximum allowable vessel length overall of 101 feet. Based on Federal logbook data, this fleet's 1999 landings were 28.3 million pounds (238,000, pounds per vessel) and gross ex-vessel revenue was $47.4 million ($398,000 per vessel). This fleet took 1,137 trips in 1999 (1,103 in 2000), an average of 9.5 trips per vessel. Thirty-one (6%) of these trips targeted swordfish, 296 (26%) had mixed swordfish/tuna targets, and 776 (68%) targeted tunas. Landings consisted of 6,830,000 pounds ($13 million) of swordfish, 10,300,000 pounds ($27 million) of tunas, and 10,620,000 pounds ($7.3 million) of other billfish (marlins), mahimahi, wahoo, moonfish and sharks. In 1999, 48% of fleet effort was expended on the high seas, 34% within the EEZ surrounding the Main Hawaiian Islands, 12% within the EEZ

surrounding the Northwestern Hawaiian Islands, and 6% within the EEZ surrounding the US Pacific Remote Island Areas.

The longline fishery provides approximately 85% of fresh commercial seafood landings in Hawaii. As such it supports a substantial fishery supply sector (fuel, oil, bait, gear etc.) as well as an auction house, and numerous fish wholesaling and retailing operations. The Hawaii longline fishery, valued at $46.7 million in a 1998 baseline economic analysis, has been estimated to have a total impact on Hawaii business sales of $113 million using an input-output model of the Hawaii commercial fishery (Sharma *et al.*, 1999). This model calculates the inter-relationship of industries producing inputs to the longline fishery -- what are termed "backward" linkages. The total sales figure includes the direct effect of the ex-vessel sales and the indirect and induced income effects on other industries -- what we term associated businesses. Using this model, the personal and corporate income effect of the longline fishery is $50 million with upwards to 1,500 jobs directly associated with the Hawaii longline fishery. State and local taxes are approximately $8 million. In addition there are "forward" linkages which refer to the supply effect of Hawaii longline-caught fish on the seafood auction, wholesalers and retailers, etc. These measures are more difficult to measure but have been estimated to represent an additional $8-16 million in value-added.

Landings by Hawaii-based fisheries in 1998 ranged from to 28.6 million pounds by the longline fleet to 696,000 pounds by the aku boats and are summarized in Table 4. Tunas (*Thunnus* spp.), and broadbill swordfish (*Xiphias gladius*) are the dominant target species, but a variety of other pelagic species are also landed incidentally, including blue sharks *(Prionace glauca)*, *opah* (*Lampris guttatus*), marlin (Family *Tetrapturidae*, and Family *Makairadae*), and *mahimahi* (Family *Coryphaenidae*).

**Table 4. Fishery Information for Hawaii Pelagic Fisheries for 1998. (Source: Adapted from WPRFMC, 1998 Annual Report; NMFS, 1990)**

| Gear/Vessel Type | Longline | Charter Fishery | Troll/Handline Fisheries | Pole-and-line Fishery (*Aku* Fishery) |
|---|---|---|---|---|
| Area Fished | EEZ around Hawaii (25-200 nm) and high seas | Inshore and EEZ | Inshore and EEZ | Inshore and EEZ |
| Total Landings | 28.6 million pounds | 1.8 million pounds | 4,570,000 pounds | 696,000 pounds |
| Catch Composition | 24% bigeye tuna<br>24% pelagic sharks<br>12% albacore tuna<br>11% swordfish<br>6% yellowfin tuna | billfish<br>wahoo<br>yellowfin tuna<br>skipjack tuna<br><br>(catch percentages are unknown) | yellowfin tuna<br>skipjack tuna<br>*mahimahi*<br>Wahoo<br>striped marlin<br>bigeye tuna<br><br>(catch percentages are unknown) | 99.6% skipjack tuna |
| Season | All year | All year | All year | All year |
| Active Vessels | 114 | 199 | 1,824 | 6 |
| Total Permits | 164 (transferable) (Limited Entry) | NA | NA | NA |
| Total Trips | 1,140 | 16,700 (estimate) | 26,203 | 223 |
| Total Ex-vessel Value | $46.7 million | $15.3 million | $7.2 million | $0.9 million |

Note: Data do not include all landings for recreational fishers. For the charter fishery, gross revenue estimates include charter fees, fish sales, and mount sales commissions for a 12-month period in 1996-1997.

Total pelagic landings experienced a slow decline from the early 1950s through the mid-1980s. The decline was primarily due to reduced landings by the *aku* fleet although decreases in longline landings are also apparent in Figure 1. Landings by the troll fleet began to increase in the early 1970s but the overall decline in pelagic landings continued. The pelagic landings of the longline fleet began to slowly increase in the late 1970s but it wasn't until the mid-1980s when longline landings began to increase substantially that the decline of more than three decades was overcome. Total pelagic landings increased dramatically through the mid-1990s with substantial variability since that time.

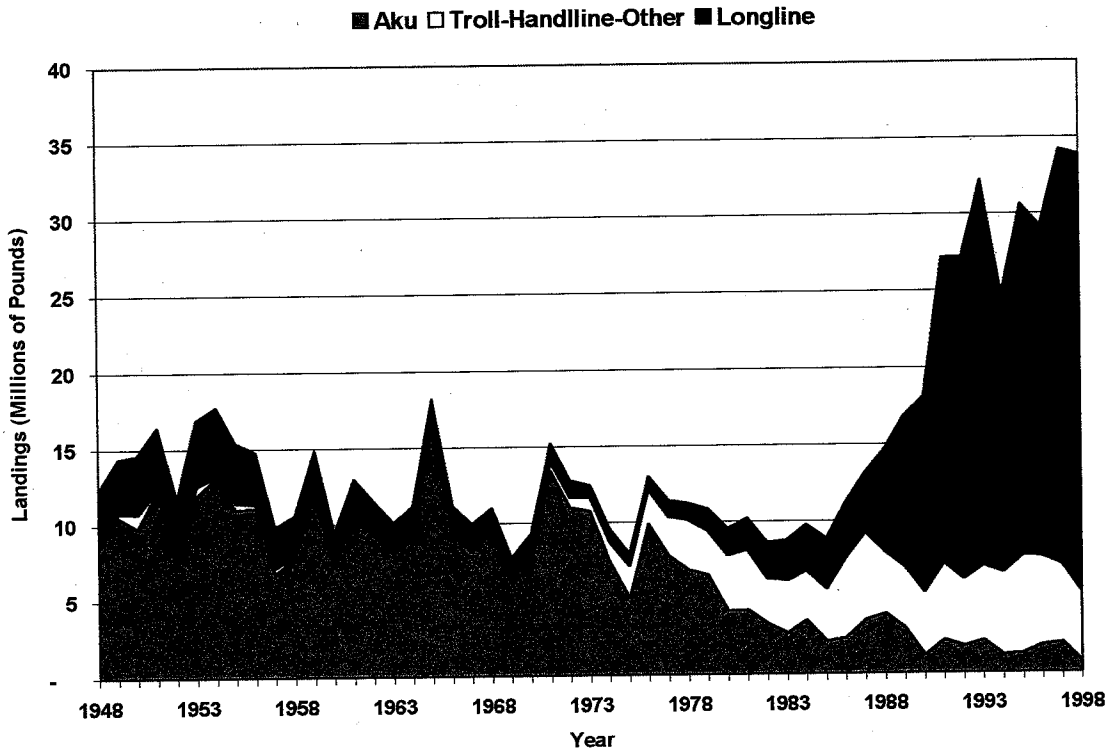


**Figure 1. Pelagic landings in Hawaii from 1948 to 1999**

## Markets for Hawaii's Pelagic Fisheries

The marketing and distribution system for fresh pelagic fish landed in Hawaii is part of a larger network of interconnected local and worldwide components that supplies a variety of fresh and frozen products to consumers in Hawaii and elsewhere (Pooley, 1986). Hawaii's fishers supply a variety of pelagic fish in a range of qualities and quantities.

Local fishers using a variety of fishing methods are the dominant source of fresh pelagic fish for the Hawaii market. Hawaii's large pelagic longline fleet targets bigeye, yellowfin, and albacore tunas as well as swordfish. Longliners also supply marlin to the market, primarily as incidental catch. The handline fishing fleet targets yellowfin, bigeye, and skipjack tunas. Commercial trollers provide a variety of pelagic fish, especially *mahimahi*, wahoo, marlin, and yellowfin tuna, depending on the season (DBEDT, 2000; Bartram, 1997). Table 5 shows 1999 landings of major pelagic species in Hawaii.

**Table 5. Hawaii Reported Landings for Pelagic Species, 1999. Source: WPacFin (http://wpacfin.nmfs.hawaii.edu/).**

| | Landing Volume (Pounds) | Volume Sold (Pounds) |
|---|---|---|
| Bigeye Tuna | 5,139,432 | 5,105,270 |
| Yellowfin Tuna | 3,930,995 | 3,785,305 |
| Albacore Tuna | 3,348,820 | 3,326,670 |
| Skipjack Tuna | 1,839,834 | 1,728,767 |
| Blue Marlin | 1,090,920 | 985,385 |
| Striped Marlin | 849,041 | 830,386 |
| Swordfish | 3,834,710 | 3,833,810 |
| *Mahimahi* | 1,179,583 | 1,103,132 |
| *Ono* | 899,880 | 819,144 |
| Moonfish | 1,000,844 | 1,000,665 |
| Pomfret | 288,435 | 287,449 |
| Sharks [a] | 256,794 | 166,316 |
| **Total** | **23,659,288** | **22,972,299** |

[a] This figure for sharks does not include data on sharks that were harvested for fins only with the carcass discarded. The U.S. Congress prohibited the finning of sharks in December 2000.

Export markets are important for tuna and swordfish, which are produced and traded extensively on an international scale. However, much of the highest-quality tuna never finds it way out of the Hawaii market, where consumers are among the most discriminating in the world.

Historically, swordfish did not have a strong demand in Hawaii, and the bulk of landed swordfish is exported to larger, established markets on the U.S. mainland and in Japan. Subsequently, a market niche developed. Other pelagic species harvested in Hawaiian waters, such as blue marlin, striped marlin, *mahimahi* (also known as dolphinfish) and *ono* (also known as wahoo), are consumed largely in the local market. Marlin, prized in some markets, is considered an affordable alternative to the more expensive tuna. *Mahimahi* and *ono* have an established niche in the local market, which consumes the entire local supply, supplemented by imports of these species from other fisheries (Bartram, 1997).

Per capita seafood consumption by residents and visitors to Hawaii is twice the U.S. average. Therefore, it is not surprising that the local supply falls short of local demand. For certain grades and species of fish, such as *aku* (skipjack tuna), demand is greater than landings in Hawaii's waters. To meet the excess demand, much fresh and frozen fish is imported to Hawaii. Although the imported volume may be as high as two-thirds of local production, substantial portions of the imports are re-exported to other markets. Hawaii's central Pacific location is convenient for consolidating fish shipments from other Pacific islands for shipping on to the U.S. mainland (Bartram, 1997).

Markets for pelagic species fluctuate throughout the year. Prices for a given species may vary seasonally with fluctuations in quality, quantity, demand, and quantities of substitutes. Quality is a function of several factors. Gear and fishing method affect the condition of the fish and the quality of the meat. Fish quality is also thought to change seasonally with water temperature fluctuations.

**Tuna**

Tuna forms the largest segment of Hawaii's fish production and is an expanding market. Variation in uses of different species is apparent, as Hawaii has both significant imports and exports of tuna (Bartram, 1997). The high-quality tuna that is exported from Hawaii is sold mostly to Japanese buyers. Hawaii exporters and fishers target the Japanese tuna market because of its renowned high prices for fish. Tuna is also sold to mainland U.S. markets. These markets rely on sources other than Hawaii for high-quality fish. However, they import some lesser grades of tuna from Hawaii to serve the demand for lower-quality fish (Bartram *et al.*, 1996).

Although significant exports are made, annual local consumption of fresh tuna alone is approximately 6,349,000 pounds. Several niches within Hawaii's tuna market have developed, each with its own quality standards. The market for tuna served raw as *sashimi* is generally known as the most demanding. Other markets include cooking (highly variable in quality demanded), *poke* (raw cubes served with spices and condiments), and smoking or drying (with the lowest quality requirements) (Bartram, 1997).

As much as 40 percent of local tuna consumption is raw, in the form of *sashimi* and *poke*, a local favorite. Bigeye and yellowfin tunas are commonly used for *sashimi*, but bigeye is the species of choice because of its brighter muscle color, higher fat content, and longer shelf life (Bartram, 1997).

Hawaii's consumers have traditionally placed a high demand on the Hawaii market for high-quality tuna. The Hawaii market has historically supplemented its local supply by importing substantial quantities of bigeye and yellowfin tunas, mostly from the Indo-Pacific region. Imports have declined in recent years as consumers have sought to satisfy more of their demand from the local supply. The reasons for the decline in imports are somewhat unclear. One contributing cause is the decline of the tuna fleet in the Marshall Islands in the mid-1990s and changes in fleet operations in the Pacific. In addition, the Hawaii market has seemed more willing to substitute local, high-quality albacore at times when top-quality bigeye and yellow fin tunas are in short supply (Bartram, 1997).

**Swordfish**

Swordfish is the second largest fishery in Hawaii after bigeye tuna. The majority of swordfish is exported to the continental United States. Although swordfish is used locally for *sashimi* at times, grilling is the most popular method of preparation.

Most swordfish are caught by the longline fleet using nighttime shallow fishing techniques with luminescent attractants. Swordfish are also occasionally caught by tuna longline fishers as incidental catch. Trollers and handliners also participate in this fishery, but to a minor degree.

The peak season for swordfish is the early summer months from April to July. Most of the fish are sold at the Honolulu fish auction. A portion, however, is sold directly to wholesalers and exporters. Most of the fish are shipped to the US East coast, where Hawaii swordfish brings a premium price. East coast purchasers commonly purchase swordfish in airline container quantities to realize economies of scale in shipping.

Harvest levels grew substantially during the early 1990s due to the adoption of the nighttime surface fishing techniques. In 1987 and 1988, swordfish landings averaged 50,000 pounds. By 1991, landings had grown to more than ten million pounds. Swordfish landings peaked in 1993 at slightly more than 13 million pounds and have since ranged between 5.5 million and slightly more than seven million pounds a year (WPRFMC, 1999.).

Hawaii generally is one of many suppliers of swordfish to a major US market served by a worldwide supply. In 1998 (when Hawaii landings were slightly more than seven million pounds), approximately 34.6 million pounds of swordfish were imported into the continental US market. Imports of fresh swordfish in excess of two million pounds were received in the United States from Brazil, Chile, and Australia. Singapore alone exported more than eight million pounds of swordfish to the U.S. market (WPRFMC, 1999.; Seafood Market Analyst, 2000). In addition, other areas of the continental United States recorded significant harvests. In 1998, the U.S. Pacific fleet (excluding Hawaii) caught three million pounds of swordfish, and the Atlantic and Gulf fleets caught an additional 4.8 million pounds (Hamm *et al.*, 1999).[4] Assuming that most of this domestic landings are used in the U.S. East coast market, Hawaii's landings comprise less than 15 percent of the U.S. East coast swordfish market.

**Blue Marlin and Striped Marlin**

Neither marlin species is targeted by commercial fishers in Hawaii. The majority of the landings are caught incidentally by the longline tuna fleet. Trollers also contribute to Hawaii marlin harvests. Sport fishers, however, target blue marlin and often sell their landings in the commercial market, with proceeds going to the boat and crew. Most commercial marlin landings are sold in the Honolulu auction. Sport fishers and trollers, however, may sell their landings directly to wholesalers, retailers, or restaurants (DBEDT, 2000).

Marlin is used as *sashimi* and *poke* in Hawaii. Large group caterers often prefer marlin because it discolors more slowly than tuna. Premium *sashimi*-quality striped marlin, which has orange-red meat and higher fat content, is thought to be of higher quality than blue marlin, although blue

[4] Data for the 1999 U.S. catch are unavailable. In the last four years for which data are available, catch was relatively stable, between 7.5 million and eight million pounds.

marlin with acceptable fat content is used as *sashimi*. Both are cooked by Hawaii restaurants. Blue marlin is popular with lower-income and fixed-income groups and often is smoked (Bartram, 1997; DBEDT, 2000).

The blue marlin and striped marlin harvests are a significant but secondary part of the Hawaii market. The combined annual landings of both species in the past ten years typically have been about two million tons. Historically, striped marlin harvests have exceeded blue marlin harvests, but in two of the last four years, blue marlin exceeded striped marlin by more than 100,000 lb (WPRFMC, 1999.).

Seasonal variability in price is greater for both blue marlin and striped marlin than for tuna. The Hawaii blue marlin season peaks between June and October. The peak of the striped marlin season is opposite, beginning in November and continuing until June. The seasonal price changes are similar for the two fish, suggesting that the prices are driven by changes in tuna supply and total demand for fish rather than by the volume of marlin harvests. Marlin prices reach annual highs from February to April and again in September and December. The high prices early in the year coincide with a period of low tuna supplies. The transition from summer yellowfin to winter bigeye is the likely explanation for the high price for marlin in September. Marlin is also likely substituted for tuna in December when demand is high. The low prices in June and July occur during the period when tuna supply is at its highest and overall demand is at a low. Low prices occur in October, when marlin and bigeye are in high supply (DBEDT, 2000).

The markets for billfish in particular have been affected by limits on mercury in imported fish. The U.S. Food and Drug Administration has a limit of 1.0 parts per million for methyl mercury in fish imports. Every lot imported is tested before release for sale. The procedures allow an importer to obtain a "green card" limiting testing requirements if the importer's first five shipments all test below the limit. The procedure is costly for minor importers and is believed to limit the inflow of swordfish into the United States. The sampling procedure is also costly and can damage fish, further deterring imports of swordfish into U.S. markets (Bartram, 1997).

**Other Pelagic Species: *Mahimahi*, *Ono*, Moonfish, and Pomfret**

Most Hawaii restaurants have diversified menus that include *mahimahi* and several other species, such as marlin, *ono* (wahoo), *opah* (moonfish), and large-scale black pomfret. Demand for these pelagic species has led to substantial landings by Hawaii fishers, who sell to the Hawaii market. Harvests of *mahimahi* and *ono*, the most commonly targeted species, fluctuate seasonally. Significant quantities of *opah* and pomfret are caught incidentally. Quantities of these two species fluctuate significantly, but follow no seasonal trend. All of these species are sold fresh, because almost no market exists for frozen local landings (Bartram, 1997; DBEDT, 2000).

Most *mahimahi* and *ono* are caught by trollers, although portions of the harvest are taken by longline and pole-and-line fishers. These species are sold through the Honolulu and Hilo fish auctions and directly to wholesalers and restaurants. *Mahimahi* is a favorite in many local

restaurants. *Ono* is generally substituted when *mahimahi* is in short supply. The limited local supply of *mahimahi* has led to import of substantial quantities to Hawaii from Taiwan, Japan, and Latin America. Since imported fish tend to be slightly cheaper than fresh local fish, imported fish tend to be directed toward less expensive restaurants. Little of either of these species is exported, because local consumers consume most of the local supply.

Pomfret and moonfish are also frequently sold in local restaurants. These species complement the supply of *mahimahi* and *ono* in the local fresh market. Both species are primarily incidental catch of the longline fleet and are sold almost exclusively through auctions (Bartram, 1997, DBEDT, 2000).

**Sharks**

Prior to its prohibition of by the Hawaii Legislature and the U.S. Congress in 2000, shark finning had been a source of significant revenue for crewmembers in the Hawaii-based longline fishery. Most of these revenues are generated by sales of blue shark fins sold to satisfy the demand for fins in the Asian market. A small market has also developed recently for thresher and mako sharks. The landings of these two species is small and does not contribute substantially to the overall revenue in the fleet.

The prohibitions on finning of sharks are likely to substantially limit the activity of Hawaii-based longline vessels in the Asian market for shark fins. No market exists for the carcass of blue sharks, which is the dominant incidental catch species in Hawaii longline fisheries (WPRFMC, 2001), and until such a market develops, the landing of these sharks is unlikely.

**American Samoa, Guam and Northern Mariana Islands Fisheries**

American Samoa-based pelagic fisheries consist of a small fleet of *alia* longliners, a few mid-size and larger longliners, and a small fleet of trolling vessels. Guam is home to an active trolling fleet and several charter sportfishing vessels, as is the CNMI. These fleets target albacore, skipjack tuna, yellowfin tuna, and other pelagic species, and in 1998, made landings ranging from 25,000 pounds by American Samoa trollers to 884,000 pounds by American Samoa *alia* longliners (Table 6).

**Table 6. Pelagic Fishery Information for American Samoa, Guam, and CNMI, 1998. (Source: Adapted from WPRFMC, 1999).**

| Islands | American Samoa - 1998 | | Guam - 1998 | CNMI - 1998 |
|---|---|---|---|---|
| **Gear** | **Longline** | **Troll/Charter** | **Troll/Charter** | **Troll/Charter** |
| **Area Fished** | Inshore and EEZ | Inshore and EEZ | Inshore and EEZ | Inshore and EEZ |
| **Total Landings** | 884,154 lb | 25,271 lb | 817,087 lb | 192,568 lb* |
| **Catch Composition** | 72% albacore tuna<br>8% yellowfin tuna<br>< 5% all others | 74% skipjack tuna<br>6% barracuda<br>4% yellowfin tuna<br>< 4% all others | 31% mahimahi<br>23% skipjack tuna<br>19% yellowfin tuna | 70% skipjack tuna<br>11% mahimhai<br>8% dogtooth tuna<br>6% yellowfin tuna |
| **Season** | All year | All year | All year | All year |
| **Active Vessels** | 25 | 24 | 438 | 89 |
| **Total Permits** | 50<br>(open access) | NA | NA | NA |
| **Total Trips** | 2,359 | 123 | 14,324 | 2,230 |
| **Total Ex-vessel Value** | $968,361 | $29,949 | $711,066** | $398,086 |

Notes:
*Landings for CNMI are recorded commercial landings, but not all commercial landings are recorded (D. Hamm, NMFS SWSFC-HL, pers. comm., November 3, 2000).
**Total ex-vessel value of landings in Guam are estimated from commercial landings, which are less than 50 percent of total landings.

## American Samoa

Despite a 40 year history of tuna canning in American Samoa by two large processors, commercial fishing for tuna by domestic (local) vessels in the EEZ around American Samoa is a relatively recent endeavor. The importance of pelagic fish as a source of income and employment in American Samoa's small-scale fishery has increased rapidly since 1996, following the adoption of longline fishing methods patterned after those in the neighboring country of Samoa. American Samoa's small-scale fishery is presently evolving from the realm of traditional subsistence activities to more commercial activities.

The small-scale pelagic fishery in American Samoa employs relatively simple troll and longline fishing technology. More than 90 percent of the respondents in a survey of 20 longline fishermen planned to increase their efforts at longlining (Severance *et al.*, unpub. research). Until very recently, most of the small-scale fleet was comprised of boats under 30 ft in overall length. New and safer types of small-scale vessels have begun to enter the pelagic fishery and they are capable of extending the safe range of fishing farther offshore.

### The Longline Fishery in American Samoa

The American Samoa based longline fishery consists of vessels that fish under a western Pacific general longline permit. This permit allows the vessel to fish for PMUS using longline gear in the EEZ around American Samoa, Guam, the Commonwealth of the Northern Mariana Islands (CNMI) or other U.S. island possessions, excluding the Hawaiian Islands. Unlike Hawaii

longline permits the number of Western Pacific general longline permits is not restricted. As of 1998, there were 48 general longline permitted vessels in American Samoa, three in Guam and one in the CNMI, however, however only those based in American Samoa were active during 1998.

Prior to 1995, the non-purse seine pelagic fishery in American Samoa was largely a troll-based fishery. In mid-1995, four vessels began longlining and by 1997, 33 vessels had permits to longline. Approximately 17 of these were actively fishing on a monthly basis. In 1998, only 26 of the 50 federally permitted longliners actually fished. These 26 vessels reported total landings of 884,000 pounds in 1998.

Apart from a few larger (> 40 ft) inboards, longlining out of American Samoa generally takes place on alias, twin-hulled (wood with fiberglass or aluminum) boats about 30 feet long, and powered by small gasoline outboard engines. Navigation on the alias is visual using landmarks. The gear is stored on deck attached to a hand crank reel which can hold as much as 10 miles of monofilament mainline. Participants set between 100 and 300 hooks on a typical eight-hour trip. The gear is set by spooling the mainline off the reel and retrieved by hand cranking back onto the reel. Currently most fishing is done within 25 miles of shore, but with better equipped vessels, fishing activity may extend further. Generally, gear setting begins in early morning with retrieval in the mid-morning to afternoon. The fish are stored in containers secured to the decks or in the hulls. Albacore tuna is the primary species landed followed by skipjack tuna and yellowfin tuna. Most fish are sold to large scale canneries, but some are sold to restaurants, and donated for family functions.

As stated above, this fishery is presently open access, with no limits on the number of longline vessels, individual or total vessel capacity, catch or effort. A control date of November 13, 1997, has been established and some applicants for longline permits after that date are informed that they may not qualify for exemptions to limitations placed on longline vessels greater than 50 ft in overall length. In anticipation of the possibility of a limited entry program for domestic longline fishing vessels, the Council and NMFS have established a control date of July 15, 2000, after which any vessel of any size entering the fishery will not be assured of being allowed to use longline gear to fish for pelagic management unit species in the EEZ around American Samoa (WPRFMC, 2000a).

The length distribution of vessels owned by longline permit holders, as of October 2000, is summarized in Table 7.

**Table 7: Longline Permit Holders Based in American Samoa, October 2000. Source: NMFS *in* WPRFMC, 2000.**

| No. of Vessels, by Length Overall | | | | | |
|---|---|---|---|---|---|
| < 30 ft | 31-35 ft | 35-40 ft [a] | 41-45 ft [b] | 46-50 ft [c] | 50+ ft |
| 34 | 14 | 9 | 2 | 0 | 5 |

[a] A newer and safer version of *alia* (a catamaran-style vessel that is the most common type of fishing boat in American Samoa and Samoa) is being assembled in Samoa from pre-cut aluminum plates manufactured in New Zealand. Mostly 38 to 42 ft in length, this version is equipped with a larger fuel tank, navigational aids, higher freeboard, and more safety equipment to extend fishing range to well over 100 nm from shore. Several new fishing enterprises in American Samoa have plans to acquire vessels of this type.
[b] In addition to planned acquisitions in this length class, FAO is designing a 45 ft catamaran-style vessel for the next phase of longline fishery expansion in neighboring Samoa. This design will also be available for boatbuilding in American Samoa.
[c] A design for a monohull vessel assembled from precut steel plates in the 46 to 50 ft class has been prepared in American Samoa.

## Guam

This section describes the pelagic fisheries of the Territory of Guam. Pelagic fishing vessels based on Guam fall into two broad categories: (1) distant-water purse seiners and longliners that fish primarily outside the EEZ around Guam and transship through Guam; and (2) small, primarily recreational trolling boats that are either towed to boat launch sites or berthed in marinas and fish only local waters (within the EEZ around Guam or in the adjacent EEZ waters of the CNMI. This discussion covers primarily the local small boat pelagic fishery (WPRFMC, 1999.). As of 1998, there were three vessels with general longline permits in Guam, but none were active (NMFS, 2000a).

Aggregate landings of all pelagics, tuna, and non-tuna PMUS by the small boat fleet fluctuate greatly, but appear to be increasing. In the early 1980s, the pelagic landings consisted primarily of tunas. Then beginning in 1985, non-tuna PMUS, primarily *mahimahi*, began making up the bulk of the landings. The commercial landings of all pelagics also show a similar trend (WPRFMC, 1999.).

The total landings data are extrapolated from the Guam Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and other available commercial fishing data. Unfortunately, the information necessary to reconcile the difference between commercial and all landings is not available. Therefore, this analysis assumes that the balance of the total landings is associated with fishing for personal and recreational purposes.

Most fishing boats are less than ten meters (33 ft) in length and are typically owner-operated by persons who earn a living outside of fishing (WPRFMC, 1999.). Most fishers sell a portion of their landings at one time or another, and it is difficult to distinguish among recreational, subsistence, and commercial fishers. A small, but significant, segment of the pelagic fleet consists of marina-berthed charter vessels that are operated primarily by full-time captains and crews (WPRFMC, 1999.).

In Guam, trolling with lures and (occasionally) baited hooks conducted from catamarans and other small commercial, recreational, and charter vessels in coastal waters, near seamounts, or

around FADs. Charter boat activity decreased between 1997 and 1999, primarily because of a significant drop in the number of tourists as a result of the Asian economic crisis.

In 1981 and 1984, the bulk of pelagic landings consisted of tunas. However, after 1984 non-tuna PMUS began making up the bulk of pelagic landings due to an interest in targeting blue marlin, an increase in *mahimahi* landings, and a lack of interest in skipjack tuna. In 1998, total pelagic landings increased ten percent, tuna landings increased nine percent, and non-tuna PMUS increased nine percent. Charter trolling trips accounted for 15 percent of overall pelagic landings (WPRFMC, 1999.).

In 1998, skipjack tuna landings decreased by nine percent from 1997 landings, while yellowfin tuna landings increased 52 percent. For most years, skipjack landings exceeded yellowfin landings by a two-to-one ratio. Given the relative unmarketability of skipjack tuna in the local market and the desirability of yellowfin tuna, the availability of skipjack tuna probably exceeds yellowfin availability by a wider margin.

Reliable estimates of the total economic contribution of the domestic fishing fleets in Guam are currently unavailable.

**CNMI**

The CNMI is a string of islands in the western Pacific Ocean (longitude 145° E., and latitude 14° N. to 21° N.). Inhabitants live on three primary islands: Saipan, Rota, and Tinian. The pelagic fishery activities occur primarily from the island of Farallon de Medinilla south to the island of Rota (NMFS, 2000a). Commercial, subsistence, and recreational fishing are practiced.

Trolling is the most common fishery in the CNMI, with bottomfishing and reef fishing also conducted (Glazier, 1999). The product is primarily skipjack tuna. This fishery is on the increase, most likely due to increasing population in CNMI (WPRFMC, 1999.). All domestic commercial fishery product is consumed locally. Yellowfin tuna and *mahimahi* are targeted to a lesser degree, and are easier targets for the local fishermen during seasonal runs. (Yellowfin are preferred to skipjack, but are rarely encountered. These species are accepted by all ethnic groups in the CNMI and have maintained their market demand with the ongoing in-migrating population growth on Saipan (more than half of the population on Saipan is non-native) (WPRFMC, 1999.).

No large-scale longline or purse seine activity occurs around the CNMI at this time. However, fishery development consultants for the CNMI have suggested providing incentives for the longline fleet to move into CNMI waters (University of Hawaii, 2000). If longline fleets move into the CNMI, the domestic commercial fisheries will be affected. Currently only one vessel in CNMI has a General Longline Permit, which allows the vessel to fish with longline gear in the EEZ around CNMI, Guam, and American Samoa. This vessel was not active as a longliner in 1998 (WPRFMC, 1999.).

Because skipjack are common in nearshore waters off the CNMI, these fish are caught with minimal travel time and fuel costs. Trolling is the primary gear. Most trips are less than a full day. Trolling for skipjack tuna takes place throughout the year. The *mahimahi* season is February through April, and the yellowfin tuna season is April to September (WPRFMC, 1999.).

The pelagic fishing fleet, other than charter boats, consists primarily of vessels less than 7.32 m (24 ft) in length, which usually travel in a limited 20-mile radius from Saipan (WPRFMC, 1999.). Most are 3.66-7.32 m (12-24 ft), outboard-powered, runabout-type vessels (NMFS, 2000a).

According to WPRFMC (1999a), about 82 percent of all boats registered with the DPS participated in some form of fishing activity in the CNMI in 1998 (75 full-time commercial, 65 part-time commercial, and 143 subsistence/recreational). Of the registered vessels, 24 were charter vessels, which generally retain their landings and sell to local markets (WPRFMC, 1999.). The amount of charter boat sales is not known. However, it constitutes a small portion of the local fish market, and most fish are typically consumed by the charter crew (Hamm *et al.*, 1999).

Official estimates of the number of crewmembers involved in the commercial fishery in CNMI are not available. However, since the primary gear is trolling, it is reasonable to assume that there is one crew person in addition to the skipper, as is typical on troll boats in Hawaii (Hamilton and Huffman, 1997).

Most vessels in the CNMI pelagic fishery are based on Saipan. Although available data do not indicate actual residence of vessel owners, it is reasonable to assume that most landings in Saipan are made by residents of Saipan.

Cost studies of the pelagic fisheries in CNMI similar to studies for Hawaii in Hamilton and Huffman (1997) do not appear to have been conducted. Nor does it appear that an input-output study, similar to work in Sharma *et al.* (1999), is available.

**PRIAs**

There is limited knowledge of fishing activity and effort in the PRIA because of limited reporting requirements for vessels active in this fishery. Longline vessels that fish in EEZ waters around the PRIA must be registered under a longline general permit or the Hawaii-based longline limited access permit. These vessels have federal reporting requirements. There are no federal reporting requirements for commercial troll and handline vessels targeting pelagic species in these areas. The only existing reporting requirement for recreational and charter vessels in this area is a U.S. Fish and Wildlife Service requirement for maintaining a "Midway Sports Fishing Boat Trip Log." This requirement applies to fishing within the Midway Atoll National Wildlife Refuge. The log, however, need not include any information about interactions with protected species.

Two Hawaii-based troll and handline vessels are known to have fished recently in EEZ waters around Palmyra and Kingman Reef targeting pelagic (including yellowfin and bigeye tunas, wahoo, *mahimahi*, and sharks) and bottomfish species. Catch and effort data on these vessels are unavailable.

Five charter vessels are known to be based on Midway, two of which troll for pelagic species. The other three are used for nearshore and lagoon fishing. Approximately seven vessels are maintained and used for recreational fishing by Midway residents. Three of these are known to troll for pelagic species including yellowfin tuna, *ono*, and blue and striped marlin.

### 8.1 Foreign fisheries in the Central and Western Pacific

Fisheries managed under the Pelagics FMP compete with a variety of foreign fleets operating on the high seas and within the EEZs of many Pacific nations. Large-scale, distant-water foreign fisheries include three gear types: longline, pole-and-line and purse seine.

The pole-and-line fleet in the western and central Pacific Ocean (WCPO) was composed of approximately 1,400 vessels in 1999. Most of the vessels are small to medium-sized and operate in the domestic fisheries in Indonesia and Japan. There are few environmental issues concerning pole-and-line fishing because the technique is very selective in catching tuna species, primarily skipjack tuna.

Purse seine vessels from Japan and the United States have fished in the WCPO since the mid-1970s and new vessels from Korea and Taiwan entered the fishery in the early 1980s. In 1999 the WCPO purse seine fleet was comprised of 223 vessels including 159 distant-water vessels, 31 domestic Pacific Island vessels, and 33 domestic non-Pacific Island vessels (e.g., Australia, Indonesia, Japan and New Zealand). The 1999 catch of 1,033,000 mt was comprised of: skipjack tuna – 781,000 mt (76 percent of the total), yellowfin tuna– 218,000 mt (21 percent) and bigeye – 35,000 mt (three percent).

The diverse longline fleet in the WCPO was composed of roughly 4,700 vessels in 1999. These vessels can be divided into four components largely based on the area of fishing operations: (1) over 400 vessels are domestically based in the Pacific Islands with the Samoa [formerly Western Samoa] *alia* fleet representing half of these vessels; (2) approximately 3,000 vessels are domestically based in non-Pacific Island countries, largely in Japan and Taiwan; (3) about 750 large distant-water freezer vessels from Japan, Korea and Taiwan that operate over large areas in the region; and (4) about 450 offshore vessels based in Pacific Island countries and composed of roughly equal numbers of vessels from mainland China, Japan and Taiwan. Pacific-wide longline effort increased from 300 to 500 million hooks from 1962 to 1980. Since 1980, annual pelagic longline effort has been roughly 560 million hooks. Effort in the longline fishery is the most widespread of any industrial fishery in the Pacific.

Longline fisheries usually target tuna or swordfish. Tuna longlining is characterized by day fishing at moderate depths (100-250 m) to target albacore and yellowfin tunas, or deeper depths (250-400 m) to effectively target bigeye tuna (Hanamoto, 1976; Boggs, 1992). The Japanese longline fleet had mainly targeted albacore for canning until the early 1970s. These longliners deployed "conventional" longline gear of four to six hooks between floats (HBF) fishing a depth of approximately 90-150 meters. In the early 1970s longliners changed to 'deep' sets by placing more hooks between longline floats. The deeper longline gear was more effective in catching bigeye tuna and the fleet shifted activities in waters near the equator where the thermocline is shallower.

In addition to the sector of the Hawaii-based longline fishery which targets swordfish, there are several foreign fleets (e.g., longline, gillnet and harpoon) that target swordfish in the Pacific. While most of the foreign longline effort targets tuna species, the shallower swordfish longlining has a higher incidence of encountering a protected or endangered species. Foreign longline fisheries specifically targeting swordfish occur in Japan, Chile and Australia. Fishing methods by the Japanese swordfish fleets are similar to the Hawaii fleet: night fishing with three or four branchlines between each float which results in a shallow gear configuration.

The above fishery descriptions are extracted from a Final Environmental Impact Statement on the Pelagic Fisheries of the Western Pacific Region (NMFS 2001a). Following is a summary of the physical environment in which these fisheries operate. This summary is also extracted from the Final Environmental Impact Statement on the Pelagic Fisheries of the Western Pacific Region. Please see that document for a detailed discussion of these fisheries and their physical environment.

### 8.2 Physical Environment

**Ecosystem and Stocks**

It is important to recognize that the pelagic ecosystem responds to ambient climatological and oceanographic conditions on a variety of spatial and temporal scales, and that even in the complete absence of any fishing stock sizes would fluctuate, sometimes quite dramatically. It is also clear from the species accounts that initiation of very marked declines in some groups such as sea turtles, seabirds and possibly sharks coincided with prosecution of the high seas drift-gillnet fishery in the 1980s and early 1990s. Added to the serious impacts to protected species resulting from that fishery was a regime shift that markedly lowered the carrying capacity and productivity of the ecosystem at that time. Because of the long life spans and limited reproductive potential of sea turtles, seabirds and sharks, these populations are likely only beginning to recover from these circumstances.

**Pelagic Management Unit Species**

The Pelagics FMP focuses its management efforts on a suite of "management unit species" (PMUS see Table 8). These species have been assigned to species assemblages based upon the ecological relationships among species and their preferred habitat. The species complex designations for the PMUS are marketable species, non-marketable species, and sharks. The marketable species complex has been subdivided into tropical and temperate assemblages. The temperate species complex includes those PMUS that are found in greater abundance in higher latitudes as adults including swordfish, bigeye, bluefin and albacore tuna, striped marlin and pomfret. The tropical species complex includes all other tunas and billfish as well as *mahimahi*, wahoo, and *opah*. Included in these assemblages are the species targeted by pelagic fisheries in the region, but the fisheries affect many other, non-targeted species as well as a variety of protected species.

**Table 8. Pelagic species of fish comprising the management unit in the Council's Pelagics Fisheries Management Plan.**

| English Common Name | Scientific Name |
|---|---|
| *Mahimahi* (dolphinfishes) | *Coryphaena* spp. |
| Wahoo | *Acanthocybium solandri* |
| Indo-Pacific blue marlin | *Makaira mazara:* |
| Black marlin | *M. indica* |
| Striped marlin | *Tetrapturus audax* |
| Shortbill spearfish | *T. angustirostris* |
| Swordfish | *Xiphias gladius* |
| Sailfish | *Istiophorus platypterus* |
| Oceanic sharks | Alopiidae, Carcharinidae, Lamnidae, Sphynidae |
| Albacore | *Thunnus alalunga* |
| Bigeye tuna | *T. obesus* |
| Yellowfin tuna | *T. albacares* |
| Northern bluefin tuna | *T. thynnus* |
| Skipjack tuna | *Katsuwonus pelamis* |
| *Kawakawa* | *Euthynnus affinis* |
| Dogtooth tuna | *Gymnosarda unicolor* |
| Moonfish | *Lampris* spp |
| Oilfish family | Gempylidae |
| Pomfret | family Bramidae |
| Other tuna relatives | *Auxis* spp, *Scomber* spp; *Allothunus* spp |

Species of oceanic pelagic fish live in tropical and temperate waters throughout the world's oceans, and they are capable of long migrations that reflect complex relationships to oceanic environmental conditions. These relationships are different for larval, juvenile and adult stages of life. The larvae and juveniles of most species are more abundant in tropical waters, whereas the adults are more widely distributed. Geographic distribution varies with seasonal changes in ocean temperature. Migration patterns of pelagic fish stocks in the Pacific Ocean are not easily understood or categorized, despite extensive tag-and-release projects for many of the species. This is particularly evident for the more tropical tuna species (e.g., yellowfin, skipjack, bigeye) which appear to roam extensively within a broad expanse of the Pacific centered on the equator. Likewise, the oceanic migrations of billfish are poorly understood, but the results of limited tagging work conclude that most billfish species are capable of transoceanic movement, and some seasonal regularity has been noted.

Movements of pelagic species are not restricted to the horizontal dimension. In the ocean, light and temperature diminish rapidly with increasing depth, especially in the region of the thermocline. Many pelagic fish make vertical migrations through the water column, often moving toward the surface at night to feed on prey species that exhibit similar diurnal vertical migrations. Certain species, such as swordfish, are more vulnerable to fishing when they are concentrated near the surface at night. Bigeye tuna may visit the surface during the night, but generally, longline catches of this fish are highest when hooks are set in deeper, cooler waters.

Adult swordfish are opportunistic feeders, preying on squid and various fish species. Oceanographic features such as frontal boundaries that tend to concentrate forage species (especially cephalopods) apparently have a significant influence on adult swordfish distributions in the North Pacific.

None of the PMUS stocks in the Pacific are known to be overfished, although concern has been expressed for several species, and data are unavailable for others. Trends in overall catch and size composition of animals comprising the Hawaii landings indicate that the swordfish population that supports the fishery within the Council's jurisdiction appears to be capable of sustaining current levels of effort.

Blue marlin stocks are of concern to recreational trollers and charter fleets. Various recent analyses characterize the blue marlin population as stable and close to that required to support average maximum sustainable yield (AMSY). Little is known about the status of stocks of striped marlin, black marlin, short-billed spearfish or sailfish.

Because of their primary importance in many of the pelagic fisheries, more is known about tuna stocks. Most indicators suggest a reduction of bigeye tuna biomass in the past several years although biomass in the eastern Pacific seems to have stabilized. Although some analyses suggest that current levels of harvest may exceed MSY the stock is well above minimum sustainable stock threshold (MSST) and is therefore not overfished. The current population size is probably approximately at a level that can support AMSY. Recently, increased concern has

arisen about the status of the stock in the face of large catches of juvenile tuna being taken from around floating objects in the equatorial regions of the Pacific.

Albacore stocks appear to be in good condition and are experiencing moderate levels of exploitation. Neither the northern nor southern stocks are regarded as overfished and current catches are likely to be sustainable.

Yellowfin tuna catch rates in the major industrial fleets (purse seine and longline) show "flat" trends and, in general, the Pacific yellowfin stock appears to be in good condition and current catch levels are considered sustainable.

Bluefin tuna are slower to become sexually mature than other species of tuna and they reproduce in a more limited portion of the Pacific than other tuna species. This makes them more vulnerable to overfishing.

All recent analyses indicate that harvest ratios for skipjack tuna are appropriate for maintaining current catch levels and that overall the stocks are very healthy. Although local depletions and variability may occur in response to local environmental conditions and fishing practices, the overall stock is healthy and can support existing levels of fishing.

**Non-target Species**

Pelagic fisheries catch a number of non-target species, both PMUS and non-PMUS. This is particularly true for the longline fishery. NMFS observers recorded more than 60 different species caught by the Hawaii-based longline fleet between 1994 and 1997. Of significance are the 85,523 sharks caught by the fleet in 1997, of which the majority (approximately 95 percent) were blue sharks. Up until about five years ago, most sharks caught by pelagic longline gear were released alive. However, as a result of the growing demand for shark fins in Asian markets the practice of shark finning increased during the late 1990s. This practice is now prohibited as defined in the Shark Finning Prohibition Act. About one percent of the sharks, mainly mako and thresher, are retained for later sale.

**Sea Turtles**

In addition to PMUS and non-PMUS fish species, pelagic fisheries interact with protected species. In particular, the longline fisheries interact with seabirds and sea turtles. All sea turtles are designated under the U.S. ESA as either threatened or endangered. The breeding populations of Mexico olive ridley turtles are currently listed as endangered, while all other ridley populations are listed as threatened. Leatherback turtles and hawksbill turtles are also classified as endangered. The loggerhead turtles and the green turtles are listed as threatened (note the green turtle is listed as threatened under the ESA throughout its Pacific range, except for the endangered population nesting on the Pacific coast of Mexico). These five species of sea turtle

are highly migratory, or have a highly migratory phase in their life history, and therefore, are susceptible to being incidentally caught by fisheries operating in the Pacific Ocean.

All five sea turtle species of concern forage in the waters surrounding the Hawaiian Archipelago. Leatherback, loggerhead, and green sea turtles however, are the species of principal concern with regard to incidental take in the Hawaii-based pelagic longline and other commercial fisheries of the Pacific. These fisheries are conducted mainly by Japan, Taiwan, Spain, Korea, and, to a lesser extent, the United States. It is estimated that on average about 570 million longline hooks are set by all fleets in the Pacific each year. The Hawaii-based longline fishery sets on average 14.3 million hooks per year. Between 1991 and 1998, there were no interactions with hawksbill turtles recorded by fisheries observers monitoring the Hawaii-based pelagic longline fleet, and green sea turtles have been infrequently encountered.

The dramatic decline over the last decade in the number of leatherbacks nesting annually leads to the conclusion that the leatherback turtle is now on the verge of extinction in the Pacific Ocean. Primary threats to the species are the incidental killing of turtles by coastal and high seas fishing and to a lesser extent the killing of nesting females and collection of eggs at the nesting beaches. There are no nesting populations of the leatherback turtle in areas under U.S. jurisdiction in the Pacific; however, there are important foraging areas off the west coast of the continental United States and on the high seas near the Hawaiian islands.

The diet of the leatherback turtle generally consists of cnidarians (i.e., medusae and siphonophores) in the pelagic environment. Leatherbacks have the most extensive range of any living reptile and have been reported circumglobally from latitudes 71° N. to 42° S. in the Pacific and in all other major oceans. In a single year a leatherback may swim more than 10,000 km. They lead a completely pelagic existence, foraging widely in temperate waters except during the nesting season, when gravid females return to beaches to lay eggs. Typically leatherbacks are found in convergence zones and upwelling areas in the open ocean, along continental margins, and in archipelagic waters. Hawaii fishers in offshore waters commonly see leatherback turtles, generally beyond the 100 fm curve but within sight of land. Two areas where sightings often take place are off the north coast of Oahu and the west coast of the Island of Hawaii. The pelagic zone surrounding the Hawaiian Islands is apparently regularly used as foraging habitat and migratory pathways for this species. Further to the north of the Hawaiian islands, a high seas aggregation of leatherback turtles is known to occur at 35° N. latitude, between 175° W. and 180° longitudes (NMFS, 1991).

The loggerhead turtle is listed as a threatened species throughout its range, primarily due to incidental mortality associated with commercial fishing operations and the alteration and destruction of its habitat. It is a cosmopolitan species found in temperate and subtropical waters and inhabiting continental shelves, bays, estuaries and lagoons. Major nesting grounds are generally located in warm temperate and subtropical regions, generally north of 25° N. or south of 25° S. latitude in the Pacific Ocean. For their first several years of life, loggerheads forage in open ocean pelagic habitats. Both juvenile and subadult loggerheads feed on pelagic crustaceans,

mollusks, fish, and algae. As they age, loggerheads begin to move into shallower waters, where, as adults, they forage over a variety of benthic hard- and soft-bottom habitats (reviewed in Dodd, 1988). Satellite telemetry studies show that loggerhead turtles tend to follow 17° and 20° C sea surface isotherms north of the Hawaiian islands.

The olive ridley turtle is listed as threatened in the Pacific, except for the Mexican nesting population, which is listed as endangered, primarily because of over-harvesting of females and eggs. The olive ridley is one of the smallest living sea turtles (carapace length usually between 60 and 70 cm) and is regarded as the most abundant sea turtle in the world. Since the directed take of sea turtles was stopped in the early 1990s, the nesting populations in Mexico appear to be recovering, with females nesting in record numbers in recent years. In 1996, the primary nesting beach at La Escobilla in Oaxaca sustained over 800,000 nests. There is some discussion in Mexico that the species should be considered recovered. The olive ridley turtle is omnivorous and identified prey include a variety of benthic and pelagic items such as shrimp, jellyfish, crabs, snails, and fish, as well as algae and sea grass (Marquez, 1990).

Green turtles in Hawaii are genetically distinct and geographically isolated which is uncharacteristic of other regional sea turtle populations. Both the nesting population and foraging populations of green turtles in Hawaii appear to have increased over the last 17 years. While green turtles in the Hawaiian Islands have demonstrated some encouraging signs of population recovery after 17 years of protective efforts, the conservation outlook for the future is compromised by the mortality of turtles from the increasing scope and magnitude of a tumor affliction disease known as fibropapilloma (Murakawa et al. 2000).

The hawksbill turtle is listed as endangered throughout its range. In the Pacific, this species is apparently declining due to the harvesting of the species for its meat, eggs and shell, as well as the destruction of nesting habitat by human occupation and disruption. There are no reports of interactions between this species and the Hawaii-based longline fishery, although the potential for interaction exists. Hawksbills have a relatively unique diet of sponges.

**Western Pacific Troll and Handline Fisheries**

There have been no reported interactions with sea turtles in the fisheries of the Pelagics FMP other than the Hawaii-based longline fishery, the American Samoa-based longline fishery, and the central and western Pacific U.S. purse seine fishery. There is a chance, based on fishing methods including bait used and gear-type, that these other fisheries do interact with sea turtles although the information is not reported. Due to low effort and target-species selectivity of the gear, incidental take and mortality in these fisheries is likely minimal and has an insignificant effect on the survival and recovery of sea turtle populations (NMFS, 2001b).

**Western Pacific Purse Seine Fishery**

From 1988 to the present, observers have recorded the incidental take of only six loggerheads by the central and western Pacific U.S. purse seine fishery; all were released alive (A. Coan, NMFS, pers. comm., February 2001, *in* NMFS, 2001b). In addition, logbook data during this period show that there were no reported sea turtle takes. This suggests under-reporting. Although the U.S. fleet is required to have 20 percent observer coverage and to maintain catch and bycatch logbooks, a straight extrapolation of the known observed takes is probably not an accurate representation of the effect this fishery has on sea turtles. Collecting data on sea turtles is a lower priority for observers, and since vessels are likely to release turtles immediately after pursing the net, it is likely that very little information on the bycatch of turtles is recorded (NMFS, 2001b).

Based on information collected in the eastern tropical Pacific tuna purse seine fishery (100 percent coverage), the mortality of sea turtles taken by purse seine is low (around ten percent). Most sea turtles taken by purse seine fishery are able to reach the surface to breathe, and therefore they are not forcibly submerged. In addition, the mesh is small enough that the likelihood of entanglement is low. Purse seiners setting on fish aggregating devices do tend to take more turtles because of the close association that exists between floating objects and sea turtles in the open ocean. Since 1997, U.S. purse seiners fishing in the central and western Pacific Ocean have begun shifting their strategy to setting more often on drifting FADs. This may increase the likelihood of sea turtle interactions with the fishery. However, NMFS cannot speculate as to what effect this change in fishing strategy may have on sea turtles in the central and western Pacific (NMFS, 2001b).

Based on observer data, logbooks, and information from the Forum Fisheries Agency (K. Staisch, pers. comm., February 2001, *in* NMFS, 2001b), NMFS cannot quantitatively estimate the amount or extent of sea turtle take by the central and western Pacific purse seine fishery; however, it is believed to be low (NMFS, 2001b).

**American Samoa-based Longline Fishery**

For the American Samoa-based longline fishery, the federal logbooks from 1992 to 1999 indicate a range of interactions with sea turtles (i.e., hooking/entanglement). There is no observer coverage of this fishery, so none of the species' identifications were validated by NMFS. In addition, logbook data may not be a reliable method to measure sea turtle interactions in this fishery. From 1992-1999, the take of sea turtles by the American Samoa-based longline fishery included at least four hardshelled turtles (with three released alive, one mortality), one leatherback, and one unidentified sea turtle (NMFS, 2001b).

**Hawaii-based Longline Fishery**

A previous NMFS Biological Opinion on the effects of the Hawaii-based longline fishery on sea turtle populations (NMFS, 1998) concluded that the operation of the fishery was not likely to

jeopardize the continued existence and recovery of any sea turtle populations. Incidental take levels were derived by calculating the average of the upper 95 percent confidence limits of the fishery's estimated annual takes and mortalities for each species over a four year period, based on data collected by the NMFS Southwest Region (NMFS SWR) Observer and Vessel Logbook Programs from 1994-1997. These anticipated incidental take levels were updated in 1998, as a part of that BO.

On May 18, 2000, NMFS finalized its annual assessment of the impact of the Hawaii-based longline fishery on sea turtles during 1999. This evaluation produced estimates of interactions in 1999, as well as updated previous years' estimates through the inclusion of NMFS observer and logbook data in a refined statistical model. The results indicate that, in 1999, the fishery exceeded its anticipated incidental take for olive ridley mortalities. A Section 7 consultation under the Endangered Species Act on the fishery and especially its impacts on olive ridley turtles was therefore re-initiated on June 7, 2000. This resulted in a new Biological Opinion on sea turtle interactions with western Pacific pelagic fisheries issued by NMFS in March 2001 (NMFS, 2001b).

Because sampling probabilities are unknown and less than five percent of Hawaii-based longline fishing trips were observed during the 1994-1999 period, a model-based predictor was used to estimate the total take of sea turtles by the fishery. Because the abundance and distribution, migration and foraging patterns, and physiology vary so significantly between the four species of sea turtles that may be encountered by domestic longliners fishing in the central and western Pacific Ocean, their vulnerability to Hawaii-based longline fishing operations also varies. In developing the prediction model, explanatory variables were considered in order to estimate takes accurately and precisely. Such variables included: latitude, longitude, distance to the 17° C isotherm, distance to the 19° C isotherm, year (1994-1999), month, day, hooks, hooks/float, temperature, catch of other species (e.g., tuna species, marlin, albatross, etc.), vessel length, and trip type (i.e., swordfish, tuna, mixed). Some of the variables considered and found to be associated with take were poorly represented in the logbooks during the time period of data gathering and were therefore not considered for prediction purposes (McCracken, 2000).

(1) Level of fishery interactions with green turtles: The incidental take of green turtles by the Hawaii-based longline fishery is rare. Observers have recorded the incidental take of ten green turtles by the fishery from 1994-1999. All of these turtles were hooked either externally (nine), or internally (one), and only one was observed dead, the rest were injured. In addition, all green turtles were taken from different trips; therefore, there was no evidence within the data that a green turtle take in one set implies a higher probability of a green turtle take in another set from the same trip (McCracken, 2000).

Green turtles have been observed taken in the Hawaii-based longline fishery during the months of February through July only. Both adult and subadult (straight carapace lengths ranging from 28.5 cm to 73.5 cm) have been observed. The turtles were caught in the area bounded by 155° W. and approximately 180° longitude and between 5° N. and 30° N. latitude. Six out of the ten

turtles were caught in an area around the Hawaiian island chain between 155° W. and 160° W. longitude and between 15° N. and 30° N. latitude. The remaining four were caught either far south of the Hawaiian islands (n=1), or to the northwest of the MHI (n=3). In addition, more green turtles were observed taken in a swordfish-style set compared to a tuna-style set. Eight out of the ten turtles caught were taken in sets with less than ten hooks per float, indicative of swordfish-style, shallow-set gear (NMFS, 2001b).

From observer data, and using a model-based predictor, McCracken (2000) estimated that between 37 and 45 green turtles (average 40) were taken each year by the Hawaii-based longline fishery, and of these, an average of five were killed (given a 13 percent mortality rate) (Table 9).

**Table 9. Green Sea Turtle Take and Kill Estimates with 95 Percent Prediction Intervals (PI). Source: McCracken, 2000.**

| Year | | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | Annual Average |
|---|---|---|---|---|---|---|---|---|
| Takes | Estimate | 37 | 38 | 40 | 38 | 42 | 45 | 40 |
| | 95% PI | [15-65] | [15-70] | [19-70] | [14-73] | [18-76] | [18-76] | |
| Kills | Estimate | 5 | 5 | 5 | 5 | 5 | 6 | 5 |
| | 95% PI | [0-16] | [0-17] | [1-17] | [0-17] | [1-19] | [1-19] | |

Green turtles encountered during longline fishing may originate from a number of known proximal, or even distant, breeding colonies in the region. However the most likely candidates would include those from Hawaii (French Frigate Shoals) and the Pacific coast of Mexico population. This is based on limited genetic sampling conducted within the NMFS observer program for the Hawaii-based longline fishery. Of eight greens caught by the Hawaii-based longline fishery and genetically tested, four were of eastern Pacific (Mexico) origin, while three were either of Hawaiian origin or eastern Pacific origin, and one was of Hawaiian origin (P. Dutton, NMFS, pers. comm., January 2001, *in* NMFS, 2001b).

(2) Level of fishery interactions with leatherback turtles: From 1994-1999, observers recorded the incidental take of 40 leatherback turtles by the Hawaii-based longline fishery. Of these, three were entangled, released alive and uninjured (7.5 percent), 31 were injured (77.5 percent – comprised of three entanglements, 23 hooked externally, one hooked internally, and four hooked in an unknown location), three died as a result of the interaction (7.5 percent - comprised of two that were entangled and one that was hooked externally), and for three leatherbacks taken, there were no records (i.e., the observer was unable to identify the fate or condition of the turtle) (NMFS, 2001b).

Leatherback turtles have been observed taken in all months of the year, except August. The leatherbacks were caught in the area bounded by 170° E. and 133° W. longitude and between 5° N. and 41° N. latitude. Leatherbacks caught in sets above 20° N. latitude (34 out of 40 leatherbacks observed, or 85 percent) were caught in sets with less than ten hooks per float, indicative of swordfish-style, shallow-set gear and also indicative of the general area in which

swordfish-style fishing methods are used. Leatherback takes in these sets occurred primarily between 165° W. and 130° W. longitude and 20° N. and 40° N. latitude. The remaining leatherbacks observed taken (six out of 40), were taken in sets with more than ten hooks per float, indicative of tuna-style, deep-set gear. Leatherback takes in these sets occurred between 157° W. and 167° W. longitude and 5° N. and 15° N. latitude (NMFS, 2001b).

Sea surface temperatures, latitude, and the distance to the approximate 17° C and 19° C isotherms were associated with the takes, but there was a high degree of collinearity between these variables (McCracken, 2000). When examining four latitude predictor categories for leatherbacks,[5] McCracken (2000) found that the proportion of sets with positive leatherback takes was higher in the northernmost and southernmost breakdown of latitudes used. These areas had fewer observed sets than the middle two categories, which had more observed sets but fewer observed takes.

Based on observations of all sea turtles taken by the Hawaii-based longline fishery, it appears that leatherbacks in particular tend to get hooked externally or entangled rather than ingesting the hook. This is most likely due to their foraging strategy as well as their physiology. Whereas some hard-shelled turtle species (e.g., loggerheads) are piscivores and will forage on the bait (e.g., squid) used on longlines and therefore become hooked internally, leatherbacks tend to target cnidarians (e.g., medusae and siphonophores), so they may also be attracted to the lightsticks used on the longlines at night to attract squid and subsequently are hooked externally or entangled (NMFS, 2001b).

From observer data, and using a model-based predictor, McCracken (2000) estimated that between 88 and 132 leatherback turtles (average 112) were taken each year by the Hawaii-based longline fishery, and of these, an average of nine were killed (giving an eight percent mortality rate) (Table 10).

**Table 10. Leatherback Turtle Take and Kill Estimates with 95 Percent Prediction Intervals (PI). Source: McCracken, 2000.**

| Year | | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | Annual Average |
|---|---|---|---|---|---|---|---|---|
| Takes | Estimate | 109 | 99 | 106 | 88 | 139 | 132 | 112 |
| | 95% PI | [68-153] | [62-141] | [69-148] | [55-124] | [79-209] | [76-193] | |
| Kills | Estimate | 9 | 8 | 9 | 7 | 12 | 11 | 9 |
| | 95% PI | [0-22] | [0-21] | [1-21] | [0-18] | [1-28] | [1-27] | |

Based on genetic analysis of mitochondrial DNA (mtDNA), leatherback stocks encountered in the Hawaii-based longline fishery are derived from two Pacific stocks: (1) the eastern Pacific region (Mexico and Costa Rica); and (2) the Western Pacific Region (Malaysia, Indonesia and

[5]These four categories were: less than 14.95° N., between 14.95° N. and 24.84° N., between 24.84° N. and 33.82° N., and greater than 33.82° N. (McCracken, 2000).

Solomon Islands). To date mtDNA analyses indicated that 12 of 14 leatherbacks captured in the Hawaii-based longline fishery originated from nesting populations in the southwestern Pacific; the other two specimens, taken in the southern range of the Hawaii-based fishery, were from nesting beaches in the eastern Pacific (Dutton *et al.*, in press; P. Dutton, NMFS, pers. comm., May 2000, *in* NMFS, 2001b).

(3) Loggerhead impacts: Of all marine turtles, loggerheads are the species most often taken by the Hawaii-based longline fishery. From 1994-1999, observers recorded the incidental take of 147 loggerheads. Of these, three were released alive and uninjured (two percent), 139 were injured by hooking (94.5 percent) (56 hooked externally, 83 hooked internally), and four died as a result of the interaction (three percent) (one hooked internally and three hooked in an unknown location). There was no record of its condition for one loggerhead interaction. From life history data collected by observers, it appears that the Hawaii-based longline fishery primarily interacts with juvenile loggerheads (NMFS, 2001b).

When loggerhead takes were analyzed statistically with several different variables (described earlier), sea surface temperature, latitude, and the distance to the approximate 17° C and 19° C isotherms were associated with the take of loggerheads, but there was a high degree of collinearity between these variables. Where both latitude and sea surface temperature were used in the prediction model, there was a cluster of positive observations at the higher latitudes, and at these latitudes, the cluster was located in the colder temperatures. When comparing loggerhead take with latitude and time of year, there were fewer observed trips at the higher latitudes in May and June (months five and six). In fact, there were no observed takes of loggerheads during the months of May and June, and most interactions occurred during the fall and winter months, especially in January and February. Degrees of latitude appeared to be associated with the probability of loggerhead take; for example, there were no observed loggerhead takes south of 22° N. (1,263 sets observed below this latitude had zero takes) (McCracken, 2000). Kleiber (1998) also found latitude to be the primary explanatory variable. In addition, of 55 trips with positive takes of loggerheads, 29 had positive takes of loggerheads in more than one set. Therefore, it is likely that (1) loggerheads forage or migrate in groups, which is evidenced by the witnessed reports of thousands of loggerheads feeding on pelagic crabs off Baja California; and/or (2) longliners target swordfish and tuna in areas of high loggerhead concentration (NMFS, 2001b).

All of the 147 loggerheads observed taken by the Hawaii-based longline fishery from 1994-1999 were captured by longliners targeting swordfish (i.e., target depth less than 100 meters, using less than ten hooks per float, fishing at night, using lightsticks). The mean dive depth for loggerheads (post-nesting female and subadult) is between 9 and 22 meters; therefore, loggerheads are more likely to interact with a shallow swordfish set than a tuna set, which generally has a target depth greater than 100 meters. In addition, as described below, loggerheads tend to congregate in areas typically fished by longliners targeting swordfish, taking advantage of high productivity associated with particular oceanographic features (NMFS, 2001b).

Recent satellite tracking by Polovina *et al.* (2000) indicates that loggerheads of all life stages are active migrators, swimming against weak geostrophic currents along two convergent fronts as they travel from east to west across the Pacific. Of nine juvenile loggerheads tracked in the central North Pacific, six were associated with a front characterized by 17° C sea surface temperature (SST) (termed "cool group") and the other three were associated with a front with a sea surface temperature of 20°C ("warm group"). Seasonally, these 17° C and 20° C isotherms move north and south over ten degrees of latitude, and as the turtles moved westward, they also appeared to move north and south coincident with these isotherms. During the first quarter, the distribution of surface longline sets (targeting swordfish) is largely between the 17° C and 20° C SST fronts used by loggerheads. Swordfish are believed to move south through the fronts, perhaps following squid, so during the second quarter, the fishery is well to the south of the 17° C SST front but overlapping the 20° C SST front. Sea turtles tracked during the first quarter of the years (1997 and 1998) occupied waters with a mean of 17° C SST, with considerable overlap with the SST occupied by the fishery in the northern portion of the fishing grounds. As the fishery moves south in the second quarter, those "warm group" turtles following the 20° C front may be well within the fishing grounds, while the "cool group" will likely be well north of the fishing grounds (Polovina *et al.*, 2000). Observer data show that the interaction rate (turtles per longline set) is substantially greater at 17° C SST than at 20° C SST (P. Kleiber, NMFS, pers. comm. *in* Polovina *et al.*, 2000; NMFS, 2001b).

Loggerheads in North Pacific pelagic habitats are opportunistic feeders that generally forage on items floating near or at the surface, although they will actively feed at depth if there are high densities of prey available. Loggerheads captured and killed by the international high-seas driftnet fishery in the Pacific Ocean were opportunistically necropsied to determine stomach contents. Based on the results from 52 turtles, it appears that loggerheads are omnivorous predators of the surface layer, feeding both by swallowing floating prey whole and/or biting off prey items from larger floating objects. In samples that contained *pyrosomas*, the prey items often comprised a high percent of the total gut content, indicating that the turtles were encountering dense patches of this prey item. In addition, prey items normally found in the upper photic zone (within 100 meters of the surface) but not the surface layer were also found in the gut, indicating that the loggerheads actively hunted for these species (Parker *et al.*, in press). With 57 percent of loggerheads observed hooked internally, it is likely that they are foraging at depth and may have been confusing lightsticks for prey items or were attracted to the baited hooks. In addition, the presence of a float in the water may have caused the initial interest and attraction to the gear (NMFS, 2001b).

Using mortality and take estimates described above, McCracken (2000) estimated the take and kill of loggerheads per year, as shown in Table 11. An estimated 418 were taken and 73 were killed per year from 1994-1999 (giving a 17.5 percent mortality rate).

**Table 11. Loggerhead Take and Kill Estimates with 95 Percent Prediction Intervals (PI). Source: McCracken, 2000.**

| Year | | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | Annual Average |
|---|---|---|---|---|---|---|---|---|
| Takes | Estimate | 501 | 412 | 445 | 371 | 407 | 369 | 418 |
| | 95% PI | [315-669] | [244-543] | [290-594] | [236-482] | [259-527] | [234-466] | |
| Kills | Estimate | 88 | 72 | 78 | 65 | 71 | 64 | 73 |
| | 95% PI | [36-141] | [31-115] | [34-127] | [28-102] | [32-112] | [28-102] | |

Genetic analyses of 124 loggerheads caught in the Hawaii-based longline fishery indicated that the majority (nearly 100 percent) originated from Japanese nesting stock (Dutton *et al.*, 1998) and the rest derived from Australia (P. Dutton, NMFS, pers. comm., January 2001, *in* NMFS, 2001b).

(4) Level of fishery interactions with olive ridley turtles: From 1994-1999, observers recorded the incidental take of 32 olive ridleys by the Hawaii-based longline fishery. Of these, 26 were injured (81 percent – all hooking incidents, ten hooked externally and 16 hooked internally) and six died as a result of the interaction (19 percent - comprised of four that were hooked externally, and two that were hooked internally). In addition, of the 32 olive ridleys observed taken, 26 were captured in swordfish-style sets, and six were caught in tuna-style sets. Based on life history data collected by observers, it appears that the fishery is interacting with both subadult and adult life stages of olive ridleys (NMFS, 2001b).

None of the olive ridleys observed taken by the fishery were entangled - all were hooked, 14 externally, and 16 internally; therefore, it is likely that the olive ridleys may be attracted to the baited hook or to the lightsticks, which may be confused for *pyrosomas* by the turtle.

From 1994 to 1999, olive ridleys were observed taken by the Hawaii-based longline fishery during all months of the year except February, with most of the take occurring during the warmer months (May-August). In addition, the fishery interacted with olive ridleys throughout the fishing grounds, with observed takes ranging from as far north as 33° N. to as far south as 7° N. latitude, and from longitudes 143° W., west to 175° W. Sea surface temperatures, latitude, and the distance to the approximate 17° C and 19° C isotherms were associated with the takes, but there was a high degree of collinearity between these variables. There was a clear distinction between the proportion of takes between the two categories of sea surface temperature, but over latitude, the pattern was less clear (McCracken, 2000).

Based on observer data, olive ridleys had the highest mortality rate of all sea turtles taken by the Hawaii-based longline fishery, most likely because more olive ridleys were captured and killed in tuna-style sets than any other species of sea turtle. As shown in Table 12, an estimated 146 were taken and an estimated 49 were killed per year from 1994-1999 (giving a 33.25 percent mortality rate). Although pathological lesions were noted in five olive ridleys necropsied after being taken

and killed by the fishery, these were considered mild and incidental (i.e., the turtles were probably not predisposed to being taken as a result of the lesions) (Work, 2000). Therefore, the turtles that died as a result of the interaction most likely drowned, suffocated, or succumbed to injuries suffered as a result of their being hooked. Of the six taken by tuna-style sets, five died. This high mortality rate is most likely a result of the turtles' inability to reach the surface, due to the deep sets (NMFS, 2001b).

**Table 12. Olive Ridley Take and Kill Estimates with 95 Percent Prediction Intervals (PI). Source: McCracken, 2000.**

| Year | | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | Annual Average |
|---|---|---|---|---|---|---|---|---|
| Takes | Estimate | 107 | 143 | 153 | 154 | 157 | 164 | 146 |
| | 95% PI | [70-156] | [90-205] | [103-210] | [103-216] | [102-221] | [111-231] | |
| Kills | Estimate | 36 | 47 | 51 | 51 | 52 | 55 | 49 |
| | 95% PI | [8-64] | [7-84] | [11-90] | [8-92] | [11-92] | [11-96] | |

Results from genetic analyses suggest that olive ridley stocks interacting with the Hawaii-based longline fishery may originate from nesting beaches in both the western and Indian Pacific, and in the eastern Pacific. Although haplotypes for olive ridley rookeries have not been identified due to small sampling sizes, there is a current effort underway to expand the rookery database. Thus far, genetic analyses suggest that of the 20 sampled olive ridleys taken by the Hawaii-based longline fishery, 40 percent (n=8) originate from the Indian/western Pacific and 60 percent (n=12) originate from the eastern Pacific (P. Dutton, NMFS, pers. comm., January 2001). Some areas of large relative take of olive ridleys indicated representation from both eastern and western Pacific beaches, signifying that ridleys from both sides of the Pacific converge in the North Pacific pelagic environment (NMFS, 2001b).

**Estimates of sea turtle mortalities in Hawaii-based longline fishery**

Until the new Pelagics BiOp was issued in March 2001 (NMFS, 2001b), mortality estimates for sea turtles taken by the Hawaii-based longline fishery had been based on limited data from Aguilar *et al.* (1992) and from information recorded by observers on the condition of the turtles when released (Kleiber, 1998). Aguilar *et al.* (1992) estimated a 29 percent mortality rate for loggerheads ingesting a longline hook; therefore all turtles (hard-shelled and leatherback) that had been hooked internally were assigned a mortality rate of 29 percent by NMFS. Turtles recorded as dead had a 100 percent mortality rate, and turtles recorded as okay (released uninjured) were assigned a zero percent mortality rate. All species of turtles hooked externally were also assigned a zero percent mortality rate (McCracken, 2000).

The methodology for estimating annual mortality of sea turtles was changed in the BiOp (NMFS, 2001b). The estimated mortality rates summarized in Table 13 were applied to the proportion of a species externally hooked, deeply hooked, or retrieved dead based on past observations. A 27 percent mortality rate is assigned to externally hooked turtles with minor or moderate injuries and

a 42 percent mortality rate is assigned to turtles with more serious injuries, including deep hooks, For example, of the ten green turtles observed in the Hawaii-based longline fishery (tuna-style and swordfish-style gear combined) ten percent experienced immediate mortality (100 percent mortality rate), 80 percent were externally hooked (broadly estimated as 27 percent mortality rate), and ten percent were deeply hooked (42 percent mortality rate).

**Table 13. Sea Turtle Mortality Estimates Used by NMFS Based on Level and Type of Interaction with Longline Fishing Gear (NMFS, 2001b).**

| Interaction | Response | Injury | Mortality Rate |
|---|---|---|---|
| Entangled / no hook | Disentangled | No injury | 0% |
| Entangled / external hook | Disentangled, no gear | Minor | 27% |
| | Disentangled, trailing gear | Moderate | 27% |
| | Dehooked, no gear | Minor | 27% |
| Hooked in beak or mouth | Hook left, no gear | Moderate | 27% |
| | Hook left, trailing gear | Serious | 42% |
| | Dehooked, no gear | Moderate | 27% |
| Hook swallowed | Hook left, no gear | Serious | 42% |
| | Hook left, trailing gear | Serious | 42% |
| Turtle retrieved dead | — | Lethal | 100% |

Applying these revised mortality rates to the annual estimated range of incidental take of sea turtles, NMFS calculated that 7-26 green, 28-57 leatherback, 102-195 loggerhead, and 48-98 olive ridley sea turtles may have been killed by the Hawaii-based longline fishery each year (NMFS, 2001b).

### What information is available to predict the fate of released sea turtles?

The best available information to estimate sea turtle mortality after incidental take and release of hooked sea turtles is limited and relatively weak. Studies are of two types: (1) satellite telemetry tracking of sea turtles after longline capture and release (Riewald *et al.*, 2000; Polovina *et al.*, 2000); and (2) onshore observations of hooked turtles in tanks (Aguilar *et al.*, 1992). The limitations of these studies should be kept in mind as the research results are applied to sea turtle mortality estimates in the Hawaii-based longline fishery.

### Review of telemetry studies

Satellite telemetry tracking has been conducted in both the Atlantic and the Pacific to estimate post-hooking survival and behavior of sea turtles captured by longline gear. The data are inconclusive because of problems with interpreting available results. It is not possible to distinguish sea turtle mortalities from equipment-related cessation of transmissions. Battery

failure, transmitter failure, detachment of transmitter and turtle death are all potential causes of cessation of transmissions. Equipment-related cessations are relatively common events, adding considerable uncertainty to interpreting currently available telemetry data to make estimates of post-release mortality. Whether or not turtles are assumed to have died, or whether or not the transmitters stopped transmitting in these studies is a matter of speculation.

In the Azores study (Riewald *et al.*, 2000) that tracked a total of ten loggerhead turtles (four controls and six hooked in the esophagus), transmitters failed in two out of four controls (dip netted) and only one out of six hooked turtles. This cannot be interpreted as dipnetting causing 50 percent mortality and hooking only 16.6 percent mortality. The authors of the Azores study stress that transmitter failure should not be interpreted as an indication of mortality. Overall, dive behavior appeared similar between hooked and non-hooked turtles. Even when the transmitters work, the authors were reluctant to conclude mortalities to turtles, in light of recorded diving and swimming behavior or location after release.

In the Pacific, from 1997 to late 2000, a total of 49 pelagic turtles hooked by the Hawaii-based longline fishery have had satellite transmitters attached to them in order to track their location and distance traveled following the interaction. Of these 49 turtles, 15 produced no transmissions, or their transmissions lasted less than a month - eleven had deeply ingested hooks (turtles had swallowed the hook, and it was not removed) and four were lightly hooked (turtles had the hook lodged externally (beak or flipper), permitting easy removal) (D. Parker and G. Balazs, NMFS, pers. comm., November 2000, *in* NMFS, 2001b).

For the 34 turtles that did produce successful tracks for periods lasting more than a month, there were no significant differences ($P>0.05$) found for the duration of tracking (days) and the distance traveled between lightly hooked turtles ($N=15$) and turtles with deeply ingested hooks ($N=19$). Even when the 15 turtles that did not produce successful tracks were taken into account, no significant differences were found in terms of distance traveled and duration between the two groups (19 total lightly hooked, and 30 total deeply ingested). Furthermore, when individual species were analyzed for the two categories, no significant differences were found (NMFS, 2001b).

Polovina *et al.* (2000) reported the results of satellite telemetry tracking of nine loggerhead turtles released after interactions with the Hawaii-based longline fishery. Four of the sea turtles were entangled or lightly hooked without ingestion, whereas five had swallowed the hooks. Transmitter signals were received from 2.2 to 6.9 months after hooking and turtles traveled from 1,311 to 5,199 km after being released. All nine animals moved in the same westerly direction against a largely eastward "geostrophic flow" and there did not appear to be any difference in the duration of the transmitter signals or the total distance traveled by sea turtles that had been lightly hooked versus those that had deeply ingested hooks.

**Review of Aguilar *et al.* (1992) Study**

The available information from on-shore observation indicates that hooked sea turtles can and do survive for long periods and even pass hooks after nine months. Prior to the issuance of the BiOp (NMFS, 2001bb), estimates of post-hooking mortality by NMFS were derived from a study of loggerhead turtles caught by Spanish swordfish longliners in the Mediterranean (Aguilar *et al.*, 1992). This study monitored the fate of deeply hooked loggerhead turtles by observing them in shore-side holding facilities. After observing 38 loggerhead turtles between 1986 and 1992, eleven turtles died, leading to the calculated mortality rate estimate associated with deep hooking of 28.9 percent. This study is the basis of the mortality estimate of 29 percent being applied to deeply hooked loggerhead turtles. This same mortality estimate has been applied to all species of sea turtles in the absence of species-specific post-hooking mortality data.

Although the Aguilar *et al.* (1992) study may be the best available information on post-hooking mortality, it has serious limitations. The report lacks a detailed description of the condition of the turtles on-board the fishing vessel. It is important to have an indication of the initial condition of the turtles, if they were active and alert, or lethargic or comatose and whether they had other signs of disease or injury. The report does not describe the on-board handling of the turtles at sea during transport to shore facilities. It is important to know if the turtles were held in a tank of water, kept under a wet canvas or merely left on deck during transport. There is also no description of how soon after capture the turtles were delivered to the shore facilities. The stress associated with transport may have had an effect on survival of the turtles.

The described husbandry conditions and associated stress of captivity may have contributed to the observed mortalities, although there is a possibility that survival could have been enhanced by conditions of captivity. The reported salinity appears high (43-48 ppt) and the water temperature range may be extreme (9.6° C to 27.6° C). There is no mention of whether the turtles were fed, what they were fed, if they ate, and whether they were given any other treatments (chemotherapeutics, nutritional supplements, etc.).

The study did not include a control group of non-hooked turtles that would be needed to better assess the potential contributing factors leading to the observed mortalities. Sea turtles and other wildlife are susceptible to morbidity and mortality as a result of captivity alone, without hooking interactions. The study does not report necropsy findings of those turtles that died in captivity nor does it note how long after being captured the turtles died. Although it may be assumed that deeply ingested hooks have the potential for causing serious pathology, thorough necropsies would have been extremely valuable in determining the cause of death. The lack of a control group, uncertainties about the effects of the stress induced by capture, transport at sea and captivity, and the lack of necropsy results raise questions about the post-hooking mortality estimates based on Aguilar *et al.* (1992).

**Population Effects of Hawaii-based Longline Fishery Interactions with Sea Turtles**

In addition to uncertainty about the actual level of sea turtle mortalities associated with Hawaii-based longline fishery interactions, there is insufficient information about the size and age structure and movement patterns of sea turtle populations to evaluate the effects of these interactions on long-term population viability and recovery. The survival of the affected sea turtle species will largely depend on their ability to retain sufficient abundances that enable populations to persist in the face of chance events operating at several levels (demographic variation, environmental variation, genetic variation) that affect the likelihood of extinction. The same traits that make long-lived species with delayed sexual maturity, such as sea turtles, so vulnerable to reduced survival rates also make their populations slow to recover once depleted (NMFS, 2000b). A population remains viable when it maintains sufficient genetic variation for evolutionary adaptation to a changing environment. It has been recommended that effective population sizes of at least hundreds of individuals be maintained to preserve evolutionarily important amounts of genetic variation (Lande and Barrowclough, 1987).

Population maintenance and recovery is highly sensitive to changes in the survival rates of the age classes that have a higher reproductive value (i.e., large juveniles and adults) than early life stages (i.e., eggs and hatchlings). Juvenile and adult survival rates should be sufficiently high to ensure enough juveniles survive to and through their reproductive years to maintain stable populations. Even seemingly small numbers of takes, especially of certain life stages, may have negative effects on population viability and the prospects for recovery (NMFS, 2000b).

Expert testimony given to the Court in CMC v. NMFS indicated that reduction of sea turtle take and mortalities in the Hawaii-based longline fishery alone would have only a minimal effect on the prospects for population viability and recovery of protected sea turtle species. Alternatives intended to reduce sea turtle interactions in the longline fishery are considered in the EIS.

Recognizing that the Hawaii-based longline fishery is a small proportion of the total amount of longline fishing that occurs in the Pacific Ocean, NMFS believes that the establishment of a research program is critical to developing gear technologies and fishing strategies for reducing sea turtle capture rates throughout the Pacific Ocean. Furthermore, a research program is necessary if the U.S. is going to cultivate an open dialogue within the international community to formulate collaborative efforts to address the incidental sea turtle interaction problem.

### 8.3 New Information on Affected Fisheries

Because the primary data source for this document (the March 2001 Final Environmental Impact Statement) was, in most cases, able to include data only through 1998, Table 14 shows the catch and revenues from pelagic fishing in the Western Pacific Region in 1999, the year in which management measures were first implemented to mitigate turtle interactions with the Hawaii longline fishery. Pelagic fisheries as a whole comprised nearly 87 percent of Hawaii's total

commercial fishery revenues in 1999, with the Hawaii longline fishery forming 68 percent of the total and 79 percent of pelagic landings.

**Table 14. Summary of US federally managed pelagic fisheries in the Western Pacific Region**

| Fishery | 1999 Catch (lb) | 1999 Revenue ($) | Percent of Western Pacific 1999total fishery revenues[a] |
|---|---|---|---|
| Hawaii pole-and-line | 1,309,000 | 1,669,000 | 2.4 |
| Hawaii longline | 27,722,000 | 46,493,000 | 68.1 |
| Hawaii comm. troll | 2,258,000 | 4,298,021 | 6.3 |
| Hawaii charter troll | 713,000 | 1,357,169 | 2.0 |
| Hawaii recreational troll | 4,200,000 | | |
| Hawaii handline | 2,312,000 | 4,400,808 | 6.4 |
| Am. Samoa longline | 1,073,821 | 1,105,799 | 1.6 |
| Am. Samoa troll | 46,420 | 46,041 | 0.1 |
| Guam comm. troll | 566,030 | 1,047,155 | 1.5 |
| Guam charter troll | 77,314 | 143,030 | 0.2 |
| NMI comm. troll | 141,252 | 280,000 | 0.4 |
| Total | 39,109,837 | 59,171,023 | 86.6 |

a. 1999 estimated total commercial fishery revenues for the Western Pacific = $68.3 million (WPacFIN website: http://wpacfin.nmfs.hawaii.edu/regional.htm).

During the year 2000, 125 Hawaii-based longline vessels were active, landing 23.8 million pounds of fish worth $50.2 million ex vessel. However participation and landings declined substantially in the fourth quarter of 2000 due to the Court-order reduction in swordfish targeting.

Participation in the Hawaii longline fishery in the first three quarters of 2001 was reduced to an average of 88 vessels fishing per quarter or a reduction of total fleet size of about 20% compared to the first three quarters of 2000 [NMFS Honolulu Laboratory longline summary reports]. Fishery participation was potentially affected by a number of factors, including the two week Court-ordered closure; the two month southern area closure implemented by NMFS; and the

aftermath of September 11th. However fishing effort, measured in number of hooks set for the year, probably will be greater in 2001 due to the transfer of all remaining targeting to (bigeye) tuna-directed fishing which uses more hooks per set and tends to take more sets per year (per vessel).

Preliminary estimates of landings for 2001 indicate that swordfish landings will be down roughly 90% compared to 1999 and 2000 but it was also a relatively poor year for bigeye tuna, probably caused by inter-annual fluctuations in availability. Landings for albacore and yellowfin tuna will probably be in their normal ranges. The combined effect is that total estimated landings (all species combined) by weight and value may be reduced by up to 20% as compared to 2000.

Like the Hawaii fishery, pelagic fishing in American Samoa is experiencing a period of rapid change. At the beginning of 2001, about 23 alias were actively engaged in the fishery; however, by July 3, 63 alias were registered with longline general permits. As for large fishing vessels, in 1997 the fishery consisted of four longliners ranging in length from 65 to 109 ft (19.8 to 33.2 m); today there are about 24 large longline vessels active in the American Samoa pelagic fishery and this is expected to increase to over 30 active vessels by the end of 2001. These increases in effort may result in increased levels of incidental take of sea turtles, however it is impossible to speculate what take levels would be with this increased effort. NMFS has recently approved a measure, recommended by the Council, that implements a 50 nm closed area around the American Samoan archipelago from which pelagic fishing vessels greater than 50 ft in overall length are excluded. It is likely that the Council will also recommend introduce a limited entry program to cap the total fleet size.

## 9.0 Management Objectives

The objective of this management action is to mitigate the potentially harmful effects of fishing by western Pacific pelagic fisheries regulated under the Pelagics FMP on Pacific sea turtles, and the jeopardy this represents to sea turtles. Achieving this objective would reduce a source of mortality for all sea turtles, but in particular leatherback, loggerhead and Eastern Pacific green turtles which have populations thought to be in decline.

### 9.1 Consistency with Council's Pelagics Fisheries Management Plan

The objectives of the Council's Pelagic Fishery Management Plan are as follows:

1. To manage fisheries for management unit species in the Western Pacific Region to achieve optimum yield (OY).

2. To promote, within the limits of managing at OY, domestic harvest of the management unit species in the Western Pacific EEZ and domestic fishery values associated with these species, for example, by enhancing the opportunities for:

a. satisfying recreational fishing experiences

b. continuation of traditional fishing practices for non-market personnel consumption and cultural benefits

c. domestic commercial fishermen, including charter boat operations, to engage in profitable fishing operations

3. To diminish conflicts in the EEZ, particularly in areas of concentrated domestic fishing

4. To improve the statistical base for conducting better stock assessments and fishery evaluations thus supporting fishery management and resource conservation in the EEZ and throughout the range of the management unit species

5. To promote the formation of a regional or international arrangement for assessing and conserving the management unit species and tunas throughout their range

6. To preclude waste of management unit species associated with longline, purse seine, pole-and-line or other fishing operations.

7. To promote within the limits of managing OY, domestic marketing of the management unit species in American Samoa Guam, NMI and Hawaii

The FMP objectives were developed in the mid-1980s when the FMP was first promulgated in 1986 (WPRFMC, 1986). The objectives were revised in the first amendment to the FMP in 1990 (WPRFMC, 1990), and are based on the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA). This management measure is based on the ESA through the March 29th 2001 BiOp, and therefore may not be entirely consistent with the FMP objectives. However, it might be argued that, as a whole, the FMP objectives seek to promote sustainable fisheries, and while the preferred alternative constrains fishery operations it avoids complete closure and therefore promotes the continuity of these fisheries.

The preferred alternative appears to be consistent with the third FMP objective, since shallow set longline fishing on the Cross Seamount, located within the Hawaii EEZ, has created gear conflicts between Hawaii-based longliners and pelagic handline fishermen operating on this seamount. The Council has had to mediate a dispute between the different fisheries in the past (Itano and Holland 2000), due to longliners floating shallow set lines across the top of the seamount, which tangle with the parachute drogue anchors employed by handline fishermen. The preferred alternative would not stop longline vessels from fishing on the Cross Seamount, but the gear configuration and depth requirements should minimize the interactions with small vessel handline fishermen.

The preferred alternative is also consistent with the MSFCMA which requires consistency with other applicable legislation and defines the term conservation and management as referring to all of the rules, regulations, conditions, methods and other measures which are required to rebuild, restore or maintain any fishery resource and the marine environment and which are designed to assure that irreversible or long-term adverse effects on fishery resources and the marine environment are avoided. Further, the MSFCMA includes in its statement of purpose that the national fishery conservation and management program encourages development of practical measures that minimize bycatch and avoid unnecessary waste of fish, and is workable and effective.

### 9.2 Impacts of the Alternatives

Data in this section are drawn from both the BiOp and the March 2001 FEIS. They are presented here as NMFS' estimates of the impacts of the management alternatives considered in this document. The Council has chosen not to undertake further analyses of these alternatives at this time.

Alternative A: *No action*

Under the no action alternative it is anticipated that fishing participation, patterns, catches, revenues and sea turtle takes (non-lethal interactions) rates would initially return to those seen in the FMP baseline (see Section 8 for a discussion of these baseline rates). Sea turtle mortalities would likely be reduced by some unquantified amount due to the continuation of the March 28, 2000 rule which implemented handling procedures for sea turtles hooked on entangled in longline fishing gear. Further actions taken by NMFS following a Council recommendation of the no action alternative would likely consist of the implementation of a Secretarial amendment containing the reasonable and prudent alternative contained in the BiOp and would ultimately lead to the same results presented here as an impact of the preferred alternative. However, under the no action alternative, there is a potential for further litigation, or a temporary closure of one or more Pelagic FMP fisheries by NMFS while that agency prepares and implements a Secretarial amendment. The likelihood and costs of these outcomes are not possible to determine, but it is primarily to avoid these occurrences that the Council has rejected the no action alternative.

Alternative B: *Implementation of the reasonable and prudent alternative of the March 29, 2001 Biological Opinion via Council action*

**Impacts on sea turtles**: Based on information contained in the BiOp (which is predicated on the assumption that active Hawaii-based swordfish target longline vessel operators will convert their vessels to target tuna, and all affected longline vessel operators will relocate their effort to open areas during the April-May area closure), NMFS anticipates that sea turtle takes (non-lethal interactions), and mortalities under the preferred alternative are given in Table 15.

**Table 15. Estimated annual turtle takes in the Hawaii-based longline fishery[15].**

| Species | Annual estimated incidental take | Annual estimated incidental mortality |
|---|---|---|
| **Green** | 11 (0-28) | 7 (0-18) |
| **Leatherback** | 29 (0-59) | 16 (0-32) |
| **Loggerhead** | 0-5 | 0-2 |
| **Olive ridley** | 98 (7-185) | 87 (7-163) |

According to the BiOp, the numbers estimated for all other fisheries are "possible minimums" that must be re-evaluated after one year of data has been gathered on these fisheries (Tables 16 and 17).

**Table 16. Estimated annual turtle takes in longline fisheries other than Hawaii.**

| Fishery[1] | Annual estimated incidental take | Annual estimated incidental mortality |
|---|---|---|
| **American Samoa** | 3 hardshells, 1 leatherback | 1 hardshell |
| **Guam** | 3 hardshells, 1 leatherback | 1 hard shell |
| **Northern Marianas** | 3 hardshells, 1 leatherback | 1 hardshell |

**Table 17. Estimated annual turtle takes in non-longline fisheries in the Western Pacific Region (numbers are for all species combined).**

| Fishery | Annual estimated incidental take | Annual estimated incidental mortality |
|---|---|---|
| **All handline fisheries** | 1 | 0 |
| **All troll fisheries** | 1 | 0 |
| **Hawaii pole-and-line fishery** | 1 | 0 |

[15] Corrected numbers provided by personal communication from P.Ruevelas, Office of Protected Resources, Southwest Region, NMFS.

**Impacts on target and non-target species**

A large amount of information exists on the effects of environmental fluctuations on the productivity and distribution of pelagic species. According to the FEIS, at the present time, these environmental influences are thought to be the major factor affecting the essential habitat for pelagic species. No data currently exist which indicate that the pelagic fisheries managed under the Pelagics FMP have a discernable effect on the pelagic environment, or the essential habitat for pelagic species, that would be detectable against the background of cyclical large-scale oceanographic events which drive the pelagic ecosystem.

Again, according to the FEIS, none of the management scenarios described in the EIS (singly or cumulatively) would have a deleterious impact on the status of any of the PMUS falling under the Council's jurisdiction because:

1. The pelagic fisheries under the Council's jurisdiction exploit PMUS stocks that are pan-Pacific in distribution.

2. At current levels of exploitation, these pan-Pacific stocks are able to sustain the combined fishing effort of the various gears used by the entire United States and international fleets.

3. Hawaii-based fisheries (longline, troll, handline) and other fisheries under the Council's jurisdiction account for a very small percentage of the total catch of PMUS taken in the Pacific. Any changes in catch due to changes in fisheries regimes under the Council's jurisdiction will be obscured by natural variation and catches made by the much larger sectors of the Pacific fleet.

In 1990, the Hawaii-based fisheries accounted for less than eight percent of the Pacific-wide catch of pelagic species. For that period, estimates ranged from 14 percent for swordfish to 2.7 percent for the Pacific-wide blue marlin catch and 0.4 percent for yellowfin tuna (Skillman *et al.*, 1993). More recent analyses show similar results. For example, Council fisheries were estimated to take 1.5 percent of the 1994 Pacific bigeye catch, 3.7 percent of the 1997 blue marlin catch and 23 percent of the 1997 swordfish catch. However, even this 23 percent of the total Pacific catch represents only ten percent of the estimated MSY (Boggs *et al.*, 2000).

With the possible exception of swordfish, the small percentage of the total pelagic species harvest taken by Hawaii-based fleets means that any putative changes in harvest levels that might accrue from the various alternative management schemes would probably not measurably impact PMUS stocks (Boggs *et al.*, 2000; Boggs and Ito, 1993). The preferred alternative would eliminate [the] 23 percent of the [Pacific-wide] swordfish catch taken by the Hawaii fleet, although it is possible that some or all of this catch would be taken by foreign fleets. This interpretation is reinforced for all management alternatives and PMUS by the fact that no Council-imposed restrictions would apply to foreign pelagic fishing fleets which could increase their presence in areas vacated by the Hawaii-based fleet and/or experience marginally increased

catch-per-unit-effort (CPUE) in response to decreased harvests by the Hawaii-based fleet. For all these PMUS, meaningful management can only be obtained through a Pacific-wide management structure. Unilateral reduction in catches by the Council fleet would be ineffectual and would run counter to the intent of the MSFCMA (Boggs *et al.*, 2000).

The FEIS goes on to state that the preferred alternative would also have a minimal effect on the total populations of non-target and dependent species (NADS). None of these species are thought to be depleted by fisheries operating under the Pelagics FMP. Additionally, the impact on NADS from domestic pelagic fisheries is slight in comparison to the diverse array of international fisheries. For example, in 1998, the Hawaii-based longline fleet caught approximately three percent of the total weight of blue sharks landed by all high-seas fishing in the Pacific. Although the preferred alternative would likely result in some redistribution and/or reduction of localized fishing effort, the affected vessels are likely to continue operating in pelagic fisheries in the Pacific Ocean. Because there would be no net loss of fishing activity for the basin as a whole, and the habitat for the non-target and associated pelagic species includes the entire Pacific Ocean basin, the impact to non-PMUS from the preferred alternative would be similar to that of the no-action alternative.

**Economic impacts**

**Impacts on Hawaii-based longline vessels**

The preferred alternative will both reduce and restrict fishing effort using a combination of temporal and spatial closures and restrictions on permissible methods. The preferred alternative also includes a prohibition on the deployment of shallow-set gear to reduce sea turtle interactions, as well as fisher education and training on methods to reduced interactions and release methods that reduce mortality. The prohibition on shallow sets will essentially require that all fishers have line-shooters, which can be purchased for approximately $12,000. Although the March 2001 FEIS analyzed impacts of this alternative under two scenarios (with and without swordfish effort switching and relocation of effort to open areas), the BiOp assumed that effort switching and relocation will occur, leading to a "worst case scenario" for turtle populations as presented above. However, the following section, extracted from the FEIS, examines the economic impacts of both scenarios as it is not unlikely that some vessels will fail to switch to tuna targeting or will fail to relocate their effort to available open areas during April and May. This analysis employs a calculation of the number of Hawaii-based longline vessels which are anticipated to "break-even" under various scenarios. Please see the FEIS for a complete description of this methodology.

To prevent fishers relocating from the Hawaii-based fishery for a portion of the year to avoid the area closures and other restrictions, this alternative will include a provision that requires any vessel owner who de-registers a Hawaii Longline Permit from a vessel to re-register that vessel

under their permit only during the month of October[6]. Currently, approximately 30 vessels from the Hawaii-based fleet have moved to California for the peak swordfish season in that area, which begins in October. Some, but not all of these vessels have de-registered their [Hawaii Longline] permits. By processing of permit applications exclusively in October, fishers that choose to fish the peak swordfish season with shallow gear in California[7] will be prevented from reentering the Hawaii fishery for a full year. The reentry restriction is thought to increase the effectiveness of the management measures by limiting the ability of fishers to move between the Hawaii-based fishery and other less regulated areas, where they would otherwise be allowed to use shallow-set gear.

Projected outcomes under the preferred alternative are presented in Tables 18 and 19, both of which are drawn from the FEIS. Table 18 assumes that 100% of historical effort is successfully switched and relocated to open areas. Under this scenario, 34 swordfish vessels are projected to switch from swordfish to target tuna, increasing the number of tuna targeting vessels by almost 46 percent. Total gross revenues in the Hawaii-based longline fishery are projected to decline by approximately $4.3 million or 10.5 percent. This may be regarded as the "best case scenario" for fishery participants.

Table 19 presents similar calculations, this time based on the assumption that vessels targeting swordfish leave the fishery completely, and historic effort displaced by the April-May closure is not relocated to available open areas. In this instance, only two of the swordfish vessels are able to realize revenues from mixed sets sufficient to break even, resulting in an increase of three (or four percent) in the number of tuna targeting vessels. Since swordfish fishing is prohibited and swordfish vessels are unable to switch targets, total gross revenues are projected to decline by approximately $17.6 million or 43 percent. The actual impact of the preferred alternative is likely to be somewhere between the two scenarios presented here.

**Table 18. Projections of Economic Impacts Under the Preferred Alternative, with Effort Switching.**

| | Preferred Alternative With Switching | | | Change from Baseline | | | Percentage Change from Baseline | | |
|---|---|---|---|---|---|---|---|---|---|
| | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total |
| Break-even Vessels (Number) | 108 | 0 | 108 | 34 | -45 | -11 | 45.9 | -100.0 | -9.2 |
| Persons on Break-even Vessels | 594 | 0 | 594 | 187 | -203 | -16 | 45.9 | -100.0 | -2.6 |
| Effort (Sets) | 11,879 | 0 | 11,879 | 4,751 | -4,751 | 0 | 66.7 | -100.0 | 0.0 |
| Effort (Trips) | 1,190 | 0 | 1,190 | 476 | -433 | 43 | 66.7 | -100.0 | 3.7 |

[6]New entrants to the fishery would be accepted at any time of the year.

[7]This would be legal only if the Hawai'i Permit is de-registered from the vessel during the period it is fishing with shallow-set gear.

**Table 18. Projections of Economic Impacts Under the Preferred Alternative, with Effort Switching.**

| | Preferred Alternative With Switching | | | Change from Baseline | | | Percentage Change from Baseline | | |
|---|---|---|---|---|---|---|---|---|---|
| | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total |
| Trips per Break-even Vessel | 11.0 | 0.0 | 11.0 | 1.4 | -9.6 | 1.4 | 14.2 | -100.0 | 14.3 |
| Tuna Revenue ($Millions) | 31.5 | 0.0 | 31.5 | 12.0 | -5.2 | 6.9 | 61.6 | -100.0 | 27.9 |
| Swordfish Revenue ($Millions) | 1.3 | 0.0 | 1.3 | 0.8 | -11.3 | -10.5 | 173.3 | -100.0 | -89.2 |
| Shark Revenue ($Millions) | 0.4 | 0.0 | 0.4 | -0.0 | -1.2 | -1.2 | -9.5 | -100.0 | -77.5 |
| Other PMUS Revenue ($Millions) | 3.2 | 0.0 | 3.2 | 1.6 | -1.0 | 0.6 | 93.4 | -100.0 | 22.5 |
| Total Gross Revenue ($Millions) | 36.4 | 0.0 | 36.4 | 14.4 | -18.6 | -4.3 | 65.1 | -100.0 | -10.5 |

**Table 19. Projections of Economic Impacts Under the Preferred Alternative with No Effort Switching.**

| | Preferred Alternative Without Switching | | | Change from Baseline | | | Percentage Change from Baseline | | |
|---|---|---|---|---|---|---|---|---|---|
| | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total |
| Break-even Vessels (Number) | 77 | 0 | 77 | 3 | -45 | -42 | 4.1 | -100.0 | -35.3 |
| Persons on Break-even Vessels | 424 | 0 | 424 | 17 | -203 | -186 | 4.2 | -100.0 | -30.5 |
| Effort (Sets) | 7,640 | 0 | 7,640 | 512 | -4,751 | -4,239 | 7.2 | -100.0 | -35.7 |
| Effort (Trips) | 766 | 0 | 766 | 51 | -433 | -382 | 7.2 | -100.0 | -33.3 |
| Trips per Break-even Vessel | 9.9 | 0.0 | 9.9 | 0.3 | -9.6 | 0.3 | 3.0 | -100.0 | 3.1 |
| Tuna Revenue ($Millions) | 20.5 | 0.0 | 20.5 | 1.0 | -5.2 | -4.1 | 5.2 | -100.0 | -16.8 |
| Swordfish Revenue ($Millions) | 0.7 | 0.0 | 0.7 | 0.3 | -11.3 | -11.1 | 57.0 | -100.0 | -93.8 |
| Shark Revenue ($Millions) | 0.2 | 0.0 | 0.2 | -0.2 | -1.2 | -1.4 | -41.7 | -100.0 | -85.5 |
| Other PMUS Revenue ($Millions) | 2.0 | 0.0 | 2.0 | 0.4 | -1.0 | -0.6 | 22.0 | -100.0 | -22.7 |
| Total Gross Revenue ($Millions) | 23.5 | 0.0 | 23.5 | 1.5 | -18.6 | -17.1 | 6.7 | -100.0 | -42.1 |

**Impacts on Other Hawaii-Based Pelagic FMP Fisheries**

Based on information in the FEIS, the preferred alternative is not expected to have significant direct impacts on Hawaii-based catch and effort of commercial troll and handline vessels, nor is it expected that the preferred alternative will have significant direct effects on catch and effort of charter and recreational vessels in the pelagic fisheries. Not discussed in the FEIS is the effect on local tuna prices which are likely to result from changes in the catch composition of the Hawaii-based longline fleet.

**Impacts on Pelagic FMP Fisheries Based in American Samoa, Guam, and CNMI**

The FEIS does not address these impacts in detail but does say that just as the total PMUS catch of the entire fleet fishing under the Pelagics FMP represents a very small fraction of the overall Pacific harvest, so the handline and troll fleets represent a small fraction of the catch under this FMP (WPRFMC, 1999). Thus, there exists the possibility of an increase in handline fishing, 'vertical longlining' and trolling for tuna if management measures are imposed that [severely] restrict longline fishing for tuna. This increase in effort would result in an increased harvest of sub-adult yellowfin and bigeye tuna and may possibly cause gear competition and local depletions. Other than these possible local impacts, there are no management alternatives for the handline and troll fisheries under the Council's jurisdiction that would have a significant impact on the status of any PMUS stocks. The preferred alternative is not included in the list of FEIS alternatives which would severely restrict longline fishing for tuna.

### 9.3 Consistency with National Standards for Fishery Conservation and Management

**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.**

The preferred alternative is consistent with National Standard 1 as it balances the ongoing harvest of pelagic fish in the western Pacific region with the protection to endangered and threatened sea turtles that is mandated under the Endangered Species Act.

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

The preferred alternative is based on the reasonable and prudent alternative in the March 29th BiOp, which was based on the best information available at the time the BiOp document was drafted. The development of the terms conditions however, in the March BiOp represents a fundamental policy shift by NMFS, which in a 1998 Biological Opinion concluded that the actions of the Hawaii-based longline fishery did not jeopardize the continued existence of the listed marine turtle species. This policy shift represents a difference in the interpretation of data, rather than the emergence and analysis of new data, and is therefore consistent with National Standard 2.

**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 March 29th BiOp considers the cumulative impacts of takes by all pelagic fisheries under the FMP on Pacific populations of marine turtles in developing a jeopardy opinion for loggerhead, leatherback and Eastern Pacific green turtles, and is therefore consistent with National Standard 3.

**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.**

This regulatory amendment does not does not discriminate between residents of different states, nor is it specifically concerned with allocation of fishing privileges, and therefore it appears to be consistent with the with National Standard 4.

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

The preferred alternative appears to be consistent with National Standard 5 as it allows the all fleets to remain active as long as longline vessels use deep setting techniques and do not target swordfish. In this manner, a portion of the fisheries are preserved, while impacts to turtle populations are also taken into account.

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

The preferred alternative is consistent with National Standard 6 as it requires varying management measures by fishery and area, which are based on the data available for each region.

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

The preferred alternative is consistent in with National Standard 7. The regulations stemming from these measures should minimize enforcement problems and associated costs, and do not duplicate existing regulations and statutes. The ban on swordfish longline fishing north of the equator is clear and unequivocal. So too are the stipulations on how longline gear is to be configured for deep setting, including a ban on the possession of light sticks, an important component for targeting of swordfish when conducting shallow sets at night. Log book and auction data can be monitored for swordfish catches and VMS data for individual vessels can be checked for vessels landing suspiciously large volumes of swordfish to ascertain where fishing took place.

**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 preferred alternative is consistent with National Standard 8. These measures have maintained a viable longline fishery in Hawaii, while achieving a major reduction in sea turtle takes. The impacts of these measures have been felt most strongly by those longline vessels which made swordfish or mixed sets, and which comprised about 30 percent of the Hawaii-based fleet. However, these vessels were not prevented entirely from fishing for swordfish in the North Pacific, but only in a fishery under Council jurisdiction. Several swordfish longliners were able to relocate to the US West Coast, where under normal circumstances they had fished for part of

the year, and were able to continue fishing for swordfish on the high seas from ports in southern California.

The preferred alternative may have some impacts on fishermen in the Guam and the Northern Mariana Islands, since longline fishing in these more tropical waters tends to be with shallow sets targeting yellowfin tuna. The impacts on other pelagic fisheries in the Western Pacific Region such as trollers and handline vessels are minimal, and are restricted to carrying line-clippers and wire or bolt cutters to remove hooks and release turtles. Such gear will likely be part of any fisherman's equipment carried on a fishing vessel.

**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 preferred alternative is consistent with National Standard 9 as it minimizes turtle bycatch in the Hawaii-based longline fishery by removing that element of the fishery that has the greatest interaction rates with sea turtles and other protected species. The preferred alternative also attempts to minimize the impact of all pelagic fisheries under Council jurisdiction on turtle bycatch mortality through requirements for bolt cutters, so that where possible, hooks can be removed, and line-clippers to cut fishing line close to the eye of a hook that cannot be removed without harming the turtle further.

**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 is consistent with National Standard 10, in that it does not include any actions which may fall outside the usual activities and routines in pelagic fisheries under Council jurisdiction.

## 10.0 Relationship to Other Applicable Laws and Provisions of the Magnuson-Stevens Act

### 10.1 National Environmental Policy Act (NEPA)

In March of 2001, a Final Environmental Impact Statement (FEIS) concerning the ongoing operations of the pelagic fisheries of the western Pacific region (those managed under the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region) was published by NMFS. This comprehensive analysis examined a range of issues facing pelagic fisheries, including their interactions with endangered and threatened sea turtles and provides detailed examination of the action recommended here, as well as a range of alternative actions. For further details, please see the complete FEIS, which is available from the NMFS Southwest regional office (501 West Ocean Boulevard, Suite 4200, Long Beach, CA 90802-4213; http://swr.ucsd.edu/).

## 10.2 Executive Order 12866

In order to meet the requirements of Executive Order 12866 (E.O. 12866) the National Marine Fisheries Service requires that a Regulatory Impact Review (RIR) be prepared for all regulatory actions that are of public interest (see Appendix I for the complete RIR - in preparation). This review provides an overview of the problem, policy objectives, and anticipated impacts of the action, 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 rule is not likely to have an annual effect on the economy of more $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 rule is not likely to create any serious inconsistencies or otherwise interfere with any action taken or planned by another agency; (3) This rule 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 rule is not likely to raise novel or policy issues arising out of legal mandates, or the principles set forth in the Executive Order. In summary, it is anticipated that both Alternative A (no action) and Alternative B (preferred alternative) will lead to identical national costs and benefits as under both scenarios, the reasonable and prudent alternative will ultimately be implemented. However, under the no action alternative, there is a potential for further litigation, or a temporary closure of one or more Pelagic FMP fisheries by NMFS while that agency prepares and implements a Secretarial amendment. The likelihood and costs of these outcomes are not possible to determine, but it is primarily to avoid these occurrences that the Council has rejected the no action alternative.

## 10.3 Regulatory Flexibility Act

The Regulatory Flexibility Act, 5 U.S.C. 601 et seq. (RFA) requires government agencies to assess the impact of regulatory actions on small businesses and other small organizations. An Initial Regulatory Flexibility Analyses prepared by NMFS is presented in full in Appendix I of this document. In general only the Hawaii-based longline fleet is expected to experience significant direct effects under the preferred alternative. This fishery averaged annual ex-vessel gross revenues of $40.7 million between 1994-1998 (the focus of the Biological Opinion and the last full year prior to the implementation of a sequence of measures to protect sea turtles). Assuming that fishing effort that is displaced as a result of the swordfish targeting prohibition or seasonal area closure is transferred into allowable effort in open areas, the anticipated annual loss of ex-vessel gross revenues from this fishery is estimated to be 11 percent ($4.3 million). At the other end of the extreme is a scenario in which all displaced effort is removed from the western Pacific longline fishery, resulting in an estimated annual decline of 42 percent ($17.2 million) in ex-vessel revenues. Impacts on the American Samoa-based pelagic longline fisheries (the only active non-Hawaii longline fishery in the western Pacific region) are anticipated to be minimal as these vessels generally fish below the equator and thus will not be affected by either the targeting restrictions or the seasonal area closure. The only direct cost for this fleet is that of acquiring bolt cutters and line clippers, for the smaller vessels, and bolt cutters, line clippers, and dip nets

for the larger vessels. Assuming that these items are purchased from Hawaii and are useable for several years, the average cost per vessel is anticipated to be approximately $20 per vessel for bolt cutters, $30 per vessel for line clippers, and $75 per vessel for dip nets. The impact on fishing operations of using these items is anticipated to be minor because the likelihood of encountering a turtle is low, and in the event that a turtle is hooked or entangled, it is not a time consuming procedure to free it. Impacts on non-longline pelagic vessels throughout the region are also anticipated to be minimal as the proposed rule will not affect the operations of these vessels beyond the requirement that vessel operators purchase and use bolt cutters and line clippers to free hooked or entangled sea turtles. Again, assuming that these items are purchased in Hawaii and can be used for several years, the average cost per vessel is anticipated to be approximately $20 per vessel for bolt cutters. Although the use of long handled line clippers is optional on these small vessels, it is believed that the majority of these vessel operators will employ their bolt cutters to cut their fishing line if necessary. For those that choose to purchase long handled line clippers, the estimated cost is $30. The impact on fishing operations of using these items is anticipated to be minor because the likelihood of encountering a turtle is low, and in the event that a turtle is hooked or entangled, it is not a time consuming procedure to free it using line clippers.

A range of alternatives was also considered in the IRFA, but these were rejected as the reasonable and prudent alternative contained in the BiOp is required for the continued operation of the pelagic fisheries of the western Pacific region under the Endangered Species Act. These alternatives included no action, a prohibition on shallow setting, closure of all western Pacific EEZ waters to longline fishing, and a seasonal area closure for longline vessels. Please see Appendix I for a full discussion of these alternatives.

### 10.4 Coastal Zone Management Act

The CZMA requires a determination that a recommended management measure has no effect on the land or water uses or natural resources of the coast zone, or is consistent to the maximum extent practicable with an affected state's approved coastal zone management program. A copy of this document has been submitted to the appropriate state government agency in Hawaii, American Samoa, Guam and the Northern Mariana Islands for review and concurrence with a determination made by the Council that the recommended measure is consistent, to the maximum extent practicable, with the state and territorioal coastal zone management programs.

### 10.5 Endangered Species Act

On March 29, 2001, NMFS issued a biological opinion on the continued operation of western pacific pelagic fisheries regulated under the Pelagics Fishery Management Plan. The following text is based primarily on that document, with some additional material on fishery interactions with the short-tail albatross (Please see the complete biological opinion for further details National Marine Fisheries Service Southwest Region 501 West Ocean Boulevard, Suite 4200, Long Beach, CA 90802-4213; http://swr.ucsd.edu/piao/wpfbofinal/wpfbo.htm).

The following endangered and threatened species occur in the action area and may be affected by continued regulation of domestic fisheries in the Western Pacific Region under the Pelagics FMP:

| **Marine Mammals** | **Status** |
|---|---|
| Hawaiian monk seal (*Monachus schauinslandi*) | Endangered |
| Blue whale (*Balaenoptera musculus*) | Endangered |
| Fin whale (*Balaenoptera physalus*) | Endangered |
| Humpback whale (*Megaptera novaeangliae*) | Endangered |
| Northern right whale (*Eubalaena glacialis*) | Endangered |
| Sei whale (*Balaenoptera borealis*) | Endangered |
| Sperm whale (*Physeter macrocephalus*) | Endangered |
| **Sea Turtles** | |
| Green turtle (*Chelonia mydas*) | Endangered/Threatened |
| Hawksbill turtle (*Eretmochelys imbricata*) | Endangered |
| Leatherback turtle (*Dermochelys coriacea*) | Endangered |
| Loggerhead turtle (*Caretta caretta*) | Threatened |
| Olive Ridley turtle (*Lepidochelys olivacea*) | Endangered /Threatened |
| **Seabirds** | |
| Short-tail albatross (*Phoebastaria albatrus*). | Endangered |

The endangered Hawaiian monk seal is currently found throughout the NWHI, specifically: Kure Atoll, Midway Islands, Pearl and Hermes Reef, Lisianski Island, Laysan Islands, French Frigate Shoals, Gardner Pinnacles, Necker Island and Nihoa Island. These islands form a chain approximately 1,840 km long. Hawaiian monk seals are also occasionally found in the main Hawaiian Islands. In May 1998, NMFS designated critical habitat for the Hawaiian monk seal from shore out to 20 fathoms in 10 areas of the Northwestern Hawaiian Islands. Critical habitat for these species includes "all beach areas, sand spits and islets, including all beach crest vegetation to its deepest extent inland, lagoon waters, inner reef waters, and ocean waters out to a depth of 20 fathoms around the following: Kure Atoll, Midway Islands, except Sand Island and its harbor, Lisianksi Island, Laysan Island, Maro Reef, Gardner Pinnacles, French Frigate Shoals, Necker Island, and Nihoa Island (50 CFR 226.201). The longline area closure around the NWHI instituted in 1991 (longline fishing prohibited within 50 nm of the NWHI and in 100 nm closed corridors connecting the non-contiguous closed circles) appears to have eliminated monk seal interactions with the Hawaii-based longline fleet, as there have been no observer or reported interactions with this fishery since then. In addition, there have been no reported interactions between Hawaiian monk seals and other fisheries under the Pelagics FMP. Some U.S. fisheries regulated under the Pelagics FMP fish in critical habitat areas of the Hawaiian monk seal (i.e., ocean waters out to 20 fathoms depth), although they do not target or incidentally catch prey

species of the Hawaiian monk seals. Therefore, NMFS has determined that the proposed action is not likely to adversely affect the Hawaiian monk seal.

Although blue whales, fin whales, northern right whales, and sei whales are found within the action area and could potentially interact with U.S. fisheries under the Pelagics FMP, there have been no reported or observed incidental takes of these species in these fisheries. Therefore, the proposed action is not likely to adversely affect blue whales, fin whales, northern right whales, or sei whales.

In 1991, one humpback whale was reported by an observer entangled in the mainline of a Hawaii-based longline vessel. The animal was released with trailing gear (Dollar, 1991). The interaction occurred inside what is now the protected species zone (50 nautical miles) of the islands and atolls of the Northwestern Hawaiian Islands (Bob Harmon, NMFS personal communication, November 2000). Another humpback whale was reported entangled in longline gear off Lanai (Nitta and Henderson, 1993) and by whale watch operators off Maui in 1993 (Hill and DeMaster, 1999). Confirmation was not made as to whether the gear type was pelagic longline, and it is believed to be the same whale.

Humpback whales favor waters less than 100 fathoms (183 meters) around the main Hawaiian Islands. The highest densities of humpback whales occur in the shallow-water, inter-island channels of the four-island region (Maui, Lanai, Molokai, and Kahoolawe) and Penguin Bank (Mazzuca *et al.*, 1998). Because humpback whales prefer shallower waters and the 1991 interaction occurred inside the 50 nautical mile area now closed to longline fishing, NMFS considers the likelihood of another interaction low and does not expect the Hawaii-based longline fishery to interact with a humpback whale. In addition, there have been no reported interactions between humpbacks and other fisheries under the Pelagics FMP. Therefore NMFS has concluded that the proposed action is not likely to adversely affect humpback whales.

NMFS has observed one sperm whale interaction by the Hawaii-based longline fishery. The event occurred in May 1999, inside the Northwestern Hawaiian Islands EEZ (about 140 miles north of Raita Bank), and the vessel was targeting swordfish (gear was set at night, lightsticks were used, and no line-shooter was used). According to the observer report, the sperm whale's pectoral fin was entangled in the mainline. The captain stopped the boat, let out more mainline, and then backed up until he could reach the other end of the mainline. At this point, both ends of the mainline, on each side of the vessel, were secured on the vessel. During this time, the whale broke the mainline and swam away without trailing gear. This is the first reported interaction by the Hawaii-based longline fleet since it has been monitored (1991). In addition, there have been no reported sperm whale interactions by fishers in their logbook submissions.

NMFS has observed 3,251 sets representing approximately 3,874,635 hooks (data from February 1994 through December 31, 1999), since the implementation of the mandatory observer program. Based on this information, the observed entanglement rate for sperm whales would equal approximately 0.31 whales per 1,000 sets, or 0.0002 per 1,000 hooks. However, with only one

sperm whale entanglement, NMFS believes that this entanglement rate does not represent the actual entanglement rate. One whale entanglement cannot provide a reliable estimate of the true entanglement rate with any certainty. At this time, there is insufficient data to suggest that a sperm whale interaction with longline gear is anything more than a one time random event. Nevertheless, NMFS recognizes the potential that sperm whales could interact with longline gear set in the open water but without more accurate data is unable to predict with any confidence the likelihood of an interaction. Therefore, without additional information to support the frequency of entanglements, NMFS does not anticipate that there will be another sperm whale interaction in the foreseeable future by the Hawaii-based longline fishery. In addition, there have been no reported interactions between sperm whales and other fisheries under the Pelagics FMP. Therefore, NMFS has determined that the proposed action is not likely to adversely affect sperm whales.

Based on previous patterns of interactions between the fisheries and endangered sea turtles, the BiOp concludes that the proposed fisheries are not likely to adversely affect hawksbill sea turtles, (*Eretmochelys imbricata*), but are likely to adversely affect Eastern Pacific green turtles *(Chelonia mydas*), leatherback turtles (*Dermochelys coriacea*), loggerhead turtles (*Caretta caretta*) and olive ridley turtles (*Lepidochelys olivacea*). NMFS based this conclusion on previous patterns of turtles that have been captured, injured, or killed through interactions with the gear used in the fisheries.

Limited quantitative information on all of the turtle species was available for NMFS' analysis. To conduct its jeopardy analyses in the absence of definitive, quantitative information, NMFS used a conceptual model that considered the information available on the numbers of sea turtles captured, injured, or killed in the US Pacific pelagic fisheries to determine if these injuries or deaths could be expected to reduce a species' reproduction, numbers, or distribution. As part of these analyses, NMFS made assumptions about the number of adult, female sea turtles that might be captured, injured, or killed in the pelagic fisheries. NMFS also projected the effects of the proposed fisheries on the turtles' survival and fecundity over the time it would take the 2001 cohort of hatchlings to recruit into the adult, breeding population. NMFS then considered the probable effects on turtle mortalities in the fisheries on the species' population structure, the status and trends of the various populations, the vital rates, and the relationship between vital rates and the population's status and trend (that is, the population's rate of increase). Specifically, NMFS considered whether mortalities associated with the fisheries are a significant or chronic source of (a) reduced fecundity in the breeding population of these turtles or (b) decreased rates of survival in one or more life history stages of these sea turtles.

Based on these qualitative analyses, NMFS concluded that the numbers of green, leatherback and loggerhead turtles captured, injured, or killed in the proposed fisheries would reduce the numbers and reproduction of those species in a way that would be expected to appreciably reduce their likelihood of surviving and recovering in the wild. NMFS concluded that the numbers of olive ridley captured, injured, or killed in the proposed fisheries would not reduce the numbers and reproduction of that species in a way that would reduce its likelihood of surviving and recovering

in the wild. The BiOp outlines a reasonable and prudent alternative that is expected to avoid the likelihood of jeopardizing green, leatherback, and loggerhead turtles.

The only listed or candidate species of seabirds that interacts with the Hawaii longline fishery is the short-tailed albatross. The world breeding population of the short-tailed albatross is estimated to be about 1,200 birds (H. Hasegawa unpubl. data, as cited in 65 FR 46643) and the only two breeding colonies for the species are located on Torishima and Minami-Kojima Islands in the western Pacific. Short-tailed albatrosses are known to visit the NWHI, but there are no reports of a successful breeding. There are also no observed reports of a short-tailed albatross interacting with a Hawaii-based longline vessel. In 1997, one short-tailed albatross was seen flying near the stern of the NOAA vessel *Townsend Cromwell* during longline gear haulback research operations 593 nautical miles north of the island of Hawaii at 30° 28′ N., 153° 37′ W. In January 2000, a NMFS observer saw a juvenile short-tailed albatross flying near a Hawaii longline fishing vessel at 33° 09′ N., 147° 49′ W.

The preferred alternative is not expected to have a significant negative impact on short-tail albatross populations, indeed, there may be a net benefit from these measures. The Hawaii longline fishery is known to interact with Laysan and black-footed albatross populations that nest each year in the Northwestern Hawaiian Islands, causing the mortalities of between 1,000-2,000 of each species annually. Most of these interactions occur with longline vessels targeting swordfish or a mix of swordfish and tuna with shallow sets. Data collected through NMFS observers indicates that the bycatch rate of Laysan and black-footed albatross for tuna targeting sets is about 3 percent of that for swordfish/mixed sets. The termination of swordfish and mixed style shallow set longline fishing, north of the equator, should therefore greatly reduce the potentially negative impacts of the Hawaii-based longline fleet to all albatross species, including short-tail albatrosses. This major reduction in the threat to short-tail albatrosses has prompted NMFS to initiate a consultation with the US Fish and Wildlife Service (USFWS) on the continuing operation of the Hawaii-based longline fishery.

### 10.6 Marine Mammal Protection Act

All pelagic fisheries in the Western Pacific Region under Council jurisdiction, including the Hawaii-based longline fishery, are classified as Category III under Section 118 of the Marine Mammal Protection Act (MMPA) of 1972 (FR Vol. 66, No. 158, pp42780-42801). Marine mammals not listed as endangered or threatened under the ESA that have been observed in the action area are as follows:

Pacific white-sided dolphin (*Lagenorhynchus obliquidens*)
Rough-toothed dolphin (*Steno bredanensis*)
Risso's dolphin (*Grampus griseus*)
Bottlenose dolphin (*Tursiops truncatus*)
Pantropical spotted dolphin (*Stenella attenuata*)
Spinner dolphin (*Stenella longirostris*)

Striped dolphin (*Stenella coeruleoalba*)
Melon-headed whale (*Peponocephala electra*)
Pygmy killer whale (*Feresa attenuata*)
False killer whale (*Pseudorca crassidens*)
Killer whale (*Orcinus orca*)
Pilot whale, short-finned (*Globicephala melas*)
Blainville's beaked whale (*Mesoplodon densirostris*)
Cuvier's beached whale (*Ziphius cavirostris*)
Pygmy sperm whale (*Kogia breviceps*)
Dwarf sperm whale (*Kogia simus*)
Bryde's whale (*Balaenoptera edeni*)

The preferred alternative will likely result in a reduction of the take of species listed under the MMPA, which interact with the Hawaii-based longline fishery. Interactions between marine mammals and the Hawaii longline fishery are very rare events, compared even with the infrequency of sea turtle interactions. NMFS observers have reported about 20 dolphin and whale interactions in 3,813 sets observed between 1994 and 2000. This represents one encounter for every 190 longline sets, but this is likely skewed upwards by the focusing of observers on swordfish vessels, which have a higher interaction rate with marine mammals. The interaction rate for tuna-targeting sets is one whale/dolphin interaction per 521 tuna sets compared with one whale/dolphin per116 swordfish or mixed sets over the same time period. When expanded to the longline fleet as a whole, the observer data suggests that there are probably at most 60 interactions per year between whales and dolphins (Kleiber, 1998). The closure of the swordfish and mixed component of the Hawaii longline fishery will likely reduce these infrequent interactions by at least 50%, i.e. reducing and making more remote, the rare possibility for an interaction between the Hawaii-based longline fleet and marine mammals.

It might be argued that the April and May restriction of the tuna-targeting longliners north of the 15° N line of latitude may concentrate the fleet fishing effort over a smaller area of ocean and hence increase the likelihood of whale/dolphin interactions with this segment of the fleet. However, interaction rates will also depend on the spatial distribution and movements of the various whales and dolphins encountered by the Hawaii longline fleet, about which little is known. Further, the high (20 percent) observer coverage on the Hawaii longline fleet since August 2000, means that more accurate information on interaction rates will be available, and the threat to marine mammals posed by the Hawaii fleet can be more accurately assessed. Presently the Hawaii-based longline fleet is ranked in the lowest threat classification (MMPA Category III) by NMFS (FR Vol. 66, No. 158 Wednesday, August 15, 2001).

### 10.7 Paperwork Reduction Act

The Paperwork Reduction Act requires federal agencies to minimize paperwork and reporting burdens whenever collecting information from the public. This regulatory amendment does not contain a collection-of -information requirement for the purpose of this Act.

### 10.8 EFH consultation

The proposed measures to implement the reasonable and prudent alternative of the March 29, 2001 biological opinion (see Section 7 for a description of these measures) via a regulatory amendment under the Fishery Management Plan for the Pelagics Fisheries of the Western Pacific Region are not expected to have adverse impacts on essential fish habitat (EFH) or habitat areas of particular concern (HAPC) for species managed under the Pelagics, Bottomfish and Seamount Groundfish, Precious Corals, or Crustaceans Western Pacific Fishery Management Plans. EFH and HAPC for these species groups has been defined as presented in Table 20. The proposed measures will not adversely affect EFH or HAPC for any managed species as the measures 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.

**Table 20. Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC) for species managed under the Pelagics, Crustaceans, Bottomfish and Seamount Groundfish, Precious Corals, and Crustaceans, Western Pacific Fishery Management Plans. All areas are bounded by the shoreline, and the outward boundary of the EEZ, unless otherwise indicated.**

| SPECIES GROUP (FMP) | 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 and Seamount Groundfish | 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 |
| Precious Corals | Keahole, Makapu'u, Kaena, Wespac, Brooks, and 180 Fathom gold/red coral beds, and Miloli'i, S. Kauai and Au'au Channel black coral beds | not applicable | Makapu'u, Wespac, and Brooks Bank beds, and the Au'au Channel |
| Crustaceans | bottom habitat from shoreline to a depth of 100 m | water column down to 150 m | all banks within the Northwestern Hawaiian Islands with summits less than 30 m |

## 11.0 Appendix I: Draft Regulatory Impact Review and Initial Regulatory Flexibility Analysis

## I INTRODUCTION

In order to meet the requirements of Executive Order 12866 (EO 12866) the National Marine Fisheries Service (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 EO 12866, the following is set forth: (1) This rule is not likely to have an annual effect on the economy of more $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 rule is not likely to create any serious inconsistencies or otherwise interfere with any action taken or planned by another agency; (3) This rule 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; and (4) This rule is not likely to raise novel or policy issues arising out of legal mandates, or the principles set forth in the Executive Order. In addition, the Regulatory Flexibility Act, 5 U.S.C. 601 et seq. (RFA) requires government agencies to assess the impact of their regulatory actions on small businesses and other small organizations via the preparation of Regulatory Flexibility Analyses.

This document examines the costs and benefits of regulatory actions contained in the reasonable and prudent alternative of a Biological Opinion on the Authorization of Pelagic Fisheries under the Fishery Management Plan for the Pelagic Fisheries of the Western Pacific Region (BiOp) prepared and issued by NMFS on March 29, 2001. It also contains an analyses of the economic impacts of this action on affected small businesses and other small organizations.

## II PROBLEM STATEMENT AND NEED FOR ACTION

In February of 1999, EarthJustice Legal Defense Fund filed a complaint on behalf of the Center for Marine Conservation and the Turtle Island Restoration Network, alleging NMFS failed to follow the proper National Environmental Policy Act (NEPA) process and challenging NMFS' determinations under the Endangered Species Act (ESA) that continued conduct of the Hawaii-based longline fishery (defined as those pelagic longline vessels registered for use under Hawaii longline limited access permits) is not likely to jeopardize the continued existence of leatherback, loggerhead, olive ridley, hawksbill, or green sea turtles, (Center for Marine Conservation v. NMFS (D. Haw.) Civ. No. 99-00152 DAE (CMC v. NMFS).

The ESA and its implementing regulations set out a detailed consultation process for determining the biological impact of a proposed activity. That consultation process results in the issuance of a Biological Opinion in which NMFS states whether it believes that the activity is likely to jeopardize the continued existence of a listed species. If so, then NMFS must suggest reasonable and prudent alternatives to mitigate the effects of the activity (16 U.S.C. 1536(b)(3)(a)). If the proposed action complies with ESA Section 7(a)(2)(16 U.S.C. 1536(a)(2)), the ESA authorizes NMFS to issue an incidental take statement that sets levels for incidental take of the species (as long as the activity is not likely to jeopardize the continued existence of the species). The EarthJustice legal action challenged NMFS' November 1998 Biological Opinion and incidental take statement for the Hawai'i -based longline fishery, as well as NMFS' compliance with NEPA.

The U.S. District Court upheld NMFS' analyses and findings under the ESA that the fishery was not jeopardizing the existence of any protected species. However, the Court determined that the agency had failed to prepare a comprehensive EIS for the fishery as required by NEPA. Subsequently, on November 23, 1999, the Court issued an injunction (entered on November 26, 1999, and amended by an order filed January 11, 2000) setting terms to apply during the period while NMFS prepared the EIS. This first injunction led to the temporary closing of certain waters north of Hawaii to fishing by Hawaii-based pelagic longline vessels (64 FR 72290 December 27, 1999, and 65 FR 37917 June 19,2000).

On June 23, 2000, the Court issued a second injunction (amended on June 26, July 21, and August 4, 2000) ordering that NMFS implement a year-round area closure between 28° N. and 44° N. between 137° W. and 173° W. (with an allowance of 601 sets in a portion of that closed area with 100% observer coverage), a minimum 20% observer coverage in the remaining area, a total fishery closure in the months of April and May, mandatory 100% observer coverage, and a prohibition on targeting swordfish. The Court also ordered that NMFS complete its comprehensive EIS by April 1, 2001 in order to lessen the duration of this injunction's impacts on fishery participants. (CV. No. 99-00152 DAE 8/4/2000)

NMFS prepared and filed this EIS on March 30, 2001. The Final EIS (FEIS) contains a preferred alternative which includes a series of actions (including a new time/area closure) to mitigate the fishery's adverse impacts on sea turtles. These measures are based on a new Biological Opinion written as a part of a section 7 consultation under the Endangered Species Act. Upon receiving this FEIS, the Court issued an Order Modifying [its previous] Injunction which made immediately effective those aspects of the preferred alternative which are intended to mitigate Hawaii longline fishery interactions with sea turtles. The Court further ordered NMFS to immediately codify these requirements into Federal regulations. NMFS did so, and on June 12, 2001 an interim emergency rule implementing those measures was published.

At this time, the Western Pacific Regional Fishery Management Council has recommended that the BiOp's reasonable and prudent alternative, intended to mitigate other pelagic fishery interactions with sea turtles, be permanently implemented via a regulatory amendment to the

Pelagics Fishery Management Plan. Thus, the complete reasonable and prudent alternative of the BiOp comprises this document's preferred alternative.

## III DESCRIPTION OF THE FISHERIES

The Western Pacific Pelagics Fishery Management Plan has the authority to regulate pelagic fishing activities in the EEZ around Hawaii, American Samoa, Guam, the CNMI, and the Pacific Remote Island Areas of Howland, Baker and Jarvis Islands, Midway, Johnston, Palmyra and Wake Atolls, and Kingman Reef (PRIAs).

The FMP manages unique and diverse fisheries. Hawaii-based longline vessels are capable of traveling long distances to high-seas fishing grounds, with trips typically ranging from 14 to 44 days, while the smaller handline, troll, charter, and pole-and-line fisheries, which may be commercial, recreational, or subsistence generally occur within 25 miles of land, with trips generally lasting only one day. These fisheries are discussed below, first by gear type and then by geographic area. These descriptions are extracted from a Final Environmental Impact Statement on the Pelagic Fisheries of the Western Pacific Region (NMFS 2001a). Please see that document for a complete description of these fisheries (http://swr.nmfs.noaa.gov/piao/eisdocs.htm).

### III.1 Description of Fisheries by Gear Type

**Commercial Fisheries**

The Hawaii-based longline fleet has historically operated in two distinct modes based on gear deployment: deep-set longlines by vessels that target primarily tuna and shallow-set longlines by those that target swordfish or have mixed target trips including swordfish, albacore and yellowfin tuna. Swordfish and mixed target sets are buoyed to the surface, have few hooks between floats, and are relatively shallow. These sets use a large number of lightsticks since swordfish are primarily targeted at night. Tuna sets use a different type of float placed much further apart, have more hooks per foot between the floats, and the hooks are set much deeper in the water column. These sets must be placed by use of a line-shooter to provide slack in the line which allows it to sink. The fleet includes a few wood and fiberglass vessels, and many newer steel longliners that were previously engaged in fisheries off the U.S. mainland. There is a maximum vessel length of 101 feet for this fleet.

Apart from a few larger (> 40 ft) inboards, longlining out of American Samoa generally takes place on alias, twin-hulled (wood with fiberglass or aluminum) boats about 30 feet long, and powered by small gasoline outboard engines. Navigation on the alias is visual using landmarks. The gear is stored on deck attached to a hand crank reel which can hold as much as 10 miles of monofilament mainline. Participants set between 100 and 300 hooks on a typical eight-hour trip. The gear is set by spooling the mainline off the reel and retrieved by hand cranking back onto the reel. Currently most fishing is done within 25 miles of shore, but with better equipped vessels, fishing activity may extend further. Generally, gear setting begins in early morning; with retrieval

in the mid-morning to afternoon. The fish are stored in containers secured to the decks or in the hulls. Albacore tuna is the primary species landed followed by skipjack tuna and yellowfin tuna.

The Hawaii-based skipjack tuna or *aku* fishery is also known as the pole-and-line fishery, or the bait boat fishery because of its use of live bait to target aku (skipjack tuna). The *aku* fishery is a labor-intensive, and highly selective operation. Live bait is broadcast to entice the primary targets of skipjack and juvenile yellowfin tuna to bite on lures made from barbless hooks with feather skirts. During the fast and furious catching activity, tuna are hooked on lines and in one motion swung onto the boat deck by crew members.

Handline fishing is an ancient technique used to catch yellowfin and bigeye tunas with simple gear and small boats. Handline gear is set below the surface to catch relatively small quantities of large, deep-swimming tuna that are suitable for *sashimi* markets. This fishery continues in isolated areas of the Pacific, and is the basis of an important commercial fishery in Hawaii. Three methods of pelagic handline fishing are practiced in Hawaii, the *ika-shibi* (nighttime) method, the *palu-ahi* (daytime) method, and seamount fishing (which combines both handline and troll methods).

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

**Charter and Recreational Fisheries**

The region's charter fisheries primarily troll for billfish. Big game sportfishing rods and reels are used, with four to six lines trolled at any time with outriggers. Both artificial and natural baits are used. In addition to lures, trollers occasionally use freshly caught skipjack tuna and small yellowfin tuna as live bait to attract marlin, the favored landings for charter vessels, as well as yellowfin tuna.

The recreational fleet primarily employs troll gear to target pelagic species. Although their motivation for fishing is recreational, some of these vessel operators sell a portion of their landings to cover fishing expenses and have been termed "expense" fishermen (Hamilton, 1999). While some of the fishing methods and other characteristics of this fleet are similar to those described for the commercial troll fleet, a survey of recreational and expense fishermen showed substantial differences in equipment, avidity, and catch rates compared to commercial operations. Vessel operators engaged in subsistence fishing are included in this recreational category.

## III.2 Description of Fisheries by Geographical Area

### Hawaii Fisheries

Hawaii's pelagic fisheries are small in comparison with other Pacific pelagic fisheries such as distant-water purse seine fisheries and other foreign pelagic longline fisheries (NMFS, 1991), but they comprise the largest fishery sector in the state of Hawaii (Pooley, 1993). Tuna, billfish and other tropical pelagic species supply most of the fresh pelagic fish consumed by Hawaii residents and support popular recreational fisheries (Boggs and Kikawa, 1993).

Of all Pelagics FMP fisheries, the Hawaii-based limited access longline fishery is the largest. This fishery accounted for 85 percent of Hawaii's commercial pelagic landings (28.6 million lb) in 1998 (Ito and Machado., 1999). The fleet operates under a limited entry regime with a total of 164 transferable permits (119 of which were active in 1999, the last full year prior to Court-required restrictions) and a maximum allowable vessel length overall of 101 feet. Based on Federal logbook data, this fleet's 1999 landings were 28.3 million pounds (238,000, pounds per vessel) and gross ex-vessel revenue was $47.4 million ($398,000 per vessel). This fleet took 1,137 trips in 1999 (1,103 in 2000), an average of 9.5 trips per vessel. Thirty-one (6%) of these trips targeted swordfish, 296 (26%) had mixed swordfish/tuna targets, and 776 (68%) targeted tunas. Landings consisted of 6,830,000 pounds ($13 million) of swordfish, 10,300,000 pounds ($27 million) of tunas, and 10,620,000 pounds ($7.3 million) of other billfish (marlins), mahimahi, wahoo, moonfish and sharks. In 1999, 48% of fleet effort was expended on the high seas, 34% within the EEZ surrounding the Main Hawaiian Islands, 12% within the EEZ surrounding the Northwestern Hawaiian Islands, and 6% within the EEZ surrounding the US Pacific Remote Island Areas.

The longline fishery provides approximately 85% of fresh commercial seafood landings in Hawaii. As such it supports a substantial fishery supply sector (fuel, oil, bait, gear etc.) as well as an auction house, and numerous fish wholesaling and retailing operations. The Hawaii longline fishery, valued at $46.7 million in a 1998 baseline economic analysis, has been estimated to have a total impact on Hawaii business sales of $113 million using an input-output model of the Hawaii commercial fishery (Sharma *et al.*, 1999). This model calculates the inter-relationship of industries producing inputs to the longline fishery -- what are termed "backward" linkages. The total sales figure includes the direct effect of the ex-vessel sales and the indirect and induced income effects on other industries -- what we term associated businesses. Using this model, the personal and corporate income effect of the longline fishery is $50 million with upwards to 1,500 jobs directly associated with the Hawaii longline fishery. State and local taxes are approximately $8 million. In addition there are "forward" linkages which refer to the supply effect of Hawaii longline-caught fish on the seafood auction, wholesalers and retailers, etc. These measures are more difficult to measure but have been estimated to represent an additional $8-16 million in value-added.

Landings by Hawaii-based fisheries in 1998 ranged from to 28.6 million pounds by the longline fleet to 696,000 pounds by the *aku* boats and are summarized in Table 1. Tunas (*Thunnus* spp.), and broadbill swordfish (*Xiphias gladius*) are the dominant target species, but a variety of other pelagic species are also landed incidentally, including blue sharks *(Prionace glauca)*, *opah*

(*Lampris guttatus*), marlin (Family *Tetrapturidae*, and Family *Makairadae*), and *mahimahi* (Family *Coryphaenidae*).

**Table 1. Fishery Information for Hawaii Pelagic Fisheries for 1998.** (Adapted from WPRFMC, 1998 Annual Report; NMFS, 1999).

| Gear/Vessel Type | Longline | Charter Fishery | Troll/Handline Fisheries | Pole-and-line Fishery (*Aku* Fishery) |
|---|---|---|---|---|
| Area Fished | EEZ around Hawaii (25-200 nm) and high seas | Inshore and EEZ | Inshore and EEZ | Inshore and EEZ |
| Total Landings | 28.6 million pounds | 1.8 million pounds | 4,570,000 pounds | 696,000 pounds |
| Catch Composition | 24% bigeye tuna<br>24% pelagic sharks<br>12% albacore tuna<br>11% swordfish<br>6% yellowfin tuna | billfish<br>wahoo<br>yellowfin tuna<br>skipjack tuna<br><br>(catch percentages are unknown) | yellowfin tuna<br>skipjack tuna<br>*mahimahi*<br>Wahoo<br>striped marlin<br>bigeye tuna<br><br>(catch percentages are unknown) | 99.6% skipjack tuna |
| Season | All year | All year | All year | All year |
| Active Vessels | 114 | 199 | 1,824 | 6 |
| Total Permits | 164 (transferable) (Limited Entry) | NA | NA | NA |
| Total Trips | 1,140 | 16,700 (estimate) | 26,203 | 223 |
| Total Ex-vessel Value | $46.7 million | $15.3 million | $7.2 million | $0.9 million |

Note: Data do not include all landings for recreational fishers. For the charter fishery, gross revenue estimates include charter fees, fish sales, and mount sales commissions for a 12-month period in 1996-1997.

Total pelagic landings experienced a slow decline from the early 1950s through the mid-1980s. The decline was primarily due to reduced landings by the *aku* fleet although decreases in longline landings are also apparent in Figure 1. Landings by the troll fleet began to increase in the early 1970s but the overall decline in pelagic landings continued. The pelagic landings of the longline fleet began to slowly increase in the late 1970s but it wasn't until the mid-1980s when longline landings began to increase substantially that the decline of more than three decades was overcome. Total pelagic landings increased dramatically through the mid-1990s with substantial variability since that time.

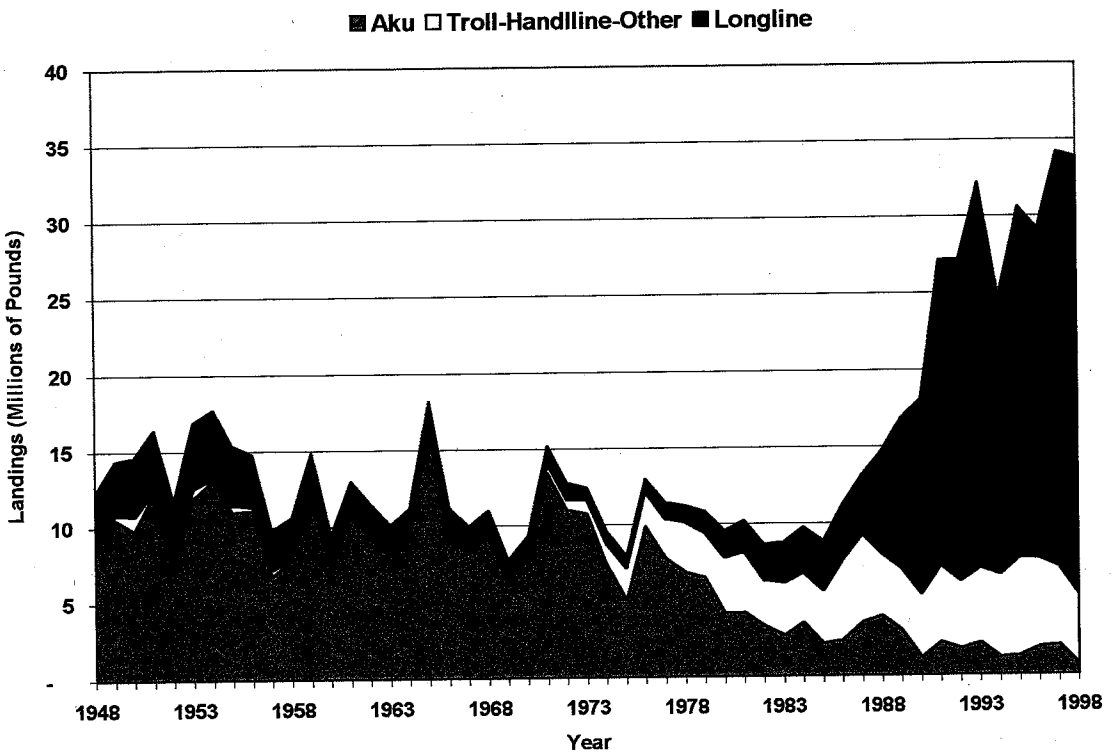


**Figure 1. Pelagic landings in Hawaii from 1948 to 1999**

***Markets for Hawaii's Pelagic Fisheries***

The marketing and distribution system for fresh pelagic fish landed in Hawaii is part of a larger network of interconnected local and worldwide components that supplies a variety of fresh and frozen products to consumers in Hawaii and elsewhere (Pooley, 1986). Hawaii's fishers supply a variety of pelagic fish in a range of qualities and quantities.

Local fishers using a variety of fishing methods are the dominant source of fresh pelagic fish for the Hawaii market. Hawaii's large pelagic longline fleet targets bigeye, yellowfin, and albacore tunas as well as swordfish. Longliners also supply marlin to the market, primarily as incidental catch. The handline fishing fleet targets yellowfin, bigeye, and skipjack tunas. Commercial trollers provide a variety of pelagic fish, especially *mahimahi*, wahoo, marlin, and yellowfin tuna, depending on the season (DBEDT, 2000; Bartram, 1997). Table 2 shows 1999 landings of major pelagic species in Hawaii.

**Table 2. Hawaii 1999 reported landings of pelagic species.** (Source: NMFS, Honolulu Laboratory, WPacFin)

| | Landing Volume (Pounds) | Volume Sold (Pounds) |
|---|---|---|
| Bigeye Tuna | 5,139,432 | 5,105,270 |
| Yellowfin Tuna | 3,930,995 | 3,785,305 |
| Albacore Tuna | 3,348,820 | 3,326,670 |
| Skipjack Tuna | 1,839,834 | 1,728,767 |
| Blue Marlin | 1,090,920 | 985,385 |
| Striped Marlin | 849,041 | 830,386 |
| Swordfish | 3,834,710 | 3,833,810 |
| *Mahimahi* | 1,179,583 | 1,103,132 |
| *Ono* | 899,880 | 819,144 |
| Moonfish | 1,000,844 | 1,000,665 |
| Pomfret | 288,435 | 287,449 |
| Sharks [a] | 256,794 | 166,316 |
| **Total** | **23,659,288** | **22,972,299** |

[a] This figure for sharks does not include data on sharks that were harvested for fins only with the carcass discarded. The U.S. Congress prohibited the finning of sharks in December 2000.

Export markets are important for tuna and swordfish, which are produced and traded extensively on an international scale. However, much of the highest-quality tuna never finds it way out of the Hawaii market, where consumers are among the most discriminating in the world.

Historically, swordfish did not have a strong demand in Hawaii, and the bulk of landed swordfish is exported to larger, established markets on the U.S. mainland and in Japan. Subsequently, a market niche developed. Other pelagic species harvested in Hawaiian waters, such as blue marlin, striped marlin, *mahimahi* (also known as dolphinfish) and *ono* (also known as wahoo), are consumed largely in the local market. Marlin, prized in some markets, is considered an affordable alternative to the more expensive tuna. *Mahimahi* and *ono* have an established niche in the local market, which consumes the entire local supply, supplemented by imports of these species from other fisheries (Bartram, 1997).

Per capita seafood consumption by residents and visitors to Hawaii is twice the U.S. average. Therefore, it is not surprising that the local supply falls short of local demand. For certain grades and species of fish, such as *aku* (skipjack tuna), demand is greater than landings in Hawaii's waters. To meet the excess demand, much fresh and frozen fish is imported to Hawaii. Although the imported volume may be as high as two-thirds of local production, substantial portions of the imports are re-exported to other markets. Hawaii's central Pacific location is convenient for consolidating fish shipments from other Pacific islands for shipping on to the U.S. mainland (Bartram, 1997).

Markets for pelagic species fluctuate throughout the year. Prices for a given species may vary seasonally with fluctuations in quality, quantity, demand, and quantities of substitutes. Quality is a function of several factors. Gear and fishing method affect the condition of the fish and the quality of the meat. Fish quality is also thought to change seasonally with water temperature fluctuations.

***Tuna***

Tuna forms the largest segment of Hawaii's fish production and is an expanding market. Variation in uses of different species is apparent, as Hawaii has both significant imports and exports of tuna (Bartram, 1997). The high-quality tuna that is exported from Hawaii is sold mostly to Japanese buyers. Hawaii exporters and fishers target the Japanese tuna market because of its renowned high prices for fish. Tuna is also sold to mainland U.S. markets. These markets rely on sources other than Hawaii for high-quality fish. However, they import some lesser grades of tuna from Hawaii to serve the demand for lower-quality fish (Bartram *et al.*, 1996).

Although significant exports are made, annual local consumption of fresh tuna alone is approximately 6,349,000 pounds. Several niches within Hawaii's tuna market have developed, each with its own quality standards. The market for tuna served raw as *sashimi* is generally known as the most demanding. Other markets include cooking (highly variable in quality demanded), *poke* (raw cubes served with spices and condiments), and smoking or drying (with the lowest quality requirements) (Bartram, 1997).

As much as 40 percent of local tuna consumption is raw, in the form of *sashimi* and *poke*, a local favorite. Bigeye and yellowfin tunas are commonly used for *sashimi*, but bigeye is the species of choice because of its brighter muscle color, higher fat content, and longer shelf life (Bartram, 1997).

Hawaii's consumers have traditionally placed a high demand on the Hawaii market for high-quality tuna. The Hawaii market has historically supplemented its local supply by importing substantial quantities of bigeye and yellowfin tunas, mostly from the Indo-Pacific region. Imports have declined in recent years as consumers have sought to satisfy more of their demand from the local supply. The reasons for the decline in imports are somewhat unclear. One contributing cause is the decline of the tuna fleet in the Marshall Islands in the mid-1990s and changes in fleet operations in the Pacific. In addition, the Hawaii market has seemed more willing to substitute local, high-quality albacore at times when top-quality bigeye and yellow fin tunas are in short supply (Bartram, 1997).

***Swordfish***

Swordfish is the second largest fishery in Hawaii after bigeye tuna. The majority of swordfish is exported to the continental United States. Although swordfish is used locally for *sashimi* at times, grilling is the most popular method of preparation.

Most swordfish are caught by the longline fleet using nighttime shallow fishing techniques with luminescent attractants. Swordfish are also occasionally caught by tuna longline fishers as incidental catch. Trollers and handliners also participate in this fishery, but to a minor degree.

The peak season for swordfish is the early summer months from April to July. Most of the fish are sold at the Honolulu fish auction. A portion, however, is sold directly to wholesalers and exporters. Most of the fish are shipped to the US East coast, where Hawaii swordfish brings a premium price. East coast purchasers commonly purchase swordfish in airline container quantities to realize economies of scale in shipping.

Harvest levels grew substantially during the early 1990s due to the adoption of the nighttime surface fishing techniques. In 1987 and 1988, swordfish landings averaged 50,000 pounds. By 1991, landings had grown to more than ten million pounds. Swordfish landings peaked in 1993 at slightly more than 13 million pounds and have since ranged between 5.5 million and slightly more than seven million pounds a year (WPRFMC, 1999.).

Hawaii generally is one of many suppliers of swordfish to a major US market served by a worldwide supply. In 1998 (when Hawaii landings were slightly more than seven million pounds), approximately 34.6 million pounds of swordfish were imported into the continental US market. Imports of fresh swordfish in excess of two million pounds were received in the United States from Brazil, Chile, and Australia. Singapore alone exported more than eight million pounds of swordfish to the U.S. market (WPRFMC, 1999.; Seafood Market Analyst, 2000). In addition, other areas of the continental United States recorded significant harvests. In 1998, the U.S. Pacific fleet (excluding Hawaii) caught three million pounds of swordfish, and the Atlantic and Gulf fleets caught an additional 4.8 million pounds (Hamm *et al.*, 1999).[8] Assuming that most of this domestic landings are used in the U.S. East coast market, Hawaii's landings comprise less than 15 percent of the U.S. East coast swordfish market.

***Blue Marlin and Striped Marlin***

Neither marlin species is targeted by commercial fishers in Hawaii. The majority of the landings are caught incidentally by the longline tuna fleet. Trollers also contribute to Hawaii marlin harvests. Sport fishers, however, target blue marlin and often sell their landings in the commercial market, with proceeds going to the boat and crew. Most commercial marlin landings are sold in the Honolulu auction. Sport fishers and trollers, however, may sell their landings directly to wholesalers, retailers, or restaurants (DBEDT, 2000).

Marlin is used as *sashimi* and *poke* in Hawaii. Large group caterers often prefer marlin because it discolors more slowly than tuna. Premium *sashimi*-quality striped marlin, which has orange-red meat and higher fat content, is thought to be of higher quality than blue marlin, although blue marlin with acceptable fat content is used as *sashimi*. Both are cooked by Hawaii restaurants.

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[8] Data for the 1999 U.S. catch are unavailable. In the last four years for which data are available, catch was relatively stable, between 7.5 million and eight million pounds.

Blue marlin is popular with lower-income and fixed-income groups and often is smoked (Bartram, 1997; DBEDT, 2000).

The blue marlin and striped marlin harvests are a significant but secondary part of the Hawaii market. The combined annual landings of both species in the past ten years typically have been about two million tons. Historically, striped marlin harvests have exceeded blue marlin harvests, but in two of the last four years, blue marlin exceeded striped marlin by more than 100,000 lb (WPRFMC, 1999.).

Seasonal variability in price is greater for both blue marlin and striped marlin than for tuna. The Hawaii blue marlin season peaks between June and October. The peak of the striped marlin season is opposite, beginning in November and continuing until June. The seasonal price changes are similar for the two fish, suggesting that the prices are driven by changes in tuna supply and total demand for fish rather than by the volume of marlin harvests. Marlin prices reach annual highs from February to April and again in September and December. The high prices early in the year coincide with a period of low tuna supplies. The transition from summer yellowfin to winter bigeye is the likely explanation for the high price for marlin in September. Marlin is also likely substituted for tuna in December when demand is high. The low prices in June and July occur during the period when tuna supply is at its highest and overall demand is at a low. Low prices occur in October, when marlin and bigeye are in high supply (DBEDT, 2000).

The markets for billfish in particular have been affected by limits on mercury in imported fish. The U.S. Food and Drug Administration has a limit of 1.0 parts per million for methyl mercury in fish imports. Every lot imported is tested before release for sale. The procedures allow an importer to obtain a "green card" limiting testing requirements if the importer's first five shipments all test below the limit. The procedure is costly for minor importers and is believed to limit the inflow of swordfish into the United States. The sampling procedure is also costly and can damage fish, further deterring imports of swordfish into U.S. markets (Bartram, 1997).

***Other Pelagic Species: Mahimahi, Ono, Moonfish, and Pomfret***

Most Hawaii restaurants have diversified menus that include *mahimahi* and several other species, such as marlin, *ono* (wahoo), *opah* (moonfish), and large-scale black pomfret. Demand for these pelagic species has led to substantial landings by Hawaii fishers, who sell to the Hawaii market. Harvests of *mahimahi* and *ono*, the most commonly targeted species, fluctuate seasonally. Significant quantities of *opah* and pomfret are caught incidentally. Quantities of these two species fluctuate significantly, but follow no seasonal trend. All of these species are sold fresh, because almost no market exists for frozen local landings (Bartram, 1997; DBEDT, 2000).

Most *mahimahi* and *ono* are caught by trollers, although portions of the harvest are taken by longline and pole-and-line fishers. These species are sold through the Honolulu and Hilo fish auctions and directly to wholesalers and restaurants. *Mahimahi* is a favorite in many local restaurants. *Ono* is generally substituted when *mahimahi* is in short supply. The limited local supply of *mahimahi* has led to import of substantial quantities to Hawaii from Taiwan, Japan,

and Latin America. Since imported fish tend to be slightly cheaper than fresh local fish, imported fish tend to be directed toward less expensive restaurants. Little of either of these species is exported, because local consumers consume most of the local supply.

Pomfret and moonfish are also frequently sold in local restaurants. These species complement the supply of *mahimahi* and *ono* in the local fresh market. Both species are primarily incidental catch of the longline fleet and are sold almost exclusively through auctions (Bartram, 1997, DBEDT, 2000).

***Sharks***

Prior to its prohibition of by the Hawaii Legislature and the U.S. Congress in 2000, shark finning had been a source of significant revenue for crew members in the Hawaii-based longline fishery. Most of these revenues are generated by sales of blue shark fins sold to satisfy the demand for fins in the Asian market. A small market has also developed recently for thresher and mako sharks. The landings of these two species is small and does not contribute substantially to the overall revenue in the fleet.

The prohibitions on finning of sharks are likely to substantially limit the activity of Hawaii-based longline vessels in the Asian market for shark fins. No market exists for the carcass of blue sharks, which is the dominant incidental catch species in Hawaii longline fisheries (WPRFMC, 2001), and until such a market develops, the landing of these sharks is unlikely.

**American Samoa, Guam and Northern Mariana Islands Fisheries**

American Samoa-based pelagic fisheries consist of a small fleet of *alia* longliners, a few mid-size and larger longliners, and a small fleet of trolling vessels. Guam is home to an active trolling fleet and several charter sportfishing vessels, as is the CNMI. These fleets target albacore, skipjack tuna, yellowfin tuna, and other pelagic species, and in 1998, made landings ranging from 25,000 pounds by American Samoa trollers to 884,000 pounds by American Samoa *alia* longliners (Table 3).

**Table 3. Pelagic fishery information for American Samoa, Guam, and CNMI, 1998.** (Adapted from WPRFMC, 1998 Annual Report; NMFS,1999).

| Islands | American Samoa - 1998 | | Guam - 1998 | CNMI - 1998 |
|---|---|---|---|---|
| Gear | Longline | Troll/Charter | Troll/Charter | Troll/Charter |
| Area Fished | Inshore and EEZ | Inshore and EEZ | Inshore and EEZ | Inshore and EEZ |
| Total Landings | 884,154 lb | 25,271 lb | 817,087 lb | 192,568 lb* |
| Catch Composition | 72% albacore tuna<br>8% yellowfin tuna<br>< 5% all others | 74% skipjack tuna<br>6% barracuda<br>4% yellowfin tuna<br>< 4% all others | 31% mahimahi<br>23% skipjack tuna<br>19% yellowfin tuna | 70% skipjack tuna<br>11% mahimhai<br>8% dogtooth tuna<br>6% yellowfin tuna |
| Season | All year | All year | All year | All year |
| Active Vessels | 25 | 24 | 438 | 89 |

| Islands | American Samoa - 1998 | | Guam - 1998 | CNMI - 1998 |
|---|---|---|---|---|
| Gear | Longline | Troll/Charter | Troll/Charter | Troll/Charter |
| Total Permits | 50 (open access) | NA | NA | NA |
| Total Trips | 2,359 | 123 | 14,324 | 2,230 |
| Total Ex-vessel Value | $968,361 | $29,949 | $711,066** | $398,086 |

Notes:
*Landings for CNMI are recorded commercial landings, but not all commercial landings are recorded (D. Hamm, NMFS SWSFC-HL, pers. comm., November 3, 2000).
**Total ex-vessel value of landings in Guam are estimated from commercial landings, which are less than 50 percent of total landings.

## American Samoa Fisheries

Despite a 40 year history of tuna canning in American Samoa by two large processors, commercial fishing for tuna by domestic (local) vessels in the EEZ around American Samoa is a relatively recent endeavor. The importance of pelagic fish as a source of income and employment in American Samoa's small-scale fishery has increased rapidly since 1996, following the adoption of longline fishing methods patterned after those in the neighboring country of Samoa. American Samoa's small-scale fishery is presently evolving from the realm of traditional subsistence activities to more commercial activities.

The small-scale pelagic fishery in American Samoa employs relatively simple troll and longline fishing technology. More than 90 percent of the respondents in a survey of 20 longline fishermen planned to increase their efforts at longlining (Severance *et al.*, unpub. research). Until very recently, most of the small-scale fleet was comprised of boats under 30 ft in overall length. New and safer types of small-scale vessels have begun to enter the pelagic fishery and they are capable of extending the safe range of fishing farther offshore.

### *The Longline Fishery in American Samoa*

The American Samoa based longline fishery consists of vessels that fish under a western Pacific general longline permit. This permit allows the vessel to fish for PMUS using longline gear in the EEZ around American Samoa, Guam, the Commonwealth of the Northern Mariana Islands (CNMI) or other U.S. island possessions, excluding the Hawaiian Islands. Unlike Hawaii longline permits the number of Western Pacific general longline permits is not restricted. As of 1998, there were 48 general longline permitted vessels in American Samoa, three in Guam and one in the CNMI, however, however only those based in American Samoa were active during 1998.

Prior to 1995, the non-purse seine pelagic fishery in American Samoa was largely a troll-based fishery. In mid-1995, four vessels began longlining and by 1997, 33 vessels had permits to longline. Approximately 17 of these were actively fishing on a monthly basis. In 1998, only 26 of the 50 federally permitted longliners actually fished. These 26 vessels reported total landings of 884,000 pounds in 1998.

Apart from a few larger (> 40 ft) inboards, longlining out of American Samoa generally takes place on alias, twin-hulled (wood with fiberglass or aluminum) boats about 30 feet long, and powered by small gasoline outboard engines. Navigation on the alias is visual using landmarks. The gear is stored on deck attached to a hand crank reel which can hold as much as 10 miles of monofilament mainline. Participants set between 100 and 300 hooks on a typical eight-hour trip. The gear is set by spooling the mainline off the reel and retrieved by hand cranking back onto the reel. Currently most fishing is done within 25 miles of shore, but with better equipped vessels, fishing activity may extend further. Generally, gear setting begins in early morning with retrieval in the mid-morning to afternoon. The fish are stored in containers secured to the decks or in the hulls. Albacore tuna is the primary species landed followed by skipjack tuna and yellowfin tuna. Most fish are sold to large scale canneries, but some are sold to restaurants, and donated for family functions.

As stated above, this fishery is presently open access, with no limits on the number of longline vessels, individual or total vessel capacity, catch or effort. A control date of November 13, 1997, has been established and some applicants for longline permits after that date are informed that they may not qualify for exemptions to limitations placed on longline vessels greater than 50 ft in overall length. In anticipation of the possibility of a limited entry program for domestic longline fishing vessels, the Council and NMFS have established a control date of July 15, 2000, after which any vessel of any size entering the fishery will not be assured of being allowed to use longline gear to fish for pelagic management unit species in the EEZ around American Samoa (WPRFMC, 2000f).

The length distribution of vessels owned by longline permit holders, as of October 2000, is summarized in Table 4.

**Table 4: Longline permit holders based in American Samoa as of October 2000.** Source: NMFS *in* WPRFMC, 2000.

| No. of Vessels, by Length Overall | | | | | |
|---|---|---|---|---|---|
| **< 30 ft** | **31-35 ft** | **35-40 ft [a]** | **41-45 ft [b]** | **46-50 ft [c]** | **50+ ft** |
| 34 | 14 | 9 | 2 | 0 | 5 |

[a] A newer and safer version of *alia* (a catamaran-style vessel that is the most common type of fishing boat in American Samoa and Samoa) is being assembled in Samoa from pre-cut aluminum plates manufactured in New Zealand. Mostly 38 to 42 ft in length, this version is equipped with a larger fuel tank, navigational aids, higher freeboard, and more safety equipment to extend fishing range to well over 100 nm from shore. Several new fishing enterprises in American Samoa have plans to acquire vessels of this type.
[b] In addition to planned acquisitions in this length class, FAO is designing a 45 ft catamaran-style vessel for the next phase of longline fishery expansion in neighboring Samoa. This design will also be available for boatbuilding in American Samoa.
[c] A design for a monohull vessel assembled from precut steel plates in the 46 to 50 ft class has been prepared in American Samoa.

### Guam Fisheries

Pelagic fishing vessels based on Guam fall into two broad categories: (1) distant-water purse seiners and longliners that fish primarily outside the EEZ around Guam and transship through Guam; and (2) small, primarily recreational trolling boats that are either towed to boat launch sites or berthed in marinas and fish only local waters (within the EEZ around Guam or in the adjacent EEZ waters of the CNMI. This discussion covers primarily the local small boat pelagic

fishery (WPRFMC, 1999.). As of 1998, there were three vessels with general longline permits in Guam, but none were active (NMFS, 2000a).

Aggregate landings of all pelagics, tuna, and non-tuna PMUS by the small boat fleet fluctuate greatly, but appear to be increasing. In the early 1980s, the pelagic landings consisted primarily of tunas. Then beginning in 1985, non-tuna PMUS, primarily *mahimahi*, began making up the bulk of the landings. The commercial landings of all pelagics also show a similar trend (WPRFMC, 1999.).

The total landings data are extrapolated from the Guam Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and other available commercial fishing data. Unfortunately, the information necessary to reconcile the difference between commercial and all landings is not available. Therefore, this analysis assumes that the balance of the total landings is associated with fishing for personal and recreational purposes.

Most fishing boats are less than ten meters (33 ft) in length and are typically owner-operated by persons who earn a living outside of fishing (WPRFMC, 1999.). Most fishers sell a portion of their landings at one time or another, and it is difficult to distinguish among recreational, subsistence, and commercial fishers. A small, but significant, segment of the pelagic fleet consists of marina-berthed charter vessels that are operated primarily by full-time captains and crews (WPRFMC, 1999.).

In Guam, trolling with lures and (occasionally) baited hooks conducted from catamarans and other small commercial, recreational, and charter vessels in coastal waters, near seamounts, or around FADs. Charter boat activity decreased between 1997 and 1999, primarily because of a significant drop in the number of tourists as a result of the Asian economic crisis.

In 1981 and 1984, the bulk of pelagic landings consisted of tunas. However, after 1984 non-tuna PMUS began making up the bulk of pelagic landings due to an interest in targeting blue marlin, an increase in *mahimahi* landings, and a lack of interest in skipjack tuna. In 1998, total pelagic landings increased ten percent, tuna landings increased nine percent, and non-tuna PMUS increased nine percent. Charter trolling trips accounted for 15 percent of overall pelagic landings (WPRFMC, 1999.).

In 1998, skipjack tuna landings decreased by nine percent from 1997 landings, while yellowfin tuna landings increased 52 percent. For most years, skipjack landings exceeded yellowfin landings by a two-to-one ratio. Given the relative unmarketability of skipjack tuna in the local market and the desirability of yellowfin tuna, the availability of skipjack tuna probably exceeds yellowfin availability by a wider margin.

Reliable estimates of the total economic contribution of the domestic fishing fleets in Guam are currently unavailable.

**CNMI fisheries**

The CNMI is a string of islands in the western Pacific Ocean (longitude 145° E., and latitude 14° N. to 21° N.). Inhabitants live on three primary islands: Saipan, Rota, and Tinian. The pelagic fishery activities occur primarily from the island of Farallon de Medinilla south to the island of Rota (NMFS, 2000a). Commercial, subsistence, and recreational fishing are practiced.

Trolling is the most common fishery in the CNMI, with bottomfishing and reef fishing also conducted (Glazier, 1999). The product is primarily skipjack tuna. This fishery is on the increase, most likely due to increasing population in CNMI (WPRFMC, 1999.). All domestic commercial fishery product is consumed locally. Yellowfin tuna and *mahimahi* are targeted to a lesser degree, and are easier targets for the local fishermen during seasonal runs. (Yellowfin are preferred to skipjack, but are rarely encountered. These species are accepted by all ethnic groups in the CNMI and have maintained their market demand with the ongoing in-migrating population growth on Saipan (more than half of the population on Saipan is non-native) (WPRFMC, 1999.).

No large-scale longline or purse seine activity occurs around the CNMI at this time. However, fishery development consultants for the CNMI have suggested providing incentives for the longline fleet to move into CNMI waters (University of Hawaii, 2000). If longline fleets move into the CNMI, the domestic commercial fisheries will be affected. Currently only one vessel in CNMI has a General Longline Permit, which allows the vessel to fish with longline gear in the EEZ around CNMI, Guam, and American Samoa. This vessel was not active as a longliner in 1998 (WPRFMC, 1999.).

Because skipjack are common in nearshore waters off the CNMI, these fish are caught with minimal travel time and fuel costs. Trolling is the primary gear. Most trips are less than a full day. Trolling for skipjack tuna takes place throughout the year. The *mahimahi* season is February through April, and the yellowfin tuna season is April to September (WPRFMC, 1999.).

The pelagic fishing fleet, other than charter boats, consists primarily of vessels less than 7.32 m (24 ft) in length, which usually travel in a limited 20-mile radius from Saipan (WPRFMC, 1999.). Most are 3.66-7.32 m (12-24 ft), outboard-powered, runabout-type vessels (NMFS, 2000a).

According to WPRFMC (1999a), about 82 percent of all boats registered with the DPS participated in some form of fishing activity in the CNMI in 1998 (75 full-time commercial, 65 part-time commercial, and 143 subsistence/recreational). Of the registered vessels, 24 were charter vessels, which generally retain their landings and sell to local markets (WPRFMC, 1999.). The amount of charter boat sales is not known. However, it constitutes a small portion of the local fish market, and most fish are typically consumed by the charter crew (Hamm *et al.*, 1999).

Official estimates of the number of crewmembers involved in the commercial fishery in CNMI are not available. However, since the primary gear is trolling, it is reasonable to assume that there

is one crew person in addition to the skipper, as is typical on troll boats in Hawaii (Hamilton and Huffman, 1997).

Most vessels in the CNMI pelagic fishery are based on Saipan. Although available data do not indicate actual residence of vessel owners, it is reasonable to assume that most landings in Saipan are made by residents of Saipan.

Cost studies of the pelagic fisheries in CNMI similar to studies for Hawaii in Hamilton and Huffman (1997) do not appear to have been conducted. Nor does it appear that an input-output study, similar to work in Sharma *et al.* (1999), is available.

**PRIA fisheries**

There is limited knowledge of fishing activity and effort in the PRIA because of limited reporting requirements for vessels active in this fishery. Longline vessels that fish in EEZ waters around the PRIA must be registered under a longline general permit or the Hawaii-based longline limited access permit. These vessels have federal reporting requirements. There are no federal reporting requirements for commercial troll and handline vessels targeting pelagic species in these areas. The only existing reporting requirement for recreational and charter vessels in this area is a U.S. Fish and Wildlife Service requirement for maintaining a "Midway Sports Fishing Boat Trip Log." This requirement applies to fishing within the Midway Atoll National Wildlife Refuge. The log, however, need not include any information about interactions with protected species.

Two Hawaii-based troll and handline vessels are known to have fished recently in EEZ waters around Palmyra and Kingman Reef targeting pelagic (including yellowfin and bigeye tunas, wahoo, *mahimahi*, and sharks) and bottomfish species. Catch and effort data on these vessels are unavailable.

Five charter vessels are known to be based on Midway, two of which troll for pelagic species. The other three are used for nearshore and lagoon fishing. Approximately seven vessels are maintained and used for recreational fishing by Midway residents. Three of these are known to troll for pelagic species including yellowfin tuna, *ono*, and blue and striped marlin.

**Foreign fisheries in the Central and Western Pacific**

Fisheries managed under the Pelagics FMP compete with a variety of foreign fleets operating on the high seas and within the EEZs of many Pacific nations. Large-scale, distant-water foreign fisheries include three gear types: longline, pole-and-line and purse seine.

The pole-and-line fleet in the western and central Pacific Ocean (WCPO) was composed of approximately 1,400 vessels in 1999. Most of the vessels are small to medium-sized and operate in the domestic fisheries in Indonesia and Japan. There are few environmental issues concerning pole-and-line fishing because the technique is very selective in catching tuna species, primarily skipjack tuna.

Purse seine vessels from Japan and the United States have fished in the WCPO since the mid-1970s and new vessels from Korea and Taiwan entered the fishery in the early 1980s. In 1999 the WCPO purse seine fleet was comprised of 223 vessels including 159 distant-water vessels, 31 domestic Pacific Island vessels, and 33 domestic non-Pacific Island vessels (e.g., Australia, Indonesia, Japan and New Zealand). The 1999 catch of 1,033,000 mt was comprised of: skipjack tuna – 781,000 mt (76 percent of the total), yellowfin tuna– 218,000 mt (21 percent) and bigeye – 35,000 mt (three percent) (Coan *et al.* 2000).

The diverse longline fleet in the WCPO was composed of roughly 4,700 vessels in 1999. These vessels can be divided into four components largely based on the area of fishing operations: (1) over 400 vessels are domestically based in the Pacific Islands with the Samoa [formerly Western Samoa] *alia* fleet representing half of these vessels; (2) approximately 3,000 vessels are domestically based in non-Pacific Island countries, largely in Japan and Taiwan; (3) about 750 large distant-water freezer vessels from Japan, Korea and Taiwan that operate over large areas in the region; and (4) about 450 offshore vessels based in Pacific Island countries and composed of roughly equal numbers of vessels from mainland China, Japan and Taiwan. Pacific-wide longline effort increased from 300 to 500 million hooks from 1962 to 1980. Since 1980, annual pelagic longline effort has been roughly 560 million hooks. Effort in the longline fishery is the most widespread of any industrial fishery in the Pacific.

Longline fisheries usually target tuna or swordfish. Tuna longlining is characterized by day fishing at moderate depths (100-250 m) to target albacore and yellowfin tunas, or deeper depths (250-400 m) to effectively target bigeye tuna (Hanamoto, 1976; Boggs, 1992). The Japanese longline fleet had mainly targeted albacore for canning until the early 1970s. These longliners deployed "conventional" longline gear of four to six hooks between floats (HBF) fishing a depth of approximately 90-150 meters. In the early 1970s longliners changed to 'deep' sets by placing more hooks between longline floats. The deeper longline gear was more effective in catching bigeye tuna and the fleet shifted activities in waters near the equator where the thermocline is shallower.

In addition to the sector of the Hawaii-based longline fishery which targets swordfish, there are several foreign fleets (e.g., longline, gillnet and harpoon) that target swordfish in the Pacific. While most of the foreign longline effort targets tuna species, the shallower swordfish longlining has a higher incidence of encountering a protected or endangered species. Foreign longline fisheries specifically targeting swordfish occur in Japan, Chile and Australia. Fishing methods by the Japanese swordfish fleets are similar to the Hawaii fleet: night fishing with three or four branchlines between each float which results in a shallow gear configuration.

**III.3 Regional and Socioeconomic Context of Western Pacific Pelagic FMP Fisheries**

Fishing industry sectors related to the harvest, processing and transshipment of tuna and other highly-migratory pelagic species have made U.S. ports in the Western Pacific Region among the nation's leaders in terms of value of catch landed. However, fisheries occurring inside the U.S. EEZ of the Western Pacific – that is, the area covered by the FMP – account for only a small

fraction of the volume of pelagic species caught in the Pacific basin. This small percentage reflects the fact that Pacific pelagic stocks are capable of extensive movement and are the targets of intense competition among a multitude of distant-water U.S. and foreign fishing fleets that operate on the high-seas and within the EEZs of many nations.

Hawaii is unique in the Western Pacific Region in that a relatively high proportion of the pelagic fish landed in this sub-region are harvested within the U.S. EEZ. Even then, about half of the catch of the pelagic fishery of greatest economic importance to Hawaii - the longline fishery - occurs outside the EEZ. The sub-region with the next highest landings of pelagic species harvested within the U.S. EEZ is American Samoa. Yet, the quantity of fish landed by boats operating in federal waters around the territory are far eclipsed by the landings of domestic and foreign distant-water fishing vessels that deliver tuna to American Samoa's fish canneries. Similarly, in Guam catches of pelagic species in the EEZ are much smaller than the landings by the international fleet of distant-water tuna vessels that utilize the territory as a reprovisioning and transshipment center. Even in the CNMI, which benefits the least from distant-water fishing fleets in the Pacific, the quantity of tuna that enters local air transshipment operations from island areas outside the commonwealth exceeds catches of pelagic species within the EEZ around the CNMI. In considering the baseline or existing conditions of the pelagic fisheries of the Western Pacific Region (and the subsequent analysis of alternatives) it is fundamentally important to understand the relative role of that portion of the fishery subject to direct management under the FMP.

***Community and Sociocultural Setting of the Pelagic Fisheries***

The community setting of the pelagic fisheries of the Western Pacific Region is a complex one. While the region shares some features with domestic fishing community settings elsewhere, it is unlike any other area of the United States or its territories and affiliates in terms of its geographic span, the relative role of U.S. EEZ versus foreign EEZ versus high seas area dependency, as well as its general social and cultural history. Further, the identification of specific, geographically identical and bounded communities in these small insular areas is often problematic, at least for the purpose of social impact analysis. Participants in some pelagic fisheries may reside in one area on an island, moor or launch their vessels in another area, fish offshore of a different area, and land their fish in yet another area. In these cases, an island or group of islands is the most logical unit of analysis for describing the community setting and assessing community-level impacts. On the other hand, in cases such as the Hawaii-based longline fishery the influence of and dependency upon the fishery appears to be concentrated in certain areas of a particular island. Unfortunately, in most instances there is a paucity of socioeconomic data on fishery participants at a sub-island level with which to illustrate these points.

***Economic Importance to Communities***

The management of pelagic fisheries is of particular importance to the sub-regions and communities of the Western Pacific, as the harvest of pelagic species is the major component of fishing industry or activity in the region. The Pacific basin contains immense pelagic fisheries resources and provides more than 40 percent of the world tuna catch. The annual landings of

various tuna species harvested from the entire Pacific islands region total over one million metric tons (mt), with a dockside value of $1.5 billion (Lawson, 1995).

When the WPRFMC was created in 1977, foreign fleets were fishing heavily for tuna as close as twelve miles to American-flag Pacific islands. The Council's initial priority was to restrict foreign fishing and allow domestic fishers more opportunities to catch fish. Hawaii, being the most industrialized and populated island area, was in the best position to support an expansion of the domestic commercial fishery. At that time it was the policy of the United States that highly migratory fish could be effectively managed only through international arrangements. This policy led to a provision in the Magnuson Act of 1976 that effectively precluded the authority of coastal nations to establish exclusive fishing rights over tuna within their EEZs.[37] Despite the inability of the WPRFMC to manage tuna fishing by foreign vessels in the U.S. EEZ, the number of domestic longline vessels based in Hawaii grew from 14 in 1979 to 141 in 1991. Landings by longline vessels increased from 1,900 mt to 11,500 mt between 1987 and 1993. The inflation-adjusted ex-vessel value of the catch more than tripled during this period to $56 million. Swordfish catches accounted for most of this revenue and represented about 60 percent of the total domestic landings for this species. More recently, the longline fleet has returned to targeted tuna species, and the harvest of albacore, bigeye and yellowfin reached a record high of 7,651 mt in 1997. In 1998, the port of Honolulu ranked 30th in the nation in terms of the quantity of fish landed, but it ranked 7th in terms of the value landings (Table 6).

**Table 6: Ex-vessel value of fish landings by commercial domestic and foreign vessels at major U.S. ports, 1996-1998.** Source: WPRFMC, 1999.

| Port | Value of Landings ($ millions) | | |
|---|---|---|---|
| | 1996 | 1997 | 1998 |
| Pago Pago, American Samoa | 211.8 | 192.7 | ~232.0 |
| Dutch Harbor-Unalaska, Alaska | 118.7 | 122.6 | 110.0 |
| New Bedford, Massachusetts | 100.5 | 103.2 | 93.5 |
| Agana, Guam | 94.2 | NA | NA |
| Kodiak, Alaska | 82.3 | 88.6 | 78.7 |
| Brownsville-Port Isabel, Texas | 60.0 | 46.1 | 64.2 |
| Honolulu, Hawaii | 50.1 | 53.7 | 49.0 |
| Key West, Florida | 62.8 | 54.9 | NA |
| Reedville, Virginia | NA | 29.5 | 42.6 |
| Point Judith, Rhode Island | 46.0 | 47.6 | 41.8 |

The expansion of the longline fishery in Hawaii during the past two decades has been accompanied by a general trend away from bulk fisheries for pelagic species (e.g., fish cake and

[37] In 1992, the Magnuson Act was amended to include all tunas as management unit species so that the United States recognized coastal state jurisdiction over highly migratory species within EEZ boundaries.

canned tuna) and development of quality, high-price products (e.g., *sashimi* tuna) that have enhanced the market value of Hawaii's pelagic fisheries (Boehlert, 1993). Local and export markets for Hawaii's seafood products have expanded enormously in recent years, and fresh fish from Hawaii's waters now appears on restaurant menus throughout the United States, from Honolulu to Des Moines to Boston (Pooley, 1993).

Hawaii's smaller-scale troll and handline fisheries have also benefitted in recent years from this expanding local and export markets for high-quality seafood products. Annual revenues within these fisheries total around $10 million.

Related to the troll fishery is the charter boat industry that targets billfish, tuna and other pelagic species mainly for a tourism-based clientele. With direct revenues of $17 million from patrons' fees and fish sales and indirect revenues of up to $30 million, and some 77,000 anglers participating annually, charter fishing is a notable component of tourism in Hawaii (Glazier, 2000). Selling the catch is a priority for many charter vessel operators, with the revenues from fish sales generally being split evenly among the captain, crew and vessel owner (Hamilton, 1998). One component of recreational fishing that has gained in popularity is tournament fishing. Most notable is the Hawaiian International Billfish Tournament conducted annually on the Island of Hawaii. Since its inception in 1958, this tournament has consistently attracted the most serious big game anglers in the world. In 1995, 72 boats with fishers from 15 countries participated. An indication of the economic significance of these tournaments is that the winner of a 1998 fishing tournament in Kona won $111,000 after landing a 500 lb blue marlin. Recreational fishing is also of economic importance in Hawai'i. The U.S. Fish and Wildlife Service (USFWS, 1998) estimates that in 1996, 260,000 anglers in the state spent $130 million on fishing trip-related items.

The other areas within the Western Pacific Region have not experienced the same increase in domestic industrial-scale fisheries that occurred in Hawaii, at least within the harvest sector. The local fishing fleets that operate in the EEZs around American Samoa, Guam, and the CNMI consist mainly of small boats operated by part-time commercial or recreational fishers. However, these islands have discovered alternative ways to take economic advantage of expanding Pacific pelagic fisheries. Tuna processing, transshipment and home port industries have developed in these islands because they possess a comparative economic advantage over other locations in the Pacific basin. These advantages include proximity to fishing grounds, shipping routes and markets; the availability and relatively low cost of fuel and other goods and services that support tuna fishing operations; tariff-free market access to the United States; and significant tax incentives.

American Samoa has seen a level of fish processing related activity unequaled elsewhere in the United States, with the capital of Pago Pago easily being the leading port in the United States in terms of the value of fish landings. For many years Pago Pago has been the site of a major tuna canning industry, and the StarKist cannery in Pago Pago is the current world's largest tuna processing facility. In 1998, American Samoa received 208,300 short tons of fish worth

approximately $232 million. Since the tuna processing industry began in American Samoa four decades ago, it has been the largest private sector employer in the territory and leading exporter.

The link between local waters and processors in American Samoa, however, is not a straightforward one. The principal suppliers of tuna to the canneries are island-based U.S. purse seiners that fish primarily between five and ten degrees north or south of the Equator for skipjack and yellowfin tuna. From 1990 to 1998, about 95 percent of the domestic purse seine harvest in the central and western Pacific occurred outside the U.S. EEZ, with most of the fishing taking place between Papua New Guinea, the Federated States of Micronesia and Kiribati. However, during some years, particularly during an *El Niño*-Southern Oscillation event, a substantial portion of the U.S. purse seine harvest comes from the U.S. EEZs around Palmyra Atoll, Jarvis Island, Howland Island and Baker Island. For example, 36,970 mt of skipjack and yellowfin tuna (26 percent of the total harvest) were caught around these islands in 1997. Other major suppliers of tuna to the canneries in American Samoa include U.S. albacore trollers operating in the North and South Pacific and foreign longline vessels that fish for large albacore, yellowfin and bigeye tuna. In addition, freezer vessels deliver tuna to American Samoa from various transshipment centers around the Pacific.

Guam has also benefitted from the development of an industrial scale pelagic fishery that is not focused exclusively either on a locally-based harvest fleet, or on fish from its portion of the U.S. EEZ. During the past decade Guam has been one of the largest tuna transshipment centers in the Pacific, and the value of the fish transshipped in Guam in 1996 was estimated to be more than $94 million. Frozen fish is delivered by domestic and foreign purse seiners and fresh fish is landed by foreign longliners or air-freighted from the Marshall Islands, Federated States of Micronesia and other neighboring Pacific islands. The fish is then shipped from Guam to markets in Japan and elsewhere.

Some Western Pacific Region communities have also found ways to benefit from the regional pelagic fisheries beyond involvement in just the harvesting and processing sectors. A particularly lucrative activity related to the tuna canning and transshipment industry is the re-supplying of the fishing boats that deliver the fish. Pago Pago Harbor in American Samoa and Apra Harbor in Guam are home ports to several hundred foreign and domestic longline and purse seine vessels. Expenditures by these fleets on fuel, provisions and repairs make an important contribution to the economies of these islands. Fleet expenditures in American Samoa were estimated in 1994 to be between $45 million and $92 million (Hamnett and Pintz, 1996). Fleet expenditures in Guam were about $68 million in 1998 (Guam Department of Commerce, 1999). This home port industry in the islands has both created primary jobs and enhanced investment opportunities for local entrepreneurs.

It should be specifically noted that with the exception of the U.S. Pacific remote island areas, all of the sub-regions in the Western Pacific benefit from foreign as well as domestic fishing operations. While the importance of foreign longline vessels as suppliers of fish to the tuna canneries in American Samoa has steadily decreased in recent years, Pago Pago remains an

important re-provisioning base for foreign distant-water '*sashimi*' vessels that transship their catch to carrier vessels in the harbor. Foreign longline and purse seine vessels are the principal customers in Guam's home port and transshipment industry. This type of support activity is not limited to surface transportation, as Guam is also the center of a large air transshipment operation that flies fresh fish caught by foreign vessels to overseas markets. A similar air transshipment operation is based in the CNMI. Finally, a substantial number of foreign fishing vessels find Hawaii an attractive and convenient location for port calls. These vessels also transship a large volume of shark fins through the state.

***Sociocultural Importance to Communities***

The sociocultural setting of the Western Pacific Region pelagic fisheries reflects the particular cultural and social history of the area, with different aspects of the fisheries encompassing, by varying degrees, aspects of lifeways of a divergent mix of groups, from the traditions of the descendants of the earliest inhabitants of the islands to those of some of the most recently arrived groups. In general, the sociocultural setting or aspects of a fishery include the shared technology, customs, terminology, attitudes and values related to fishing of a wide variety of these groups. While it is the fishers that benefit directly from the fishing lifestyle, individuals who participate in the marketing or consumption of fish or in the provision of fishing supplies often share in the fishing culture. An integral part of this framework is the broad network of inter-personal social and economic relations through which the cultural attributes of a fishery are transmitted and perpetuated. The relations that originate from a shared dependence on fishing and fishing-related activities to meet economic and social needs can have far-reaching effects in the daily lives of those involved. For example, they may constitute important forms of social capital, i.e., social resources that individuals and families can draw on to help them achieve desired goals.

The products of fishing supplied to the community may also have sociocultural significance. For instance, beyond their dietary importance fish may be important items of exchange and gift-giving that also help develop and maintain social relationships within the community. Alternatively, at certain celebratory meals various types of seafood may become imbued with specific symbolic meanings.

The sociocultural context of fishing may include the contribution fishing makes to the cultural identity and continuity of the broader community or region as well. As a result of this contribution, the activity of fishing may have existence value for some members of the general public. Individuals who do not fish themselves and are never likely to, may derive satisfaction and enjoyment from knowing that this activity continues to exist. They may value the knowledge that the traditions, customs and lifeways of fishing are being preserved.

It is also important to note that fishing is a traditional economic activity in the islands of the Western Pacific Region, and that fishing, in many cases, represents a continuity with the past that may or may not have parallels in other aspects of life and making a living in the modern context. The degree of 'traditional-ness' can and does vary by vessel and gear type, with some types of fishing more closely associated with particular social, cultural, and ethnic groups than others.

This is important for the analysis of fishery management measures for pelagic species to the extent that specific measures may differentially impact specific regions and communities, and social, cultural, or ethnic groups.

Culturally distinct ideas and values of relevance to the management of the pelagic fisheries are not restricted to the domain of the target species and activities associated with the use of those species. For example, issues of primary concern to the contemporary management of the longline fishery relate to the incidental mortality of sea turtles and seabirds and the controversy associated with shark finning. In these cases there are concerns that could be categorized as 'existence' or 'ethically motivated' values. For example, value may emanate from the satisfaction of just knowing that a leatherback turtle or Laysan albatross exists in a natural state. Alternatively, the public, or some portions of the public, may place an intrinsic value on sea turtles and seabirds for religious or philosophical reasons. These animals may have symbolic value as a unique life form similar to the way some marine mammals have become 'charismatic megafauna.' However, perceptions of the value of sea turtles and appropriate protection strategies vary considerably from culture to culture and between social and ethnic groups in the Western Pacific Region. In the CNMI, for example, Saipan Carolinians have strongly argued that they should be allowed to capture green sea turtles for cultural purposes if it is determined that the stock could support a limited harvest (McCoy, 1998). Some Native Hawaiians have also requested a limited harvest of green sea turtles for traditional and customary uses (Charles Ka'ai'ai, pers. comm., 20 November 2000, WPRFMC).

The above fishery descriptions are extracted from a Final Environmental Impact Statement on the Pelagic Fisheries of the Western Pacific Region (NMFS 2001a). Following is a summary of the physical environment in which these fisheries operate. This summary is also extracted from the Final Environmental Impact Statement on the Pelagic Fisheries of the Western Pacific Region. Please see that document for a detailed discussion of these fisheries and their physical environment.

## III.4 Physical Environment

***Ecosystem and Stocks***

It is important to recognize that the pelagic ecosystem responds to ambient climatological and oceanographic conditions on a variety of spatial and temporal scales, and that even in the complete absence of any fishing stock sizes would fluctuate, sometimes quite dramatically. It is also clear from the species accounts that initiation of very marked declines in some groups such as sea turtles, seabirds and possibly sharks coincided with prosecution of the high seas drift-gillnet fishery in the 1980s and early 1990s. Added to the serious impacts to protected species resulting from that fishery was a regime shift that markedly lowered the carrying capacity and productivity of the ecosystem at that time. Because of the long life spans and limited reproductive potential of sea turtles, seabirds and sharks, these populations are likely only beginning to recover from these circumstances.

***Pelagic Management Unit Species***

The Pelagics FMP focuses its management efforts on a suite of "management unit species" (PMUS). These species have been assigned to species assemblages based upon the ecological relationships among species and their preferred habitat. The species complex designations for the PMUS are marketable species, non-marketable species, and sharks. The marketable species complex has been subdivided into tropical and temperate assemblages. The temperate species complex includes those PMUS that are found in greater abundance in higher latitudes as adults including swordfish, bigeye, bluefin and albacore tuna, striped marlin and pomfret. The tropical species complex includes all other tunas and billfish as well as *mahimahi*, wahoo, and *opah*. Included in these assemblages are the species targeted by pelagic fisheries in the region, but the fisheries affect many other, non-targeted species as well as a variety of protected species. Species of oceanic pelagic fish live in tropical and temperate waters throughout the world's oceans, and they are capable of long migrations that reflect complex relationships to oceanic environmental conditions. These relationships are different for larval, juvenile and adult stages of life. The larvae and juveniles of most species are more abundant in tropical waters, whereas the adults are more widely distributed. Geographic distribution varies with seasonal changes in ocean temperature. Migration patterns of pelagic fish stocks in the Pacific Ocean are not easily understood or categorized, despite extensive tag-and-release projects for many of the species. This is particularly evident for the more tropical tuna species (e.g., yellowfin, skipjack, bigeye) which appear to roam extensively within a broad expanse of the Pacific centered on the equator. Likewise, the oceanic migrations of billfish are poorly understood, but the results of limited tagging work conclude that most billfish species are capable of transoceanic movement, and some seasonal regularity has been noted.

Movements of pelagic species are not restricted to the horizontal dimension. In the ocean, light and temperature diminish rapidly with increasing depth, especially in the region of the thermocline. Many pelagic fish make vertical migrations through the water column, often moving toward the surface at night to feed on prey species that exhibit similar diurnal vertical migrations. Certain species, such as swordfish, are more vulnerable to fishing when they are concentrated near the surface at night. Bigeye tuna may visit the surface during the night, but generally, longline catches of this fish are highest when hooks are set in deeper, cooler waters.

Adult swordfish are opportunistic feeders, preying on squid and various fish species. Oceanographic features such as frontal boundaries that tend to concentrate forage species (especially cephalopods) apparently have a significant influence on adult swordfish distributions in the North Pacific.

None of the PMUS stocks in the Pacific are known to be overfished, although concern has been expressed for several species, and data are unavailable for others. Trends in overall catch and size composition of animals comprising the Hawaii landings indicate that the swordfish population that supports the fishery within the Council's jurisdiction appears to be capable of sustaining current levels of effort.

Blue marlin stocks are of concern to recreational trollers and charter fleets. Various recent analyses characterize the blue marlin population as stable and close to that required to support average maximum sustainable yield (AMSY). Little is known about the status of stocks of striped marlin, black marlin, short-billed spearfish or sailfish.

Because of their primary importance in many of the pelagic fisheries, more is known about tuna stocks. Most indicators suggest a reduction of bigeye tuna biomass in the past several years although biomass in the eastern Pacific seems to have stabilized. Although some analyses suggest that current levels of harvest may exceed MSY the stock is well above minimum sustainable stock threshold (MSST) and is therefore not overfished. The current population size is probably approximately at a level that can support AMSY. Recently, increased concern has arisen about the status of the stock in the face of large catches of juvenile tuna being taken from around floating objects in the equatorial regions of the Pacific.

Albacore stocks appear to be in good condition and are experiencing moderate levels of exploitation. Neither the northern nor southern stocks are regarded as overfished and current catches are likely to be sustainable.

Yellowfin tuna catch rates in the major industrial fleets (purse seine and longline) show "flat" trends and, in general, the Pacific yellowfin stock appears to be in good condition and current catch levels are considered sustainable.

Bluefin tuna are slower to become sexually mature than other species of tuna and they reproduce in a more limited portion of the Pacific than other tuna species. This makes them more vulnerable to overfishing.

All recent analyses indicate that harvest ratios for skipjack tuna are appropriate for maintaining current catch levels and that overall the stocks are very healthy. Although local depletions and variability may occur in response to local environmental conditions and fishing practices, the overall stock is healthy and can support existing levels of fishing.

***Non-target Species***

Pelagic fisheries catch a number of non-target species, both PMUS and non-PMUS. This is particularly true for the longline fishery. NMFS observers recorded more than 60 different species caught by the Hawaii-based longline fleet between 1994 and 1997. Of significance are the 85,523 sharks caught by the fleet in 1997, of which the majority (approximately 95 percent) were blue sharks. Up until about five years ago, most sharks caught by pelagic longline gear were released alive. However, as a result of the growing demand for shark fins in Asian markets the practice of shark finning increased during the late 1990s. This practice is now prohibited as defined in the Shark Finning Prohibition Act. About one percent of the sharks, mainly mako and thresher, are retained for later sale.

***Sea Turtles***

In addition to PMUS and non-PMUS fish species, pelagic fisheries interact with protected species. In particular, the longline fisheries interact with sea turtles. All sea turtles are designated under the U.S. ESA as either threatened or endangered. The breeding populations of Mexico olive ridley turtles are currently listed as endangered, while all other ridley populations are listed as threatened. Leatherback turtles and hawksbill turtles are also classified as endangered. The loggerhead turtles and the green turtles are listed as threatened (note the green turtle is listed as threatened under the ESA throughout its Pacific range, except for the endangered population nesting on the Pacific coast of Mexico). These five species of sea turtle are highly migratory, or have a highly migratory phase in their life history, and therefore, are susceptible to being incidentally caught by fisheries operating in the Pacific Ocean.

All five sea turtle species of concern forage in the waters surrounding the Hawaiian Archipelago. However, leatherback, loggerhead, and green sea turtles are the species of principal concern with regard to incidental take in the Hawaii-based pelagic longline and other commercial fisheries of the Pacific. These fisheries are conducted mainly by Japan, Taiwan, Spain, Korea, and, to a lesser extent, the United States. It is estimated that on average about 570 million longline hooks are set by all fleets in the Pacific each year.

***Sea Turtle Interactions with the Hawaii-based Longline Fishery***

On May 18, 2000, NMFS finalized its annual assessment of the impact of the Hawaii-based longline fishery on sea turtles during 1999. This evaluation produced estimates of interactions in 1999, as well as updated previous years' estimates through the inclusion of NMFS observer and logbook data in a refined statistical model. Using estimated mortality rates as summarized in the BiOp, NMFS calculated that 28-57 leatherback, 102-195 loggerhead, and 7-26 green sea turtles may have been killed each year by the Hawaii-based longline fishery each year. (NMFS, 2001b).

***Sea Turtle Interactions with the American Samoa-based Longline Fishery***

For the American Samoa-based longline fishery, the federal logbooks from 1992 to 1999 indicate a range of interactions with sea turtles (i.e., hooking/entanglement). There is no observer coverage of this fishery, so none of the species' identifications were validated by NMFS. In addition, logbook data may not be a reliable method to measure sea turtle interactions in this fishery. From 1992-1999, interactions with sea turtles by the American Samoa-based longline fishery included at least four hardshelled turtles (with three released alive, one mortality), one leatherback, and one unidentified sea turtle (NMFS, 2001b).

***Sea Turtle Interactions with the Western Pacific Troll and Handline Fisheries***

There have been no reported interactions with sea turtles in the fisheries of the Pelagics FMP other than the Hawaii-based longline fishery, the American Samoa-based longline fishery, and the central and western Pacific U.S. purse seine fishery. There is a chance, based on fishing methods including bait used and gear-type, that these other fisheries do interact with sea turtles although the information is not reported. Due to low effort and target-species selectivity of the

gear, incidental take and mortality in these fisheries is likely minimal and has an insignificant effect on the survival and recovery of sea turtle populations (NMFS, 2001b).

***Sea Turtle Interactions with the Western Pacific Purse Seine Fishery***

From 1988 to the present, observers have recorded the incidental take of only six loggerheads by the central and western Pacific U.S. purse seine fishery; all were released alive (A. Coan, NMFS, pers. comm., February 2001, *in* NMFS, 2001bb). In addition, logbook data during this period show that there were no reported sea turtle takes. This suggests under-reporting. Although the U.S. fleet is required to have 20 percent observer coverage and to maintain catch and bycatch logbooks, a straight extrapolation of the known observed takes is probably not an accurate representation of the effect this fishery has on sea turtles. Collecting data on sea turtles is a lower priority for observers, and since vessels are likely to release turtles immediately after pursing the net, it is likely that very little information on the bycatch of turtles is recorded (NMFS, 2001b).

Based on information collected in the eastern tropical Pacific tuna purse seine fishery (100 percent coverage), the mortality of sea turtles taken by purse seine is low (around ten percent). Most sea turtles taken by purse seine fishery are able to reach the surface to breathe, and therefore they are not forcibly submerged. In addition, the mesh is small enough that the likelihood of entanglement is low. Purse seiners setting on fish aggregating devices do tend to take more turtles because of the close association that exists between floating objects and sea turtles in the open ocean. Since 1997, U.S. purse seiners fishing in the central and western Pacific Ocean have begun shifting their strategy to setting more often on drifting FADs. This may increase the likelihood of sea turtle interactions with the fishery. However, NMFS cannot speculate as to what effect this change in fishing strategy may have on sea turtles in the central and western Pacific (NMFS, 2001b).

Based on observer data, logbooks, and information from the Forum Fisheries Agency (K. Staisch, pers. comm., February 2001, *in* NMFS, 2001bb), NMFS cannot quantitatively estimate the amount or extent of sea turtle take by the central and western Pacific purse seine fishery; however, it is believed to be low (NMFS, 2001b).

## III.5 New Information on Affected Fisheries

Because the primary data source for this document (the March 2001 Final Environmental Impact Statement) was, in most cases, able to include data only through 1998, Table 11 shows the catch and revenues from pelagic fishing in the Western Pacific Region in 1999, the year in which management measures were first implemented to mitigate turtle interactions with the Hawaii longline fishery. Pelagic fisheries as a whole comprised nearly 87 percent of Hawaii's total commercial fishery revenues in 1999, with the Hawaii longline fishery forming 68 percent of the total and 79 percent of pelagic landings.

**Table 11. Summary of US federally managed pelagic fisheries in the Western Pacific Region.**

| Fishery | 1999 Catch (lb) | 1999 Revenue ($) | Percent of Western Pacific 1999total fishery revenues[a] |
|---|---|---|---|
| Hawaii pole-and-line | 1,309,000 | 1,669,000 | 2.4 |
| Hawaii longline | 27,722,000 | 46,493,000 | 68.1 |
| Hawaii commercial troll | 2,258,000 | 4,298,021 | 6.3 |
| Hawaii charter troll | 713,000 | 1,357,169 | 2.0 |
| Hawaii recreational troll | 4,200,000 | 0 | 0.0 |
| Hawaii handline | 2,312,000 | 4,400,808 | 6.4 |
| American Samoa longline | 1,073,821 | 1,105,799 | 1.6 |
| American Samoa troll | 46,420 | 46,041 | 0.1 |
| Guam commercial troll | 566,030 | 1,047,155 | 1.5 |
| Guam charter troll | 77,314 | 143,030 | 0.2 |
| CNMI commercial troll | 141,252 | 280,000 | 0.4 |
| | | | |
| **Total** | **39,109,837** | **59,171,023** | **86.6** |

a. 1999 estimated total commercial fishery revenues for the Western Pacific = $68.3 million (WPacFIN website: http://wpacfin.nmfs.hawaii.edu/regional.htm).

During the year 2000, 125 Hawaii-based longline vessels were active, landing 23.8 million pounds of fish worth $50.2 million ex vessel. However participation and landings declined substantially in the fourth quarter of 2000 due to the Court-order reduction in swordfish targeting.

Participation in the Hawaii longline fishery in the first three quarters of 2001 was reduced to an average of 88 vessels fishing per quarter or a reduction of total fleet size of about 20% compared to the first three quarters of 2000 [NMFS Honolulu Laboratory longline summary reports]. Fishery participation was potentially affected by a number of factors, including the two week Court-ordered closure; the two month southern area closure implemented by NMFS; and the aftermath of September 11th. However fishing effort, measured in number of hooks set for the year, probably will be greater in 2001 due to the transfer of all remaining targeting to (bigeye)

tuna-directed fishing which uses more hooks per set and tends to take more sets per year (per vessel).

Preliminary estimates of landings for 2001 indicate that swordfish landings will be down roughly 90% compared to 1999 and 2000 but it was also a relatively poor year for bigeye tuna, probably caused by inter-annual fluctuations in availability. Landings for albacore and yellowfin tuna will probably be in their normal ranges. The combined effect is that total estimated landings (all species combined) by weight and value may be reduced by up to 20% as compared to 2000.

Like the Hawaii fishery, pelagic fishing in American Samoa is experiencing a period of rapid change. At the beginning of 2001, about 23 alias were actively engaged in the fishery; however, by July 3, 63 alias were registered with longline general permits. As for large fishing vessels, in 1997 the fishery consisted of four longliners ranging in length from 65 to 109 ft (19.8 to 33.2 m); today there are about 24 large longline vessels active in the American Samoa pelagic fishery and this is expected to increase. NMFS recently approved a measure that implemented a 50 nm closed area around the American Samoan archipelago in which fishing for pelagic species on vessels greater than 50 ft in length overall is prohibited. This measure is aimed at protecting the livelihoods of the small alia catamaran segment of the American Samoa longline fishery. It is likely that the Council will also recommend a limited entry program to cap the total fleet size.

## IV CURRENT MANAGEMENT MEASURES

**The FMP Baseline (fishery regulations in place as of December 27, 1999)**
The management measures in place as of December 27, 1999 for western Pacific pelagic fisheries under the authority of the Pelagics FMP, together with applicable state and local regulations constitute the FMP baseline. Although the regulatory structure has changed since 1999, fishery data (including turtle takes) from 1994 through 1998, comprise the basis for the BiOp as well as a common reference point to which various alternatives may be compared. To date, the Pelagics FMP has not regulated non-longline pelagic fisheries in the western Pacific, including domestic troll, handline, pole-and-line or purse seine fishing activities.

The FMP for the Pelagic Fisheries of the Western Pacific Region was published in 1987 (52 FR 5987, March 23, 1987). The FMP includes initial estimates of maximum sustainable yields (MSY) for the stocks and sets optimum yields for these fisheries in the EEZs. The management unit species at the time the FMP was published were billfish, wahoo, mahimahi, and oceanic sharks. Tuna species were later designated as fish under U.S. management authority and included in the FMP's management unit species (57 FR 48564, November 1992). Regulatory measures in place as of December 1999 provide that:

- Fishing for pelagic species in the western Pacific EEZs with drift gillnets is prohibited (52 FR 5987, March 23, 1987).

- Each vessel using longline gear to fish for pelagic species in the EEZs around American Samoa, Guam, the Commonwealth of Northern Mariana Islands (CNMI), or other U.S. islands of the western Pacific, and vessels used to transport or land longline-harvested pelagic species shoreward of the outer boundary of these same EEZs, must be registered for use with a general longline permit (CFR 660.16) and must keep daily logbooks (CFR 660.14) detailing species harvested, area of harvest, time of sets, and other information. Also, longline gear used in the western Pacific EEZs must be marked with the official number of the permitted vessel (CFR 660.16) that deploys the gear (56 FR 24731, May 1991).
- Longline vessels must carry a NMFS observer if requested to do so (55 FR 49285, November 1990; 58 FR 67699, December 1993).
- Each vessel that uses longline gear to fish for pelagic species in the EEZ around Hawaii, or is used to transport or land longline-harvested pelagic species shoreward of the outer boundary of the EEZ around Hawaii, must be registered for use with one of 164 Hawaii-based longline limited entry permits (59 FR 26979, June 1994).
- As requested by NMFS, all vessels registered for use with a Hawaii-based longline limited access permit must carry a NMFS-owned "vessel monitoring system" (VMS) transmitter (59 FR 58789, November 1994).
- Longline fishing for pelagic species is prohibited in circular areas (known as "protected species zones") 50 nm around the center points of each of the Northwestern Hawaiian Islands (NWHI), plus a 100 nm wide corridor connecting those circular closed areas that are non-contiguous (56 FR 52214, October 1991). To avoid gear conflicts with troll and handline fisheries near the Main Hawaiian Islands (MHI), longline fishing is prohibited in areas approximately 75 nm around the islands of Kaua'i, Ni'ihau, Ka'ula, and O'ahu, and approximately 50 nm off the islands of Hawaii, Maui, Kaho'olawe, Lana'i, and Moloka'i. This prohibition is lessened from October 1 through January 30, when the longline closed areas decrease on the windward sides to approximately 25 nm off Hawaii, Maui, Kaho'olawe, Lana'i, Moloka'i, Kaua'i, Ni'ihau, and Ka'ula, and approximately 50 nm off O'ahu (56 FR 28116, June 1991)[38]. Longline fishing is also prohibited in an area approximately 50 nm off Guam (57 FR 7661, March 1992).

**Other Pelagic Fishery Management in the State of Hawaii and the Western Pacific Territories**

The territories of American Samoa and Guam and the CNMI have no regulations that affect pelagic fishing activities in territorial waters, although fishing vessel registration is required. In American Samoa, some villages impose fishing curfews on Sundays (R. Tulafono, Director DMWR, pers. comm.). The State of Hawaii prohibits the sale of yellowfin and bigeye tuna (both known in Hawaii as *ahi*) smaller than three pounds landed by all domestic fisheries. The State

[38]A few longline vessel owners qualify for exemptions to fish in portions of longline closed areas around the MHI where they can document historical longline fishing activity prior to 1970.

also requires fishers who sell any portion of their catch to hold a commercial marine license and file catch reports.

**Pelagic Fishery Management in the EEZs Around U.S. Pacific Remote Island Areas**

Longline vessels registered for Hawaii-based longline limited access permits are subject to the management requirements of the FMP throughout the Western Pacific Region, including the EEZs around remote U.S. Pacific island possessions (Jarvis, Howland, Baker, Wake and Midway Islands, Kingman Reef, Johnston and Palmyra Atolls). There are no other NMFS regulations specifically applicable to domestic pelagic fishing activities in those areas, however, the National Wildlife Refuge Administration Act of 1966, as amended, prohibits fishing activities without a special use permit within the seaward boundaries of National Wildlife Refuges (NWRs) in the Northwestern Hawaiian Islands, at Midway Atoll, Baker Island, Howland Island, Jarvis Island, Johnston Atoll and Rose Atoll and in new NWRs established at Kingman Reef and Palmyra Atoll in January 2001.

**The Current Status Quo (fishery regulations in place as of September, 2001)**

On March 28, 2000, NMFS published a final rule which requires operators of Hawaii-based longline vessels to carry and use dip nets and line-clippers which meet NMFS design standards to disengage sea turtles hooked or entangled by longline fishing gear (see AppendixIII). This rule also includes requirements concerning the handling, resuscitation, and release of sea turtles. Specifically, all incidentally taken sea turtles brought aboard for dehooking and/or disentanglement must be handled in a manner to minimize injury and promote post-hooking survival. If a sea turtle is too large or hooked in such a manner to preclude safe boarding without causing further damage/injury to the turtle, line-clippers must be used to clip the line and remove as much line as possible prior to releasing the turtle. When practicable, comatose sea turtles must be brought on board immediately, with a minimum of injury, and handled as follows: if the sea turtle brought aboard appears dead or comatose, the sea turtle must be placed on its belly (on the bottom shell or "plastron") so that the turtle is right side up and its hindquarters elevated at least six inches (15.24 cm) for a period of no less than four hours and no more than 24 hours. The amount of the elevation depends on the size of the turtle; greater elevations are needed for larger turtles. A reflex test, performed by gently touching the eye and pinching the tail of a sea turtle, must be administered by a vessel operator, at least every three hours, to determine if the turtle is responsive. Sea turtles being resuscitated must be shaded and kept damp or moist but under no circumstances may be placed into a container holding water. A water-soaked towel placed over the eyes, carapace, and flippers is the most effective method in keeping a turtle moist. Those that revive and become active, as well as those that do not revive within 24 hours must be returned to the sea by first putting the vessel engine in neutral gear so that the propeller is disengaged and the vessel is stopped. The turtle must then be released away from any deployed gear and, if alive, observed to be safely away from the vessel before the propeller is engaged and fishing operations are continued.

This rule was initiated and implemented by NMFS.. On June 12, 2001, NMFS additionally promulgated an emergency interim rule, which implemented those aspects of the April, 2001, FEIS' preferred alternative which are designed to reduce interactions between sea turtles and the Hawaii-based longline fleet. Also included in this emergency rule were measures to reduce interactions between the Hawaii-based longline fleet and seabirds. This emergency rule was initially effective through December 10, 2001 but has now been extended through June 8, 2002 The turtle mitigation components of this emergency rule: (a) prohibit Hawaii-based longline vessels from using longline gear to target swordfish north of the equator; (b) require Hawaii-based longline vessels to deploy longline gear such that the "sag" (deepest point) between any two floats is at least 100 m (328.1 ft) below the sea surface and the float line suspending the mainline beneath a float is at least 20 m (65.6 ft) long, with a minimum of 15 branch lines deployed between any two floats; (c) prohibit possession of light sticks on board a Hawaii-based longline vessel during fishing trips; (d) prohibit Hawaii-based longline vessels from fishing with longline gear during the months of April and May in the area bounded on the south by the equator, on the west by 180° longitude, on the east by 145° W. longitude, on the north by 15° N. latitude; (e) prohibit the transshippment of pelagic fish caught by longline gear within the closed area during April and May to any vessel registered for use under a Western Pacific receiving vessel permit; (f) allow the re-registration of a Hawaii-based longline vessel that has been de-registered from a Hawaii longline limited access permit after March 29, 2001, only during the month of October; (g) require Hawaii-based longline vessel operators to annually attend a protected species workshop conducted by NMFS; (h) require Hawaii-based longline vessel operators to cease gear retrieval if a sea turtle is discovered hooked or entangled on a longline until the turtle has been removed from the gear or brought onto the vessel's deck; (i) require that hooks be removed from sea turtles as quickly and carefully as possible; however, if a hook cannot be removed, that the line be cut as close to the hook as possible; (j) require that wire or bolt cutters capable of cutting through a longline hook be on board Hawaii-based longline vessels to facilitate cutting of hooks imbedded in sea turtles; (k) require that the additional resuscitation technique of placing the turtle on its back and pumping its breastplate (or "plastron") with hand or foot be used as appropriate and; (l) require that no turtle taken incidentally during the course of fishing or scientific research activities be consumed, sold, landed, offloaded, transshipped, or kept below unless requested by NMFS. All of the regulations contained in this emergency rule are in addition to those described in the FMP baseline and those implemented by the March 28, 2000 rule.

The second aspect of this emergency rule implemented the terms and conditions of a recent Biological Opinion concerning fishery interactions with the endangered short-tailed albatross issued by the Fish and Wildlife Service (FWS) on November 28, 2000. The terms and conditions in that Biological Opinion are based on a suite of seabird mitigation measures developed by the Western Pacific Fishery Management Council. Because they are not directed at reducing interactions with sea turtles, those measures are not a part of the preferred alternative contained in this document.

An act adopted by the Hawaii State Legislature (SB 2712, Hawaii State Legislature 2000 session) to require sharks to be landed whole in Hawaii with the fins still attached became law in August 2000. The new State law applies only to vessels actually landing fish in the State of Hawaii and does not affect foreign vessels re-provisioning in Hawaii with shark fins onboard. Nor does the State law halt the transshipment of shark fins through the State as bonded cargo that does not enter U.S. commerce and is exported to foreign destinations (WPRFMC, 2001). The new State law does not limit the entry (as cargo) into Hawaii of shark fins or cartilage shipped from foreign sources.

A second rule on shark finning was published by NMFS on February 11, 2002, and will become effective March 13, 2002. This rule implements the Shark Finning Prohibition Act and prohibits the possession or landing of shark fins without their associated carcasses.

Presidential Executive Orders 13178 (December 4, 2000) and 13196 (January 18, 2001) established the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve. The Executive Orders prohibit commercial pelagic fishing within the boundaries of the reserve except for pelagic trolling by fishers who had Federal NWHI bottomfish permits on December 4, 2000. Recreational fishing for pelagic fish in the reserve is capped at historical levels to be determined by the National Ocean Service.

## V DESCRIPTION OF THE ALTERNATIVES

Five alternatives are examined in this document, and unless noted otherwise, the text and analyses are drawn from the March 29th 2001 BiOp and the NMFS FEIS for Pelagic Fisheries of the Western Pacific Region, which included the March 29th BiOp RPA as a part of the preferred alternative. Because the FEIS provides a comprehensive review of the management regime for these fisheries, not all aspects of its alternatives are related to the protection of sea turtles. However, the FEIS does discuss a range of measures to protect sea turtles including the implementation of limited gear restrictions, a regional longline closure, a seasonal closure of all western Pacific longline fisheries, and the combination of these measures which comprises the preferred alternative. Although, given the issuance of the BiOp, implementation of these (non-preferred) measures would ultimately lead to the same outcomes as the no action alternative, they are included here to provide an overview of their theoretical impacts. Please see the complete FEIS for further discussion of these scenarios.

**Alternative A:** *No action*
Under this alternative, the Council would not implement the reasonable and prudent alternative of the sea turtle BiOp and the Western Pacific pelagic fisheries would continue to be regulated by the measures currently contained in the Pelagics FMP, as well as those measures implemented by NMFS on March 28, 2000. The additional measures implemented by NMFS' June 12, 2001 emergency rule are effective through June 8, 2002. It is likely that at the end of this period NMFS would either implement the reasonable and prudent alternative of the BiOp via a

unilateral Secretarial amendment to the FMP's regulations, or would close one or more FMP fisheries until it reached a decision on how to proceed.

**Alternative B:** *Implement the reasonable and prudent alternative of the March 29, 2001, Biological Opinion via Council action (Preferred)*
For the sake of clarity the measures contained in this alternative are split between those that apply only to longline vessels and those that apply to all vessels (including commercial, recreational, and subsistence operations) using hooks to target Pacific pelagic management unit species (PMUS) within the Exclusive Economic Zone (EEZ) around Hawaii, American Samoa, Guam, the Commonwealth of the Northern Mariana Islands or the Pacific remote island areas.

Under this alternative, the regulations under the Pelagics FMP for longline fishing vessels would be amended to: (a) prohibit the operators of all US longline vessels permitted under the Pelagics FMP (including vessels based in American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands from using any longline gear to target swordfish north of the equator; (b) require the operators of all US longline vessels permitted under the Pelagics FMP and fishing north of the equator to deploy all longline gear such that the "sag" (deepest point) between any two floats is at least 100 m (328.1 ft) below the sea surface and the float line suspending the mainline beneath a float is at least 20 m (65.6 ft) long, with a minimum of 15 branch lines deployed between any two floats when fishing with monofilament gear and a minimum of 10 branch lines deployed between any two floats when fishing with basket-style longline gear; (c) prohibit possession of light sticks on board all US longline vessels permitted under the Pelagics FMP during fishing trips north of the equator; (d) prohibit the operators of all US longline vessels permitted under the Pelagics FMP from fishing with longline gear during the months of April and May in the area bounded on the south by the equator, on the west by 180° longitude, on the east by 145° W. longitude, on the north by 15° N. latitude (the closed area); (e) prohibit the transhipment of pelagic fish caught by longline gear within the closed area during April and May to any vessel registered for use under a Western Pacific receiving vessel permit; (f) require the operators of all US longline vessels permitted under the Pelagics FMP to cease gear retrieval if a sea turtle is discovered hooked or entangled on a longline until the turtle has been removed from the gear or brought onto the vessel's deck; (g) require the operators of all "large" US longline vessels (those with a working platform 3' or more above the sea surface) permitted under the Pelagics FMP to, if practicable, use a dip net meeting NMFS' specifications to hoist a sea turtle onto the deck to facilitate the removal of the hook or to revive a comatose sea turtle. Operators of all "small" US longline vessels (those with a working platform less than 3' above the sea surface) permitted under the Pelagics FMP would be required to, if practicable, ease a sea turtle onto the deck by grasping its carapace (shell) or flippers; (h) allow the re-registration of a Hawaii-based longline vessel that has been de-registered from a Hawaii longline limited access permit after March 29, 2001, only during the month of October; (i) prohibit the landing of more than 10 swordfish per trip by any US longline vessel permitted under the Pelagics FMP; (j) require the operators of all US longline vessels permitted under the Pelagics FMP to annually attend a protected species workshop conducted by NMFS on sea turtle resuscitation requirements and on gear and hook removal or disentangling techniques. NMFS shall also provide to the maximum

extent possible, similar training and educational materials to operators of all other vessels using hooks under the Pelagics FMP.

In addition, this alternative would amend the Pelagic FMP regulations to require operators of all pelagic fishing vessels fishing with hooks for Pelagic Management Unit Species within EEZ waters of the western Pacific region to adhere to the following regulations: (k) carry and use line-clippers to cut fishing line from hooked or entangled sea turtles. Operators of "large" vessels (those with working platforms more than 3' above the sea surface) would be required to use line clippers meeting NMFS' performance standard (see the summary of regulatory text for these standards). Operators of "small" vessels (those with working platforms 3' or less above the sea surface) would be required to carry and use either a line cutter that meets NMFS' performance standard, or one that is more appropriate to the size and configuration of the fishing vessel, but in either case this line clipper must be capable of cutting the vessel's fishing line or leader within approximately 1' of the eye of an embedded hook; (l) carry and use wire or bolt cutters capable of cutting through fishing hooks to facilitate cutting of hooks embedded in sea turtles; (m) remove all hooks from sea turtles as quickly and carefully as possible; however, if a hook cannot be removed, cut the line as close to the hook as possible (e.g. within approximately 1' of the eye of the hook); (n) handle all incidentally taken sea turtles brought aboard for dehooking and/or disentanglement in a manner to minimize injury and promote post-hooking survival. If a sea turtle is too large or hooked in such a manner to preclude safe boarding without causing further damage/injury to the turtle, line-clippers must be used to clip the line and remove as much line as possible prior to releasing the turtle. When practicable, comatose sea turtles must be brought on board immediately, with a minimum of injury, and handled as follows: if the sea turtle brought aboard appears dead or comatose, the sea turtle must be placed on its belly (on the bottom shell or "plastron") so that the turtle is right side up and its hindquarters elevated at least 6 inches (15.24 cm) for a period of no less than four hours and no more than 24 hours. The amount of the elevation depends on the size of the turtle; greater elevations are needed for larger turtles. A reflex test, performed by gently touching the eye and pinching the tail of a sea turtle, must be administered by a vessel operator, at least every three hours, to determine if the turtle is responsive. Sea turtles being resuscitated must be shaded and kept damp or moist but under no circumstances may be placed into a container holding water. A water-soaked towel placed over the eyes, carapace, and flippers is the most effective method in keeping a turtle moist. Those that revive and become active, as well as those that do not revive within 24 hours must be returned to the sea by first putting the vessel engine in neutral gear so that the propeller is disengaged and the vessel is stopped. The turtle must then be released away from any deployed gear and, if alive, observed to be safely away from the vessel before the propeller is engaged and fishing operations are continued. In addition; (o) the resuscitation technique of placing the turtle on its back and pumping its breastplate (plastron) with hand or foot must be used as appropriate and; (p) no turtle taken incidentally during the course of fishing or scientific research activities may be consumed, sold, landed, offloaded, transshipped, or kept below deck unless requested by NMFS.

**Alternative C:** *Require Hawaii-based longline vessels to use line shooters and/or weighted branch lines (no shallow setting) when setting longline gear, carry and use line clippers and dip nets, and follow turtle handling guidelines.*

Under this alternative, these measures (as detailed in Alternative B for all longline vessels) would be applied only to those vessels registered for use under Hawaii limited access longline permits.

**Alternative D:** *Close all areas north of 29 °N latitude from July through January of every year to longline fishing by Hawaii-based longline vessels, and require these vessels to carry and use line clippers and dip nets, and follow turtle handling guidelines.*
Under this alternative, Hawaii-based longline vessels would be subject to a seasonal area closure and be required to carry and use specific gear and handling procedures to mitigate the effects of interactions on sea turtles.

**Alternative E:** *Prohibit all pelagic longline fishing by US vessels in waters of the EEZ of the western Pacific region and prohibit the landing of pelagic longline fish by US vessels in all US ports of the western Pacific region.*
Under this alternative all western Pacific longline permits (for both Hawaii and all other island areas) would be eliminated and all existing and potential domestic longline effort in the western Pacific waters of the EEZ would be prohibited. Landing of pelagic species by US longline vessels would be prohibited in US ports in the western Pacific region including American Samoa, Hawaii, Guam, CNMI and the US Pacific remote island areas.

## VI DESCRIPTION OF SMALL BUSINESSES TO WHICH THE RULE WOULD APPLY

Tables 12 and 13 present data on the number of fishing operations would be directly affected by the alternatives. These fishing operations are all regarded as small businesses. Please see Section III for a description of these vessels' gear types and operating patterns. Both Alternatives A (no action) and B (preferred) would affect all operations in Tables 12 and 13, while Alternatives C through E would only affect the Hawaii-based longline fleet.

**Table 12: Number of longline fishing operations potentially affected.**

| **Western Pacific longline fisheries** | | |
|---|---|---|
| Base | Number of permit holders | Number of active permits |
| Hawaii | 164 | 114 |
| American Samoa | 50 | 25 |
| Guam | 3 | 0 |
| CNMI | 1 | 0 |

**Table 13: Number of non-longline fishing operations potentially affected.**

| Non-longline fisheries | |
|---|---|
| Base and fishery | Number of active vessels |
| Hawaii charter | 199 |
| Hawaii troll and handline | 1,824 |
| Hawaii pole and line | 6 |
| American Samoa troll/charter | 24 |
| Guam troll/charter | 438 |
| CNMI troll/charter | 89 |
| PRIA troll/charter | 7 |

## VII ECONOMIC IMPACTS OF THE ALTERNATIVES

To provide a common reference point, each alternative presented here is compared to the management measures in place under the Western Pacific Fishery Pelagics Management Plan. This baseline was described above but is not regarded as a feasible alternative because the reasonable and prudent alternative of the BiOp requires certain changes under the authority of the ESA in order for the fishery to continue operating. However, the baseline represents the only long term data available to provide comparisons with each alternative. Similarly, the current status quo described above (fishery regulations in place as of September, 2001 including an emergency rule to protect sea turtles) is not a feasible alternative as emergency rules cannot be extended beyond 360 days. Table 17, adapted from the FEIS presents the "baseline" scenario for Hawaii-based longline vessels, which is derived from 1994-1999 fishery data.

**Table 17: Baseline scenario for the Hawaii-based longline fishery.**

| Economic Indicators | Target Effort Type | | |
|---|---|---|---|
| | Tuna | Swordfish | Total |
| Break-even Vessels (Number) | 74 | 45 | 119 |
| Crew on Break-even Vessels (Number of persons) | 407 | 203 | 610 |
| Effort (Total Sets) | 7,128 | 4,751 | 11,879 |
| Effort (Total Trips) | 714 | 433 | 1,148 |
| Trips per Break-even Vessel | 9.7 | 9.6 | 9.6 |
| Tuna Revenue ($Millions) | 19.5 | 5.2 | 24.7 |
| Swordfish Revenue ($Millions) | 0.5 | 11.3 | 11.8 |
| Shark Revenue ($Millions) | 0.4 | 1.2 | 1.6 |
| Other PMUS Revenue ($Millions) | 1.7 | 1.0 | 2.6 |
| Total Revenue ($Millions) | 22.1 | 18.6 | 40.7 |
| Average Revenue per Break-even Vessel ($Millions) | 0.298 | 0.414 | 0.342 |

**Alternative A:** *No action*
The impacts of the no action alternative are difficult to quantify as it is uncertain how NMFS would proceed in response. At a minimum, it would appear that the Hawaii-based longline fishery would be closed for some period of time while NMFS prepared and implemented a Secretarial amendment to the FMP. Though unlikely, at a maximum all pelagic fisheries of the western Pacific region would be permanently closed. The operations, numbers, and revenues of these entities are described in section III.

**Alternative B:** *Implementation of the BiOp's reasonable and prudent alternative (preferred)*

**Impacts on Hawaii-based longline vessels**
The preferred alternative would restrict fishing effort using a combination of temporal and spatial closures and restrictions on gear configurations (no shallow setting). The preferred alternative also includes fisher education and training on methods to reduced interactions and release methods that reduce mortality. The prohibition on shallow sets will essentially require that all fishers have line-shooters, which can be purchased for approximately $12,000. Although the March 2001 FEIS analyzed impacts of this alternative under two scenarios (with and without swordfish effort switching and relocation of effort to open areas), the BiOp assumed that effort switching and relocation will occur, leading to a "worst case scenario" for turtle populations as presented above. However, the following section, extracted from the FEIS, examines the economic impacts of both scenarios as it is not unlikely that some vessels will fail to switch to tuna targeting or will fail to relocate their effort to available open areas during April and May. This analysis employs a calculation of the number of Hawaii-based longline vessels which are anticipated to "break-even" under various scenarios. Please see the FEIS for a complete description of this methodology.

To prevent fishers relocating from the Hawaii-based fishery for a portion of the year to avoid the area closures and other restrictions, this alternative will include a provision that allows any vessel owner who de-registers vessel from a Hawaii limited access longline permit to re-register that vessel under their permit only during the month of October[6]. By processing of permit applications exclusively in October, fishers that choose to fish the peak swordfish season with shallow gear in California[7] will be prevented from reentering the Hawaii fishery for a full year. The reentry restriction is thought to increase the effectiveness of the management measures by limiting the ability of fishers to move between the Hawaii-based fishery and other less regulated areas, where they would otherwise be allowed to use shallow-set gear.

Projected outcomes under the preferred alternative are presented in Tables 18 and 19, both of which are drawn from the FEIS. Table 18 assumes that 100% of historical effort is successfully switched and relocated to open areas. Under this scenario, 34 swordfish vessels are projected to

[6]New entrants to the fishery would be accepted at any time of the year.

[7]This would be legal only if the Hawaii permit is de-registered from the vessel during the period it is fishing with shallow-set gear.

switch from swordfish to target tuna, increasing the number of tuna targeting vessels by almost 46 percent and resulting in the overall loss of 11 vessels from the fishery. Total gross revenues in the Hawaii-based longline fishery are projected to decline by approximately $4.3 million or 10.5 percent. This may be regarded as the "best case scenario" for fishery participants.

Table 19 presents similar calculations, this time based on the assumption that vessels targeting swordfish leave the fishery completely, and historic effort displaced by the April-May closure is not relocated to available open areas. In this instance, only two of the swordfish vessels are able to realize revenues from mixed sets sufficient to break even, resulting in an increase of three (or four percent) in the number of tuna targeting vessels. Since swordfish fishing is prohibited and swordfish vessels are unable to switch targets, total gross revenues are projected to decline by approximately $17.1 million or 42 percent. In this scenario a total of 42 vessels are projected to be lost from the fishery. This may be regarded as the "worst case scenario" for fishery participants.

The actual impact of the preferred alternative is likely to be somewhere between the two scenarios presented here. Data gathered since the completion of the FEIS indicate that, as of September 2001, 38 longline vessels had been active in California during 2001, 35 of which at one time had Hawaii limited access permits. These 35 vessels made 78 longline trips out of California as of September 2001. The movement of some Hawaii longline vessels to California following the peak of the Hawaii swordfish season each spring has been a usual occurrence over the history of the longline fishery. However, it appears that 25 former Hawaii longline vessels are now based in California.

**Table 18. Projections of annual economic impacts on the Hawaii-based longline fleet under the Preferred Alternative (B), with effort switching.**

| | Preferred Alternative With Switching | | | Change from Baseline | | | Percentage Change from Baseline | | |
|---|---|---|---|---|---|---|---|---|---|
| | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total |
| Break-even Vessels (Number) | 108 | 0 | 108 | 34 | -45 | -11 | 45.9 | -100.0 | -9.2 |
| Crew on Break-even Vessels (Number) | 594 | 0 | 594 | 187 | -203 | -16 | 45.9 | -100.0 | -2.6 |
| Effort (Total Sets) | 11,879 | 0 | 11,879 | 4,751 | -4,751 | 0 | 66.7 | -100.0 | 0.0 |
| Effort (Total Trips) | 1,190 | 0 | 1,190 | 476 | -433 | 43 | 66.7 | -100.0 | 3.7 |
| Trips per Break-even Vessel | 11.0 | 0.0 | 11.0 | 1.4 | -9.6 | 1.4 | 14.2 | -100.0 | 14.3 |
| Tuna Revenue ($Millions) | 31.5 | 0.0 | 31.5 | 12.0 | -5.2 | 6.9 | 61.6 | -100.0 | 27.9 |
| Swordfish Revenue | 1.3 | 0.0 | 1.3 | 0.8 | -11.3 | -10.5 | 173.3 | -100.0 | -89.2 |

| | Preferred Alternative With Switching | | | Change from Baseline | | | Percentage Change from Baseline | | |
|---|---|---|---|---|---|---|---|---|---|
| | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total |
| ($Millions) | | | | | | | | | |
| Shark Revenue ($Millions) | 0.4 | 0.0 | 0.4 | -0.0 | -1.2 | -1.2 | -9.5 | -100.0 | -77.5 |
| Other PMUS Revenue ($Millions) | 3.2 | 0.0 | 3.2 | 1.6 | -1.0 | 0.6 | 93.4 | -100.0 | 22.5 |
| Total Gross Revenue ($Millions) | 36.4 | 0.0 | 36.4 | 14.4 | -18.6 | -4.3 | 65.1 | -100.0 | -10.5 |
| Average Gross Revenue per Break-even Vessel ($Millions) | 0.336 | 0.0 | 0.336 | 0.038 | -0.414 | -0.006 | 12.8 | -100.0 | -1.8 |

**Table 19. Projections of annual economic impacts on the Hawaii-based longline fleet under the Preferred Alternative (B), with no effort switching.**

| | Preferred Alternative Without Switching | | | Change from Baseline | | | Percentage Change from Baseline | | |
|---|---|---|---|---|---|---|---|---|---|
| | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total |
| Break-even Vessels (Number) | 77 | 0 | 77 | 3 | -45 | -42 | 4.1 | -100.0 | -35.3 |
| Crew on Break-even Vessels (Number) | 424 | 0 | 424 | 17 | -203 | -186 | 4.2 | -100.0 | -30.5 |
| Effort (Total Sets) | 7,640 | 0 | 7,640 | 512 | -4,751 | -4,239 | 7.2 | -100.0 | -35.7 |
| Effort (Total Trips) | 766 | 0 | 766 | 51 | -433 | -382 | 7.2 | -100.0 | -33.3 |
| Trips per Break-even Vessel | 9.9 | 0.0 | 9.9 | 0.3 | -9.6 | 0.3 | 3.0 | -100.0 | 3.1 |
| Tuna Revenue ($Millions) | 20.5 | 0.0 | 20.5 | 1.0 | -5.2 | -4.1 | 5.2 | -100.0 | -16.8 |
| Swordfish Revenue ($Millions) | 0.7 | 0.0 | 0.7 | 0.3 | -11.3 | -11.1 | 57.0 | -100.0 | -93.8 |
| Shark Revenue ($Millions) | 0.2 | 0.0 | 0.2 | -0.2 | -1.2 | -1.4 | -41.7 | -100.0 | -85.5 |
| Other PMUS | 2.0 | 0.0 | 2.0 | 0.4 | -1.0 | -0.6 | 22.0 | -100.0 | -22.7 |

| | Preferred Alternative Without Switching | | | Change from Baseline | | | Percentage Change from Baseline | | |
|---|---|---|---|---|---|---|---|---|---|
| | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total |
| Revenue ($Millions) | | | | | | | | | |
| Total Gross Revenue ($Millions) | 23.5 | 0.0 | 23.5 | 1.5 | -18.6 | -17.1 | 6.7 | -100.0 | -42.1 |
| Average Gross Revenue per Break-even Vessel ($Millions) | 0.305 | 0.0 | 0.305 | 0.007 | -0.414 | -0.037 | 2.3 | -100.0 | -10.8 |

Although not discussed in the FEIS, the economic impact of the swordfish trip limit (10 fish per trip) is likely to be insignificant as targeting of swordfish is already prohibited. Analysis of historical data indicates that vessels targeting tuna have an average incidental catch of less than two swordfish per trip, with 57% of tuna trips landing zero swordfish. Thus, given the prohibition on targeting of swordfish, the swordfish trip limit should not result in additional economic losses to typical operations.

**Impacts on Other Hawaii-Based Pelagic FMP Fisheries**

Based on information in the FEIS, the preferred alternative is not expected to have significant direct impacts on Hawaii-based catch and effort of commercial troll and handline vessels, nor is it expected that the preferred alternative will have significant direct effects on catch and effort of charter and recreational vessels in the pelagic fisheries. Not discussed in the FEIS is the direct costs to these vessel operators for the purchase of bolt cutters and line clippers to free hooked or entangled sea turtles. Assuming that these items are purchased in Hawaii and can be used for many years, the average cost per vessel is anticipated to be approximately $20 per vessel for bolt cutters. Although the use of long handled line clippers is optional on these small vessels, it is believed that the majority of these vessel operators will employ their bolt cutters to cut their fishing line if necessary. For those that choose to purchase long handled line clippers, the estimated cost is $30. The impact on fishing operations of actually using these items is anticipated to be extremely low because the likelihood of encountering a turtle is low, and in the event that a turtle is hooked or entangled, it is not a time consuming procedure to free it.

**Impacts on American Samoa-based Longline Vessels**

These impacts are not discussed in detail in the FEIS because "in general only the Hawaii-based longline fleet is expected to experience significant direct effects from the preferred alternative". The only cost which can be directly attributed to the preferred alternative is that of acquiring bolt cutters, for the smaller vessels, and bolt cutters, line clippers, and dip nets for the larger vessels. Again assuming that these items are purchased from Hawaii and are useable for many years, the average cost per vessel is anticipated to be approximately $20 per vessel for bolt cutters, $30 per vessel for line clippers, and $75 per vessel for dip nets. The impact on fishing operations of

actually using these items is anticipated to be extremely low because the likelihood of encountering a turtle is low, and in the event that a turtle is hooked or entangled, it is not a time consuming procedure to free it.

**Impacts on Other Pelagic FMP Fisheries Based in American Samoa, Guam, and CNMI**
Again, the FEIS does not address these impacts in detail as they are anticipated to be insignificant. The only cost which can be directly attributed to the preferred alternative is that of acquiring bolt cutters, and line clippers to free hooked or entangled sea turtles. Again assuming that these items are purchased from Hawaii (they are not available in American Samoa, Guam or CNMI) and are useable for many years, the average cost per vessel is anticipated to be approximately $20 per vessel for bolt cutters. Although the use of long handled line clippers is optional on these small vessels, it is believed that the majority of these vessel operators will employ their bolt cutters to cut their fishing line if necessary. For those that choose to purchase long handled line clippers, the estimated cost is $30. The impact on fishing operations of actually using these items is anticipated to be extremely low because the likelihood of encountering a turtle is low, and in the event that a turtle is hooked or entangled, it is not a time consuming procedure to free it.

**Alternative C:** *Prohibition on shallow setting by Hawaii-based vessels*
As above, the analysis of this alternative was undertaken using two scenarios. Table 20 assumes that shallow sets that were made in the baseline case are converted to deep sets while Table 21 assumes that full conversion to tuna target fishing with deep-setting gear is not economically viable for swordfish vessels and that instead all swordfish vessels leave the fishery (no effort switching). In reality, it is likely that some swordfish vessels will be able to convert and some will be forced to leave the fishery in which case the outcome is likely to fall somewhere between the two extremes presented here.

Because this alternative focuses on effort defined by the depth of the set rather than on effort defined by the target of the set, outcomes under Alternative C are not directly comparable to outcomes under alternatives A, D, or E. The mismatch arises because 512 of the sets that were defined as mixed-target sets under the baseline (and therefore assigned to swordfish vessels) meet the specifications that define effort as "deep" under Alternative C. Therefore, the amount of effort assigned to tuna vessels Table 21 (no switching) is greater than the amount of effort assigned to tuna in the baseline and these 512 sets add a total of $1.8 million in gross revenue to vessels that are designated as tuna vessels. To be consistent to the extent possible with analytical constructs used for all other alternatives, the assessment of Alternative C retains the assumption that all sets made for mixed targets, regardless of the depth of the set, were made on swordfish vessels. Therefore, in estimating the number of break-even vessels in Table 20 (without switching), it is assumed that the original 74 vessels that target tuna require $298,000 to break even, and that the additional vessels that are re-categorized from targeting swordfish to targeting tuna require $414,000 to break even.

Under the switching analysis, all 45 swordfish vessels are anticipated to leave the swordfish fishery. Nine vessels or eight percent of the fleet are projected to leave the Hawaii-based longline fishery, while 36 vessels are projected to switch to targeting tuna. The overall impact is a reduction in fleet gross revenue by about $3.3 million or eight percent.

In the without switching analysis, no vessels target swordfish and all but four of the vessels currently categorized as swordfish vessels drop out of the pelagic fishery altogether. The effort that appears to switch to tuna targeting is actually current deep sets that target tuna and are made by the present swordfish fleet. Instead of removing these deep sets from the fishery effort, the model structure assigns them all to four swordfish boats, which are projected to remain in the fishery after the regulation is put into effect.

Again, the prohibition on shallow sets will essentially require that all fishers have line-shooters, which can be purchased for approximately $12,000.

**Table 20. Projections of economic impacts on the Hawaii-based longline fleet under Alternative C, with effort switching.**

| Indicator | Alternative C With Switching | | | Change from Baseline | | | Percentage Change from Baseline | | |
|---|---|---|---|---|---|---|---|---|---|
| | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total |
| Break-even Vessels (Number) | 110 | 0 | 110 | 36 | -45 | -9 | 48.6 | -100.0 | -7.6 |
| Crew on Break-even Vessels (Number) | 605 | 0 | 605 | 198 | -203 | -5 | 48.6 | -100.0 | -0.8 |
| Effort (Total Sets) | 11879 | 0 | 11,879 | 4,751 | -4751 | 0 | 66.7 | -100.0 | 0 |
| Effort (Total Trips) | 1,190 | 0 | 1,190 | 476 | -433 | 43 | 66.7 | -100.0 | 3.7 |
| Trips per Break-even Vessel | 10.8 | 0.0 | 10.8 | 1.2 | -9.6 | 1.2 | 12.1 | -100.0 | 12.2 |
| Tuna Revenue ($millions) | 32.7 | 0.0 | 32.7 | 13.2 | -5.2 | 8.0 | 67.5 | -100.0 | 32.5 |
| Swordfish Revenue ($millions) | 1.1 | 0.0 | 1.1 | 0.7 | -11.3 | -10.7 | 142.0 | -100.0 | -90.4 |
| Shark Revenue ($Millions) | 0.5 | 0.0 | 0.5 | 0.1 | -1.2 | -1.1 | 15.7 | -100.0 | -71.2 |
| Other PMUS Revenue ($Millions) | 3.1 | 0.0 | 3.1 | 1.4 | -1.0 | 0.4 | 83.3 | -100.0 | 16.2 |
| Total Gross Revenue ($Millions) | 37.4 | 0.0 | 37.4 | 15.3 | -18.6 | -3.3 | 69.3 | -100.0 | -8.2 |
| Average Gross Revenue per Break-even Vessel ($) | 338,000 | 0 | 338,000 | 40,000 | -414,000 | -4,000 | 13.4 | -100.0 | -1.2 |

**Table 21. Projections of annual economic impacts on the Hawaii-based longline fleet under Alternative C, with no effort switching.**

| Indicator | Alternative C Without Switching | | | Change from Baseline | | | Percentage Change from Baseline | | |
|---|---|---|---|---|---|---|---|---|---|
| | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total |
| Break-even Vessels (Number) | 78 | 0 | 78 | 4 | -45 | -41 | 5.4 | -100.0 | -34.5 |
| Crew on Break-even Vessels (Number) | 429 | 0 | 429 | 22 | -203 | -181 | 5.4 | -100.0 | -29.7 |
| Effort (Total Sets) | 7,640 | 0 | 7,640 | 512 | -4,751 | -4,239 | 7.2 | -100.0 | -35.7 |
| Effort (Total Trips) | 766 | 0 | 766 | 51 | -433 | -382 | 7.2 | -100.0 | -33.3 |
| Trips per Break-even Vessel | 9.8 | 0.0 | 9.8 | 0.2 | -9.6 | 0.2 | 1.7 | -100.0 | 1.8 |
| Tuna Revenue ($Millions) | 20.9 | 0.0 | 20.9 | 1.4 | -5.2 | -3.8 | 7.0 | -100.0 | -15.3 |
| Swordfish Revenue ($Millions) | 0.7 | 0.0 | 0.7 | 0.2 | -11.3 | -11.1 | 45.3 | -100.0 | -94.2 |
| Shark Revenue ($Millions) | 0.3 | 0.0 | 0.3 | -0.1 | -1.2 | -1.3 | -31.5 | -100.0 | -82.9 |
| Other PMUS Revenue ($Millions) | 2.0 | 0.0 | 2.0 | 0.3 | -1.0 | -0.7 | 17.8 | -100.0 | -25.4 |
| Total Gross Revenue ($Millions) | 23.8 | 0.0 | 23.8 | 1.8 | -18.6 | -16.9 | 8.0 | -100.0 | -41.5 |
| Average Gross Revenue per Break-even Vessel ($) | 305,000 | 0 | 305,000 | 7,000 | -414,000 | -37,000 | 2.3 | -100.0 | -10.8 |

**Alternative D:** *Seasonal closure of the Hawaii-based longline fishery*
Because this alternative does not differentiate between gear types, its analysis is limited to a single scenario, as presented in Table 22.

**Table 22. Projections of annual economic impacts on the Hawaii-based longline fleet under Alternative D.**

| Indicator | Alternative D | | | Change from Baseline | | | Percentage Change from Baseline | | |
|---|---|---|---|---|---|---|---|---|---|
| | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total |
| Break-even Vessels (Number) | 73 | 42 | 115 | -1 | -3 | -4 | -1.4 | -6.7 | -3.4 |
| Crew on Break-even Vessels (Number) | 402 | 189 | 591 | -5 | -14 | -19 | -1.2 | -6.9 | -3.1 |
| Effort (Total Sets) | 7128 | 4,751 | 11,879 | 0 | 0 | 0 | 0.0 | 0 | 0 |
| Effort (Total Trips) | 714 | 433 | 1,148 | 0 | 0 | 0 | 0.0 | 0 | 0 |
| Trips per Break-even Vessel | 9.8 | 10.3 | 10.0 | 0.1 | 0.7 | 0.3 | 1.4 | 7.1 | 3.5 |
| Tuna Revenue ($Millions) | 19.5 | 6.7 | 26.3 | 0.0 | 1.6 | 1.6 | 0.1 | 30.6 | 6.5 |
| Swordfish Revenue ($Millions) | 0.4 | 9.5 | 10.0 | 0.0 | -1.8 | -1.8 | -7.4 | -15.8 | -15.5 |
| Shark Revenue ($Millions) | 0.3 | 0.1 | 0.3 | -0.1 | -1.1 | -1.3 | -36.5 | -94.6 | -80.1 |
| Other PMUS Revenue ($Millions) | 1.7 | 1.4 | 3.1 | 0.0 | 0.4 | 0.4 | 0.1 | 46 | 16.9 |
| Total Gross Revenue ($Millions) | 21.9 | 17.7 | 39.6 | -0.2 | -0.9 | -1.1 | -0.7 | -4.8 | -2.6 |
| Average Gross Revenue per Break-even Vessel ($) | 300,000 | 421,000 | 344,000 | 2,000 | 7,000 | 2,000 | 0.7 | 1.7 | 0.6 |

Under Alternative E, three swordfish vessels and one tuna vessel (or three percent of the fleet total) would be anticipated to leave the fishery. The overall effect would be a reduction in total gross revenue by about $1.1 million or three percent.[27] This alternative would be expected to reduce gross revenue from the sale of swordfish by $1.8 million. The reduced catch of swordfish is expected to be partially offset by a $1.6 million increase in sales of tuna as swordfish fishers move into waters that are more productive for tuna, but less productive for swordfish. Gross revenues of swordfish vessels are expected to decline by approximately $0.9 million (or almost five percent of the swordfish longline fleet gross revenue), and gross revenues of tuna vessels are

[27]No vessels will switch targets under this alternative because swordfish fisheries remain open to the fleet.

expected to decline by approximately $0.2 million (or less than one percent of the tuna longline fleet gross revenue).

**Alternative E:** *Prohibition on fishing or landing longline caught pelagic species in EEZ waters or ports of the western Pacific region.*
Again because this alternative does not differentiate between gear types, its analysis is limited to a single scenario. This is presented in Table 23.

**Table 23. Projections of annual economic impacts on the Hawaii-based longline fleet under Alternative E.**

| Indicator | Alternative E | | | Change from Baseline | | | Percentage Change from Baseline | | |
|---|---|---|---|---|---|---|---|---|---|
| | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total | Tuna | Sword-fish | Total |
| Break-even Vessels (Number) | 0 | 0 | 0 | -74 | -45 | -119 | -100.0 | -100.0 | -100.0 |
| Crew on Break-even Vessels (Number) | 0 | 0 | 0 | -407 | -203 | -610 | -100.0 | -100.0 | -100.0 |
| Effort (Total Sets) | 0 | 0 | 0 | -7,128 | -4,751 | -11,879 | -100.0 | -100.0 | -100.0 |
| Effort (Total Trips) | 0 | 0 | 0 | -714 | -433 | -1,148 | -100.0 | -100.0 | -100.0 |
| Trips per Break-even Vessel | 0.0 | 0.0 | 0.0 | -9.7 | -9.6 | -9.6 | -100.0 | -100.0 | -100.0 |
| Tuna Revenue ($Millions) | 0.0 | 0.0 | 0.0 | -19.5 | -5.2 | -24.7 | -100.0 | -100.0 | -100.0 |
| Swordfish Revenue ($Millions) | 0.0 | 0.0 | 0.0 | -0.5 | -11.3 | -11.8 | -100.0 | -100.0 | -100.0 |
| Shark Revenue ($Millions) | 0.0 | 0.0 | 0.0 | -0.4 | -1.2 | -1.6 | -100.0 | -100.0 | -100.0 |
| Other PMUS Revenue ($Millions) | 0.0 | 0.0 | 0.0 | -1.7 | -1.0 | -2.6 | -100.0 | -100.0 | -100.0 |
| Total Gross Revenue ($Millions) | 0.0 | 0.0 | 0.0 | -22.1 | -18.6 | -40.7 | -100.0 | -100.0 | -100.0 |
| Average Gross Revenue per Break-even Vessel ($) | 0 | 0 | 0 | -298,000 | -414,000 | -342,000 | -100.0 | -100.0 | -100.0 |

This alternative would close the Hawaii-based longline fishery as well as the longline fishery in American Samoa. The result would be the complete displacement of the entire longline fleet in

both fisheries. Displaced vessels and fishers may or may not move to fisheries not subject to the regulation.

All participation, effort, landings, revenues, and economic output from longline fisheries are reduced by 100 percent from the baseline case by this alternative. Approximately $40.1 million in gross revenues are projected to be lost by the Hawaii-based fleet. In addition, slightly less than $1 million is projected to be lost by the American Samoa longline fleet. The projections for the Hawaii-based longline fleet under this alternative are presented in Table 23. Projections for the American Samoa-based longline fleet are presented in Table 24.[28]

**Table 24. Projections of annual economic impacts on the American Samoa-based longline fleet under Alternative E.**

| American Samoa Longline Fishery | Alternative E | Change from 1998 | Percentage Change from 1998 |
|---|---|---|---|
| Active Vessels | 26 | -26 | -100.0 |
| Total Landings (Pounds) | 884,000 | -884,000 | -100.0 |
| Total Trips | 2,359 | -2,359 | -100.0 |
| Total Ex-vessel Value ($) | 976,913 | -976,913 | -100.0 |

In addition to direct effects on the longline vessels, the closure of the longline fishery would result in significant impacts on businesses to supply goods and services to the longline vessels and on businesses that rely fishery trade and distribution. In 1998, input purchases from longline vessels represented nearly 35 percent of all purchases from Hawaii-based pelagic fisheries and 31 percent of all inputs purchased by commercial fishing vessels in Hawaii (Sharma *et al.*, 1999). It is likely that business that are dependent on sales to commercial fishing vessels would face significant hardships. The importance of the longline fishery to input suppliers in American Samoa is unknown, but it is likely that they would be negatively impacted.

The economic and financial impacts of total longline closure would be far reaching throughout the Hawaii economy. Since longlining supplies most of the fish to Hawaii, stopping that flow would result in the probable closure of numerous local fish markets and suppliers of inputs to the fishery. The lack of supply to the local market would create a demand void which would be filled to one extent or another with imports. Some of the local import/export firms would replace lost export business with imports and others probably would not. Since there is a net export of fish from Hawaii at this time there would be a significant decrease in the import/export sector and related local economic activity would not be as large as it is now. It is expected that handline, troll and expense/recreational fishermen would work to fill this market void to the extent they could. The result would mean increased effort, expenditures and gross revenues for this group. Local retail outlets for fish including restaurants, hotels and fish markets would likely use more

[28] Guam issued three longline licenses and the CNMI issued one longline license in 1998; however, none of those vessels were active in the longline fishery. American Samoa issued 48 longline licenses in 1998, but only 26 vessels were active in the fishery.

imported fish than is the case now and some consumers would substitute other food products. Consumers, use to enjoying fresh, locally caught fish are expected to suffer a large decrease in consumer surplus.

## VIII IMPACTS ON NATIONAL COSTS AND BENEFITS

The implementation of the preferred alternative would also likely to have implications beyond those on small businesses and entities participating in the affected fisheries. Non-use values, also referred to as passive-use or existence values, do not involve personal consumption of derived products nor *in situ* contact. (Bishop, 1987). Non-use values may, nevertheless, be the most important benefit derived from some endangered species, simply because such species are [so] few in number that many people are unlikely to have seen them or to have had very much tangible experience regarding them. The most visible manifestation of existence values is the donation of funds to private organizations that support activities to preserve endangered species. However, whether people enjoy existence values of resources is not contingent upon whether they donate money to support a cause. Any impact of non-use values would be a hedonic (non-market) effect.

Particularly in the United States and western Europe, there are those who consider that certain marine species represent a special group of animals that should not be killed, deliberately or incidentally, under any circumstances. Certain marine animals are viewed symbolically as unique or majestic creatures – "charismatic megafauna" – similar to African big game. From this perspective, every incidental catch of such a species would be a severe problem.

The perceived need for conservation of such species may be independent of any impact caused by fishing or of its stock status. This perception may also influence the response of resource managers to bycatch management issues. For example, the case of three ice-entrapped gray whales in Alaska might be seen as an example of where the ecological impact is minimal but where public perception and political attractiveness may lead to disproportionate effort. Such views are strongly culture-dependent (Hall, 1998).

Numerous studies have been conducted on the value of endangered species (e.g., Loomis and White 1996) and several studies provide estimates of the value of protected species in Hawaii, including the Hawaiian monk seal (WPRFMC, 2000b). Metrick and Weitzman (1996) were unable to identify a satisfactory measure of charisma in the context of endangered species but they note that eye-size or eye-body ratio have been suggested. Another possible component of existence value is the degree to which a species is considered to be a higher form of life and possibly possess (anthropomorphic) capabilities for feeling, thought and pain (Metrick and Weitzman, 1996; Kellert, 1986). There may also be existence value for the contribution of particular species to biodiversity (Metrick and Weitzman, 1996). However, no valuation studies have been conducted specifically for sea turtles in the western Pacific region and for other species of interest in Pelagics FMP-managed fisheries. As a result, new research would be

needed to understand the non-use value of these species and how such values would be affected by the alternatives.

Ultimately, all alternatives considered here would be expected to displace Hawaii-based swordfish longline fishing effort. The level of fishery interactions with protected species, including sea turtles, will depend on where fishing effort relocates. Proximity of longline fishing to nesting beaches in Mexico and Costa Rica could increase takes and mortalities for some sea turtle species. If the boats displaced from the Hawaii-based longline fishery move from Mexico and Costa Rica to other fishing grounds, sea turtle interactions and mortality would be expected to change again.

Until other countries adopt similar standards, regulations that remove vessels or landings from western Pacific domestic pelagic fleets may be a relatively ineffective tool for limiting the global mortality of turtles. The result would likely be to simply transfer the fish harvests (and consequently turtle interactions) to unregulated fisheries. Assuming that a sea turtle interaction or mortality in another fishery has the same non-use value as a sea turtle interaction or mortality in these fisheries, then none of the alternatives would be expected to significantly change the cumulative effects on non-use values for sea turtles because fishery interactions and mortalities would be apt to be transferred to areas away from the western Pacific region. It is likely to require global conservation efforts to prevent a significant cumulative loss of non-use value associated with sea turtles and other pelagic fish and non-fish species of interest. However the implementation of these measures for U.S. pelagic fishing vessels in the western Pacific region would demonstrate a leadership role and commitment to other countries that continue to impact endangered and threatened sea turtles.

## 12.0 Appendix II: Future sea turtle mitigation research and monitoring turtles at sea

Table 25 includes a complete synopsis of the Reasonable and Prudent Measures (RPM), Conservation Measures (CM) and RPA in the NMFS March 29th 2001 Biological Opinion. Most of the direct impacts to fishermen are contained in the RPA, while the RPM and CM refer mainly to actions to be conducted by NMFS. These include observer coverage for all longline fisheries managed by the Council, timely evaluation of observer data to estimate takes, collection of turtle interaction data for pelagic fisheries other than longlining, and disposition of dead turtles as a result of a fishery interaction.

**Table 25. Summary of all Reasonable and Prudent Measures, Conservation Measures and Reasonable and Prudent Alternative in the NMFS March 29th 2001 Biological Opinion**

| **Reasonable and Prudent Alternative (REQUIRED BY LAW)** |
|---|
| **1. Prohibit Swordfish Style Fishing Methods**<br>NMFS shall prohibit longline fishing practices targeting swordfish or a mixture of targets north of the equator, and restrict the quantity of swordfish that may be landed by longline vessels operating under the Pelagics FMP. |
| **2. Time/Area Closure for Tuna Style Fishing Methods**<br>NMFS shall implement time and area closures to prohibit all longline fishing south of 15° N. latitude, north of the equator (0°), west of 145 W. and east of the 180 longitude between April 1 and May 31. |
| **3. Limited Access Permit Restrictions**<br>NMFS shall allow the processing of applications for the re-registration to Hawaii limited access permits of vessels that were de-registered after March 29, 2001, only during the month of October. |
| **4. Fishing Techniques and Gear Modification Research**<br>NMFS shall focus the research community on the formation of innovative strategies and measures to diminish the impacts of commercial fishing operations on sea turtle species. NMFS shall research modifications to existing gear that (1) reduce the likelihood of gear interactions and (2) dramatically reduce the immediate and/or delayed mortality rates of captured turtles. All research funding and/or implemented by NMFS must be covered by a research and enhancement permit pursuant to section 10(a)(1)(a) of the ESA. |
| **5. Reduce the Harmful Effects of Fishing Gear Interactions** |
| **a. Hawaii-based, American Samoa, Guam and CNMI Longline Fisheries**<br>NMFS shall establish or fund programs to ensure that impacts to turtles captured in these fisheries are avoided or minimized to the maximum extent practicable. |
| **b. Troll and Handline Fisheries**<br>NMFS shall establish or fund programs to ensure that impacts to turtles captured in these fisheries are avoided or minimized to the maximum extent practicable. These programs can include but are not limited to: observer programs, crew training programs, or changes in fishing method or area to avoid interactions. |

| c. Required Measures to Reduce the Harmful Effects of Sea Turtle Interactions | |
|---|---|
| **1.** Vessel operators and observers subject to provisions or managed by the Pelagics FMP shall be educated on sea turtle biology and on methods that will reduce injury or mortality during fishing operations. | |
| **1A.** | NMFS shall conduct skipper education workshops |
| **1B.** | NMFS shall include in the skipper education workshops a module of information on sea turtle biology and ways to avoid and minimize sea turtle impacts. |
| **1C.** | NMFS shall include sea turtle resuscitation techniques and sea turtle biology information during observer training. |
| **2.** Live captured sea turtles shall be released from fishing gear in a manner that minimizes injury and the likelihood of further gear entanglement or entrapment. | |
| **2A.** | All sea turtles shall be removed from fishing gear or brought on deck prior to continuing with gear retrieval. |
| **2B.** | Trained personnel aboard boats fishing with hooks (longline, handline, troll, etc...) must remove the hook from a turtle, if feasible, as quickly and carefully as possible to avoid injury or mortality.If the hook cannot be removed (e.g., the hook is deeply ingested), each vessel must carry a line clipper to cut the line as close to the hook as practicable. The line cutter must have a cutting blade capable of cutting 2.0-2.1 millimeter monofilament line and nylon or polypropylene multi-strand material commonly known as braided mainline or tarred mainline. The cutting blade must be securely fastened to a pole that is at least 6 feet (1.82 meters) in length. |
| **2C.** | Each longline vessel fishing under a general permit or limited access permit must carry a sea turtle dip net to hoist a sea turtle onto the deck, if practicable, to facilitate the removal of the hook. |
| **2D.** | Each vessel fishing with hooked gear must have wire or bolt cutters aboard the vessel capable of cutting through a hook that may be imbedded externally, including the head/beak area of a turtle. |
| **3.** Comatose and lethargic sea turtles shall be retained on board, handled, resuscitated, and released according to the procedures outlined in the 50 CFR 223.206(d)(1). | |
| **3A.** | Vessel operators shall bring comatose sea turtles aboard, if feasible, and perform resuscitation techniques according to the procedures described at 50 CFR 223.206(d)(1) and 50 CFR 660.32(b). |
| **3B.** | If an observer is aboard the vessel, the observer shall perform resuscitation techniques on comatose sea turtles. |
| **Reasonable and Prudent Measures** | **(REQUIRED BY LAW)** |
| **RPM 1. NMFS shall collect data on capture, injury and mortality of sea turtles in addition to life history information on longline fishing vessels.** | |

**Terms and Conditions for RPM 1**

**1A.** NMFS shall continue the observer program maintained at a level of 20 percent.

**1B.** NMFS shall establish an observer program where feasible, aboard longline vessels fishing under a Pelagics FMP general permit.

**1C.** Observer programs shall collect information regarding the incidental capture, injury and mortality of sea turtles by species, gear and set information in which each interaction occurred, and life history information.

**1D.** NMFS shall also collect life history information on sea turtles captured by longline fisheries including species identification; measurements, including direct measure or visual estimates of tail length; condition; skin biopsy samples; and estimated length of gear left on the turtle at release.

**1E.** NMFS observers shall record the presence of absence of tags on all sea turtles captured by longline fisheries.

**1F.** Data collected by observers shall be evaluated at least on a quarterly basis to determine whether estimated annual incidental injuries or mortalities of sea turtles has exceeded allowable take levels. A report will be sent to the Sea Turtle Coordinator in Silver Spring, Maryland, shall be made available on the Southwest Regional website.

**RPM 2. NMFS shall develop a system that will enable NMFS to collect basic listed species bycatch data in the troll and handline fisheries under the Pelagics FMP.**

**Terms and Conditions for RPM 2 (incorrectly listed as RMP 3 in BO)**

**2A.** NMFS shall develop a system to collect basic listed species bycatch data associated with the troll and handline fisheries under the Pelagics FMP. NMFS shall develop an independent, anonymous survey that can be implemented either through a written survey (post-card mailer) or a dockside interview in an effort to obtain better and more representative data on interactions, if any, of listed species with the troll and handline fisheries.

**RPM 3. Sea turtle mortalities shall be disposed of at sea unless NMFS requests retention of the carcass for sea turtle research.**

**Terms and Conditions for RPM 3 (incorrectly listed as RMP 4 in BO)**

**3A.** Dead sea turtles may not be consumed, sold, landed, offloaded, transhipped or kept below deck, but must be returned to the ocean after identification unless NMFS requires the turtle be kept for further study.

## Conservation Recommendations (OPTIONAL)

**1.** NMFS should research modifications to existing gear that (1) reduce the likelihood of gear interactions and (2) dramatically reduce the immediate and/or delayed mortality rates of captured turtles (e.g., visual or acoustic cues, dyed bait, hook type). All research funded and/or implemented by NMFS must be covered by a research and enhancement permit pursuant to section 10(a)(1)(a) of the ESA. The goal of any research should be to develop a technology or method, via a robust experimental assessment, which would achieve the above two goals and remain economically and technically feasible for fishermen to implement.

| |
|---|
| **2.** NMFS should research development or modifications of existing technologies, such as sonar, to detect and alert fishers if sea turtles or marine mammals become entangled in their gear. |
| **3.** NMFS should explore the feasibility of developing a system for fishermen to collect life history information on sea turtles. |
| **4.** NMFS should continue efforts to gather international support for the Inter-American Convention for the Protection and Conservation of Sea Turtles. |
| **5.** NMFS should support the development of a trans-Pacific international agreement that would include Pacific island and pacific rim nations for the protection and conservation of sea turtle populations. |
| **6.** NMFS should undertake efforts to implement protection measures and management actions to protect nesting leatherbacks and increase hatchling production at key nesting beaches in the Pacific. |
| **7.** NMFS should establish an observer program for the California-based longline fishery to determine the impact of the fishery may be having on sea turtle and other protected species populations. |
| **8.** NMFS should provide technical and financial assistance necessary to export advances in knowledge of techniques and gear modifications that reduce interactions with sea turtles an/or dramatically reduce the immediate and/or delayed mortality rates of captured turtles with other nations engaged in similar fishing practices to reduce fishery impacts to sea turtle populations worldwide. |
| **9.** NMFS should collaborate with the Forum Fisheries Agency (FFA) to collect data on capture, injury and mortality of sea turtles and life history information aboard U.S. tuna purse seine vessels fishing in the western Pacific under the Treaty on Fisheries Between the governments of Certain Pacific Island States and the Government of the United States of America (South Pacific Tuna Treaty Act). |

## 13.0 Appendix III: Proposed Regulations

List of Subjects in 50 CFR Part 660

Administrative practice and procedure, American Samoa, Fisheries, Fishing, Guam, Hawaiian Natives, Indians, Northern Mariana Islands, and Reporting and recordkeeping requirements.

Authority: 16 U.S.C. 1801 et seq.

Dated:

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For the reasons set out in the preamble, 50 CFR part 660 is proposed to be amended as follows:

PART 660 - FISHERIES OFF WEST COAST STATES AND IN THE WESTERN PACIFIC

1. The authority citation for part 660 continues to read as follows:

Authority: 16 U.S.C. 1801 et seq.

2. In § 660.21, new paragraph (l) is added to read as follows:

§ 660.21 Permits.

* * * * *

(l) Applications for the re-registration of any vessel that was de-registered from a Hawaii longline limited access

permit after March 29, 2001, must be received at PIAO or postmarked, between September 15 and October 15.

3. In § 660.22 paragraphs (cc), (dd), and (mm) through (tt) are removed, (uu) is redesignated as (ii), and paragraphs (z) through (hh) are added to read as follows:

§ 660.22 Prohibitions.

* * * * *

(z) Fail to carry line clippers, dip nets, and wire or bolt cutters on a vessel registered for use under a Hawaii longline limited access permit or a Western Pacific general longline permit that has a working platform more than 3 ft above the sea surface in violation of § 660.32 (a).

(aa) Fail to comply with the sea turtle handling, resuscitation, and release requirements when operating a vessel registered for use under a Hawaii longline limited access permit or a Western Pacific general longline permit, or fishing with hooks for Pacific pelagic management unit species within EEZ waters around Hawaii, American Samoa, Guam, the Commonwealth of the Northern Mariana Islands, Midway, Johnston or Palmyra Atolls, Kingman Reef, and Wake, Jarvis, Baker, or Howland Islands in violation of § 660.32(b).

(bb) Direct fishing effort toward the harvest of swordfish (Xiphias gladius) using longline gear deployed north of the

equator on a vessel registered for use under a Hawaii longline limited access permit or a Western Pacific general longline permit in violation of § 660.33(a).

(cc) Fish for Pacific pelagic management unit species with a vessel registered for use under a Hawaii longline limited access permit or a Western Pacific general longline permit within closed areas or by use of unapproved gear configurations in violation of § 660.33 (b), (c), (g), or (h).

(dd) Use a receiving vessel registered for use under a receiving vessel permit to receive, land, or tranship from another vessel Pacific pelagic management unit species harvested from closed areas with longline gear in violation of § 660.33 (d).

(ee) Land or tranship shoreward of the outer boundary of the EEZ around Hawaii, American Samoa, Guam, the Northern Mariana Islands, Midway, Johnston or Palmyra Atolls, Kingman Reef, and Wake, Jarvis, Baker, or Howland Islands, Pacific pelagic management unit species that were harvested from closed areas with longline gear in violation of § 660.33 (e).

(ff) Possess a light stick on board a vessel registered for use under either a Hawaii longline limited access permit or a Western Pacific general longline permit, on fishing trips that include any fishing north of the equator (0 ° lat.) in violation of § 660.33 (f).

(gg) Possess or land more than 10 swordfish from a fishing trip where any part of the trip included fishing north of the equator (0° lat.) in violation of § 660.33 (i).

(hh) Operate a vessel registered for use under a Hawaii longline limited access permit or a Western Pacific general longline permit to fish for Pacific pelagic management unit species without having onboard a valid protected species workshop certificate issued by NMFS or a legible copy thereof in violation of § 660.34.

4. In § 660.22 paragraph (rr) is redesignated as paragraph (hh), and paragraphs (mm) through (tt) are removed.

5. In § 660.32 (a) paragraphs(a)(1) and (a)(2) are redesignated as paragraphs (a)(4) and (a)(5) respectively, and new paragraphs(a)(1), (a)(2), and (a)(3) are added to read as follows:

§ 660.32 Sea turtle take mitigation measures.

(a) Possession and use of required mitigation gear.

(1) Owners and operators of vessels registered for use under a Hawaii longline limited access permit or a Western Pacific general longline permit that have working platforms more than 3 ft above the sea surface must carry aboard their vessels line clippers meeting the minimum design standards as specified in paragraph (a)(4) of this section, dip nets meeting minimum standards prescribed in paragraph (a)(5) of this section, and

wire or bolt cutters capable of cutting through the vessel's hooks. These items must be used to disengage any hooked or entangled sea turtles with the least harm possible to the sea turtles and as close to the hook as possible in accordance with the requirements specified in paragraphs (b) through (d) of this section.

(2) Owners and operators of vessels using hooks to target Pacific pelagic management unit species within EEZ waters around Hawaii, American Samoa, Guam, the Commonwealth of the Northern Mariana Islands, Midway, Johnston or Palmyra Atolls, Kingman Reef, and Wake, Jarvis, Baker, or Howland Islands, that have working platforms more than 3 ft above the sea surface must carry aboard their vessels line clippers meeting the minimum design standards as specified in paragraph (a)(4) of this section, and wire or bolt cutters capable of cutting through the vessel's hooks. These items must be used to disengage any hooked or entangled sea turtles with the least harm possible to the sea turtles and as close to the hook as possible in accordance with the requirements specified in paragraphs (b) through (d) of this section.

(3) Owners and operators of vessels registered for use under a Hawaii longline limited access permit or a Western Pacific general longline permit, or using hooks to target Pacific pelagic management unit species within EEZ waters around Hawaii, American

Samoa, Guam, the Commonwealth of the Northern Mariana Islands, Midway, Johnston or Palmyra Atolls, Kingman Reef, and Wake, Jarvis, Baker, or Howland Islands, that have working platforms 3 ft or less above the sea surface must carry aboard their vessels line clippers capable of cutting the vessels fishing line or leader within approximately 1 ft of the eye of an embedded hook as well as wire or bolt cutters capable of cutting through the vessel's hooks. These items must be used to disengage any hooked or entangled sea turtles with the least harm possible to the sea turtles and as close to the hook as possible in accordance with the requirements specified in paragraphs (b) through (d) of this section.

* * * * *

6. §660.33 is added to read as follows:

§ 660.33 Western Pacific longline fishing restrictions.

(a) Owners and operators of vessels registered for use under a Hawaii longline access permit or a Western Pacific general longline permit may not use longline gear to fish for or target swordfish(Xiphias gladius) north of the equator (0° lat.).

(b) The length of each float line used to suspend the main longline beneath a float must be longer than 20 m (65.6 ft or 10.9 fm) if deployed by, or possessed on, a vessel registered for use under a Hawaii longline limited access permit or a Western

Pacific general longline permit, that is fishing for Pacific pelagic management unit species north of the equator (0 ° lat.).

(c) From April 1 through May 31, owners and operators of vessels registered for use under a Hawaii longline limited access permit or a Western Pacific general longline permit may not use longline gear in waters bounded on the south by 0° lat., on the north by 15° N. lat., on the east by 145° W. long., and on the west by 180 ° long. (see Figure 3 to this section).

(d) From April 1 through May 31, owners and operators of vessels registered for use under a receiving vessel permit may not receive from another vessel Pacific pelagic management unit species that were harvested by longline gear in waters bounded on the south by 0° lat., on the north by 15 ° N. lat., on the east by 145° W. long., and on the west by 180° long. (see Figure 3 to this section).

(e) From April 1 through May 31, owners and operators of vessels registered for use under a Hawaii longline limited access permit, a Western Pacific general longline permit, or a receiving vessel permit, may not land or transship Pacific pelagic management unit species that were harvested by longline gear in waters bounded on the south by 0° latitude, on the north by 15° N. lat., on the east by 145° W. long., and on the west by 180° long. (see Figure 3 to this section).

(f) No light stick may be possessed on board a vessel registered for use under either a Hawaii longline limited access permit or a Western Pacific general longline permit, during fishing trips that include any fishing north of the equator (0° lat.).

(g) When a conventional monofilament longline is deployed in the water north of 0° lat. by a vessel registered for use under a Hawaii longline limited access permit or a Western Pacific general longline permit fishing, no fewer than 15 branch lines may be set between any 2 floats. Vessel operators using basket-style longline gear must set a minimum of 10 branch lines between any 2 floats when fishing north of the equator.

(h) Longline gear deployed north of 0° lat. by a vessel registered for use under a Hawaii longline limited access permit or a Western Pacific general longline permit must be deployed such that the deepest point of the main longline between any 2 floats, i.e., the deepest point in each sag of the main line, is at a depth greater than 100 m (328.1 ft or 54.6 fm) below the sea surface.

(i) Owners and operators of longline vessels registered for use under a Hawaii longline limited access permit or a Western Pacific general longline permit may land or possess no more than 10 swordfish from a fishing trip where any part of the trip included fishing north of the equator (0° lat.).

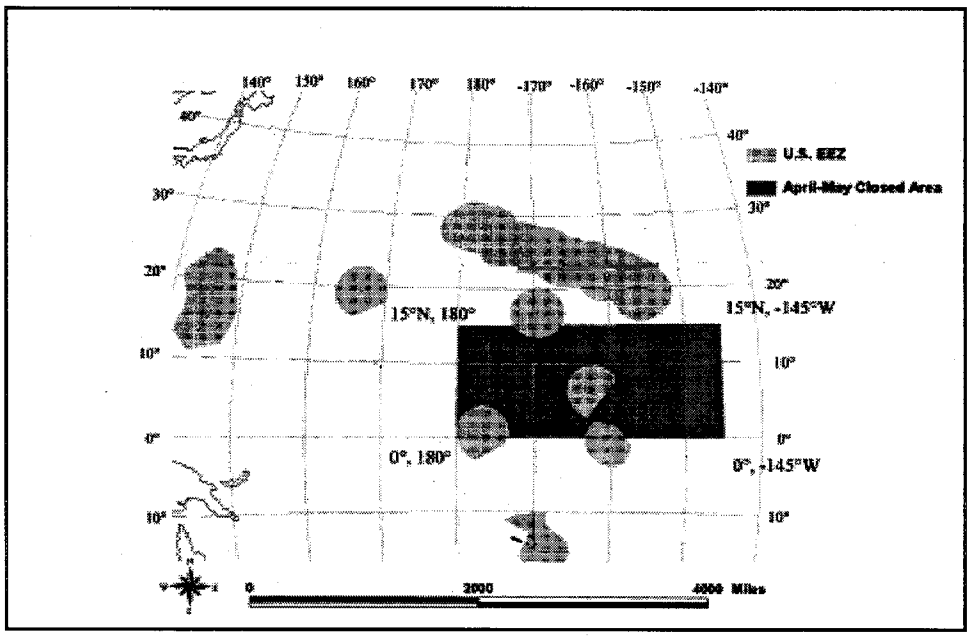


Figure 3. Western Pacific longline fishery restrictions

Insert Figure 3

7. § 660.34 is removed.

8. § 660.36 is redesignated as § 660.34 and revised to read as follows:

§ 660.34 Protected species workshop.

(a) Each year the operator of a vessel registered for use under a Hawaii longline limited access permit or a Western Pacific general longline permit must attend and be certified for completion of a workshop conducted by NMFS on mitigation, handling, and release techniques for turtles and seabirds and other protected species.

(b) A protected species workshop certificate will be issued by NMFS annually to any person who has completed the workshop.

(c) An operator of a vessel registered for use under Hawaii longline limited access permit or a Western Pacific general longline permit and engaged in longline fishing, must have on board the vessel a valid protected species workshop certificate issued by NMFS or a legible copy thereof.

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