APPENDIX A

Final Regulatory Flexibility Analysis and Regulatory Impact Review

Regulatory Impact Review and Final Regulatory Flexibility Analysis

Management Measures to Implement New Technologies for the Western Pacific Pelagic Longline Fisheries

A Regulatory Amendment to the Fishery Management Plan for the Pelagic Fisheries of the Western Pacific Region

March 5, 2004

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.

(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 proposed for the domestic pelagic longline fisheries under the Fishery Management Plan for the Pelagic Fisheries of the Western Pacific Region (FMP). It also contains an analyses of the economic impacts of these actions on affected small businesses and other small organizations.

II. PROBLEM STATEMENT AND NEED FOR ACTION

On March 29, 2001, the National Marine Fisheries Service (NMFS) issued a Biological Opinion under section 7 of the Endangered Species Act for the authorization of fisheries under the FMP. The Biological Opinion (BiOp) contained a series of non-discretionary actions (Reasonable and

Prudent Alternative) to mitigate interactions between the Hawaii-based longline fishery's and sea turtles. At the 110th Council Meeting held June 18-21, 2001, staff of the Western Pacific Regional Fishery Management Council (WPRFMC) were directed to prepare a regulatory amendment recommending implementation of the Reasonable and Prudent Alternative (RPA) as required under the Endangered Species Act (ESA). This recommendation was prepared, and it was implemented by NMFS on June 12, 2002. New measures included a ban on the use of shallow-set swordfish longline fishing north of the equator and a seasonal area closure from 15° N. lat. to the equator and from 145° W. long. to 180° long. during April and May for any longline vessel fishing under the authority of the FMP.

On December 12, 2001, NMFS reinitiated section 7 consultation on the Western Pacific Region's pelagic fishery. This reinitiation was based on new information that could improve the agency's ability to quantify and evaluate the effects of the fishery on listed sea turtle populations, as well the economic impacts of the implementation of the March 2001 RPA. At the conclusion of this reconsultation NMFS issued a new BiOp (November 15, 2002), which maintained the June 12, 2002 regulations including the ban on shallow-setting north of the equator and the April-May southern area closure. Meanwhile, on September 24, 2002, the D.C. District Court vacated the 2001 BiOp and RPA, effective November 15, 2002.

At its 118th meeting in June, 2003, the Council reviewed a number of potential modifications to the southern area closure to determine whether modifications could be made to support the economic viability of the fleet without jeopardizing sea turtles. The Council subsequently directed its staff to continue its preparation of a regulatory amendment to the Pelagic FMP containing a further range of alternatives and the impacts of those alternatives on sea turtles, fisheries, and the environment. Staff were also directed to include analyses of the impacts of those alternatives on sea turtles, fisheries and the environment. The Council directed staff to work with the NMFS Pacific Islands Regional Office (PIRO) and Pacific Islands Fisheries Science Center (PIFSC) to complete the package so the Council could consider it for final action at its 119th meeting, scheduled for mid-September 2003, with the intention of implementing this change prior to the 2004 seasonal area closure.

However on August 31, 2003, the Federal Court invalidated the 2002 BiOp and the regulations put in place in June 2002. Consequently, at its 119th meeting on September 23, 2003, the Council voted to recommend an emergency action which would allow a model swordfish longline fishery north of the equator at approximately 75% of historic (1994-1998 average annual) swordfish levels of effort (sets) in conjunction with fishing experiments that stay within the anticipated takes in the model fishery. The fishery would only be allowed to operate with circle hooks instead of J hooks and mackerel-type bait instead of squid, measures proven successful in reducing and mitigating sea turtle interactions in the Atlantic Ocean.

On October 6, 2003, the Federal Court stayed the execution of the August 31, 2003 order until April 1, 2004 to allow NMFS to develop a new BiOp and hopefully render a more permanent solution than interim or emergency measures. The purpose of this action is thus to implement measures for the long-term management of the Hawaii-based longline fishery.

At its 120th meeting (October 20, 2003), the Council directed its staff to continue its development of a long-term rule package through a series of meetings of the special advisory committee, workshops and seminars, and preparation appropriate documents, with the goal of meeting the December 1 deadline. However given the abbreviated time available, the Council declined to withdraw the emergency rule package, instead recommending that, if the long-term rule package is not completed according to NMFS' timeline, NMFS should process the Council's emergency rule for implementation by April 1, 2004.

The Council's Sea Turtle Conservation Special Advisory Committee held a series of three meetings to craft recommendations for further analysis and possible Council action. Committee membership included representation from fishery managers, scientists, industry, and environmental organizations. The Committee's first two meetings resulted in five potential alternatives that were submitted to NMFS' Office of Protected Resources (OPR) for their review and feedback. At the Committee's third and last meeting, OPR's comments were circulated and discussed. In summary, OPR ranked the proposed action as representing the second lowest risk of the five alternatives considered. This assessment was based on the fact that although other alternatives would have similar anticipated interactions, under the proposed action a greater percent of loggerhead and green turtle interactions would be expected to involve shallow-set longline gear (with circle hooks and mackerel-type bait) which would minimize potential harm to these species.

Because the impetus for this action is concern for pelagic fishery interactions with sea turtles, and because the FMP's Hawaii-based longline fishery (vessels registered to Hawaii limited access longline permits) is the only Pelagic FMP fishery thought to interact significantly with sea turtles, these alternatives focus on that fishery. (The other pelagic fisheries include the American Samoa longline fishery as well as small-boat troll and handline fisheries in each of the western Paficic jurisdictions.) Thus, under all alternatives, the management of the other pelagic fisheries would remain unchanged, except for general longline permit holders who would be affected by time/area closures and prohibitions on shallow-setting north of the equator under some alternatives. No alternatives would allow general longline permit holders to participate in the Hawaii-based longline fishery (meaning to fish in Hawaii's EEZ or to land fish in Hawaii) without obtaining a Hawaii longline limited access permit.

This analysis includes a range of alternatives considered for the long-term management of the longline fisheries managed under the Council's Pelagic Fishery Management Plan. These alternatives supplement those described in NMFS' 2001 Final Environment Impact Statement (FEIS) for the Pelagic Fisheries of the Western Pacific Region through the examination of an additional range of levels of swordfish fishing, in conjunction with circle hooks and mackerel-type bait which have recently been shown to be effective in reducing sea turtle interactions, while maintaining swordfish catch rates.

On November 25, 2003, the Council held its 121st meeting via teleconference at the Council's Honolulu office. This was an emergency meeting and the measures discussed here were its sole focus. The Council reviewed available information as well as the Committee's alternatives and

estimates of their relative impacts. The Council's final action on this measure was to recommend that NMFS now allow 2,120 swordfish sets to be made annually by Hawaii longline limited access permit holders to model the use of circle hooks with mackerel-type bait, dehookers and other new technologies shown to reduce and mitigate interactions with sea turtles, in addition to a continued tuna fishery

In summary, the closure of the Hawaii-based swordfish fishery greatly reduced fishery interactions with sea turtles. However, this was achieved at the expense of the Hawaii-based longline fishery, chiefly by eliminating swordfish longline fishing, which resulted in a 20% decline in landings and a 40% decline in ex-vessel revenue in the first year following its implementation (WPRFMC 2002). In addition, although tuna-targeting longline fishing has continued, it has been constrained by a seasonal longline closure of about 1 million square nautical miles (nm) of ocean bounded by 15˚ N. lat. to the equator and from 145˚ W. long. to 180˚ long.. These closures denies the fleet access to swordfish, yellowfin and bigeye catches and, if not necessary to protect sea turtles, are contrary FMP objectives 1, 2, and 7 as follow:

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

2. To promote, within the limits of managing at OY, domestic harvest of the MUS in the Western Pacific Region 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 practice for non-market personal consumption and cultural benefits; and
   c. domestic commercial fishermen, including charter boat operations, to engage in profitable fishing operations.

7. To promote, within the limits of managing at OY, domestic marketing of the MUS in American Samoa, CNMI, Guam and Hawaii.

Thus, in accordance with FMP Objectives 1, 2 and 7, the objective of this action is to achieve optimum yield and promote domestic marketing of MUS on a long-term basis from the region's pelagic fishery, without likely jeopardizing the continued existence of any threatened or endangered species. Therefore, this document examines a range of potential changes to the seasonal area closure, in addition to a limited swordfish fishery using the circle hooks and mackerel-type bait that have been proven to be effective in reducing and mitigating sea turtle interactions. Finally, this document examines alternatives that include conservation measures intended to improve sea turtle recruitment and thus offset any potential harm the Hawaii longline fishery could still pose to sea turtles.

The proposed rule is being promulgated under the authority of the Magnuson-Stevens Fishery Conservation and Management Act.

III. DESCRIPTION OF THE FISHERIES

The Pelagic FMP manages unique and diverse fisheries. Hawaii-based longline vessels are capable of traveling long distances to high-seas fishing grounds, while the smaller handline, troll, charter and pole-and-line fisheries—which may be commercial, recreational or subsistence —generally although not exclusively occur within 25 miles of land, with trips lasting only one day. These fisheries are discussed below, first by sector (commercial, recreational and charter) and then by gear type.

Due to the issuance of series of court orders and BiOps focused on the Hawaii-based longline fleet's interactions with sea turtles, the swordfish sector of this fishery has been effectively closed since March 31, 2001, when the first court order prohibiting swordfish-style gear configurations north of the equator (shallow-setting) was issued.
Because the impetus for this action is concern for fishery interactions with sea turtles, and because the Hawaii-based longline fishery is the only one thought to interact significantly with sea turtles the regulatory measures in this document focus on that fishery. In addition, there are unlikely to be increased competition with the smaller fisheries so the discussion is this document focuses on the Hawaii longline fishery and not the smaller fisheries.

Commercial Fisheries: The Hawaii-based pelagic longline fleet is the largest fishery managed by the FMP. The longline fleet has historically operated in two distinct modes based on gear deployment: deep-set longline by vessels that target primarily tuna and shallow-set longlines by those that target swordfish or have mixed target trips including 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 Hawaii-based skipjack tuna, or *aku* (skipjack tuna) fishery, is also known as the pole-and-line fishery or the bait boat fishery because of its use of live bait. 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." The majority of Hawaii-based troll fishing is non-commercial; however, some full-time commercial trollers do exist.

Charter and Recreational Fisheries: Hawaii'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: 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). Most of the local consumption of pelagic species comes from Hawaii's domestic fisheries, although some is imported (primarily frozen mahimahi). Hawaii's pelagic fisheries are small in comparison with other Pacific pelagic fisheries such as domestic and foreign distant-water purse seine fisheries and foreign pelagic longline and pole-and-line fisheries (NMFS 1991), but they have comprised the largest fishery sector in the State of Hawaii for over a decade (Pooley 1993).

Of all Pelagic 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 includes a few wood and fiberglass vessels, and many newer steel longliners that were previously engaged in fisheries off the U.S. mainland. None of the vessels are over 101 ft in length and the total number is limited to 164 vessels by a permit moratorium.

Hawaii-based tuna longline vessels typically deploy about 34 horizontal miles of mainline in the water and use a line shooter. The line shooter increases the speed at which the mainline is set, which causes the mainline to sag in the middle (more line between floats), allowing the middle hooks to fish deeper. The average speed of the shooter is 9 knots with an average vessel speed of about 6.8 knots. No light sticks are used. Float line lengths average 22 m (72 feet) and branch line lengths average 13 m (43 feet). The average number of hooks deployed is 1,690 hooks per set with an average of 27 hooks set between floats. There are approximately 66 floats used

during each set. The average target depth is 167 m, and gear is allowed to soak during the day, with total fishing time typically lasting about 19 hours, including the setting and hauling of gear.

Table 1. Hawaii-based longline fishery landings 1999-2002 (Source: NMFS, PIFSC, published and unpublished data, 2003 data are unavailable

Item	1999	2000	2001	2002
Area Fished	EEZ and high seas	EEZ and high seas	EEZ and high seas	EEZ and high seas
Total Landings (million lbs)	28.3	23.8	15.6	17.2
Catch Composition*				
Tuna	41%	41%	52%	52%
Swordfish	9%	9%	1%	1%
Miscellaneous	32%	32%	36%	37%
Sharks	18%	18%	11%	10%
Season	All year	All year	All year	All year
Active Vessels	119	125	101	100
Total Permits	164	164	164	164
Total Trips	1,137	1,103	1,034	1,164
Total Ex-vessel Value (nominal) ($millions)	$47.4	$50.2	$33.0	$37.5

* Number of fish

Table 2. Fishery information for Hawaii small-boat pelagic fisheries for 2000 (Sources: Adapted from WPRFMC, 2002)

Gear/Vessel Type	Troll/Handline	Pole-and-line Fishery (*Aku* Fishery)
Area Fished	Inshore and EEZ	Inshore and EEZ
Total Landings	3.4 million pounds	696,000 pounds
Catch Composition	48% yellowfin 18% mahimahi 10% wahoo 8% albacore 7% blue marlin	99.6% skipjack tuna <1% <1% <1% <1%
Season	All year	All year
Active Vessels	1,455	6
Total Permits	NA	NA
Total Trips	18,700	198
Total Ex-vessel Value	$8 million	$1.1 million

Note: Data do not include all landings for recreational fishers.

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 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 limited access permits, the number of Western Pacific general longline permits is not restricted.

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.

Table 3. American Samoa-based longline fishery vessel operations and landings, 1999-2002. Source: WPacFIN, 2003

Time period	1999	2000	2001	2002	
Active vessels	72	35	68	61	
Total sets	2,112	2,814	4,801	6,861	
Total landings (numbers of fish)	29,540	46,393	216,875	423,023	
Catch composition:					
Albacore	53%	69%	86%	79%	
Skipjack	15%	5%	4%	11%	
Yellowfin	15%	13%	4%	4%	
All others	<2%	<2%	<2%	<4%	

Information on small-boat fishing from American Samoa, Guam, and the CNMI is presented in Table 4.

Table 4. Small-boat pelagic fishery information for American Samoa, Guam, and CNMI, 2000. Source: Adapted from WPRFMC, 2001

Island Area		**Guam**	**CNMI**
Gear	**Troll/Charter**	**Troll/Charter**	**Troll/Charter**
Area Fished	Inshore and EEZ	Inshore and EEZ	Inshore and EEZ
Total Landings	23,014	643,149	146,880*
Catch Composition	74% skipjack tuna 6% barracuda 4% yellowfin tuna < 4% all others	31% mahimahi 23% skipjack tuna 19% yellowfin tuna	70% skipjack tuna 11% mahimhai 8% dogtooth tuna 6% yellowfin tuna
Season	All year	All year	All year
Active Vessels	19	416	107
Total Permits	NA	NA	NA
Total Trips	283	13,204	2,084
Total Ex-vessel Value	$24,164	$641,081**	$275,758

*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.

Other Pelagic FMP fisheries:

There has been limited historical pelagic fishing activity and effort (other than that conducted by longline vessels) in the Pacific Remote Island Areas (PRIAs, Johnston, Midway and Palmyra Atolls, Wake, Jarvis, Howland and Baker Islands, and Kingman Reef). Although longline vessels that fish in the waters of the Exclusive Economic Zone (EEZ) around the PRIA have been required to be registered under a longline general permit or the Hawaii-based longline limited access permit for some time, other pelagic vessels did not have federal permit and reporting requirements until May of 2002.

Prior to that time, two Hawaii-based troll and handline vessels were known to have fished in EEZ waters around Palmyra Atoll 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.

Since the broad implementation of permit and reporting requirements, there have been no permits issued or reports submitted from non-longline vessels targeting pelagic species around the PRIAs.

Recent plans for a sportsfishery based on Palmyra Atoll appear to have fallen through, as did an earlier attempt to establish a transhipping station utilizing Palmyra's airstrip. Although a small charter and recreational fishery was based on Midway Atoll during the late 1990s, it is now defunct due to a lack of vendor interest.

Prior to current regulatory restrictions, a California-based longline fishery existed consisting largely of vessels that were based in Hawaii and registered to Hawaii permits but that would move to California to seasonally fish swordfish as this allowed them to target ground further east than they could reach from Hawaii. In the latter part of 1997, 15 longline vessels migrated to California and fished mainly swordfish for the remainder of the year. The number of Hawaii-based longline vessels migrating to California increased slightly in 1998 (WPRFMC, 1999d). There were 18 Hawaii-based longline vessels that transited to California in the latter part of 1998 (Ito and Machado, 1999). Six East Coast vessels returned in 1998 but switched from targeting swordfish to tuna (Ito & Machado, 1999). In 1999,over 30 Hawaii-based longliners fished out of California (NMFS, 2000e; Dang, pers. comm.). Effective, June 12, 2001 Hawaii permit holders were prohibited from this type of movement.

Description of the Hawaii-based Longline Fishery's Markets and Economic Impacts:
Export markets are important for tuna 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 wwordfish did not have a strong demand in Hawaii, and the bulk of landed swordfish was exported to larger, established markets on the U.S. mainland and in Japan. Subsequently, a market niche for high quality fresh swordfish developed in Hawaii, primarily in restaurants. 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

During the 1990s, wwordfish was the second largest fishery in Hawaii after bigeye tuna until the closure of the swordfish component of the fishery. The majority of swordfish was 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 were 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. As above, most of the fish were historically 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).

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. 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 six 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 are small and do not contribute substantially to the overall revenue in the fleet.

The prohibitions on finning of sharks has substantially limited the activity of Hawaii-based longline vessels in the 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.

Economic Impacts

The Hawaii-based longline fishery has historically provided 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, was 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 historic longline fishery was $50 million with upwards to 1,500 jobs directly associated with the Hawaii longline fishery. State and local taxes were 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 were estimated to represent an additional $8-16 million in value-added.

Foreign fisheries in the Central and Western Pacific:

Fisheries managed under the Pelagic 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. Between 1999 and 2001, Hawaii-based longline vessels are estimated to have exerted only about 3% of the pelagic longline effort in the Pacific.

Purse seine catches form the bulk of the catch in both the Eastern and Western Pacific, with fleets targeting primarily skipjack tuna in the Western Pacific and yellowfin tuna in the Eastern Pacific. Current total Pacific purse seine catches are just over 1.6 million mt of fish.

Pole-and -line fishing has declined in the Pacific over the last 50 years, with most of the catch from this method of fishing now g produced by Japan’s long-range pole-and-line vessels. Pole-and-line fishing is highly selective, with most of the catch comprising skipjack fished from surface schools.

Longline fisheries across the Pacific catch about 260,000 mt, with most of the catch (80%) being caught in the Western and Central Pacific. Longliners target primarily yellowfin, bigeye and

albacore tuna, with significant amounts of swordfish being taken by longliners in New Zealand, New Caledonia, Australia, Japan and Taiwan.

Apart from small near shore coastal trollers, which target a variety of pelagic fishes, there are over 800 high seas troll vessels which target albacore tuna in the North and South Pacific. These vessels catch annually about 18-20,000 mt of albacore, with the majority of vessels operating in the North Pacific.

Directed swordfish fisheries

In addition to the sector of the Hawaii-based longline fishery which targeted swordfish prior to 2000, there are several foreign fleets (e.g., longline, gillnet and harpoon) that target swordfish in the Pacific. While most of the Pacific longline effort targets tuna species, shallow-set swordfish longlining has a higher incidence of encountering a protected or endangered species. Information on swordfish fisheries largely comes from reviews by Takahashi and Yokawa (1999), and Ward and Elscot (2000).

Foreign longline fisheries specifically targeting swordfish occur in Japan, Chile and Australia. Moderate catches of swordfish occur as bycatch in the tropical tuna fisheries, domestic Taiwan fishery and the Japanese tuna fishery in the eastern Australian fishing zone. Japanese longline fisheries are classified into three categories based on vessel size: coastal (10-20 gt), offshore (20-120 gt) and distant-water vessels (120-500 gt). Japanese offshore and distant-water vessels produce annual catches of about 11,000 mt. In the north Pacific, the longline catch was over 9,000 mt in 1985 and 1987, declined to 4,800 mt during 1991 and fluctuated between 6,000 and 8,000 mt since 1992. The offshore and distant-water Japanese catch in the north Pacific represents about 55 percent of the Pacific-wide catch. Catches in the coastal Japanese longline fleet were less than 1,000 mt in the 1980s, but increased to about 1,300 since 1993. The coastal and offshore fleets participate in a directed swordfish fishery in the Higashioki fishing grounds where the largest longline catches and catch rates occur. The Higashioki grounds are between 140˚-180˚E. and 20˚-45˚N., geographically to the west of where the Hawai‘i-based longline fishery operates. Fishing methods by the Japanese swordfish fleets are similar to the former Hawaii-based swordfish fleet: night fishing with three or four branchlines between each float which results in a shallow gear configuration.

Activity by domestic Australia longliners increased substantially during the late 1990s, with many larger vessels entering the fishery, thereby extending the range of longline activities further offshore. Fishing effort doubled from four million hooks in 1996 to 9 million in 1998 and has
remained stable thereafter. Over the same period, swordfish catches increased from 456 mt to 1,355 mt and reached a peak at 1,844 mt in 1999. Bycatch is monitored on CSIRO research cruises and on Japanese fishing vessels. The swordfish fishery is relatively new and there is potential for longliners to interact with turtles (Ward and Elscot, 2000). In particular, the Brisbane grounds are adjacent to major nesting sites of loggerhead turtle at Mon Repos and Capricorn-Bunkers. While Australian observers have monitored over 2,000 longline sets in the Japanese tuna fishery in the Australian EEZ, the Australian Fisheries Management Authority

initiated a domestic observer program in 2003.

New Zealand has a fleet of about 140 longline vessels that target bigeye and southern bluefin tunas but which also catches over 1000 mt of swordfish. This domestic longline fleet has grown exponentially since its start in1991, although it has yet to reach a size where effort is equivalent to the historic foreign fleet activity.

Chile has a substantial longline fleet, but most vessels are involved in other fisheries (e.g., Patagonian toothfish). Swordfish fishing is highly seasonal and distributed over a wide latitudinal range (15˚-40˚S.) near Chile. Up to 143 vessels have fished for swordfish since 1985 and annual longline catches have increased to over 2,000 mt in 1998.

Gillnet fisheries that target swordfish and marlin occur in Japan, Mexico and Chile. Large-mesh gillnet operations occur within the 200 nm EEZ of Japan near the Tohuku and Hokkaido regions. Fishing effort has declined substantially since 1990 and the 1996 swordfish catch was 400 mt. A small gillnet fishery in Mexico targets swordfish and marlin beyond 50 nm off the coast. Catches were 800 mt of swordfish in 1991, declined to 100 mt in 1994 and increased to 250 mt in 1998. Similarly, artisanal gillnet fishers in Chile have fished since the early 1980s and average about 3,000 mt. Both Taiwan and Japan have harpoon fisheries that target a complex of marlins and swordfish, but encounters with protected species would be rare.

IV. REGIONAL AND SOCIOECONOMIC CONTEXT OF WESTERN PACIFIC PELAGIC FMP 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. 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 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 fishermen 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. 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 exists in a natural state. Alternatively, the public, or some portions of the public, may place an intrinsic value on sea turtles 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 Kaʻaiʻai, pers. comm., 20 November 2000, WPRFMC).

V. PHYSICAL ENVIRONMENT

Ecosystem and Stocks

The pelagic ecosystem responds to ambient climatological and oceanographic conditions on a variety of spatial and temporal scales, and even in the complete absence of any fishing, stock sizes 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 oceanic 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 Pelagic 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.

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. As discussed above, these fisheries are conducted mainly by Japan, Taiwan, Spain, Korea, and, to a lesser extent, the United States.

Sea Turtle Interactions with the Hawaii-based Longline Fishery
Based on past interactions NMFS' (now invalidated) 2002 Biological Opinion estimated that the historical fishery (including both tuna and swordfish sectors) annually interacted with an average of 112 leatherback turtles (including 9 lethal interactions), 418 loggerhead turtles (including 73 lethal interactions), 40 green turtles (including 5 lethal interactions), and 146 olive ridley turtles (including 49 lethal interactions).

VI. CURRENT MANAGEMENT MEASURES

This section details the regulations in place for the Council managed pelagic fisheries as of November 25, 2003. Those considered to have been remanded by the Judge's August 31, 2003 order[1] (and reinstated through April 1, 2004 by the subsequent October 6, 2003 Court order) are

[1] The Court did not specify which specific regulations were vacated or restored.

indicated by strike outs and explanatory annotations are provided.

1 Fishing for PMUS in EEZ waters of the Western Pacific Region with drift gillnets is prohibited (52 FR 5987, March 23, 1987).

2 Vessels using longline gear to fish for PMUS in EEZ waters of the Western Pacific Region and vessels transporting or landing longline-harvested PMUS shoreward of the outer boundary of these same EEZ waters must be registered for use with a general longline permit and must keep daily logbooks detailing species harvested, area of harvest, time of sets and other information. Also, longline gear used in theEEZ waters of the Western Pacific Region must be marked with the official number of the permitted vessel that deploys the gear (56 FR 24731, May 1991).

3 Hawaii-based longline vessels must carry a NMFS observer if requested to do so (55 FR 49285, November 1990; 58 FR 67699, December 1993).

4 Each vessel that uses longline gear to fish for PMUS in EEZ waters around Hawaii, or is used to transport or land longline-harvested PMUS shoreward of the outer boundary of the EEZ around Hawaii, must be less than 101 feet in length and registered for use with one of 164 Hawaii-based longline limited entry permits (59 FR 26979, June 1994).

5 As requested by NMFS, all vessels registered for use with a Hawaii-based longline limited access permit must carry and use a NMFS-owned VMS transmitter (59 FR 58789, November 1994). Longline fishing for PMUS is prohibited in circular areas (known as "protected species zones") 50 nm around the center points of each of theNWHI islands and atolls, 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 MHI, longline fishing is prohibited in areas approximately 75 nm around the islands of Kauai, Niihau, Kaula, and Oahu, and approximately 50 nm off the islands of Hawaii, Maui, Kahoolawe, Lanai and Molokai. 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, Kahoolawe, Lanai, Molokai, Kauai, Niihau and Kaula and approximately 50 nm off Oahu (56 FR 28116, June 1991)[2]. Longline fishing is also prohibited in an area approximately 50 nm around Guam (57 FR 7661, March 1992).

6 Domestic vessels greater than 50 feet, except as exempted, are prohibited from fishing for PMUS within approximately 50 nm around the islands of American Samoa, including Tutuila, Manua and Swains Islands and Rose Atoll (67 FR 4369, January 30, 2002).

7 Federal regulations implementing the Shark Finning Prohibition Act prohibit any person under U.S. jurisdiction from engaging in shark finning, possessing shark fins harvested on board a U.S. fishing vessel without corresponding shark carcasses or landing shark fins harvested without corresponding carcasses (67 FR 6194 February 11, 2002).

8 Any domestic fishing vessel that employs troll or handline gear to target PMUS in

[2]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.

EEZ waters around the U.S. PRIA must be registered for use with a permit issued by NMFS and must maintain and submit daily logbooks detailing species harvested, area of harvest, fishing effort and other information, including interactions with protected species (67 FR 30346, May 6, 2002).

9 Vessels registered to Hawaii limited-access longline permits operating north of 23° N lat. must use line setting machines with a weight of at least 45 g attached to each branch line within 1 m of each hook or employ traditional basket-style longline gear when setting longline gear to fish for PMUS; use thawed blue-dyed bait; and discharge offal strategically (67 FR 34408, May 14, 2002). The operator and crew of all vessels registered to Hawaii limited access permits who accidentally hook or entangle an endangered short-tailed albatross must also employ specific handling procedures (67 FR 34408, May 14, 2002). *History: on 5/14/02 a final rule implementing the 2000 FWS BiOp was published. This rule noted in its preamble that although "shallow swordfish-style setting is currently prohibited by an emergency rule implemented to protect sea turtles, the USFWS BiOp requires that vessel operators making shallow sets north of 23 N. latitude begin setting the longline at least 1 hour after local sunset and complete the setting process by local sunrise, using only the minimum vessel lights necessary".*

10 All vessels registered for use with Hawaii limited access ~~or longline general permits, as well as domestic pelagic troll and handline vessels fishing for PMUS in EEZ waters of the Western Pacific Region~~, are required to employ sea turtle handling measures. Specifically, vessels that have a freeboard of 3 feet or more must carry aboard their vessels line clippers meeting the NMFS minimum design standards, including a 6-foot handle, 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 in accordance with the handling, resuscitation and release requirements. Vessels that have a freeboard of 3 feet or less must carry aboard their vessels line clippers capable of cutting the vessel's fishing line or leader within approximately 1 foot 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 in accordance with the handling, resuscitation, and release requirements. In addition, all incidentally taken sea turtles brought aboard these vessels for dehooking and/or disentanglement must be handled in a manner to minimize injury and promote post-hooking survival. When practicable, comatose sea turtles must be brought on board immediately, with a minimum of injury. If a sea turtle is too large or hooked in such a manner as to preclude safe boarding without causing further damage/injury to the turtle, line clippers meeting the NMFS standards must be used to clip the line and remove as much line as possible prior to releasing the turtle. If a sea turtle brought aboard appears dead or comatose, the sea turtle must be placed on its bottom shell or plastron, so that the turtle is right side up and its hindquarters elevated at least 6 inches for a period of no less than four hours and no more than 24 hours. The turtle must be shaded and kept damp or moist but under no circumstances placed in a container holding water. The turtle should be periodically rocked gently left to right

and right to left by holding the outer edge of the shell (carapace) and lifting one side about 3 inches and then alternate to the other side. A reflex test must be performed at least every three hours to see if the turtle is responsive. Turtles that revive and become active must be gently returned to the sea; those that fail to revive in 24 hours must also be returned to the sea. (65 FR 16346, March 28, 2000; 66 FR 67495 December 31, 2001; 67 FR 40232, June 12, 2002). Note: Bringing sea turtles aboard vessels is only required "when practicable"; this action is not likely to be practicable on many non-longline vessels. *History: a proposed rule was published on 2/17/00 that cited NMFS' 1998 BiOp's ITS, as well as a 9/26/99 court order directing NMFS to require "every vessel with a Hawaii longline permit to carry and use line clippers and dip nets to disengage hooked or entangled sea turtles". In addition, the rule imposed handling requirements. This rule was finalized on 3/28/00. On 12/31/01 the handling requirements were slightly revised due to findings by NMFS that pumping a turtle's plastron may be detrimental. On 6/12/02, in a final rule that "implements the reasonable and prudent alternative of the March 29, 2001 BiOp", the mitigation gear and handling requirements were enlarged to include American Samoa longline, and non-longline vessels, as well as being slightly relaxed for vessels with less than 3' in freeboard (based on a request from the Council and PIRO).*

11 Operators and owners of vessels registered to Hawaii limited access permits ~~or longline general permits (after August 31, 2002)~~ must annually attend protected species workshops conducted by NMFS that discuss sea turtle and seabird biology, conservation and mitigation techniques (67 FR 34408, May 14, 2002; 67 FR 40232, June 12, 2002). *History: on 5/14/02 a final rule implementing the 2000 FWS BiOp was published. This rule appears to require both the owner and operator of Hawaii registered longline vessels to annually attend protected species workshops sponsored by NMFS. The 6/12/02 final rule extended the requirement to include operators of vessels registered to longline general permits.*

12 ~~A Hawaii longline limited access permit may be re-registered to a vessel only during the month of October, if its owner had previously de-registered that from its permit vessel after March 31, 2001 (67 FR 40232, June 12, 2002).~~

13 ~~Vessels registered to Hawaii limited access permits are prohibited from using longline gear to catch PMUS or engaging in fish transshipping operations supporting longline fishing from April 1 through May 31 in waters between the equator and 15°N lat. and from 145°W to 180° long. (67 FR 40232, June 12, 2002).~~

14 ~~Vessels registered to Hawaii limited-access or general longline permits are prohibited from using longline gear to fish for or target swordfish north of the equator. When fishing north of the equator, these vessels must deploy longline gear such that the deepest point of the main longline between any two floats, i.e., the deepest point in each sag of the mainline, is at a depth greater than 100 m below the sea surface. The length of each float line used to suspend the main longline beneath a float must be longer than 20 m with no fewer than 15 branch lines set between any two floats if the main longline is monofilament set by a line setting machine or no fewer than 10 branch lines between any two floats if the main longline is non-monofilament line set by traditional basket-style technique. In addition, the~~

~~possession or use of light sticks or any other light-emitting device, such as glow worms or glow beads, as artificial lures to attract and catch swordfish north of the equator is prohibited (67 FR 40232, June 12, 2002).~~

~~Vessels registered to Hawaii limited access or general longline permits are prohibited from possessing or landing more than 10 swordfish on any fishing trip that included any fishing north of the equator (67 FR 40232, June 12, 2002).~~

In December 2000, Congress passed a bill amending the Magnuson-Stevens Act in order to implement a nationwide ban on landing of shark fins without the shark carcass. A final rule became effective March 13, 2002.

VII. DESCRIPTION OF THE ALTERNATIVES

In this section is a description of the compliance requirements of the proposed rule, a description of the skills necessary to meet those requirements, identification of duplicating, overlapping, and conflicting Federal rules, a description and history of all the alternatives that were considered, a description of the reasons for not choosing the alternatives, and a description of the non-regulatory elements of the alternatives.

Description of the Proposed Reporting, Recordkeeping, and other Compliance Requirements

As described further in Section VIII, there are two types of businesses to which the rule would apply: businesses operating under Hawaii longline limited access permits and businesses operating under longline general permits. Throughout this section, vessels registered for use under Hawaii longline limited access permits are referred to as “Hawaii-based longline vessels.”The proposed rule would:

1) Establish an annual limit on the amount of shallow-set longline fishing effort north of the equator that may be collectively exerted by Hawaii-based longline vessels (set at 2,120 shallow-sets per year);
2) divide and distribute this shallow-set effort limit each calendar year in equal portions (in the form of transferable single-set certificates valid for a single calendar year) to all holders of Hawaii longline limited access permits that respond positively to an annual solicitation of interest from NMFS;
3) prohibit any Hawaii-based longline vessel from making more shallow-sets north of the equator during a trip than the number of valid shallow-set certificates on board the vessel;
4) require that operators of Hawaii-based longline vessels submit to the Regional Administrator within 72 hours of each landing of pelagic management unit species one valid shallow-set certificate for every shallow-set made north of the equator during the trip;
5) require that Hawaii-based longline vessels, when making shallow-sets north of the equator, use only circle hooks sized 18/0 or larger with a 10-degree offset;

6) require that Hawaii-based longline vessels, when making shallow-sets north of the equator, use only mackerel-type bait;
7) establish annual limits on the numbers of interactions between leatherback and loggerhead sea turtles and Hawaii-based longline vessels while engaged in shallow-setting (set equal to the annual estimated incidental take for the respective species in the shallow-set component of the Hawaii-based fishery, as established in the prevailing biological opinion issued by NMFS pursuant to section 7 of the ESA);
8) establish a procedure for closing the shallow-setting component of the Hawaii-based longline fishery for the remainder of the calendar year when either of the two limits is reached, after giving 1 week advanced notice of such closure to all holders of Hawaii longline limited access permits (the numbers of interactions will be monitored with respect to the limits using year-to-date estimates derived from data recorded by NMFS vessel observers);
9) require that operators of Hawaii-based longline vessels notify NMFS in advance of every trip whether the longline sets made during the trip will involve shallow-setting or deep-setting and require that Hawaii-based longline vessels make sets only of the type declared (i.e., shallow-sets or deep-sets);
10) require that operators of Hawaii-based longline vessels carry and use NMFS-approved de-hooking devices; and
11) require that Hawaii-based longline vessels, when making shallow-sets north of 23° N. lat., start and complete the line-setting procedure during the nighttime (specifically, no earlier than one hour after local sunset and no later than local sunrise).

The regulatory measures listed above would replace the existing restrictions on longlining north of the equator, which will be eliminated on April 1, 2004, by the Court rulings of August 31, 2002, and October 6, 2003 (see Sections II and VI for description of restrictions that will be eliminated). Certain measures that will be eliminated by the Court ruling would not be reinstated under the proposed rule. Specifically, the proposed restrictions related to shallow-setting would apply only to Hawaii-based longline vessels, not general longline vessels; Hawaii-based longline vessels and general longline vessels would no longer be prohibited from longlining during April and May in certain waters south of the Hawaiian Islands; operators of general longline vessels would no longer be required to annually complete a protected species workshop; operators of general longline vessels and of other vessels using hooks to target Pacific pelagic species would no longer be required to employ specified sea turtle handling measures; and the period during which vessels de-registered from a Hawaii longline limited access permit after March 29, 2001, would be allowed to be re-registered to Hawaii longline limited access permits would no longer be limited to the month of October.

Skills Necessary to Meet Compliance Requirements

No special skills would be required to comply with the proposed compliance requirements. All affected entities already have the skills necessary to comply with the proposed longline gear-related requirements. NMFS may provide additional training in the proper use of the required dehookers through the protected species workshops that owners and operators of Hawaii longline

limited access permits must attend and complete each year. All affected entities already have the skills necessary to comply with the proposed notification requirements (i.e., notifying NMFS each year if interested in receiving shallow-set certificates and indicating in the already-required pre-trip notification to NMFS whether shallow-sets or deep-sets will be done during the trip).

Identification of Duplicating, Overlapping, and Conflicting Federal rules

To the extent practicable, it has been determined that there are no Federal rules that may duplicate, overlap, or conflict with this proposed rule.

Development and Description of Alternatives

Because the impetus for this action is concern for fishery interactions with sea turtles, and because the Hawaii-based longline fishery is the only FMP-managed fishery thought to interact significantly with sea turtles this action focuses on that fishery. Thus, under all alternatives considered here the management of all other fisheries would remain unchanged, except in the case of time/area closures which would also affect general longline permit holders who are currently subject to the southern time/area restriction along with Hawaii-based longline vessels. General longline permit holders would also continue to be prohibited from participating in the Hawaii-based longline fishery (meaning to fish in Hawaii's EEZ or to land fish in Hawaii) without obtaining a Hawaii longline limited access permit.

As discussed in Section II, the Council's Sea Turtle Conservation Special Advisory Committee held a series of meetings in late 2003 to craft the following recommendations for further analysis and possible Council action. As stated above, all action alternatives would require night-setting by vessels shallow-setting north of 23° N., and Committee Alternatives 1-5 would require the use of dehookers in accordance with NMFS' guidelines now being written. In addition, all alternatives include the implementation of a suite of conservation measures and potential fishing trials as described below.

Committee Alternative 1. Allow 1,060 model swordfish sets annually, in conjunction with tuna fishing with no time/area closure.

Committee Alternative 2. Allow 1,560 model swordfish sets in conjunction with tuna fishing with no time/area closure.

Committee Alternative 3. Allow 2,120 model swordfish sets annually, in conjunction with tuna fishing under the reimplementation of the recent time/area closure modified by opening EEZ waters around Palmyra Atoll.

Committee Alternative 4. (preferred) Allow 2,120 model swordfish sets annually, in conjunction with tuna fishing with no time/area closure.

Committee Alternative 5. Allow 3,179 model swordfish sets annually, in conjunction with tuna fishing with no time/area closure.

Committee Alternative 6. (current fishery) Do not allow any swordfish sets, allow tuna fishing with recent time/area closure.

Committee Alternative 7. (no action) No management action is taken by April 1, 2004, June 12, 2001 rules are vacated, fishery returns to previous FMP management regime.

Implementing Details

There are several available options in implementing a system that distributes and monitors and controls a restricted amount of fishing effort allowable for the model swordfish fishery. The details of how this effort is managed are not likely to significantly impact the number of sea turtle interactions or mortalities. However, they can affect the operations and success of fishery participants and thus are relevant to this action's objective of achieving OY. Due to ease and familiarity in implementation, these options assume that allowable fishing effort would be identified and monitored in number of sets, though limits on the number of trips, vessels, or other systems could also be appropriate. A series of Participation Options examine ways in which allowable effort is distributed, while two Closure Options examine ways in which the model swordfishery could be closed when allowable limits are reached. Under all options, allowable effort would not be temporally restricted, meaning that participants would be able to fish at any time during the season or year.

Participation Options 1-4 were discussed at the 120th Council meeting. The Council indicated that it preliminarily preferred Option 4, but in recognition of some outstanding issues an advisory group consisting of industry members, scientists, and managers was formed to make recommendations to NMFS concerning its technical and operational details. Option 5 (preferred) which would divide allowable effort equally among interested permit holders is the result of that group's work.

Participation Option 1-Allow participation in the model swordfish-style fishery based on "first come first served." Depending on the amount of allowable effort, this option could result in a derby-style fishery where many participants gear up and fish in a competitive manner until the effort limit is reached. This could lead to safety problems if fishing occurs during hazardous weather or sea conditions, market effects if many vessels offload simultaneously, and inefficient (excess) investment if more boats gear up than are necessary. This option could be seen as avoiding issues of equity by providing an equal opportunity for all permit holders to participate in the swordfish-style fishery and it would be relatively easy to allocate available effort. However the necessary monitoring and closure of the fishery would be difficult as on any given day there are many vessels at sea - some of which are actively fishing and others of which are in transit. In addition, not every vessel has communication capabilities that are compatible with NMFS' systems.

Participation Option 2 - Allow participation in the model swordfish-style fishery based on individual historical participation Basing participation on each vessel's fishing history could be seen as equitable by many participants although there would likely be some dissension between those permit holders whose vessels have remained in Hawaii and those that have recently based their vessels in California to continue swordfishing. In addition, it would represent an uncompensated loss of access to the tuna sector which was not historically prohibited from participating in the swordfish fishery. This option could be difficult to implement as logbooks would have to be analyzed, decisions over which historical fishing to consider would have to be made, and trails of vessel and permit transfers would need to be traced. Costs to fishery participants would be a function of which vessels were allowed to participate and whether successful vessels were currently rigged for tuna-style or swordfish-style fishing. This option may result in efficiencies if there is no method for uninterested successful permit holders to transfer their allowable effort to those who do want to fish swordfish-style.

Participation Option 3 - Divide allowable effort equally among all boats. This option would allow each permit holder to fish an equal amount of effort (days, sets, hooks etc.). Although apparently fair, it is likely to result in inefficiencies if there is no method for uninterested permit holders to transfer their allowable effort to those who want to fish swordfish-style.

Participation Option 4 - Allow participation in the model swordfish-style fishery based on a lottery. Perceptions of equity are likely to be a function of who is eligible to participate in the lottery. Opening it to all permit holders might be seen as unfair to those who have historically fished swordfish-style (although the swordfish sector has never had its own limited entry program), while only allowing historical participants in would be likely to be seen unfavorably by tuna fishermen. The issue of unused effort could be addressed by opening a lottery to all (and only) those who express an interest. Assuming that fair notice is given to all permit holders, this may be seen as a reasonable compromise.

Participation Option 5 - Divide allowable effort equally among interested permit holders (preferred) Under this refined version of Participation Option 3, certificates for allowable sets would be evenly divided among permitted vessels belonging to interested permit holders (including those whose vessels are not currently registered to their permits) based on their positive response to a letter sent by NMFS. Permit holders could either fish their shares themselves, or trade, sell, or give them to other Hawaii longline limited access permit holders to use during that fishing year. The use of uniquely numbered physical certificates for each set will allow permit holders to transfer allowable effort among themselves with no intervention or recordkeeping by NMFS. This should result in increased efficiency as effort shares should be worth more to (and thus move toward) those who believe that they have a higher likelihood of shallow-setting profitably (e.g. experienced swordfish fishermen). Restricting effort shares to those who express interest will help to ensure that allowable effort is used. This option was endorsed by the Hawaii Longline Association.

Several options for the monitoring and control of model swordfishing effort and turtle interactions have been discussed. Fishery data would continue to be collected based on logbooks

and other fishery monitoring systems, with fishing ceasing each year when all allowable effort certificates were used. Interaction data would continue to be collected by NMFS through its observer program. NMFS has reported that the recent recalibration of its observer placement design to achieve random sampling should allow relatively simple and timely extrapolations of observed interactions into fleet wide estimates.

The following options consider the action to be taken when these extrapolations indicate that the model swordfishery has reached its anticipated takes. Closure Options 1 and 2 were discussed at the 120th Council meeting. The Council indicated that it preliminarily preferred Option 1, but in recognition of some outstanding issues, an advisory group consisting of industry members, scientists, and managers was formed to make recommendations to NMFS concerning its technical and operational details. Option 3 (preferred) which would apply a "hard limit" for the swordfish fishery for leatherbacks and loggerheads is the result of that group's work.

Closure Option 1- When the swordfish fishery's incidental take statement or other limit is reached close the swordfish fishery ("hard limit"). This alternative would provide certainty to fishery participants and managers that the swordfish fishery would stop fishing when its average incidental take statement or other limit is reached. If the hard limit is set correctly, it could also avoid the reinitation of section 7 consultations due to excessive interactions.

Closure Option 2 - When swordfish fishery's incidental take statement or other limit is exceeded reinitiate consultation on the swordfish fishery. As compared to Closure Option 1, reinitiation of consultation would provide a less certain outcome in terms of continued swordfish fishing. In the past, reinitiation of consultations has resulted at times in fishery closures, however some fisheries have been allowed to continue fishing during the re-consultation period.

Closure Option 3 - When the swordfish fishery's new incidental take statement is reached for leatherback or loggerhead turtles, close the model swordfish fishery (preferred). Under this refinement of Closure Option 2, hard limits would be placed on the swordfish fishery for leatherback and loggerhead turtles (the species of concern in the shallow-set fishery) and the model swordfishery would be closed each calendar year when its new incidental take statement (concerning total interactions) for leatherback or loggerhead sea turtles is reached. Interactions and incidental take statements for green and ridley turtles would be combined with those for the tuna fishery and normal ESA procedures would apply to these species (as they would also apply to leatherbacks and loggerheads taken by the swordfish fishery). Updated information on year-to-date interactions will be available from fishery managers to inform participants as to the fishery's status regarding the established hard limits. This will allow vessel operators to avoid embarking on trips that are likely to be ended prematurely, as well implicitly providing notice of upcoming closures. Fishery participants would receive formal notice from NMFS at least one week in advance of any closure. Barring other new information, the fishery would automatically reopen on January 1 of the next year. Hard limits would not be used for olive ridley and green sea turtles. Although this option could also result in a derby-style fishery, it is unlikely as incidental take statements are calculated taking into consideration total anticipated fishing effort. Therefore the threat of the incidental take statement being exceeded is low and the incentive to

race to the fish (turtles) is also low.

Providing separate incidental take statements would allow early closure of fisheries that are having high rates of interactions with the species of highest concern, but allow fishing to continue by lower impact gear types. Data on anticipated interactions has historically been grouped into deep vs. shallow-set gears so this will not pose a new estimation problem. However, due to sampling procedures and the desire to maintain consistent rates of observer coverage, participants would have to declare their trip type (deep or shallow set) when they contacted NMFS as to whether they would need to carry an observer. Once the trip commenced, participants would be prohibited from switching gear types for the remainder of that trip.

In addition to the measures described above, the advisory group has suggested that NMFS hold dockside or other sessions to educate participants in the model swordfish fishery on the proper use of circle hooks with mackerel-type bait, and to educate all fishery participants on the appropriate use of dehookers. This group also suggested that NMFS consider providing 100% observer coverage for the model swordfish fishery for at least the first year, as this would provide complete information on the frequency and nature of fishery interactions with sea turtles as well as detailed information on the fishing practices of all vessels. Regardless of observer coverage, the group recommended that if realtime estimates are necessary and practicable, NMFS provide observers with a reliable means of shoreside communications for them to call-in immediately if interactions are observed.

Reasons for not Choosing Alternatives

The alternatives included two variations on the seasonal area longline closure, including one that would retain the current April-May closure in certain waters south of the Hawaiian Islands and one that would retain the current April-May closure with the exception of the EEZ waters around Palmyra Atoll (the proposed rule would eliminate the current April-May area closure). The alternatives were rejected because they would unnecessarily constrain the fishing activities and economic performance of holders of longline general permits and Hawaii longline limited access permits, and adverse impacts to sea turtles could be mitigated through other measures.

The alternatives included five variations on the amount of shallow-setting longline effort north of the equator that would be allowed by Hawaii-based vessels, ranging from zero to unlimited, as well as one alternative that would allow only a one-time trial of 1,560 sets (the proposed rule would limit shallow-setting effort at 2,120 sets, about 50 percent of the 1994-1998 annual average level). The alternatives allowing shallow-setting at levels greater than 50 percent of the 1994-1998 average were rejected because they might fail to adequately minimize adverse impacts on sea turtles. The alternatives allowing shallow-setting at levels less than 50 percent of the 1994-1998 average were rejected because they would unnecessarily constrain the fishing activities and economic performance of Hawaii-based longline vessels, and adverse impacts to sea turtles could be mitigated through other measures.

The alternatives included several variations on how the allowable level of shallow-setting effort

north of the equator would be allocated among holders of Hawaii longline limited access permits. Variations included allocating the available effort by lottery, allocating it equally among all permit holders, allocating it in proportion to the permit holders' historical shallow-setting effort, and not allocating the effort in any particular way, in which case the fishery would be closed each year once the fleet-wide limit is reached (the proposed rule would divide and distribute the limit equally among all interested permit holders in the form of transferable shallow-set certificates). The lottery variation was rejected because it would impose a substantial amount of uncertainty on fishermen and might be considered inequitable by some fishermen. The equal-distribution variation was rejected because it would give each permit holder too few shallow sets to be able to make it worth investing and participating in the shallow-set component of the fishery, thereby constraining the economic performance of that component. The fleet-wide limit variation was rejected because it would be administratively difficult and could create an incentive for each permit holder to do as much shallow-setting as possible before the fishery is closed, thereby encouraging fishermen to shallow-set under what would otherwise be sub-optimal conditions (in terms of both economic performance and safety).

The alternatives included several variations on the sea turtle interaction limit(s), including no limit and a limit for every species for which there is an Incidental Take Statement issued under the ESA. The preferred alternative rule would close the shallow-set component of the fishery if the annual limit on interactions with leatherback sea turtles or loggerhead sea turtles is reached. These limits would be set equal to the annual estimated incidental interactions with the respective species in the shallow-set component of the Hawaii-based fishery, as established in the prevailing biological opinion issued by NMFS pursuant to section 7 of the ESA. The no-limit variation was rejected because it might fail to adequately minimize adverse impacts on sea turtles. The variation of establishing limits for all affected species was rejected because it would likely result in the shallow-set component of the fishery being closed more often than is needed to adequately mitigate adverse impacts on sea turtles.

Non-Regulatory Elements of Alternatives

In addition to the regulatory elements of the various alternatives, some of the alternatives included non-regulatory elements, as described below.

Fishing Trials

Committee Alternative 4 (preferred) would also potential for fishing trials within the model swordfish fishery, if recommended by NMFS' scientists. These trials would take place on commercial fishing boats and use the circle hooks and mackerel-type bait described here as a control. All fishing effort expended, and turtle interactions recorded during any such trials, would count against the swordfish fisheries effort and turtle limits. Examples of technologies that might be tried include turtle repellent bait, the use of lights that turtles perceive as flashing and unattractive but which appear steady and attractive to fish, and other techniques that could be used in conjunction with circle hooks and mackerel-type bait to further reduce and mitigate interactions with sea turtles.

Description of Conservation Projects Included in All Alternatives

Five conservation projects are being undertaken as a part of all alternatives. Although non-regulatory, these measures are designed to conserve sea turtles, as well as to mitigate the impacts of the fishery on affected populations. Of the four sea turtle species of concern, the population of Hawaii green sea turtles are increasing and olive ridley turtle nesting aggregations in the western Pacific appear to be somewhat stable or increasing slightly. On the other hand, leatherback and loggerhead turtles are the species most often captured by the Hawaii-based longline fishery and their Pacific populations are in general decline. For that reason, these species are the focus of the measures proposed here to mitigate the impacts of the Hawaii-based longline fishery on sea turtles.

For leatherback sea turtles, the emphasis of these measures is placed on the western Pacific leatherback stock because the majority of interactions with the Hawaii-based longline fishery have been with this stock (16 out of 17 sampled turtles have been from the western Pacific stock). Although geneticists have been unable to trace these fishery interactions to specific nesting beaches, beaches in Papua (formerly Irian Jaya) and Papua New Guinea are believed to comprise the majority of western Pacific nesting populations and are thus most likely to contain populations affected by the fishery. Satellite telemetry data from the electronic tagging of turtles from the northern coast of Irian Jaya has also shown that these turtles are the likely source of the majority of leatherback turtles that migrate through the areas of ocean fished by the Hawaii longline fleet. In addition to the egg protection which is a necessary component of a conservation and recovery program, leatherback measures emphasize protection of adults as the fishery is known to interact with adults and sub-adults. Loggerheads measures focus on the North Pacific (Japanese) stock because all fishery interactions have been with this population. Loggerhead measures have a particular emphasis on juveniles as that is the life stage with which the fishery interacts.

Under the proposed conservation measures, the Council will continue to collaborate with NMFS to develop and fund contracts with relevant non-governmental organizations (NGOs) such as World Wildlife Fund - Indonesia (WWF-Indo), Kamiali Integrated Conservation Development Group (KICDG) of Papua New Guinea, the Sea Turtle Association of Japan, and Wildcoast in Baja, Mexico. The conservation measures in this document have come directly from these NGOs currently working at relevant sites conducting research and population monitoring activities and were reviewed and endorsed by the Council's Sea Turtle Advisory Committee at their July 2003 meeting. This committee was established by the Council to direct and advise the Council in its activities related to sea turtle conservation and sea turtle related fishery management initiatives. Committee members include world renowned experts in sea turtle biology, conservation and recovery, including several scientists from NMFS' Science Centers. The committee concluded that the projects described here are valuable, hold scientific merit, and should be incorporated into the management measures considered by the Council. The conservation measures described below are new projects, but cost estimates are dependent on preexisting programs. In other words, proposed projects are designed to augment programs already in existence to support additional conservation objectives and projects. As noted below, establishment of some of these projects has commenced in order to protect turtles during the 2003 nesting season.

Papua (formerly Irian Jaya), War-mon Beach:
The Council is developing a contract with the World Wildlife Fund-Indonesia (WWF-Indo), commencing November 1, 2003 to hire villagers to protect the War-mon nesting beach at Jamursba-Medi, Bird's Head Peninsula in Papua (formerly Irian Jaya). This measure will build on existing programs already established by WWF-Indo and supported by the Indonesian Government at Jamursba-Medi, the largest known leatherback nesting site in Indonesia. WWF-Indo has achieved great success in eliciting the enthusiastic support and involvement of local people for nesting beach protection and management in this area.

This effort will protect 1/3 of the known leatherback nesting beach habitat along the north coast of Papua and protect between 90% and 100% of the currently unprotected War-mon beach at Jamursba-Medi. This effort has been estimated to result in the protection of approximately 1,000 leatherback nests per year (TAC 2003, P. Dutton, NMFS SWFSC) from predation by feral pigs, beach erosion and egg collectors. Protection may be achieved through the use of an electric fence to keep pigs off beach, by relocating eggs to more secure areas, and deter poachers through monitoring presence. In addition, through monitoring presence, measures are expected to conserve and additional 10 adult nesting females per year from poachers.

Western Papua coastal foraging grounds:
The Council has contracted with WWF-Indo to work with villagers in western Papua's Kei Kecil islands to reduce and /or eliminate the harpooning of about 100 adult leatherback turtles per year in the coastal foraging grounds (TAC 2003, P. Dutton, NMFS SWFSC). In addition, effort will be made to explore and identify alternative food resources.

Papua New Guinea nesting beaches:
The Council has contracted with the Kamiali Integrated Conservation Development Group (KICDG), commencing November 1, 2003 to work with up to three villages of the Kamiali community in Papua New Guinea to eliminate egg harvesting and nest predation of leatherback eggs, and move those eggs laid in areas likely to be lost to beach erosion. Current practices have a 2 km section of beach marked off as a "no take" area. This effort will provide additional protection of approximately 90% of the nesting beach, and is estimated to save about 1,000 to 1,500 nests per year (TAC 2003, P. Dutton, NMFS SWFSC).

In addition to establishing nesting beach management measures in Papua New Guinea, the Council, NMFS PIRO/PIFSC and NMFS Southwest Fisheries Science Center (SWFSC) will conduct aerial surveys of the coastal areas of northern Papua New Guinea, Solomon Islands and Vanuatu over the next 4 years to establish a comprehensive inventory of leatherback nesting beaches for which further conservation projects might be established. An initial feasibility study to conduct the initial surveys has been funded for late 2003 (WPRFMC in prep.), and funding has been identified for a more complete survey of northern Papua New Guinea in 2004.

Baja, Mexico halibut gillnet fishery:
The Council is developing a contract with Wildcoast to conduct mortality reduction workshops with fishermen and place observers on local boats to insure that all the live loggerheads that

comprise the estimated 3,000 loggerhead juveniles per year caught in the halibut gillnets are returned to the ocean (TAC 2003, P. Dutton, NMFS SWFSC). Without observers these loggerheads become part of the catch.

Japan nesting beaches:
The Sea Turtle Association of Japan (STAJ) has proposed moving loggerhead eggs from locations prone to washing out and provide shading to nests that experience extreme temperatures at two nesting beaches. A contract has been developed with STAJ for this work to begin during the May 2004 nesting season. This activity is estimated to result in saving 53 loggerhead nests (TAC 2003, G. Balazs, NMFS PIFSC), and would provide valuable benefits towards establishing cooperative working relationships.

The Council will also continue to augment and expand its role in developing educational materials to support the establishment of a nesting beach management program at War-mon beach and for the establishment of similar programs elsewhere in Melanesia. In addition, a contract has been developed with the Ostional National Wildlife Refuge in Costa Rica to assist managers to convene workshops to reduce sea turtle mortalities in longline fisheries based in Costa Rica.

Finally, in addition to the measures described above, a Council advisory group including fishery managers and industry representatives formed to provide technical advice on the implementation of the proposed action has suggested that NMFS hold dockside or other sessions to educate participants in the model swordfish fishery on the proper use of circle hooks with mackerel-type bait, and to educate all fishery participants on the appropriate use of dehookers.

VIII. DESCRIPTION OF SMALL BUSINESSES TO WHICH THE RULE WOULD APPLY

Table 5 presents data for 2003 that indicate the number of fishing operations that would be directly affected by the alternatives. All the Hawaii-based vessels operate under Hawaii longline limited access permits, the number of which is limited to 164. The vessels based in American Samoa, Commonwealth of the Northern Mariana Islands, and Guam operate under longline general permits, which are not limited in number. The majority of vessels are owner operated however some individuals hold permits for more than one vessel, or own more than one vessel. Maximum fleet (vessel) percentage ownership by any one individual or entity is believed to be less than 10%. All these fishing operations are believed to be small businesses; that is, they have gross revenues of less than $3.5 million annually, they are independently owned and operated, and they are not dominant in their field. Please see Section III for a description of these vessels' gear types and operating patterns.

Table 5. Number of longline fishing operations to which the rule would apply

2003 Western Pacific longline fisheries		
Base	Number of permits	Number of active vessels (preliminary data)
Hawaii	164	126
American Samoa	65	48
Guam	1	0
CNMI	1	0

IX. COMMENTS RECEIVED ON THE INITIAL REGULATORY FLEXIBILITY ANALYSIS

One commentor stated that the IRFA's analysis of the participation options contained inadequate information concerning their genesis, refinement, and potential impacts especially concerning perceptions of fairness. Fairness can be achieved in many ways and what may appear fair to some may appear unfair to others. The primary consideration in the refinement of the preferred alternatives participation option was input from the Hawaii Longline Association which represents the affected parties (permit holders) as it is their perceptions of fairness which would seem most relevant. This FRFA contains additional text on these issues. No changes were made to the preferred alternative or the proposed rule for this action.

X. ECONOMIC IMPACTS OF THE ALTERNATIVES ON SMALL BUSINESSES

To provide a common reference point, each alternative presented here is compared to the management measures in place under the FMP between 1994 and 1999 (when the Hawaii-based swordfish and tuna fisheries were both fully active). This baseline is used as it represents the most recent long-term data used by scientists to fully analyze the relative impacts of each alternative. Data below do not include California landings by vessels which carry Hawaii permits.

However it should be noted that the peak of Hawaii's swordfish fishery occurred between 1991 and 1993 when an average of almost 12 million pounds of swordfish were landed annually. Table 6 presents the baseline (1994-1999 annual averages) for the factors used in this analysis.

Table 6. Baseline for the Hawaii-based longline fleet (1994-1999 average annual data)
Source: *Annual Report of the Hawaii-based Longline Fishery for 2000* HL Admin Report H-01-07

Number of active vessels	113

Number of vessels that targeted swordfish on at least one trip	40
Average annual swordfish trips per vessel above	3
Number of vessels that targeted tuna on at least one trip	83
Average annual tuna trips per vessel above	8
Number of vessels with mixed targets on at least one trip	49
Average annual mixed trips per vessel above	6
Swordfish landings and ex-vessel revenue	6.5 million pounds $13.8 million
Bigeye tuna landings and ex-vessel revenue	5.2 million pounds $17 million
Albacore tuna landings and ex-vessel revenue	2.5 million pounds $3 million
Yellowfin tuna landings and ex-vessel revenue	1.7 million pounds $4.6 million
Other landings and ex-vessel revenue	8.5 million pounds $7 million
Total fishery landings and ex-vessel revenue	24.4 million pounds $45.4 million
Average landings and ex-vessel revenue per vessel	215,929 pounds $401,770

In comparison, Table 7 provides 2001 available information on the fishery under the current regulations including the ban on swordfish targeting and the seasonal southern area closure.

Table 7. 2001 data for the Hawaii-based longline fleet Source: Draft 2002 Annual Report on the Pelagic Fisheries of the Western Pacific Region (WPRFMC)

Number of active vessels	102
Number of tuna trips (based on current regulations, only deep-set tuna targeting trips are allowed)	1,193
Average trips per vessel	12
Incidental swordfish landings and ex-vessel revenue	.5 million pounds $1.2 million

Bigeye tuna landings and ex-vessel revenue	5.2 million pounds $18.2 million
Albacore tuna landings and ex-vessel revenue	2.8 million pounds $3.2 million
Yellowfin tuna landings and ex-vessel revenue	2.2 million pounds $5.5 million
Other landings and ex-vessel revenue	4.8 million pounds $4.9 million
Total fishery landings and ex-vessel revenue	15.5 million pounds $33 million
Average landings and ex-vessel revenue per vessel	151,961 pounds $323,529

NMFS scientists have modeled the anticipated impacts of the alternatives on fleet-wide catches of major species and ex-vessel revenues in relation to the 1994-1999 baseline. Table 7 presents these data.

Impact on Hawaii-based Longline Vessel Operations

Table 8. Comparison of impacts of the alternatives on the annual catch and revenue of the Hawaii-based longline fleet. Source: NMFS PIFSC

Committee Alternative	Change in swordfish catches	Change in bigeye catches	Change in albacore catches	Change in yellowfin catches	Changes in fleet-wide ex-vessel revenue
1	-67.2%	19.2%	27.8%	18.2%	-6.6%
2	-56.6%	16.2%	23.5%	15.3%	-5.6%
3	-44.5%	11.3%	21.7%	18.2%	-4.4%
4 (preferred alternative)	-44.8%*	12.8%	18.6%	12.1%	-4.4%*
5	-22.4%	6.4%	9.3%	6.1%	-2.2%
6 (Current fishery, 2002 data)	-92.3%	0.0%	12.0%	29.4%	-27.3%
7 (No action, 1994-1999 baseline)	6.5 million pounds	5.2 million pounds	2.5 million pounds	1.7 million pounds	$45.4 million

* Modeling for these estimates did not include the 30% increase seen in swordfish catches when circle hooks with mackerel bait were used in the Atlantic longline fishery.

The impact on the seafood marketing sector, fishing supply businesses, and other associated businesses is expected to be proportional to the impact on ex-vessel revenue in an input-output perspective.

The distribution of impacts on individual vessel operators under each of the alternatives would vary according to their historical and future operating patterns. Assuming that allowable effort shares (transferable single set certificates) are distributed as in the preferred participation option (distributed equally among interested Hawaii longline limited access permit holders), it is expected that these shares will be transferred to those permit holders who are most interested in using them.. Economic theory would predict that these will be the individuals who are able to use them most efficiently (i.e. profitably) as they will be willing to pay a higher price than those who do not expect to achieve similar profits swordfishing. Since the de facto partial opening of the

swordfish fishery provides an opportunity but not a restriction on current operations, the cost of doing so is essentially equivalent to exercising an option, rather than a regulatory cost per se.

These are likely to be permit holders with a history (and therefore experience) in swordfishing, and may include a significant number of vessels now temporarily based in California and targeting swordfish. These vessels are already outfitted for this fishing style as compared to vessels which have remained in Hawaii to target tuna so their costs to gear up will be low. However it is unknown how many of the now California based vessel operators have satisfactorily relocated their families to California and how many would like to return to Hawaii. In addition, there will be relocation costs for any California vessels and crews (with or without families) for the relatively limited duration of the swordfish fishery. Thus the advantages to vessels choosing to swordfish, or those who would choose to swordfish, may be reduced by the cost of acquiring sufficient certificates to enable full operations for all or part of the season, as well as the transition costs of shifting from current tuna longline operations or from swordfish operations in California. Costs for acquiring specialized equipment, including circle hooks and dehookers (which would be required for all Hawaii-based longline vessels), and for using mackerel-type bait, are minimal in the context of total longline operating costs (which are in the range of $250,000 annually) for medium-sized vessels.

Participation Option 1, which would allow fishing on a first-come first-served basis, was rejected because it could result in a derby-style fishery with the associated congestion, market gluts and shortages which could accompany a fishery that contracts its annual effort into a limited time period. Although it would be relatively easy to allocate available effort, the necessary monitoring and closure of the fishery would be difficult as on any given day there are many vessels at sea - some of which are actively fishing and others of which are in transit. Participation Option 2 which would distribute allowable effort in proportion to historical participation in the swordfish fishery was rejected in part because of the administrative challenges given the short timeline for implementing this action, and because it would exclude those participants who have historically targeted tuna, but who were not previously barred from participating in the swordfish sector. Participation Option 3, which would distribute allowable effort equally among all permit holders, was rejected on the basis that this could result in unused allowable effort by disinterested parties, which was considered to constitute a waste of economic opportunity. Participation Option 4, which would have implemented a lottery among permit holders with historical swordfishing experience, was rejected for the same reason as for Option 2, it would be difficult to implement given the short timeline for finalizing this action, and because it would exclude those participants who have historically targeted tuna, but who were not previously barred from participating in the swordfish sector. The preferred option's provision to allow transfers of effort shares among permit holders means that those who sell their effort shares will be compensated for yielding their right to participate in the model swordfish fishery. Allowing shares to be transferable will likely lead to their acquiring monetary value, this will help to ensure that all allowable effort is used, thus achieving optimum yields from the fishery which is one of the objectives of this action. The costs of acquiring such shares, as well as the reduction in operational flexibility associated with the requirement to make sets only of the type indicated to NMFS in advance of each trip (i.e., shallow-setting or deep-setting, to insure appropriate levels of observer coverage)

represent costs and thus reduce efficiency to a degree. However, to the extent that reopening the swordfish fishery provides additional fishing options for certain vessels, the decision to undertake swordfish operations represents a net benefit (as also discussed in the RIR).

All participants in both the swordfish and tuna sectors of the fishery will also potentially be impacted by the limitations implicitly contained in a Biological Opinion anticipated to be issued by NMFS prior to the finalization of this action. Biological Opinions are the result of consultations conducted under the authority of section 7 of the Endangered Species Act (ESA). If a consultation concludes that an action is likely to jeopardize the continued existence of a population listed under the ESA, the resultant Biological Opinion will include an Incidental Take Statement which specifies the annual number of lethal and non-lethal fishery interactions anticipated under the action. (A Biological Opinion may also include a number of non-discretionary changes to the proposed action, if this action is subject to such changes, they will be discussed and analyzed in the final regulatory flexibility analysis for this action.) If actual interactions exceed anticipated interactions in any calendar year, the ESA provides for the reinitiation of consultation on the fishery, during which time the fishery may or may not be closed at the discretion of NMFS. Although fishery participants were not fully cognizant of this potentiality in the past, the majority of Hawaii longline limited access permit holders now understand that this implicit limitation exists and that fishery closures become more probable as each year progresses. The inclusion of a "hard limit" for leatherback and loggerhead interactions in the swordfish fishery under the preferred alternative would make this implicit limitation explicit by closing this sector if anticipated interactions (as specified in the incidental take statement to be produced by NMFS) are exceeded. This has the potential to create a derby style fishery in which participants race to use their allowable effort in advance of potentially exceeding the hard limits for leatherbacks and loggerheads. However this is unlikely as incidental take statements are calculated taking into consideration total anticipated fishing effort. Therefore the threat of the incidental take statement being exceeded is low and the incentive to race to the fish (turtles) is also low.

Impacts on American Samoa-based Longline Vessel Operations

These vessels are registered for use under general longline permits. These vessels would not, under any of the alternatives, be allowed to fish in the EEZ around Hawaii or land longline-caught fish in Hawaii. They would be allowed to engage in shallow-setting north of the equator without any of the restrictions to which the Hawaii-based longline vessels would be subject. Although this represents new fishing opportunities for these vessels, the restrictions on fishing in the EEZ around Hawaii and on landing fish in Hawaii make it unlikely to be a cost-effective option, and it is unlikely to be taken advantage of. Operators and owners of these vessels would be positively affected by any alternative (including the preferred alternative) which removes the current southern time/area closure to which they are subject. American Samoa-based longline operations would benefit from the fact that the preferred alternative would not reinstate the requirement for vessel operators to annually complete protected species workshops and to use specified sea turtle handling methods.

Impacts on Guam and CNMI Longline Vessel Operations

Although two general longline permits have been issued by NMFS for longline operations based

in Guam and CNMI, neither vessel is active at this time. In the event that they or others become active, they will be largely unaffected by any alternatives as, like the American Samoa-based longline vessels, they are unlikely to be able to profit from the opportunity to engage in shallow-setting north of the equator and they are located far west of the current southern time/area closure. Guam- and CNMI-based operations would benefit from the fact that the preferred alternative would not reinstate the requirement for vessel operators to annually complete protected species workshops and to use specified sea turtle handling methods.

Impacts on Small Boat Fisheries

None of the alternatives are expected to have significant direct impacts on effort or catches by commercial troll and handline vessels, nor are they expected to have effects on the catch and effort of charter and recreational vessels in the region's pelagic fisheries. Alternatives which would allow the establishment of a Hawaii-based model swordfish fishery are expected to result in increased longline catches of blue marlin, which are an important species for charter vessels. Because prime swordfishing grounds are well north of Hawaii, it is not anticipated that these increased longline catches will affect the catches or catch rates of the much smaller Hawaii-based charter vessels which generally fish within 50 miles of shore. Non-longline vessels that fish for pelagic species with hooks would benefit from the fact that the preferred alternative would not reinstate the requirement for vessel operators to use specified sea turtle handling methods.

In summary, the preferred alternative is expected to have positive economic impacts on participants in the region's longline fisheries and other small businesses and entities as it provides additional fishing opportunities for those who choose to undertake them, as well as means of compensating those who choose to transfer their allowable swordfishing effort rather than using it themselves. It will also increase economic opportunities to shoreside wholesalers and retailers as it is expected to lead to increased landings of swordfish, and a more regular supply of tuna.

XI. IMPACTS OF THE PREFERRED ALTERNATIVE ON NATIONAL COSTS AND BENEFITS

The implementation of the preferred alternative would be expected to increase the efficiency of the Hawaii-based longline fleet and of those longline vessels currently fishing out of California who choose to relocate to Hawaii. Most of these vessels had previously chosen to target swordfish from Hawaii which exhibits their revealed preference for those operating patterns compared to regulation-required changes in their economic operations. The increase in net revenue is likely to be more than proportional to the increase in ex-vessel revenue previously modeled because of these efficiencies. This represents the primary national benefit from this proposed regulation.

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 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.

Alternatives that would establish a model swordfish fishery are expected to restore some of the historic Hawaii-based swordfish longline fishing effort but which would increase interactions with sea turtles would represent a national (non-market) cost. However, at least some of of this increase in swordfish effort would be relocated from California where vessel operators are not subject to the current prohibition on swordfish fishing and will not be subject to any new requirements to use circle hooks with mackerel-type bait to reduce and mitigate sea turtle interactions. This would be a positive result for sea turtles as it would reduce overall domestic

fishery interactions compared to the unregulated California fishery.

Due to the large amount of foreign pelagic longline fishing effort, as well as predation, habitat destruction, and directed takes of sea turtles at their nesting beaches and in coastal foraging areas, it is likely to require global conservation efforts to prevent a significant cumulative loss of non-use value associated with sea turtles. Beyond domestic requirements, the development and subsequent "export" of environmentally responsible fishing technologies is an essential step in recovering sea turtle populations. As long as there is demand for fish that is associated with sea turtle interactions, there will be fisheries attempting to target those fish. The US cannot begin to realistically attempt to reduce the impacts of these fisheries until there are practical and effective tools to reduce and mitigate fishery interactions with sea turtles.

How will these tools be "exported", what will motivate other nations or fleets to adopt them? It is unclear how many fishing nations have laws to protect endangered species, those that do are likely to have constituencies that would assist in raising awareness and enthusiasm for the implementation of environmentally friendly fishing methods. Assuming mitigation methods that are practical and effective, at least some nations or fleets would likely adopt them simply to reduce adverse impacts on sea turtles which are widely regarded as charismatic mega-fauna.

Simultaneously, the existence of practical and effective mitigation methods would allow for the negotiation of trade sanctions, similar to those in place for shrimp. This would provide significant support for the less prescriptive efforts described above, and improve their chances for success while also ensuring an effective and consistent underlying platform for cases in which they fail.

In addition scientists have found that recovery of sea turtle populations requires protection of their nesting beaches and coastal foraging areas as it is in these areas that the majority of adverse impacts occur. These impacts include beach degradation, foraging by dogs and pigs, and directed harvests of eggs and adults. Although located in remote areas, US fishery managers and other agencies have begun to fund protection programs for some of these important areas. A similar approach is a part of the preferred alternative for this action, with the acknowledged intent of gaining "offsets" in terms of turtles saved which then can be balanced against those interactions occurring in their fishery. Experience has shown that the inclusion of domestic fishermen and fishing organizations in the implementation and ongoing support of conservation programs has been successful not only in motivating those involved, but in raising awareness and altering behaviors of those who are indirectly exposed through educational or media campaigns.

Due to the low cost of funding beach protection and other turtle conservation programs as compared to closing domestic fisheries, such an approach also maximizes net national benefits by utilizing cost-efficient methods of achieving management objectives.