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June, 2005

Regulatory Amendment 4 to the Pelagics Fishery Management Plan was transmitted to NMFS on April 19, 2005 and as of June 2005 is awaiting approval and implementation.

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Sea Turtle Mitigation Measures: Gear and Handling Requirements; Protected Species Workshop Attendance; and Shallow-setting Restrictions

A Regulatory Amendment to the Western Pacific Pelagic Fisheries Management Plan

Including an Environmental Assessment

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Abstract

This regulatory amendment includes a range of measures to minimize interactions with turtles by non-Hawaii based domestic longline vessels operating in the Western Pacific under general longline permits. Under this amendment, vessels with longline general permits making shallow sets north of the equator are required to use 18/0 offset circle hooks with mackerel-type bait and dehookers to release any accidently caught turtles. The amendment also requires both operators and owners of vessels with general longline permits to annually attend protected species training workshops. Further, operators of vessels with general longline permits are required to carry and use specific mitigation gear to aid in the release of sea turtles accidently hooked or entangled by longlines. These include dipnets, long-handled line clippers and bolt cutters (with allowances for boats with < 3' freeboard). This regulatory amendment also requires operators of non-longline pelagic vessels fishing with hooks (e.g. trollers and handliners) to follow handling guidelines and remove trailing gear from sea turtles when fishing in the EEZ and when fishing on the high seas for stocks managed by the Council.

April 19, 2005

2.0 Summary

The Council is considering the implementation of several new measures to conserve sea turtles, via an amendment to the regulations under the Fishery Management Plan for the Pelagics Fisheries (FMP). Recent fishing gear research in the Atlantic Ocean has greatly increased the ability of pelagic longline fisheries to fish in an environmentally responsible manner which minimizes fishery interactions with sea turtles. A combination of large (18/0) circle hooks with a 10° offset and mackerel bait were shown to reduce hookings of loggerhead sea turtles by 92 % and leatherback turtles by 67% and improve swordfish catches 30%, when used on Atlantic pelagic longline vessels making shallow sets to target swordfish (Watson et al. 2004). Circle hooks have also been found to hook turtles predominantly in the mouth rather than the delicate tissues of the oesophagus, thus minimizing trauma and increasing survival rates for those turtles that are unavoidably hooked.

The discovery of this new fishing technique meant that shallow-set swordfish longline fishing, which had been prohibited in the Western Pacific since 2001 to protect sea turtles, could be reopened. The Western Pacific Fishery Management Council (Council) accordingly amended its Pelagics FMP in March 2004 to require the use of circle hooks and mackerel-type bait by the 164 permitted Hawaii-based longline vessels making shallow sets north of the equator (a final rule was published on April 2, 2004). This rule also restricted such effort to no more than 2,120 sets annually, imposed annual limits on the number of sea turtle interactions with this fishery sector, and removed an existing time/area closure for Hawaii-based deep-setting longline vessels. It did not include any measures for other fishing vessels managed under the Pelagics FMP.

Prior to approval by the National Marine Fisheries Service (NMFS, also known as NOAA Fisheries), NMFS' Office of Protected Resources completed a section 7 consultation under the Endangered Species Act on these measures. The result of this consultation was a Biological Opinion that was issued by NMFS on February 23, 2004 (NMFS 2004). The 2004 Opinion concluded that the fisheries managed under the Pelagics FMP were not likely to jeopardize the continued existence of sea turtles or other species listed as threatened or endangered under the Endangered Species Act. Included in the action considered under the Biological Opinion were several measures required by a previous (November 15, 2002) Biological Opinion on the Pelagics FMP fisheries which were vacated on April 1, 2004 by a Court order invalidating that opinion. The measures are included as terms and conditions of the 2004 Biological Opinion and require that (1) owners and operators of vessels registered to longline general permits annually attend protected species workshops; (2) owners and operators of vessels registered to longline general permits carry and use dip nets, line clippers, and bolt cutters and follow sea turtle handling, resuscitation, and release requirements for incidentally hooked or entangled sea turtles (vessels with a freeboard less than 3 ft do not have to carry dipnets or long-handled line clippers); and (3) operators of non-longline vessels using hooks to target PMUS follow sea turtle handling, resuscitation, and release requirements, as well as remove all trailing gear from incidentally hooked or entangled sea turtles.

At its 122nd meeting (March 22-25, 2004), the Council took initial action on these three measures by indicating its preliminarily preferred alternatives and directing Council staff to continue the development of the full range of alternatives. The Council also requested its staff to develop alternatives for a related fourth issue as follows: (4) to require operators of longline vessels registered to general longline permits (vessels registered to general longline permits and those that in the future will be registered to American Samoa limited entry longline permits) to use circle hooks and mackerel-type bait and dehookers recommended by NMFS when shallow-setting north of the equator.

The reason for inclusion of this fourth issue is to extend the conservation benefits of the use of mackerel-type bait, large circle hooks and dehooking devices to any longline vessel that shallow-sets north of the equator under a Western Pacific general or other longline permit. To date, all longline fishing under general permits has been concentrated south of the equator in the American Samoa EEZ and has targeted deep swimming albacore tuna for the Pago Pago canneries. To date, no general longline permit holders have elected to target swordfish (or other species) using shallow sets north of the equator. One reason for this is that the principal market for swordfish in the Western Pacific is Hawaii and to land longline caught fish directly into Honolulu or other ports in the State requires a Hawaii limited entry longline permit.

Vessels with general permits could potentially land in other ports within and beyond the Western Pacific Region. Besides Hawaii, the only major market for longline caught fish is the Pago Pago canneries - and a tiny domestic market for fresh swordfish. There are no domestic longline fisheries in Guam and the Northern Mariana Islands, although there is local interest in developing such fisheries. Longline vessels from the Western Pacific used to land swordfish into California ports, but this opportunity is now closed to vessels not permitted under the Pacific Council's Pelagics FMP. Two Hawaii-based vessels made landings in Alaska in the early 1990s but this has not happened since and was an anomaly due to the two vessels fishing further north than the normal extent of the fishery. No Western Pacific longline vessels have opted to land fish at ports outside the US in Central and South America., such as Costa Rica, Panama or Ecuador, as the economics of doing so militate against this. Nonetheless, the Council believes that it would be prudent to anticipate the possibility of vessels registered to general permits (or American Samoa limited entry permits) shallow-setting north of the equator, no matter how remote this might seem at present.

Under current regulations, fish could potentially be transhipped from a general permitted vessel to a vessel with a Hawaii receiving permit and landed in Hawaii. This has never happened in the history of the fishery but it might be argued that such an operation would be profitable as it would allow a general permitted longline vessel to fish at sea for longer and reduce operating expenses. However, this would mean identifying crew who were prepared to stay sea for extended periods of time on a longline vessel. While foreign crews may accept this hardship, crew of American nationality may be unwilling to accept the hardship of remaining at sea for periods exceeding the usual one month fishing trip. Moreover, the ability of a vessel to continue operating at sea is not only dependent on unloading fish, but on water, ice and other consumables. Costs for both the fishing vessel and the carrier vessel including both crew pay, insurance and consumables would have to be adequately covered by the volume of fish caught by a single vessel. Further, the Hawaii longline fishery is a premium fresh fish fishery, meaning that excessive handling of fish is minimized to preserve quality and price. Transhipment at sea would likely reduce the quality of the fish and further jeopardize the operation of a transhipment operation (Sean Martin, Hawaii Longline Association, pers comm.). Freezing the fish is an option to minimize handling issues during transhipment but would result in a lower price for the fish. Lastly, transhipping tens of thousands of pounds of fish between two vessels on the high seas is dangerous and involves risks which fishermen are unlikely to countenance. For these reasons it is unlikely that a transhipment operation into Honolulu by a general longline permit holder would prosper. This issue is further complicated by the fact that there is some interest in foreign vessels transhipping through Hawaii. For these reasons, the Council and NMFS will monitor and deal with transhipping issues in a future action.

The alternatives considered by the Council are as follows:

Measure 1. Protected species workshop attendance:

Alternative 1A - No Action: do not require annual workshop attendance by operators of vessels registered to general longline permits (vessels registered to general longline permits and those that in the future will be registered to American Samoa limited entry longline permits).

Alternative 1B - Require annual workshop attendance by vessel operators.

Alternative 1C - Require annual workshop attendance by both vessel operators and vessel owners, with consideration of mechanisms for remote attendance. **(preferred)**

Measure 2: Sea turtle mitigation gear (dip nets, line clippers, and bolt cutters):

Alternative 2A - No Action: do not require operators of vessels registered to general longline permits (vessels registered to general longline permits and those that in the future will be registered to American Samoa limited entry longline permits) to carry and use dip nets, line clippers, and bolt cutters to release hooked or entangled sea turtles.

Alternative 2B - Require that operators of general longline vessels carry and use dip nets, line clippers, and bolt cutters (longline vessels with less than 3' freeboard such as alias would not have to carry dip nets or long handled line clippers, however they would need to carry an instrument capable of cutting trailing fishing line) to release hooked or entangled sea turtles. **(preferred)**

Alternative 2C - Require operators of general longline vessels to carry and use dip nets, line clippers, and bolt cutters to release hooked or entangled sea turtles with no exceptions for longline vessels with less than 3' freeboard.

Measure 3: Non-longline vessel sea turtle handling requirements:

Alternative 3A - No action: do not require operators of non-longline vessels managed under the Pelagics FMP and using hooks to target pelagic species, to follow any sea turtle handling requirements including removing trailing gear.

Alternative 3B - Require operators of non-longline vessels managed under the Pelagics FMP and using hooks to target pelagic species, to follow certain sea turtle handling requirements (as specified in 50 CFR 223.206(d)(1)(i) and (ii)), and also remove any trailing gear, when fishing in the EEZ.

Alternative 3C - Require operators of non-longline vessels managed under the Pelagics FMP and using hooks to target pelagic species, to follow the sea turtle handling requirements including removing trailing gear, when fishing in the EEZ and when fishing on the high seas for stocks managed by the Council. **(preferred)**

Measure 4: Shallow-setting north of the equator.

Alternative 4A- No action: do not require vessels registered to general longline permits (vessels registered to general longline permits and those that in the future will be registered to American Samoa limited entry longline permits) to shallow-set north of the equator to use circle hooks with a 10°offset and mackerel-type bait.

Alternative 4B - Require vessels registered to general longline permits to shallow-set north of the equator only if the circle hooks (as described above), mackerel-type bait (as described above) and dehookers currently required by vessels registered to Hawaii longline permits are used. **(preferred)**

Alternative 4C- Prohibit shallow-setting north of the equator by vessels registered to general longline permits.

The impacts of the various alternatives on sea turtles range from neutral under the no action alternatives, to potentially positive under the action alternatives. No alternatives are seen as highly positive as the affected fisheries have very low to zero interaction rates with sea turtles. Impacts on fishery participants range from neutral under the no action alternatives to potentially onerous under alternative 4C which would eliminate current opportunities to develop a non-Hawaii based longline fishery which shallow-sets north of the equator.

At its 123rd meeting in June, 2004 the Council reviewed available information on these alternatives and took final action to reiterate its selection of the above preferred alternatives and recommended their approval and implementation by NMFS.

At its 125th meeting held on January 26, 2005 the Council reviewed concerns expressed by NMFS that an inappropriate section of the CFR was discussed for inclusion (223.206 vs. 660.32) at the Council's 123rd meeting, and that there was no exemption in preferred alternative 4B from the requirement to use long-handled dehookers on small longline fishing vessels shallow-setting north of the equator. Although the likelihood of such fishing is extremely remote, such an exemption would require operators of these vessels to carry and use short-handled dehookers and would be consistent with the 2004 BiOP as well as with preferred alternative 2B described above. Because these concerns were not raised at the 123rd Council meeting, NMFS directed that another Council meeting be held to resolve them.

At its 125th meeting the Council recommended that the previously preferred alternative 3B be modified to read as follows:

In the event of an interaction, an operator of a vessel not using longlines but using hooks (i.e. handline, troll and pole-and-line vessels) to target PMUS, must handle the turtle in a manner to minimize injury and promote post-hooking survival as outlined in CFR 660.32 (c) and (d), and remove trailing gear when fishing in the EEZ and when fishing on the high seas for stocks managed by the Council. In addition, dead sea turtles may not be consumed, sold, landed, offloaded, transhipped or kept below deck, but must be returned to the ocean after identification unless NOAA Fisheries requests the turtle be kept for further study.

The Council further recommended at its 125th meeting that the previously preferred alternative 4B be modified to read as follows:

Require vessels registered to general longline permits (and those that in the future will be issued to participants in the American Samoa longline limited entry program) to shallow-set north of the equator only if the circle hooks (as described above), mackerel-type bait (as described above) and dehookers currently required by vessels registered to Hawaii longline permits are used. Longline vessels with less than 3' freeboard such as alias would not have to carry long-handled dehookers, provided that there in concurrence from NMFS Office of Protected Resources. A letter requesting concurrence was sent to NMFS on January 31, 2005, concurrence was received from NMFS on April 1, 2005

3.0 Table of Contents

3.1 List of tables

3.2 List of figures

3.3 List of acronyms and abbreviations

CNMI	Commonwealth of the Northern Mariana Islands
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
FEIS	Final Environmental Impact Statement
FMP	Fishery Management Plan
FWS	Fish and Wildlife Service
HAPC	Habitat Areas of Particular Concern
MHI	Main Hawaiian Islands
MSY	Maximum Sustainable Yield
nm	nautical mile
NEPA	National Environment Policy Act
NMFS	National Marine Fisheries Service
NWHI	Northwestern Hawaiian Islands
OY	Optimum Yield
PIFSC	Pacific Islands Fisheries Science Center - NMFS
PIRO	Pacific Islands Regional Office - NMFS
PMUS	Pelagic Management Unit Species

4.0 Introduction

4.1 Responsible agencies

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

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4.2 Public review process and schedule

On February 23, 2004, NMFS issued a Biological Opinion related to a range of measures recommended by the Council to reduce and mitigate sea turtle interactions. That Biological Opinion, as well as the Council's regulatory amendment and Supplemental Environmental Impacts Statement on which the Biological Opinion is based, are available on the Council's web site (www.wpcouncil.org). On March 10, 2004 the Council distributed an options paper to the permit holders of potentially affected longline vessels (those registered under general longline permits), as well as to all holders of Hawaii commercial marine licenses and other interested parties on the Council's mailing list. The options paper was also made available both on the Council's website and at the 122nd Council meeting. It included an overview of the issues and alternatives and notified readers that the Council anticipated taking initial action at their 122nd meeting. This action item was also noted in the March 10, 2004 Federal Register notice and local newspaper advertisements announcing the meeting. Following a public hearing at its 122nd

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

meeting (March 22-25, 2004), the Council took initial action towards the implementation of four measures to conserve sea turtles.

Following the 122nd meeting, Council staff completed the preparation of a draft regulatory amendment document so that the Council could take final action at it 123rd meeting (June 21-24, 2004). The Council distributed a summary of the regulatory amendment to general longline permit holders, as well as to all holders of Hawaii commercial marine licenses and other interested parties on the Council's mailing list. The summary reviewed the range of alternatives for the different measures contained within the amendment and indicated which were the Council's preliminary preferred alternatives. Notification that final action could be taken at the 123rd Council meeting was also included in this mailing, as well as in the May 21, 2004 Federal Register notice and local newspaper advertisements announcing the meeting. Following a public hearing at its 123rd meeting, the Council took final action to reiterate its selection of the initially preferred alternatives and recommended their approval and implementation by NMFS. At its 125th meeting held on January 26, 2005 the Council reviewed concerns expressed by NMFS that an inappropriate section of the CFR was discussed for inclusion (223.206 vs. 660.32) at the Council's 122nd and 123rd meetings, and that there was no exemption in preferred alternative 4B from the requirement to use long-handled dehookers on small longline fishing vessels shallow-setting north of the equator. Although the likelihood of such fishing is extremely remote, such an exemption would require operators of these vessels to carry and use short-handled dehookers and would be consistent with the 2004 BiOP as well as with preferred alternative 2B described above. Because these concerns were not raised at the previous Council meetings, NMFS directed that another Council meeting be held to resolve them.

The 125th Council meeting was advertised in the Federal Register and through local newspaper advertisements, Following a public hearing at that meeting the Council took final action to recommend that the previously preferred alternative 3B be modified to read as follows:

In the event of an interaction, an operator of a vessel not using longlines but using hooks (i.e. handline, troll and pole-and-line vessels) to target PMUS, must handle the turtle in a manner to minimize injury and promote post-hooking survival as outlined in CFR 660.32 (c) and (d), and remove trailing gear when fishing in the EEZ and when fishing on the high seas for stocks managed by the Council. In addition, dead sea turtles may not be consumed, sold, landed, offloaded, transhipped or kept below deck, but must be returned to the ocean after identification unless NOAA Fisheries requests the turtle be kept for further study.

The Council further recommended at its 125th meeting that the previously preferred alternative 4B be modified to read as follows:

Require vessels registered to general longline permits (and those that in the future will be issued to participants in the American Samoa longline limited entry program) to shallow-set north of the equator only if the circle hooks (as described above), mackerel-type bait (as described above) and dehookers currently required by vessels registered to Hawaii longline permits are *used. Longline vessels with less than 3' freeboard such as alias would not have to carry long-handled dehookers, provided that there in concurrence from NMFS Office of Protected Resources.* A letter requesting concurrence was sent to NMFS on January 31, 2005, concurrence was received from NMFS on April 1, 2005

4.3 List of preparers

This document was prepared by (in alphabetical order):

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Marcia Hamilton, Economist, WPRFMC

Irene Kinan, Sea Turtle Coordinator, WPRFMC

5.0 Purpose and Need for Action

The Council is considering the implementation of several new measures to conserve sea turtles, via an amendment to the regulations under the Fishery Management Plan for the Pelagics Fisheries (FMP). Recent fishing gear research in the Atlantic Ocean has greatly increased the ability of pelagic longline fisheries to fish in an environmentally responsible manner which minimizes fishery interactions with sea turtles. A combination of large (18/0) offset circle hooks and mackerel bait were shown to reduce hookings of loggerhead sea turtles by 92 % and leatherback turtles by 67% and improve swordfish catches 30%, when used on Atlantic pelagic longline vessels making shallow sets to target swordfish (Watson et al., 2004). Circle hooks have also been found to hook turtles predominantly in the mouth rather than the delicate tissues of the oesophagus, thus minimizing trauma and increasing survival rates for those turtles that are unavoidably hooked.

The discovery of this new fishing technique meant that shallow-set swordfish longline fishing, which had been prohibited in the Western Pacific since 2001 to protect sea turtles, could be reopened. The Western Pacific Fishery Management Council (Council) accordingly amended its Pelagics FMP in March 2004 to require the use of circle hooks and mackerel-type bait by the 164 permitted Hawaii-based longline vessels making shallow sets north of the equator (a final rule was published on April 2, 2004). This rule also restricted such effort to no more than 2,120 sets annually, imposed annual limits on the number of sea turtle interactions with this fishery sector, and removed an existing time/area closure for Hawaii-based deep-setting longline vessels. It did not include any measures for other fishing vessels managed under the Pelagics FMP.

Prior to approval of these measures, the National Marine Fisheries Service's (NMFS, also known as NOAA Fisheries), Office of Protected Resources completed a section 7 consultation under the Endangered Species Act. The result of this consultation was a Biological Opinion that was issued by NMFS on February 23, 2004 (NMFS 2004). The 2004 Opinion concluded that the fisheries managed under the Pelagics FMP were not likely to jeopardize the continued existence of sea turtles or other species listed as threatened or endangered under the Endangered Species Act. Included in the action considered under the Biological Opinion were several measures required by a previous (November 15, 2002) Biological Opinion on the Pelagics FMP fisheries which were vacated on April 1, 2004 by a Court order invalidating that opinion. The measures are included as terms and conditions of the 2004 Biological Opinion and require that (1) owners and operators of vessels registered to longline general permits annually attend protected species workshops; (2) owners and operators of vessels registered to longline general permits carry and use dip nets, line clippers, and bolt cutters and follow sea turtle handling, resuscitation, and release requirements for incidentally hooked or entangled sea turtles (vessels with a freeboard less than 3 ft do not have to carry dipnets or long-handled line clippers); and (3) operators of non-longline vessels using hooks to target PMUS follow sea turtle handling, resuscitation, and release requirements, as well as remove all trailing gear from incidentally hooked or entangled sea turtles.

At its 122nd meeting (March 22-25, 2004), the Council took initial action on these three measures by indicating its preliminarily preferred alternatives and directing Council staff to continue the development of the full range of alternatives. The Council also requested its staff to develop alternatives for a related fourth issue as follows: (4) To require operators of longline vessels registered to general longline permits (vessels registered to general longline permits and those that in the future will be registered to American Samoa limited entry longline permits) to use circle hooks and mackerel-type bait and dehookers recommended by NMFS when shallow-setting north of the equator.

The reason for inclusion of this fourth issue is to extend the conservation benefits of the use of mackerel-type bait, large circle hooks and dehooking devices to any longline vessel that shallow-sets north of the equator under a Western Pacific general or other longline permit. To date, all longline fishing under general permits has been concentrated south of the equator in the American Samoa EEZ and has targeted deep swimming albacore tuna for the Pago Pago canneries. To date, no general longline permit holders have elected to target swordfish (or other species) using shallow sets north of the equator. One reason for this is that the principal market for swordfish in the Western Pacific is Hawaii and to land longline caught fish directly into Honolulu or other ports in the State requires a Hawaii limited entry longline permit.

Vessels with general permits could potentially land in other ports within and beyond the Western Pacific Region. Besides Hawaii, the only major market for longline caught fish is the Pago Pago canneries - and a tiny domestic market for fresh swordfish. There are no domestic longline fisheries in Guam and the Northern Mariana Islands, although there is local interest in developing such fisheries. Longline vessels from the Western Pacific used to land swordfish into California ports, but this opportunity is now closed to vessels not permitted under the Pacific Council's Pelagics FMP. Two Hawaii-based vessels made landings in Alaska in the early 1990s but this has not happened since and was an anomaly due to the two vessels fishing further north than the normal extent of the fishery. No Western Pacific longline vessels have opted to land fish at ports outside the US in Central and South America., such as Costa Rica, Panama or Ecuador, as the economics of doing so militate against this. Nonetheless, the Council believes that it would be prudent to anticipate the possibility of vessels registered to general permits (or American Samoa limited entry permits) shallow-setting north of the equator, no matter how remote this might seem at present.

Under current regulations, fish could potentially be transhipped from a general permitted vessel to a vessel with a Hawaii receiving permit and landed in Hawaii. This has never happened in the history of the fishery but it might be argued that such an operation would be profitable as it would allow a general permitted longline vessel to fish at sea for longer and reduce operating expenses. However, this would mean identifying crew who were prepared to stay sea for extended periods of time on a longline vessel. While foreign crews may accept this hardship, crew of American nationality may be unwilling to accept the hardship of remaining at sea for periods exceeding the usual one month fishing trip. Moreover, the ability of a vessel to continue operating at sea is not only dependent on unloading fish, but on water, ice and other consumables. Costs for both the fishing vessel and the carrier vessel including both crew pay, insurance and consumables would have to be adequately covered by the volume of fish caught by a single vessel. Further, the Hawaii longline fishery is a premium fresh fish fishery, meaning that excessive handling of fish is minimized to preserve quality and price. Transhipment at sea would likely reduce the quality of the fish and further jeopardize the operation of a transhipment operation (Sean Martin, Hawaii Longline Association, pers comm.). Freezing the fish is an option to minimize handling issues during transhipment but would result in a lower price for the fish. Lastly, transhipping tens of thousands of pounds of fish between two vessels on the high seas is dangerous and involves risks which fishermen are unlikely to countenance. For these reasons it is unlikely that a transhipment operation into Honolulu by a general longline permit holder would prosper. This issue is further complicated by the fact that there is some interest in foreign vessels transhipping through Hawaii. For these reasons, the Council and NMFS will monitor and deal with transhipping issues in a future action.

6.0 Management Objectives

The objectives of the Pelagics FMP are as follows:

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.

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

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

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

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

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

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.

7.0 Initial Actions

The Pelagics FMP of the Western Pacific Region was published in 1987. The FMP did not include specific measures to conserve Pacific sea turtles; however, Amendment 2 (implemented in May 1991) required the operators of Hawaii-based longline vessels to contact NMFS for potential observer placement before fishing in a 50 nm protected species zone around the Northwestern Hawaiian Islands (NWHI). Amendment 3 (implemented in October 1991) extended this requirement to require that NMFS observers be accommodated aboard all Hawaii-based longline vessels to collect information on interactions with sea turtles and other protected species. Amendment 3 also established a 50 nm area closure around the NWHI, which together with a 25-75 nm longline closure around the Main Hawaiian Islands implemented through Amendment 5, afforded protection to adult green turtles foraging in nearshore coastal waters. Amendments 4 and 7 (October 1991 and June 1994, respectively) implemented a limited entry program for the Hawaii-based longline fishery with a limit of 164 permits and a maximum vessel length of 101 feet, thus controlling fleet effort. As discussed above, following a long series of legal and regulatory actions, the National Marine Fishery Service's (NMFS, also known as NOAA Fisheries) Office of Protected Resources completed a section 7 consultation under the Endangered Species Act on the Pelagics FMP that was triggered by the Council's recommendation of a range of regulatory and conservation measures to reduce and mitigate interactions between sea turtles and the Hawaii-based longline fishery. On April 2, 2004 a final rule was published which implemented the regulatory aspects of those measures. In summary, the April 2, 2004 rule requires operators of Hawaii-based longline vessels to use circle hooks and mackerel-type bait when shallow-setting north of the equator. It also restricted this Hawaii-based shallow-set effort to no more than 2,120 sets annually, imposed annual limits on the number of sea turtle interactions with this fishery sector, and removed an existing time/area closure for Hawaii-based deep-setting longline vessels. It did not include any measures for other fishing vessels managed under the Pelagics FMP.

At the 122st meeting (March 22-25, 2004), the Council took initial action on this document's four measures by indicating its preliminarily preferred alternatives and directing Council staff to continue the development and analysis of the full range of alternatives. In some cases (Measures 1 and 3), the Council's preliminarily preferred alternative is stricter than that included in the 2004 Biological Opinion. At the 123rd meeting, the Council took final action to recommend approval and implementation by NMFS of the preferred alternatives for four measures to conserve sea turtles, as indicated in Section 8 below.

8.0 Management Measures and Alternatives

Measure 1. Protected species workshop attendance:

Alternative 1A - No Action: do not require annual workshop attendance by operators of vessels registered to general longline permits (vessels registered to general longline permits and those that in the future will be registered to American Samoa limited entry longline permits).

Alternative 1B - Require annual workshop attendance by vessel operators.

Alternative 1C - Require annual workshop attendance by both vessel operators and vessel owners, with consideration of mechanisms for remote attendance. **(preferred)**

Measure 2: Sea turtle mitigation gear (dip nets, line clippers, and bolt cutters):

Alternative 2A - No Action: do not require operators vessels registered to general longline permits (vessels registered to general longline permits and those that in the future will be registered to American Samoa limited entry longline permits) to carry and use dip nets, line clippers, and bolt cutters to release hooked or entangled sea turtles.

Alternative 2B - Require that operators of general longline vessels carry and use dip nets, line clippers, and bolt cutters (longline vessels with less than 3' freeboard such as alias would not have to carry dip nets or long handled line clippers, however they would need to carry an instrument capable of cutting trailing fishing line) to disengage any hooked or entangled sea turtles with the least harm possible to the sea turtles, and if it is done by cutting the line, any trailing fishing line must be cut as close to the hook as possible. **(preferred)**

Alternative 2C - Require operators of general longline vessels to carry and use dip nets, line clippers, and bolt cutters to release hooked or entangled sea turtles with no exceptions for longline vessels with less than 3' freeboard.

Measure 3: Non-longline vessel sea turtle handling requirements:

Alternative 3A - No action: do not require operators of non-longline vessels managed under the Pelagics FMP and using hooks to target pelagic species to follow any sea turtle handling requirements including removing trailing gear.

Alternative 3B - Require operators of non-longline vessels managed under the Pelagics FMP and using hooks to target pelagic species to follow sea turtle handling requirements, as specified in 50 CFR 223.206(d)(1) (i) and (iii) below:

(i) Any specimen taken incidentally during the course of fishing or scientific research activities must be handled with due care to prevent injury to live specimens, observed for activity, and returned to the water according to the following procedures:

(A) Sea turtles that are actively moving or determined to be dead as described in paragraph (d)(1)(i)(C) of this section must be released over the stern of the boat. In addition, they must be released only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels.

(B) Resuscitation must be attempted on sea turtles that are comatose, or inactive, as determined in paragraph (d)(1) of this section, by: (1) Placing the turtle on its bottom shell (plastron) so

that the turtle is right side up and elevating its hindquarters at least 6 inches (15.2 cm) for a period of 4 up to 24 hours. The amount of the elevation depends on the size of the turtle; greater elevations are needed for larger turtles. Periodically, rock the turtle gently left to right and right to left by holding the outer edge of the shell (carapace) and lifting one side about 3 inches (7.6 cm) then alternate to the other side. Gently touch the eye and pinch the tail (reflex test) periodically to see if there is a response. (2) Sea turtles being resuscitated must be shaded and kept damp or moist but under no circumstance be placed into a container holding water. A water-soaked towel placed over the head, carapace, and flippers is the most effective method in keeping a turtle moist. (3) Sea turtles that revive and become active must be released over the stern of the boat only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels. Sea turtles that fail to respond to the reflex test or fail to move within 4 hours (up to 24, if possible) must be returned to the water in the same manner as that for actively moving turtles.

(C) A turtle is determined to be dead if the muscles are stiff (rigor mortis) and/or the flesh has begun to rot; otherwise the turtle is determined to be comatose or inactive and resuscitation attempts are necessary,

(iii) Any specimen taken incidentally during the course of fishing or scientific research activities must not be consumed, sold, landed, offloaded, transshipped, or kept below deck.

Vessel operators must also disengage any hooked or entangled sea turtles with the least harm possible to the sea turtles including cutting any trailing fishing line as close to the hook as possible, when fishing in the EEZ.

Alternative 3C - Require operators of non-longline vessels managed under the Pelagics FMP and using hooks to target pelagic species to follow sea turtle handling requirements as specified in 50 CFR 223.206(d)(1) (i) and (iii) and described in Alternative 3B, including disengaging any hooked or entangled sea turtles with the least harm possible to the sea turtles and cutting any trailing fishing line as close to the hook as possible, when fishing in the EEZ and when fishing on the high seas for stocks managed by the Council. **(preferred)**

Measure 4: Shallow-setting north of the equator.

Alternative 4A-	No action: do not require vessels registered to general longline permits (vessels registered to general longline permits and those that in the future will be registered to American Samoa limited entry longline permits) to shallow-set north of the equator to use circle hooks with a 10°offset (a circle hook sized 18/0 or larger is one whose outer diameter at its widest point is no smaller than 1.97 inches (50 mm) when measured with the eye of the hook on the vertical axis and perpendicular to the horizontal axis. A 10° offset is measured from the barbed end of the hook and is relative to the parallel plane of the eyed-end, or shank, of the hook when laid on its side) , mackerel-type bait (mackerel-type bait means a whole fusiform fish with a predominantly blue, green, or grey back and predominantly grey, silver, or white lower sides and belly)
Alternative 4B -	Require vessels registered to general longline permits to shallow-set north of the equator only if the circle hooks (as described above), mackerel-type bait (as described above) and dehookers currently required by vessels registered to Hawaii longline permits are used. **(preferred)**
Alternative 4C-	Prohibit shallow-setting north of the equator by vessels registered to general longline permits.

Table 1. List of required equipment and sample models that meet requirements for the use of dehookers

Required Item	Sample model
(i) Long-handled dehooker for ingested hooks	ARC Pole Model Deep-Hooked Dehooker (Model BP11)
(ii) Long-handled dehooker for external hooks	ARC Model LJ6P (6 ft (1.83 m)); ARC Model LJ36; or ARC Pole Model Deep-Hooked Dehooker (Model BP11); ARC 6 ft (1.83 m) Pole Big Game Dehooker (Model P610)
(iii) Long-handled device to pull an "inverted V"	ARC Model LJ6P (6 ft); Davis Telescoping Boat Hook to 96 inch (2.44 m) (Model 85002A); West Marine #F6H5 Hook and #F6-006 Handle
(iv) Tire	Any standard automobile tire free of exposed steel belts
(v) Short-handled dehooker for ingested hooks	ARC 17–inch (43.18–cm) Hand-Held Bite Block Deep-Hooked Turtle Dehooking Device (Model ST08)
(vi) Short-handled dehooker for external hooks	ARC Hand-Held Large J-Style Dehooker (Model LJ07); ARC Hand-Held Large J-Style Dehooker (Model LJ24); ARC 17–inch (43.18–cm) Hand-Held Bite Block Deep-Hooked Turtle Dehooking Device (Model ST08); Scotty's Dehooker
(vii) Long-nose or needle-nose pliers	12–inch (30.48–cm) S.S. NuMark Model #030281109871; any 12–inch (30.48–cm) stainless steel long-nose or needle-nose pliers
(ix) Monofilament line cutters	Jinkai Model MC-T
(x) Mouth openers and gags (at least two from A-G):	
(A) Block of hard wood	Any block of hard wood meeting the standards, including Great American Manufacturing Inc. Curved Shoe Handle Wire Brush with Beveled Scraper (Model SS0416), with wires and scraper removed; Olympia Tools Long-Handled Wire Brush and Scraper (Model 974174), with wires and scraper removed.
(B) Set of three canine mouth gags	Jorvet Model #4160, 4162, and 4164
(C) Set of two sturdy canine chew bones	Nylabone (a trademark owned by T.F.H. Publications, Inc.); Gumabone (a trademark owned by T.F.H. Publications, Inc.); Galileo (a trademark owned by T.F.H. Publications, Inc.)
(D) Set of two rope loops covered with hose	Any set of two rope loops covered with hose meeting standards
(E) Hank of rope	Any size soft braided nylon rope, provided it creates a hank of rope 2 - 4 inches (5.08 cm - 10.16 cm) in thickness
(F) Set of four PVC splice couplings	A set of four Standard Schedule 40 PVC splice couplings (1–inch (2.54–cm), 1 1/4–inch 3.175–cm), 1 1/2 inch (3.81–cm), and 2–inch (5.08–cm)
(G) Large avian oral speculum	Webster Vet Supply (Model 85408); Veterinary Specialty Products (Model VSP 216–08); Jorvet (Model J–51z); Krusse (Model 273117)

At its 125th meeting held on January 26, 2005 the Council reviewed concerns expressed by NMFS that an inappropriate section of the CFR was discussed for inclusion (223.206 vs. 660.32) at the Council's 122nd and 123rd meetings, and that there was no exemption in preferred alternative 4B from the requirement to use long-handled dehookers on small longline fishing vessels shallow-setting north of the equator. Although the likelihood of such fishing is extremely remote, such an exemption would require operators of these vessels to carry and use short-handled dehookers and would be consistent with the 2004 BiOP as well as with preferred alternative 2B described above. Because these concerns were not raised at the previous Council meetings, NMFS directed that another Council meeting be held to resolve them.

At its 125th meeting the Council recommended that the previously preferred alternative 3B be modified to read as follows:

In the event of an interaction, an operator of a vessel not using longlines but using hooks (i.e. handline, troll and pole-and-line vessels) to target PMUS, must handle the turtle in a manner to minimize injury and promote post-hooking survival as outlined in CFR 660.32 (c) and (d), and remove trailing gear when fishing in the EEZ and when fishing on the high seas for stocks managed by the Council. In addition, dead sea turtles may not be consumed, sold, landed, offloaded, transhipped or kept below deck, but must be returned to the ocean after identification unless NOAA Fisheries requests the turtle be kept for further study.

The Council further recommended at its 125th meeting that the previously preferred alternative 4B be modified to read as follows:

Require vessels registered to general longline permits (and those that in the future will be issued to participants in the American Samoa longline limited entry program) to shallow-set north of the equator only if the circle hooks (as described above), mackerel-type bait (as described above) and dehookers currently required by vessels registered to Hawaii longline permits are used. Longline vessels with less than 3' freeboard such as alias would not have to carry long-handled dehookers, provided that there in concurrence from NMFS Office of Protected Resources.

A letter requesting concurrence was sent to NMFS on January 31, 2005, concurrence was received from NMFS on April 1, 2005.

The sections of the CFR referenced in revised alternative 3B are not significantly from those in 223.206 and are as follows:

<u>660.32(c) Resuscitation.</u> *If the sea turtle brought aboard appears dead or comatose, the sea turtle must be placed on its belly (on the bottom shell or plastron) so that the turtle is right side up and its hindquarters elevated at least 6 inches (15.24 cm) for a period of no less than 4 hours and no more than 24 hours. The amount of the elevation depends on the size of the turtle; greater*

elevations are needed for larger turtles. A reflex test, performed by gently touching the eye and pinching the tail of a sea turtle, must be administered by a vessel operator, at least every 3 hours, to determine if the sea turtle is responsive. Sea turtles being resuscitated must be shaded and kept damp or moist but under no circumstance may be placed into a container holding water. A water-soaked towel placed over the eyes, carapace, and flippers is the most effective method in keeping a turtle moist. Those that revive and become active must be returned to the sea in the manner described in paragraph (d) of this section. Sea turtles that fail to revive within the 24-hour period must also be returned to the sea in the manner described in paragraph (d)(1) of this section.

660.32(d) Release. *Live turtles must be returned to the sea after handling in accordance with the requirements of paragraphs (b) and (c) of this section:*

(1) By putting the vessel engine in neutral gear so that the propeller is disengaged and the vessel is stopped, and releasing the turtle away from deployed gear; and

(2) Observing that the turtle is safely away from the vessel before engaging the propeller and continuing operations.

(b) Handling requirements. *(1) All incidentally hooked or entangled sea turtles must be handled in a manner to minimize injury and promote post-hooking or post-entangling survival.*

(2) When practicable, comatose sea turtles must be brought on board immediately, with a minimum of injury, and handled in accordance with the procedures specified in paragraphs (c) and (d) of this section.

(3) If a sea turtle is too large or hooked or entangled in a manner as to preclude safe boarding without causing further damage/injury to the turtle, the items specified in paragraphs (a)(2) and (a)(4) of this section must be used to cut the line and remove as much line as possible prior to releasing the turtle.

9.0 National Environmental Policy Act

This section has been prepared in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969, to assess the impacts on the human environment that may result from the proposed action. In March of 2004, NMFS published a Final Supplemental Environmental Impact Statement for the Pelagics Fisheries of the Western Pacific Region (FSEIS - NMFS, 2004), which supplemented NMFS' 2001 Final Environmental Impact Statement on the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region (NMFS, 2001) and provided an overall assessment of the impacts of the region's pelagic fisheries on the human environment. Both documents are available from the Western Pacific Regional Fishery Management Council (1164 Bishop St. Suite 1400, Honolulu, HI 96813) and the 2004 FSEIS is also available online at www.wpcouncil.org. The FSEIS analyzed in detail specific issues surrounding the need for mitigating sea turtle interactions with Hawaii-based longliners. The following Environmental Assessment (EA) (sections 9.1.1 - 9.1.5) tiers off of that document. It examines in detail a range of alternatives designed to address four management issues related to potential interactions between sea turtles and vessels managed under the Western Pacific Pelagics Fishery Management Plan that are not Hawaii-based longliners. It also incorporates by reference the cover sheet, table of contents, list of preparers, list of agencies, public review process and schedule, list of references as well as the discussion the purpose and need for action, and the description of its alternatives from other sections of this document as indicated.

9.1.1 Purpose and need for action

The purpose and need for action are described in Section 5.0 of this document.

9.1.2 Description of the alternatives

A description of the alternatives considered is provided in Section 8.0 of this document.

9.1.3 Affected environment given cumulative impacts to date

As well as providing new information, this section summarizes and incorporates by reference the additional information provided in Section 9.1.4 of the 2004 FSEIS (NMFS, 2004) and in Chapter 3 of the 2001FEIS (NMFS, 2001) for the Fishery Management Plan of the Pelagic Fisheries of the Western Pacific Region. For further details, please see the FSEIS and FEIS.

9.1.3.1 Oceanographic environment

This section provides background information on the natural environment in which the Pelagics FMP fisheries operate.

The Hawaiian Archipelago and the Marianas Archipelago, which includes Guam and the Commonwealth of the Northern Mariana Islands (CNMI), lie in the North Pacific subtropical gyre, while American Samoa lies in the South Pacific subtropical gyre. These subtropical gyres rotate clockwise in the Northern Hemisphere and counter clockwise in the Southern Hemisphere in response to tradewind and westerly wind forcing. Hence the Main Hawaiian Islands (MHI), Guam and CNMI, and American Samoa experience weak mean currents flowing from east to west, while the northern portion of the Hawaiian Archipelago experiences a weak mean current flowing from west to east. Imbedded in this mean flow are an abundance of mesoscale eddies created from wind and current interactions with bathymetry. These eddies, which can rotate either clockwise or counter clockwise, have important biological impacts. Eddies create vertical fluxes, with regions of divergence (upwelling) where the thermocline shoals and deep nutrients are pumped into surface waters enhancing phytoplankton production, and also regions of convergence (downwelling) where the thermocline deepens. North and south of the islands are frontal zones that also provide an important habitat for pelagic fish and thus are targeted by fishers. To the north of the Hawaiian and Marianas Archipelagoes, and also to the south of

American Samoa, lie the subtropical frontal zones consisting of several convergent fronts located along latitudes 25°-40° N. and S. often referred to as the Transition Zones. To the south of the Hawaiian and Marianas Archipelagoes, and to the north of American Samoa, spanning latitudes 15° N.-15° S. lies the equatorial current system consisting of alternating east and west zonal flows with adjacent fronts.

A significant source of interannual physical and biological variation are the *El Niño* and *La Niña* events. During an *El Niño,* the normal easterly trade winds weaken, resulting in a weakening of the westward equatorial surface current and a deepening of the thermocline in the central and eastern equatorial Pacific. Water in the central and eastern equatorial Pacific becomes warmer and more vertically stratified with a substantial drop in surface chlorophyll. A *La Niña* event exhibits the opposite conditions. During an *El Niño* the purse seine fishery for skipjack tuna shifts over 1,000 km from the western to the central equatorial Pacific in response to physical and biological impacts (Lehodey *et al.*, 1997).

Physical and biological oceanographic changes have also been observed on decadal time scales. These low frequency changes, termed regime shifts, can impact the entire ocean basin. Recent regime shifts in the North Pacific have occurred in 1976 and 1989, with both physical and biological (including fishery) impacts (Polovina, 1996; Polovina *et al.*, 1995).

Pelagic species are closely associated with their physical and chemical environment. Suitable physical environment for these species depends on gradients in temperature, oxygen or salinity, all of which are influenced by oceanic conditions on various scales. In the pelagic environment, physical conditions such as isotherm and isohaline boundaries often determine whether or not the surrounding water mass is suitable for pelagic fish, and many of the species are associated with specific isothermic regions. Additionally, areas of high trophic transfer as found in fronts and eddies are an important habitat for foraging, migration, and reproduction for many species (Bakun, 1996).

Oceanic pelagic fish such as skipjack and yellowfin tuna, and blue marlin prefer warm surface layers, where the water is well mixed by surface winds and is relatively uniform in temperature and salinity. Other fish such as albacore, bigeye tuna, striped marlin and swordfish, prefer cooler, more temperate waters, often meaning higher latitudes or greater depths. Preferred water temperature often varies with the size and maturity of pelagic fish, and adults usually have a wider temperature tolerance than sub-adults. Thus, during spawning, adults of many pelagic species usually move to warmer waters, the preferred habitat of their larval and juvenile stages. Large-scale oceanographic events (such as *El Niño*) change the characteristics of water temperature and productivity across the Pacific, and these events have a significant effect on the habitat range and movements of pelagic species. Tunas are commonly most concentrated near islands and seamounts that create divergences and convergences which concentrate forage species, also near upwelling zones along ocean current boundaries, and along gradients in temperature, oxygen and salinity. Swordfish and numerous other pelagic species tend to concentrate along food-rich temperature fronts between cold, upwelled water and warmer oceanic water masses.

These fronts represent sharp boundaries in a variety of physical parameters including temperature, salinity, chlorophyll, and sea surface height (geostrophic flow) (Niiler and Reynolds, 1984; Roden, 1980; Seki *et al.*, in press). Biologically, these convergent fronts appear to represent zones of enhanced trophic transfer (Bakun, 1996; Olsen *et al.*, 1994). The dense cooler phytoplankton-rich water sinks below the warmer water creating a convergence of phytoplankton (Roden, 1980; Polovina *et al.*, in review). Buoyant organisms, such as jellyfish as well as vertically swimming zooplankton, can maintain their vertical position in the weak down-welling, and aggregate in the front to graze on the down-welled phytoplankton (Bakun, 1996; Olsen *et al.*, 1994). The increased level of biological productivity in these zones attracts higher trophic-level predators such as swordfish, tunas, seabirds, and sea turtles, and ultimately a complete pelagic food web is assembled.

Near Hawaii, there are two prominent frontal zones. These frontal zones are associated with two isotherms (17° C and 20° C), and they are climatologically located at latitudes 32°-34° N. (the Subtropical Front or STF) and latitudes 28°-30° N. (the South Subtropical Front or SSTF) (Seki *et al.*, in press). Both the STF and SSTF represent important habitats for swordfish, tunas, seabirds and sea turtles. Variations in their position play a key role in catch rates of swordfish and albacore tuna, and distribution patterns of Pacific pomfret, flying squid, loggerhead turtles (Seki *et al.*, in press), and seabirds. Hawaii-based longline vessels targeting swordfish set their lines where the fish are believed to be moving south through the fronts following squid, the primary prey of swordfish (Seki *et al.*, in press). Squid is also the primary prey item for albatross (Harrison *et al.*, 1983), hence the albatross and longline vessels targeting swordfish are often present at the same time in the same area of biological productivity.

These frontal zones have also been found to be likely migratory pathways across the Pacific for loggerhead turtles (Polovina *et al.*, 2000). Loggerhead turtles are opportunistic omnivores that feed on floating prey such as the pelagic cnidarian *Velella velella* ("by the wind sailor"), and the pelagic gastropod *Janthina sp.*, both of which are likely to be concentrated by the weak downwelling associated with frontal zones (Polovina *et al.*, 2000). Data from on-board observers in the Hawaii-based longline fishery indicate that incidental catch of loggerheads occurs along the 17° C front (STF) during the first quarter of the year and along the 20° C front (SSTF) in the second quarter of the year. The interaction rate, however, is substantially greater along the 17° C front (Polovina *et al.*, 2000).

Species of oceanic pelagic fish live in tropical and temperate waters throughout the world's oceans. 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. In both the Northern and Southern Hemispheres, there is seasonal movement of tunas and related species toward the pole in the warmer seasons and a return toward the equator in the colder seasons. In the western Pacific, pelagic adult fish range from as far north as Japan to as far south as New Zealand. Albacore, striped marlin and swordfish can be found in even cooler waters at latitudes as far north as latitude 50° N. and as far south as latitude 50° S. As a result, fishing for these species is conducted year-round in tropical waters and seasonally in temperate waters.

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. Although tagging and genetic studies have shown that some interchange does occur, it appears that short life spans and rapid growth rates restrict large-scale interchange and genetic mixing of eastern, central and far-western Pacific stocks of yellowfin and skipjack tuna. Morphometric studies of yellowfin tuna also support the hypothesis that populations from the eastern and western Pacific derive from relatively distinct sub-stocks in the Pacific. The stock structure of bigeye in the Pacific is poorly understood, but a single, Pacific-wide population is assumed. The movement of the cooler-water tuna (e.g., bluefin, albacore) is more predictable and defined, with tagging studies documenting regular and well-defined seasonal movement patterns relating to specific feeding and spawning grounds. 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.

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. They tend to inhabit surface waters at night and deeper waters during the day, but several species make extensive vertical migrations between surface and deeper waters throughout the day. Certain species, such as swordfish and bigeye tuna, 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 just above the thermocline (275-550 meters or 150-300 fathoms). Surface concentrations of juvenile albacore are largely concentrated where the warm mixed layer of the ocean is shallow (above 90 m or 50 fm), but adults are caught mostly in deeper water (90-275 m or 50-150 fm). Swordfish are usually caught near the ocean surface, but are known to venture into deeper waters. Swordfish demonstrate an affinity for thermal oceanic frontal systems which may act to aggregate their prey (Seki *et al.*, in press) and enhance migration by providing an energetic gain by moving the fish along with favorable currents (Olsen *et al.*, 1994).

9.1.3.2 Pelagics FMP fisheries

The Pelagics 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 occur within 25 miles of land, with trips lasting only one day. These fisheries are discussed below, by gear type within each of the four island areas.

Hawaii

Hawaii's pelagic fisheries are small in comparison with other Pacific pelagic fisheries, but comprise the largest fishery sector in the State of Hawaii (Pooley 1993) (Tables 1 & 2). 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).

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 longline fishery accounted for the majority of Hawaii's commercial pelagic landings (17.3 million lb) in 2003 (Table 2). 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. Vessels with a Western Pacific general permit may not land longline caught fish in Hawaii. Conceivably, longline vessels with a general permit could catch swordfish with shallow sets beyond the 200 mile EEZ around Hawaii and tranship to a Hawaii-based vessel with a receiving permit. However there is no record of such an operation over the entire history of the Hawaii-based longline fishery. Among the reasons why this option has not been pursued are costs associated with running two vessels, impacts of transhipping at sea on fresh fish, and safety at sea associated with transhipping large pelagic fish from one vessel to another (Sean Martin, Hawaii Longline Association, pers comm.).

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. Tuna are hooked on lines and in one motion swung onto the boat deck by crew members. The aku fishing fleet has declined from a maximum of 32 vessels in the 1950s to only 2-3 vessels. This fleet currently lands about 700,000 lbs of fish (Table 3).

Table 2. Hawaii-based longline fishery landings 1999-2003 (Source: NMFS, PIFSC, published and unpublished data)

Item	1999	2000	2001	2002	2003
Area Fished	EEZ and high seas	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	17.5	17.3
Catch Composition*					
Tuna	41%	41%	52%	52%	65%
Swordfish	9%	9%	1%	1%	2%
Miscellaneous	32%	32%	36%	37%	31%
Sharks	18%	18%	11%	10%	2%
Season	All year	All year	All year	All year	All year
Active Vessels	119	125	101	100	110
Total Permits	164	164	164	164	164
Total Trips	1137	1103	1034	1164	1216
Total Ex-vessel Value (nominal) ($millions)	$47.4	$50.2	$33.0	$37.5	$37.5

* Number of fish

Pelagic handline fishing is 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 (Table 3). 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 commercial troll production (Table 3) is generated by part time fishermen, however, some full-time commercial trollers do exist.

Table 3. Fishery information for Hawaii's non-longline pelagic fisheries for 2002 (Sources: Adapted from WPRFMC, 2004)

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	1455	6
Total Permits	NA	NA
Total Trips	18700	198
Total Ex-vessel Value	$8 million	$1.1 million

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.

A summary of recreational catches in Hawaii is given in the Council's 2002 Pelagic Fisheries Annual Report (WPRFMC 2004). The total recreational catch for Hawaii was estimated to be

12,932,744 lbs, of which about 95% (in terms of weight) was caught from boats, and of which pelagic fish account for about 90%.

American Samoa, Guam and Northern Mariana Islands Fisheries

A summary of the pelagic fisheries in American Samoa, Guam and CNMI is given in Table 4. CNMI has an active commercial trolling fleet and several charter sportfishing vessels, as is Guam although production declined markedly following a December 2002 super typhoon. Until the mid-1990s, pelagic fishery production in American Samoa was also generated by trolling vessels. Longline fishing has grown markedly American Samoa since 1994, and landed in excess of 15 million pounds of fish in 2002 and 11.2 million pounds in 2003. Troll fishery production has declined in American Samoa with the advent of longlining, as many of the vessels previously troll fishing converted to small-scale longlining. Troll fishing in American Samoa in 2003 amounted to just over 30,000 lb. American Samoa has a bimodal longline fleet, comprising 30-45 ft outboard-powered catamarans, and conventional large (>50ft) monohull longliners. The longline fleet targets primarily albacore, a species found in surface schools in cooler sub-tropical and temperate waters, but requiring fishing at depths of 100 to 200 meters in the near equatorial waters of American Samoa. American Samoa longline vessels currently fish under a general permit, but a limited entry program for this fishery is currently nearing implementation.

American Samoa vessels could conceivably fish north of the equator and make shallow sets for swordfish but have no history of doing so. Based on logbook information from NMFS, to date, there has been no fishing north of the equator by American Samoa based domestic longline vessels (Figure 1). Moreover, the American Samoa fleet targets primarily albacore for the two fish canneries in Pago Pago, and there is little to no market for fresh swordfish in American Samoa. More importantly, there is no easy access to markets elsewhere on the U.S. mainland, unlike Hawaii, where most of the swordfish catch was sent. Two general longline permits have been issued in the Mariana Islands, one in Guam and the other in Commonwealth of the Northern Mariana Islands (CNMI). Neither permit is being used to conduct longline fishing from these locations. Further, based on historical data from other fleets, any longline fishing conducted around the Marianas would target tunas and not swordfish.

Table 4. Summary of Pelagic Fishery Information for American Samoa, Guam, and CNMI, 2003. (Source: Adapted from WPRFMC, 2004)

Island Area	American Samoa		Guam	CNMI
Gear	Longline	Troll/Charter	Troll/Charter	Troll/Charter
Area Fished	Inshore and EEZ	Inshore and EEZ	Inshore and EEZ	Inshore and EEZ
Total Landings	11121704	30952	643149	226,164*
Catch Composition	72% albacore tuna 8% yellowfin tuna < 5% all others	74% skipjack tuna 6% barracuda 4% yellowfin tuna < 4% all others	31% mahimahi 23% skipjack tuna 19% yellowfin tuna	70% skipjack tuna 11% mahimahi 8% dogtooth tuna 6% yellowfin tuna
Season	All year	All year	All year	All year
Active Vessels	50	19	416	107
Total Permits	88 (open access)	NA	NA	NA
Total Trips	888	283	6962	2084
Total Ex-vessel Value	$10,263,160	$29,094	$641,081**	$441,515

Notes: *Landings for CNMI are recorded commercial landings, but not all commercial landings are recorded (D. Hamm, NMFS SWSFC-HL, pers. comm., November 3, 2000).

**Total ex-vessel value of landings in Guam are estimated from commercial landings, which are less than 50 percent of total landings.

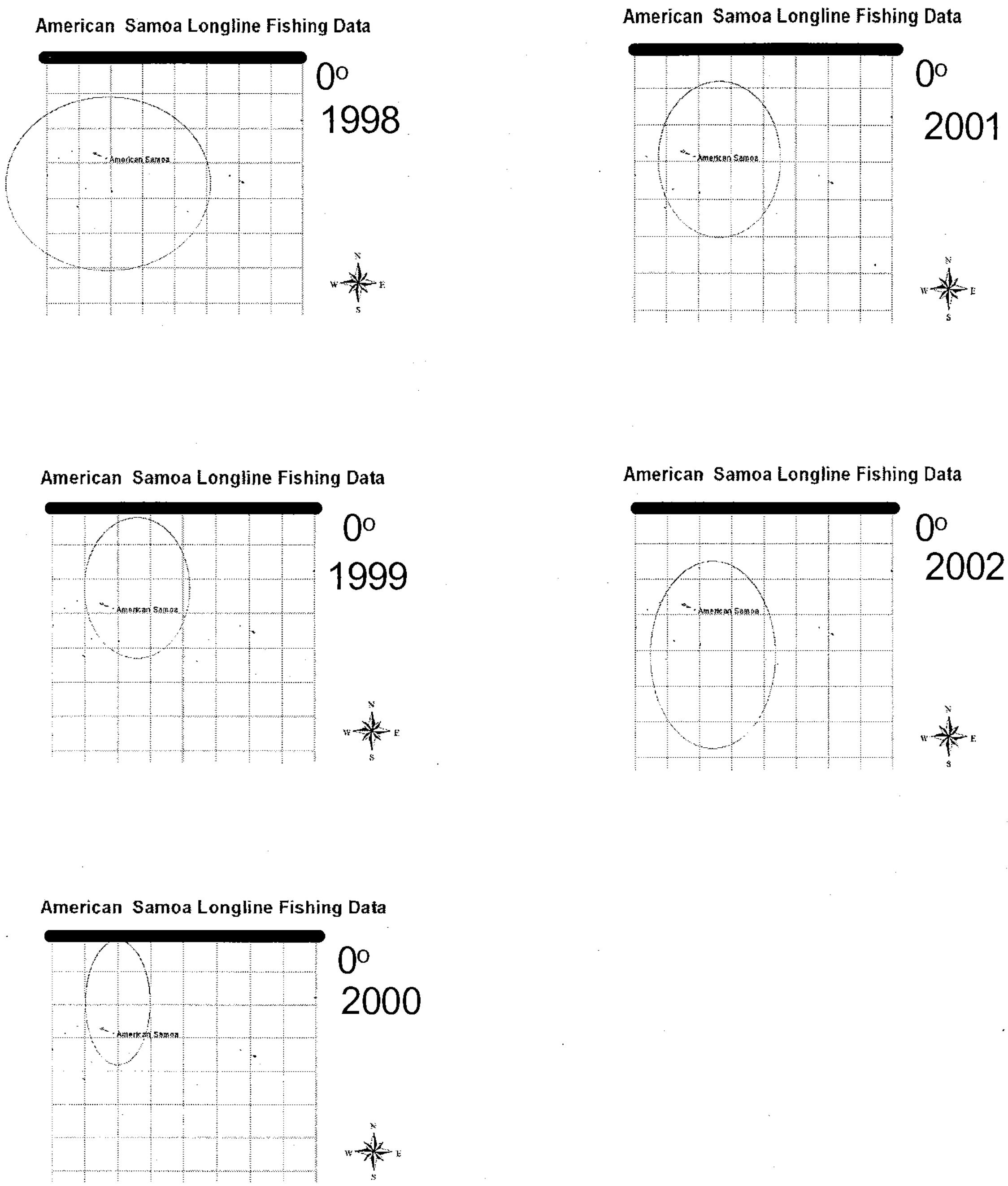

Figure 1. Distribution of American Samoa longline fishing effort between 1998 and 2002. The ellipses encompass the annual distribution of fishing effort in each year

9.1.3.3 Ecosystem and stocks

This section provides background information on the affected ecosystem as well as available information on the status of stocks managed under the Pelagics FMP.

It is important to recognize that the pelagic ecosystem responds to ambient climatic and oceanographic conditions on a variety of spatial and temporal scales and that, 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 operations of the high seas drift-gillnet fishery in the 1980s and early 1990s. Added to the serious impacts to protected species resulting from that fishery was a regime shift that markedly lowered the carrying capacity and productivity of the ecosystem at that time. Because of the long life spans and limited reproductive potential of sea turtles, seabirds and sharks, these populations are likely to be only beginning to recover from these circumstances .

Pelagic Management Unit Species: The Pelagics FMP manages a suite of "pelagic management unit species" (PMUS, see Table 5). These species have been assigned to species assemblages based upon the ecological relationships between 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 tuna, bluefin tuna, albacore tuna, striped marlin and pomfret. The tropical species complex includes all other tunas and billfish as well as *mahimahi*, wahoo and *opah*.

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.

Table 5. Pelagic Management Unit Species

English or Common Name	Scientific Name
Mahimahi (dolphinfishes)	*Coryphaena* spp.
Wahoo	*Acanthocybium solandri*
Indo-Pacific blue marlin: Black marlin	*Makaira mazara: M. indica*
Striped marlin	*Tetrapturus audax*
Shortbill spearfish	*T. angustirostris*
Swordfish	*Xiphias gladius*
Sailfish	*Istiophorus platypterus*
Pelagic thresher shark	*Alopias pelagicus*
Bigeye thresher shark	*Alopias superciliosus*
Common thresher shark	*Alopias vulpinus*
Silky shark	*Charcharinus falciformis*
Oceanic whitetip shark	*Carcharhinus longimanus*
Blue shark	*Prionace glauca*
Shortfin mako shark	*Isurus oxyrinchus*
Longfin mako shark	*Isurus paucus*
Salmon shark	*Lamna ditropis*
Albacore	*Thunnus alalunga*
Bigeye tuna	*T. obesus*
Yellowfin tuna	*T. albacares*
Northern bluefin tuna	*T. thynnus*
Skipjack tuna	*Katsuwonus pelamis*
Kawakawa	*Euthynnus affinis*
Dogtooth tuna	*Gymnosarda unicolor*
Moonfish	*Lampris* spp
Oilfish family	*Gempylidae*
Pomfret	*family Bramidae*
Other tuna relatives	*Auxis* spp, *Scomber* spp; *Allothunus* spp

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. Concise definitions of the various criteria used in the Pelagics FMP to analyze current levels of harvest exploitation and the status of PMUS stocks can be found in a publication by Boggs *et al.* (2000). That document and the 2001 NMFS Report to the U.S. Congress both contain estimates of the status of PMUS stocks. Those two publications and the most recent report of the Standing Committee on Tuna and Billfish (SCTB) are the main sources for the following sections regarding the current status of PMUS stocks.

Swordfish

There is considerable debate concerning the stock structure of swordfish in the Pacific. Several studies have been unable to reject the hypothesis that there is a single, Pacific-wide stock, while some recent evidence indicates that there may, in fact, be some delineation of separate stocks in different parts of the Pacific Ocean (Ward and Elscot, 2000). A stock assessment for North Pacific Swordfish by Kleiber & Yokawa (2002), using the Multifan-CL length-based, age structured, model suggests that the population in recent years is well above 50% of the unexploited biomass, implying that swordfish are not over-exploited and relatively stable at current levels of fishing effort.

Bigeye tuna

Genetic analyses indicate that there is a single pan-Pacific stock of bigeye (Grewe and Hampton, 1998). The most recent stock assessment of bigeye was presented at the SCTB 's 16^{th} meeting held in June 2003 Hampton et al (2003). Recruitment in all analyses is estimated to have increased since about 1980. It is possible that the pre-1965 levels of recruitment and recruitment variability are poorly estimated in this assessment because of the lack of size composition data for the longline fisheries. Biomass for the Western and Central Pacific Ocean (WPCO) is estimated to have declined to about half of its initial level by about 1970 and has been fairly stable since then. This pattern is characteristic of all regions except the subtropical southwestern Pacific, in which biomass is estimated to have remained fairly stable for most of the time-series, but to have increased strongly during the last five years of the assessment. Fishing mortality for adult and juvenile bigeye tuna is estimated to have increased continuously since the beginning of industrial tuna fishing. Current fishing mortality levels are close to or exceed the levels of natural mortality. Overall, depletion is estimated to have been rapid, particularly in recent years, with recent biomass levels estimated to be about 30% of the unexploited biomass. Even though the estimated biomass has remained fairly stable over time, it appears to have been sustained only by above average recruitment. If recruitment were to return to the average level estimated in this assessment, biomass decline would be rapid. The attribution of depletion to various fisheries or groups of fisheries indicates that the longline fishery has the greatest impact throughout the model domain. The purse seine and Indonesian fisheries also have substantial impact in the equatorial western and central Pacific.

Albacore tuna

Albacore stocks appear to be in good condition and are experiencing moderate levels of exploitation. The most recent stock assessment of the southern albacore stock was presented at the SCTB 's 16th meeting held in June 2003 by Labelle & Hampton (2003), using the Multifan-CL stock assessment model. They concluded that current biomass is estimated to be about half of the maximum estimated levels and about 60% of the estimated equilibrium unexploited biomass. The impact of the fisheries on total biomass is estimated to have increased over time, but is likely to be low, a reduction of about 3% from unexploited conditions. The model results continue to indicate that recent catches are less than the MSY, aggregate fishing mortality is less than F_{MSY} and the adult biomass is greater than B_{MSY}.

North Pacific albacore stocks are assessed at 1-2 year intervals by the North Pacific Albacore Workshop, comprising the USA, Japan, Canada and Taiwan. According to the latest assessment (NPALW, 2000), the albacore stock is healthy and not being overfished (F/F_{msy} = 0.5-0.9; B/B_{msy} = 1.10 > MSST), even though present catches are in the estimated MSY and OY range. Stock and catches are both increasing due to the continuation of a high productivity oceanic regime.

Yellowfin tuna

Some genetic analyses suggest that there may be several semi-independent yellowfin stocks in the Pacific including possible eastern and western stocks which may diverge around 150°W (Grewe and Hampton, 1998; Itano, 2000). On the other hand, tagging studies have shown individual animals are capable of large east-west movements that would suggest considerable pan-Pacific mixing of the stock. In fact, earlier mtDNA analysis failed to distinguish the presence of geographically distinct populations (Scoles and Graves, 1993; Ward *et al.*, 1994).

The most recent stock assessment of western Pacific yellowfin was presented by Hampton & Kleiber, 2003, at the SCTB 's 16th meeting held in June 2003, employing the Multifan-CL model. Fishing mortality for adult and juvenile yellowfin tuna is estimated to have increased continuously since the beginning of industrial tuna fishing. A significant component of the increase in juvenile fishing mortality is attributable to the Philippines and Indonesian fisheries, which have the weakest catch, effort and size data, which is of continuing concern.

The ratios of biomass (B) to the unexploited biomass (B_0) provide a time-series index of population depletion by the fisheries. Depletion has increased steadily over time, reaching a recent level of 0.65 - 0.80. This represents a moderate level of stock-wide depletion that would be well within the equivalent equilibrium based limit reference point (B_{MSY}/B_0 = 0.37-0.40). This depletion is somewhat greater for some individual model regions, notably the western and central Pacific equatorial regions where recent depletion levels are approximately 0.50. Other regions are much less depleted, with indices of 0.75-0.90 or greater. The assessment model concluded those yellowfin stocks in the central and western equatorial regions were fully exploited, while the remaining regions were under-exploited. The attribution of depletion to various fisheries or groups of fisheries indicates that the Indonesian fishery has the greatest impact, particularly in its home region. The western Pacific purse seine fishery also has high impact in regions 2 and 3. It is notable that the composite longline fishery is responsible for biomass depletion of <5% in each region. These estimates are in stark contrast to a recent analysis (Myers and Worm 2003) claiming that the initial 15 years of industrial longline fishing (i.e. from about 1950 to 1965) had caused an 80% reduction in the biomass of large pelagics generally.

Bluefin tuna

Bluefin tuna are slower to become sexually mature than other species of tuna and this makes them more vulnerable to overfishing. Variability in CPUE in the eastern Pacific seems to be due to variability in the number of fish migrating from the western Pacific to the coast of North America. This variability may be driven by changes in the forage base available in the western Pacific. Conceivably, these variations in trans-Pacific movements could affect the catch rates of Hawaii-based vessels.

The IATTC reviews the status of bluefin tuna occasionally (IATTC 2001). Catches have decreased since the late 1950s, but now appear to be in recovery. Evidence for overfishing or for persisting decline in the stock, which is mainly in the western Pacific, is lacking. An MSY has not been determined, but a proxy value has been established by the Pacific Regional Fishery Management Council (PRFMC, 2003) of 20,000 metric tonnes (44 million pounds), with OY 75% of that MSY.

Skipjack tuna

It is believed that the skipjack tuna in the Pacific belong to a single population (Shomura *et al.*, 1994). All recent analyses indicate that harvest ratios are appropriate for maintaining current catch levels and that overall the stocks are very healthy (Boggs *et al.*, 2000). 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 (PFRP, 1999; SCTB, 2003).

The most recent stock assessment for western Pacific stocks was also presented at the SCTB's 16th meeting (Langley et al, 2003) using the Mutlifan-CL method. The results showed that biomass trends are driven largely by recruitment, with the highest biomass estimates for the model period being those in 1998-2001. The model results suggest that the skipjack population in the WCPO in recent years has been at an all-time high. The impact of fishing is predicted to have reduced biomass by 20-25%. An equilibrium yield analysis confirms that skipjack is currently exploited at modest level relative to its biological potential. The estimates of F/Fmsy and B/Bmsy suggest that the stock is neither being overfished nor in an overfished state. Recruitment variability, and influences by environmental conditions will continue to be the primary influence on stock size and fishery performance.

Kawakawa tuna, black marlin, shortbilled spearfish, sailfish

The stock status of small tunas such as the kawakawa (*Euthynnus affinis*) and various billfish are unknown. Catches of these species comprise a minor fraction of pelagic fisheries in the Western Pacific.

Blue marlin

Based on the assumption that there is a single, Pacific-wide stock, various recent analyses characterize the blue marlin population as stable and close to that required to support average maximum sustainable yield (AMSY) (Boggs *et al,* 2000; IATTC, 1999; PFRP, 1999; Hinton and Nakano, 1996). Kleiber et al (2003) conducted a Multifan-CL stock assessment of Pacific blue marlin. They found that there was considerable uncertainty in quantifying the fishing effort levels that would produce a maximum sustainable yield. It was concluded that, at worst, blue marlin in the Pacific are close to a fully exploited state, that is the population and the fishery are somewhere near the top of the yield curve. It appears that the stock has been in this condition for the past 30 years, while the level of longline fishing effort has increased in the Pacific.

Striped marlin

Little is known about the overall status of the putative northern stock that supports the fishery in the management area although longline CPUE has demonstrated a declining trend in recent years (WPRFMC, 2004). Hinton & Bayliff (2002) presented an assessment of Eastern Pacific Ocean (EPO) striped marlin. The trends for the catch rates of the northeastern and northwestern areas of the central-eastern Pacific are not significantly different. The same is the case for catch rates in the EPO north and south of 10°N. These results suggest that the fish in the EPO belong to one stock. Reexamination of published genetic data by Hinton & Bayliff (2002) suggests that there is a stock located in the southwestern Pacific (Australia) , but provided no clear resolution of separate stocks for the Ecuador-Hawaii-Mexico triad of sampling locations.

The current biomass of striped marlin in the EPO is apparently equal to that which would produce the average maximum sustainable yield of about 4,500 mt. Retained catch and standardized fishing effort for striped marlin decreased in the EPO from 1990-1991 through 1998, and preliminary estimates indicate that nominal fishing effort in the area has continued to decrease during the 1999-2001 period. This may result in a continued decrease in standardized fishing effort for striped marlin, with an associated continuing increase in their biomass in the EPO.

Blue shark

Nakano and Watanabe (1992) attempted a stock assessment for blue sharks based on catch data from the high seas driftnet fishery (which ceased in 1992) with supplemental data from longliners. Although there was some concern about whether Nakano and Watanabe had sufficient information to make an adequate estimate of stock size (Wetherall and Seki, 1991), they estimated minimum stock size in the North Pacific at 52-67 million individuals and argued that "even the minimum stock can sustain the present catch level although the mortality rate at [the] early stage is not known for blue shark."

More recently, Matsunaga and Nakano (1999) analyzed catch data from Japanese longline research and training vessels. Two data sets were available, one from 1967-1970 and one from 1992-1995, and were geographically stratified. They found blue sharks to comprise between 73% and 85% of total catch in the 10°-20°N strata and 31-57% in the 0°-10°N strata during the two time periods. Matsunaga and Nakano found that blue shark CPUE increased slightly from the 1967-1970 to the 1992-1995 period in these two strata, but the difference was not statistically significant.

The most current stock assessment of blue shark in the Pacific was conducted by Kleiber et al (2001) using the Multifan-CL model. All scenarios generated by the model show a significant decline in the blue shark population during the 1980s followed by various degrees of recovery during the 1990s. The decline in the 1980s coincided with the existence of an extensive small-mesh driftnet fishery in the North Pacific and recovery of the stock occurs following the banning of the driftnet fishery. On the basis of the most pessimistic estimate of stock size, maximum sustainable yield (MSY) is estimated to be approximately twice the current take (average of annual takes from 1994 through 1998) by all fisheries in the North Pacific. In this scenario, the fishing mortality at MSY (F_{msy}) is approximately twice the current level of fishing mortality (average of fishing mortality from 1994 through 1998) by all fisheries in the North Pacific. Other, equally plausible estimates indicate that the stock could support an MSY up to four times current take levels and F_{msy} up to 15 times current fishing mortality.

Thresher sharks

In California, 94 percent of the total thresher shark commercial landings are taken in the driftnet ("drift gillnet") fishery for swordfish, where it is the second most valuable species landed. Catches peaked early in this fishery with approximately 1,000 mt taken in 1982 , but declined sharply in 1986 (Hanan *et al.*, 1993). Since 1990, annual catches have averaged 200 mt (1990-1998 period) and appear stable (Holts, 1998). Catch per unit effort (CPUE) has also declined from initial levels.

Declines in CPUE indicate a reduction in the thresher shark population (Holts, 1998). The decline in the driftnet CPUE as a measure of the magnitude of the decline of the stock is confounded by the effects of the various area and time closures, the offshore expansion of the fishery, and the changed emphasis from shark to swordfish among most of the fishers. Based on the estimated rate of population increase, the common thresher MSY is estimated to be as little as four to seven percent of the standing population that existed at the beginning of the fishery.

Mako sharks

This species is also taken primarily by the California driftnet fishery for swordfish. Although current catches are only about 80 mt/yr in the California fishery, the mako shark is still the second most valuable species taken in the fishery. Like the common thresher, shortfin mako catches have been affected by the changes that occurred in the driftnet fishery. Catches peaked soon after the fishery started (240 mt in 1982) and then declined. Makos are also taken in smaller amounts (<10 mt/yr) by California-based longliners operating beyond the EEZ (Vojkovich and Barsky, 1998). This fishery takes primarily juveniles and subadults, probably because the area serves as a nursery and feeding area for immature stages (Hanan *et al.*, 1993). The mako shark distribution is affected by temperature, with warmer years being associated with more northward movement. According to PRFMC (2003), clear effects of exploitation of the shrortfin mako shark have not been shown for West Coast populations, and local stocks are thought not to be overfished.

Ocean whitetip shark

The oceanic whitetip shark is one of the three most abundant sharks (Compagno, 1984). Bonfil (1994) estimated 8,200 tons of oceanic whitetips were caught from the WPCO in 1989. Stevens (1996) "roughly estimated" 50,000 to 239,000 tons of oceanic whitetips were caught by the international Pacific high-seas fisheries (purse seine, longline, and drift-net) in 1994. Although silky sharks represent more of the fisheries catch, oceanic whitetips are believed to be more

abundant (Strasburg, 1958). There have been no quantitative assessments of Pacific oceanic whitetip shark populations published to date.

Silky shark

The silky shark is one of the three most abundant pelagic sharks, along with the blue and oceanic whitetip sharks (Compagno, 1984). Bonfil (1994) estimated 19,900 tons of silky sharks were caught from the South Pacific Commission (SPC) zone in the central and south Pacific in 1989. Stevens (1996) estimated 84,000 tons of silky sharks were caught in the international Pacific high-seas fisheries (purse seine, longline, and drift-net). There have been no quantitative assessments of Pacific silky shark populations published to date.

Mahimahi and Wahoo

Stock characteristics for *C. hippurus* are not known. A preliminary analysis of mahimahi in the central and western Pacific was presented at the 16th SCTB in June 2003 (Dalzell and Williams unpublished). Annual mahimahi catches in the Pacific Islands were generally small, of the order of a few hundred tonnes, but Taiwan, with its large longline fleet landed on average almost 7,000 tonnes per year. Plots of mahimahi and wahoo across the C-W Pacific showed that catch rates of mahimahi of these species were highest in sub-tropical latitudes. Catch rates were also strongly seasonal, with on average a three-fold difference between low and high season CPUEs. Longline catch rates of mahimahi and wahoo showed strong stratification by depth (as expressed by distance of the hook from the float line), with mahimahi CPUE highest on the shallowest hook, and wahoo CPUE highest on the third hook from the float line.

Catches of both species have been variable in both longline and troll fisheries in the U.S. Pacific Islands, but have increased markedly in American Samoa due to the rapid expansion of the longline fishery after 2000. Troll and longline catches have increased over the past 20 years in Hawaii. Catch rates have also been variable , but both troll and longline catch per unit effort (CPUE) data shows reasonably similar trend in Hawaii and American Samoa. Similar CPUE trends for mahimahi and wahoo were noted for troll fisheries in Guam and the Northern Mariana Islands. The average size of wahoo in troll and longline catches in Hawaii had remained relatively stable over the past two decades, as did the troll caught mean size of mahimahi. Hawaii longline caught mahimahi showed a major decline in mean size between the 1980s and 1990s. The average size of mahimahi and wahoo were larger in longline compared to troll catches. Troll caught wahoo declined in size in American Samoa. The average sizes of mahimahi in Guam and the CNMI were similar, but wahoo were slightly larger in the CNMI troll fishery.

9.1.3.4 Sea turtles

The following sea turtle species occur in the region and may be affected by the fisheries managed under the Pelagics FMP. For more detailed information regarding the biology and status of these potentially affected sea turtles, including historical information on sea turtle interactions with the pelagic fisheries managed under the Pelagics FMP, refer to the FSEIS.

Leatherback turtles (*Dermochelys coriacea*)
Loggerhead turtles (*Caretta caretta*)
Green turtles (*Chelonia mydas*)
Olive ridley turtles (*Lepidochelys olivacea*)
Hawksbill turtles (*Eretmochelys imbricata*)

Leatherback turtles
The leatherback turtle is listed as endangered under the ESA throughout its global range. Furthermore, the Red List 2000 of the IUCN has classified the leatherback as "critically endangered"[2] due to "an observed, estimated, inferred or suspected reduction of at least 80% over three generations" based on: (a) direct observation; (b) an index of abundance appropriate for the taxon; and (c) actual or potential levels of exploitation. Increases in the number of nesting females have been noted at some sites *in the Atlantic*, but these are far outweighed by local extinctions, especially of island populations, and the demise of once large populations *throughout the Pacific*, such as in Malaysia and Mexico. Spotila *et al.* (1996) estimated the *global* population of female leatherback turtles to be only 34,500 (confidence limits: 26,200 to 42,900) nesting females; the eastern Pacific population has continued to decline since that estimate, leading some researchers to conclude that the leatherback is now on the verge of extinction in the Pacific Ocean (e.g. Spotila, *et al.*, 1996; Spotila, *et al.*, 2000).

Leatherback turtles are widely distributed throughout the oceans of the world. The species is often divided into four main populations in the Pacific, Atlantic, and Indian Oceans, and the Caribbean Sea. In the Pacific Ocean, Leatherback turtles are found on the western and eastern coasts of the Pacific, with nesting aggregations in Mexico and Costa Rica (eastern Pacific) and Malaysia, Indonesia, Australia, the Solomon Islands, Papua New Guinea, Thailand, and Fiji (western Pacific).

2Taxa are categorized as critically endangered when they are facing an extremely high risk of extinction in the wild in the immediate future.

Genetic markers in 16 of 17 leatherback turtles sampled to date from the central North Pacific (captured in the Hawaii-based longline fishery) have identified those turtles as originating from nesting populations in the southwestern Pacific; the other specimen, taken in the southern range of the Hawaii fishery, was from nesting beaches in the eastern Pacific (Dutton and Eckert, in press).

Based on published estimates of nesting female abundance, leatherback populations are declining at all major Pacific basin nesting beaches, particularly in the last two decades (Spotila *et al.*, 1996; NMFS and USFWS, 1998c; Spotila, *et al.*, 2000). Declines in nesting populations have been documented through systematic beach counts or surveys in Malaysia (Rantau Abang, Terengganu), Mexico and Costa Rica. In other leatherback nesting areas, such as Irian Jaya and the Solomon Islands, there have been no systematic consistent nesting surveys, so it is difficult to assess the status and trends of leatherback turtles at these beaches. In all areas where leatherback nesting has been documented, however, current nesting populations are reported by scientists, government officials, and local observers to be well below abundance levels of several decades ago. The collapse of these nesting populations was most likely precipitated by a tremendous overharvest of eggs coupled with incidental mortality from fishing (Sarti *et al.*, 1996; Eckert and Sarti 1997). The decline can be attributed to many factors, including fisheries interactions, direct harvest, egg collection, and degradation of habitat. On some beaches, nearly 100% of the eggs laid have been harvested. Eckert and Sarti (1997) and Spotila *et al.* (1996) note that adult mortality has also increased significantly, particularly as a result of driftnet and longline fisheries.

Loggerhead turtles

The loggerhead turtle is listed as threatened under the ESA throughout its range, primarily due to direct take, incidental capture in various fisheries, and the alteration and destruction of its habitat. The loggerhead is categorized as endangered by the IUCN, where taxa so classified are considered to be facing a very high risk of extinction in the wild in the near future. Loggerheads are circumglobal, inhabiting continental shelves, bays, estuaries, and lagoons in temperate, subtropical, and tropical waters. Major nesting grounds are generally located in temperate and subtropical regions, with scattered nesting in the tropics (*in* NMFS and USFWS, 1998d).

In the Pacific Ocean, loggerhead turtles are represented by a northwestern Pacific nesting aggregation (located in Japan) and a smaller southwestern nesting aggregation that occurs in Australia (Great Barrier Reef and Queensland), New Caledonia, New Zealand, Indonesia, and Papua New Guinea. Of the loggerheads taken in the Hawaii-based longline fishery, all were determined to have originated from Japanese nesting beaches, based on genetic analyses (P. Dutton, NMFS, personal communication, October 2002).

Loggerhead nesting in the Pacific basin is restricted to the western region, primarily Japan and Australia. In the western Pacific the only major nesting beaches are in the southern part of Japan (Dodd, 1988), but the population status of the loggerhead nesting colonies here and the surrounding region is less clear. Balazs and Wetherall (1991) speculated that 2,000 to 3,000 female loggerheads may nest annually in all of Japan; however, more recent data suggest that only approximately 1,000 female loggerhead turtles may currently nest there (Bolten *et al.* 1996; Sea Turtle Association of Japan, 2002). Nesting beach monitoring at Gamoda (Tokushima Prefecture) has been ongoing since 1954. Surveys at this site showed a marked decline in the number of nests between 1960 and the mid-1970s. Since then, the number of nests has fluctuated, but has been downward since 1985 (Bolten *et al.*, 1996; Sea Turtle Association of Japan, 2002). Recent information from the Sea Turtle Association of Japan (N. Kamezaki, personal communication, August 2001) indicates that the number of nests at Gamoda is still very low, fluctuating between near zero (1999) to near 50 (1996 and 1998). Monitoring on several other nesting beaches, surveyed since the mid-1970s, revealed increased nesting during the 1980s before declining during the early 1990s. Recent data reflect a continuing decline N. Kamezaki, Sea Turtle Association of Japan, personal communication, August 2001). Low density nesting of loggerheads has been documented on the Ryukyu Archipelago (between Taiwan and Kyushu Island, Japan), but information on abundance or trends is limited (Kikukawa, *et al.*, 1999).

Aggregations of juvenile loggerheads off Baja California Mexico have been reported, although their status with regard to increasing or declining abundance has not been determined. NMFS and USFWS (1998d) report "foraging populations ... range from 'thousands, if not tens of thousands' (Pitman, 1990) to 'at least 300,000 turtles' (Bartlett, 1989). Extrapolating from 1988 offshore census data, Ramirez-Cruz et al. (1991) estimated approximately 4,000 turtles in March, with a maximum in July of nearly 10,000 turtles."

In the south Pacific, Limpus (1982) reported an estimated 3,000 loggerheads nesting annually in Queensland, Australia during the late 1970s. However, long-term trend data from Queensland indicate a 50 percent decline in nesting by 1988-89, due to incidental mortality of turtles in the coastal trawl fishery. This decline is corroborated by studies of breeding females at adjacent feeding grounds (Limpus and Reimer, 1994). Currently, approximately 300 females nest annually in Queensland, mainly on offshore islands (Capricorn-Bunker Islands, Sandy Cape, Swains Head) (Dobbs, 2001). In southern Great Barrier Reef waters, nesting loggerheads have declined approximately 8% per year since the mid-1980s (Heron Island), while the foraging ground population has declined 3% and were comprised of less than 40 adults by 1992. Researchers attribute the declines to perhaps recruitment failure due to fox predation of eggs in the 1960s and mortality of pelagic juveniles from incidental capture in longline fisheries since the 1970s (Chaloupka and Limpus, 2001).

Scattered nesting has also been reported on Papua New Guinea, New Zealand, Indonesia, and New Caledonia; however, population sizes on these islands have not been ascertained. Survey data are not available for other nesting assemblages in the south Pacific. (NMFS and USFWS, 1998d).

Green turtles

The genus *Chelonia* is composed of two taxonomic units at the population level, the eastern Pacific green turtle (referred to by some as "black turtle," *C. mydas agassizii*), which ranges (including nesting) from Baja California south to Peru and west to the Galapagos Islands, and the nominate *C. m. mydas* in the rest of the range (insular tropical Pacific, including Hawaii).

Green turtles are listed as threatened under the ESA, except for breeding populations found in Florida and the Pacific coast of Mexico, which are listed as endangered. The International Union for Conservation of Nature and Natural Resources (IUCN) has classified the green turtle as "endangered"[3] due to an "observed, estimated, inferred or suspected reduction of at least 50% over the last 10 years or three generations, whichever is longer," based on: (a) direct observation; (b) an index of abundance appropriate for the species; and (c) actual or potential levels of exploitation. Using a conservative approach, Seminoff (2002) estimates that the global green turtle population has declined by 34% to 58% over the last three generations (approximately 150 years) although actual declines may be closer to 70% to 80%. Causes for this decline include harvest of eggs, subadults and adults, incidental capture by fisheries, loss of habitat, and disease.

In general, green turtles are thought to be declining throughout the Pacific Ocean, with the exception of Hawaii, as a direct consequence of a historical combination of overexploitation and habitat loss (Eckert, 1993; Seminoff, 2002).

In the western Pacific, the only major (> 2,000 nesting females) populations of green turtles occur in Australia and Malaysia. In Queensland, Australia there are three distinct genetic breeding stocks of green turtles; although they occupy the same foraging habitats, very little interbreeding exists. The southern Great Barrier Reef subpopulation (located at the Capricorn/ Bunker group of islands and in the Coral Sea Islands Territory) has an average annual nesting population of 8,000 females; the northern Great Barrier Reef subpopulation (Raine Island and Moulter Cay) consists of an average of 30,000 nesting females; and the Gulf of Carpenteria (nesting concentrated around Wellesley) averages 5,000 nesting females. Threats to green turtles in this area include boat strikes, indigenous harvest of adults and eggs, increased incidence of disease, ingestion of synthetic materials, incidental catch in shark control programs and by commercial fisheries, predation of eggs at nesting beaches, and tourism (*in* Dobbs, 2001). In a study conducted between 1985 and 1992 on foraging greens near southern Great Barrier Reef waters, researchers documented an 11% per year increase in the resident green turtle population, while the female nesting population increased at 3% per year. In 1992, the resident green turtle population was estimated to be comprised of 1,300 individuals (Chaloupka and Limpus, 2001).

Although there are no current estimates available, Pulau Redang, a coral fringed island located approximately 45 kilometers off the coast of Terengganu, Malaysia contains one of the largest green turtle rookeries in peninsular Malaysia, and a one nautical mile no-fishing zone has been established around the island to prevent interactions between fishing gear and internesting females (Liew and Chan, 1994).

3Under the IUCN, taxa are classified as endangered when they are not "critically endangered, but are facing a very high risk of extinction in the wild in the near future."

The primary green turtle nesting grounds in the eastern Pacific are located in Michoacán, Mexico, and the Galapagos Islands, Ecuador (NMFS and USFWS, 1998a). Here, green turtles were widespread and abundant prior to commercial exploitation and uncontrolled subsistence harvest of nesters and eggs. More than 165,000 turtles were harvested from 1965 to 1977 in the Mexican Pacific. In the early 1970s nearly 100,000 eggs per night were collected from these nesting beaches (*in* NMFS and USFWS, 1998a). The nesting population at the two main nesting beaches in Michoacán (Colola, responsible for 70% of total green turtle nesting in Michoacán (Delgado and Alverado, 1999), and Maruata) decreased from 5,585 females in 1982 to 940 in 1984. Despite long-term protection of females and their eggs at these sites since 1990, the population continues to decline, and it is believed that adverse impacts (including incidental take in various coastal fisheries as well as illegal directed take at forage areas) continue to prevent recovery of endangered populations (P. Dutton, NMFS, personal communication, 1999; Nichols, 2002). There are few historical records of abundance of green turtles from the Galapagos - only residents are allowed to harvest turtles for subsistence, and egg poaching occurs only occasionally. An annual average of 1,400 nesting females was estimated for the period 1976-1982 in the Galapagos Islands (NMFS and USFWS, 1998a).

Green turtles encountered by U.S. vessels fishing managed under the Pelagics FMP may originate from a number of known proximal, or even distant, breeding colonies in the Pacific Ocean. Genetic sampling of green turtles taken by the Hawaii-based longline fishery on observer trips indicates representation from nesting beaches on Hawaii (French Frigate Shoals) and the eastern Pacific (Mexico - Revillagigedos, Michoacan and Galapagos). Preliminary genetic analysis has revealed that of 14 green turtles sampled by observers in the Hawaii-based longline fishery from 1994 to 2001, six were of eastern Pacific (Mexico) stock origin, five were of Mexican (Islas Revillagigedos) or Hawaiian nesting stock origin, two were of Hawaii stock origin, and one was of unknown origin, although it is most likely to be of eastern Pacific stock due to similarities in mtDNA sequence. (P. Dutton, NMFS, personal communication, October 2002). Both the nesting population and foraging populations of green turtles appear to have increased over the past 30 years. Balazs and Chalopuka (2004) document a substantial long-term increase in abundance of the once seriously depleted green turtle stock in Hawaii. This population increase has occurred in a far shorter period of time than previously thought possible.

Olive ridley turtles

Although the olive ridley is regarded as the most abundant sea turtle in the world, olive ridley populations on the Pacific coast of Mexico are listed as endangered under the ESA; all other populations are listed as threatened. The olive ridley is categorized as endangered by the IUCN, where taxa so classified are considered to be facing a very high risk of extinction in the wild in the near future (IUCN Red List, 2000).

Nesting aggregations in the Pacific Ocean are found in the Marianas Islands, Australia, Indonesia, Malaysia, and Japan (western Pacific) and Mexico, Costa Rica, Guatemala, and South America (eastern Pacific). In the eastern Pacific, nesting occurs all along the Mexico and Central American coast, with large nesting aggregations occurring at a few select beaches located in

Mexico and Costa Rica. Few turtles nest as far north as southern Baja California, Mexico (Fritts, *et al.*, 1982) or as far south as Peru (Brown and Brown, 1982). Where population densities are high enough, nesting takes place in synchronized aggregations known as *arribadas*. The largest known *arribadas* in the eastern Pacific are off the coast of Costa Rica (~475,000 - 650,000 females estimated nesting annually) and in southern Mexico (~800,000+ nests/year at La Escobilla, in Oaxaca (Millán, 2000).

Recent genetic information analyzed from 39 olive ridleys taken in the Hawaii-based longline fishery indicate that 74% of the turtles (n=29) originated from the eastern Pacific (Mexico and Costa Rica) and 26% of the turtles (n=10) were from the Indian and western Pacific rookeries (P. Dutton, NMFS, personal communication, January 2001), indicating the animals from both sides of the Pacific converge in the north Pacific pelagic environment. An olive ridley taken in the CA/OR drift gillnet fishery originated from an eastern Pacific stock (i.e. Costa Rica or Mexico) (P. Dutton, NMFS, personal communication, October 2002).

The nationwide ban on commercial harvest of sea turtles in Mexico, enacted in 1990, has improved the situation for the olive ridley. Surveys of important olive ridley nesting beaches in Mexico indicate increasing numbers of nesting females in recent years (Marquez, *et al.*, 1995; Arenas, *et al.*, 2000). Annual nesting at the principal beach, Escobilla Beach, Oaxaca, Mexico, averaged 138,000 nests prior to the ban, and since the ban on harvest in 1990, annual nesting has increased to an average of 525,000 nests (Salazar, *et al.*, in press). At a smaller olive ridley nesting beach in central Mexico, Playon de Mismalayo, nest and egg protection efforts have resulted in more hatchlings, but the population is still "seriously decremented and is threatened with extinction" (Silva-Batiz, *et al.*, 1996). Still, there is some discussion in Mexico that the species should be considered recovered (Arenas, *et al.*, 2000).

In Costa Rica, 25,000 to 50,000 olive ridleys nest at Playa Nancite and 450,000 to 600,000 turtles nest at Playa Ostional each year (NMFS and USFWS, 1998e). In an 11-year review of the nesting at Playa Ostional, (Ballestero, *et al.*, 2000) report that the data on numbers of nests deposited is too limited for a statistically valid determination of a trend; however, there does appear to be a six-year decrease in the number of nesting turtles. Under a management plan, the community of Ostional is allowed to harvest a portion of eggs. Between 1988 and 1997, the average egg harvest from January to May ranged between 6.7 and 36%, and from June through December, the average harvest ranged from 5.4 to 20.9% (Ballestero, *et al.*, 2000). At Playa Nancite, concern has been raised about the vulnerability of offshore aggregations of reproductive individuals to "trawlers, longliners, turtle fishermen, collisions with boats, and the rapidly developing tourist industry" (Kalb, *et al.*, 1996). The greatest single cause of olive ridley egg loss comes from the nesting activity of conspecifics on *arribada* beaches, where nesting turtles destroy eggs by inadvertently digging up previously laid nests or causing them to become contaminated by bacteria and other pathogens from rotting nests nearby. At a nesting site in Costa Rica, an estimated 0.2 percent of 11.5 million eggs laid during a single *arribada* produced hatchlings (*in* NMFS and USFWS, 1998e).

Hawksbill turtles

The hawksbill turtle is listed as endangered under the ESA and in the International Union for the Conservation of Nature (IUCN) Red Data Book. Under Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the hawksbill is identified as "most endangered." Anecdotal reports throughout the Pacific indicate that the current population is well below historical levels. In the Pacific, this species is rapidly approaching extinction primarily due to the harvesting of the species for its meat, eggs, and shell, as well as the destruction of nesting habitat by human occupation and disruption (Meylan and Donnelly 1999, NMFS, 2001)

There are no world population estimates for hawksbill turtles, but a minimum of 15,000 to 25,000 females are thought to nest annually in more than 60 geopolitical entities (Groombridge and Luxmoore 1989, Meylan and Donnelly 1999). Moderate population levels appear to persist around the Solomons, northern Australia, Palau, Persian Gule islands, Oman, and parts of the Seychelles (Groombridge 1982). In more recent reviews, Groombridge and Luxmoore (1989) and Meylan and Donnelly (1999) list Papua New Guinea, Queensland, and Western Australia as likely to host 500-1,000 nesting females per year, while Indonesia and the Seychelles may support >1,000. The largest known nesting colony in the world is located on Milman Island, Queensland, Australia where Loop (1995) tagged 365 hawksbills nesting within an 11-week period. With the exception of Mexico, and possibly Cuba, nearly all Wider Caribbean countries are estimated to receive <100 nesting females per year (Meylan 1989).

Hawksbills appear to be declining throughout their range. By far the most serious problem hawksbill turtles face is the harvest by humans, while a less significant threat, but no less important, is loss of habitat due to expansion of resident human populations and/or increased tourism development. Dramatic reductions in the numbers of nesting and foraging hawksbills have occurred in Micronesia and the Mexican Pacific coast, probably due largely to technological advances in fishing gear, which facilitate legal and illegal harvest. In addition, the hawksbill tortoiseshell trade probably remains an important contributing factor in the decline of the hawksbill. Although the Japanese market was closed in 1994, southeast Asia and Indonesia markets remain lucrative (NMFS and USFWS, 1998b). In addition to the demand for the hawksbill's shell, there is a demand for other products including leather, oil, perfume, and cosmetics. Prior to being certified under the Pelly Amendment, Japan had been importing about 20 metric tons of hawksbill shell per year, representing approximately 19,000 turtles. A negotiated settlement was reached regarding this trade on June 19, 1992. The hawksbill shell commands high prices (currently $225/kilogram), a major factor preventing effective protection[4]

In the Pacific Ocean, there have been no hawksbill sightings off the U.S. Pacific west coast (Meylan and Donnelly 1999). Hawksbills have been observed in the Gulf of California as far as 29°N, throughout the northwestern states of Mexico, and south along the Central and South American coasts to Columbia and Ecuador (Meylan and Donnelly 1999). In the Hawaiian

4Http://www.nmfs.noaa.gov/prot_res/species/turtles/hawksbill.html

Islands, hawksbill turtles nest in the main islands, primarily on several small sand beaches on the Islands of Hawaii and Molokai. Two of these sites are at a remote location in the Hawaii Volcanos National Park. Along the far western and southeastern Pacific, hawksbill turtles nest on the islands and mainland of southeast Asia, from China to Japan, and throughout the Philippines, Malaysia, Indonesia, Papua New Guinea, the Solomon Islands (McKeown, 1977) and Australia (Limpus, 1982). Along the eastern Pacific rim, hawksbill turtles were common to abundant in the 1930s (Cliffton *et al.*, 1982). By the 1990s, the hawksbill turtle was rare to absent in most localities where it was once abundant (Cliffton *et al.*, 1982); Cornelius, 1982).

9.1.3.5 Marine mammals

Based on research, observer, and logbook data, the following marine mammals occur in the region and may be affected by the fisheries managed under the Pelagics FMP:

Marine mammals listed as threatened or endangered:

Hawaiian monk seal (*Monachus schauinslandi*)
Humpback whale (*Megaptera novaeangliae*)
Sperm whale (*Physeter macrocephalus*)
Blue whale (*Balaenoptera musculus*)
Fin whale (*Balaenoptera physalus*)
Northern right whale (*Eubalaena glacialis*)
Sei whale (*Balaenoptera borealis*)

Other marine mammals:

Pacific white-sided dolphin (*Lagenorhynchus obliquidens*)
Rough-toothed dolphin (*Steno bredanensis*)
Risso's dolphin (*Grampus griseus*)
Bottlenose dolphin (*Tursiops truncatus*)
Pantropical spotted dolphin (*Stenella attenuata*)
Spinner dolphin (*Stenella longirostris*)
Striped dolphin (*Stenella coeruleoalba*)
Melon-headed whale (*Peponocephala electra*)
Pygmy killer whale (*Feresa attenuata*)
False killer whale (*Pseudorca crassidens*)
Killer whale (*Orcinus orca*)
Pilot whale, short-finned (*Globicephala melas*)
Blainville's beaked whale (*Mesoplodon densirostris*)
Cuvier's beached whale (*Ziphius cavirostris*)
Pygmy sperm whale (*Kogia breviceps*)
Dwarf sperm whale (*Kogia simus*)
Bryde's whale (*Balaenoptera edeni*)

Although blue whales, fin whales, northern right whales, and sei whales are found within the area and could potentially interact with the Pelagics FMP fisheries, there have been no reported or observed incidental takes of these species in these fisheries. Therefore, these species are not discussed in this document.

Humpback whales

The International Whaling Commission first protected humpback whales in the North Pacific in 1965. Humpback whales were listed as endangered under the ESA in 1973. They are also protected by the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) and the MMPA. Critical habitat has not been designated for this species.

Humpback whales typically migrate between tropical/sub-tropical and temperate/polar latitudes. Humpback whales feed on krill and small schooling fish on their summer grounds. The whales occupy tropical areas during winter months when they are breeding and calving, and polar areas during the spring, summer, and fall, when they are feeding, primarily on small schooling fish and krill (Caldwell and Caldwell, 1983).

Humpback whales occur off all eight Hawaiian Islands during the winter breeding season, but particularly within the shallow waters of the "four-island" region (Kaho'olawe, Molokai, Lanai, Maui), the northwestern coast of the island of Hawaii (Big Island), and the waters around Niihau, Kauai and Oahu (Wolman and Jurasz, 1977; Herman et al., 1980; Baker and Herman, 1981).

Estimates of the number of individuals in the Northern Pacific stock have recently risen. Estimates in the 1980s ranged from 1,407 to 2,100 (Baker, 1985; Darling and Morowitz, 1986; Baker and Herman, 1981), while recent estimates of abundances were approximately 6,000 (Calambokidis et al., 1997; Mobley et al., 1999).

Studies based on resighting individuals through photographs resulted in an estimate of 6,010 animals (S.E. = 474) for the entire North Pacific (Calambokidis et al., 1997). The central North Pacific stock of humpback whales winters in the waters of the main Hawaiian Islands and feeds on the summer grounds of Southeast Alaska and Prince William Sound. A population estimate of 1,407 whales was derived using capture-recapture methodology (95% CI 1,113 - 1,701) for data collected in 1980-83 (Baker and Herman, 1987).

Cerchio (1998) estimated that about 4,000 animals visit Hawaii annually. Aerial surveys conducted between 1976 and 1990 found a significant increase in sighting rates of humpbacks over that time (Mobley et al., 1999), consistent with the increase in photographic estimates. Finally, aerial surveys using line-transect methodologies were conducted in 1993, 1995 and 1998. Hawaii population estimates for nearshore waters derived from the sighting data show an increase from 2,717 (+/- 608) in 1993, to 3,284 (+/- 646) in 1995 and 3,852 (+/- 777) in 1998 (Mobley et al., 1999).

Hawaiian monk seals

The Hawaiian monk seal was listed as endangered under the ESA in 1976. The species is endemic to the Hawaiian Archipelago and Johnston Atoll, and is one of the most endangered marine mammals in the United States. It is also the only endangered marine mammal that exists wholly within the jurisdiction of the United States.

Monks seals are one of the most primitive genera of seals. They are nonmigratory, but recent studies show that their home ranges may be extensive (Abernathy and Sniff, 1998). Counts of individuals or shore compared with enumerated subpopulations at some of the NWHI indicate that monk seals spend about one-third of their time on land and about two thirds in the water. (Forney et al. 2000)

Before human habitation of the Hawaiian Archipelago, the monk seal population may have measured in the tens of thousands as opposed to the hundreds of thousands or millions typical of some pinniped species. When population measurements were first taken in the 1950s, the population was already considered to be in a state of decline. In 1998, minimum population estimate for monk seals was 1,436 individuals (based on enumeration of individuals of all age classes at each of the subpopulations in the NWHI, derived estimates based on beach counts for Nihoa and Necker, and estimates for the MHI) (Forney et al., 2001). Taking into account the first year survival rates, NMFS Southwest Fisheries Science Center - Honolulu Laboratory estimated the species population size to be between 1,300 and 1,400 individuals (Laurs, 2000). Monk seals are found at six main reproductive sites in the NWHI: Kure Atoll, Midway Island, Pearl and Hermes Reef, Lisianski Island, Laysan Island and French Frigate Shoals. Smaller populations also occur on Necker Island, and Nihoa Island. NMFS researchers have also observed monk seals at Gardner Pinnacles and Maro Reef. Monk seals are also increasingly found in the MHI (including Niihau), where preliminary surveys have counted more than 50 individuals. Additional sightings and at least one birth have occurred at Johnston Atoll, excluding eleven adult males that were translocated to Johnston Atoll (nine from Laysan Island and two from French Frigate Shoals) over the past 30 years.

Population trends for monk seals are determined by the highly variable dynamics of the six main reproductive subpopulations. At the species level, demographic trends over the past decade have been driven primarily by the dynamics of the French Frigate Shoals subpopulation, where the largest monk seal population is experiencing an increasingly unstable age distribution resulting in an inverted age structure. This age structure indicates that recruitment of females and pup production may soon decrease. In the near future, total population trends for the species will likely depend on the balance between continued losses at French Frigate Shoals and gains at other breeding locations including the Main Hawaiian Islands.

There was some evidence in the early 1990s that longline operations were adversely affecting the Hawaiian monk seals, as indicated by the sighting of a few animals with hooks and other non-natural injuries. In 1991, Amendment 3 established a permanent 50-mile Protected Species Zone around the NWHI that is closed to longline fishing. Since 1993, no interactions with Hawaiian monk seals in the pelagic longline fishery have been reported.

Sperm whales

Sperm whales have been protected from commercial harvest by the IWC since 1981, although the Japanese continued to harvest sperm whales in the North Pacific until 1988 (Reeves and Whitehead 1997). Sperm whales were listed as endangered under the ESA in 1973. They are also protected by the Convention on International Trade in Endangered Species of wild flora and fauna and the Marine Mammal Protection Act of 1972. Critical habitat has not been designated for sperm whales.

Sperm whales are distributed in all of the world's oceans. Several authors have recommended three or more stocks of sperm whales in the North Pacific for management purposes (Kasuya 1991, Bannister and Mitchell 1980). However, the IWC's Scientific Committee designated two sperm whale stocks in the North Pacific: a western and eastern stock (Donovan 1991). The line separating these stocks has been debated since their acceptance by the IWC's Scientific Committee. For stock assessment purposes, NMFS recognizes three discrete population "centers" of sperm whales: (1) Alaska, (2) California/Oregon/Washington, and (3) Hawaii.

A 1997 survey to investigate sperm whale stock structure and abundance in the eastern temperate North Pacific area did not detect a seasonal distribution pattern between the U S EEZ waters off California and areas farther west, out to Hawaii (Forney et al., 2000). A 1997 survey, which combined visual and acoustic line-transect methods, resulted in estimates of 24,000 (CV=0.46) sperm whales based on visual sightings, and 39,200 sperm whales (CV=0.60) based on acoustic detections and visual group size estimates (Forney et al., 2000). An analysis for the eastern tropical Pacific estimates abundance at 22,700 sperm whales (95% C. I. = 14,800-34,000; Forney et al., 2000).

Sperm whales have been sighted in the Kauai Channel, the Alenuihaha Channel between Maui and the island of Hawaii, and off the island of Hawaii (Mobley, et al.1999, Forney et al., 2000). Additionally, the sounds of sperm whales have been recorded throughout the year off Oahu (Thompson and Friedl 1982). Twenty-one sperm whales were sighted during aerial surveys conducted in nearshore Hawaiian waters conducted from 1993 through 1998. Sperm whales sighted during the survey tended to be on the outer edge of a 50 - 70 km distance from the Hawaiian Islands, indicating that presence may increase with distance from shore (Mobley, pers. comm. 2000). However, from the results of these surveys, NMFS has calculated a minimum abundance of sperm whales within 46 km of Hawaii to be 43 individuals (Forney et al., 2000).

Delphinids

The Pacific white-sided dolphin is found throughout the temperate North Pacific (Hill and DeMaster, 1999). Two stocks of this species are recognized, but the stock structure throughout the North Pacific is poorly defined. Population trends and status of the Central North Pacific stock of Pacific white-sided dolphins relative to the optimum sustainable population are currently unknown (Hill and DeMaster, 1999).

The rough-toothed dolphin's distribution is worldwide in oceanic tropical and warm temperate waters (Miyazaki and Perrin, 1994). They have been sighted northeast of the Northern Mariana Islands during winter (Reeves *et al.*, 1999). Rough-toothed dolphins are also found in the waters off the Main Hawaiian islands (Shallenberger, 1981) and have been observed at least as far north as French Frigate Shoals in the Northwestern Hawaiian Islands (Nitta and Henderson, 1993). The stock structure for this species in the North Pacific is unknown (Forney *et al.*, 2000). The status of rough-toothed dolphins in Hawaii's waters relative to their optimum sustainable population is unknown, and there are insufficient data to evaluate trends in abundance (Forney *et al.*, 2000).

Risso's dolphins are found in tropical to warm-temperate waters worldwide (Kruse *et al.*, 1999) but appear to be rare in the waters around Hawaii. There have been four reported strandings of Risso's dolphins on the Main Hawaiian Islands (Nitta, 1991). Risso's dolphins have also been sighted near Guam and the Northern Mariana Islands (Reeves *et al.*, 1999). Nothing is known about stock structure for this species in the North Pacific (Forney *et al.*, 2000). The status of Risso's dolphins in Hawaii's waters relative to their optimum sustainable population is unknown, and there are insufficient data to evaluate trends in abundance (Forney *et al.*, 2000).

Bottlenose dolphins are widely distributed throughout the world in tropical and warm-temperate waters (Reeves *et al.*, 1999). The species is primarily coastal, but there are also populations in offshore waters. Bottlenose dolphins are common throughout the Hawaiian Islands (Shallenberger, 1981). Data suggest that the bottlenose dolphins in Hawaii belong to a separate stock from those in the eastern tropical Pacific (Scott and Chivers, 1990). The status of bottlenose dolphins in Hawaii's waters relative to their optimum sustainable population is unknown, and there are insufficient data to evaluate trends in abundance (Forney *et al.*, 2000).

As its name implies, the pantropical spotted dolphin has a pantropical distribution in both coastal and oceanic waters (Perris and Hohn, 1994). Pantropical spotted dolphins are common in Hawaii, primarily on the lee sides of the islands and in the inter-island channels (Shallenberger, 1981). They are also considered common in American Samoa (Reeves *et al.*, 1999). Morphological differences and distribution patterns have been used to establish that the spotted dolphins around Hawaii belong to a stock that is distinct from those in the eastern tropical Pacific (Dizon *et al.*, 1994). The status of pantropical dolphins in Hawaii waters relative to their optimum sustainable population is unknown, and there are insufficient data to evaluate trends in abundance (Forney *et al.*, 2000).

Spinner dolphins are the cetaceans most likely to be seen around oceanic islands throughout the Pacific and are also seen in pelagic areas far from land (Perrin and Gilpatrick, 1994). This species is common around American Samoa (Reeves *et al.* 1999). There is some suggestion of a large, relatively stable resident population surrounding the island of Hawaii (Norris *et al.*, 1994). Spinner dolphins are among the most abundant cetaceans in Hawaii's waters. However, the status of spinner dolphins in Hawaii's waters relative to their optimum sustainable population is unknown, and there are insufficient data to evaluate trends in abundance (Forney *et al.*, 2000).

The striped dolphin occurs in tropical and warm temperate waters worldwide (Perrin *et al.*, 1994). Several sightings were made in winter to the north and west of the Northern Mariana Islands (Reeves *et al.*, 1999). In Hawaii, striped dolphins have been reported stranded 13 times between the years of 1936-1996 (Nitta, 1991), yet there have been only two at-sea sightings of this species (Shallenberger, 1981). Striped dolphin population estimates are available for the waters around Japan and in the eastern tropical Pacific, but it is not known whether any of these animals are part of the same population that occurs in Hawaii (Forney *et al.*, 2000). The status of striped dolphins in Hawaii's waters relative to their optimum sustainable population is unknown, and there are insufficient data to evaluate trends in abundance (Forney *et al.*, 2000).

The pygmy killer whale has a circumglobal distribution in tropical and subtropical waters (Ross and Leatherwood, 1994). They have been observed several times off the lee shore of Oahu (Pryor *et al.*, 1965), and Nitta (1991) documented five strandings on Maui and the island of Hawaii. According to the MMPA stock assessment reports, there is a single Pacific management stock (Forney *et al.*, 2000). The status of pygmy killer whales in Hawaii waters relative to their optimum sustainable population is unknown, and there are insufficient data to evaluate trends in abundance (Forney *et al.*, 2000).

False killer whales occur in tropical, subtropical and warm temperate seas worldwide (Stacey *et al.*, 1994). This species occurs around the Main Hawaiian Islands, but its presence around the Northwestern Hawaiian Islands has not yet been established (Nitta and Henderson, 1993). For the MMPA stock assessment reports, there is a single Pacific management stock (Forney *et al.*, 2000). The status of false killer whales in Hawaii waters relative to their optimum sustainable population is unknown, and there are insufficient data to evaluate trends in abundance (Forney *et al.*, 2000).

The killer whale has a cosmopolitan distribution (Reeves *et al.* 1999). Observations from Japanese whaling or whale sighting vessels indicate large concentrations of these whales north of the Northern Mariana Islands and near Samoa (Reeves *et al.* 1999). Killer whales are rare in Hawaii's waters. There have been two reported sightings of killer whales, one off the Waianae coast of Oahu, and the other near Kauai (Shallenberger, 1981). Except in the northeastern Pacific, little is known about stock structure of killer whales in the North Pacific (Forney *et al.*, 2000). The status of killer whales in Hawaii's waters relative to their optimum sustainable population is unknown, and there are insufficient data to evaluate trends in abundance (Forney *et al.*, 2000).

The melon-headed whale has a circumglobal, tropical to subtropical distribution (Perryman *et al.*, 1994). Large herds of this species are seen regularly in Hawaii's waters (Shallenberger, 1981). Strandings of melon-headed whales have been reported in Guam (Reeves *et al.* 1999). For the MMPA stock assessment reports, there is a single Pacific management stock (Forney *et al.*, 2000). The status of melon-headed whales in Hawaii's waters relative to their optimum sustainable population is unknown, and there are insufficient data to evaluate trends in abundance (Forney *et al.*, 2000).

Whales

The short-finned pilot whale ranges throughout tropical and warm temperate waters in all the oceans, often in sizable herds (Reeves *et al.*, 1999). It is one of the most frequently observed cetaceans around Guam (Reeves *et al.*, 1999). Short-finned pilot whales are commonly observed around the Main Hawaiian Islands, and are probably present around the Northwestern Hawaiian Islands (Shallenberger, 1981). Stock structure of short-finned pilot whales has not been adequately studied in the North Pacific, except in the waters around Japan (Forney *et al.*, 2000). The status of short-finned whales in Hawaii's waters relative to their optimum sustainable population is unknown, and there are insufficient data to evaluate trends in abundance (Forney *et al.*, 2000).

Bryde's whales have a pantropical distribution and are common in much of the tropical Pacific (Reeves *et al.*, 1999). Shallenberger (1981) reported a sighting of a Bryde's whale southeast of Nihoa in 1977. Available evidence provides no biological basis for defining separate stocks of Bryde's whales in the central North Pacific (Forney *et al.*, 2000). The status of Bryde's whales in Hawaii waters relative to their optimum sustainable populations is unknown, and there are insufficient data to evaluate trends in abundance (Forney *et al.*, 2000).

The Blainsville's beaked whale has a cosmopolitan distribution in tropical and temperate waters (Mead, 1989). Sixteen sightings of this species were reported from the Main Hawaiian Islands by Shallenberger (1981). Cuvier's beaked whale probably occurs in deep waters throughout much of the tropical and subtropical Pacific (Heyning, 1989). Strandings of this species have been reported in the Main and Northwestern Hawaiian Islands (Nitta, 1991; Shallenberger, 1981). There is no information on stock structure of the Blainsville's beaked whale or Cuvier's beaked whale. The status of Blainsville's beaked whales and Cuvier's beaked whales in Hawaii's waters relative to their optimum sustainable populations is unknown, and there are insufficient data to evaluate trends in abundance (Forney *et al.*, 2000).

The pygmy sperm whale is likely to occur all year in many parts of the tropical and subtropical Pacific (Caldwell and Caldwell, 1989). There have been at least nine reported strandings of this species in the Hawaiian Islands (Nitta, 1991). The dwarf sperm whale is rarely observed at sea in most areas , but is apparently abundant in some (Nagorsen, 1985). Its distribution, as inferred mainly from strandings, is worldwide in tropical and temperate waters. There have been two strandings of this species in the Hawaiian Islands (Nitta, 1991). The status of pygmy sperm whales and dwarf sperm whales in Hawaii's waters relative to their optimum sustainable populations is unknown, and there are insufficient data to evaluate trends in abundance (Forney *et al.*, 2000).

Pinnipeds

Northern fur seals and northern elephant seals commonly migrate into the northeastern portion of the historic Hawaii-based fishing zone (Bigg, 1990; Stewart and DeLong, 1995). Both species may occur in this region anytime of the year, but there are periods when the probability of their presence is greatest, especially for certain age and sex groups. Juvenile northern fur seals of both sexes are believed primarily to occur in the region during the fall, early winter and early summer (Bigg, 1990). Northern elephant seal adult females also migrate into the area twice a year, returning briefly to land to breed in the winter and molt in the spring (Stewart and Delong, 1995). The eastern Pacific stock of the northern fur seal is classified as a strategic stock because it is designated as depleted under the MMPA (Hill and DeMaster, 1999). A review of elephant seal population dynamics through 1991 concluded that the status of this species could not be determined with certainty, but that these animals might be within their optimal sustainable population range (Barlow *et al.*, 1993).

9.1.4 Environmental impacts of the alternatives

This section considers the environmental impacts of each of the management alternatives discussed in Section 8 and summarized here in Table 6.

Table 6. Summary of alternatives considered

Alt.	Measure 1	Measure 2	Measure 3	Measure 4
A	No Action	No Action	No action	No action
B	Require annual attendance by vessel operators	Require that operators of general longline vessels carry and use dip nets, line clippers, and bolt cutters - except for longline vessels with less than 3' freeboard (preferred)	Require vessel operators to follow handling requirements and remove trailing gear in the EEZ	Allow shallow-setting north of the equator by vessels registered to general longline permits only if the circle hooks, mackerel-type bait and dehookers required by vessels registered to Hawaii longline permits are used, with an exemption from the requirement to use long-handled dehookers provided for longline vessels with less than 3' of freeboard (preferred)

C	Require annual attendance by both vessel operators **and** vessel owners (preferred)	Require that operators of general longline vessels carry and use dip nets, line clippers, and bolt cutters to release hooked or entangled sea turtles with no exceptions for longline vessels with less than 3' freeboard	Require vessel operators to follow handling requirements specified in 660.32 (c) and (d) and remove trailing gear wherever they fish (preferred)	Prohibit shallow-setting north of the equator by vessels registered to general longline permits

9.1.4.1 Impacts on fish stocks

None of the action alternatives are anticipated to impact the target or non-target species of fish caught by affected pelagic vessels. Requirements to attend workshops, for operators of general longline vessels to carry and use dip nets, line clippers, and bolt cutters, and for operators of non-longline pelagic vessels to follow handling requirements and remove trailing gear from accidently caught turtles will have no impact on fishing operations. A requirement for vessels registered to general longline permits to use circle hooks and mackerel-type bait and dehookers when shallow-setting north of the equator could conceivably affect fishing operations of vessels fishing under a general permit (or American Samoa limited entry permit) based in American Samoa. However, these vessels do not target swordfish, having no access to mainland US markets comparable to the Hawaii-based-longline fishery. It is therefore extremely unlikely that they would want to diversify their fishing operations beyond targeting albacore for the Pago Pago canneries. In summary, given the healthy status of Pacific pelagic stocks and the small proportion of global Pacific fishing effort represented by the FMP longline fisheries for most species, it seems unlikely that any alternative would have a significant impact on fishery stocks.

9.1.4.2 Impacts on other species

None of the alternatives are expected to have negative impacts on sea turtles. Based on the discussion, findings and requirements in NMFS' 2004 Biological Opinion, the preferred alternatives under Measures 1-3 will cumulatively minimize the effects of accidental hookings and entanglements on any sea turtle captured by general longline permitted vessels as well as non-longline vessels managed under the Pelagics FMP. By the same logic, Measure 4's preferred alternative (Alternative 4B), the requirement to use circle hooks, mackerel-type bait and dehookers on general longline permitted vessels shallow-setting north of the equator, will also minimize the potential for sea turtle hookings, facilitate the removal of such hooks and allow sea turtles to be returned to the sea with a minimum of trauma so as to maximize post-hooking survival. The impacts on sea turtles of the rejected alternatives for Measure 1 would range from neutral for the No Action alternatives to less positive for Alternative 1B, which would only require vessel operators to attend protected species workshops and would thus reduce the potential for vessel owners to reinforce the message and importance of the education provided at the workshops. The impacts on sea turtles of rejected alternatives for Measure 2 would range from neutral for the No Action alternative to adverse for Alternative 2C, which would require operators of vessels with a freeboard of less than 3' to also carry and use dipnets and long-handled line clippers. The use of dipnets on these small vessels would be unwieldy and could result in sea turtles be dropped on deck as compared to being gently eased onboard by lifting them under their flippers. In addition the use of long-handled line clippers on these small vessels could result in added injury to sea turtles as their long-handles would reduce vessels operator's control of the cutting blade as compared to using a knife or other handheld implement to carefully cut fishing line as close as possible to embedded hooks. The impacts on sea turtles of rejected alternatives for Measure 3 would range from neutral for the No Action alternative to somewhat positive for Alternative 3B would apply the requirements for non-longline vessels to follow sea turtle handling requirements only to EEZ waters of the Western Pacific region. Although this alternative would benefit some sea turtles, it would not mitigate the impacts of this fishery sector throughout its range. The impacts on sea turtles of rejected alternatives for Measure 4 would range from neutral for the No Action alternative to potentially of increased benefit for Alternative 4C which would prohibit shallow-set fishing north of the equator by all non-Hawaii based longline vessels fishing north of the equator. Because no such fishing has been conducted to date, these benefits would be predicated on such fishing occurring and resulting in sea turtle interactions prior to further management action by the Council or NMFS.

Interaction rates between longliners and marine mammals in the Hawaii longline fishery are relatively infrequent and none have been recorded for the American Samoa longline fishery in the limited number of observations conducted to date. Because none of the alternatives are expected to change current fishing patterns or operations, they are not anticipated to increase interaction rates with marine mammals. The impacts on marine mammals of the rejected alternatives for Measure 1 would range from neutral for the No Action alternatives to positive for the preferred alternative (Alternative 1C) which would require both vessel operators and vessel owners to annually attend protected species workshops where they would be educated on appropriate techniques for mitigating potential interactions with marine mammals. Alternative 1B would be somewhat less positive as it would only require vessel operators to attend workshops and would thus reduce the potential for vessel owners to reinforce the message and importance of the education provided at the workshops. The impacts on marine mammals of all alternatives for Measures 2 and 3 would be neutral as those measures focus on specific techniques for mitigating interactions with sea turtles and none would require or be anticipated to result in changes to the rate, nature, or mitigation of fishery interactions with marine mammals. The impacts on marine mammals of the alternatives considered for Measure 4 would range from neutral to potentially beneficial as circle hooks would be likely to reduce external hookings as their barbs are turned inwards as compared to J-hooks. Although none of the alternatives would require vessel operators to attempt to remove ingested hooks from marine mammals, if they were to do so it is likely that, as with sea turtles, the use of circle hooks and dehookers would facilitate the removal of such hooks and allow the animals to be returned to the sea with a minimum of trauma so as to maximize post-hooking survival.

Fishery interactions with seabirds under the Pelagics FMP appear to be largely confined to Hawaii-based vessels fishing for swordfish to the north of the Hawaiian Islands. Little information exists on interactions with other fishery sectors, however none of the other fishing methods or geographic fishing areas are believed or known to have other than minor to non-existent seabird impacts. For this reason all of the alternatives considered here focus are likely to have neutral to positive effects on seabirds. Potential positive effects would arise under alternatives which would require attendance at protected species workshops where techniques for seabird handling and release are demonstrated, as well as from the potential use of large circle hooks on non-Hawaii based longline vessels should any be used to shallow-set north of the equator. The use of 18/0 or larger circle hooks which are at least 2" in diameter and thus less likely to be swallowed - and if swallowed the curve of the hook makes it less likely than current J-hooks to lodge in seabird's gullet (seabirds are known to have an ability to regurgitate some metal objects) - may reduce the severity of interactions that result in the ingestion of hooks. Although no research on seabirds has been conducted, circle hooks are also believed to lessen the likelihood of external hookings of seabirds as their barbs are turned inwards as compared to J-hooks.

9.1.4.3 Impacts on habitat

Because the alternatives considered here require either no action or the use of metal fishing hooks or mitigation gear that would be used near the surface of the ocean, none of the alternatives are anticipated to lead to substantial physical, chemical, or biological alterations to the habitat, result in loss of, or injury to, managed species or their prey, or have any substantial impact on the physical and chemical properties of the water column. For these reasons they will not adversely affect ocean or coastal habitat, essential fish habitat, or habitat areas of particular concern.

9.1.4.4 Impacts on biodiversity and ecosystem function

The Hawaii longline fishery at its peak generated a mixed catch of between 15 to 30 million lb of fish (7,000 - 14,000 mt), while the American Samoa longline fishery production peaked in 2002 at about 7,000 mt. This is a very small fraction of the tropical and subtropical pelagic ecosystem biomass. In addition, it is not expected that any of the alternatives will significantly change fishery operating patterns or catches. It is therefore anticipated that none of alternatives considered here would negatively affect biodiversity or ecosystem functions.

9.1.4.5 Impacts on public health and safety

Due to the fact that none of the alternatives considered would require operating in ways significantly outside of historical patterns, public health and safety are not anticipated to be affected.

9.1.4.6 Social and economic impacts

The alternatives considered for the four measures would have a range of social and economic impacts. The impacts of all No Action alternatives would be most highly negative as they would likely cause the fisheries to be out of compliance with the Endangered Species Act and thus any fishery participant that interacted with a sea turtle could be personally prosecuted and subject to resultant penalties. It is difficult to predict the number of individuals that would continue fishing, interact with sea turtles and be prosecuted under this scenario. The type of amount of penalties that would be imposed on such individuals is also unknown. However these would clearly be adverse impacts on fishery participants. In a worse case scenario the No Action alternatives could result in fishery closures while NMFS and the Council considered and pursued the appropriate course of action to get the fisheries back into compliance. Such actions would result the loss of all ex-vessel revenues for these fisheries, as well as the loss of the unquantified social and economic benefits that extend to fishery participants, fishery support services, and other individuals and businesses that indirectly support, rely on, or benefit from these fisheries. Measure 1's Alternatives 1B and 1C would both require attendance at protected species workshops. Alternative 1B would only apply this to operators of non-Hawaii based longline vessels. It is presumed that NMFS would offer this workshop where the vessels are based (at this time the only non-Hawaii based longline vessels are based in American Samoa and workshops are being offered in both places) and thus the maximum cost for vessel operators to attend would be the unquantified opportunity cost of a lost half-day of fishing or other activities. The preferred alternative (Alternative 1C) would also include the owners of these vessels in this requirement. Under this alternative, a substantial cost may be incurred for vessel owners residing outside of Hawaii and American Samoa. Although vessel owners would presumably be allowed to receive interim training through the receipt of a computer compact disk with protected species information as is allowed for the Hawaii-based fleet, annual (in person) certification would be required, and thus under this alternative vessel owners living beyond Hawaii and American Samoa would incur the costs of travel to attend the workshops unless provisions for remote attendance and certification are established. It is difficult to predict how many individuals would have to make special trips to one of these locations to attend annual workshops or what their travel costs would be, but they could be significant in some cases. Measure 2's Alternative2 would require operators of general permit longline vessels to carry and use dipnets, long-handled line clippers and bolt cutters. These measures were previously implemented under the Pelagics FMP but were removed when the regulations were vacated on April,1, 2004. Most longline vessels therefore already have this gear on board. However, should vessels need to re-equip themselves, the costs are not expected to exceed $100. The preferred alternative (Alternative 1C) recognizes that small longliners like alia catamarans would not be required to carry a dip net or long-handled line clippers (however they would need to carry an instrument capable of cutting trailing fishing line), as they can simply retrieve and release the turtle from the side of the vessel without risk of additional injury to the animal. Operators of these vessels are believed to routinely carry instruments capable of cutting through both fishing line and fish hooks and thus would not need to acquire any additional equipment and would not be expected to experience any social or economic impacts under this alternative. Similarly, fishery participants that would be affected by Measure 3's Alternatives 3B and 3C are believed to routinely carry the instruments required to cut through trailing fishing line and thus would not be expected to experience and social or economic impacts under either of these alternatives. However they may potentially experience difficulties in complying with some the handling requirements included in both of these alternatives, specifically the requirement that comatose or inactive sea turtles be brought onboard and held in a shaded place for 4 to 24 hours. Many of the vessels affected by this measure are small trollers or handliners (18'-25' in length overall) which lack sufficient deck space to accomplish this. In addition many take trips of 6 to 12 hours which do not allow for holding sea turtles for longer time periods. It remains unclear what vessel operators would be expected to do, or would actually do in these situations. Fortunately interactions between these vessels and sea turtles are believed to be rare to non-existent.

Measure 4's Alternative 4B would require general permit longline vessels to use the circle hooks, mackerel-type bait and de-hookers currently required on Hawaii-based vessels when shallow-setting north of the equator. This would incur additional costs in terms of re-rigging longlines with 18/0 circle hooks plus swivels, at a cost of $1.50/hook and with longlines typically setting 2000-2,600 hooks (Sean Martin, Pacific Ocean Producers, pers. comm.) at a start up cost of $3,450. American Samoa-based vessels would also be required to use mackerel-type bait for shallow set fishing north of the equator, at a cost of between $0.25-0.30/hook (Sean Martin, Pacific Ocean Producers, pers. comm.). American Samoa-based vessels usually employ sardine or sanma bait, which conform to the definition of 'mackerel-type bait' (a whole fusiform fish with a predominantly blue, green, or grey back and predominantly grey, silver, or white lower sides and belly). However, the requirement for a larger circle hook may mean that a larger bait would be required to be retained on the hook. In summary, switching to shallow-set longlining north of the equator would incur additional costs to American Samoa longline vessels of between about $2,500 to $3,500 per vessel. There would also be an additional costs of about $500 per vessel for the approved dehookers and associated equipment as detailed in Table A- 4 (Tom Graham, NMFS PIRO, pers comm.). In addition the results of trials suggests that although this gear does not lead to a decrease in catch or revenues when making shallow sets to target swordfish a 80% reduction in bigeye catch rates was observed compared to conventional J-hooks and squid bait (Watson et al. 2004). Thus this alternative could have a significant impact on affected vessels' ex-vessel revenues when making shallow sets targeting yellowfin tuna, by reducing the catch rates of incidentally caught bigeye tuna. Measure 4's Alternative 4C would prohibit all shallow-setting north of equator by these vessels. Although no potentially affected vessels are known to have made shallow sets north of the equator to date, this alternative would foreclose that opportunity and all future social and economic returns that might result.

9.1.4.7 Cumulative impacts

The preferred alternatives are not expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species, based on historical and predicted fishing effort and the condition of these stocks. As discussed in Section 9.1.4.1 the preferred alternatives under Measures 1-3 will cumulatively minimize the effects of accidental hookings or entanglement on any turtle captured by general longline permitted vessels and non-longline gears such as troll and handline gear and thus maximize post-hooking survival. The preferred alternative under Measure 4, the requirement to use circle hooks and mackerel-type bait for general longline permitted vessels shallow-setting north of the equator, will minimize the potential for sea turtle hookings or entanglements.

Given the lack of complete information on the rate of interactions between marine mammals and pelagic fisheries in the Western Pacific Region and on the condition of marine mammal stocks, the effects of the preferred alternatives on marine mammals cannot be determined at this time with any degree of precision. However as discussed in Section 9.1.4.2 the impacts are anticipated to range from neutral to potentially beneficial.

Seabird interactions with US longline vessels in the Western Pacific appear to be largely confined to Hawaii-based vessels fishing for swordfish to the north of the Hawaiian Islands. However as discussed in Section 9.1.4.2, the preferred alternatives are anticipated to have neutral to potentially beneficial impacts on seabirds.

The shallow-set longline fishery operating from California was closed in 2004 through a rule imposed following the issuance by NMFS of a February 4, 2004 Biological Opinion on that fishery (NMFS, 2004b). Some of those California-based vessels could return to Hawaii and reactivate their latent Hawaii permits, in which case they would be obliged to fish under the conditions imposed on the Hawaii-based fishery, which include fleet-wide set limits, hard limits on loggerhead and leatherback takes, as well as the circle hook, mackerel-type bait and dehooker requirements contemplated in this document for vessels registered to general longline permits. The potential impacts of these operations are discussed in the 2004 SEIS.

Vessels with general permits could potentially land in other ports within and beyond the Western Pacific Region. Besides Hawaii, the only major market for longline caught fish is the Pago Pago canneries - and a tiny domestic market for fresh swordfish. There are no domestic longline fisheries in Guam and the Northern Mariana Islands, although there is local interest in developing such fisheries. Longline vessels from the Western Pacific used to land swordfish into California ports, but this opportunity is now closed to vessels not permitted under the Pacific Council's Pelagics FMP. Two Hawaii-based vessels made landings in Alaska in the early 1990s but this has not happened since and was an anomaly due to the two vessels fishing further north than the normal extent of the fishery. No Western Pacific longline vessels have opted to land fish at ports outside the US in Central and South America., such as Costa Rica, Panama or Ecuador, as the economics of doing so militate against this.

Under current regulations, fish could potentially be transhipped from a general permitted vessel to a vessel with a Hawaii receiving permit and landed in Hawaii. This has never happened in the history of the fishery but it might be argued that such an operation would be profitable as it would allow a general permitted longline vessel to fish at sea for longer and reduce operating expenses. However, this would mean identifying crew who were prepared to stay sea for extended periods of time on a longline vessel. While foreign crews may accept this hardship, crew of American nationality may be unwilling to accept the hardship of remaining at sea for periods exceeding the usual one month fishing trip. Moreover, the ability of a vessel to continue operating at sea is not only dependent on unloading fish, but on water, ice and other consumables. Costs for both the fishing vessel and the carrier vessel including both crew pay, insurance and consumables would have to be adequately covered by the volume of fish caught by a single vessel. Further, the Hawaii longline fishery is a premium fresh fish fishery, meaning that excessive handling of fish is minimized to preserve quality and price. Transhipment at sea would likely reduce the quality of the fish and further jeopardize the operation of a transhipment operation (Sean Martin, Hawaii Longline Association, pers comm.). Freezing the fish is an option to minimize handling issues during transhipment but would result in a lower price for the fish. Lastly, transhipping tens of thousands of pounds of fish between two vessels on the high seas is dangerous and involves risks which fishermen are unlikely to countenance. For these reasons it is unlikely that a transhipment operation into Honolulu by a general longline permit holder would prosper.

The economies of the island areas in the Western Pacific Region could be seriously affected by numerous factors exogenous to pelagic fisheries, including changes in regional tourism patterns and government spending. With the exception of American Samoa, commercial fishing in general plays a minor economic role in these island areas. Tourism is the most important industry in Hawaii, Guam, and the Commonwealth of the Northern Mariana Islands. Hawaii's tourist industry appears to be recovering after a sharp decline in Asian visitors during the 1990s. However, a listless overall state economy continues to hamper the ability of Hawaii fishers to adapt to regulatory changes by supplementing fishing incomes with shore-based employment. Labor market opportunities in construction and other economic sectors where Hawaii fishers have found employment in the past have not yet recovered to pre-1990 levels. Changes in the level of government-related activities, such as federally-funded capital works projects or defense spending, also have a dramatic effect on economic conditions in the island areas. The economy of American Samoa is especially dependent on federal assistance.

None of the exogenous factors which contribute to cumulative effects on essential fish habitat, the marine environment or pelagic management unit species are expected to be modified by the indirect effects of any alternative discussed here when the estimated direct and indirect effects are combined with the potential effects of exogenous factors on essential fish habitat, the marine environment, or the stock status or availability of pelagic management unit species. This is largely because the FMP longline fisheries represent a very small amount (less than 5%) of Pacific wide catch and effort. No significant cumulative effects that need mitigation were identified for these resources.

10.0 Consistency with Other Laws and Statues

10.1 National Standards for fishery conservation and management

This section examines the four preferred alternatives for Measures 1-4 for their consistency with the National Standards of the Magnuson-Stevens Act. The four preferred alternatives are as follows:

Measure 1. To require annual attendance at a NMFS Protected Species Workshop by operators and owners of general longline vessels (vessels registered to general longline permits and those that in the future will be registered to American Samoa limited entry longline permits) - with consideration of mechanisms for remote attendance.

Measure 2. To require operators of general longline vessels (vessels registered to general longline permits and those that in the future will be registered to American Samoa limited entry longline permits) to carry and use dip nets, line clippers, and bolt cutters and follow proscribed turtle resuscitation and release guidelines, with an exemption from carrying a dipnet or long-handled line clipper for small longline vessels with freeboard less than or equal to 3 ft. (however they would need to carry an instrument capable of cutting trailing fishing line).

Measure 3. To require operators of non-longline pelagic vessels targeting Pelagic Management Unit Species with hooks to follow proscribed turtle resuscitation and release guidelines and remove trailing gear from accidentally caught turtles, wherever they fish.

Measure 4. To require operators of longline vessels registered to general longline permits (vessels registered to general longline permits and those that in the future will be registered to American Samoa limited entry longline permits) to use circle hooks, mackerel-type bait and dehookers when shallow-setting north of the equator.

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

The preferred alternatives are consistent with National Standard 1, since they would allow operators of general longline vessels to fish north of the equator, and diversify their fishing. The diversification of fishing, through allowing shallow-set longlining may reduce the targeting of bigeye tuna and hence reduce the fraction of fishing mortality on this stock, generated by any longline vessels with general longline permits. Although not a target species, and not a component of the Pelagic Management Unit, the preferred alternatives also mitigate fishery impacts on Pacific turtle populations.

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

The preferred alternatives are consistent with National Standard 2 as they are based on the best scientific data available for new technologies, and the best practices for the conservation and care of accidently hooked or entangled Pacific sea turtles caught by longline and non-longline pelagic fishing vessels. The preferred alternatives also provide for the continued and detailed dissemination of this information at NMFS' Protected Species Workshops to operators and owners of general longline vessels (vessels registered to general longline permits and those that in the future will be registered to American Samoa limited entry longline permits).

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

The preferred alternatives are consistent with National Standard 3. The Council has considered and taken into account of the range of managed species in formulating these management measures for the vessels fishing under general longline permits. Measure 4's preferred alternative recognizes that vessels fishing under a general longline permit may wish to fish in the North Pacific, and diversify catches from tuna and to potentially include swordfish by making shallow sets.

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

The preferred alternatives are consistent with National Standard 4 because they do not discriminate between residents of different states.

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

The preferred alternatives are largely consistent with National Standard 5. Although, general longline permit holders would be constrained to only using mackerel-type bait and circle hooks when making shallow sets north of the equator, the results of trial in the Atlantic suggest that the use of this gear and bait combination can improve swordfish catch rates, but it can also reduce catch rates for bigeye tuna.

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

The preferred alternatives are consistent with National Standard 6 since they close a potential gap in the regulations which would allow general longline permit holders to fish in the North Pacific without using the mackerel-type bait and circle hook combination, known to greatly reduce interactions with turtles. Limited information collected to date from longlining south of the equator in American Samoa suggests that turtle interactions are not a problem, compared to longline fisheries in the North Pacific.

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

The preferred alternatives are consistent with National Standard 7 because their gear modifications, (circle hooks, mackerel-type bait and dehookers), are low cost, practicable and effective modifications to the method of longline fishing for swordfish. They do not differ markedly from fishing methods already employed by the longline fishery, but used in combination have been shown to greatly reduce turtle interactions.

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

The preferred alternatives are consistent with National Standard 8 in that they would allow for vessels operating in American Samoa under general longline permits to diversify their catches should they be able to identify markets for swordfish. The American Samoa-based fishery is almost entirely dependent on marketing catches to the Pago Pago tuna canneries, making the fishery vulnerable to a cannery closure or downsizing. The preferred alternatives would also mean that vessels fishing from ports in the Mariana archipelago would have the choice of diversifying catches of longline caught fish north of the equator.

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

The preferred alternatives are consistent with National Standard 9 as they are designed to minimize the mortality of any turtles accidently caught by longline vessels or non-longline vessels such as trollers or pelagic handliners.

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

The preferred alternatives are consistent with National Standard 10. The gear requirements for the fishery are not dissimilar to those already used in the fishery and thus do not represent any additional hazard to fishermen. The use of circle hooks may in fact reduce accidental hookings of fishermen, and the use of dehookers may similarly reduce the opportunity for injuries that arise from removing hooks by hand.

10.2 Essential fish habitat

Based on the above information, the preferred alternatives are not expected to have adverse impacts on essential fish habitat (EFH) or habitat areas of particular concern (HAPC) for species managed under the Pelagics, Bottomfish and Seamount Groundfish, Precious Corals, Crustaceans, or Coral Reef Ecosystems Western Pacific Fishery Management Plans. EFH and HAPC for these species groups has been defined as presented in Table 7. The preferred alternatives will not adversely affect EFH or HAPC for any managed species as they are not likely to lead to substantial physical, chemical, or biological alterations to the habitat, or result in loss of, or injury to, these species or their prey. For the same reason, the preferred alternatives are not anticipated to cause substantial damage to the ocean and coastal habitats.

Table 7. Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC) for species managed under the Pelagics, Crustaceans, Bottomfish and Seamount Groundfish, Precious Corals, Crustaceans, and Coral Reef Ecosystems, Western Pacific Fishery Management Plans. All areas are bounded by the shoreline, and the outward boundary of the EEZ, unless otherwise indicated.

SPECIES GROUP (FMP)	EFH (juveniles and adults)	EFH (eggs and larvae)	HAPC
Pelagics	water column down to 1,000 m	water column down to 200 m	water column down to 1,000 m that lies above seamounts and banks.
Bottomfish	water column and bottom habitat down to 400 m	water column down to 400 m	all escarpments and slopes between 40-280 m, and three known areas of juvenile opakapaka habitat
Seamount Groundfish	(adults only): water column and bottom from 80 to 600 m, bounded by 29°-35°N and 171°E -179°W	(including juveniles): epipelagic zone (0-200 nm) bounded by 29°-35°N and 171°E - 179°W	not identified
Precious Corals	Keahole, Makapuu, Kaena, Wespac, Brooks, and 180 Fathom gold/red coral beds, and Milolii, S. Kauai and Auau Channel black coral beds	not applicable	Makapuu, Wespac, and Brooks Bank beds, and the Auau Channel
Crustaceans	bottom habitat from shoreline to a depth of 100 m	water column down to 150 m	all banks within the Northwestern Hawaiian Islands with summits less than 30 m
Coral Reef Ecosystems	water column and benthic substrate to a depth of 100 m	water column and benthic substrate to a depth of 100 m	all Marine Protected Areas identified in FMP, all PRIAs, many specific areas of coral reef habitat (see FMP)

10.3 Regulatory Flexibility Act

The Regulatory Flexibility Act, 5 U.S.C. 601 et seq. (RFA) requires government agencies to assess the impact of their regulatory actions on small businesses and other small organizations via the preparation of Regulatory Flexibility Analyses. An Initial Regulatory Flexibility Analysis prepared for this action is provided in Appendix A to this document.

10.4 Executive Order 12866

In order to meet the requirements of Executive Order 12866 (E.O. 12866) the National Marine Fisheries Service requires that a Regulatory Impact Review (RIR) be prepared for all regulatory actions that are of public interest. This review provides an overview of the problem, policy objectives, and anticipated impacts of the proposed action, and ensures that management alternatives are systematically and comprehensively evaluated such that the public welfare can be enhanced in the most efficient and cost effective way. In accordance with E.O. 12866, the following is set forth by the Council: (1) This rule is not likely to have an annual effect on the economy of more than $100 million or to adversely affect in a material way the economy, a sector of the economy, productivity, jobs, the environment, public health or safety, or state, local, or tribal governments or communities; (2) This rule is not likely to create any serious inconsistencies or otherwise interfere with any action taken or planned by another agency; (3) This rule is not likely to materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights or obligations of recipients thereof; (4) This rule is not likely to raise novel or policy issues arising out of legal mandates, or the principles set forth in the Executive Order; (5) This rule is not controversial. An analysis of this rule is provided in Appendix A to this document.

10.5 Coastal Zone Management Act

The Coastal Zone Management Act requires a determination that a recommended management measure has no effect on the land or water uses or natural resources of the coastal zone or is consistent to the maximum extent practicable with an affected state's approved coastal zone management program. A copy of this document will be submitted to the appropriate state and territorial government agencies in Hawaii, American Samoa, Guam and CNMI for review and concurrence with a determination that the recommended measure is consistent, to the maximum extent practicable, with the state and territorial coastal zone management programs.

10.6 Endangered Species Act

Species listed as endangered or threatened under the Endangered Species Act (ESA) that have been observed in the area where fishing vessels managed under the Pelagics FMP operate are as follows:

Species listed as endangered
Short-tailed albatross (*Phoebastria albatrus*)
Hawaiian monk seal (*Monachus schauinslandi*)
Pacific olive ridley turtle *(Lepidochelys olivacea*)
Leatherback turtle (*Dermochelys coriacea*)
Hawksbill turtle (*Eretmochelys imbricata*)
Green turtle (*Chelonia mydas*) - Florida and Pacific coast of Mexico breeding populations only
Humpback whale (*Megaptera novaeangliae*)
North Pacific Right Whale (*Eubalaena japonica*)
Sperm whale (*Physeter macrocephalus*)
Blue whale (*Balaenoptera musculus*)
Fin whale (*B. Physalus*)
Sei whale (*B. Borealis*)

Species listed as threatened
Loggerhead turtle (*Caretta caretta*)
Asian stocks of Pacific olive ridley (*Lepidochelys olivacea*) and green turtles (*Chelonia mydas*)

The only listed species of seabirds that may interact with the fisheries managed under the Pelagics FMP is the short-tailed albatross, however, no interactions have been observed for any fishery sectors. Other listed species known to interact with the Hawaii longline fishery and which may potentially interact with other fisheries managed under the Pelagics FMP are the leatherback turtle, loggerhead turtle, green turtle, olive ridley turtles, and hawksbill turtles. In addition, several Hawaii-based small troll vessels have reportedly collided with humpback whales. The Biological Opinion completed in February 2004 by NMFS concluded that the fisheries managed under the Pelagics Fishery Management Plan, in conjunction with Measures 1-3 discussed here, are unlikely to jeopardize the continued existence of threatened and endangered species in the Western Pacific.

Troll fisheries: Although the spatial distribution of FMP troll fisheries overlaps with the distribution of sea turtles and listed marine mammals, there have been no reported fishing interactions by vessel operators. In addition, sea turtles are not likely to interact with troll fishing gear because the gear is towed through the water faster than sea turtles may be traveling Furthermore, sea turtles and listed marine mammals do not prey on the bait species used by the troll fisheries. Several Hawaii-based small troll vessels have reportedly collided with humpback whales. However, this type of interaction is extremely rare, and there are no confirmed gear interactions with marine mammals or sea turtles in this fishery, although a lack of reported information does not necessarily equate to a lack of interactions. In general, incidental capture of sea turtles or marine mammals in these fisheries is expected to be rare and, due to the immediate retrieval of the gear, not believed likely to result in serious injury or mortality of the captured animal. However under the preferred alternatives discussed here, if a sea turtle is hooked or entangled, vessel operators would be required to follow the handling guidelines described above to maximize post-hooking survival. No listed seabird species are known to interact with this fishery.

Handline fisheries: There have been no reported interactions between gear used in the Pelagics FMP handline fisheries and sea turtles or listed marine mammals. Although there is the risk that sea turtles or listed marine mammals may become hooked or entangled in the fishing gear, any caught animal can be immediately dehooked or disentangled and released. Moreover, most turtles or listed marine mammals found in the area of the handline fisheries are not likely to prey on the baited hooks. However under the preferred alternatives discussed here, if a sea turtle is hooked or entangled, vessel operators would be required to follow the handling guidelines discussed above to maximize post-hooking survival. No listed seabird species are known to interact with this fishery.

Pole-and-line fishery: Although the distribution of the FMP pole-and-line fishery overlaps with the distribution of sea turtles and listed marine mammals, the likelihood of an interaction with a sea turtle or listed marine mammal is very low because sea turtles and listed marine mammals are not likely to prey on the anchovy bait typically used, and the fish feeding frenzies produced by these fishing operations would deter turtles from remaining in the area. However under the preferred alternatives discussed here, if a sea turtle is hooked or entangled, vessel operators would be required to follow the handling guidelines discussed above to maximize post-hooking survival. No listed seabird species are known to interact with this fishery.

Longline gear - American Samoa- based fishery:
Federal logbooks for the American Samoa-based longline fishery, between 1992 and 2002 indicate six interactions with sea turtles (i.e. hooking/entanglement). In 1992, one vessel interacted with a green turtle. In 1998, one vessel interacted with an unidentified sea turtle; it was released alive. In 1999, one vessel reported interactions with four sea turtles. Three turtles released alive were recorded as a hawksbill, a leatherback, and an olive ridley. One turtle, identified as a green, was reported to have died from its interaction with this vessel. None of the species' identification were validated by NMFS' Southwest Fisheries Science Center. NMFS cannot attest to the local knowledge of fishermen regarding the identity of various turtle species, particularly hard-shelled turtles. A total of 76 sets in the American Samoa longline were observed on conventional monohull longline vessels between August to October, 2002. No interactions with protected species were observed. Further, a total of 13 sets on monohull vessels and 7 sets on alia catamarans were observed in the longline fishery in neighboring Samoa by observers deployed during 2002 by the Oceanic Fisheries Program of the Secretariat of the Pacific Community. No interactions with protected species were observed. Effort has greatly increased in this fishery in the last few years, but if a limited entry program is established as proposed in FMP Amendment 11, effort is unlikely to substantially increase in the future. Amendment 11 will also require that observers be carried on domestic longline vessels based in American Samoa if requested by NMFS. Although there is no minimum observer coverage level required it seems likely that NMFS will seek to achieve 20% coverage as this is the goal for the Hawaii-based longline fishery. Under the preferred alternatives discussed here, operators of these

vessels would be required to use circle hooks, mackerel-type bait and dehookers when shallow-setting north of the equator. Although this fleet has not fished north of the equator, this measure will minimize the potential for sea turtle hookings, facilitate the removal of such hooks and allow sea turtles to be returned to the sea with a minimum of trauma if such effort does occur. Similarly, although this fleet has not had any reported or observed interactions with marine mammals, and has not fished north of the equator, the impacts on marine mammals of the preferred alternatives discussed here would also be potentially beneficial as the circle hooks would be likely to reduce external hookings as their barbs are turned inwards as compared to J-hooks. Although vessel operators would not be required to use dehookers to attempt to remove ingested hooks from marine mammals, if they were to do so it is likely that, as with sea turtles, the use of circle hooks and dehookers would facilitate the removal of such hooks and allow the animals to be returned to the sea with a minimum of trauma. In addition, the requirement that vessel owners and operators annually attend at protected species workshops where techniques for sea turtle, marine mammal and seabird handling and release are demonstrated should lead to potential positive impacts if interactions with these species occur throughout the fleet's range. Finally, although this fleet is not known to interact with any listed seabirds, the preferred alternatives requirement for circle hooks when shallow-setting north of the equator could have potential beneficial impacts on listed seabirds as the use of 18/0 or larger circle hooks which are at least 2" in diameter and thus less likely to be swallowed - and if swallowed the curve of the hook makes it less likely than current J-hooks to lodge in seabird's gullet (seabirds are known to have an ability to regurgitate some metal objects) - may reduce the severity of interactions that result in the ingestion of hooks. Although no research on seabirds has been conducted, circle hooks are also believed to lessen the likelihood of external hookings of seabirds as their barbs are turned inwards as compared to J-hooks.

10.7 Marine Mammal Protection Act

The Hawaii-based longline fishery was categorized as Category I under section 118 of the Marine Mammal Protection Act of 1972 (62 FR 28657, May 27, 1997) effective September 9, 2004 (69 FR 48407, August 10, 2004). All other fisheries managed under the Pelagics FMP remain Category III fisheries. The elevation of the Hawaii-based longline fishery to Category I status is based on NMFS' findings that interaction rates between these vessels and false killer whales within Hawaii's EEZ exceeds this stock's Potential Biological Removal level.

Marine mammals not listed as endangered or threatened under the Endangered Species Act that have been observed in the area where fisheries managed under the Pelagics FMP operate are as follows:

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

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

As discussed in Sections 9.1.4.2, and 10.6, the preferred alternatives are likely to have neutral to potentially beneficial impacts on marine mammals that occur in the Western Pacific region. Please see those sections for a detailed discussion.

10.8 Paperwork Reduction Act

The purpose of the Paperwork Reduction Act of 1995 (PRA) is to minimize the paperwork burden on the public. The Act requires federal agencies toensure that information collected from the public is needed and is collected in an efficient manner (44 U.S.C. 3501 (1)). The proposed action does not include any collection-of-information requirements that would be subject to approval by the Office of Management and Budget (OMB), pursuant to the PRA.

10.9 Traditional Indigenous Fishing Practices

None of the alternatives are expected to have any impact on traditional and indigenous fishing practices.

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