WESTERN
PACIFIC
REGIONAL
FISHERY
MANAGEMENT
COUNCIL

MAGNUSON-STEVENS ACT DEFINITIONS AND REQUIRED PROVISIONS

OVERFISHING PROVISIONS

Amendment 6 (Supplement) to the Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region

Amendment 8 (Supplement) to the Fishery Management Plan for the Pelagic Fisheries of the Western Pacific Region

Amendment 10 (Supplement) to the Fishery Management Plan for the Crustaceans Fisheries of the Western Pacific Region

Including an Environmental Assessment

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Western Pacific Regional Fishery Management Council
1164 Bishop St., Suite 1400
Honolulu, Hawaii 96813
Telephone (808) 522-8220
Fax (808) 522-8226

Cover Sheet

Summary

On October 11, 1996 the Magnuson-Stevens Fishery Conservation and Management Act (MSA) was re-authorized and amended by the Sustainable Fisheries Act (SFA). As a result, the MSA contains new requirements, making it necessary for Fishery Councils to amend all of their existing Fishery Management Plans (FMP) to incorporate these requirements. The Western Pacific Fishery Management Council (Council) developed amendments to its four FMPs to address these requirements, which were published in September 1998 and submitted to the National Marine Fisheries Service (NMFS) for review and approval. NMFS only partially approved the amendments, as described in a Federal Register notification published on April 19, 1999 (64 FR 19067). Among other elements, the overfishing provisions (those required under Section 303(a)(10) and related sections of the MSA, as amended by the SFA) in Amendment 6 to the Bottomfish FMP, Amendment 8 to the Pelagics FMP, and Amendment 10 to the Crustaceans FMP were disapproved.

These FMP amendments supplement those partially approved amendments by providing new specifications of overfishing criteria. The new criteria address NMFS' concerns that the previously specified criteria using spawning potential ratio (SPR) as a proxy for maximum sustainable yield (MSY) were not appropriate because they do not provide a measure of stock biomass, as required by the MSA. In addition, the original amendments did not adequately describe control rules that would trigger Council action based on the status of these fisheries.

Biological and fishery data are poor for all species and island areas covered by the Bottomfish FMP. Given these limitations, MSY-based control rules and overfishing thresholds are specified for multi-species stock complexes. Stock status determination criteria, including a maximum fishing mortality threshold (MFMT) and a minimum stock size threshold (MSST), are specified for the stock complexes based on recommendations in the NMFS technical guidance for implementing National Standard 1. Standardized values of catch per unit effort and fishing effort will be used as proxies for stock biomass and fishing mortality, respectively. In addition to the overfishing thresholds, secondary reference points and control rules designed to prevent recruitment overfishing will be applied to individual species where possible. A process is established for making stock status determinations. The Bottomfish FMP includes a number of measures that serve to prevent overfishing and keep stocks from becoming overfished, including a moratorium on the harvest of armorhead in the seamount groundfish fishery, prohibitions on the use of destructive fishing methods, and limited access programs in the two NWHI management zones that serve to limit fishing mortality. Additional measures that will be considered if the control rules call for remedial action include additional area closures, seasonal closures, a reduction in the number of available permits in the NWHI limited entry fisheries, the establishment of limited entry systems in other areas, limits on catch per trip, limits on effort per trip, and fleet-wide limits on catch or effort.

Many of the pelagic species have enough data to be treated individually. Stock-wide relative mortality rates and relative biomass can be estimated for these "data-moderate" stocks. Stock status determination criteria, including MFMT and MSST, are specified for these stocks based on recommendations in the NMFS technical guidance for implementing National Standard 1. Species that are data-poor will be treated as part of multi-species stock complexes. A process is

established for making stock status determinations. The trans-boundary nature of the pelagic stocks makes management difficult, as stock-wide fishing mortality cannot be sufficiently controlled through action solely within Council jurisdiction. Such control will require participation by the Council and NMFS in regional management frameworks. The Pelagics FMP includes a number of measures that serve to prevent local overfishing and keep stocks from becoming locally overfished, including a limited access program for the Hawaii-based longline fishery, a prohibition on the use of drift gillnets, the recent closure of the swordfish-directed longline fishery, prohibitions on shark finning, and several longline area closures. The Council will continue to consider adjustments to these measures and additional measures in order to achieve localized objectives.

The major crustacean fishery targets several lobster species in the NWHI. Until the fishery was closed in 2000, it had been operating under a seasonal harvest guideline specified at 13% of the exploitable stock. Stock status determination criteria, including MFMT and MSST, are specified for the NWHI lobster stocks based in part on recommendations in the NMFS technical guidance for implementing National Standard 1. Target and rebuilding control rules and reference points are also specified, using the same risk-based approach used in the existing constant harvest rate policy, which sets the harvest rate such that there is a 10% risk of overfishing. A process is established for making stock status determinations. The Crustaceans FMP includes a number of measures that serve to prevent overfishing and keep stocks from becoming overfished, including gear design restrictions, catch report requirements, a limited access program for the NWHI, a maximum limit on the number of traps per vessel, a six-month closed season, area closures encompassing about 16% of NWHI lobster habitat, and annual bank-specific maximum harvest guidelines for the NWHI based on a constant harvest rate strategy. The primary management action that would be considered if the control rules call for remedial action are adjustments to the harvest rate. Other possible actions would include additional area closures, adjustments to the NWHI seasonal closure, and full-year closures. The NWHI lobster fishery has been closed since 2000, when uncertainty in the status of the stocks and the models used to assess the stocks led to an emergency closure. The future of the fishery is also uncertain because of the implications of the NWHI Coral Reef Ecosystem Reserve, which appears to preclude lobster fishing in the NWHI.

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1. Introduction

1.1 Responsible agencies

The Western Pacific Fishery Management Council (Council or WPFMC) was established by the Magnuson-Stevens Fishery Conservation and Management Act (MSA) to develop fishery management plans (FMPs) for fisheries operating in the US Exclusive Economic Zone (EEZ) around American Samoa, Guam, Hawaii, the Northern Mariana Islands and the Pacific Remote Island Areas (PRIAs).[1] Once an FMP is approved by the Secretary of Commerce (Secretary), it is implemented by federal regulations, which are enforced by the National Marine Fisheries Service (NMFS) and the US Coast Guard, in cooperation with state agencies.

For further information, contact:

Kitty M. Simonds
Executive Director
WPFMC
1164 Bishop St., #1400
Honolulu, HI 96813
Telephone: (808) 522-8220
Fax: (808) 522-8226

Charles Karnella
Administrator
NMFS Pacific Islands Area Office
1601 Kapiolani Blvd., #1110
Honolulu, HI 96814-0047
Telephone: (808) 973-2937
Fax: (808) 973-2941

1.2 Public review process and schedule

The original Comprehensive Amendment of all Council Fishery Management Plans (FMPs) was sent to NMFS for review and approval on September 18, 1998, and the partial approval notice was published in the Federal Register (FR 64, no. 74, 19067-19069) on April 19th 1999. The Council began revising the disapproved sections for bycatch (Pelagic and Bottomfish FMPs), fishing communities in Hawaii (all FMPs) and MSY/overfishing control rules (Crustacean, Pelagic and Bottomfish FMPs) in late 2001, and presented the revised drafts to its Scientific and Statistical Committee (SSC) on the 12th March 2002. The revisions were discussed at the Council's 112th meeting on March 19th 2002, at which time there was an opportunity for the public to comment on the revised sections of the Comprehensive Amendment. The Council voted to forward the revised sections on bycatch and fishing communities to NMFS for review and approval, and accepted the SSC recommendation that additional work was required on the MSY/overfishing control rule document. The MSY/overfishing control rule revisions were discussed at the Bottomfish Plan Team meeting (April 10, 2002), Pelagic Plan Team (1 May 2002) and the 80th SSC meeting (14th May, 2002). The Council took final action on the MSY/overfishing control rule section of the Comprehensive Amendment at the 113th Council meeting on June 25th 2002, at which time there was a public hearing prior to the Council decision to send the document to NMFS for review and approval.

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

1.3 List of preparers

This document was prepared by:

Western Pacific Fishery Management Council:	Paul Dalzell
NMFS Pacific Islands Area Office:	Marcia Hamilton
Council contractors:	Kit Dahl, Tom Graham

2. Existing Management Measures

2.1 Bottomfish and Seamount Groundfish FMP

The FMP for Bottomfish and Seamount Groundfish Fisheries in the Western Pacific Region became effective by a final rule published on August 27, 1986 (51 FR 27413). The FMP prohibits certain destructive fishing techniques, including explosives, poisons, trawl nets, and bottom-set gillnets; establishes a moratorium on the commercial harvest of seamount groundfish stocks at the Hancock Seamounts, and implements a permit system for fishing for bottomfish in the EEZ around the Northwestern Hawaiian Islands (NWHI) (the current moratorium on the seamount groundfish fishery was published June 29, 1998 (63 FR 35162) and is in effect until 2004). The plan also establishes a management framework that provides for adjustments to be made, such as catch limits, size limits, area or seasonal closures, fishing effort limitation, fishing gear restrictions, access limitation, permit and/or catch reporting requirements, and a rules-related notice system.

Amendment 1 became effective on November 11, 1987 (52 FR 38102) and established limited access systems for bottomfish fisheries in the EEZ surrounding American Samoa and Guam within the framework measures of the FMP.

Amendment 2 became effective on September 6, 1988 (53 FR 299907). It was developed to reduce the risk of biological overfishing and improve the economic health and stability of the bottomfish fishery in the NWHI. The amendment divides the EEZ around the NWHI into two zones, the Hoomalu Zone and Mau Zone. A limited access system was established for the Hoomalu Zone, including landing requirements for permit renewal and for new entry into the fishery. One requirement for permit issuance is that the primary vessel operator must complete a protected species workshop. Access to the Mau Zone was left unrestricted, except for excluding vessel owners permitted to fish in the Hoomalu Zone. The Mau Zone is intended to serve as an area where fishermen can gain experience fishing in the NWHI, thereby enhancing their eligibility for subsequent entry into the Hoomalu Zone.

Amendment 3, which became effective on January 16, 1991 (56 FR 2503), defines recruitment overfishing as a condition in which the ratio of the spawning stock biomass per recruit at the current level of fishing to the spawning stock biomass per recruit that would occur in the absence of fishing is equal to or less than 20%. Amendment 3 also delineates the process by which overfishing is monitored and evaluated.

Amendment 4 became effective on May 26, 1991 (56 FR 24351). It requires vessel owners or operators to notify NMFS at least 72 hours before leaving port if they intend to fish in a protected species study zone that extends 50 nautical miles (nm) around the NWHI. This notification allows federal observers to be placed on board bottomfish vessels to record interactions with protected species if this action is deemed necessary.

Amendment 5 became effective on May 28, 1999 (64 FR 22810). It establishes a limited entry program for the Mau Zone in the NWHI, including landing requirements for permit renewal. One requirement for permit issuance is that the primary vessel operator must complete a protected species workshop.

Amendment 6 included new provisions required under the 1996 Sustainable Fisheries Act (SFA). Portions of the amendment that were approved included designations of essential fish habitat and descriptions of the various fishing sectors. Those provisions became effective on April 19, 1999 (64 FR 19067). Portions that were disapproved included provisions regarding fishing communities, overfishing definitions, and bycatch.

Of relevance to the management of the NWHI bottomfish fishery is the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, established December 4, 2000 through Executive Order (EO) 13178 (65 FR 76903), as modified by EO 13196 on January 18, 2001 (66 FR 7395). The Reserve is managed by the Department of Commerce under the National Marine Sanctuaries Act. The EO includes prohibitions on commercial and recreational fishing, including the taking of living coral and dead coral, in certain “Reserve Preservation Areas” within the Reserve. It also includes provisions that cap the number of permits and the “annual aggregate take” for particular types of fishing based on historical levels of permit issuance and “take.” The intent and effects of the fishing-related provisions, however, are not entirely clear. The EO calls for the Secretary of Commerce to initiate the process to designate the Reserve as a National Marine Sanctuary. The public scoping associated with that process began in April 2002.

In June 1998 the State of Hawaii implemented several management measures for bottomfish in the state waters of the MHI (Hawaii Administrative Rule, Chapter 13-94). Because bottomfish are managed under the FMP on an archipelagic-wide basis and because there are bottomfishing grounds in federal waters that are adjacent to state waters, these measures directly impact the stocks managed under the Bottomfish FMP. The new rules apply to seven species of bottomfish and include gear restrictions, bag limits for non-commercial fishermen, areas closed to fishing and possession of fish, and a requirement that bottomfishing vessels be registered with the state (see Section 4.1.1.3 for further details).

A number of FMP amendments and framework adjustments are in various stages of preparation and approval. Although they have not been approved or implemented through regulations, the following descriptions give an indication of the actions being proposed and considered.

Amendment 7 was prepared and submitted in parallel with the FMP for Coral Reef Ecosystems of the Western Pacific Region. NMFS issued a Record of Decision on June 14, 2002 that partially approves the Coral Reef Ecosystems FMP and Amendment 7 to the Bottomfish FMP, but a final rule has yet to be published. The amendment would prohibit the harvest of Bottomfish and Seamount Groundfish Management Unit Species (BMUS) in the no-take marine protected areas established under the Coral Reef Ecosystems FMP. The Coral Reef Ecosystems FMP would establish such areas at Rose Atoll in American Samoa, Kingman Reef, Jarvis Island, Howland Island, and Baker Island. No-take areas were also proposed in the NWHI, but all proposed measures in the Coral Reef Ecosystems FMP that would have applied to the waters around the NWHI (including Midway) were disapproved in the Record of Decision because of possible conflict and duplication with the management regime of the NWHI Coral Reef Ecosystem Reserve.

A proposed regulatory adjustment to the FMP would establish provisions for allowing new entry into the Mau Zone, with eligibility criteria based on historical participation in the Hawaii bottomfish fishery. The proposed adjustment was transmitted to NMFS for review and approval on January 31, 2002.

A proposed regulatory adjustment to the FMP would suspend the minimum landing requirements for annual permit renewal in the NWHI Hoomalu and Mau Zone limited access programs. The proposed adjustment was transmitted to NMFS for review and approval on July 19, 2002.

Draft Amendment 8, currently under development, would include the federal waters around the Commonwealth of the Northern Mariana Islands (CNMI) and the Pacific Remote Island Areas (PRIA) under the FMP and designate 49 additional bottomfish species as BMUS.

Two draft supplements to Amendment 6 (in addition to this supplement), currently under development, would include measures to address SFA requirements having to do with the identification of fishing communities and the minimization and measurement of bycatch.

2.2 Pelagics FMP

The FMP for the Pelagic Fisheries of the Western Pacific Region became effective by a final rule published on March 23, 1987 (52 FR 5987). The FMP includes initial estimates of Maximum Sustainable Yields (MSY) and sets Optimum Yield (OY) for the stocks. The Pelagic Management Unit Species (PMUS) at that time were billfish, wahoo, mahimahi, and oceanic sharks. The FMP prohibits drift gillnet fishing within the region's EEZ and foreign longline fishing within certain areas of the EEZ.

Amendment 1 was drafted in response to the Secretary of Commerce MSA National Standard Guidelines (see 50 CFR 600) requiring a measurable definition of recruitment overfishing for each species or species complex in an FMP. It became effective on March 1, 1991 (56 FR 9686). The OY for PMUS was also defined as the amount of fish that can be harvested by domestic and foreign vessels in the EEZ without causing local overfishing or economic overfishing.

Amendment 2 became effective on May 26, 1991 (56 FR 24731). It requires domestic longline fishing and transport vessels to have Federal permits, to maintain Federal fishing logbooks, and, if wishing to fish within 50 nm of the NWHI, to have observers placed on board if directed by NMFS. Amendment 2 also requires longline gear to be marked with the official number of the permitted vessel. It also incorporated the waters of the EEZ around the CNMI into the area managed under the FMP.

Amendment 3, which became effective on October 14, 1991 (56 FR 52214), creates a 50 nm longline exclusion zone around the NWHI to protect endangered Hawaiian monk seals. As defined at 50 CFR 660.12, this is a contiguous area extending 50 nm from named features in the NWHI and connected by corridors between those areas where the 50-nm-radius circles do not intersect. The amendment also contains framework provisions for establishing a mandatory observer program to collect information on interactions between longline fishing and sea turtles.

Amendment 4 became effective on October 16, 1991 (56 FR 14866). It establishes a three-year moratorium on new entry into the Hawaii-based domestic longline fishery.[2] The final rule implementing the amendment establishes an expiration date for the moratorium of April 22, 1994. The amendment included provisions for establishing a mandatory vessel monitoring system for domestic longline vessels fishing in the Western Pacific Region. On November 15, 1994 Hawaii-based longline vessels were specifically required to carry a NMFS-owned vessel monitoring system transmitter (59 FR 58789).

Amendment 5 creates a domestic longline vessel exclusion zone around the Main Hawaiian Islands (MHI) ranging from 50 to 75 nm and a similar 50 nm exclusion zone around Guam and its offshore banks. It became effective on March 2, 1992 (57 FR 7661). The zones are primarily intended to prevent gear conflicts and vessel safety issues arising from interactions between longline vessels and smaller fishing boats. A seasonal reduction in the size of the closure was implemented in October 1992; between October and January, longline fishing is prohibited within 25 nm of the windward shores of all islands except Oahu, where longline fishing is prohibited within 50 nm from the shore.

Amendment 6, which became effective on November 27, 1992 (57 FR 48564) specifies that all tuna species are designated as fish under US management authority. It also applies the longline exclusion zones of 50 nm around the island of Guam and the 50–75 nm zone around the Main Hawaiian Islands (MHI) to foreign vessels.

Amendment 7 became effective on June 24, 1994 (59 FR 26979). It institutes a limited entry program for the Hawaii-based domestic longline fishery. The number of vessels allowed in the fishery is limited to 164, and the length of these vessels is limited to being no greater than 101 feet.

Amendment 8 included new provisions required under the 1996 Sustainable Fisheries Act (SFA). Portions of the amendment that were approved included designations of essential fish habitat and descriptions of the various fishing sectors. Those provisions became effective on April 19, 1999 (64 FR 19067). Portions that were disapproved included provisions regarding fishing

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[2] Throughout this document the term "Hawaii-based longline vessels" (or longliners) refers to vessels fishing under a Hawaii longline limited access permit as described at 50 CFR 660.21.

communities, overfishing definitions, and bycatch.

In August 2000, the State of Hawaii enacted a law prohibiting the retention of shark fins separate from the carcass (a practice called "finning"). In December 2000 the MSA was amended with a similar nation-wide prohibition.

In February 1999, the Earthjustice Legal Defense Fund filed a complaint on behalf of the Center for Marine Conservation and the Turtle Island Restoration Network in the U.S. District Court for the District of Hawaii. The complaint was centered on two issues involving the Endangered Species Act (ESA) and the National Environmental Policy Act (NEPA). First, the plaintiffs challenged NMFS' determination under Section 7 of the ESA that continued conduct of the Hawaii-based longline fishery is not likely to jeopardize the existence of leatherback, loggerhead, olive ridley, or green turtles. Second, the Plaintiffs argued that an EIS should have been prepared before the issuance of a 1998 Biological Opinion (BO) and its Incidental Take Statement for sea turtles.

The U.S. District Court for the District of Hawaii upheld NMFS' analyses and findings under the ESA that the fishery was not jeopardizing the existence of any protected species. However, the court determined that the agency had failed to prepare a comprehensive EIS for the fishery as required by NEPA. Subsequently, on November 23, 1999, the Court issued an injunction (entered on November 26, 1999, and amended by an order filed January 11, 2000) setting terms to apply during the period that NMFS prepares an EIS. This first injunction (64 FR 72290, December 23, 1999) led to the temporary closing of certain waters north of Hawaii to fishing by Hawaii-based pelagic longline vessels, as well as permanent requirements that all vessels follow prescribed techniques for handling and releasing turtles.[3]

While the EIS was being prepared NMFS re-initiated Section 7 consultations with respect to sea turtles and issued a new BO (NMFS 2001a). The terms and conditions of the BO were incorporated into the Final EIS (FEIS) as part of the preferred alternative, which was filed with the Environmental Protection Agency (EPA) on March 30, 2001. A concurrently issued court order made effective immediately those provisions in the preferred alternative meant to mitigate the Hawaii-based longline fishery's interactions with sea turtles. An emergency interim rule putting the substance of the preferred alternative and Court Order into regulation was published on June 12, 2001 (66 FR 31561), and revised and extended December 10, 2001 (66 FR 63630), with an expiration date of June 8, 2002. This rule also implemented the seabird mitigation measures mandated by the short-tailed albatross BO issued by the US Fish and Wildlife Service (see below).

[3] This Order was substantially modified and new emergency regulations were implemented in August 2000. Several other minor modifications and supplements occurred during and after this period. For a detailed description of the litigation history through March 2001, see the Pelagics FMP FEIS (NMFS 2001b) and the relevant Federal Register notices issued on December 27, 1999 (64 FR 72290), March 28, 2000 (65 FR 16346), June 19, 2000 (65 FR 37917), August 25, 2000 (65 FR 51992), November 3, 2000 (65 FR 66186), and February 22, 2001 (66 FR 11120). Federal Register notices on March 19, 2001 (66 FR 15358), June 12, 2001 (66 FR 31561), December 10, 2001 (67 FR 63630), and June 12, 2002 (67 FR 40232) provide additional information on the management regime implemented since completion of the FEIS.

The major elements of the new sea turtle related rules were a prohibition on swordfish-directed longlining fishing north of the equator (including several specific restrictions on gear configuration), closure of the area bounded by the equator and 15° N latitude and 145° W and 180° longitude to longline fishing during the months of April and May, a restriction on re-registration of vessels to Hawaii longline limited access permits to the month of October, requirements for vessels that fish for pelagic fish with hook-and-line gear to carry line clippers and bolt or wire cutters and to employ a number of sea turtle handling and resuscitation measures, and requirements for longline vessel operators to annually complete protected species educational workshops conducted by NMFS. On April 5, 2002 (67 FR 16323) NMFS published additional interim rules, including a landing and possession limit of 10 swordfish per trip by longline vessels fishing north of the equator and a longline fishing closure north of 26° N latitude. These regulations expired June 8, 2002 and were replaced with permanent regulations implemented through the FMP amendment process, as described below.

An FMP regulatory amendment published June 12, 2002 (67 FR 40232) incorporates the reasonable and prudent alternative of the March 2001 BO on sea turtles, replacing the interim emergency regulations described above for sea turtles, with the exception of the prohibition on longline fishing north of 26° N latitude, which was not included and has now expired. While the emergency regulations applied only to Hawaii-based longline vessels, the regulatory amendment applies to all longline vessels and to all vessels fishing for pelagic species with hook-and-line gear throughout the Western Pacific Region.

The March 2001 BO was superceded by a BO published by NMFS on November 15, 2002 (NMFS 2002a). This new BO examined the impact of Western Pacific pelagic fisheries on marine mammals and sea turtles listed under the ESA in light of the changes to the Hawaii longline fishery in 2001. The new BO did not propose any significant changes in the management of the Hawaii longline fishery, implemented in the June 12, 2002 regulatory amendment. It did conclude, however, that with these measures in place the fishery was not likely to jeopardize the continued existence of Pacific sea turtles.

A BO for the endangered short-tailed albatross, issued by the US Fish and Wildlife Service (USFWS) on November 28, 2000, contains terms and conditions that would require longline fishermen to institute a variety of line and bait handling techniques and to employ specific methods of handling incidentally caught short-tailed albatrosses. These terms and conditions were implemented by the same set of emergency rules mentioned above for sea turtles and published on June 12, 2001 (66 FR 31561). The BO was amended on October 18, 2001 to allow the use of traditional basket-style longline gear as an alternative to monofilament gear set with a line-setting machine and weighted branch lines.

An FMP framework adjustment published May 14, 2002 (67 FR 34408) incorporates the terms and conditions of the November 2000 BO on seabirds, replacing the interim emergency regulations regarding seabirds. The regulations include requirements to use several seabird mitigation practices: Hawaii-based longline vessels fishing north of 23° N must use thawed blue-dyed bait and strategically discard offal to distract birds during the setting and hauling of longlines. Hawaii-based longline vessels fishing north of 23° N must, when making deep sets, use a line-setting machine with weighted branch lines or basket-style longline gear. Vessels making shallow-sets (if allowed in the future) must begin setting the longline at least one hour after local sunset and complete the setting process by local sunrise, using only the minimum vessels lights necessary. The use of additional mitigation practices, such as towed deterrents, is optional. If a short-tailed albatross is brought on board, the crew must notify NMFS and ensure that the bird displays four specific traits before being released. All seabirds brought on board alive must be handled using certain techniques in order to maximize the probability of their long-term survival once released. Owners and operators of Hawaii-based longline vessels must annually complete a protected species educational workshop conducted by NMFS.

The November 2000 BO was superceded by a new opinion issued by USFWS, dated November 18, 2002. The new BO stemmed primarily from the changes to the Hawaii longline fishery resulting from the June 12, regulatory amendment, which banned shallow set longline fishing for swordfish north of the equator. The new BO does not make any alterations to the non-discretionary measures for setting for tuna fishing north of 23° N, but reduces the level of allowable take of short-tailed albatrosses, consistent with the reduction in the threat posed by Hawaii longline fishery.

A regulatory adjustment published January 30, 2002 (67 FR 4369) establishes an area seaward of 3 nm out to approximately 50 nm around the islands of American Samoa in which fishing for PMUS is prohibited by vessels greater than 50 feet in length that did not land PMUS in American Samoa under a federal longline general permit prior to November 13, 1997. The measure is intended to prevent gear conflicts and catch competition between large fishing vessels and locally based small fishing vessels.

In anticipation of the possibility of establishing a limited access program for the American Samoa longline fishery, on June 3, 2002 (67 FR 38245) a revised control date of March 21, 2002 was established to provide notice that vessels entering the American Samoa longline fishery after that date would not be guaranteed future participation in the fishery should a limited access program be established. The new control date replaces two dates previously established by the Council, November 13, 1997 and July 15, 2000.

Of relevance to the pelagic troll and handline fishery in the NWHI is the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, established December 4, 2000 through Executive Order (EO) 13178 (65 FR 76903), as modified by EO 13196 on January 18, 2001 (66 FR 7395). The Reserve is managed by the Department of Commerce under the National Marine Sanctuaries Act. The EO includes prohibitions on commercial and recreational fishing in certain "Reserve Preservation Areas" within the Reserve. It also includes provisions that cap the number of permits and the "annual aggregate take" for particular types of fishing based on historical levels of permit issuance and "take." The intent and effects of the fishing-related provisions, however, are not entirely clear. The EO calls for the Secretary of Commerce to initiate the process to designate the Reserve as a National Marine Sanctuary. The public scoping associated with that process began in April 2002.

A number of FMP amendments and framework adjustments are in various stages of preparation and approval. Although they have not been approved or implemented through regulations, the following descriptions give an indication of the actions being proposed and considered.

Amendment 10 was prepared and submitted in parallel with the FMP for Coral Reef Ecosystems of the Western Pacific Region. NMFS issued a Record of Decision on June 14, 2002 that partially approves the Coral Reef Ecosystems FMP and Amendment 10 to the Pelagics FMP, but a final rule has yet to be published. The amendment would remove all species of shark except nine pelagic species, as well as dogtooth tuna, from the Pelagic MUS list. Dogtooth tuna and coastal shark species would be managed under the Coral Reef Ecosystem FMP. The amendment would also prohibit the harvest of PMUS in the no-take marine protected areas established under the Coral Reef Ecosystems FMP. The Coral Reef Ecosystems FMP would establish such areas at Rose Atoll in American Samoa, Kingman Reef, Jarvis Island, Howland Island, and Baker Island. No-take areas were also proposed in the NWHI, but all proposed measures in the Coral Reef Ecosystems FMP that would have applied to the waters around the NWHI (including Midway) were disapproved in the Record of Decision because of possible conflict and duplication with the management regime of the NWHI Coral Reef Ecosystem Reserve.

An FMP framework adjustment published as a proposed rule May 6, 2002 (67 FR 30346) would establish permit and reporting requirements for any vessel using troll or handline gear to catch PMUS in the Pacific Remote Island Areas.

Draft Amendment 9, under development since early 2000, would put controls on the harvest and/or retention of sharks in the Hawaii-based longline fishery. A version of the amendment was submitted to NMFS prior to the national ban on shark finning. It is now being re-drafted in the context of that ban, and the draft preferred measure is to establish a retention limit of one non-blue shark per trip. The amendment would also define bottom-set longline gear as a fishing gear.

Draft Amendment 11, currently under development, would limit longline fishing participation and/or effort in the EEZ around American Samoa; the draft preferred measure would do so through a limited access program.

Two draft supplements to Amendment 8 (in addition to this supplement), currently under development, would include measures to address SFA requirements having to do with the identification of fishing communities and the minimization and measurement of bycatch.

2.3 Crustaceans FMP

Initial provisions of the FMP, which was initially for the "Spiny Lobster Fisheries of the Western Pacific Region," went into effect March 9, 1983 (48 FR 5560, 7 February 1983). It includes for a management area established in the NWHI: permit requirements, a minimum size limit for spiny lobsters, gear requirements (traps only, of certain dimensions), a ban on the harvest of egg-bearing female spiny lobsters, the closure of certain areas to fishing for spiny lobster (within 20 nm of Laysan Island, in all waters shallower than 10 fm, and within lagoon waters of the NWHI), a mandatory logbook program, and a requirement to take a vessel observer if directed by NMFS. For a management area established for MHI, American Samoa, and Guam, only the permit, data reporting, and observer requirements apply.

Amendment 1, made effective December 20, 1983, adopts the State of Hawaii's lobster fishing regulations for the federal waters around the MHI.

Amendment 2 modifies the allowable trap opening dimensions, with the intent of minimizing the risk of harm to the Hawaiian monk seal while allowing sufficient flexibility in trap design.

Amendment 3 revises the minimum spiny lobster size specifications for the NWHI management area, switching from a carapace length-based limit (7.7 cm) to a limit on tail width (5.0 cm). The amendment was made after the revisions were first made through emergency regulations, effective April 25, 1995.

Amendment 4, effective in March 1987, applies the existing closed areas (within 20-nm of Laysan Island, in waters shallower than 10 fm, within the lagoon waters of the NWHI) to slipper lobster.

Amendment 5 implements a minimum size for slipper lobster (5.6 cm tail width), requires the release of egg-bearing female slipper lobsters, requires escape vents in all lobster traps, and revises some of the permit application and reporting requirements. It also changes the FMP name from "Spiny Lobster Fisheries" to "Crustaceans Fisheries."

Amendment 6 defines recruitment overfishing for lobster stocks in terms of reference points that are expressed in terms of the spawning potential ratio (SPR), the ratio of the spawning potential per recruit in a given area at present to that in an unfished condition (56 FR 3072). The minimum SPR threshold, below which the stock would be considered recruitment overfished, is 20%. It is also specified that if the stock's SPR value is found to be between 20% and the optimum yield level of 50%, remedial management action would be considered.

An emergency action was taken on May 13, 1991 to close the fishery from May 8 through August 12, 1991 in response to indications of NWHI lobster stocks approaching an overfished condition (56 FR 21961). The closure was extended until November 12, 1991 through another emergency action on July 30, 1991 (56 FR 36912).

In response to the indications of stock decline in 1990 and 1991, Amendment 7 (1992) establishes a limited access program, an adjustable fleet-wide annual harvest, and a closed season in the NWHI fishery. Participation is limited to 15 permits/vessels, with permits issued according to criteria based on historical and current participation. Permits are freely transferable. Permit renewal is contingent on meeting minimum landings requirements over a two-year period. The program includes a maximum limit on the number of traps per vessel (1,100), revisions to reporting requirements, and certain other provisions. The fleet-wide annual harvest quota is set each year based on a (constant) target catch-per-unit-effort (CPUE) of 1.0 lobster/trap-haul, among other factors. The NWHI fishery is closed for the calendar year once the quota is reached. The closed season is January through June.

Amendment 8 eliminates the minimum landings requirements for permit renewal in the limited access program, allows the CPUE target that is used to set the harvest quota to be changed through the framework process, changes the term "initial quota" to "forecast quota" and provides a framework procedure to consider the allowance of fishing even when the forecast quota is zero, and modifies the reporting requirements.

Amendment 9 establishes an "annual harvest guideline" system in place of the annual harvest quota. The guideline is set based on a constant harvest rate of the population (i.e., it is proportional to the estimated exploitable population size) that is set based on a specified acceptable risk of overfishing. The acceptable risk of overfishing is specified at 10% (which was found through simulation results to be associated with a constant harvest rate of 13%). The annual harvest guideline for the NWHI permit area is published by NMFS no later than February 28 each year. The in-season quota adjustment procedures are also eliminated. The amendment also eliminates the minimum size limit and no-berried-lobster requirements, making it a "retain-all" fishery, and provides for certain regulatory adjustments to be made through framework procedures.

Amendment 10 includes new provisions required under the 1996 Sustainable Fisheries Act (SFA). Portions of the amendment that were approved included provisions regarding essential fish habitat, descriptions of the various fishing sectors, and bycatch. Those provisions became effective on April 19, 1999 (64 FR 19067). Portions that were disapproved included provisions regarding fishing communities and overfishing definitions.

A regulatory amendment published July 8, 1999 (64 FR 36820) establishes a framework procedure for setting bank-specific harvest guidelines in the NWHI. It divides the NWHI management area into four sub-areas: Necker Island, Gardner Pinnacles, Maro Reef, and all remaining NWHI lobster fishing grounds combined. The annual NHWI harvest guideline can be allocated among the four sub-areas, recognizing differences in fishing effort and recruitment in each area.

On June 26, 2000, NMFS made an emergency closure of the NWHI lobster fishery, effective July 1 through December 31, 2000 (65 FR 39314). The action was taken as a precautionary measure to protect lobster stocks because of shortcomings in understanding the dynamics of the NWHI lobster populations, the increasing uncertainty in population model parameter estimates, and the lack of appreciable rebuilding of the lobster population despite significant reductions in fishing effort throughout the NWHI. The closure was continued through the 2001 and 2002 seasons through announcements by NMFS on February 22, 2001 (66 FR 11156) and March 15, 2002 (67 FR 11678), respectively, that no annual harvest guidelines for the NWHI permit area would be issued. The actions were taken because of continuing uncertainty about the status and dynamics of the lobster populations and the models used to describe them, as well as because of a federal court order to keep the fishery closed until completion of an Environmental Impact Statement (under the National Environmental Policy Act) and a Biological Opinion (under the Endangered Species Act). Also taken into account were the apparent implications of the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, established in December 2000 (see below).

Of relevance to the management of the NWHI crustaceans fishery is the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, established December 4, 2000 through Executive Order (EO) 13178 (65 FR 76903), as modified by EO 13196 on January 18, 2001 (66 FR 7395). The Reserve is managed by the Department of Commerce under the National Marine Sanctuaries Act. The EO includes prohibitions on commercial and recreational fishing in certain "Reserve Preservation Areas" within the Reserve. It also includes provisions that cap the number of permits and the "annual aggregate take" for particular types of fishing based on historical levels of permit issuance and "take." Specifically, there is a provision stating that "the annual level of aggregate take under all permits of any particular type of fishing may not exceed the aggregate level of take under all permits of that type of fishing in the years preceding the date of this order…" (7)(a)(1)(C). The EO calls for the Secretary of Commerce to initiate the process to designate the Reserve as a National Marine Sanctuary. The public scoping associated with that process began in April 2002.

A number of FMP amendments and framework adjustments are in various stages of preparation and approval. Although they have not been approved or implemented through regulations, the following descriptions give an indication of the actions being proposed and considered.

Amendment 11 was prepared and submitted in parallel with the FMP for Coral Reef Ecosystems of the Western Pacific Region. NMFS issued a Record of Decision on June 14, 2002 that partially approves the Coral Reef Ecosystems FMP and Amendment 11 to the Crustaceans FMP, but a final rule has yet to be published. The amendment would prohibit the harvest of Crustacean MUS in the no-take marine protected areas established under the Coral Reef Ecosystems FMP. The Coral Reef Ecosystems FMP would establish such areas at Rose Atoll in American Samoa, Kingman Reef, Jarvis Island, Howland Island, and Baker Island. No-take areas were also proposed in the NWHI, but all proposed measures in the Coral Reef Ecosystem FMP that would have applied to the waters around the NWHI (including Midway) were disapproved in the Record of Decision because of possible conflict and duplication with the management regime of the NWHI Coral Reef Ecosystem Reserve.

Draft Amendment 12, currently under development, would include the federal waters around the Commonwealth of the Northern Mariana Islands (CNMI) and the PRIAs under the FMP.

A draft supplement to Amendment 10 (in addition to this supplement), currently under development, would include measures to address the requirements of the SFA regarding fishing communities.

3. Purpose and Need for Action

On October 11, 1996 the Magnuson-Stevens Fishery Conservation and Management Act (MSA) was re-authorized and amended by enactment of the Sustainable Fisheries Act (SFA). As a result, the MSA contains new requirements, making it necessary for Fishery Councils to amend all of their existing FMPs to incorporate these requirements. The requirements pertain to bycatch, fishing sectors, essential fish habitat, fishing communities, and overfishing. To address the SFA-related requirements of the MSA, the Council prepared a comprehensive document with amendments to all four of its FMPs. Amendment 6 to the Bottomfish FMP, Amendment 8 to the Pelagics FMP, Amendment 10 to the Crustaceans FMP, and Amendment 4 to the Precious Corals FMP were published in September 1998 and submitted to NMFS for review. NMFS only partially approved the amendments, as described in a Federal Register notification published on April 19, 1999 (64 FR 19067). Three components of the amendments were disapproved: the bycatch provisions (MSA §301(a)(9), §303(a)(11), and other sections) for the Bottomfish and Pelagics FMPs, the overfishing provisions (§303(a)(10) and other sections) for the Bottomfish, Pelagics, and Crustaceans FMPs, and for all four FMPs, the description of the State of Hawaii as a single fishing community (MSA §301(a)(8), §303(a)(9), and other sections).

This document addresses the disapproved sections of Bottomfish FMP Amendment 6, Pelagic FMP Amendment 8, and Crustaceans FMP Amendment 10 that addressed the new MSA requirements regarding overfishing. It replaces Sections 4.5.1 through 4.5.3 in the 1998 submissions of those amendments.

In disapproving the overfishing provisions in those amendments, NMFS stated that "the Council's use of spawning potential ratio (SPR) percentages or ranges as a proxy for maximum sustainable yield (MSY) in determining minimum stock size threshold as described in the amendment is not acceptable." "SPR is not an appropriate proxy for MSY, because it does not provide a measure of stock biomass as required by the Magnuson-Stevens Act to determine the status of each stock" (64 FR 19068). The disapproval notice also stated that the term "control rule" was used incorrectly. "A control rule should contain two elements: A precautionary target (meaning a reference point that is precautionary with respect to the limit reference point and stocks status), which triggers action before the limit reference point is reached, and the action to be taken to expediently control (reduce) fishing mortality if such a point is reached" (64 FR 19068).

The 1996 SFA amendments to the MSA added the requirement that any FMP shall (MSA §303(a)(10)):

> *specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished (with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stocks of fish in that fishery) and, in the case of a fishery which the Council or the Secretary has determined is approaching an overfished condition or is overfished, contain conservation and management measures to prevent overfishing or end overfishing and rebuild the fishery.*

These overfishing criteria are applied in the context of National Standard 1 (not modified by the SFA), which states (MSA §301(a)(1)):

> *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 SFA also provided the following definitions (MSA §3(29)):

> *The terms "overfishing" and "overfished" mean a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis.*

The SFA also modified the definition of optimum yield (MSA §3(28)):

> *The term `optimum', with respect to the yield from a fishery, means the amount of fish which—*
>
> > *(A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems;*
> >
> > *(B) is prescribed on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant social, economic, or ecological factor; and*

(C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.'';

The SFA also amended MSA §304(e) regarding provisions for rebuilding overfished fisheries, including procedures for notifying the Congress and the Councils regarding the status of stocks, requirements for remedial action by the Councils, and constraints on the time periods for ending overfishing and rebuilding the fishery. MSA §305(c) was amended to provide for the promulgation of emergency regulations or interim measures if needed to address overfishing.

The purpose of these amendments is, pursuant to MSA §303(a)(10), to specify objective and measurable criteria for identifying when the fisheries to which the three FMPs apply are overfished. These specifications are expressed in terms of harvest control rules and associated reference points. These control rules can be separated into three types: 1) maximum sustainable yield (MSY) control rules, which serve as the basis for specifying the overfishing thresholds, 2) target control rules, which are used to guide management of the fishery when the stock is in "good" condition, and 3) rebuilding control rules, which are used when the stock is in an overfished state. In Section 4, for each of the three FMPs, management alternatives are presented under each of three categories that correspond to the three types of control rules, as well as two additional categories that pertain to the application of the specified control rules:

1) MSY control rules and stock status determination criteria,
2) target control rules and reference points,
3) rebuilding control rules and reference points,
4) stock status determination process, and
5) measures to prevent overfishing and overfished stocks.

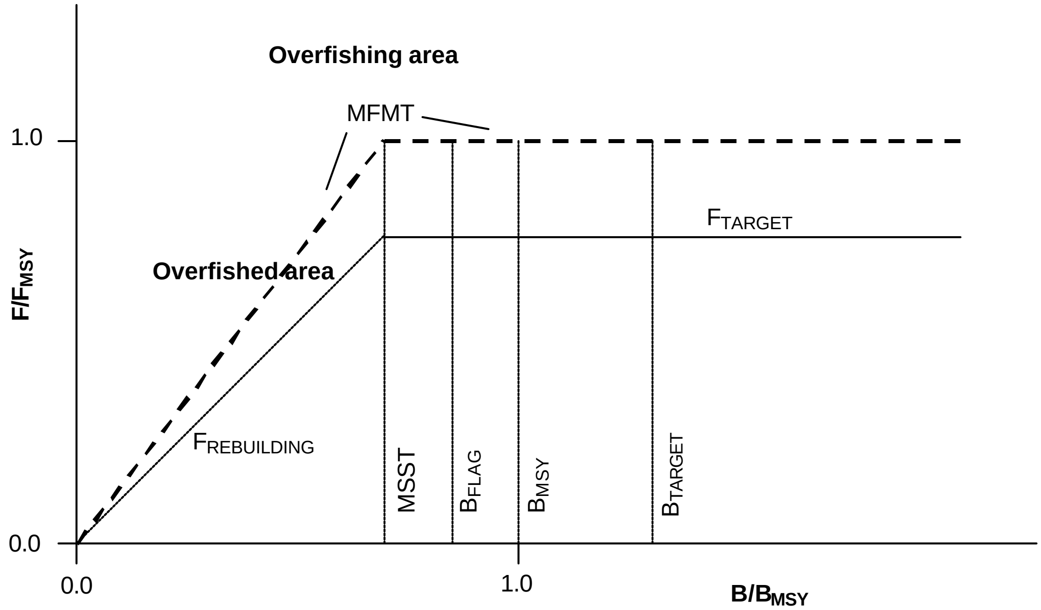
Further general background on these five categories is provided in Section 3.1.

3.1 Background: National Standard 1

The MSA seeks to ensure long-term fishery sustainability by halting or preventing overfishing, and by rebuilding any overfished stocks. Overfishing occurs when fishing mortality (F) is higher than the level at which fishing produces maximum sustainable yield (MSY). MSY is the maximum long-term average yield that can be produced by a stock on a continuing basis. A stock is overfished when stock biomass (B) has fallen to a level substantially below what is necessary to produce MSY. So there are two aspects that managers must monitor to determine the status of a fishery: the level of F in relation to F at MSY (F_{MSY}), and the level of B in relation to B at MSY (B_{MSY}).

The National Standard Guidelines (CFR 50 CFR §600.305 et. seq.) for National Standard 1 call for the development of control rules identifying "good" versus "bad" fishing conditions in the fishery and the stock and describing how a variable such as F will be controlled as a function of some stock size variable such as B in order to achieve good fishing conditions. The technical guidance for implementing National Standard 1 (Restrepo et al. 1998) provides a number of recommended default control rules that may be appropriate, depending on such things as the richness of data available. For the purpose of illustrating the following discussion of approaches for fulfilling the overfishing-related requirements of the MSA, a generic model that includes example MSY, target, and rebuilding control rules is shown in Figure 1. The y-axis, F/F_{MSY}, indicates the variable which managers must control as a function of B/B_{MSY} on the x-axis.

Figure 1. Example MSY, target, and rebuilding control rules



The dashed horizontal and diagonal line represents a model MSY control rule that is used as the MFMT; the solid horizontal and diagonal line represents a model integrated target (F_{TARGET}) and rebuilding ($F_{REBUILDING}$) control rule.

3.1.1 MSY Control Rule and Stock Status Determination Criteria

An MSY control rule is a control rule that specifies the relationship of F to B or other indicator of productive capacity under an MSY harvest policy. Because fisheries must be managed to achieve optimum yield, not MSY, the MSY control rule is a benchmark control rule rather than an operational one. However, the MSY control rule is useful for specifying the "objective and measurable criteria for identifying when the fishery to which the plan applies is overfished" that are required under the MSA. The National Standard Guidelines (50 CFR 600.310) refer to these criteria as "status determination criteria" and state that they must include two limit reference points, or thresholds: one for F that identifies when overfishing is occurring and a second for B or its proxy that indicates when the stock is overfished. The status determination criterion for F is the maximum fishing mortality threshold (MFMT). Minimum stock size threshold (MSST) is the criterion for B. If fishing mortality exceeds the MFMT for a period of one year or more, overfishing is occurring. If stock biomass falls below MSST in a given year, the stock or stock complex is overfished. A Council must take remedial action in the form of a new FMP, an FMP amendment, or proposed regulations when it has been determined by the Secretary of Commerce that overfishing is occurring, a stock or stock complex is overfished, either of the two thresholds is being approached,[4] or existing remedial action to end previously identified overfishing has not

[4] A threshold is being "approached" when it is projected that it will be reached within two years (50 CFR 600.310 (e)(1)).

resulted in adequate progress. The Secretary reports annually to the Congress and the Councils on the status of fisheries according to the above overfishing criteria.

The National Standard Guidelines state that the MFMT may be expressed as a single number or as a function of some measure of the stock's productive capacity, and that it "must not exceed the fishing mortality rate or level associated with the relevant MSY control rule" (50 CFR 600.310(d)(2)(i)). The technical guidance in Restrepo et al. (1998:17) regarding specification of the MFMT is based on the premise that the MSY control rule "constitutes the MFMT." In the example in Figure 1 the MSY control rule sets the MFMT constant at F_{MSY} for values of B greater than the MSST and decreases the MFMT linearly with biomass for values of B less than the MSST. This is the default MSY control rule recommended in Restrepo et al. (1998). Again, if F is greater than the MFMT for a period of one year or more, overfishing is occurring.

The National Standard Guidelines state that "to the extent possible, the stock size threshold [MSST] should equal whichever of the following is greater: One-half the MSY stock size, or the minimum stock size at which rebuilding to the MSY level would be expected to occur within 10 years if the stock or stock complex were exploited at the maximum fishing mortality threshold" (50 CFR 600.310(d)(2)(ii)). The MSST is indicated in Figure 1 by a vertical line at a biomass level somewhat less than B_{MSY}. A specification of MSST below B_{MSY} would allow for some natural fluctuation of biomass above and below B_{MSY}, which would be expected under, for example, an MSY harvest policy. Again, if B falls below MSST the stock is overfished.

Warning reference points comprise a category of reference points that will be considered in these amendments together with the required thresholds. Although not required under the MSA, warning reference points could be specified in order to provide warning in advance of B or F approaching or reaching their respective thresholds. Considered in these amendments is a stock biomass flag (B_{FLAG}) that would be specified at some point above MSST, as indicated in Figure 1. The control rule would not call for any change in F as a result of breaching B_{FLAG} – it would merely serve as a trigger for consideration of action or perhaps preparatory steps towards such action. Intermediate reference points set above the thresholds could also be specified in order to trigger changes in F – in other words, the MFMT could have additional inflection points.

3.1.2 Target Control Rule and Reference Points

A target control rule specifies the relationship of F to B for a harvest policy aimed at achieving a given target. Optimum yield (OY) is one such target, and National Standard 1 requires that conservation and management measures both prevent overfishing and achieve OY on a continuing basis. Optimum yield is the yield that will provide the greatest overall benefits to the nation, and is prescribed on the basis of MSY, as reduced by any relevant economic, social, or ecological factor. MSY is therefore an upper limit for OY. The National Standard Guidelines further require that fishery councils adopt a precautionary approach to specification of OY. For example, "Target reference points, such as OY, should be set safely below limit reference points, such as the catch level associated with the fishing mortality rate or level defined by the status determination criteria" (50 CFR 600.310(f)(5)).

A target control rule can be specified using reference points similar to those used in the MSY control rule, such as F_{TARGET} and B_{TARGET}. For example, the recommended default in Restrepo et al. (1998) for the target fishing mortality rate for certain situations (ignoring all economic, social, and ecological factors except the need to be cautious with respect to the thresholds) is 75 percent of the MFMT, as indicated in Figure 1. Simulation results using a deterministic model have shown that fishing at 0.75 F_{MSY} would tend to result in equilibrium biomass levels between 1.25 and 1.31 B_{MSY} and equilibrium yields of 0.94 MSY or higher (Mace 1994).

It is emphasized that while MSST and MFMT are limits, the target reference points are merely targets. They are guidelines for management action, not constraints. For example, the technical guidance for National Standard 1 states that "Target reference points should not be exceeded more than 50% of the time, nor on average" (Restrepo et al. 1998:13).

3.1.3 Rebuilding Control Rule and Reference Points

In the case that it has been determined that overfishing is occurring, a stock or stock complex is overfished, either of the two thresholds is being approached, or existing remedial action to end previously identified overfishing has not resulted in adequate progress, the Council must take remedial action within one year. In the case that a stock or stock complex is overfished (i.e., biomass falls below MSST in a given year), the action must be taken through a stock rebuilding plan (which is essentially a rebuilding control rule as supported by various analyses) with the purpose of rebuilding the stock or stock complex to the MSY level (B_{MSY}) within an appropriate time frame, as required by MSA §304(e)(4). The details of such a plan, including specification of the time period for rebuilding, would take into account the best available information regarding a number of biological, social, and economic factors, as required by the MSA and National Standard Guidelines.

If B falls below MSST, management of the fishery would shift from using the target control rule to the rebuilding control rule. Under the rebuilding control rule in the example in Figure 1, F would be controlled as a linear function of B until B recovers to MSST (see $F_{REBUILDING}$), then held constant at F_{TARGET} until B recovers to B_{MSY}. At that point, rebuilding would have been achieved and management would shift back to using the target control rule (F set at F_{TARGET}). The target and rebuilding control rules "overlap" for values of B between MSST and the rebuilding target (B_{MSY}). In that range of B, the rebuilding control rule is used only in the case that B is recovering from having fallen below MSST. In the example in Figure 1, the two rules are identical in that range of B (but they do not need to be), so the two rules can be considered a single, integrated, target control rule for all values of B.

None of the stocks managed under these three FMPs have been determined to be overfished, so rebuilding plans are not required for any of the stocks managed under the three FMPs,[5] but this does not preclude the possibility of specifying rebuilding control rules in advance of a stock becoming overfished.

[5] Pelagic armorhead, managed in the Bottomfish and Seamount Groundfish FMP, is one exception. It has been subject to a stock rebuilding plan (in which fishing mortality within Council jurisdiction is set at zero) since inception of the FMP.

3.1.4 Stock Status Determination Process

In order to apply the specified control rules and associated reference points to the fishery, there should be an established process for assessing the stocks and taking remedial action if required. In addition to assessing the status of stock biomass and fishing mortality against their respective reference points, for example, there may also be a need to periodically re-estimate the values of the reference points themselves.

3.1.5 Measures to Prevent Overfishing and Overfished Stocks

The control rules specify how fishing mortality will be controlled in response to observed changes in stock biomass or its proxies. Implicitly associated with those control rules are management actions that would be taken in order to manipulate fishing mortality according to the rules. In the case of a fishery which has been determined to be "approaching an overfished condition or is overfished," MSA §303(a)(10) requires that the FMP "contain conservation and management measures to prevent overfishing or end overfishing and rebuild the fishery."

In the cases of the stocks managed under these three FMPs, it has not been determined that overfishing is occurring, a stock or stock complex is overfished, or that a threshold is being approached (with the exception of the seamount groundfish stock complex, in which case the FMP contains a measure with the purpose of rebuilding the stock – a moratorium on fishing). Therefore no new management measures are required at this time. If needed, new management measures to control fishing mortality could be implemented through FMP amendments, or in some cases, through framework procedures.

4. Management Alternatives

This document is intended to fulfill the requirements of the National Environmental Policy Act (NEPA) and is organized to incorporate an environmental assessment. Section 4 describes the alternatives, Section 5 describes the affected environment, and Section 6 analyzes the likely impacts of each of the three alternatives.

Subsequent to the disapproval of the overfishing provisions in the FMP amendments that were submitted in 1998, the NMFS Honolulu Laboratory developed new recommendations for overfishing criteria specifications for each of the three FMPs (Boggs et al. 2000; DiNardo and Wetherall 2000; Moffitt and Kobayashi 2000). For each FMP, those recommendations, with some revisions, are presented here as one management alternative (Alternative 3). A second alternative (Alternative 2), developed from the recommendations of the NMFS Honolulu Laboratory reports but revised based on subsequent deliberations of the Council, its Plan Teams, and its Scientific and Statistical Committee, is also presented. The no-action alternative (Alternative 1) is also presented for each FMP. Each of these alternatives is described in detail in Sections 4.1, 4.2, and 4.3 for the bottomfish, pelagics, and crustaceans FMPs, respectively, after brief background descriptions of the fisheries and fish stocks. To introduce the alternatives, below is a summary of the main elements of the alternatives and the main differences between them.

Alternative 1 (no action) would propose no new management measures.

Alternative 2 would specify new overfishing thresholds (for stock biomass and fishing mortality) and a warning reference point (for stock biomass) for the managed stocks. These reference points and associated control rules would be dependent on the estimated value of the natural mortality rate (M) of a given stock. That value would be periodically re-estimated using the best available information. For the bottomfish and seamount groundfish stocks, a secondary, species-specific control rule would also be established to prevent recruitment overfishing of particular species. This alternative would not specify target or rebuilding control rules for the managed stocks. This alternative would establish a process for determining the status of stocks, which would include periodic re-estimations of M.

Alternative 3 would specify new overfishing thresholds and warning reference points identical to those in Alternative 2 except the value of M for a given stock would be specified in these amendments and remain fixed instead of being periodically re-estimated. Like Alternative 2, a secondary, species-specific control rule would also be established for the bottomfish and seamount groundfish stocks to prevent recruitment overfishing of particular species. Unlike Alternative 2, this alternative would specify target (optimum yield) and rebuilding control rules for the managed stocks. Like Alternative 2, this alternative would establish a process for determining the status of stocks, but it would not include a process for periodically re-estimating the value of M for a given stock since it would be treated as a fixed value.

Because some elements of a given alternative might be preferred for one FMP but not preferred for another, each of the alternatives is broken down into elements that correspond to the five subsections of Section 3:

1) MSY control rule and stock status determination criteria,
2) target control rule and reference points,
3) rebuilding control rule and reference points,
4) stock status determination process, and
5) measures to prevent overfishing and overfished stocks.

None of the alternatives propose any regulatory action to prevent overfishing, so discussion of the fifth element is descriptive only and does not include any alternatives.

In order to describe the preferred combination of elements for a given FMP (which may include elements from different alternatives), a summary subsection is provided for each FMP (Sections 4.1.7, 4.2.7, and 4.3.7). The summary includes an illustration (in graphical form, like the example in Figure 1) of the preferred combination of control rules and reference points, as well as an illustration of the combination that is not preferred.

Discussion of the reasons that the Council prefers one alternative (or certain of its elements) over another are summarized in Section 6.9. That discussion follows an analysis of the likely consequences of each of the alternatives in Sections 6.1 through 6.8.

4.1 Bottomfish and Seamount Groundfish FMP

4.1.1 Background

General background information on the bottomfish and seamount groundfish fisheries is provided in Section 5.1. Information that is particularly relevant to the specification of overfishing criteria is discussed here.

4.1.1.1 Description of the fisheries

The Bottomfish and Seamount Groundfish FMP manages two fisheries, the seamount groundfish fishery and the bottomfish fishery. The groundfish fishery, prosecuted by foreign trawlers, was closed with FMP implementation in 1986 because of the depleted status of the stocks. As a result, no trawl fisheries occur in waters under Council jurisdiction.

Bottomfish fisheries target demersal species of etiline snappers, carangids, and groupers in deep water (30-150 fm), including outer reef slopes and seamounts. There is also a shallow-water fishery throughout the region, but this is not federally managed since it occurs almost exclusively in state waters.

In Hawaii there are two separately managed handline bottomfish fisheries. In the NWHI all participants fish commercially on a full- or part-time basis, while in the MHI fishery there are also “expense” and recreational fishermen. The NWHI are divided into two management zones, the Mau Zone (between 161^{o} 20’ W and 165^{o} W) and the Hoomalu Zone (west of 165^{o} W).[6] Participation in the two NWHI zones is controlled through a limited access program. Eleven vessels participated in the NWHI bottomfish fishery in 2001. Available data suggest that fishing effort in the MHI fishery has been declining since the late 1980s. Fishing vessels use electric, hydraulic or hand-powered reels to deploy and retrieve a monofilament leader, from which 4-6 droppers with baited hooks project. The mainline terminates in a heavy weight. Vessels are usually equipped with depth sounders, fish echo sounders and satellite navigational devices.

A single bottom-set longline vessel operated briefly in the NWHI in 1998-1999. Although pelagic longlining is prohibited within a protected species zone encompassing shallow depths in the NWHI, this gear, because it is deployed on the bottom, has not been subject to the area restrictions for pelagic gears. The gear used in the 1998-1999 fishery consisted of a heavy (700 to 1,400-lb test) monofilament groundline. Gangions, buoys and lead weights were attached to this during deployment. The 10-12 ft long gangions, spaced every 20 fm along the groundline, terminated in baited circle hooks. Buoys allowed gear retrieval while weights anchored the groundline to the bottom. The gear was set at an average depth of 34.5 fm.

In American Samoa small skiffs and *alia* catamarans equipped with handlines and hand-powered reels fish on the deep outer-reef slope. The fishery targets a mix of snappers, groupers, jacks and

[6] These zones were established based on fishery characteristics and do not have any biological basis. Both genetic analysis of onaga and ehu and NMFS simulations of larval drift (suggesting considerable genetic exchange between the MHI and NWHI) provide evidence that fish in the bottomfish complex should be treated as a single stock throughout the Hawaiian archipelago.

emperors. In the EEZ around Guam and the CNMI deep-water bottomfish fishing is conducted mainly by commercial vessels equipped with electric-powered reels.[7] Shallow-water BMUS are also caught on seamounts using rod and reel.

4.1.1.2 Existing overfishing and optimum yield specifications

FMP Amendment 3 defined recruitment overfishing to occur when the spawning potential ratio (SPR) is equal to or less than 20%. SPR is defined as the ratio of the spawning stock biomass per recruit at the current level of fishing to the spawning stock biomass per recruit that would occur in the absence of fishing.

Optimum yield for the bottomfish fishery is defined as follows (WPRFMC 1986:8-3):

> *The optimum yield (OY) to be achieved from the fisheries for species included in the management unit addressed by this framework plan is the amount of bottomfish which will be caught by fishermen in the FCZ and adjacent waters around Hawaii, Guam, and American Samoa under the management measures implemented under the FMP to achieve, to the greatest extent practicable, the following management objectives: ….*

Optimum yield for the seamount groundfish fishery was initially set at zero (WPRFMC 1986), subject to being re-specified depending on stock recovery.

4.1.1.3 Stock status

There are five stock complexes subject to the FMP: the bottomfish stock complexes of the Hawaiian archipelago, American Samoa, Guam, and the Northern Mariana Islands, and the seamount groundfish stock complex at Hancock Seamounts at the northeast end of the Hawaiian archipelago. The proposed specifications would apply to each of the stock complexes except where noted otherwise.

SPRs are estimated annually for those stocks for which adequate data are available. In Hawaii, SPR values are estimated for the entire Hawaiian archipelago, as evidence from larval drift simulations and preliminary genetic work has indicated that the primary target bottomfish species should be assessed as archipelagic-wide stocks. SPR values are also estimated for each of the three management zones in Hawaii.

In the most recent assessment, in 2000, SPR values were calculated for five bottomfish species in Hawaii. The latest SPR estimate for armorhead is based on 1997 data. Data have not been available to calculate SPR values for bottomfish stocks in American Samoa, Guam, or the CNMI.

Based on 1997 data, the SPR for armorhead, the main target species of the seamount groundfish fishery, was last estimated at about 1% (WPRFRC 2002b). The trawl fishery that targets the seamount groundfish stocks has been closed within the US EEZ since FMP implementation in 1986. NMFS notified the Council in September 1997 that the armorhead stock was overfished.

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[7] Bottomfish fisheries occurring in the EEZ around the CNMI are not managed under the FMP.

After continuation of the moratorium on the fishery, the Council was informed by NMFS in January 1998 that no further action was required in order to rebuild the stock.

The year-2000 point estimates of SPR for the five assessed bottomfish species in the Hawaiian archipelago were all greater than 20%, ranging from a low of 27% for onaga to a high of 52% for uku and opakapaka. The values for ehu and hapuupuu were 40% and 49%, respectively (WPRFMC 2002b). The ranges that accompanied the point estimates (upper and lower bounds of the estimate) overlapped the 20% level for only onaga. SPRs for these five species have been estimated for each of the years 1986 through 2000 and none of the annual point estimates reached as low as 20% (WPRFMC 2002b).

The NWHI portions of the bottomfish stocks are recognized to be in better condition than those in the MHI. For example, localized SPR for onaga and ehu in the MHI were estimated to be 7% and 8%, respectively, in 2000 (WPRFMC 2002b). In the NWHI, in contrast, localized analyses of SPR in the NWHI indicated no localized depletion problems for any BMUS in either of the two NWHI management zones (WPRFMC 2002b).

The SPR estimates and other indicators of declining stock condition in the MHI, particularly for onaga and ehu, spurred the State of Hawaii to implement several management measures in state waters of the MHI (Hawaii Administrative Rule, Chapter 13-94). The new rules, which became effective June 1, 1998, apply to seven species of bottomfish, onaga, ehu, kalekale, opakapaka, gindai, hapu'upu'u, and lehi. The measures include gear restrictions, bag limits for non-commercial fishermen, areas closed to fishing and possession of fish, and a requirement that bottomfishing vessels be registered with the state. It is prohibited to use nets, traps, trawls, and bottom-set longline, with the intention of restricting the fishery to traditional handline gear. The bag limit for non-commercial fishermen is a total of five onaga and ehu combined. The system of restricted areas, which may be modified at the administration level, includes 20 areas that are broadly distributed through the MHI and include about 20% of all known fishing areas for onaga and ehu. The new rules also establish a control date of June 1, 1998 that may be used to qualify applicants for a limited entry program should one be established in the future.

In American Samoa, the CNMI, and Guam, stock status indicators in recent years, such as catch-per-unit-effort, have not indicated any cause for concern over stock status.

The status of the bottomfish and seamount groundfish stocks managed under the FMP was reviewed in the Annual Report to Congress on the Status of U.S. Fisheries–2001 (NMFS 2002b). With the exception of armorhead, none of the stocks managed under the FMP was indicated as being in, or approaching, an overfished condition.

4.1.2 MSY Control Rule and Stock Status Determination Criteria

4.1.2.1 Alternative 1 (no action)

Under the no-action alternative no new stock status determination criteria would be specified.

4.1.2.2 Alternative 2 (preferred)

Biological and fishery data are poor for all species and island areas covered by the Bottomfish FMP. Generally, data are only available on commercial landings by species and catch-per-unit-effort (CPUE) for the multi-species complexes as a whole. It would not be possible to partition these effort measures among the various Bottomfish Management Unit Species (BMUS) for any fishery except the MHI, where effort data are available for the four major species caught.

The overfishing criteria and control rules would be specified and applied to individual species within the multi-species stock whenever possible. Where this is not possible, they would be based on an indicator species for the multi-species stock. It is important to recognize that individual species would be affected differently based on this type of control rule, and it is important that for any given species fishing mortality does not exceed a level that would lead to its required protection under the Endangered Species Act (ESA). For the seamount groundfish stocks, armorhead would serve as the indicator species. No indicator species would be used for the four bottomfish multi-species stock complexes (American Samoa, CNMI, Guam and Hawaii). Instead, the control rules would be applied to each of the four stock complexes as a whole.[8]

The MSY control rule would be used as the MFMT. The MFMT and MSST would be specified based on the recommendations of Restrepo et al. (1998) and both would be dependent on the natural mortality rate (M). The value of M to be used to determine the reference point values would not be specified in this amendment. The latest estimate, which would be published annually in the SAFE report, would be used, and the value would be occasionally re-estimated using the best available information. The range of M among species within a stock complex would be taken into consideration when estimating and choosing the M to be used for the purpose of computing the reference point values.

In addition to the thresholds MFMT and MSST, a warning reference point, B_{FLAG}, would also be specified at some point above the MSST to provide a trigger for consideration of management action prior to B reaching the threshold. MFMT, MSST, and B_{FLAG} would be specified as indicated in Table 1.

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[8] The National Standards Guidelines allow overfishing of "other" components in a mixed stock complex if (1) long-term benefits to the nation are obtained, (2) similar benefits cannot be obtained by modification of the fishery to prevent the overfishing, and (3) the results will not necessitate ESA protection of any stock component or ecologically significant unit.

Table 1. Alternative 2 overfishing threshold specifications for bottomfish and seamount groundfish stocks

MFMT	MSST	B_{FLAG}
$F(B) = \frac{F_{MSY} B}{c\, B_{MSY}}$ for $B \le c\, B_{MSY}$ $F(B) = F_{MSY}$ for $B > c\, B_{MSY}$	$c\, B_{MSY}$	B_{MSY}
where $c = \max(1\text{-}M, 0.5)$		

Standardized values of fishing effort (E) and catch-per-unit-effort (CPUE) would be used as proxies for F and B, respectively, so E_{MSY}, $CPUE_{MSY}$, and $CPUE_{FLAG}$ would be used as proxies for F_{MSY}, B_{MSY}, and B_{FLAG}, respectively.

In cases where reliable estimates of $CPUE_{MSY}$ and E_{MSY} are not available, they would be estimated from catch and effort times series, standardized for all identifiable biases. $CPUE_{MSY}$ would be calculated as half of a multi-year average reference CPUE, called $CPUE_{REF}$. The multi-year reference window would be objectively positioned in time to maximize the value of $CPUE_{REF}$. E_{MSY} would be calculated using the same approach or, following Restrepo et al. (1998), by setting E_{MSY} equal to E_{AVE}, where E_{AVE} represents the long-term average effort prior to declines in CPUE. When multiple estimates are available, the more precautionary would be used.

In Hawaii, archipelago-wide estimates of the reference points would be calculated as the weighted average of estimates for each of the three management zones (MHI, Mau, and Hoomalu). Weighting factors would be calculated using the zone-specific fraction of the total length of the 100-fm contour in the archipelago. Ralston and Polovina (1982) have shown that the 100-fm contour is a valid measure of available bottomfish habitat. These weightings would be used when calculating archipelago-wide F and CPUE for the deep slope complex as a whole, rather than for any specific BMUS.

Since the MSY control rule specified here would apply to multi-species stock complexes, it is important to ensure that no particular species within the complex has a mortality rate that leads to required protection under the ESA. In order to accomplish this, a secondary set of reference points would be specified to evaluate stock status with respect to recruitment overfishing. A secondary "recruitment overfishing" control rule would be specified to control fishing mortality with respect to that status. The rule would be applied only to those component stocks (species) for which adequate data are available. The ratio of a current spawning stock biomass proxy ($SSBP_t$) to a given reference level ($SSBP_{REF}$) would be used to determine if individual stocks are experiencing recruitment overfishing. SSBP is CPUE scaled by percent mature fish in the catch. When the ratio $SSBP_t/SSBP_{REF}$, or the "SSBP ratio" (SSBPR) for any species drops below a certain limit ($SSBPR_{MIN}$), that species would be considered to be recruitment overfished and management measures would be implemented to reduce fishing mortality on that species, regardless of the effects on other species within the stock complex. The rule would apply only when the SSBP ratio drops below the $SSBPR_{MIN}$, but it would continue to apply until the ratio achieves the "SSBP ratio recovery target" ($SSBPR_{TARGET}$), which would be set at a level no less than $SSBPR_{MIN}$. These two reference points and their associated recruitment overfishing control rule, which prescribes a target fishing mortality rate ($F_{RO-REBUILD}$) as a function of the SSBP ratio, would be specified as indicated in Table 2. Again, E_{MSY} would be used as a proxy for F_{MSY}.

Table 2. Alternative 2 recruitment overfishing control rule specifications for bottomfish and seamount groundfish stocks

$F_{RO-REBUILD}$	$SSBPR_{MIN}$	$SSBPR_{TARGET}$
$F(SSBPR) = 0$ for $SSBPR \leq 0.10$ $F(SSBPR) = 0.2\,F_{MSY}$ for $0.10 < SSBPR \leq SSBPR_{MIN}$ $F(SSBPR) = 0.4\,F_{MSY}$ for $SSBPR_{MIN} < SSBPR \leq SSBPR_{TARGET}$	0.20	0.30

4.1.2.3 Alternative 3

Under this alternative the MSY control rule and associated thresholds would be the same as in Alternative 2 except for two differences. First, instead of being set equal to B_{MSY}, the warning reference point, B_{FLAG}, would be specified using the same approach used to specify MSST – it would be set as a function of B_{OY} and M just as MSST would be set as a function of B_{MSY} and M (see following subsection for specification of B_{OY}). Second, the value of M used for the reference points would be specified based on the best recent estimate and treated as a fixed value. MFMT, MSST, and B_{FLAG} would be specified as indicated in Table 3.

Table 3. Alternative 3 overfishing threshold specifications for bottomfish and seamount groundfish stocks

MFMT	MSST	B_{FLAG}
$F(B) = \frac{F_{MSY}B}{c\,B_{MSY}}$ for $B \leq c\,B_{MSY}$ $F(B) = F_{MSY}$ for $B > c\,B_{MSY}$	$c\,B_{MSY}$	$c\,B_{OY}$
where $c = \max(1\text{-}M, 0.5)$ and $M = 0.30$		

The value of 0.30 for M is taken from the recommendations in Moffitt and Kobayashi (2000), who note that deepwater snapper M estimates range from 0.3 to 0.55.

See Table 5 for specifications of B_{OY}.

As in Alternative 2, E_{MSY}, $CPUE_{MSY}$, and $CPUE_{FLAG}$ would be used as proxies for F_{MSY}, B_{MSY}, and B_{FLAG}, respectively, and would be calculated as described under Alternative 2. $CPUE_{OY}$ would be used as a proxy for B_{OY}.

As in Alternative 2, a secondary, species-specific, control rule for recruitment overfishing rule that employs a two-level recovery rule would be specified, but it would be expressed in terms relative to F_{OY} rather than F_{MSY}, as indicated in Table 4 (see following section for specification of F_{OY}).

Table 4. Alternative 3 recruitment overfishing control rule specifications for bottomfish and seamount groundfish stocks

$F_{RO\text{-}REBUILD}$	$SSBPR_{MIN}$	$SSBPR_{TARGET}$
$F(SSBPR) = 0 \quad \text{for } SSBPR \leq 0.10$ $F(SSBPR) = 0.25\,F_{OY} \quad \text{for } 0.10 < SSBPR \leq SSBPR_{MIN}$ $F(SSBPR) = 0.50\,F_{OY} \quad \text{for } SSBPR_{MIN} < SSBPR \leq SSBPR_{TARGET}$	0.20	0.30

4.1.3 Target Control Rule and Reference Points

4.1.3.1 Alternative 1 (no action)

Under the no-action alternative no target control rules or reference points would be specified.

4.1.3.2 Alternative 2 (preferred)

Under this alternative no target control rules or reference points would be specified.

4.1.3.3 Alternative 3

Because optimum yield (OY) is, by definition under the MSA, the target yield from a given fishery, any specified target control rule would necessarily be directly associated with OY. A target control rule, expressed as F_{OY}, and a target stock biomass, B_{OY}, would be specified as indicated in Table 5.

Table 5. Alternative 3 target control rule specifications for bottomfish and seamount groundfish stocks

F_{OY}	B_{OY}
$F(B) = \dfrac{0.75\,F_{MSY}B}{B_{MSY}} \quad \text{for } B \leq B_{MSY}$ $F(B) = 0.75\,F_{MSY} \quad \text{for } B > B_{MSY}$	$1.3\,B_{MSY}$

The target reference points E_{OY} and $CPUE_{OY}$ would be used as proxies for F_{OY} and B_{OY}, respectively.

The proposed specification of F_{OY} is based on a default target control rule recommended by Restrepo et al. (1998), which would set F_{OY} as 0.75 MFMT. The proposed specification made is more conservative than that recommendation, as the inflection point in the control rule would be at a greater biomass level (B_{MSY} rather than the MSST). The recommendation by Restrepo et al. (1998) of setting the target fishing mortality at 75 percent of the MFMT was based solely on the need for the OY reference points to be cautious with respect to the overfishing thresholds (see National Standard Guidelines, 50 CFR 600.310(f)(5)). Specification of this target control rule would imply that that single factor – the need to be cautious with respect to the thresholds – outweighs any other economic, social, and ecological factors of which OY is (by definition) a function (or alternatively, that all those factors have been effectively accounted for in that specification).

The proposed specification for B_{OY} is based on simulation results of equilibrium biomass associated with fishing at 0.75 F_{MSY} (Mace 1994).

4.1.4 Rebuilding Control Rule and Reference Points

4.1.4.1 Alternative 1 (no action)

Under the no-action alternative no rebuilding control rule or reference points would be specified (but the seamount groundfish stock complex, the only stock determined to be overfished, is already subject to a rebuilding plan in which fishing mortality is set at zero).

4.1.4.2 Alternative 2 (preferred)

Under the preferred alternative no rebuilding control rule or reference points would be specified for the stock complexes (but the seamount groundfish stock complex, the only stock determined to be overfished, is already subject to a rebuilding plan in which fishing mortality is set at zero).

4.1.4.3 Alternative 3

A rebuilding control rule would be specified for the stock complexes such that the rebuilding control rule is identical to the target control rule for levels of B where the rebuilding control rule is applicable (i.e., between 0 and the rebuilding target, B_{MSY}), as indicated in Table 6.

Table 6. Alternative 3 rebuilding control rule specifications for bottomfish and seamount groundfish stocks

$\mathbf{F}_{REBUILDING}$
$F(B) = \dfrac{0.75\,F_{MSY}B}{B_{MSY}}$ for $B < B_{MSY}$

$E_{REBUILDING}$ would be used as a proxy for $F_{REBUILDING}$. In the case of the seamount groundfish stock complex, which is the only stock under this FMP determined to be overfished, its existing rebuilding plan specifies F at zero.

4.1.5 Stock Status Determination Process

Stock status determinations involve three procedural steps. First, the reference points are specified. Second, the values of the reference points are estimated. Third, the status of the stock is determined by estimating the current or recent values of fishing mortality and stock biomass or their proxies and comparing them with their respective reference points.

4.1.5.1 Alternative 1 (no action)

Under the no-action alternative no new process for assessing stocks would be specified.

4.1.5.2 Alternative 2 (preferred)

The first of the three assessment steps described above would be accomplished through this amendment. Because environmental changes may affect the productive capacity of the stocks, it may be necessary to occasionally modify the specifications of some of the reference points or control rules. Modifications may also be desirable when better assessment methods become available, when fishery objectives are modified (e.g., OY), or better biological, socio-economic, or ecological data become available. Any such modifications would be made through the FMP framework process.

The second step (including estimation of M, on which the values of the overfishing thresholds would be dependent) and third step would be undertaken by NMFS and the latest results published annually in the Stock Assessment and Fishery Evaluation (SAFE) report, which is the Council's Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region Annual Report. In practice, the second and third steps may be done simultaneously—in other words, the reference point values could be re-estimated as often as the stocks' status.

No particular stock assessment period or schedule would be specified, but in practice the assessments would likely be conducted annually in coordination with the preparation of the annual SAFE report.

The best information available would be used to estimate the values of the reference points and to determine the status of stocks in relation to the status determination criteria. The determinations would be based on the latest available stock and fishery assessments. Information used in the assessments would include logbook data, creel survey data, vessel observer data (the observer program in the NWHI fishery is anticipated to be reinitiated soon), and the findings of fishery-independent surveys when they are conducted.

4.1.5.3 Alternative 3

The stock status determination process would be the same as in Alternative 2 except that the value of M used to determine the reference point values would not be routinely re-estimated. Instead, M would be treated as a fixed value (0.30), as indicated in Table 3.

4.1.6 Measures to Prevent Overfishing and Overfished Stocks

The FMP includes a number of measures aimed at preventing overfishing. These include a moratorium on the harvest of NWHI seamount groundfish, prohibitions on the use of a number of destructive fishing methods, and limited access programs in the two NWHI management zones (see Section 2.1 for details).

There are also measures in place to limit fishing effort and catch in the state waters of the MHI. Although these waters are not subject to the FMP, they contain portions of the stocks being managed under the FMP, so measures that control fishing mortality in state waters serve to reduce the risk of stock-wide overfishing. As described in Section 4.1.1.3, evidence of declining bottomfish stock condition in the MHI, particularly for onaga and ehu, spurred the State of Hawaii to implement several management measures applicable to seven species of bottomfish. They include gear restrictions, bag limits for non-commercial fishermen, and 20 areas closed to fishing and possession of bottomfish.

No stocks managed under the FMP (with the exception of seamount groundfish, which is already subject to a moratorium) have been determined to be overfished or approaching an overfished state (NMFS 2002b), so no alternatives for remedial management action are proposed in this amendment.

If in the future it is determined that overfishing is occurring, a stock is overfished, or either of those two conditions is being approached, the Council would establish additional management measures using the FMP amendment process or framework adjustment process. Measures that would be considered include additional area closures, seasonal closures, a reduction in the number of available permits in the NWHI limited entry fisheries, the establishment of limited access systems in other areas, limits on catch per trip, limits on effort per trip, and fleet-wide limits on catch or effort (e.g., in the NWHI management zones).

Although archipelago-wide multi-species reference values would be used to determine overfishing and overfished conditions for bottomfish stocks in Hawaii waters, values for each of the three Hawaii management zones could also be used to detect localized depletion, and localized management measures could be applied as appropriate to achieve localized objectives.

4.1.7 Summary

The proposed specifications of the previous subsections are merely summarized here; no new specifications or measures are presented. Table 7 shows the elements that collectively make up the preferred alternative for the bottomfish and seamount groundfish stocks.

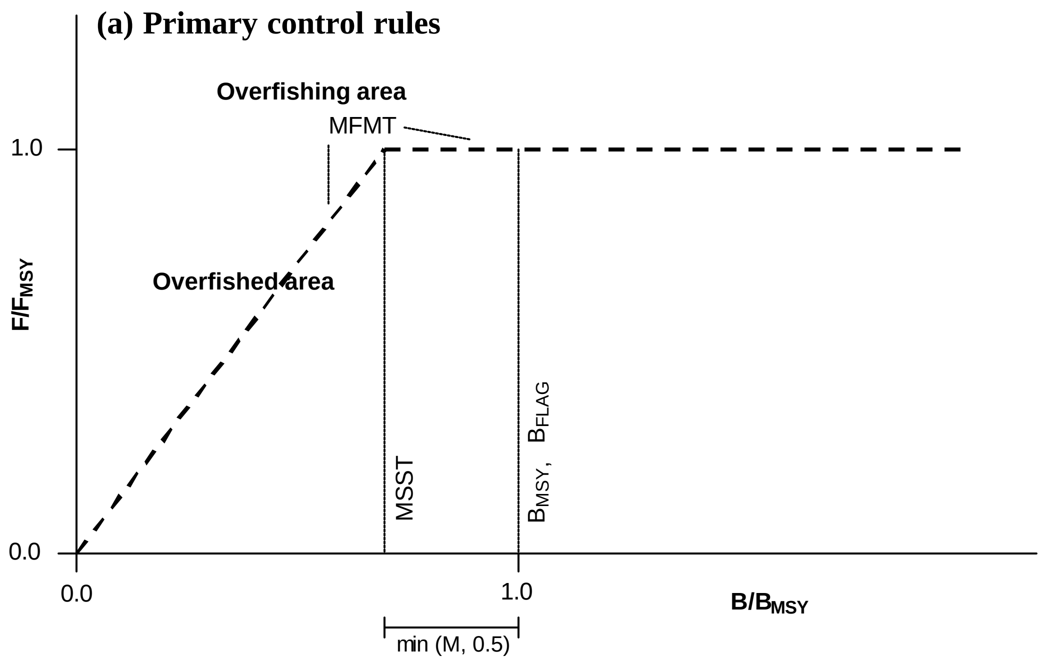
Table 7. Preferred alternative elements for bottomfish and seamount groundfish stocks

Element	Preferred alternative
MSY control rule and stock status determination criteria	2
Target control rule and reference points	2
Rebuilding control rule and reference points	2
Stock status determination process	2

The preferred combination of control rules and reference points is illustrated in Figure 2. The primary control rules that would be applied to the stock complexes are shown in part (a). Note that the position of the MSST is illustrative only; its value would depend on the best estimate of M at any given time. The secondary control rule that would be applied to particular species to provide for recovery from recruitment overfishing is shown in part (b).

In Figure 3 is an illustration of the combination of control rules and reference points that are not preferred (but not showing the no-action alternative). The primary control rules that would be applied to the stock complexes are shown in part (a). Note that because the value for M would be fixed, the positions of the MSST and B_{FLAG} would be specified and fixed at 0.7 B_{MSY} and 0.91 B_{MSY}, respectively. The secondary control rule that would be applied to particular species to provide for recovery from recruitment overfishing is shown in part (b).

Figure 2. Preferred combination of control rules and reference points for bottomfish and seamount groundfish stocks



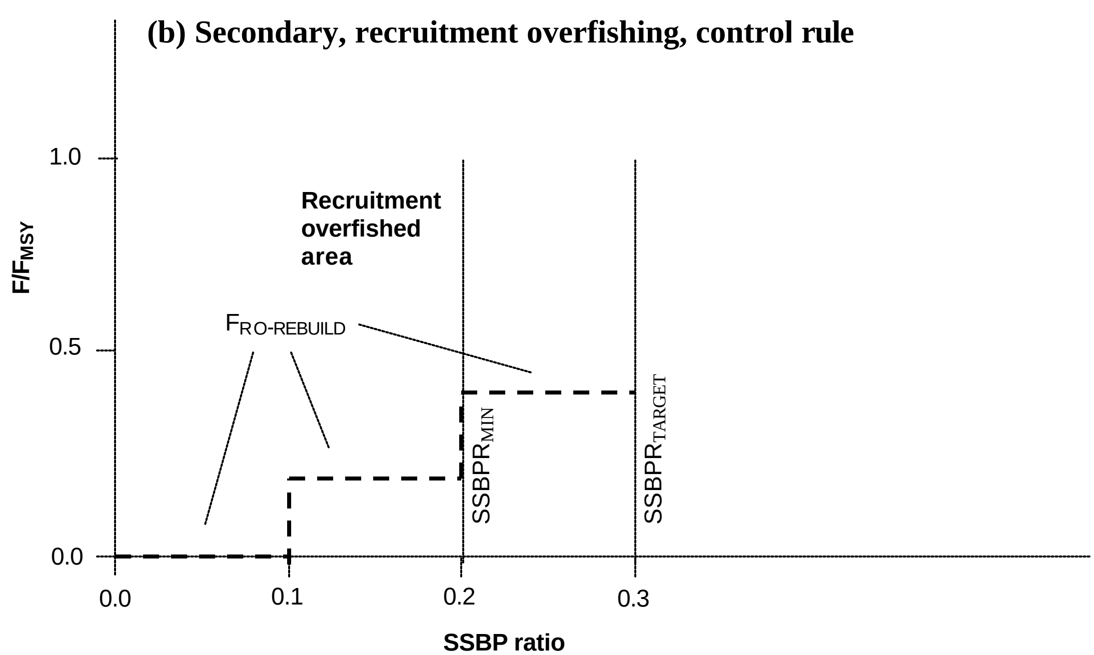
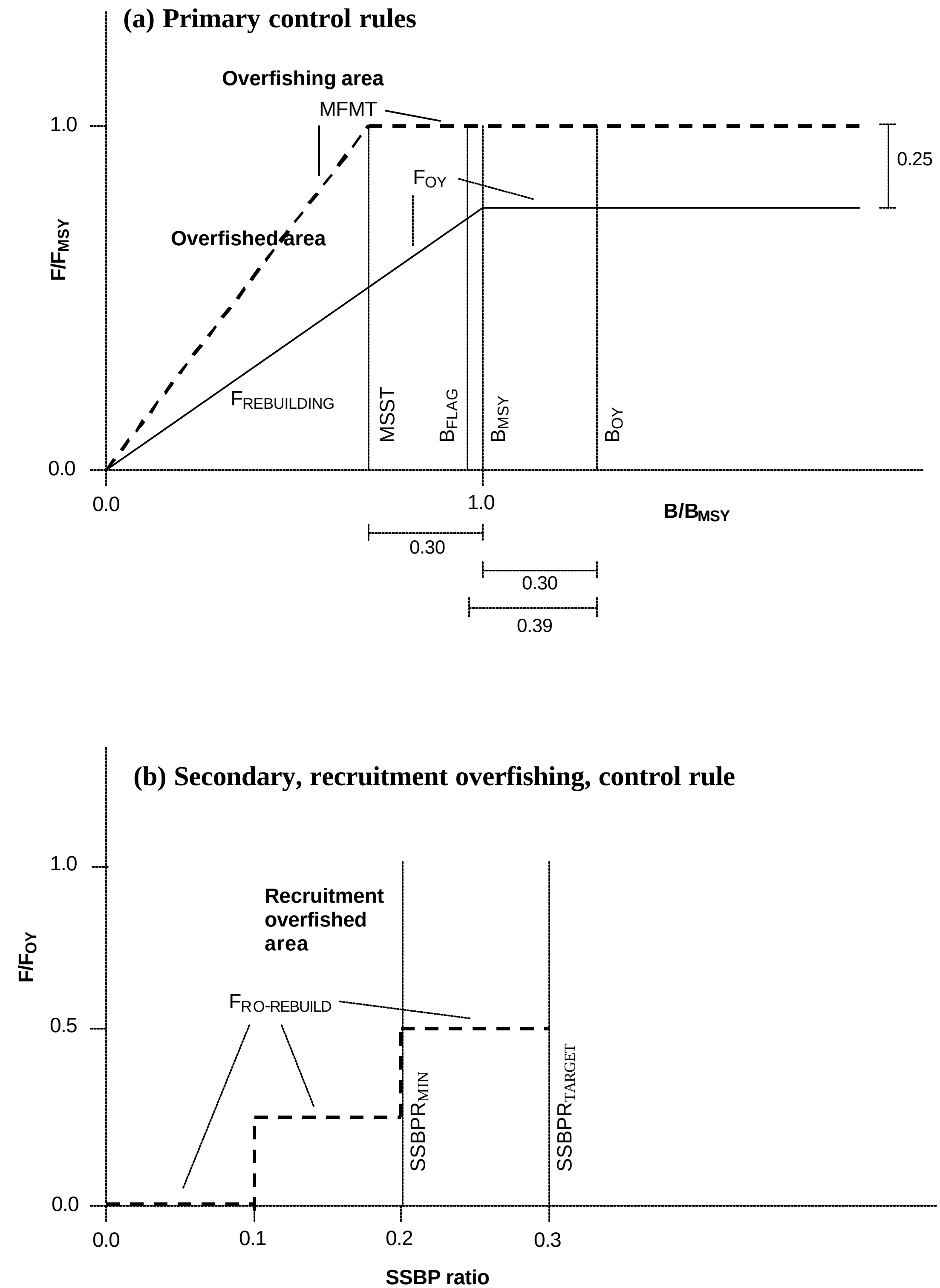


Figure 3. Not-preferred combination of control rules and reference points for bottomfish and seamount groundfish stocks



4.2 Pelagics FMP

4.2.1 Background

General background information on the pelagic fisheries is provided in Section 5.2. Information that is particularly relevant to the specification of overfishing criteria is discussed here.

4.2.1.1 Description of the fisheries

Pelagic management unit species are caught in the pelagic fisheries by longline, troll, handline, pole-and-line, and purse seine.

The Hawaii-based longline fishery is the most significant pelagic fishery under Council jurisdiction in terms of landings and value. The number of longline vessels based in Hawaii is restricted by a limited access program to 164. Currently, about 105 vessels are active. These vessels are typically 50–100 ft in length and employ a monofilament mainline 18 to 60 nm long, with 400 to 2,000 baited hooks.

Until recently the domestic longline fleet in American Samoa consisted of 20 to 30 small to medium-sized vessels (20-45 ft) that set and retrieved 300-hook longlines by hand. However, in 2000 larger vessels (>50 ft) began entering the fishery. By the third quarter of 2001, 19 of these vessels were active, mostly fishing farther offshore than the smaller vessels. Both small and large vessels predominantly catch albacore tuna, and also some skipjack tuna. The larger vessels have quickly assumed a large role, catching a majority of the fish in the fishery. For example, in 2000, the first year of participation by large vessels, they caught 22,253 tuna in comparison to 23,113 caught by the smaller vessels. In the third quarter of 2001 they caught 70,319 tuna versus 16,799 caught by the smaller vessels. Overall, albacore make up about 69% of the small vessels' tuna catch, while for the large vessels the figure is about 82%.

In Guam and the CNMI there are no domestic commercial longline fleets. Numerous foreign longline vessels, mainly from Japan and Taiwan, put in at Guam to offload catch for transshipment to markets. These vessels do not fish in US waters, however, and the Council therefore has not implemented any management measures related to their fishing activities. One domestic longline vessel recently started fishing in CNMI waters (P. Dalzell, WPFMC, pers. comm.). To date, no management regulations have been established that would apply specifically to longline fishing in CNMI waters.

Troll and handline gear are used by commercial, recreational, and charter vessels to fish for pelagic species in all the island groups.

Commercial albacore troll vessels occasionally fish in the waters around Hawaii.

A small pole-and-line fleet, which principally targets surface schools of *aku*, or skipjack tuna, operates in Hawaii.

US purse seine vessels operating in the central and western Pacific sometimes fish in the EEZ around American Samoa, Guam, and the Pacific Remote Island Areas.

4.2.1.2 Existing overfishing and optimum yield specifications

Amendment 1 defined a stock or stock complex as being overfished in terms of its spawning potential ratio, a measure of the current reproductive capacity of a stock relative to its unexploited capacity over its entire range (WPRFMC 1990a:11):

> *Billfishes, mahimahi, and wahoo are considered overfished when their Spawning Potential Ratio (SPR) is equal to or greater than 0.20.*
>
> *Oceanic sharks are considered overfished when their Spawning Potential Ratio (SPR) is equal to or less than 0.35.*

When tunas were included as PMUS in Amendment 6, their thresholds were specified as follows (WPRFMC 1992:11):

> *A tuna or related stock is defined as overfished when its Spawning Potential Ratio (SPR) is equal to or less than 0.2.*

Amendment 1 defined overfishing as follows (as restated by Amendment 6, WPRFMC 1992:11):

> *Overfishing of a Pacific pelagic management unit stock is defined as when the harvest rate that* [sic] *is not consistent with a program established to (1) maintain the species or stock above the minimum level of SPR and (2) achieve optimum yield (OY).*

Optimum yield for the pelagic fisheries was specified (revising an earlier specification) in FMP Amendment 1 as follows (WPRFMC 1990a:13):

> *OY is the amount of each management unit species or species complex that can be harvested by domestic and foreign fishing in the EEZ in accordance with the measures contained in this plan without causing "local overfishing" or "economic overfishing" within the EEZ of each island area, and without causing or significantly contributing to "growth overfishing," or (worse) recruitment overfishing on a stock-wide basis.*

4.2.1.3 Stock status

Recently, the Secretariat of the Pacific Community has performed assessments of several Pacific pelagic stocks in which stock status was expressed in terms of: 1) adult stock biomass at a given time relative to the adult stock biomass associated with maximum sustainable yield (${}_aB_t / {}_aB_{MSY}$), and 2) the fishing mortality rate at a given time relative to the fishing mortality rate associated with maximum sustainable yield (F_t / F_{MSY}).[9] The results of such assessments for western and central Pacific bigeye tuna (Hampton 2002a), western and central Pacific yellowfin tuna (Hampton 2002b), western and central Pacific skipjack tuna (Hampton 2002c), and south Pacific albacore (Hampton 2002d) are summarized below. The assessments covered the period from the

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[9] Note that the FMP's existing criteria for determining stock status are not expressed in terms of these ratios.

early 1960s through 2001 for all stocks except skipjack, for which the study period started in the early 1970s.[10]

Western and central Pacific bigeye tuna: Estimated values of F_t / F_{MSY} generally increased from the early 1960s through the mid-1990s, followed by an apparent decrease through 2001. F_t / F_{MSY} remained below 1.0 during the entire period, peaking at about 0.7 to 0.8 in the mid-1990s. Estimated values for the period since 2000 were between 0.3 and 0.7. Estimated values of ${}_aB_t / {}_aB_{MSY}$ for bigeye tuna generally decreased from the early 1960s through the mid-1990s, followed by an apparent increase through 2001. Estimated ${}_aB_t / {}_aB_{MSY}$ remained above 1.0 during the entire period, with a low of about 1.5 to 2.0 in the mid-1990s. Estimated values for the period since 2000 were between 2 and 4.

Western and central Pacific yellowfin tuna: Estimated values of F_t / F_{MSY} generally increased from the early 1960s through 2001. F_t / F_{MSY} remained well below 1.0 during the entire period, peaking at about 0.3 to 0.6 in the last year or two. Estimated values of ${}_aB_t / {}_aB_{MSY}$ for yellowfin tuna remained above 1.0 during the entire period, with a low of about 2 in the mid-1970s. Estimated values for the period since 2000 were between 2.0 and 3.5.

Western and central Pacific skipjack tuna: Estimated values of F_t / F_{MSY} were well below 1.0 since the early 1970s, peaking at less than 0.2 in the mid-1990s. Estimated values of ${}_aB_t / {}_aB_{MSY}$ for skipjack tuna remained well above 1.0 during the entire period, with a low of about 2 in the mid-1970s. Estimated values for the period since 2000 were between 3 and 9.

Southern Pacific albacore tuna: Estimated values of F_t / F_{MSY} were well below 1.0 for the entire period, peaking at about 0.2 to 0.3 in the late 1980s. Estimated values of ${}_aB_t / {}_aB_{MSY}$ for albacore tuna remained above 1.0 during the entire period. The 1990s saw the lowest values, estimated to be between 1.5 and 5.

Recent stock assessments have also been conducted by the NMFS Honolulu Laboratory, in collaboration with fishery scientists in Japan, IATTC and SPC, on North Pacific blue shark, North Pacific swordfish and Pacific blue marlin. The results of these stock assessments are summarized below.

North Pacific blue shark: Based on an analysis of catch data from 1992-1998, a stock assessment by Kleiber et al. (2001) concluded that North Pacific blue shark MSY was probably between 1.8 and 4 times the level of catch during that period and that fishing mortality during the period was between one fifteenth and one half of F_{MSY}

North Pacific swordfish: Based on an analysis of catch data from Japanese and Hawaii-based longline catch data, a stock assessment by Kleiber & Yokawa (2002) suggested that swordfish biomass was currently about 76% of the estimated biomass without fishing, indicating a significant impact of fishing on the swordfish population but probably less than the impact would

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[10] Please see these publications for further details, including the methods used, the confidence intervals associated with the estimates, and a brief discussion of the possible shortcomings of using MSY-based indicators of stock status – particularly about the questionable assumptions that have to be made about the equilibrium behavior of populations.

be at MSY.

North Pacific blue marlin: A Pacific-wide stock assessment of blue marlin based on catch data from Japan, Taiwan, Mexico, Korea and French Polynesia was recently conducted by Kleiber et al (2002). The results imply that fishing mortality has been hovering slightly above its MSY level and spawning biomass slightly below its MSY level for most of the past three decades. Recruitment is estimated to have been rising over that same period.

Boggs et al. (2000) tabulated then-recent estimates of F_t / F_{MSY} and B_t / B_{MSY} for the pelagic stocks managed under the FMP. These estimates, along with the year for which they were made, are shown in Table 8. It can be seen that for two stocks, bigeye tuna and eastern Pacific yellowfin tuna, the fishing mortality ratio was estimated to exceed 1.0 and the stock biomass ratio was estimated to be less than 1.0 (but see Hampton 2002a, above, for contrary results for bigeye tuna). Also shown in Table 8 are estimates of natural mortality rates (M) presented in Boggs et al. (2000).

Table 8. Estimates of status indicators for Pacific pelagic stocks

Stock	Year	F_t / F_{MSY}	B_t / B_{MSY}	M
Bigeye tuna	1994	1.09	0.99	0.4
Northern Pacific albacore	1995	0.9	1.1	0.3
Southern Pacific albacore	1993	0.62	2.5	0.3
Eastern Pacific yellowfin tuna	1997	1.08	0.95	0.8
Western Pacific yellowfin tuna	1998	0.11 – 0.22	1.65	0.8 – 1.6
Eastern Pacific skipjack tuna	1997	unknown	2.5	> 0.5
Western Pacific skipjack tuna	--	0.25	2.5	> 0.5
Other tunas		unknown	unknown	
Northern Pacific swordfish	1997	0.3	2.47	0.3
Blue marlin	1997	0.46 – 0.88	1.1 – 1.7	0.2
Other billfishes		unknown	unknown	
Pelagic sharks		unknown	unknown	
Other MUS		unknown	unknown	

Source: Boggs et al. (2000).

Stock assessment results for other pelagic stocks, including the other tunas, other billfishes, and other management unit species, are not available.

The status of the pelagic stocks managed under the FMP was reviewed in the Annual Report to Congress on the Status of U.S. Fisheries–2001 (NMFS 2002b). None of the stocks were indicated as being in, or approaching, an overfished condition.

Because of the highly migratory nature of the pelagic stocks, the fishing mortality imposed by the fisheries under US jurisdiction contribute relative small portions of a stock's total fishing mortality. Table 9 shows the estimated mortality rates of the fisheries under the Council's management jurisdiction relative to estimated fishing mortality rates on the stocks as a whole (F_{JUR}/F_{MSY}) (from Boggs et al. 2000). These ratios were estimated by multiplying the percentage of the stock-wide catch made by the Council-managed fisheries (C_{JUR}/C) by the mortality rate ratio (F/F_{MSY}, as indicated in Table 8). The values of F_{JUR}/F_{MSY} represent the maximum possible reduction in relative fishing mortality that could be achieved through Council action on the fisheries under its jurisdiction. It can be seen that for all the stocks for which estimates could be made, decreasing fishing mortality within Council jurisdiction to zero would result in only small reductions in stock-wide fishing mortality rates.

Table 9. Relative fishing mortality rates of pelagic stocks in Council-managed fisheries

Stock	C_{JUR}/C	F/F_{MSY}	Relative Council fishing mortality rate (F_{JUR}/F_{MSY})
Bigeye tuna	0.015	1.09	0.016
N Pac albacore	0.024	0.9	0.023
S Pac albacore	0.007	0.62	0.0043
E Pac yellowfin tuna	0.0007	1.08	0.0008
W Pac yellowfin tuna	0.004	0.11 to 0.22	0.0004 to 0.0008
E Pac skipjack tuna	0.0001	unknown	unknown
W Pac skipjack tuna	0.001	0.25	0.00025
Other tunas	unknown	unknown	unknown
N Pac swordfish*	0.23	0.3	0.069
Blue marlin	0.037	0.46 to 0.88	0.017 to 0.033
Other billfishes	unknown	unknown	unknown
Pelagic sharks	unknown	unknown	unknown
Other MUS	unknown	unknown	unknown

Source: Boggs et al. (2000).
* Subsequent to these estimates directed swordfish fishing by Hawaii-based longliners was prohibited.

4.2.2 MSY Control Rule and Stock Status Determination Criteria

4.2.2.1 Altemative 1 (no action)

Under the no-action alternative no new stock status determination criteria would be specified.

4.2.2.2 Alternative 2 (preferred)

Despite the existence of stock assessments for several of the key species, none of the PMUS stocks in the western and central Pacific can be considered data-rich. Many can be considered data-moderate and the rest are considered data-poor, as indicated in Table 10. Species for which there is insufficient data to determine status, such as those in the "other MUS" category, would be managed as part of a mixed stock complex.[11]

[11] The National Standards Guidelines allow overfishing of "other" components in a mixed stock complex if (1) long-term benefits to the nation are obtained, (2) similar benefits cannot be obtained by modification of the fishery to prevent the overfishing, and (3) the results will not necessitate ESA protection of any stock component or ecologically significant unit.

Table 10. Quality of data for pelagic stocks

Stock	Data richness
Bigeye tuna	moderate
Northern Pacific albacore	moderate
Southern Pacific albacore	moderate
Eastern Pacific yellowfin tuna	moderate
Western Pacific yellowfin tuna	moderate
Eastern Pacific skipjack tuna	moderate
Western Pacific skipjack tuna	moderate
Other tunas	poor
Northern Pacific swordfish	moderate
Blue marlin	moderate
Other billfishes	poor
Pelagic sharks	poor
Other MUS	poor

The defaults recommended in the technical guidance for National Standard 1 (Restrepo et al. 1998) for data-moderate species would be used to specify control rules and reference points, as described below. The specifications would apply to those stocks for which assessments against the criteria can be performed with available data. Efforts would be made to improve the quality of data on the data-poor stocks so that stock assessments against the specified criteria could be performed.

The MSY control rule would be used as the MFMT. The MFMT and MSST would be specified based on the recommendations of Restrepo et al. (1998) and both would be dependent on the natural mortality rate (M). The values of M to be used to determine the reference point values would not be specified in this amendment. The latest estimate for each stock, which would be published annually in the SAFE report, would be used, and the value would be occasionally re-estimated using the best available information.

Also specified would be a warning reference point, B_{FLAG}, to provide a trigger for consideration of management action prior to B reaching the threshold. MFMT, MSST, and B_{FLAG} would be specified as indicated in Table 11.

Table 11. Alternative 2 overfishing threshold specifications for pelagic stocks

MFMT	MSST	B_{FLAG}
$F(B) = \frac{F_{MSY} B}{c\, B_{MSY}}$ for $B \le c\, B_{MSY}$ $F(B) = F_{MSY}$ for $B > c\, B_{MSY}$	$c\, B_{MSY}$	B_{MSY}
where c = max (1-M, 0.5)		

To illustrate these specifications of the MSST, for species with natural mortality rates greater than 0.5 (e.g., yellowfin tuna and skipjack tuna) the MSST would be 0.5 B_{MSY}. The MSST for a species with a natural mortality rate of 0.2 would be 0.8 B_{MSY}.

The values of M to be used to determine the reference points would not be specified in this amendment. The latest estimates, which would be published annually in the SAFE report, would be used, and the values would be occasionally re-estimated using the best available information.

For some stocks (e.g., bigeye tuna, north Pacific albacore, and blue marlin), F_{MSY} can be estimated from data in published and unpublished reports. Where possible, F_{MSY} would be estimated from those sources. Where F_{MSY} cannot be reliably estimated, the technical guidance for implementing National Standard 1 (Restrepo et al. 1998) recommends a default specification of F_{MSY} = 0.8 M. That specification would be adopted here for all stocks for which F_{MSY} cannot be directly estimated.

As with F_{MSY}, some B_{MSY} values can be derived from published or unpublished sources. For other stocks, B_{MSY} would be specified as follows:

$$B_{MSY} = MSY/0.8M$$

For some stocks with relatively high fecundity B_{MSY} would be specified as suggested in the technical guidance for data-poor stocks:

$B_{MSY} = 0.4\ B_0$, where B_0 is the initial biomass, or carrying capacity

For these stocks, $CPUE_{YEAR}/CPUE_0$ would be used as a proxy for B_{YEAR}/B_0, as suggested in the technical guidance for data-poor stocks. In these cases, standardized CPUE time series extending back to the earliest years of the fishery ($CPUE_0$) would be used to estimate B_{YEAR}/B_{MSY}:

$$B_{YEAR}/B_{MSY} = (CPUE_{YEAR}/CPUE_0)\ (B_0/B_{MSY})$$

Such estimates based on CPUE time series would be periodically recalculated (i.e., re-standardized) to take into account changes in technology or fishing strategy.

4.2.2.3 Alternative 3

Under this alternative the MSY control rule and associated thresholds would be the same as in Alternative 2 except for two differences. First, instead of being set equal to B_{MSY}, the warning reference point, B_{FLAG}, would be specified using the same approach used to specify MSST – it would be set as a function of B_{OY} and M just as MSST would be set as a function of B_{MSY} and M (see following subsection for specification of B_{OY}). Second, the values of M used for the reference points would be specified based on the best recent estimates and treated as fixed values. MFMT, MSST, and B_{FLAG} would be specified as indicated in Table 12.

Table 12. Alternative 3 overfishing threshold specifications for pelagic stocks

MFMT	MSST	B_{FLAG}
$F(B) = \frac{F_{MSY} B}{c\, B_{MSY}}$ for $B \le c\, B_{MSY}$ $F(B) = F_{MSY}$ for $B > c\, B_{MSY}$	$c\, B_{MSY}$	$c\, B_{OY}$
where c = max (1-M, 0.5) and M is as follows:		
Bigeye tuna	0.4	
Northern Pacific albacore	0.3	
Southern Pacific albacore	0.3	
Eastern Pacific yellowfin tuna	0.8	
Western Pacific yellowfin tuna	> 0.5	
Eastern Pacific skipjack tuna	> 0.5	
Western Pacific skipjack tuna	> 0.5	
Other tunas	--	
Northern Pacific swordfish	0.3	
Blue marlin	0.2	
Other billfishes	--	
Pelagic sharks	--	
Other MUS	--	

The values for M were taken from information provided in Boggs et al. (2000).
See Table 13 for specifications of B_{OY}.

The methods used to estimate the necessary stock parameters would be the same as described above for Alternative 2.

4.2.3 Target Control Rule and Reference Points

4.2.3.1 Alternative 1 (no action)

Under the no-action alternative no target control rules or reference points would be specified.

4.2.3.2 Alternative 2 (preferred)

Under this alternative no target control rules or reference points would be specified.

4.2.3.3 Alternative 3

A target control rule and associated reference points, including a stock biomass target, B_{OY}, would be specified as indicated in Table 13. The specifications would apply to those stocks for which assessments against the criteria can be performed with available data. Efforts would be made to improve the quality of data on the data-poor stocks so that stock assessments against the specified criteria could be performed.

Table 13. Alternative 3 target control rule specifications for pelagic stocks

$\mathbf{F}_{OY}$	$\mathbf{B}_{OY}$
$F(B) = \frac{0.75\,F_{MSY}B}{B_{MSY}}$ for $B \leq B_{MSY}$ $F(B) = 0.75\,F_{MSY}$ for $B > B_{MSY}$	$1.3\,B_{MSY}$

The specification of F_{OY} is based on a default target control rule recommended by Restrepo et al. (1998), which would set F_{OY} as 0.75 MFMT. The specification made here is more conservative than that recommendation, as the inflection point in the control rule is at a greater biomass level (B_{MSY} rather than the MSST). The recommendation by Restrepo et al. (1998) of setting the target fishing mortality at 75 percent of the MFMT was based solely on the need for the OY reference points to be cautious with respect to the overfishing thresholds (see National Standard Guidelines, 50 CFR 600.310(f)(5)). Specification of this target control rule would imply that that single factor – the need to be cautious with respect to the thresholds – outweighs any other economic, social, and ecological factors of which OY is (by definition) a function (or alternatively, that all those factors have been effectively accounted for in that specification).

The proposed specification for B_{OY} is based on simulation results of equilibrium biomass associated with fishing at 0.75 F_{MSY} (Mace 1994).

4.2.4 Rebuilding Control Rule and Reference Points

4.2.4.1 Alternative 1 (no action)

Under the no-action alternative no rebuilding control rules or reference points would be specified.

4.2.4.2 Alternative 2 (preferred)

Under the preferred alternative no rebuilding control rules or reference points would be specified.

4.2.4.3 Alternative 3

A rebuilding control rule would be specified such that the rebuilding control rule is identical to the target control rule for levels of B where the rebuilding control rule is applicable (i.e., between 0 and the rebuilding target, B_{MSY}), as indicated in Table 14.

Table 14. Alternative 3 rebuilding control rule specifications for pelagic stocks

$\mathbf{F}_{\text{REBUILDING}}$
$F(B) = \dfrac{0.75\, F_{MSY} B}{B_{MSY}}$ for $B < B_{MSY}$

4.2.5 Stock Status Determination Process

Stock status determinations involve three procedural steps. First, the reference points are specified. Second, the values of the reference points are estimated. Third, the status of the stock is determined by estimating the current or recent values of fishing mortality, stock biomass, or their proxies and comparing them with their respective reference points.

4.2.5.1 Alternative 1 (no action)

Under the no-action alternative no new process for assessing stocks would be specified.

4.2.5.2 Alternative 2 (preferred)

The first of the three assessment steps described above would be accomplished through this amendment. Because environmental changes may affect the productive capacity of the stocks, it may be necessary to occasionally modify the specifications of some of the reference points or control rules. Modifications may also be desirable when better assessment methods become available, when fishery objectives are modified (e.g., OY), or better biological, socio-economic, or ecological data become available. Any such modifications would be made through the FMP framework process.

The second step (including estimation of M, on which the values of the overfishing thresholds are dependent) and third step would be undertaken by NMFS and the latest results published annually in the Stock Assessment and Fishery Evaluation (SAFE) report, which is the Council's Pelagics Fisheries of the Western Pacific Region Annual Report. In practice, the second and third steps may be done simultaneously—in other words, the reference point values could be re-estimated as often as the stocks' status.

No particular stock assessment period or schedule would be specified, but in practice the assessments would likely be conducted annually in coordination with the preparation of the annual SAFE report.

The best information available would be used to estimate the values of the reference points and to determine the status of stocks in relation to the status determination criteria and other reference points. The determinations would be based on the latest available stock and fishery assessments. Information used in the assessments would be taken primarily from analyses and reports issued by NMFS and fishery research organizations such as the Secretariat of the Pacific Community (SPC), the Inter-American Tropical Tuna Commission (IATTC), and the National Research Institute for Far Seas Fisheries (NRIFSF).

4.2.5.3 Alternative 3

The stock status determination process would be the same as in Alternative 2 except that the values of M used to determine the reference point values would not be routinely re-estimated. Instead, M for each stock would be treated as a fixed value, as indicated in Table 12.

4.2.6 Measures to Prevent Overfishing and Overfished Stocks

Existing measures that serve to limit fishing mortality in the Council-managed pelagic fisheries include the limited access system for the Hawaii-based longline fishery, the prohibition on the use of drift gillnets, the recent closure of the swordfish-directed longline fishery, the prohibition on shark finning, and the several longline area closures (see Section 2.2 for details).

No stocks managed under the FMP have been determined to be overfished or approaching an overfished state (NMFS 2002b), so no alternatives for remedial management action are proposed in this amendment.

If in the future it is determined that overfishing is occurring, a stock is overfished, or either of those two conditions is being approached, the Council would consider remedial management action. Given the highly migratory, trans-boundary nature of the pelagic stocks, such action may not necessarily be focused on reduction of fishing effort within the waters of Council jurisdiction. As illustrated in Table 9, any reduction of fishing effort by Council-managed fisheries would have little effect on the status of most of the stocks.

The prevention of overfishing and, if necessary, the rebuilding of overfished stocks, would require control over fishing mortality outside Council jurisdiction. To achieve such control, international cooperation would be required. To that end, NMFS and Council would continue to contribute to the development of, and participate in, regional and inter-governmental fishery management frameworks and processes. Efforts would include promoting the application of stock-wide limits on effort using limit reference points and MSY-based target control rules that are consistent with MSA requirements.

At the same time, the Council would continue to manage the fisheries within its jurisdiction to achieve localized targets. In the case that it is determined that localized overfishing is occurring, the Council would establish additional management measures using the FMP amendment process or the framework adjustment process. Measures that would be considered include additional area closures, seasonal closures, a reduction in the number of available permits in the Hawaii-based longline fishery, the establishment of limited access systems in other areas (the Council is currently considering an FMP amendment that would establish a limited access program in the American Samoa longline fishery), limits on catch per trip, limits on effort per trip, and fleet-wide limits on catch or effort.

4.2.7 Summary

The proposed specifications of the previous subsections are merely summarized here; no new specifications or measures are presented. Table 15 shows the elements that collectively make up the preferred alternative for the pelagic stocks.

Table 15. Preferred alternative elements for pelagic stocks

Element	Preferred alternative
MSY control rule and stock status determination criteria	2
Target control rule and reference points	2
Rebuilding control rule and reference points	2
Stock status determination process	2

The preferred combination of control rules and reference points is illustrated in Figure 4. Note that the position of the MSST is illustrative only; its value would depend on the best estimate of M at any given time.

In Figure 5 is an illustration of the combination of control rules and reference points that are not preferred (but not showing the no-action alternative). Note that the positions of the MSST and B_{FLAG} are illustrative only; they would be specified and fixed for each stock according to the values of M specified in Table 12.

Figure 4. Preferred combination of control rules and reference points for pelagic stocks

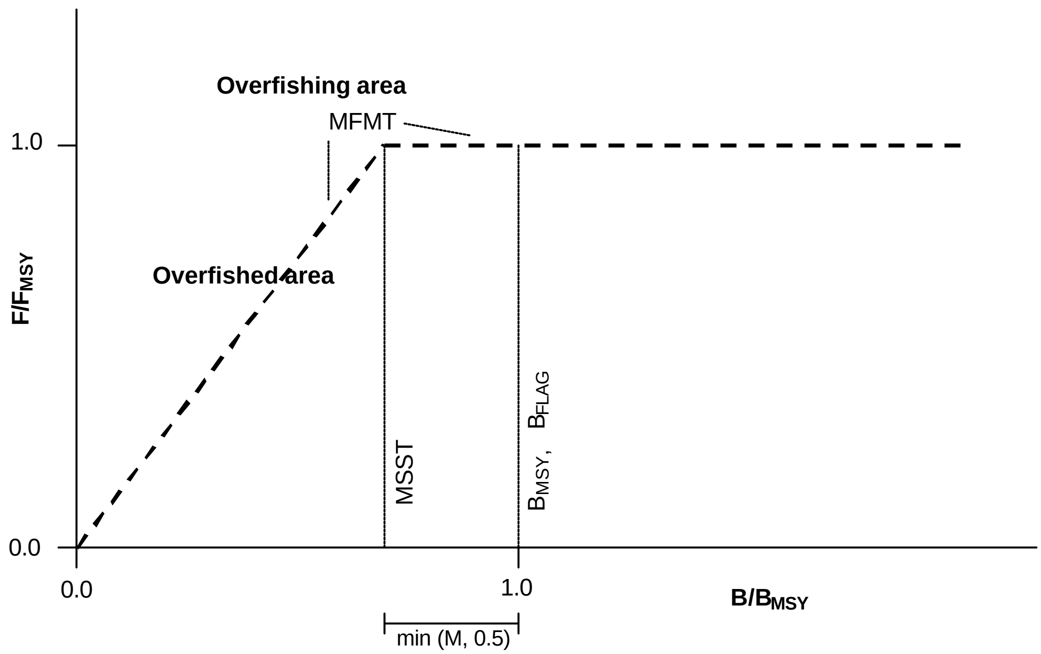
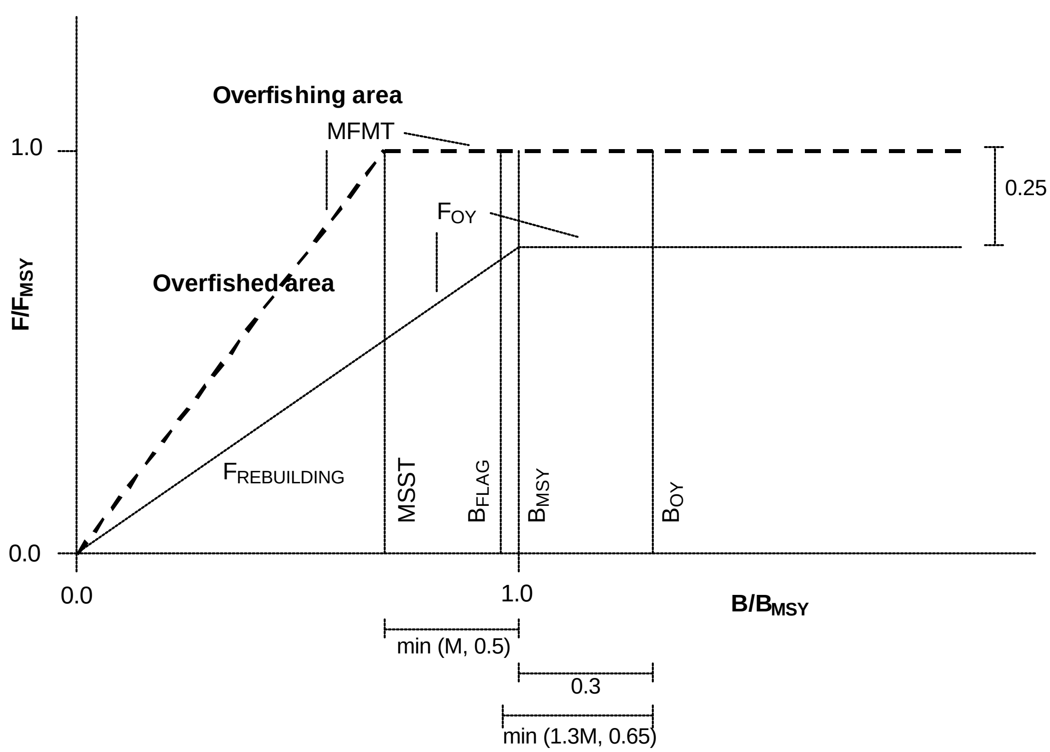


Figure 5. Not-preferred combination of control rules and reference points for pelagic stocks



4.3 Crustaceans FMP

4.3.1 Background

General background information on the crustaceans fisheries is provided in Section 5.3. Information that is particularly relevant to the specification of overfishing criteria is discussed here.

4.3.1.1 Description of the fisheries

Most crustacean landings come from the NWHI commercial lobster trap fishery, which began in the late 1970s and targets species of spiny lobster and slipper lobster. The NWHI lobster fishery operates under an annual harvest guideline (catch quota) system, with the guideline for each year based on a constant harvest rate strategy and annual estimates of stock size. The fishery opens on July 1 and closes when the guideline is reached. The harvest guideline is in numbers of lobsters, with no reference to particular species.

4.3.1.2 Existing overfishing and optimum yield specifications

FMP Amendment 6 specified that overfishing in the NWHI lobster fishery occurs (WPRFMC 1990b:6):

> *when the reproductive capacity of the stock has been reduced to a level that results in a decline in recruitment to the fishery, i.e., "recruitment overfishing."*

Amendment 6 defined recruitment overfishing (WPRFMC 1990b:6):

> *Lobster stocks shall be deemed overfished with regard to recruitment when the spawning potential ratio (measured for a specific fishing area) is 0.2 or below.*

Optimum yield was specified for the NWHI lobster fishery in the original FMP (WPRFMC 1982:151):

> *OY for the spiny lobster fishery in the NWHI is the greatest catch of non-berried lobster with a carapace length of 7.7 cm or larger, which can be taken each year from waters of the FCZ which are deeper than 10 fathoms throughout the NWHI and are more than 20 miles from Laysan Island.*

Amendment 1 extended the OY specification to the MHI (WPRFMC 1983:46):

> *the greatest amount of non-berried spiny lobster with a carapace length of 3¼ in. (8.26 cm.) or larger which can be taken each year from FCZ waters around the main Hawaiian Islands by vessels fishing in accordance with the measures in this plan.*

Note that the Crustaceans FMP is concerned primarily with NWHI lobster stocks, and overfishing definitions for other MUS species, such as Kona crab have never been developed, as these species are caught in negligible quantities in federal waters.

4.3.1.3 Stock status

The spawning potential ratio (SPR) is the ratio of spawning stock biomass per recruit (SSBR) at a given level of fishing to the spawning stock biomass per recruit of the unfished stock.

Amendment 6 refers to an SPR of 50% as being associated with optimum yield, and specifies that if SPR is found to be between 20% (the recruitment overfishing threshold) and 50%, management measures will be considered to ensure that recruitment overfishing does not occur.

In FMP Amendment 9 the Council adopted a constant harvest rate policy. Under this policy, the harvest guideline is computed as 13% of the predicted July 1 exploitable stock size, equivalent to a fishing mortality rate of 0.14 (this is an annual rate but is applied for only six months of the year). The harvest rate was determined based on acceptance of a particular level of risk of overfishing, as defined above. The Council determined that 10% was an appropriate amount of risk of overfishing. Simulation studies estimated that a 13% harvest rate would entail roughly a 10% chance that F would exceed $F_{20\%}$ (DiNardo and Wetherall 1999).

Until recently the NWHI lobster stock size (in numbers of lobster) was estimated with a discrete population model, using catch and effort data from logbook reports. The model estimated average recruitment (assumed constant since 1989), catchability, and abundance of exploitable-sized lobster, conditional on an estimate of the natural mortality rate (M, estimated at 0.456). The logbooks also provided estimates of total nominal effort. Data on size composition and reproductive state of lobsters in the catch were also available through at-sea catch sampling by NMFS observers. Gear selectivity curves were also available. Both fishery performance and biological data were available through a cooperative lobster tagging program that commenced in 1998.

In early 2000 NMFS scientists calculated preliminary year-2000 estimates of the NWHI exploitable lobster population, but for several reasons, the estimates were found to have an unacceptable degree of uncertainty associated with them. On June 26, 2000, NMFS made an emergency closure of the year-2000 fishery. The action was taken as a precautionary measure to protect lobster stocks because of shortcomings in understanding the dynamics of the NWHI lobster populations, the increasing uncertainty in population model parameter estimates, and the lack of appreciable rebuilding of the lobster population despite significant reductions in fishing effort throughout the NWHI. The closure was continued in 2001 and 2002 (through notices by NMFS that no harvest guidelines would be issued) because of continuing uncertainty about the status and dynamics of the lobster populations and the models used to describe them, as well as because of a federal court order to keep the fishery closed until completion of an Environmental Impact Statement (under the National Environmental Policy Act) and a Biological Opinion (under the Endangered Species Act). Also considered in the actions was the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, established in December 2000, which appeared to have the effect of indefinitely closing the NWHI lobster fishery.

The most recent assessment of the status of lobster stocks in the NWHI (DiNardo and Marshall 2001) found several indicators of both stock decline and increasing uncertainty in stock status. Since 1983, NWHI catches-per-unit-effort (CPUE) in the commercial fishery were found to have generally declined, but concurrent shifts in the spatial distribution of fishing effort and catch likely disguise actual trends in abundance. There was an appreciable decline in CPUE in sub-area 4 (all-other-NWHI-banks) between 1983 and 1999. The lack of any appreciable population rebuilding at those banks was found to be indicative of poor recruitment. Estimates of historical SPRs were found to vary widely depending on the value of the catchability parameter, *q*, which was estimated from different sources and methods. Based on estimates of *q* generated using a discrete population model, SPR values for Maro Reef from 1997 through 1999 were found to range between 0.67 and 0.79 (all above the warning level of 0.5). During the same period at Necker Island, SPR values based on the same source for *q* were found to range between 0.3 and 0.61 (in some cases below the warning level but in all cases above the overfishing threshold). In contrast with those estimates, using alternative estimates of *q* derived from tagging and depletion experiments, estimates of SPR values at Maro Reef during that period ranged between 0.08 and 0.20 (in all cases at or below the overfishing threshold), and at Necker Island, between 0.15 and 0.46 (in one case below the warning point and in one case below the threshold) (DiNardo and Marshall 2001).

DiNardo and Marshall (2001:16) concluded that “Excessive fishing likely led to the depletion of many local populations of spiny lobster in the NWHI.” “Despite significant reductions in commercial fishing activities in the NWHI, local populations of spiny lobster remain depressed, exhibiting no signs of rebuilding.”

Although there is substantial uncertainty about the status of the NWHI lobster stock, it has not been determined to be overfished, as indicated in the NMFS Annual Report to Congress on the Status of U.S. Fisheries—2001 (NMFS 2002b).

Much of the uncertainty with the population models used to assess the NWHI lobster stocks has to do with processes related to spatial scale and species resolution. Previous assessments have not recognized the importance of spatial heterogeneity within the NWHI and have used data that were pooled across the several lobster species. Currently under development are spatially structured population models, or metapopulation models, that incorporate spatial heterogeneity, species-specific population parameters, and other important factors of metapopulation dynamics (DiNardo and Marshall 2001; Botsford et al. 2002). Efforts are also underway to gather fishery-independent data that can be used to parameterize the new models.

The specifications that follow would apply only to the NWHI lobster stocks. They would be applied to multi-species stock complexes or to individual species, depending on the information and stock assessment tools available.

4.3.2 MSY Control Rule and Stock Status Determination Criteria

4.3.2.1 Alternative 1 (no action)

Under the no-action alternative no new stock status determination criteria would be specified.

4.3.2.2 Alternative 2 (preferred)

Stock status determination criteria for the NWHI lobster fishery would be specified as follows:

The MSY control rule would be used as the MFMT. The proposed specifications for MFMT, MSST, and B_{FLAG} would be specified as indicated in Table 16. The MFMT would be more conservative than the default recommendation in Restrepo et al. (1998), as the inflection point would be at a higher level of B (B_{MSY} rather than some level less than B_{MSY}). The proposed MSST specification is based on the default recommendation of Restrepo et al. (1998) and would be dependent on the natural mortality rate (M). The value of M to be used to determine the MSST would not be specified in this amendment. The latest estimate, which would be published annually in the SAFE report, would be used, and the value would be occasionally re-estimated using the best available information.

Table 16. Alternative 2 overfishing threshold specifications for NWHI lobster stocks

MFMT	MSST	B_{FLAG}
$F(B) = \frac{F_{MSY} B}{B_{MSY}}$ for $B \le B_{MSY}$ $F(B) = F_{MSY}$ for $B > B_{MSY}$	$c\ B_{MSY}$	B_{MSY}
where c = max (1-M, 0.5)		

4.3.2.3 Alternative 3

Under this alternative the MSY control rule and associated thresholds would be the same as in Alternative 2 except for one difference. The value of M used for the reference points would be specified based on the best recent estimate and treated as a fixed value. The MFMT, MSST, and B_{FLAG} would be specified as indicated in Table 17.

Table 17. Alternative 3 overfishing threshold specifications for NWHI lobster stocks

MFMT	MSST	B_{FLAG}
$F(B) = \frac{F_{MSY} B}{B_{MSY}}$ for $B \le B_{MSY}$ $F(B) = F_{MSY}$ for $B > B_{MSY}$	$c\ B_{MSY}$	B_{MSY}
where c = max (1-M, 0.5) and M = 0.46		

The value of 0.46 for M is based on information provided in DiNardo and Wetherall (2000).

4.3.3 Target Control Rule and Reference Points

4.3.3.1 Alternative 1 (no action)

Under the no-action alternative no target control rules or reference points would be specified.

4.3.3.2 Alternative 2

Under this alternative no target control rules or reference points would be specified.

4.3.3.3 Alternative 3 (preferred)

Because optimum yield (OY), is, by definition under the MSA, the target yield from a given fishery, any specified target control rules would be necessarily directly associated with OY.

The fishery is currently managed under a constant harvest rate policy. The harvest rate is derived through simulation modeling as the estimated level at which there is a 10% chance of F exceeding $F_{20\%}$, where $F_{20\%}$ is the level of fishing mortality associated with the recruitment overfishing threshold of SPR=20%. This risk-based approach would be retained in the target control rule given in Table 18, in which F_{OY} would be related to F_{MSY} through the coefficient *r*, which would be computed such that a fishing mortality rate of $r\,F_{MSY}$ would yield a 10% risk of the SPR reaching as low as 20%. The values of neither *r* nor M would be specified in this amendment. The latest estimates of these two parameters, which would be published annually in the SAFE report, would be used, and the values would be occasionally re-estimated using the best available information.

Table 18. Alternative 3 target control rule specifications for NWHI lobster stocks

$\mathbf{F}_{OY}$	
$F(B) = 0$	for $B \leq c\,B_{MSY}$
$F(B) = \dfrac{r\,F_{MSY}B}{B_{MSY}}$	for $c\,B_{MSY} < B \leq B_{MSY}$
$F(B) = r\,F_{MSY}$	for $B > B_{MSY}$
where $c = \max(1\text{-}M, 0.5)$	
and *r* is the value such that fishing at $r\,F_{MSY}$ would result in a 10% chance of SPR falling to 0.20	

Specification of this target control rule would imply that a single factor – the need to be risk-averse with respect to overfishing – outweighs any other economic, social, and ecological factors of which OY is, by definition, a function (or alternatively, that all those factors have been effectively accounted for in that specification).[12]

4.3.4 Rebuilding Control Rule and Reference Points

4.3.4.1 Alternative 1 (no action)

Under the no-action alternative no rebuilding control rule or reference points would be specified.

[12] Note that the risk-averse aspect of this F_{OY} specification would be expressed in terms of avoiding an SPR level of 20% rather than of avoiding the MFMT.

4.3.4.2 Alternative 2

Under this alternative no rebuilding control rule or reference points would be specified.

4.3.4.3 Alternative 3 (preferred)

In this alternative a rebuilding control rule would be specified such that the rebuilding control rule is identical to the target control rule for levels of B where the rebuilding control rule is applicable (i.e., between 0 and the rebuilding target, B_{MSY}), as specified in Table 19.

Table 19. Alternative 2 rebuilding control rule specifications for NWHI lobster stocks

$F_{REBUILDING}$	
$F(B) = 0$	for $B \le c\, B_{MSY}$
$F(B) = \dfrac{r\, F_{MSY} B}{B_{MSY}}$	for $c\, B_{MSY} < B \le B_{MSY}$
where $c = \max(1\text{-}M, 0.5)$ and r is the value such that fishing at $r\, F_{MSY}$ would result in a 10% chance of SPR falling to 0.20	

4.3.5 Stock Status Determination Process

Stock status determinations involve three procedural steps. First, the reference points are specified. Second, the values of the reference points are estimated. Third, the status of the stock is determined by estimating the current or recent values of fishing mortality, stock biomass, or their proxies and comparing them with their respective reference points.

4.3.5.1 Alternative 1 (no action)

Under the no-action alternative no new process for assessing stocks would be specified.

4.3.5.2 Alternative 2 (preferred)

The first of the three assessment steps described above would be accomplished through this amendment. Because environmental changes may affect the productive capacity of the stocks, it may be necessary to occasionally modify the specifications of some of the reference points or control rules. Modifications may also be desirable when better assessment methods become available, when fishery objectives are modified (e.g., OY), or better biological, socio-economic, or ecological data become available. Any such modifications would be made through the FMP framework process.

The second step (including estimation of M, and if applicable, *r*, on which some of the reference points are dependent) and third step would be undertaken by NMFS and the latest results published annually in the Stock Assessment and Fishery Evaluation (SAFE) report, which is the Council's Crustaceans Fisheries of the Western Pacific Region Annual Report. In practice, the second and third steps may be done simultaneously—in other words, the reference point values could be re-estimated as often as the stocks' status.

No particular stock assessment period or schedule would be specified, but in practice the assessments are generally conducted annually on a schedule that allows determination and timely publication of the annual harvest guidelines.

The best information available would be used to estimate the values of the reference points and to determine the status of stocks in relation to the status determination criteria and other reference points. The determinations would be based on the latest available stock and fishery assessments. Information used in the assessments would include catch and effort data, observer data, tagging results, and fishery-independent surveys.

4.3.5.3 Alternative 3

The stock status determination process would be the same as in Alternative 2 except that the value of M used to determine the reference point values would not be routinely re-estimated. Instead, M would be treated as a fixed value, as indicated in Table 17.

4.3.6 Measures to Prevent Overfishing and Overfished Stocks

Existing measures in the crustaceans FMP to prevent overfishing include gear design restrictions, catch report requirements, a limited access program for the NWHI, a maximum limit on the number of traps per vessel, a six-month closed season, area closures encompassing about 16% of NWHI lobster habitat, and maximum harvest guidelines for the NWHI (that can be applied to specific banks) that are specified annually based on a constant harvest rate strategy and annual estimates of stock size. As each bank-specific guideline is reached, the fisheries on those banks are closed for the remainder of the calendar year. Another measure is the ability of NMFS to not issue harvest guidelines for a given year, as was done for the 2001 and 2002 seasons (due to continuing uncertainty about stock status and the models used to assess the stocks, as well as the apparent implications of the NWHI Coral Reef Ecosystem Reserve).

No stocks managed under the FMP have been determined to be overfished or approaching an overfished state (NMFS 2002b), so no alternatives for remedial management action are proposed in this amendment.

If in the future it is determined that overfishing is occurring, a stock is overfished, or either of those two conditions is being approached, the Council would establish additional management measures using the FMP amendment process or the framework adjustment process. One important potential measure that would be considered is adjustments to the harvest rate. Other potential measures that would be considered include additional area closures and adjustments to the NWHI seasonal closure.

4.3.7 Summary

The specifications of the previous subsections are merely summarized here; no new specifications or measures are presented. Table 20 shows the elements that collectively make up the preferred alternative for the crustaceans stocks.

Table 20. Preferred alternative elements for crustaceans stocks

Element	Preferred alternative
MSY control rule and stock status determination criteria	2
Target control rule and reference points	3
Rebuilding control rule and reference points	3
Stock status determination process	2

The preferred combination of control rules and reference points is illustrated in Figure 6. Note that the positions of the MSST and F_{OY} are illustrative only; their values would depend on the best estimates of M and *r* at any given time.

In Figure 7 is an illustration of the combination of control rules and reference points that are not preferred (but not showing the no-action alternative). Note that the position of the MSST would be specified and fixed at 0.54 B_{MSY}.

Figure 6. Preferred combination of control rules and reference points for NWHI lobster stocks

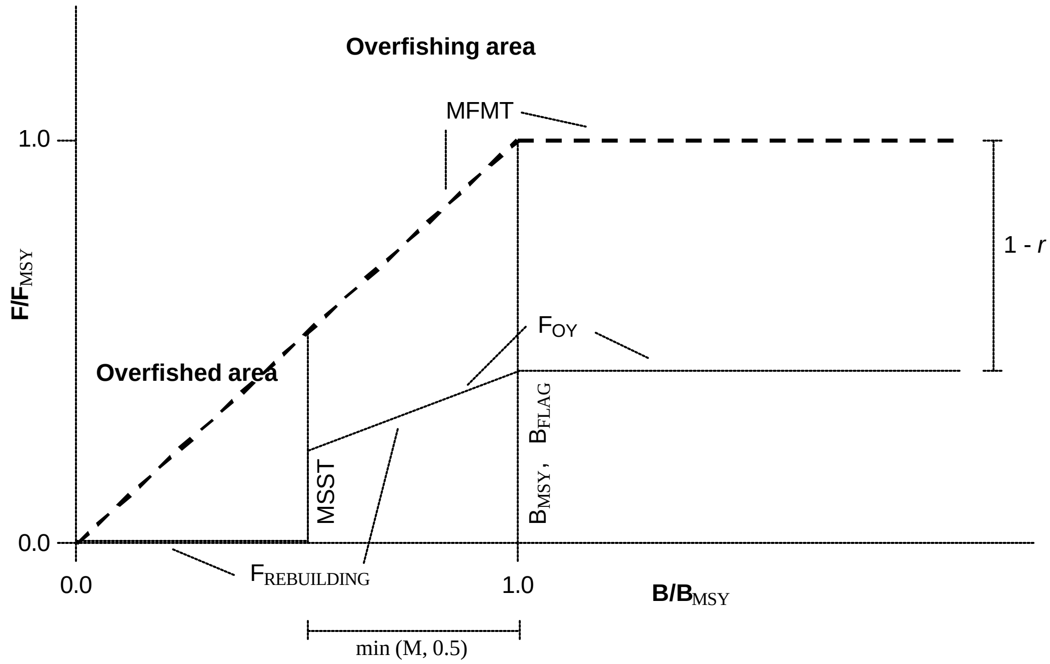
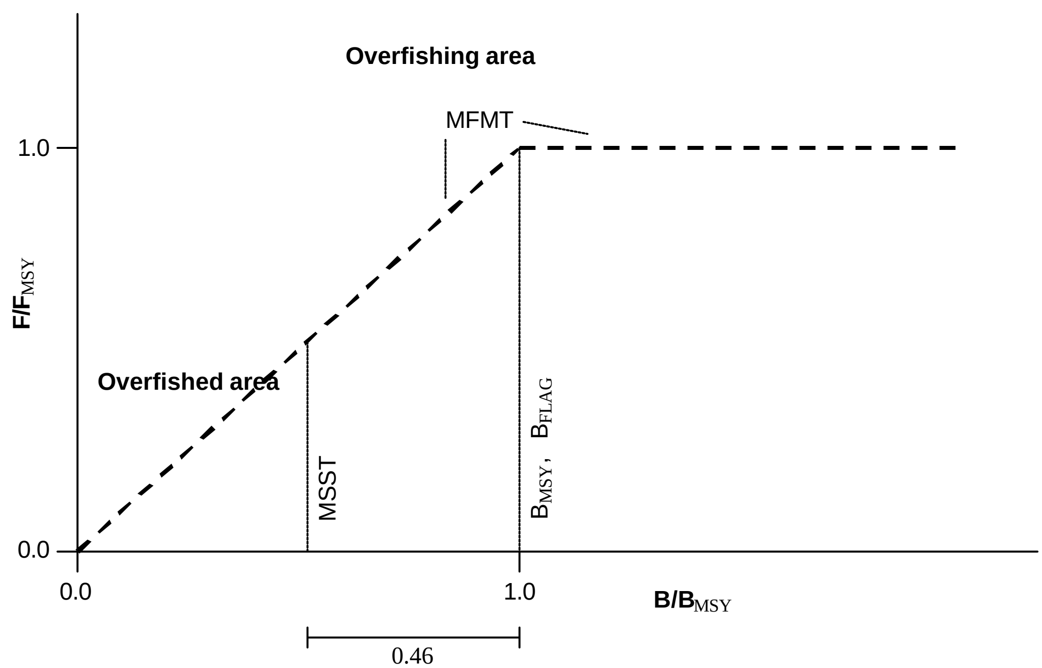


Figure 7. Not-preferred combination of control rules and reference points for NWHI lobster stocks



5. Affected Environment Given Cumulative Impacts to Date

5.1 Bottomfish and Seamount Groundfish FMP Fisheries

A summary of available information on the environment associated with the bottomfish and seamount groundfish fisheries of the Western Pacific is provided in this section. The Preliminary Draft Environmental Impact Statement (EIS) for the Bottomfish and Seamount Groundfish FMP (WPRFMC 2001b) can be referred to for additional detail.

5.1.1 Description of the Fisheries

5.1.1.1 Fishing methods and current use patterns

The Bottomfish and Seamount Groundfish FMP manages two fisheries. The seamount groundfish fishery, targeting armorhead and alfonsin at the southeast Hancock Seamount in the NWHI, was conducted by foreign trawlers since the late 1960s. The fishery was closed with FMP implementation in 1986 because of the poor condition of the target stocks and their vulnerability to overfishing. The current moratorium is in effect until 2004, subject to further extension. No seamount groundfish fishing currently occurs in waters under Council jurisdiction. Bottomfish fisheries target etiline snappers, carangids, and groupers in waters mostly between 30 and 150 fathoms (fm) deep. There is also a shallow-water bottomfish fishery throughout the region, but it occurs almost exclusively in state and territorial waters.

Bottomfishing grounds in Hawaii are divided into three management zones, the Mau and Hoomalu Zones in the NWHI and the Main Hawaiian Islands. In the MHI, about 80% of bottomfish habitat lies in state waters. Penguin Banks is the largest and most important bottomfishing grounds in the federal waters around the MHI. In the NWHI all participants fish commercially on a full- or part-time basis, while in the MHI fishery there are also recreational fishermen. Independent, owner-operator fishing operations prevail in both zones of the NWHI. The Mau Zone fleet tends to be comprised of smaller operations than in the Hoomalu Zone, and most of the Mau Zone vessels are part-time and multi-gear operations. Many vessels typically conduct mixed fishing trips (bottomfish, troll and pelagic handline), focusing on the most productive fishing method at any given time.

Bottomfishers in Hawaii use a hook-and-line method of fishing where weighted and baited lines are lowered and raised with electric, hydraulic, or hand-powered reels. The main line is typically 400-450 lb test, with hook leaders of 80-120 lb test monofilament. The hooks are circle hooks, and a typical rig uses 6 to 8 hooks branching off the main line. The weight is typically 5-6 lb. The hook leaders are typically 2-3 feet long and separated by about 6 feet along the main line. Squid is the bait typically used. It is sometimes supplemented with a chum bag containing chopped fish or squid suspended above the highest hook.

Vessels used in the NWHI fishery are typically 40-60 feet in length, and usually equipped with electronic navigation and fish-finding equipment that allow a skilled captain to harvest target species with relatively little bycatch. Fishing trips to the NWHI typically last 10-25 days, with vessels reaching as far as Kure Atoll.

A single bottom longline vessel operated briefly in the NWHI in 1998-1999, targeting sharks. Although pelagic longlining is prohibited within a protected species zone surrounding the NWHI, this gear, because it is deployed on the bottom and not considered a pelagic gear, was not subject to the closed-area restrictions. The gear consists of a heavy (700- to 1,400-pound test) monofilament groundline. Gangions, buoys, and lead weights are attached to this during deployment. The 10-12 foot long gangions, spaced every 20 fm along the groundline, terminate in baited circle hooks. Buoys allow gear retrieval while weights anchor the groundline to the bottom. The gear was set at an average depth of 34.5 fm.

In American Samoa small skiffs and *alia* catamarans equipped with handlines and hand-powered reels, most without electronic navigation or fish-finding equipment, fish on the deep outer-reef slope. Few boats carry ice, so fishing trips tend to be brief and not venture far from port. Most vessels are used for both bottomfishing and trolling. In recent years a few larger (greater than 35 feet in length) vessels with the capacity to chill or freeze fish have entered the fleet.

The bottomfish fisheries in Guam include both a deep-water (80-120 fm) component dominated by commercial vessels (mostly greater than 25 feet in length) equipped with electric-powered reels, and a shallow-water (15-80 fm) component that includes smaller boats (mostly less than 25 feet in length) using rod-and-reel that occurs mainly in waters under the jurisdiction of the Territory of Guam. The majority of the catch is made in the latter component, in which much of the fishing is done for recreational and subsistence purposes (WPRFMC 2001b). Most bottomfish fishermen that sell their catch also hold jobs outside the fishery. Most participants in the bottomfish fishery also troll for pelagic species, often mixing methods during a given trip. Charter fishing has been a substantial component of the fishery since 1995, accounting for about 15-20% of all bottomfishing trips during that period (WPRFMC 2002b).

As in Guam, the bottomfish fisheries in the CNMI include both deep-water and shallow-water components.[13] The fleet is comprised primarily of vessels smaller than 25 feet in length that primarily target the shallow-water bottomfish complex fairly close to port and fish for both commercial and subsistence purposes. They tend to be equipped with handlines, hand reels, or electric reels, and tend not to have electronic navigation or fish-finding equipment. A few larger commercial vessels with the capacity to fish in the northernmost islands of the chain have periodically entered the fishery, targeting both the deep-water and shallow-water bottomfish complexes. These vessels are generally equipped with electric or hydraulic reels and electronic navigation and fish-finding equipment. Few fishermen depend on fishing for all of their income. Most participants in the bottomfish fishery also troll for pelagic species, often mixing methods during a given trip. A few charter vessels target shallow-water bottomfish, along with reef fish.

Bottomfish fishing occasionally occurs in the waters around the PRIAs, but the catches have been sporadic and generally small.[14] One such harvest, consisting of about 40,000 lb, was made by Hawaii-based at Kingman Reef in 1999, but part of the catch tested positive for ciguatera and the vessel stopped fishing there (WPRFMC 2001b). No further information on bottomfishing in the PRIAs is provided here.

[13] Bottomfish fisheries occurring in the EEZ around the CNMI are not managed under the FMP.
[14] Bottomfish fisheries occurring in the EEZ around the PRIAs are not managed under the FMP.

5.1.1.2 Harvest and participation

Estimated landings of bottomfish from each of the island areas for the years 1989-2001 are indicated in Table 21. Recent historical participation in each of the island areas is described in Table 22.

Table 21. Bottomfish landings in the Western Pacific, 1989-2001

Year	Landings (1,000 lb)				
	NWHI	MHI	American Samoa	CNMI	Guam
1989	303	1,006	47	20	84
1990	421	646	14	11	77
1991	387	548	19	6	71
1992	424	587	13	8	87
1993	385	348	18	45	98
1994	443	458	45	20	109
1995	369	440	34	29	106
1996	311	440	39	53	153
1997	346	513	40	51	103
1998	332	479	16	46	98
1999	323	455	17	44	129
2000	262	478	28	36	146
2001	286	391	47	57	118

- Source: WPRFMC 2002b and NMFS Honolulu Laboratory.
- 2001 estimates are preliminary.
- Hawaii: includes BMUS only; includes commercial only.
- American Samoa: includes all “bottomfish” (not just BMUS); includes entire catch (not just commercial).
- CNMI: includes all “bottomfish” (not just BMUS); includes commercial only.
- Guam: includes BMUS only; includes entire catch (not just commercial).
- Relatively small catches of bottomfish are also made in the PRIAs.

Table 22. Participation in the bottomfish fisheries in the Western Pacific, 1989-2001

Year	Number of active vessels				
	NWHI	MHI	American Samoa	CNMI	Guam
1989	10	537	29	29	223
1990	19	501	19	29	226
1991	18	469	20	20	246
1992	13	407	14	38	236
1993	12	403	22	20	360
1994	17	423	19	32	298
1995	15	400	25	33	402
1996	16	466	26	69	408
1997	15	495	24	68	332
1998	14	493	16	50	354
1999	13	483	19	50	411
2000	11	495	17	64	312
2001	11	379	18	75	337

- Source: WPRFMC (2002b) and NMFS Honolulu Laboratory.
- Hawaii: accounts for BMUS only; accounts for commercial fishing only.
- American Samoa: accounts for all "bottomfish" (not just BMUS); accounts for all fishing (not just commercial).
- CNMI: accounts for all "bottomfish" (not just BMUS); accounts for commercial fishing only.
- Guam: accounts for BMUS only; accounts for all fishing (not just commercial).
- Relatively small levels of bottomfish fishing also occur in the PRIAs.

5.1.1.3 Markets

Hawaii bottomfish catches are mostly sold in the local Hawaii fresh fish market. Landings from the NWHI tend to consist of larger fish that are preferred by the restaurant market. Bottomfish imports currently supply about 40% of the Hawaii market (WPRFMC 2002b).

More than 90% of the catch of BMUS in American Samoa is sold; some has been exported to Hawaii (WPRFMC 2001b). Much of the year-to-year variation in landings and participation is related to the difference in prices of bottomfish and pelagic products, as most of the fleet is equipped for both types of fishing. Prices for local bottomfish product, for example, are influenced by prices of imported product from Samoa and Tonga. The hurricanes that occasionally reach American Samoa are also responsible for disrupting bottomfish fishing patterns.

Most of Guam's bottomfish catch is marketed locally. Prices for local product are affected by imports from elsewhere in Micronesia (WPRFMC 2001b).

In the CNMI most of the catch is consumed locally, although there have been some exports to Guam and Hawaii (WPRFMC 2001b).

5.1.1.4 Socio-economic importance

In the Hawaii-wide bottomfish fishery, BMUS landings and real (inflation-adjusted) ex-vessel revenue peaked in 1987 at about 1.8 million lb and $7.3 million (year-2000 $), respectively, after 20 years of growth (WPRFMC 2002b). In 2000 landings had declined by 50% from that peak and real revenue had declined by 60%, due primarily to decreases in participation and fishing effort (due in part to the NWHI limited access programs) and a generally weak market for fresh bottomfish in the 1990s. The trend was especially strong in the NWHI component of the fishery, where real revenue in 2000 was about 25% of that in 1987. Preliminary data for 2000 indicate gross revenue of $1.0 million for the NWHI fleet and $1.9 million for the MHI fleet (WPRFMC 2002b).

Analysis of operating costs and returns in 2000 indicated that, as in previous years, the average Hoomalu Zone vessel and the average Mau Zone vessel did not cover their total costs through bottomfishing operations (WPRFMC 2002b). This is not to say that all vessels in each of the two zones did not operate profitably from bottomfishing. In addition, other fishing activities or other income sources bring additional revenue to some or all vessels. The Mau Zone vessels, for example, are known to engage in multiple types of fishing and are generally recognized to be less reliant on bottomfishing than Hoomalu Zone vessels. Furthermore, although economic performance – based on monetary returns – has, on average, been generally low in the NWHI fishery, there are additional, non-pecuniary, benefits that accrue to fishery participants and the larger fishing community. The PDEIS (WPRFMC 2001b) describes some of these difficult-to-quantify benefits, which include the enjoyment derived from fishing and the lifestyle it entails to providing an identifiable place in the community and allowing activities that strengthen social bonds.

From 1996 through 2000 the average annual inflation-adjusted ex-vessel value of commercial landings of bottomfish in American Samoa was about $60,000 (in year-2000 $) (WPRFMC 2002b). There has been little variation in inflation-adjusted gross revenues per fishing trip since 1989 (WPRFMC 2001b). No information on net revenues for the American Samoa bottomfish fleet is available.

From 1996 through 2000 the average annual inflation-adjusted ex-vessel value of commercial landings of bottomfish in Guam was about $57,000 (in year-2000 $) (WPRFMC 2002b). Inflation-adjusted gross revenues per fishing trip has varied substantially from year to year, apparently due in large part to the entry-exit patterns of highliners. No information on net revenues for the Guam bottomfish fleet is available.

From 1996 through 2000 the average annual inflation-adjusted ex-vessel value of commercial landings of bottomfish in the CNMI was about $157,000 (in year-2000 $) (WPRFMC 2002b). Inflation-adjusted gross revenues per fishing trip increased markedly through the 1990s as a result of increases in both prices and average per-trip catches. No information on net revenues for the CNMI bottomfish fleet is available.

5.1.2 Fish Stocks

The Bottomfish Management Unit Species (BMUS) are listed in Table 23.

Table 23. Bottomfish management unit species

English common name	Local common names	Scientific name
Snappers:		
silver jaw jobfish	lehi (H); palu-gustusilvia (S)	*Aphareus rutilans*
grey jobfish	uku (H); asoama (S)	*Aprion virescens*
squirrelfish snapper	ehu (H); palu-malau (S)	*Etelis carbunculus*
longtail snapper	onaga, ʻulaʻula (H); palu-loa (S)	*Etelis coruscans*
blue stripe snapper	taʻape (H); savane (S); funai (G)	*Lutjanus kasmira*
yellowtail snapper	palu-iʻ lusama (S); yellowtail, kalekale (H)	*Pristipomoides auricilla*
pink snapper	ʻōpakapaka (H); palu-ʻtlenaʻlena (S); gadao (G)	*Pristipomoides filamentosus*
yelloweye snapper	palusina (S); yelloweye ʻōpakapaka, kalekale (H)	*Pristipomoides flavipinnis*
snapper	kalekale (H)	*Pristipomoides sieboldii*
snapper	gindai (H,G): palu-sega (S)	*Pristipomoides zonatus*
Jacks:		
giant trevally	white ulua (H); tarakito (G); sapo-anae (S)	*Caranx ignoblis*
black jack	black ulua (H); tarakito (G); tafauli (S)	*Caranx lugubris*
thick lipped trevally	pig ulua, butaguchi (H)	*Pseudocaranx dentex*
amberjack	kāhala (H)	*Seriola dumerili*
Groupers:		
blacktip grouper	fausi (S); gadau (G)	*Epinephelus fasciatus*
sea bass	hāpuʻupuʻu (H)	*Epinephelus quernus*
lunartail grouper	papa (S)	*Variola louti*
Emperor fishes:		
ambon emperor	filoa-gutumumu (S)	*Lethrinus amboinensis*
redgill emperor	filoa-paʻloʻomumu (S); mafuti (G)	*Lethrinus rubrioperculatus*
Seamount groundfish:		
alfonsin		*Beryx splendens*
ratfish/butterfish		*Hyperoglyphe japonica*
armorhead		*Pseudopentaceros richardsoni*

Source: WPRFMC (2001b).
Notes: G = Guam; H = Hawaii; S = American Samoa.

In addition to the landings of BMUS shown in Table 21, the fishery also results in bycatch of BMUS and landings and bycatch of non-BMUS. Observer data for the period 1990-1993 from the NWHI bottomfish fishery indicate that non-BMUS made up about 5% of the catch, by number, of which about 60% was discarded (Nitta 1999). About 25% of the catch of all species combined was discarded. The majority of discards in the NWHI fishery are comprised of two BMUS, kahala and butaguchi. The observer data indicate about 97% of the former and 48% of the latter, by number, being discarded, and the two species comprising 81% of all discards (Nitta 1999). Kahala from the NWHI has an especially low value because of being implicated in ciguatera poisoning incidents. Other non-target species that are often discarded in the NWHI bottomfish fishery include a variety of carangids (jacks), sharks, and reef-associated species. Relatively small numbers of target species are discarded, such as when damaged by predators.

Bycatch mortality rates in the bottomfish fisheries are difficult to measure. Although bottom-dwelling teleost fishes generally suffer high mortality from the decompression undergone while being brought to the surface, the carangid species that make up most of the bycatch in the NWHI fishery are usually released alive and viable. Sharks, which lack a swim bladder, do not suffer from decompression and most species have high chances of surviving after being released.

In addition to observed bycatch, there is some degree of unobserved mortality in the bottomfish fisheries, primarily due to predation of hooked fish. Simulation modeling by Kobayashi and Kawamoto (1995), using observations of lost hooks and predator-damaged fish, resulted in an estimate of 231 fish lost to sharks for every 1,000 fish boated, plus a relatively small number of additional losses due to predation by monk seals and dolphins.

Reliable bycatch data are not yet available for the bottomfish fisheries in the MHI, American Samoa, CNMI, or Guam, but bycatch rates in those areas are known to be substantially less than in the NWHI bottomfish fishery. The purely commercial nature of the NWHI fishery and its relatively great distance from port make storage space especially valuable and the motivation to discard thereby greater than in the bottomfish fisheries of the other island areas.

The status of the stocks managed under the FMP was reviewed in the Annual Report to Congress on the Status of U.S. Fisheries–2001 (NMFS 2002b). With the exception of armorhead, which as been subject to a fishing moratorium since inception of the FMP, none of the stocks were indicated as being in, or approaching, an overfished condition. Further information on the status of the bottomfish and seamount groundfish stocks is provided in Section 4.1.1.3.

5.1.3 Ecosystem and Habitat

The Sustainable Fisheries Act of 1996 requires that fishery management plans identify and describe essential fish habitat (EFH) for managed fisheries, minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat.

Based upon the best available data, the Council designated the EFH for the adult life stage of the seamount groundfish complex as all waters and bottom habitat bounded by latitude 29° - 35° N and longitude 171°E - 179° W between 80 and 600 meters (m) depth. EFH for eggs, larvae and juveniles is the epipelagic zone (from 0 to about 200 m depth) of all waters bounded by latitude

29° - 35° N and longitude 171° E - 179° W. This EFH designation encompasses the Hancock Seamounts, part of the northern extent of the Hawaiian Ridge, located 1,500 nautical miles northwest of Honolulu. For the bottomfish species, EFH was designated to consist of the water column down to 400 m depth for eggs and larvae, and the water column and bottom down to 400 m depth for juveniles and adults. Based on the known distribution and habitat requirements of adult bottomfish, the Council designated all escarpments/slopes between 40 and 280 m depth as habitat of particular concern (HAPC). In addition, the Council designated the three known areas of juvenile opakapaka habitat in the MHI (two off Oahu and one off Molokai) as HAPC.

The line used while bottomfishing is continuously monitored by an individual fisherman. The weight and hooks are maintained near, but not on, the bottom because the target species occur from 1 to 20 m off the bottom. Because of the nature of this type of fishing, it is likely that the risk of direct impacts from fishing gear to EFH/HAPC and other benthic habitats is negligible. Anchors used by bottomfishing vessels can cause damage to benthic habitat. The presence of fishing vessels in the vicinity of shallow and intertidal habitats, including coral reefs, also brings some degree of risk of vessel groundings and pollutant spills that could degrade those habitats (the photic zone where coral reefs and reef building organisms are normally found ranges roughly between 0 and 18 fm). Although shallow-water bottomfish fishing generally puts vessels in closer proximity to shallow-water habitats than does deep-water bottomfishing, the vessels used in the latter tend to be larger than in the former, bringing greater risks of damage due to vessel groundings or pollutant spills.

5.1.4 Protected Species

Five species of sea turtles, all of which are listed as either threatened or endangered under the Endangered Species Act (ESA), occur in fishing areas that are subject to the FMP: the leatherback (*Dermochelys coriacea*), the olive ridley (*Lepidochelys olivacea*), the hawksbill (*Eretmochelys imbricata*), the loggerhead (*Caretta caretta*), and the green turtle (*Chelonia mydas*).

Green turtles nest in the NWHI at French Frigate Shoals and then migrate to and forage around the MHI. There have been no documented takes of green turtles from bottomfishing operations in the NWHI. Vessel lighting and activity near nesting beaches has the potential to cause adverse impacts but no takes have been documented (NMFS 2002c). The NWHI green sea turtle population has increased in recent years without any corresponding increase in interactions with the bottomfish fishery (Laurs 2000). It was therefore concluded in the 2002 Biological Opinion for the Bottomfish FMP (the result of the formal consultation required under Section 7 of the Endangered Species Act) that the fishery, as managed under the FMP, is not likely to adversely affect green sea turtles (NMFS 2002c). Three of the other four sea turtle species – hawksbill, leatherback, and olive ridley – are likely to occur only very rarely in the areas where the fishery takes place. No interactions with those three species or with the loggerhead have been reported or observed, and it was concluded in the 2002 Biological Opinion that the fishery as managed under the FMP is not likely to adversely affect those species (NMFS 2002c).

Vessels intending to fish in the protected species study zone that surrounds the NWHI must notify NMFS at least 72 hours in advance of departure. Vessels must take an observer if directed by NMFS. Vessel operators must participate in a NMFS protected species workshop.

Critical habitat for the endangered Hawaiian monk seal (*Monachus schauinslandi*), which is endemic to the Hawaiian archipelago and listed as endangered under the ESA, extends from the shore to a depth of 20 fathoms in ten areas of the NWHI. Hawaiian monk seals breed primarily at six major colonies, all of which are in the western portion of the NWHI. In addition, a few individuals occasionally breed at Necker and Nihoa islands in the Mau Zone and further east in the MHI. Although little is known of the seal's population status prior to 1950, its range probably declined since humans first settled the islands. Between 1958 and 1993 the population of non-pups is estimated to have declined about 60 percent (NMFS 2002c). Counts from 1993 to 2000 have remained fairly stable, with no statistically identifiable trend. The population was most recently estimated at between 1,300 and 1,400 individuals (Laurs 2000). Some sub-populations within the NWHI have decreased in size during the last two decades while others have increased or remained stable. Poor pup survival in the last two decades in the largest sub-population – that at French Frigate Shoals – has resulted in an unstable age distribution, indicative of a future decline in sub-population size. That decrease will have to be offset by gains in other sub-populations for the population to remain stable.

The causes of the recent poor survival at French Frigate Shoals have been attributed to poor condition from starvation, shark predation, male aggression towards pups, habitat loss, and entanglement in marine debris (NMFS 2002c). The reasons for the possible lack of prey availability are not known but may be related to decadal-scale fluctuations in productivity or other changes in local carrying capacity (NMFS 2002c).

During the vessel observer program conducted in the NWHI bottomfish fishery from 1990 through 1993, monk seals were often observed taking or damaging hooked fish, with an average of one such interaction every 68 hours of fishing. Interactions occurred during 10 out of the 26 observed trips and involved a maximum of 26 seals. No entanglements or hookings of monk seals were observed (Nitta 1999). NMFS has received a number of reports from various sources of monk seals with hooks embedded in their mouths or other body parts. Positively attributing a given hooking event to a particular fishery is difficult. A review of the reports led NMFS to conclude that seven instances of hookings since 1982 may be attributable to direct interactions with the bottomfish fishery. Given those possibilities and the observed behavior of monk seals around bottomfishing vessels, it was concluded in the 2002 Biological Opinion for the Bottomfish FMP that the fishery may incidentally hook monk seals, but "... NMFS expects that the rate of incidental hookings will be very low, notably less than one monk seal per year" (NMFS 2002c:51).

The Biological Opinion also examined the possible adverse effects associated with behavioral modifications of monk seals (following vessels and feeding on hooked fish), the consumption of discarded fish by monk seals, and the possible reduction of prey available to monk seals. With regard to behavioral modifications, adverse effects were found to be difficult to identify but recognized as possible. With regard to the consumption of discarded fish, it was found that monk seals are not likely to be adversely affected, even if the discarded fish contain ciguatoxins. With regard to prey availability, it was found that bottomfish vessels are not likely to be competing directly or indirectly with monk seals for the same fish species (NMFS 2002c).

The 2002 Biological Opinion concluded that the bottomfish fishery is not likely to "reduce appreciably the likelihood of both the survival and recovery of the Hawaiian monk seal in the wild by reducing the reproduction, numbers, or distribution of the species" (NMFS 2002c:54). The Biological Opinion found that the bottomfish fishery, as managed by the FMP, is not likely to jeopardize the continued existence of the Hawaiian monk seal or result in the destruction or adverse modification of its critical habitat.

Other marine mammals listed under the ESA that are present in bottomfishing areas include the blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), right whale (*Eubalaena glacialis*), sei whale (*Balaenoptera borealis*), and sperm whale (*Physeter macrocephelus*). Sightings of humpback whales were made during the 1990-1993 vessel observer program but no interactions were observed (Nitta 1999). It was concluded in the 2002 Biological Opinion that the probability of an encounter between any of these species and the bottomfish fishery is extremely low and that the fishery, as managed under the FMP, is not likely to adversely affect these species (NMFS 2002c).

Pacific bottlenose dolphins (*Tursiops truncatus*), which are not listed under the ESA (but like all marine mammals are protected under the Marine Mammal Protection Act), are known to damage and take hooked fish from bottomfishing gear. During the 1990-1993 NWHI vessel observer program, an average of 1 bottlenose dolphin interaction was observed for every 38 fishing hours, but no hookings were observed during the 26 observed trips (Nitta 1999). Several sightings of spinner dolphins (*Stenella longirostris*), which are not listed under the ESA, were made during the 1990-1993 vessel observer program (Nitta 1999).

Vessels intending to fish in the protected species study zone that surrounds the NWHI must notify NMFS at least 72 hours in advance of departure. Vessels must take an observer if directed by NMFS. Vessel operators must participate in a NMFS protected species workshop. Participants in the NWHI bottomfish fishery have recently committed to voluntarily retaining all bycatch until well away from monk seals, dolphins, and sharks.

Although there are several seabird colonies in the MHI, the NWHI colonies harbor more than 90% of the total Hawaiian archipelago seabird populations. The NWHI provide most of the nesting habitat for more than 14 million Pacific seabirds. More than 99% of the world's Laysan albatross (*Phoebastria immutabilis*) and 98% of the world's black-footed albatross (*P. nigripes*) return to the NWHI to reproduce. Of the 18 species of seabirds known to be present in the NWHI, only the short-tailed albatross (*P. albatrus*), is listed as endangered under the Endangered Species Act. The short-tailed albatross population is the smallest of any of the albatross species occurring in the North Pacific. Land-based sighting records indicate that 15 short-tailed albatrosses have visited the NWHI over the past 60 years. Five of these visits were between 1994 and 1999 (WPRFMC 2001b). No sightings from, or interactions with, bottomfish vessels have been documented.

The 1990-1993 NMFS observer program for the NWHI bottomfish fishery reported a moderate level of interactions between seabirds and the bottomfish fishery (Nitta 1999). Interactions were characterized by attempted bait theft. Although there is a possibility of accidental hooking, circle hooks used in the bottomfish fishery do not lend easily to snagging. No seabird injuries or mortalities were reported while fishermen were fishing for bottomfish. One interaction involving a Laysan albatross occurred while a bottomfish fishing vessel was trolling for pelagic species. The bird became hooked but was subsequently released alive. The potential for indirect interaction due to competition for prey is negligible, as seabirds do not prey on bottomfish species. The level of fishery interaction with seabirds is expected to have no effect on seabird distribution, survival, or population structure (WPRFMC 2001b).

5.2 Pelagics FMP Fisheries

The information in this document incorporates by reference details provided in the Final Environmental Impact Statement (FEIS) for the Fishery Management Plan for the Pelagic Fisheries of the Western Pacific Region, which is available from the NMFS Southwest Regional Office (501 West Ocean Boulevard, Suite 4200, Long Beach, CA 90802-4213; http://www.nmfs.noaa.gov/). For further details, please see the FEIS.

A summary of the information in the FEIS (NMFS 2001b) (in most cases extracted directly from the FEIS), along with information from NMFS' March 2001 Biological Opinion on the Pelagic FMP (a product of Section-7 consultations under the ESA) (NMFS 2001a), are provided in Sections 5.2.1 through 5.2.5. The FEIS is generally based on fishery data through 1998 or 1999. That information is updated in Section 5.2.6 with information that became available since completion of the FEIS.

5.2.1 Description of the Fisheries

The Pelagics FMP manages unique and diverse fisheries. Longline vessels are capable of traveling long distances to high-seas fishing grounds, with trips typically ranging from 14 to 44 days, while the smaller handline, troll, charter, and pole-and-line fisheries, which may be commercial, recreational, or subsistence, generally occur within 25 miles of land, with trips generally lasting only one day. These fisheries are first briefly described by sector and gear type, then described in more detail by geographical area.

Commercial fisheries

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

Apart from a few larger (> 40 ft) inboards, longlining out of American Samoa generally takes place on *alia*, twin-hulled (wood with fiberglass or aluminum) boats about 30 feet long, and powered by small gasoline outboard engines. Navigation on the *alia* is visual, using landmarks. The gear is stored on deck attached to a hand crank reel which can hold as much as 10 miles of monofilament mainline. Participants set between 100 and 300 hooks on a typical eight-hour trip.

The gear is set by spooling the mainline off the reel and retrieved by hand cranking back onto the reel. Currently most fishing is done within 25 miles of shore, but with better equipped vessels, fishing activity may extend further. Generally, gear setting begins in early morning; with retrieval in the mid-morning to afternoon. The fish are stored in containers secured to the decks or in the hulls. Albacore tuna is the primary species landed followed by skipjack tuna and yellowfin tuna.

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

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

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

Charter and recreational fisheries

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

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

5.2.1.1 Hawaii pelagic fisheries

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

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

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

Landings by Hawaii-based fisheries in 1998 ranged from to 28.6 million pounds by the longline fleet to 696,000 pounds by the aku boats and are summarized in Table 24. Tunas (*Thunnus* spp.) and broadbill swordfish (*Xiphias gladius*) are the dominant target species, but a variety of other pelagic species are also landed incidentally, including blue sharks *(Prionace glauca*), opah (*Lampris guttatus*), marlin (Families *Tetrapturidae* and *Makairadae*), and mahimahi (*Coryphaena* spp.).

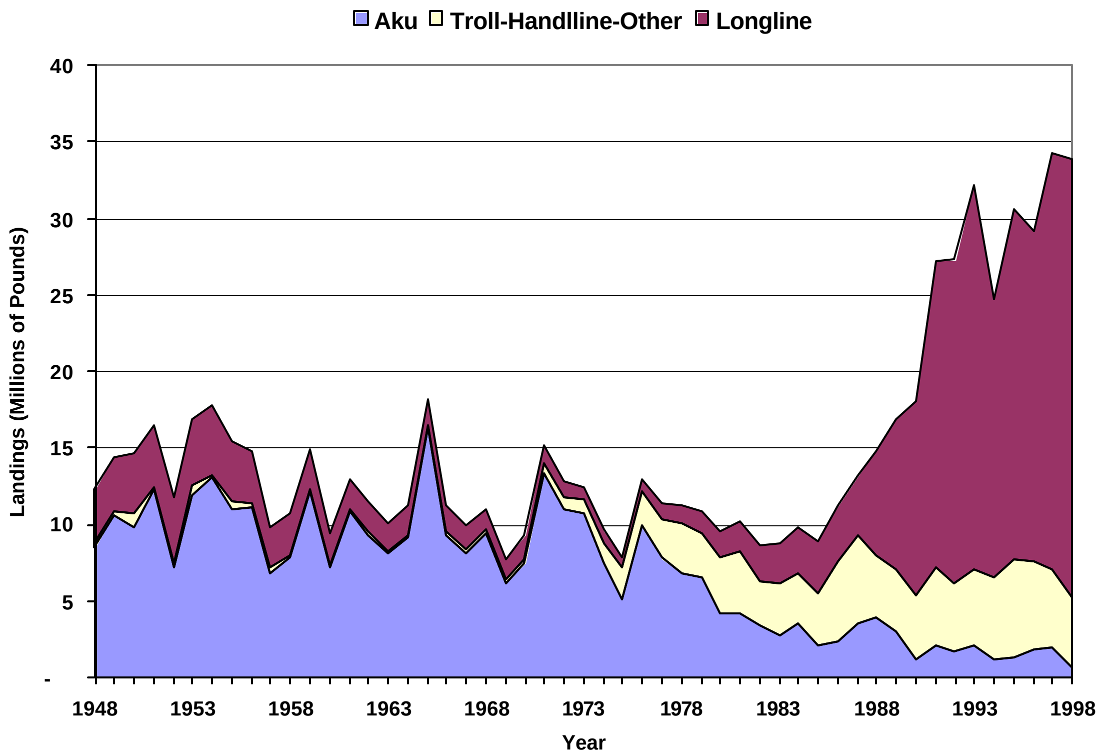
Table 24. Fishery information for Hawaii pelagic fisheries, 1998

Gear/Vessel Type	Longline	Charter Fishery	Troll/Handline Fisheries	Pole-and-line Fishery (Aku Fishery)
Area Fished	EEZ around Hawaii (25-200 nm) and high seas	Inshore and EEZ	Inshore and EEZ	Inshore and EEZ
Total Landings	28.6 million pounds	1.8 million pounds	4.6 million pounds	0.7 million pounds
Catch Composition	24% bigeye tuna 24% pelagic sharks 12% albacore tuna 11% swordfish 6% yellowfin tuna	billfish wahoo yellowfin tuna skipjack tuna (catch percentages are unknown)	yellowfin tuna skipjack tuna mahimahi wahoo striped marlin bigeye tuna (catch percentages are unknown)	99.6% skipjack tuna
Season	All year	All year	All year	All year
Active Vessels	114	199	1,824	6
Total Permits	164 (transferable) (limited entry)	NA	NA	NA
Total Trips	1,140	16,700	26,203	223
Total Ex-vessel Value	$46.7 million	$15.3 million	$7.2 million	$0.9 million

Source: Adapted from WPRFMC 1999b and NMFS 1999.
Note: Data do not include all landings for recreational fishers. For the charter fishery, gross revenue estimates include charter fees, fish sales, and mount sales commissions for a 12-month period in 1996-1997.

Total pelagic landings experienced a slow decline from the early 1950s through the mid-1980s, as shown in Figure 8. The decline was primarily due to reduced landings by the aku fleet although decreases in longline landings are also apparent in Figure 8. Landings by the troll fleet began to increase in the early 1970s but the overall decline in pelagic landings continued. The pelagic landings of the longline fleet began to slowly increase in the late 1970s but it wasn't until the mid-1980s when longline landings began to increase substantially that the decline of more than three decades was overcome. Total pelagic landings increased dramatically through the mid-1990s with substantial variability since that time.

Figure 8. Pelagic landings in Hawaii, 1948-1998



Markets for the pelagic fisheries of Hawaii

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

Local fishers using a variety of fishing methods are the dominant source of fresh pelagic fish for the Hawaii market. Hawaii's large pelagic longline fleet targets bigeye, yellowfin, and albacore tunas as well as swordfish. Longliners also supply marlin to the market, primarily as incidental catch. The handline fishing fleet targets yellowfin, bigeye, and skipjack tunas. Commercial trollers provide a variety of pelagic fish, especially mahimahi, wahoo, marlin, and yellowfin tuna, depending on the season (DBEDT 2000; Bartram 1997). Table 25 shows 1999 reported landings and sales of the major pelagic species in Hawaii.

Table 25. Hawaii reported landings and sales of pelagic species, 1999

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

Source: NMFS Honolulu Laboratory; Western Pacific Fishery Information Network.
The figures for sharks do not include data on sharks whose fins were retained and carcasses discarded.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Marlin is used as *sashimi* and *poke* in Hawaii. Large group caterers often prefer marlin because it discolors more slowly than tuna. Premium *sashimi*-quality striped marlin, which has orange-red meat and higher fat content, is thought to be of higher quality than blue marlin, although blue marlin with acceptable fat content is used as *sashimi*. Both are cooked by Hawaii restaurants. Blue marlin is popular with lower-income and fixed-income groups and often is smoked (Bartram 1997; DBEDT 2000).

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

Seasonal variability in price is greater for both blue marlin and striped marlin than for tuna. The Hawaii blue marlin season peaks between June and October. The peak of the striped marlin season is opposite, beginning in November and continuing until June. The seasonal price changes are similar for the two fish, suggesting that the prices are driven by changes in tuna

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

supply and total demand for fish rather than by the volume of marlin harvests. Marlin prices reach annual highs from February to April and again in September and December. The high prices early in the year coincide with a period of low tuna supplies. The transition from summer yellowfin to winter bigeye is the likely explanation for the high price for marlin in September. Marlin is also likely substituted for tuna in December when demand is high. The low prices in June and July occur during the period when tuna supply is at its highest and overall demand is at a low. Low prices occur in October, when marlin and bigeye are in high supply (DBEDT 2000).

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

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

Most mahimahi and ono are caught by trollers, although portions of the harvest are taken by longline and pole-and-line fishers. These species are sold through the Honolulu and Hilo fish auctions and directly to wholesalers and restaurants. Mahimahi is a favorite in many local restaurants. Ono is generally substituted when mahimahi is in short supply. The limited local supply of mahimahi has led to import of substantial quantities to Hawaii from Taiwan, Japan, and Latin America. Since imported fish tend to be slightly cheaper than fresh local fish, imported fish tend to be directed toward less expensive restaurants. Little of either of these species is exported, because local consumers consume most of the local supply.

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

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

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

5.2.1.2 American Samoa pelagic fisheries

American Samoa-based pelagic fisheries consist of a small fleet of *alia* longliners, a few mid-size and larger longliners, and a small fleet of trolling vessels. These fleets target albacore, skipjack tuna, yellowfin tuna, and other pelagic species. Landings and other attributes of these fisheries for 1998, along with those of Guam and the CNMI, are summarized in Table 26.

Table 26. Pelagic fishery information for American Samoa, Guam, and CNMI, 1998

Islands	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	884,154 lb	25,271 lb	817,087 lb	192,568 lb*
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	25	24	438	89
Total Permits	50 (open access)	NA	NA	NA
Total Trips	2,359	123	14,324	2,230
Total Ex-vessel Value	$968,361	$29,949	$711,066**	$398,086

Source: adapted from WPRFMC 1999b; NMFS 1999.
* Landings for CNMI are recorded commercial landings, but not all commercial landings are recorded (D. Hamm, NMFS Honolulu Laboratory, 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.

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

The small-scale pelagic fishery in American Samoa employs relatively simple troll and longline fishing technology. More than 90 percent of the respondents in a survey of 20 longline fishermen planned to increase their efforts at longlining (Severance et al. 1999). Until very recently, most of the small-scale fleet was comprised of boats under 30 feet in overall length.

New and safer types of small-scale vessels have begun to enter the pelagic fishery and they are capable of extending the safe range of fishing farther offshore.

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

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

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

As stated above, this fishery is presently open access, with no limits on the number of longline vessels, individual or total vessel capacity, catch or effort, but a control date has been established for the purpose of providing notice that vessels entering the fishery after the control date would not be assured of being allowed to use longline gear to fish for pelagic management unit species in the EEZ around American Samoa should a limited access program be established (WPRFMC 2000a) (see Section 2.2 for further details).

The length distribution of vessels owned by longline permit holders, as of October 2000, is summarized in Table 27.

Table 27. Longline permit holders based in American Samoa as of October 2000

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

Source: NMFS in WPRFMC 2000a.
[a] A newer and safer version of *alia* (a catamaran-style vessel that is the most common type of fishing boat in American Samoa and Samoa) is being assembled in Samoa from pre-cut aluminum plates manufactured in New Zealand. Mostly 38 to 42 ft in length, this version is equipped with a larger fuel tank, navigational aids, higher freeboard, and more safety equipment to extend fishing range to well over 100 nm from shore. Several new fishing enterprises in American Samoa have plans to acquire vessels of this type.
[b] In addition to planned acquisitions in this length class, FAO is designing a 45 ft catamaran-style vessel for the next phase of longline fishery expansion in neighboring Samoa. This design will also be available for boatbuilding in American Samoa.
[c] A design for a monohull vessel assembled from precut steel plates in the 46 to 50 ft class has been prepared in American Samoa.

5.2.1.3 Guam pelagic fisheries

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

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

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

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

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

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

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

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

5.2.1.4 CNMI pelagic fisheries

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

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

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

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

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

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

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

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

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

5.2.1.5 PRIA pelagic fisheries

There is limited knowledge of fishing activity and effort in the PRIA because of limited reporting requirements for vessels active in this fishery. Longline vessels that fish in EEZ waters around the PRIA must be registered under a longline general permit or the Hawaii-based longline limited access permit. These vessels have federal reporting requirements. Until recently, there were no federal reporting requirements for commercial troll and handline vessels targeting pelagic species in these areas. However, requirements for a federal permit and reporting were implemented through a regulatory amendment of the Pelagics FMP in September 2002 (67 FR 56500). The only existing reporting requirement for recreational and charter vessels in this area is a U.S. Fish and Wildlife Service requirement for maintaining a "Midway Sports Fishing Boat Trip Log." This requirement applies to fishing within the Midway Atoll National Wildlife Refuge. The log, however, need not include any information about interactions with protected species.

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

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

5.2.1.6 Foreign pelagic fisheries

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

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

Purse seine vessels from Japan and the United States have fished in the WCPO since the mid-1970s and new vessels from Korea and Taiwan entered the fishery in the early 1980s. In 1999 the WCPO purse seine fleet was comprised of 223 vessels including 159 distant-water vessels, 31 domestic Pacific Island vessels, and 33 domestic non-Pacific Island vessels (e.g., Australia, Indonesia, Japan and New Zealand). The 1999 catch of 1,033,000 mt was comprised of: skipjack tuna – 781,000 mt (76% of the total), yellowfin tuna– 218,000 mt (21%) and bigeye – 35,000 mt (3%) (Coan et al. 2000).

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

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

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

5.2.2 Socioeconomic Importance

5.2.2.1 The regional context

Fishing industry sectors related to the harvest, processing and transshipment of tuna and other highly-migratory pelagic species have made U.S. ports in the Western Pacific Region among the nation's leaders in terms of value of catch landed. However, fisheries occurring inside the U.S. EEZ of the Western Pacific – that is, the area covered by the FMP – account for only a small fraction of the volume of pelagic species caught in the Pacific basin. This small percentage reflects the fact that Pacific pelagic stocks are capable of extensive movement and are the targets of intense competition among a multitude of distant-water U.S. and foreign fishing fleets that operate on the high-seas and within the EEZs of many nations.

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

5.2.2.2 Community setting

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

5.2.2.3 Economic importance

The management of pelagic fisheries is of particular importance to the sub-regions and communities of the Western Pacific, as the harvest of pelagic species is the major component of fishing industry or activity in the region. The Pacific basin contains immense pelagic fisheries resources and provides more than 40 percent of the world tuna catch. The annual landings of various tuna species harvested from the entire Pacific islands region total over one million metric tons (mt), with a dockside value of $1.5 billion (Lawson 1995).

When the WPRFMC was created in 1977, foreign fleets were fishing heavily for tuna as close as twelve miles to American-flag Pacific islands. The Council's initial priority was to restrict foreign fishing and allow domestic fishers more opportunities to catch fish. Hawaii, being the most industrialized and populated island area, was in the best position to support an expansion of the domestic commercial fishery. At that time it was the policy of the United States that highly migratory fish could be effectively managed only through international arrangements. This policy led to a provision in the Magnuson Act of 1976 that effectively precluded the authority of coastal nations to establish exclusive fishing rights over tuna within their EEZs.[16] Despite the inability of the WPRFMC to manage tuna fishing by foreign vessels in the U.S. EEZ, the number of domestic longline vessels based in Hawaii grew from 14 in 1979 to 141 in 1991. Landings by longline vessels increased from 1,900 mt to 11,500 mt between 1987 and 1993. The inflation-adjusted ex-vessel value of the catch more than tripled during this period to $56 million. Swordfish catches accounted for most of this revenue and represented about 60 percent of the total domestic landings for this species. More recently, the longline fleet has returned to targeted tuna species, and the harvest of albacore, bigeye and yellowfin reached a record high of 7,651 mt in 1997. In 1998, the port of Honolulu ranked 30th in the nation in terms of the quantity of fish landed, but it ranked 7th in terms of the value landings (Table 28).

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

Table 28. Ex-vessel value of fish landings by commercial domestic and foreign vessels at major U.S. ports, 1996-1998

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

Source: WPRFMC 1999b.

The expansion of the longline fishery in Hawaii during the past two decades has been accompanied by a general trend away from bulk fisheries for pelagic species (e.g., fish cake and canned tuna) and development of quality, high-price products (e.g., *sashimi* tuna) that have enhanced the market value of Hawaii's pelagic fisheries (Boehlert 1993). Local and export markets for Hawaii's seafood products have expanded enormously in recent years, and fresh fish from Hawaii's waters now appears on restaurant menus throughout the United States, from Honolulu to Des Moines to Boston (Pooley 1993b).

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

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

Service (USFWS 1998) estimates that in 1996, 260,000 anglers in the state spent $130 million on fishing trip-related items.

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

American Samoa has seen a level of fish processing related activity unequaled elsewhere in the United States, with the capital of Pago Pago easily being the leading port in the United States in terms of the value of fish landings. For many years Pago Pago has been the site of a major tuna canning industry, and the StarKist cannery in Pago Pago is the current world's largest tuna processing facility. In 1998, American Samoa received 208,300 short tons of fish worth approximately $232 million. Since the tuna processing industry began in American Samoa four decades ago, it has been the largest private sector employer in the territory and leading exporter.

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

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

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

It should be specifically noted that with the exception of the U.S. Pacific remote island areas, all of the sub-regions in the Western Pacific benefit from foreign as well as domestic fishing operations. While the importance of foreign longline vessels as suppliers of fish to the tuna canneries in American Samoa has steadily decreased in recent years, Pago Pago remains an important re-provisioning base for foreign distant-water '*sashimi*' vessels that transship their catch to carrier vessels in the harbor. Foreign longline and purse seine vessels are the principal customers in Guam's home port and transshipment industry. This type of support activity is not limited to surface transportation, as Guam is also the center of a large air transshipment operation that flies fresh fish caught by foreign vessels to overseas markets. A similar air transshipment operation is based in the CNMI. Finally, a substantial number of foreign fishing vessels find Hawaii an attractive and convenient location for port calls. These vessels also transship a large volume of shark fins through the state.

5.2.2.4 Sociocultural importance

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

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

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

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

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

5.2.3 Fish Stocks

5.2.3.1 Pelagic management unit species

The Pelagic Management Unit Species" (PMUS) are listed in Table 29.

Table 29. Pelagic management unit species

English common name	Scientific name	Samoan or AS	Hawaiian or HI	Chamorroan or Guam	S. Carolinian or NMI	N. Carolinian or NMI
mahimahi	*Coryphaena* spp.	masimasi	mahimahi	botague	sopor	habwur
wahoo	*Acanthocybium solandri*	paala	ono	toson	ngaal	ngaal
Indo-Pacific blue marlin	*Makaira mazara*	sa'ula	a'u, kajiki	batto'	taghalaar	taghalaar
black marlin	*Makaira indica*					
striped marlin	*Tetrapturus audax*		nairagi			
shortbill spearfish	*Tetrapturus angustirostris*	sa'ula	hebi	spearfish		
swordfish	*Xiphias gladius*	sa'ula malie	a'u ku, broadbill, shutome	swordfish	taghalaar	taghalaar
sailfish	*Istiophorus platypterus*	sa'ula	a'u lepe	guihan layak	taghalaar	taghalaar
pelagic thresher shark	*Alopias pelagicus*	malie	mano	halu'u	paaw	paaw
bigeye thresher shark	*Alopias superciliosus*					
common thresher shark	*Alopias vulpinus*					
silky shark	*Carcharhinus falciformis*					
oceanic whitetip shark	*Carcharhinus longimanus*					
blue shark	*Prionace glauca*					
shortfin mako shark	*Isurus oxyrinchus*					
longfish mako shark	*Isurus paucus*					
salmon shark	*Lamna ditropis*					
albacore	*Thunnus alalunga*	apakoa	'ahi palaha, tombo	albacore	angaraap	hangaraap
bigeye tuna	*Thunnus obesus*	asiasi, to'uo	'ahi po'onui, mabachi	bigeye tuna	toghu, sangir	toghu, sangir
yellowfin tuna	*Thunnus albacares*	asiasi, to'uo	'ahi shibi	'ahi, shibi	yellowfin tuna	toghu

English common name	Scientific name	Samoan or AS	Hawaiian or HI	Chamorroan or Guam	S. Carolinian or NMI	N. Carolinian or NMI
northern bluefin tuna	*Thunnus thynnus*		maguro			
skipjack tuna	*Katsuwonus pelamis*	atu, faolua, ga'oga	aku	bunita	angaraap	hangaraap
kawakawa	*Euthynnus affinis*	atualo, kavalau	kawakawa	kawakawa	asilay	hailuway
moonfish	*Lampris* spp.	koko	opah		ligehrigher	ligehrigher
oilfish family	Gempylidae	palu talatala	walu, escolar		tekiniipek	tekiniipek
pomfret	family Bramidae	manifi moana	monchong			
other tuna relatives	*Auxis* spp., *Scomber* spp., *Allothunus* spp.	(various)	ke'o ke'o, saba (various)	(various)	(various)	(various)

Source: WPRFMC (2002a).
This list includes changes that would be made through FMP Amendment 10. It would remove from the PMUS list dogtooth tuna (*Gymnosarda unicolor*) and all species of shark except the nine pelagic species listed here. NMFS issued a Record of Decision on June 14, 2002 that approves this aspect of Amendment 10 but it has not yet implemented it through a final rule.

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.

The status of the pelagic stocks managed under the FMP was reviewed in the Annual Report to Congress on the Status of U.S. Fisheries–2001 (NMFS 2002b). None of the stocks were indicated as being in, or approaching, an overfished condition. Further information on the status of pelagic stocks is provided in Section 4.2.1.3.

5.2.3.2 Non-target finfish species

Pelagic fisheries catch a number of non-target species, both PMUS and non-PMUS. This is particularly true for the longline fishery. NMFS observers recorded more than 60 different species caught by the Hawaii-based longline fleet between 1994 and 1997. Of significance are the 85,523 sharks reported caught by the fleet in 1997, of which the majority (93%) was blue sharks. As a result of the growing demand for shark fins in Asian markets the practice of shark finning increased during the late 1990s. Logbook data for 1997 indicate that 0.3% of blue sharks were retained whole, 57% were finned, and 43% were discarded. The practice of finning is now prohibited by the Shark Finning Prohibition Act. Logbook data for 1997 indicate that about one percent of sharks, mainly mako and thresher, are headed and gutted and retained for later sale.

Most non-PMUS caught by the Hawaii-based longline fleet is discarded. Observer data for 1994-1997 indicate that the discarded non-PMUS included (in descending order, by number) lancet fish, pelagic stingray, snake mackerel, escolar, remora, crocodile shark, and mola mola.

In the troll and handline fisheries, there is relatively little information on the nature and amount of bycatch because of current reporting requirements. However, as the gears in use tend to be selective, bycatch probably constitutes a small part of the catch. Almost all the fish caught by troll and handline vessels, including charter boats, in Hawaii, American Samoa, Guam, and the CNMI are either sold or kept for personal consumption. In recent years, fishing tournaments, such as the Hawaiian International Billfish Tournament, have provided various incentives for participants to release their catch.

The albacore troll fishery occurring in the North and South Pacific outside the EEZ has an estimated discard rate of about 10% of the catch, comprised primarily of small-sized (< 60 cm) albacore.

The pole-and-line gear used to target aku in Hawaii is highly selective. Non-target species that are occasionally caught, such as kawakawa, blue marlin, striped marlin, and rainbow runner, are usually either sold or retained for personal consumption by the crew.

5.2.4 Ecosystem and Habitat

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

Essential Fish Habitat (EFH) for the adult and juvenile life stages of the PMUS was designated through FMP Amendment 8 as the water column to a depth of 1,000 m. Although most PMUS are epipelagic (the surface layer to about 200 m depth), bigeye tuna are abundant at depths greater than 400 m and swordfish have been tracked to a depth of 800 m. The vertically migrating mesopelagic fishes and squids associated with the deep scattering layer are important prey organisms for PMUS and they are seldom abundant deeper than 1,000 m.

EFH for the eggs and larvae of PMUS is the epipelagic zone, including the water column from the surface to a depth of 200 m, from the shoreline to the outer limit of the EEZ. The eggs and larvae of all teleost PMUS are pelagic, and are slightly buoyant when first spawned, spreading throughout the mixed surface layer and subject to advection by ocean currents. Eggs and larvae of PMUS are found throughout the tropical (and in summer, subtropical) epipelagic zone.

Habitat Areas of Particular Concern (HAPC) have been designated as the water column from the surface to a depth of 1,000 m that lies above all seamounts and banks with the EEZ that rise to within 2,000 m of the surface. The rationale for the HAPC designation included the ecological function provided by those waters, the rarity of the habitat type, and the susceptibility of the areas to human-induced environmental degradation.

5.2.5 Protected Species

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

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

In a March 2001 Biological Opinion (a product of Section-7 consultations under the ESA), NMFS estimated the following ranges of annual mortalities in the Hawaii-based longline fishery: 28-57 leatherback, 102-195 loggerhead, and 7-26 green sea turtles (NMFS 2001a).

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

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

Logbook data from the central-western Pacific U.S. tuna purse seine fishery during this period show that there are no reported sea turtle takes. The U.S. fleet is required to have 20 percent observer coverage and to maintain catch and bycatch logbooks. Collecting data on sea turtles is a lower priority for observers, and since vessels are likely to release turtles immediately after pursing the net, it is likely that very little information on the bycatch of turtles is recorded (NMFS 2001a).

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

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

5.2.6 New Information on Affected Environment

The information described in the previous subsections came from the March 2001 FEIS for the pelagic fisheries, which generally included fishery data only through 1998. Updates to that information are provided here.

Several important regulatory changes have recently taken place in the fishery (see Section 2.2 for details), with consequent impacts on fishing activity. They include a ban on the practice of shark finning (retaining the fins without the carcass), an effective closure of the swordfish-directed longline fishery, a large area closure south of Hawaii during April and May for the longline fishery, requirements to use certain gear-related measures to reduce the incidental catch of sea turtles and seabirds, and an area closure out to 50 nm for large longline vessels (greater than 50 feet in length) in American Samoa.

Table 30 shows the estimated catch and revenues from pelagic fishing in the Western Pacific Region in 2001.

Table 30. Summary of US federally managed pelagic fishing activity in the Western Pacific Region, 2001

<table>
<tr><th>Fishery</th><th>Landings
(1,000 lb)</th><th>Ex-vessel revenue
(1,000 $)</th><th>Number of active vessels</th><th>Number of trips</th></tr>
<tr><td>Hawaii pole-and-line</td><td>1,200</td><td>1,600</td><td></td><td>246</td></tr>
<tr><td>Hawaii longline</td><td>15,400</td><td>32,700</td><td>101</td><td>1,075</td></tr>
<tr><td>Hawaii troll</td><td>2,600</td><td>3,800</td><td></td><td>20,281</td></tr>
<tr><td>Hawaii handline</td><td>1,320</td><td>2,300</td><td></td><td>3,967</td></tr>
<tr><td>Hawaii other</td><td>600</td><td>500</td><td></td><td></td></tr>
<tr><td>American Samoa longline</td><td>8,131</td><td rowspan="2">7,817</td><td>65</td><td>(# sets:) 4,700</td></tr>
<tr><td>American Samoa troll</td><td>23</td><td>18</td><td>335</td></tr>
<tr><td>Guam commercial troll</td><td>686</td><td rowspan="2">680</td><td rowspan="2">375</td><td>9,563</td></tr>
<tr><td>Guam charter troll</td><td>74</td><td>2,453</td></tr>
<tr><td>CNMI commercial troll</td><td>143</td><td>286</td><td>111</td><td>2,176</td></tr>
<tr><td>Total</td><td>30,000</td><td>50,000</td><td></td><td></td></tr>
</table>

Source: WPRFMC 2002d and NMFS Honolulu Laboratory.
Most estimates are preliminary.
Revenues account only for sales of fish, not for charter fees or other income from fishing.

During the year 2001, 101 Hawaii-based longline vessels were active, landing 15.4 million pounds of fish worth $32.7 million ex-vessel, a decrease in landings of about 35% compared to 2000. As a result, 2001 total commercial pelagic landings (21.1 million lb; $41.3 million) for all pelagic gear types combined fell by 30% from 2000. Swordfish landings decreased by more than 90% from 2000 because of the closure of the swordfish-directed fishery, and bigeye tuna landings declined by about 10% despite a considerable shift in fishing effort from the swordfish and mixed-target sector into the tuna target sector (WPRFMC 2002d). According to logbook data compiled by the NMFS Honolulu Laboratory, the number of sharks caught in the Hawaii-based longline fishery decreased substantially (from an annual average of 102,000 during 1992-2000 to 47,000 in 2001), largely as a result of the closure of the swordfish-directed longline fishery. The percentage shark bycatch rate increased substantially (from an average of 63% in 1997-2001 to 96% in 2001) as a result of the ban on shark finning. The absolute number of sharks discarded was 45,000 in 2001, compared to an annual average of 67,000 during the 1992-2001 period.

The regulatory changes in Hawaii's longline fishery have had substantial effects on rates of interaction with sea turtles and seabirds. Interaction and mortality rates have not yet been estimated for 2001, but differences in estimated interaction rates between two periods of 2000 indicate the magnitude of the regulatory impacts. During the first eight months of 2000 there was an area closure in place, but during the last four months of the year the restrictions on the fleet were expanded to include a limit of 154 sets within a certain area and swordfish-directed fishing was prohibited in waters bounded by the equator and 28° N and by 173° E and 137° W. There were an estimated 372 sea turtle interactions in the first period of 2000, compared to 52 in the second period, and there was a statistically significant difference between the two periods in the number of interactions per set for all species but the green (WPRFMC 2002a). The estimated number of interactions with albatrosses decreased from 2,343 in the first period to 90 in the second period, and there was a statistically significant difference between the two periods in the number of interactions per set for both species (WPRFMC 2002a). (Note that there is a substantial degree of uncertainty – not described here – in these estimates of interaction rates.)

Landings, revenues, and catch rates in 2001 in Hawaii's small-boat commercial fisheries were within the ranges of recent years.

Like the Hawaii fishery, pelagic fishing in American Samoa is experiencing a period of rapid change. In 1994, five vessels were engaged in longlining, all *alia*. In 2001, 65 vessels were in the fishery, including a number of vessels larger than 50 feet in length (WPRFMC 2002d). Longline landings have consequently skyrocketed, increasing from less than a quarter of a million pounds in 1994 to 8.1 million pounds in 2001.

Eighteen vessels participated in the American Samoa troll fishery in 2001, substantially less than the average for the last 20 years of 35 vessels (WPRFMC 2002d). Landings in 2001 were 23,000 pounds.

Guam's pelagic landings of about 750,000 pounds in 2001 were about equal to the annual average of the last five years. The estimated number of boats in the troll fleet, about 375, is not significantly different from the numbers estimated for the previous ten years or so.

The estimated 2001 commercial landings in the CNMI's pelagic fisheries, about 143,000 pounds, were about the same as the previous two years, but substantially less than estimated landings during 1996-1998, which had an estimated peak of 225,000 pounds in 1996. The number of vessels engaged in the fishery has been fairly steady during the last six years, with 111 boats making commercial landings in 2001.

5.3 Crustacean FMP Fisheries

A summary of available information on the environment associated with the crustaceans fisheries of the Western Pacific is provided in this section. Much of the information has been taken from the Preliminary Draft Supplemental EIS for the Crustaceans FMP (WPRFMC 2001d), which can be referred to for additional detail.

5.3.1 Description of the Fisheries

5.3.1.1 History

The largest component of the FMP crustaceans fisheries is the NWHI lobster fishery. Although there is a lobster fishery in the MHI, there are few shallow banks in the EEZ around the MHI so the MHI lobster fishery occurs almost entirely within State of Hawaii waters. One federally permitted vessel began to operate in the EEZ surrounding the MHI in 1997, but it since discontinued operations. No federally permitted lobster vessels have operated in the EEZ surrounding American Samoa or Guam since the development of the FMP in 1983 (the waters around the CNMI and PRIAs are not currently subject to the FMP).

The Northwestern Hawaiian Islands (NWHI) crustacean fishery, which has operated for nearly 20 years, is a distant-water trap fishery with the red spiny lobster (*Panulirus marginatus*) and common slipper lobster (*Scyllarides squammosus*) as the primary target species. Other lobster species, including ridgeback slipper lobster, Chinese slipper lobster, and the green spiny lobster, are caught in relatively small numbers. Most of the NWHI lobster fishery occurs in federal waters of the U.S. exclusive economic zone (3 to 200 nm offshore).

The NWHI lobster fishery developed rapidly in the 1970s in parallel with several surveys of the NWHI lobster resources. Many of the participants came from areas such as the Pacific Northwest where crustacean fisheries were experiencing declining catches (Clarke and Pooley 1988; Pooley 1993a). These newcomers came with large vessels, some longer than 100 ft, with advanced technology freezing and processing equipment (Pooley 1993a). In addition, a number of smaller, multi-purpose boats began fishing for spiny lobsters in the NWHI, combining that operation with bottomfish fishing (HDAR 1979).

A period of low catches was followed by a rapid increase in landings as more vessels entered the fishery and markets were developed (Polovina 1993). By the mid-1980s, the NWHI lobster fishery was Hawaii's single most lucrative fishery (Pooley 1993b). Changing the trap gear from wire to plastic traps introduced from the U.S. mainland led to significant catches of slipper lobster, which had been essentially unexploited with wire traps, and an increase in fishing efficiency (Boehlert 1993; Pooley 1993a). From 1985 to 1987, the fishery targeted and largely depleted the population of slipper lobsters (Polovina 1993).

Trapping activity declined in 1987 principally due to the exit of several large vessels from the fishery (Samples and Sproul 1988), but landings reached a record high in 1988 when wind and sea conditions allowed for an extended period of fishing in the upper bank areas where spiny lobsters tend to congregate (Clarke 1989). In 1990, however, lobster catch rates fell dramatically. Overfishing is not thought to be responsible for the decline (Polovina and Mitchum 1992). Rather, the decrease was likely due to a climate-induced change in oceanic productivity (Polovina et al. 1994). Nevertheless, the 1990 season showed that there was excessive fishing capacity in the industry given the reduced population size and raised concern that an economic threshold might not prevent overfishing (Polovina and Haight 1999). Responding to this concern, the Council established a limited access program and a fleet-wide seasonal harvest quota in 1991 that significantly altered fishing operations (Kawamoto and Pooley 2000). During the 1980s, fishery participants had averaged three trips per year to the NWHI, each trip lasting about two months (Polovina 1993). With the implementation of a fleet-wide harvest quota vessels no longer fished for lobster year round, but instead shifted from other Hawaii-based fisheries or moved from fisheries in Alaska or the West Coast to participate in a short-term (less than one month) lobster fishery concentrated on the banks around Necker Island, Gardner Pinnacles and Maro Reef that were the historic mainstays of the fishery. The lobster fishery was open from July to December but it typically closed earlier because the harvest guideline was reached. Given the derby-style fishing conditions there was no incentive for fishermen to operate on secondary or marginal banks. From 1992 through 1997, Necker Island accounted for 48 to 64% of the total effort and Gardner Pinnacles and Maro Reef accounted for most of the remaining effort (WPRFMC 1999c). In 1998, the quota was allocated among four fishing areas (Necker Island Lobster Grounds, Gardner Pinnacles Lobster Grounds, Maro Reef Lobster Grounds and General NWHI Lobster Grounds) to prevent localized depletion of the lobster population at the most heavily fished banks and encourage fishermen to broaden the geographical distribution of their effort.

In 2000, NMFS promulgated emergency regulations to close the NWHI lobster fishery because of uncertainty about the dynamics of the lobster stocks and the models used to describe those stocks, and because of concerns about the potential for overfishing the lobster stocks. The closure was extended through the 2001 and 2002 seasons because of continuing uncertainty in stock status and the ability to assess the stocks using available methods. Currently under development are new population models that will incorporate stock characteristics not recognized in the models used to date, including spatial heterogeneity and differences in the population dynamics of the several lobster species. Another factor making the future of the NWHI lobster fishery uncertain is the NWHI Coral Reef Ecosystem Reserve A process is underway to designate the Reserve as a National Marine Sanctuary, which may result in changes to the management regime. Also affecting the fate of the NWHI lobster fishery is the need to prepare an EIS and issue a Biological Opinion (under the ESA), both of which are court-ordered prerequisites for re-opening the fishery.

5.3.1.2 Fishing methods and current use patterns

Two distinct types of vessels currently have recently operated in the NWHI lobster fishery (Maine Aquaculture Innovation Center 2000). About one-third of the permit holders operate North Pacific catcher-type crab vessels that travel to Hawaii for the lobster season. The other two-thirds operate Honolulu-based vessels that are also used in the pelagic longline fishery. The North Pacific crabbers are larger than the longline boats, but every vessel has the capability to carry and deploy the maximum number of traps allowed.

All the participants in the NWHI fishery use a plastic dome-shaped, single-chambered trap with two entrance funnels located on opposite sides (Polovina 1993). Although the minimum size limit established in 1985 was revoked in 1996 the traps are still required to have escape vents. The traps are typically fished in strings of several hundred traps per string. The traps are set before sunset in depths from 20 to 70 m, and retrieved the next day. Both spiny and slipper lobsters may be caught in the same trap, but fishermen can alter the proportion of each species by selecting the trapping area and depth (Polovina 1993). Almost all lobsters harvested are sold as a frozen tail product. Catch is processed, packed and frozen at sea by the individual vessels, in contrast to most other lobster fisheries in which each vessel's catch is held live on-board and transported to shore-side plants for processing and packing (Sample and Gates 1987). From 1996 to 1998, the fleet also landed a significant quantity of live lobsters.

The NWHI lobster fishery is a seasonal fishery, with many vessel operators participating in other Hawaii or U.S. mainland fisheries during other parts of the year. Fishing beyond September involves the risk of encountering severe weather. Poor sea conditions increase operational problems, increase trap losses and reduce the fishing effectiveness of traps (Maine Aquaculture Innovation Center 2000). In 1999, the average vessel fished for lobster for 42 days (WPRFMC

2000b). Although all participants in the lobster fishery engage in other fisheries, the lobster fishery occurs during a comparatively slow season for alternate fishing activities (NMFS 2000b). Therefore, the lobster fishery may represent an important component of the participants' annual fishing operations and income.

As provided in the FMP, the NMFS annually determines the harvest guidelines for the fishery. The harvest guidelines are expressed as the maximum number of lobsters (spiny and slipper lobsters combined) that may be harvested by permit holders from each of the four established fishing grounds: Necker Island, Maro Reef, Gardner Pinnacles, and all other NWHI waters combined (sub-area 4). The harvest guidelines are based on NMFS estimates of the exploitable (harvestable) lobster population at the beginning of each fishing season (July 1). In 1999, the NWHI exploitable lobster population was estimated to be 1,870,000 lobsters and the harvest guideline for the entire fishery was determined to be 243,100 lobsters (spiny and slipper lobsters combined). This total NWHI harvest guideline was allocated among the four established lobster fishing grounds as follows: Necker Island, 54,600 lobsters; Gardner Pinnacles, 27,690 lobsters; Maro Reef, 89,570 lobsters; and sub-area 4 (all other areas combined), 71,240 lobsters. During the 1999 lobster season, six boats participated in the fishery, which is limited to a maximum of 15 permits – that is, 15 vessels. The harvest guideline is derived by using a constant harvest rate (13 percent of the estimated exploitable lobster population) which is associated with a 10 percent risk of overfishing, as specified by the FMP. NMFS scientists used a risk-based simulation model to compute harvest rates for a variety of risk levels of overfishing.

When the harvest guideline of a lobster ground is reached, NMFS closes that ground until the next season. The fishery automatically closes on December 31 each year unless all the individual (bank-specific) harvest guidelines are reached earlier. Federal regulations also specify the number of traps that are allowed on a lobster boat, the number and dimensions of escape vents required for each trap, areas prohibited to lobster fishing, etc. In 1996, FMP Amendment 9 removed the minimum size requirements for harvesting lobster and prohibition on the harvest of reproductive (berried) lobster females resulting in an optional "retain-all" fishery. As a result, fishermen are not required to return decked undersized lobsters and berried females to the ocean, as was the case prior to Amendment 9. The basis for this retain-all fishery was an apparently high discard mortality rate caused by handling techniques on board the vessel, predation by sharks, and displacement of lobsters. Under the amendment every lobster brought on board the vessel, whether kept or discarded, must be counted against the harvest guideline. regime for the NWHI lobster fishery at this time.

Necker Island, Gardner Pinnacles and Maro Reef have been the most productive banks in the NWHI lobster fishery. Starting in 1998, the first year that area-specific quotas were established, fishermen have spread out their effort over a larger area (Kawamoto and Pooley 2000). During both the 1998 and 1999 seasons all four designated sub-areas received fishing pressure. In 1999, the Necker Island, Gardner Pinnacles and Maro Reef Lobster Grounds were closed within two months while the all-other-banks area remained open until the fishery was closed at the end of the year. Five of the six vessels that participated in the fishery that year fished in the all-other-banks sub-area. Three vessels fished on Necker Bank and Gardner Pinnacles and four vessels fished on Maro Reef. The harvest from Necker Island, Gardner Pinnacles and Maro Reef accounted for about 75% of the total landings.

5.3.1.3 Harvest and Participation

Between 1985 and 1991, total landings showed an overall downward trend (Figure 9). Since 1992, landings have been largely determined by the harvest guideline.

Figure 9. Landings of spiny and slipper lobsters in the NWHI lobster fishery, 1983-1999

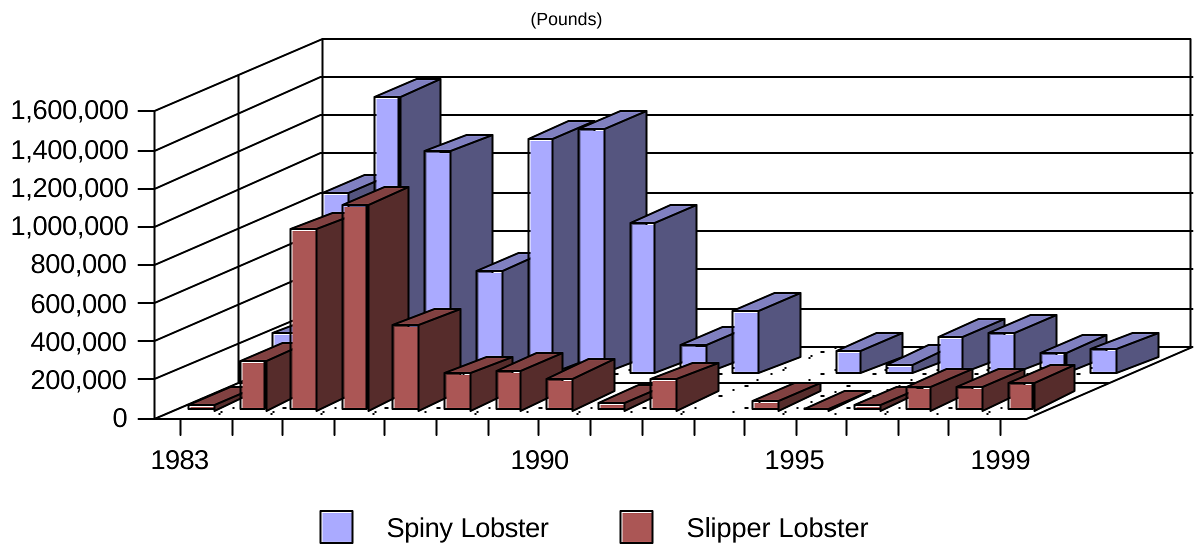
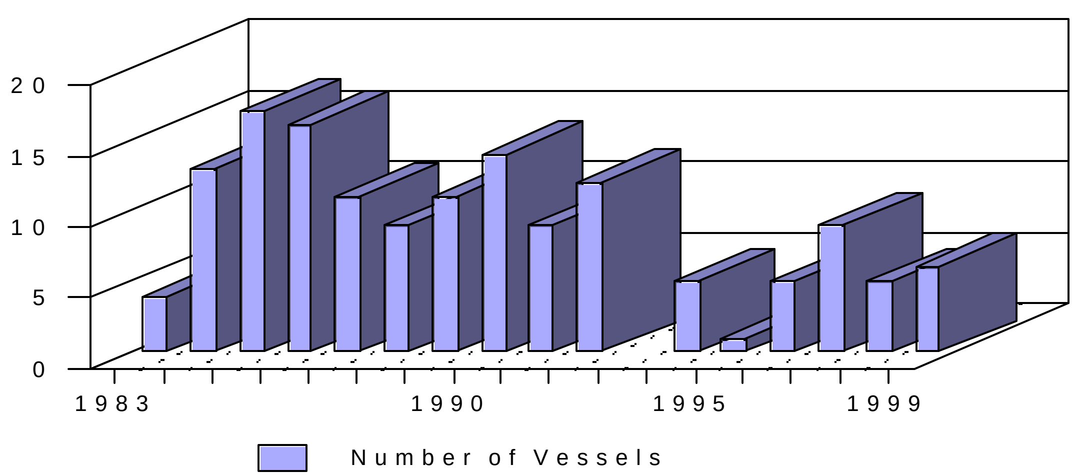


Figure 10 indicates the number of vessels that participated in the fishery each year, from 1983 through 1999.

Figure 10. Number of vessels participating in the NWHI lobster fishery, 1983-1999



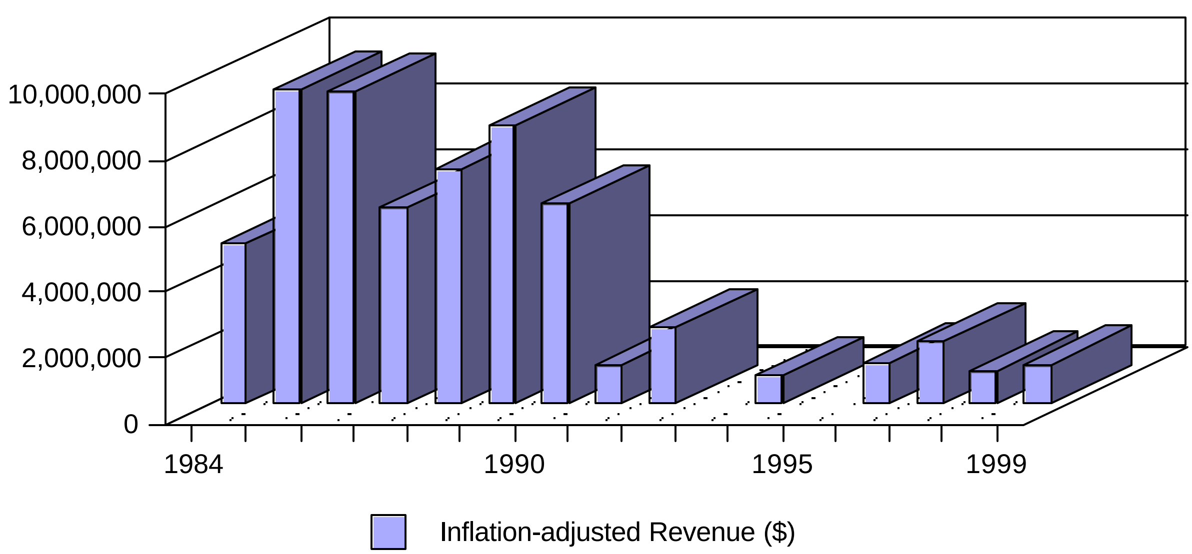
During the first years of the fishery the turnover of participants was relatively high due to the profit-seeking entry-exit behavior of vessel owners who were flexible in the choice of fishing activities (Samples and Sproul 1988). The high turnover continued after 1992, the first year of the limited access program and harvest quota. The quota announced prior to the start of the fishing season weighed heavily in the participation decision as did the annual start-up costs of participating in the lobster fishery and the potential earnings in alternative fisheries (Kawamoto and Pooley 2000). In addition, during the first five years of the limited access program there were a total of 20 permit transfers. By 1997, less than half of the permits that were issued in 1991 were still held by the original recipients.

Through 1999, approximately 37 limited access permits to participate in the NWHI lobster fishery had been issued, but only 19 of the permits had been actually used. The turnover rate has been fairly high, with only 4 of those19 active permit holders participating in the fishery for more than two years. The fishery has been closed since 1999.

5.3.1.4 Economic Performance

The total gross revenue of the NWHI lobster fishery has followed the trend in landings (Figure 11). The average gross revenue per trap has declined sharply since 1997 due to a decrease in catch-per-unit-effort and the proportionately higher catches of slipper lobsters, which have a smaller average size and lower by-weight value in comparison to spiny lobsters (Kawamoto and Pooley 2000).

Figure 11. Gross revenue in the NWHI lobster fishery, 1984-1999



A cost-earnings study of the NWHI lobster fleet was conducted by Clarke and Pooley (1988) based on economic data collected in 1985 and 1986. The study found that despite record revenues in the fishery in 1986, fishermen as a group earned little or no profit. Low fleet net returns appeared to be tied to high fishing costs and diminished average catch rates. The findings in that study do not, however, reflect the more recent operational characteristics of the fleet.

Since the mid-1980s, adjustments in the regulatory regime for the fishery have changed the economic conditions of the fishery (Pooley and Kawamoto 1998). Because the fishery is now seasonal rather than year-round, start-up costs have become significant determinants as to whether a given permit holder is likely to participate in a given year. The brief fishing season means that fixed costs have to be amortized over a shorter time period. Similarly, travel costs have become a higher percentage of total costs due to a decrease in the number of fishing days per trip. The establishment of area-specific quotas in 1998 and the resultant successive closure of banks during the 1998 and 1999 seasons as quotas were reached caused an increase in travel times and associated vessel operating costs as vessels were forced to move from bank to bank (WPRFMC 1999c).

At least some of the permit holders have been able to adapt to these changing economic conditions. Fishery participants during the 1998 season realized a positive return on operations (gross revenues less operating costs) and were able to cover a portion of their fixed costs (WPRFMC 1999c). In addition, the market value of the freely transferable limited access permits indicates that economic profits can still be earned in the fishery. Although the price of transferred permits is not recorded by NMFS, dockside reports in 1998 indicated that a permit was worth $40,000 to $100,000 (Pooley and Kawamoto 1998). However, the fact that generally only about half of the permits holders have actually participated in the fishery in recent years suggests that profits from lobster fishing are low (Maine Aquaculture Innovation Center 2000).

5.3.1.5 Markets

As an internationally traded commodity, supply and demand circumstances for lobsters tend to be volatile, resulting in frequent price adjustments (Samples and Gates 1987). In addition, the Hawaii fishery has changed over the years in terms of target species and product form. In the early years of the fishery (1977-1984) landings consisted mainly of spiny lobsters. However, for a three-year period from 1985 to 1987 the fishery targeted and largely depleted a previously lightly exploited population of slipper lobsters (Polovina 1993). Between 1988 and 1997 the target was again spiny lobsters, but the catch in 1998 and 1999 consisted mainly of slipper lobsters.

The traditional way of marketing lobsters in Hawaii was selling them live in local markets (HDAR 1979). In 1978, however, a Hawaii-based fishing company leased a modern fishing boat from the U.S. mainland equipped with on-board refrigeration for storing frozen lobster tails. Soon almost all lobsters harvested in Hawaii were sold as a frozen tail product to Hawaii and U.S. mainland buyers (Pooley 1993b). This product form dominated until 1996, when the fleet landed a significant amount of live lobsters, which were exported to Japan, Taiwan and Hong Kong or sold in up-scale restaurants in Hawaii (Pooley and Kawamoto 1998). In 1999, however, nearly all fishery participants reverted to producing frozen tails because of a drop in the price of live spiny lobsters caused by the economic downturn in Asia (Kawamoto and Pooley 2000).

Because the NWHI lobster fishery is relatively small and harvest levels have fluctuated widely, product marketing has been challenging (NMFS 2000b). Typically, seafood wholesalers and retailers prefer predictable and reliable supply sources. However, NWHI lobster has established a reputation as a locally produced quality product, and fishery participants have found buyers willing to participate on a seasonal basis.

Imports of frozen lobster tails into Hawaii from various Pacific Basin countries have shown an overall decline over the past decade, from 41,023 lb in 1990 to 3,866 lb in 1999 (NMFS Fisheries Statistics and Economics Division n.d.). A small number of live spiny lobsters are imported into Hawaii from Australia and Kiribati. The average annual amount during the past decade has been about 1,450 lb (NMFS n.d.).

5.3.1.6 Socioeconomic importance

Hawaii's commercial fishing sector includes a wide array of fisheries. The Hawaii longline fishery is by far the most important economically, accounting for 73 percent of the ex-vessel value of all commercial fish landings in the state in 1999. In the same year, the NWHI lobster fishery had an ex-vessel value of about $1.0 million from landings of 260,000 lb, contributing about 2% of the total ex-vessel value of Hawaii's commercial fisheries (data from NMFS Honolulu Laboratory).

For the period 1996-1999, the ex-vessel value of annual landings in the NWHI lobster fishery averaged about $1,349,000 (Kawamoto and Pooley 2000). However, this value reflects only the gross revenues that accrue to fishery participants from direct sales. It does not take into account the employment and income that are generated indirectly within the state by the NWHI lobster fishery. The fishery has an economic impact on businesses whose goods and services are used as inputs in the fishery such as fuel suppliers, chandlers, gear manufacturers, boatyards, tackle shops, ice plants, bait shops and insurance brokers. In addition, the fishery has an impact on businesses that use fishery products as inputs for their own production of goods and services. Firms that buy, process or distribute fishery products include seafood wholesale and retail dealers, restaurants, hotels, and retail markets. Both the restaurant and hotel trade and the charter fishing industry are closely linked to the tourism base that is so important to Hawaii's economy. Finally, people earning incomes directly or indirectly from the fishery make expenditures within the economy as well, generating additional jobs and income.

Some of the fishing vessel owners, operators and crew in the NWHI lobster fishery are year-round residents of Hawaii, while others maintain principal residences outside the state.

The home port of the majority of vessels used in the NWHI lobster fishery is Honolulu during the fishing season. Most of the large-volume, restaurant-oriented wholesalers that buy, process and distribute fishery products are located in the greater Honolulu area. Businesses whose goods and services are used as inputs in Hawaii's offshore commercial fisheries, such as ice plants, marine railways, marine suppliers, welders and repair operations, are similarly concentrated in Honolulu. However, the contribution of the harvesting and processing of fishery resources to the total economic fabric of Honolulu is small in comparison to other economic activities in the metropolitan area, such as tourism.

The Honolulu-based "sampan" fleet began to fish in the waters around the NWHI for bottomfish, lobster and other species in the early twentieth century. Most of these fishermen were Japanese immigrants who established tightly knit communities in Hawaii and adhered to many of the traditional fishing practices and customs of their homeland. As late as the 1970s, the majority of full-time commercial fishermen in the state were of Japanese descent (Garrod and Chong 1978). By the 1980s, however, a growing number of fishermen from the continental U.S. were relocating in Hawaii.

The arrival of newcomers from outside the state and increasing ethnic diversity within Hawaii's commercial fishing industry diminished some of the social cohesiveness that existed among Hawaii's early commercial fishermen. Nevertheless, networks of relations among fishery participants are still present and have a significant effect on fishing activity. For example, various groups of fishermen are still represented by a *hui* or organization, and these voluntary associations continue to play an important role in Hawaii's fishing industry. A case in point is the *hui* that permit holders in the NWHI lobster fishery formed in 1998. The members of the association negotiated an agreement whereby some permit holders consented to forego the 1998 season in exchange for a share of the revenues earned by those who would participate in the fishery.

The products of fishing supplied to the community at large may also have socio-cultural significance. For instance, beyond their dietary importance fish may be important items of exchange and gift giving that also help develop and maintain social relationships within the community. Alternatively, at certain celebratory meals various types of seafood may become imbued with specific symbolic meanings. Nearly a century ago Bryan (1915) developed a list of the various fish purchased in the Honolulu market by each of Hawaii's principal "nationalities." With specific regard to spiny lobster, Bryan (1915:469) wrote that the "... lively demand for them, owing to their excellent food qualities, brings large numbers of them fresh and sprawling into the markets every day." He also noted that the slipper lobster was "quite common in the markets" and "is a favorite food of the native people." The ethnic identification of Hawaii's *kama*ʻā*ina* (long-time residents) with particular species has continued to the present day. The large variety of fish typically offered in Hawaii's seafood markets reflects the diversity of ethnic groups in Hawaiʻi and their individual preferences, traditions, holidays and celebrations. For example, lobster are among the foods that take on a special meaning during *Oshogatsu* (Japanese New Year's), considered the most important cultural celebration for people of Japanese ancestry in Hawaii. According to Japanese tradition, a lobster symbolizes old age because of its bent body, but at the same time it expresses wishes for a youthful spirit and longevity (Clarke 1994).

5.3.2 Fish Stocks

The Crustaceans Management Unit Species are the spiny lobsters (*Panulirus marginatus* and *Panulirus penicillatus*), slipper lobsters (family Scyllaridae), and the Kona crab (*Ranina ranina*). The majority of the lobster catch in the Western Pacific Region is taken in the NWHI fishery, which targets two species: the endemic Hawaiian spiny lobster, *Panulirus marginatus,* and the common slipper lobster, *Scyllarides squammosus.* Three other species, the pronghorn spiny lobster *(Panulirus penicillatus),* ridgeback slipper lobster (*S. haanii*) and the Chinese slipper lobster (*Parribacus antarcticus*) are caught incidentally and in low abundance in the NWHI fishery.

Adult and juvenile Hawaiian spiny lobster occur throughout the NWHI from Nihoa Island to Kure Atoll (Uchida and Tagami 1984) at depths of 4-174 m (Uchida and Uchiyama 1986). In Hawaii, adult spiny lobster are typically found on rocky substrates in well-protected areas such as crevices and depressions in coral reef habitat. Although the Hawaiian spiny lobster inhabits waters up to 200 m in depth, most of the catch is taken from water depths less than 60 m. In an extensive resource survey conducted by the NMFS during the 1970s, populations of spiny lobster were found at 18 (69%) of the banks in the NWHI extending from Nihoa Island to Kure Atoll. No *P. marginatus* were found at the banks north of Kure Atoll (Uchida and Tagami 1984). Within the Hawaiian Archipelago, lobster abundance, size, and species ratio vary widely among islands and banks. Variations in abundance and species composition between banks is related to various environmental and biological factors including length of larval cycle, advection of larvae by oceanographic processes, availability of juvenile refuge habitat, and suitability of adult habitat.

5.3.2.1 Overfishing criteria and harvest guideline

To prevent overfishing a limit reference point was specified in Amendment 6 of the FMP. The amendment defined overfishing for the NWHI lobster stocks in terms of a spawning potential ratio (SPR) of 20%. Amendment 9 adopted a constant harvest rate strategy, with the rate based on acceptance of a 10% risk of overfishing. This level of risk was found through simulation modeling to correspond to a harvest rate of 13% of the exploitable NWHI lobster population. Additionally, the SPR level associated with optimum yield (50%) was established in Amendment 6 as a warning point that, if breached, would trigger consideration of remedial management action.

To calculate the harvest guideline for a given fishing season, estimates of the NWHI exploitable lobster population are produced by NMFS by applying a dynamic population model to the time-series of NWHI commercial catch and effort data. After each fishing season the model is updated with the current year's catch and effort data. Then model-based estimates of catchability, recruitment, and survival are used to estimate the exploitable population at the start of the next year's fishing season. The current year's catch and effort data provide both an input for model performance and a reference point for estimating the next year's exploitable population. After the exploitable population is estimated for the beginning of the next year's fishing season, the constant harvest rate of 13% is then applied to calculate the annual harvest guideline. Additionally, the current year's commercial catch and effort data are used to calculate SPR and fishing mortality as an indicator of how the fishery is performing with respect to the control rule criteria.

5.3.2.2 Stock status

Although there is substantial uncertainty about the status of the NWHI lobster stock, it has not been determined to be overfished, as indicated in the NMFS Annual Report to Congress on the Status of U.S. Fisheries—2001 (NMFS 2002b). Further information on the status of the crustaceans stocks, including the uncertainty in the assessment methods and the reasons for the closure of the fishery since 1999, is provided in Section 4.3.1.3.

5.3.3 Ecosystem and Habitat

For the purposes of designated Essential Fish Habitat (EFH), the Management Unit Species were separated into two assemblages based on their ecological relationships and preferred habitats. The Kona crab assemblage includes only Kona crab; the spiny and slipper lobster assemblage includes all the spiny and slipper lobster species.

The Council has designated Essential Fish Habitat (EFH) for larvae of the lobster species assemblage as the water column from the shoreline to the outer limit of the EEZ to depths of 150 m. The EFH for the settled, benthic juveniles and adults has been designated as the bottom habitat from the shoreline to a depth of 100 m. Benthic surveys of three NWHI banks (Necker Island, Maro Reef, and Lisianski Island) indicated that much of the lobster EFH was hard, relatively even substrate, with small depressions, often filled with sand. Macroalgal assemblages dominated most of this habitat (Parrish and Polovina 1994).

Research indicates that banks with summits shallower than 30 m deep support successful recruitment of juvenile spiny lobster, while deeper summits do not. For this reason, all summits shallower than 30 m deep have been designated as Habitat Areas of Particular Concern (HAPC).

The Council has designated EFH for the juvenile and adult life stages of the Kona crab as the shoreline to a depth of 100 m. EFH for this species larval stage is designated as the water column from the shoreline to the outer limit of the EEZ down to 150 m.

5.3.4 Protected Species

Concerns have been raised over prey competition between the lobster fishery and the endangered Hawaiian monk seal. One fatal interaction occurred in 1986 when a monk seal was drowned after becoming entangled in the bridle rope of a lobster pot set near Necker Island (Kinan 2002). However, there have been no further reports of such interactions. Monk seal colonies are located at Midway Atoll (a National Wildlife Refuge with no commercial fishing permitted within approximately 20 miles of shore) and five islands in Sub-area 4 (Pearl & Hermes Reef, Laysan Island, Lisianski Island, Kure Atoll, and French Frigate Shoals). In June 1999 an informal Section 7 consultation on the crustaceans fisheries examined the impacts of the implementation of bank-specific harvest guidelines and the potential for adverse impacts on monk seals resulting from the redistribution of fishing effort across the NWHI. The consultation also considered the preliminary results from a fatty acid study conducted to determine the importance of lobsters and other items in the diets of monk seals, as well as data from each major sub-population on the girth of monk seal pups at weaning. At the time of the consultation, the fatty acid results were inconclusive. Girth measurements of pups were provided as a measure of the ability of a mother to provision her offspring from energy stores and were used as an index of prey availability to pregnant females during their pregnancy. Pup girths were highest where sub-populations were growing (Pearl and Hermes Reef and Kure Atoll), intermediate where sub-populations were stable (Laysan or Lisianski Islands), and lowest where the sub-populations were declining (French Frigate Shoals). During the mid- and late 1990s pup girths increased at most sites, most notably at French Frigate Shoals, Laysan Island, and Lisianski Islands. Since that time, the fatty acid study has continued and preliminary results have indicated that lobster can be detected in monk seal blubber. To date, however, it has not been possible to determine the importance of lobster in diet of monk seals using the fatty acid technique. Monk seal pup girths have continued to increase at French Frigate Shoals, Laysan Island, and Lisianski Island and have shown little change at Pearl and Hermes Reef and Kure Atoll. Trends in the growth of each sub-population have not changed since this consultation.

The consultation concluded that there was no evidence to suggest that the establishment of bank-specific harvest guidelines based on a conservative 13% annual harvest rate would likely adversely affect Hawaiian monk seals.

No direct interactions with other protected species (e.g., sea turtles, seabirds, or other marine mammals) have been reported or observed in the NWHI lobster fishery.

6. Environmental Consequences of the Management Alternatives

This section describes the likely impacts of each of the alternatives, including the no-action alternative, based on criteria outlined in NOAA Administrative Order 216-6 (Section 6.02). Potential impacts are considered in the following areas: 1) socioeconomic impacts, 2) impacts on target and non-target fish stocks, 3) impacts on ocean and coastal habitat and essential fish habitat, 4) impacts on public health and safety, 5) impacts on protected species, 6) impacts on biodiversity and ecosystem function, and 7) cumulative impacts. In Section 6.9 is a discussion of the reasons for selecting the preferred alternative as the proposed measure.

It should be emphasized that the alternatives are non-regulatory and would have no immediate direct effect on the fisheries managed under the three FMPs. The two action alternatives would specify criteria that would be used to gauge the status of fish stocks and determine whether remedial action is needed. The no-action alternative would result in continuation of the use of the existing overfishing definitions. The three alternatives are summarized here:

Alternative 1 (no action) would propose no new management measures.

Alternative 2 would specify new overfishing thresholds (for stock biomass and fishing mortality) and a warning reference point (for stock biomass) for the managed stocks. These reference points and associated control rules would be dependent on the estimated value of the natural mortality rate (M) of a given stock. That value would be periodically re-estimated using the best available information. For the bottomfish and seamount groundfish stocks, a secondary, species-specific control rule would also be established to prevent recruitment overfishing of particular species. This alternative would not specify target or rebuilding control rules for the managed stocks. This alternative would establish a process for determining the status of stocks, which would include periodic re-estimations of M.

Alternative 3 would specify new overfishing thresholds and warning reference points identical to those in Alternative 2 except the value of M for a given stock would be specified in these amendments and remain fixed instead of being periodically re-estimated. Like Alternative 2, a secondary, species-specific control rule would also be established for the bottomfish and seamount groundfish stocks to prevent recruitment overfishing of particular species. Unlike Alternative 2, this alternative would specify target (optimum yield) and rebuilding control rules for the managed stocks. Like Alternative 2, this alternative would establish a process for determining the status of stocks, but it would not include a process for periodically re-estimating the value of M for a given stock since it would be treated as a fixed value.

Because some elements of a given alternative might be preferred for one FMP but not preferred for another, the descriptions of the alternatives in Section 4 broke them down into elements that correspond to the five subsections of Section 3:

1) MSY control rule and stock status determination criteria,
2) target control rule and reference points,
3) rebuilding control rule and reference points,
4) stock status determination process, and
5) measures to prevent overfishing and overfished stocks.

Table 31 indicates for each FMP and for each element (excluding the fifth, for which no alternative measures are proposed), the alternative that is preferred.

Table 31. Preferred alternative elements for each FMP

Element	Preferred alternative		
	Bottomfish	Pelagics	Crustaceans
MSY control rule and stock status determination criteria	2	2	2
Target control rule and reference points	2	2	3
Rebuilding control rule and reference points	2	2	3
Stock status determination process	2	2	2

6.1 Socioeconomic Impacts

6.1.1 Bottomfish and seamount groundfish FMP

The most substantial difference between Alternatives 2 and 3 is that the latter includes a target (OY) control rule while Alternative 2 does not. Although the OY control rule of Alternative 3 would have the intention of helping to achieve OY, it would not necessarily result in a greater chance of actual optimum yield being achieved than would Alternatives 1 or 2. This is because there is limited ability to measure and account for all the factors that influence optimum yield (in fact, the target rule specification in Alternative 3 accounted for no factors other than the need to be risk-averse with respect to the thresholds). For these reasons, it is not possible to determine which alternative is more likely to result in greater benefits from the fisheries or to the nation.

If stock status determinations in the future call for management action according to the specified control rules, regulatory measures could be implemented that might have socioeconomic effects. Such impacts are also possible under the no-action alternative, of course, but the process for determining when action is needed and for taking action would be somewhat more explicit under either of the two action alternatives than under the no-action alternative. For this reason, it is possible that the regulatory environment would be more predictable under Alternatives 2 and 3 than under the no-action alternative. Fishermen might be able to better anticipate regulatory changes under these alternatives and thereby avoid short-term adverse impacts on themselves and the economic performance of the fleet as a whole.

It is not known whether the overfishing threshold specifications proposed in Alternatives 2 and 3 would be more precautionary with respect to the fish stocks than the existing SPR-based thresholds under the no-action alternative. No stock assessments relative to the proposed criteria have been performed, so comparisons cannot be made.

The target control rules proposed under Alternative 3 might have the effect of being more precautionary (i.e., risk-averse with respect to the overfishing thresholds) than those under Alternative 2 (it depends on how closely fishery managers control fishing mortality to the target). The relationships between economic benefits and fishing mortality in these fisheries are too complicated to be able to predict how the degree of caution incorporated into the target control rules under Alternative 3 would impact economic performance (indeed, the lack of understanding of these relationships is a rationale for not specifying target control rules). It could be positive or negative relative to Alternatives 1 and 2.

6.1.2 Pelagics FMP

Neither of the two action alternatives would have any direct impact on economic performance, at least in the near term. The trans-boundary nature of the pelagic stocks would limit the effects of the two action alternatives relative to the no-action scenario. The overfishing thresholds proposed in Alternatives 2 and 3 may be more conservative than under Alternative 1, and the specifications proposed under Alternative 3, which include target reference points, may be more conservative (i.e., risk-averse with respect to the overfishing thresholds) than those under Alternative 2. However, the U.S. has very little control over stock-wide fishing mortality, and the only action the U.S. is likely to take in response to the stock-wide target control rule is to participate in international management frameworks. At least in the near term, it is therefore unlikely that there would be any differential effects among the three alternatives in terms of the socioeconomic impacts in the pelagics FMP fisheries. In the longer term, the specifications in Alternatives 2 and/or 3 could serve as models for international management agreements that could eventually lead to effects on the fisheries. Whether those effects would be positive or adverse is not possible to predict.

6.1.3 Crustaceans FMP

Because the target control rule under Alternative 3 is based on the existing harvest strategy, there is unlikely to be a substantial difference between the effects of Alternatives 1 and 3. Under Alternative 2, the existing harvest strategy would probably continue to be applied, so the socioeconomic impacts of Alternative 2 are unlikely to be substantially different than those of Alternatives 1 or 3.

Alternatives 2 and 3 would provide more explicit rules for management action than would Alternative 1. The rebuilding control rule of Alternative 3, for example, would provide an explicit trigger (MSST) for closing the fishery. Although this scenario is not substantially different from the no-action scenario (in which fishing mortality is prescriptively controlled each year and managers are allowed to close the fishery at any time), it is possible that the regulatory environment would be more predictable under Alternative 2, and particularly under Alternative 3, than under the no-action alternative. Fishermen might be able to better anticipate regulatory changes under these alternatives and thereby avoid short-term adverse impacts on themselves and the economic performance of the fishery as a whole.

6.2 Impacts on Target and Non-target Fish Stocks

6.2.1 Bottomfish and seamount groundfish FMP

It is not known whether the overfishing threshold specifications proposed in Alternatives 2 and 3 would be more precautionary with respect to the fish stocks than the existing SPR-based thresholds under the no-action alternative. No stock assessments relative to the proposed criteria have been performed, so comparisons cannot be made.

The specifications proposed under Alternative 3, which include target reference points, would probably have the effect of being more precautionary (i.e., risk-averse with respect to the overfishing thresholds) than those under Alternative 2, but the effect would depend on how closely fishery managers control fishing mortality to the target. In other words, the target reference points proposed in Alternative 3 would act as a precautionary guide, with the potential of safeguarding stocks more effectively than under Alternatives 1 and 2, but being targets rather than limits, the "influence" of the targets on management decisions may be limited.

Even in the absence of target reference points (e.g., Alternatives 1 and 2), there is a mechanism that serves to reduce the risk of breaching either of the two thresholds. Under the MSA, the Council must take remedial action if either of the two thresholds is being "approached" – that is, if it is projected that either threshold will be reached within two years. It is not clear whether the specification of a risk-averse target control rule such as the one proposed in Alternative 3 would provide any additional caution in terms of stock condition.

To the extent that the existing and proposed overfishing criteria serve to control fishing mortality on the MUS, they would also control fishing mortality on non-target stocks, since the control mechanisms would generally be applied to all fishing activity.

6.2.2 Pelagics FMP

The trans-boundary nature of the pelagic stocks would limit the effects of the two action alternatives relative to the no-action scenario. The overfishing thresholds proposed in Alternatives 2 and 3 may be more conservative than under Alternative 1, and the specifications proposed under Alternative 3 (which include target control rules) may be more conservative (i.e., risk-averse with respect to the overfishing thresholds) than those under Alternative 2. However, the U.S. has very little control over stock-wide fishing mortality, and the only action the U.S. is likely to take in response to the stock-wide target control rule is to participate in international management frameworks. At least in the near term, it is therefore unlikely that there would be any differential effects among the three alternatives in terms of the condition of fish stocks managed under the pelagics FMP fisheries. In the longer term, the specifications in Alternatives

2 and/or 3 could serve as models for international management agreements that could eventually lead to conservative effects on the stocks managed under the pelagics FMP.

To the extent that the existing and proposed overfishing criteria serve to control fishing mortality on the MUS, they would also control fishing mortality on non-target stocks, since the control mechanisms would generally be applied to all fishing activity.

6.2.3 Crustaceans FMP

It is not known whether the overfishing threshold specifications proposed in Alternatives 2 and 3 would be more precautionary with respect to the fish stocks than the existing SPR-based thresholds under the no-action alternative. No stock assessments relative to the proposed criteria have been performed, so comparisons cannot be made. Although the rebuilding control rule of Alternative 3 would provide an explicit trigger (MSST) for closing the fishery, it is not possible to predict whether the fishery would be managed more or less conservatively under these alternatives than under the no-action alternative (in which fishing mortality is prescriptively controlled each year and managers are allowed to close the fishery at any time).

Target control rules can serve to reduce the risk of stock depletion. Because the target control rule under Alternative 3 is based on the existing harvest strategy, there is unlikely to be a substantial difference between the effects of Alternatives 1 and 3. Under Alternative 2, the existing harvest strategy would probably continue to be applied, so the impact of Alternative 2 on lobster stocks is unlikely to be substantially different than those of Alternatives 1 or 3.

To the extent that the existing and proposed overfishing criteria serve to control fishing mortality on the MUS, they would also control fishing mortality on non-target stocks, since the control mechanisms would generally be applied to all fishing activity.

6.3 Impacts on Ocean and Coastal Habitat and Essential Fish Habitat

Neither of the action alternatives would have any direct effect on marine or coastal habitats, and neither would likely lead to substantial physical, chemical, or biological alterations of essential fish habitat (EFH) or habitat areas of particular concern (HAPC) for species managed under the Pelagics, Bottomfish and Seamount Groundfish, Precious Corals, or Crustaceans Western Pacific Fishery Management Plans. EFH and HAPC for these species groups have been designated as presented in Table 32. For the same reason, none of the alternatives is expected to cause substantial damage to ocean or coastal habitats.

Table 32. Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC) for species managed under the FMPs for the Pelagics, Bottomfish and Seamount Groundfish, Precious Corals, and Crustaceans Fisheries of the Western Pacific Region

SPECIES GROUP (FMP)	EFH (juveniles and adults)	EFH (eggs and larvae)	HAPC
Pelagics	water column down to 1,000m	water column down to 200m	water column down to 1,000m that lies above seamounts and banks
Bottomfish	water column and bottom down to 400m	water column down to 400m	all escarpments and slopes between 40-280 m, and three known areas of juvenile opakapaka habitat (2 off Oahu and 1 off Molokai)
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 to ~200m), bounded by 29° - 35° N and 171° E – 179° W	
Precious Corals	Keahole, Makapu'u, Kaena, Wespac, Brooks, and 180 Fathom gold/red coral beds, and Miloli'i, S. Kauai and Au'au Channel black coral beds	not applicable	Makapu'u, Westpac, and Brooks Bank beds, and the Au'au Channel
Crustaceans	bottom habitat from shoreline to a depth of 100m	water column down to 150m	all banks within the Northwestern Hawaiian Islands with summits less than 30m

All areas are bounded by the shoreline and the outer boundary of the EEZ unless indicated otherwise.

To the extent that fishing activity causes stress or damage to habitat, the level of any such stress or damage can be assumed to be largely a function of fishing effort. The relative effects of each of the alternatives on fishing effort are difficult to predict. However, it is unlikely that Alternatives 2 or 3 would result in greater levels of fishing effort in any of the FMP fisheries than the no-action alternative, and any differential impacts between Alternatives 2 and 3 would likely be small (see Section 6.2).

6.4 Impacts on Public Health and Safety

Neither of the action alternatives would likely have any impact on public health or safety.

6.5 Impacts on Protected Species

To the extent that fishing activity impacts protected species and/or their critical habitat (e.g., through incidental captures), such as species protected under the Endangered Species Act, Marine Mammal Protection Act, and Migratory Bird Treaty Act, the level of any such impacts can be assumed to be largely a function of fishing effort. The relative effects of each of the alternatives on fishing effort are difficult to predict. However, it is unlikely that Alternatives 2 or 3 would result in greater levels of fishing effort in any of the FMP fisheries than the no-action alternative, and any differential impacts between Alternatives 2 and 3 would likely be small (see Section 6.2).

6.6 Impacts on Biodiversity and Ecosystem Function

To the extent that fishing activity threatens or degrades biodiversity or ecosystem function, the level of any such threat or degradation can be assumed to be largely a function of fishing effort. The relative effects of each of the alternatives on fishing effort are difficult to predict. However, it is unlikely that Alternatives 2 or 3 would result in greater levels of fishing effort in any of the FMP fisheries than the no-action alternative, and any differential impacts between Alternatives 2 and 3 would likely be small (see Section 6.2).

6.7 Cumulative Impacts

For the trans-boundary pelagic stocks, the Council-managed fisheries impose only a small proportion of total fishing mortality. In order to prevent overfishing and prevent stocks from being overfished, the fishing mortality collectively exerted by all fleets would need to be controlled. A failure by any single jurisdiction (e.g., the Council) to adequately control its own incremental effort on a shared stock would result in cumulative adverse effects on the stocks if other jurisdictions similarly failed. Because the Pelagics FMP includes measures that serve to prevent localized depletion of stocks, the likelihood of such a "failure" is small. Nonetheless, Alternatives 2 and 3 provide stock-wide control rules that are more conservative than the purely localized mechanisms in place under the no-action alternative. If those prescriptive rules serve as useful models for region-wide adoption, they would serve to reduce the likelihood of adverse cumulative impacts on pelagic stocks relative to the no-action alternative. Because the inclusion of target control rules in Alternative 3 may serve to provide additional safeguards for fish stocks than under Alternative 2, Alternative 3 could serve to reduce the likelihood of these adverse cumulative impacts more than Alternative 2.

6.8 Areas of Controversy

The objectives of this management action and the measures contained in the alternatives do not appear to have generated any public concern, controversy, or opposition.

6.9 Reasons for Selecting the Preferred Alternative

6.9.1 Bottomfish and seamount groundfish FMP

Alternative 1 apparently fails to meet the requirements of the MSA with respect to the inclusion of objective and measurable overfishing criteria in FMPs, so Alternative 1 is not preferred and this discussion is limited to preferences between Alternatives 2 and 3.

6.9.1.1 MSY control rule and overfishing thresholds

The overfishing thresholds proposed in Alternatives 2 and 3 are identical except that under Alternative 3 the specifications would rely on a single, fixed, value of M while under Alternative 2 they would depend on the best currently available estimate of M. The two could yield different reference point values, and thus result in different stock status determinations (e.g., whether or not a stock is overfished). The potential differences in reference point values are likely to be relatively small and the likelihood of differences in stock status determinations is relatively small. Nonetheless, the flexible-M approach of Alternative 2 is preferred for two reasons. First, the accuracy and precision with which M can be estimated is likely to improve with time. Second, actual natural mortality rates of populations can be expected to vary over time. For example, natural mortality is generally highly dependent on age, so if the age distribution of a stock changes, so will the stock's overall natural mortality rate. For these reasons, the reference point values used under Alternative 2 would be more likely to reflect actual natural mortality rates than those used under Alternative 3. The flexible approach of Alternative 2 would not bring any greater management costs than Alternative 3 because there would not be any obligatory schedule for re-estimating M. It would likely be re-estimated only if and as new information becomes available from other sources. Alternative 2 is therefore preferred.

Another difference between Alternatives 2 and 3 is how B_{FLAG} is specified. With an M of 0.3, B_{FLAG} would be slightly lower in Alternative 3 than in Alternative 2. Given that B_{FLAG} is merely a warning point, the effects of any difference in its specification are likely to be small, and there is no strong preference for one over the other.

6.9.1.2 Target control rule and reference points

Alternative 3 includes a target control rule while Alternative 2 does not. To the extent that the target control rule is conservative with respect to the overfishing thresholds (in fact, that was the main criterion in formulating the target control rule of Alternative 3), it could serve to reduce the risk of breaching the thresholds. However, there is already an MSA requirement in place that requires that remedial action be taken in the case that either threshold is found to be "approached" – that is, project to be reached within two years. For that reason, the application of a precautionary target control rule would not necessarily result in a reduction in the risk of overfishing.

Besides helping to prevent overfishing, a target control could, of course, serve to guide management towards achieving optimum yield. However, in the case of the bottomfish fisheries, there is currently insufficient information available to quantitatively determine optimum yield and its associated fishing mortality with any useful degree of precision. The target control rule proposed in Alternative 3 could constrain the FMP's existing definition of optimum yield (see Section 4.1.1.2). The Council has determined that it would be better not to specify a target control rule at this time rather than to specify one that is likely to be poorly related to actual optimum yield. Alternative 2 is therefore preferred.

6.9.1.3 Rebuilding control rule and reference points

Alternative 3 includes a rebuilding control rule while Alternative 2 does not. Although

Alternative 3 is more proactive in this respect, its rebuilding control rule would have to be reexamined and possibly modified in the case that a stock is found to be overfished. This is because of the various biological and socioeconomic factors that must be considered in preparing a formal rebuilding plan. Therefore, there would be little practical difference between Alternatives 2 and 3. Alternative 2 is preferred because Alternative 3 would be a needless management action.

6.9.1.4 Stock status determination process

The only difference between Alternatives 2 and 3 is that the value of M would be fixed under Alternative 3 and flexible under Alternative 2. This difference stems directly from the difference in how the thresholds would be specified, so the preference for Alternative 2 in that element must extend to this element.

6.9.1.5 Summary

For the reasons listed above, and because there is unlikely to be a substantial difference between Alternatives 2 and 3 with respect to environmental impacts of the types discussed in the previous sections, all the elements of Alternative 2 are preferred for the Bottomfish and Seamount Groundfish FMP.

6.9.2 Pelagics FMP

Alternative 1 apparently fails to meet the requirements of the MSA with respect to the inclusion of objective and measurable overfishing criteria in FMPs, so Alternative 1 is not preferred and this discussion is limited to preferences between Alternatives 2 and 3.

6.9.2.1 MSY control rule and overfishing thresholds

The overfishing thresholds proposed in Alternatives 2 and 3 are identical except that under Alternative 3 the specifications would rely on a single, fixed, value of M while under Alternative 2 they would depend on the best currently available estimate of M. The two could yield different reference point values, and thus result in different stock status determinations (e.g., whether or not a stock is overfished). The potential differences in reference point values are likely to be relatively small and the likelihood of differences in stock status determinations is relatively small. Nonetheless, the flexible-M approach of Alternative 2 is preferred for two reasons. First, the accuracy and precision with which M can be estimated is likely to improve with time. Second, actual natural mortality rates of populations can be expected to vary over time. For example, natural mortality is generally highly dependent on age, so if the age distribution of a stock changes, so will the stock's overall natural mortality rate. For these reasons, the reference point values used under Alternative 2 would be more likely to reflect actual natural mortality rates than those used under Alternative 3. The flexible approach of Alternative 2 would not bring any greater management costs than Alternative 3 because there would not be any obligatory schedule for re-estimating M. It would likely be re-estimated only if and as new information becomes available from other sources. Alternative 2 is therefore preferred.

Another difference between Alternatives 2 and 3 is how B_{FLAG} is specified. With high values of

M (e.g., 0.5), B_{FLAG} would be lower in Alternative 3; with low values of M (e.g., 0.2), B_{FLAG} would be lower in Alternative 2. Given that B_{FLAG} is merely a warning point, the effects of any difference in its specification are likely to be small, and there is no strong preference for one over the other.

6.9.2.2 Target control rule and reference points

Alternative 3 includes a target control rule while Alternative 2 does not. To the extent that the target control rule is conservative with respect to the overfishing thresholds (in fact, that was the main criterion in formulating the target control rule of Alternative 3), it could serve to reduce the risk of breaching the thresholds. However, there is already an MSA requirement in place that requires that remedial action be taken in the case that either threshold is found to be "approached" – that is, projected to be reached within two years. For that reason, the application of a precautionary target control rule would not necessarily result in a reduction in the risk of overfishing.

Besides helping to prevent overfishing, a target control could, of course, serve to guide management towards achieving optimum yield. The target control rule proposed in Alternative 3 appears to be consistent with the Pelagic FMP's existing definition of optimum yield (see Section 4.2.1.2), and because of the trans-boundary nature of the stocks, it might not constrain the existing definition. Management action on the fisheries within Council jurisdiction is likely to have only small effects on stock-wide fishing mortality and biomass, as illustrated in Table 9. In other words, the utility of the specified control rules would be limited. Remedial management action would be largely limited to the participation of U.S. agencies in international management initiatives. For example, the control rules established here could be promoted as models for region-wide adoption. On the other hand, it is also important to note that the multilateral management authority anticipated to be established for the central and western Pacific may develop limits and targets based on different criteria than those mandated by the MSA and adopted by the Council. For example, both the International Commission for the Conservation of Atlantic Tunas (ICCAT) and the Inter-American Tropical Tuna Commission (IATTC) in the eastern Pacific treat F_{MSY} as a target level for fishing mortality rather than as a limit. If such an approach were adopted by a regional authority that was managing pelagic stocks in the central and western Pacific, the Council would need to consider adopting the same approach. The adoption by the Council of a more precautionary target control rule (e.g., F_{TARGET} = 0.75 MFMT) than that adopted by a regional management authority might conflict with MSA provisions intended to protect traditional levels of U.S. participation in internationally managed fisheries (e.g., §304(e)).

Given the complications associated with the trans-boundary nature of the pelagic stocks and the lack of information on the various factors needed to determine optimum yield, the Council has determined that it would be better not to specify a target control rule at this time rather than to specify one that is likely to be poorly related to actual optimum yield. Alternative 2 is therefore preferred.

6.9.2.3 Rebuilding control rule and reference points

Alternative 3 includes a rebuilding control rule while Alternative 2 does not. Although

Alternative 3 is more proactive in this respect, its rebuilding control rule would have to be reexamined and possibly modified in the case that a stock is found to be overfished. This is because of the various biological and socioeconomic factors that must be considered in preparing a formal rebuilding plan. Therefore, there would be little practical difference between Alternatives 2 and 3. Alternative 2 is preferred because Alternative 3 would be a needless management action.

6.9.2.4 Stock status determination process

The only difference between Alternatives 2 and 3 is that the values of M would be fixed under Alternative 3 and flexible under Alternative 2. This difference stems directly from the difference in how the thresholds would be specified, so the preference for Alternative 2 in that element must extend to this element.

6.9.2.5 Summary

For the reasons listed above, and because there is unlikely to be a substantial difference between Alternatives 2 and 3 with respect to environmental impacts of the types discussed in the previous sections, all the elements of Alternative 2 are preferred for the Pelagics FMP.

6.9.3 Crustaceans FMP

Alternative 1 apparently fails to meet the requirements of the MSA with respect to the inclusion of objective and measurable overfishing criteria in FMPs, so Alternative 1 is not preferred and this discussion is limited to preferences between Alternatives 2 and 3.

6.9.3.1 MSY control rule and overfishing thresholds

The overfishing thresholds proposed in Alternatives 2 and 3 are identical except that under Alternative 3 the specifications would rely on a single, fixed, value of M while under Alternative 2 they would depend on the best currently available estimate of M. The two could yield different reference point values, and thus result in different stock status determinations (e.g., whether or not a stock is overfished). The potential differences in reference point values are likely to be relatively small and the likelihood of differences in stock status determinations is relatively small. Nonetheless, the flexible-M approach of Alternative 2 is preferred for two reasons. First, the accuracy and precision with which M can be estimated is likely to improve with time. Second, actual natural mortality rates of populations can be expected to vary over time. For example, natural mortality is generally highly dependent on age, so if the age distribution of a stock changes, so will the stock's overall natural mortality rate. For these reasons, the reference point values used under Alternative 2 would be more likely to reflect actual natural mortality rates than those used under Alternative 3. The flexible approach of Alternative 2 would not bring any greater management costs than Alternative 3 because there would not be any obligatory schedule for re-estimating M. It would likely be re-estimated only if and as new information becomes available from other sources. Alternative 2 is therefore preferred.

6.9.3.2 Target control rule and reference points

Alternative 3 includes a target control rule while Alternative 2 does not. To the extent that the target control rule is conservative with respect to the overfishing thresholds, it could serve to reduce the risk of breaching the thresholds. However, given that there is a mechanism in place for remedial action to be taken in the case that either threshold is determined to be "approached," the application of a precautionary target control rule would not necessarily result in a reduction in the risk of overfishing. In the case of the NWHI lobster fishery, the existing constant harvest rate strategy is explicitly tied to a specified level of risk of overfishing. The Council has determined that such an approach continues to be the best one, and the Council prefers specifying a target control rule that is consistent with the existing policy, as proposed in Alternative 3.

Besides helping to prevent overfishing, a target control can, of course, serve to guide management towards achieving optimum yield. In the case of the NWHI lobster fishery, fairly detailed bioeconomic analyses have been performed. After many years of monitoring and adaptive management, it was determined that the most important criterion in establishing a harvest policy is risk with respect to overfishing. The existing harvest policy is based on acceptance of a 10% chance of overfishing, and that level is regarded as optimum yield. The Council prefers specifying a target control rule that is consistent with the existing policy, as proposed in Alternative 3.

6.9.3.3 Rebuilding control rule and reference points

Alternative 3 includes a rebuilding control rule while Alternative 2 does not. In contrast with the bottomfish and pelagic stocks, the Council has determined that it would be advantageous to specify a precautionary rebuilding control rule for the NWHI lobster stocks. The stocks in this fishery are harvested by a small number of participants in a limited access, seasonal pulse fishery in which rapid and strong management responses are necessary and already the norm. In other words, it has been determined that the socioeconomic impacts of a zero-fishing-mortality rebuilding control rule would be relatively small relative to the benefits of providing for rapid stock recovery should it be required. For this reason, Alternative 3 is preferred.

6.9.3.4 Stock status determination process

The only difference between Alternatives 2 and 3 is that the value of M would be fixed under Alternative 3 and flexible under Alternative 2. This difference stems directly from the difference in how the thresholds would be specified, so the preference for Alternative 2 in that element must extend to this element.

6.9.3.5 Summary

For the reasons listed above, and because there is unlikely to be a substantial difference between Alternatives 2 and 3 with respect to environmental impacts of the types discussed in the previous sections, the overfishing threshold and stock status determination process elements of Alternative 2 and the target control rule and rebuilding control rule elements of Alternative 3 are preferred for the Crustaceans FMP.

7. Consistency with National Standards for Fishery Conservation and Management

Section 301 of the MSA establishes ten national standards for fishery conservation and management. FMPs and their associated regulations must be consistent with the National Standards. The degree of consistency of the measures proposed in the preferred alternative is discussed below.

(1) 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 measures in these amendments are designed to prevent overfishing and achieve optimum yield on a continuing basis by identifying reference points and control rules that will trigger management action needed to prevent overfishing, prevent stocks from becoming overfished, and rebuild stocks should they become overfished, and to achieve optimum yield.

(2) Conservation and management measures shall be based on the best scientific information available.

The overfishing-related specifications made in these amendments were based on the best available information.

(3) 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 overfishing-related specifications made in these amendments were developed on a stock-wide basis. Most pelagic stocks are trans-boundary in nature. The amendments recognize that the contribution and participation of NMFS and the Council in regional management frameworks is essential to prevent shared stocks from being overfished.

(4) 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 proposed measures will not discriminate between residents of different States.

The measures in these amendments do not discriminate between residents of the different states and do not assign fishing privileges.

(5) 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 measures in these amendments, which are partly aimed at helping to achieve optimum yield, have taken into account economic factors. The primary purpose of these amendments is to prevent overfishing, prevent stocks from being overfished, and provide for the rebuilding of stocks should they become overfished.

(6) *Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources and catches*

The measures in these amendments have taken into account and allowed for variations among, and contingencies in, fisheries, fishery resources, and catches.

(7) *Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.*

The measures in these amendments establish stock assessment and management procedures that may require additional costs, but the measures compliment and do not duplicate existing activities.

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

The measures in these amendments are non-regulatory. Consideration of any regulatory measures that stem from the management processes established in this amendment would take into account the importance of fishery resources to fishing communities.

(9) *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 measures in these amendments will have no direct effect on bycatch, but may lead to measures affecting bycatch. Because the measures would serve to control fishing effort, they would serve to control fishing mortality of non-target species as well as target species.

(10) *Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.*

The measures in these amendments will have no effect on human safety.

8. Relationship to Other Applicable Laws and Provisions of the Magnuson-Stevens Act

8.1 National Environmental Policy Act (NEPA)

This document 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. It contains the elements consistent with an Environmental Assessment (EA), including an assessment of the likely impacts of several alternative measures. This serves as a determination of the need for an Environmental Impact Statement. NEPA requires preparation of an Environmental Impact Statement if the EA does not support a finding of no significant impact.

The purpose and need for action is described in Section 3 of this document. A description of the affected environment is provided in Section 5. A description of the alternatives considered is in Section 4. A discussion of the likely impacts of the alternatives is in Section 6. Previously approved sections of Amendment 6 to the Bottomfish FMP, Amendment 8 to the Pelagics FMP, and Amendment 10 to the Crustaceans FMP provide further details on essential fish habitat and habitat areas of particular concern.

8.1.1 Conclusions and Determination (Finding of No Significant Impact)

a. The preferred alternative is not expected to result in any substantial adverse socioeconomic impacts in the bottomfish and seamount groundfish fisheries, pelagic fisheries, or crustaceans fisheries; as it is likely to have only minor effects of any kind, and in the long terms, may serve to stabilize the fisheries (Section 6.1).

b. The preferred alternative is not expected to jeopardize the sustainability of any target or non-target fish stocks, as it will provide objective criteria for recognizing, preventing, and reacting to overfishing, the conservation benefits of which will also apply to non-target stocks (Section 6.2).

c. The preferred alternative is not expected to cause substantial damage to ocean and coastal habitats or essential fish habitat as defined under the Magnuson-Stevens Act and identified in FMPs, as it is not likely to lead to substantial physical, chemical, or biological alterations of these habitats (Section 6.3).

d. The preferred alternative is not expected to have a substantial adverse impact on public health or safety, as it is not likely to substantially affect any public health or safety aspect of the fisheries or their associated economic sectors (Section 6.4).

e. The preferred alternative is not expected to adversely affect any species protected under the Endangered Species Act or their critical habitat or any species protected under the Marine Mammal Protection Act or the Migratory Bird Treat Act, as it is unlikely to result in greater levels of fishing effort (and any attendant impacts on protected species) than under the no-action alternative (Section 6.5).

f. The preferred alternative is not expected to have a substantial impact on biodiversity or ecosystem function within the affected area, as it is unlikely to result in greater levels of fishing effort (and any attendant impacts on biodiversity or ecosystem function) than under the no-action alternative (Section 6.6).

g. The preferred alternative is not expected to result in any cumulative adverse effects, as it would likely serve to reduce the likelihood of cumulative impacts associated with the trans-boundary nature of the pelagic stocks (Section 6.7).

h. The preferred alternative is not controversial, as it does not appear to have generated any public concern or opposition (Section 6.8).

Based on the information contained in the Environmental Assessment and other sections of this document, I have determined that the preferred alternative, which would amend the Fishery

Management Plans for the Bottomfish and Seamount Groundfish Fisheries, Pelagics Fisheries, and Crustaceans Fisheries of the Western Pacific Region to include specifications of objective and measurable criteria for determining when fish stocks are overfished, and to establish processes for applying these criteria, is consistent with existing national environmental policies and objectives set forth in sections 101(a) and 101(b) of the National Environmental Policy Act and will not have a significant impact on the quality of the human environment. As described in section 5.03.c of NOAA Administrative Order 216-6, a Finding of No Significant Impact is supported and appropriate for the preferred alternative. Therefore, preparation of an Environmental Impact Statement for the preferred alternative is not required by Section 102(c) of the National Environmental Policy Act or its implementing regulations.

William T. Hogarth — Date

NOAA Assistant Administrator for Fisheries

8.2 Regulatory Impact Review (RIR)

Executive Order 12866 requires that long-term national net costs and benefits of significant regulatory actions be assessed through the preparation of a Regulatory Impact Review (RIR). None of the alternatives in these amendments proposes any regulatory changes, so an RIR is not required. If in the future regulatory action is proposed that is related to the specification of overfishing criteria, the necessary RIR will be completed.

8.3 Regulatory Flexibility Act (RFA)

The Regulatory Flexibility Act (RFA), 5 U.S.C. 601 *et seq*., requires government agencies to assess the impact of their proposed regulations on small entities, including small businesses, small non-profit organizations, and small governments. None of the alternatives in these amendments proposes any regulatory changes, so an RFA analysis is not required. If in the future regulatory action is proposed that is related to the specification of overfishing criteria, the necessary RFA analyses will be completed.

8.4 Coastal Zone Management Act (CZMA)

The CZMA requires a determination that a FMP or amendment has no effect on the land or water uses or natural resources of the coast zone, or is consistent to the maximum extent practicable with an affected state's approved coastal zone management program. A copy of the proposed amendments will be submitted to the appropriate agencies in American Samoa, Commonwealth of the Northern Mariana Islands, Guam, and Hawaii for review and concurrence with a determination made by the Council that the amendments are consistent, to the maximum extent practicable, with the coastal zone management programs of those jurisdictions.

8.5 Endangered Species Act (ESA)

Several species listed as endangered or threatened under the Endangered Species Act (ESA) occur in the areas fished by the bottomfish and pelagics fisheries. These include marine mammals, sea turtles and seabirds. The species of concern are:

Marine Mammals	**Status**
Hawaiian monk seal (*Monachus schauinslandi*)	Endangered
Humpback whale (*Megaptera novaeangliae*)	Endangered
Sperm whale (*Physeter macrocephalus*)	Endangered
Northern Pacific right whale (*Eubalaena japonica*)	Endangered
Blue whale (*Balaenoptera musculus*)	Endangered
Fin whale (*Balaenoptera physalus*)	Endangered
Sei whale (*Balaenoptera borealis*)	Endangered
Sea Turtles	
Green turtle (*Chelonia mydas*)	Threatened/Endangered
Hawksbill turtle (*Eretmochelys imbricata*)	Endangered
Leatherback turtle (*Dermochelys coriacea*)	Endangered
Loggerhead turtle (*Caretta caretta*)	Threatened

Olive Ridley turtle (*Lepidochelys olivacea*)	Threatened/Endangered

Seabirds

Short-tailed albatross (*Phoebastria albatrus*)	Endangered
Newell's shearwater (*Puffinus auricularis newelli*)	Endangered

Endangered species in the affected region and their relationships to the three FMP fisheries are discussed in Sections 5.1.4 (bottomfish), 5.2.5 (pelagics), and 5.3.4 (crustaceans). Further information is available in recent NEPA documents, including the Final EIS for the pelagics fisheries (NMFS 2001b), the Preliminary Draft EIS for the bottomfish fisheries (WPRFMC 2001b), and the Preliminary Draft Supplement EIS for the crustaceans fisheries (WPRFMC 2001d). The effects of the bottomfish and pelagics fisheries on the marine mammals and sea turtles listed above are reviewed in recent Biological Opinions issued by NMFS (2002b and 2001a).

Following is a brief description of the management alternatives (see Section 4 for more details.)

Alternative 1 (no action) would propose no new management measures. The stocks in the three FMP fisheries would continue to be assessed using the existing overfishing definitions, which apparently fail to meet the requirements of the MSA with respect to the inclusion of objective and measurable overfishing criteria in FMPs.

Alternative 2 would specify new overfishing thresholds (for stock biomass and fishing mortality) and a warning reference point (for stock biomass) for the managed stocks. These reference points and associated control rules would be dependent on the estimated value of the natural mortality rate (M) of a given stock. That value would be periodically re-estimated using the best available information. For the bottomfish and seamount groundfish stocks, a secondary, species-specific control rule would also be established to prevent recruitment overfishing of particular species. This alternative would not specify target or rebuilding control rules for the managed stocks. This alternative would establish a process for determining the status of stocks, which would include periodic re-estimations of M.

Alternative 3 would specify new overfishing thresholds and warning reference points identical to those in Alternative 2 except the value of M for a given stock would be specified in these amendments and remain fixed instead of being periodically re-estimated. Like Alternative 2, a secondary, species-specific control rule would also be established for the bottomfish and seamount groundfish stocks to prevent recruitment overfishing of particular species. Unlike Alternative 2, this alternative would specify target (optimum yield) and rebuilding control rules for the managed stocks. Like Alternative 2, this alternative would establish a process for determining the status of stocks, but it would not include a process for periodically re-estimating the value of M for a given stock since it would be treated as a fixed value.

The alternatives' likely impacts on ESA-listed species are described below for each of the FMPs.

8.5.1 Bottomfish and seamount groundfish FMP

To the extent that fishing activity impacts listed species and/or their critical habitat (e.g., through incidental catches), the level of any such impacts can be assumed to be largely a function of fishing effort. The likely effects of the alternatives on fishing effort are discussed below.

It is not known whether the overfishing threshold specifications proposed in Alternatives 2 and 3 would be more precautionary with respect to fishing mortality (and effort) than the existing SPR-based thresholds that would be used under the no-action alternative. No stock assessments relative to the proposed criteria have been performed, so comparisons cannot be made.

The specifications proposed under Alternative 3, which include target reference points, would probably have the effect of being more precautionary (i.e., risk-averse with respect to the overfishing thresholds) than those under Alternative 2, but the effect would depend on how closely fishery managers control fishing mortality to the target. In other words, the target reference points proposed in Alternative 3 would act as a precautionary guide, with the potential of safeguarding stocks more effectively than under Alternatives 1 and 2, but being targets rather than limits, the "influence" of the targets on management decisions may be limited.

Even in the absence of target reference points (e.g., Alternatives 1 and 2), there is a mechanism that serves to reduce the risk of breaching either of the two thresholds. Under the MSA, the Council must take remedial action if either of the two overfishing thresholds is being "approached" – that is, if it is projected that either threshold will be reached within two years. It is not clear whether the specification of a risk-averse target control rule such as the one proposed in Alternative 3 would provide any additional caution in terms of fishing mortality (and effort).

In summary, it is unlikely that Alternatives 2 or 3 would result in greater levels of fishing effort in the bottomfish fisheries than the no-action alternative, and any differential impacts between Alternatives 2 and 3 would likely be small. It is therefore unlikely that either of the action alternatives would adversely impact any ESA-listed species.

8.5.2 Pelagics FMP

To the extent that fishing activity impacts listed species and/or their critical habitat (e.g., through incidental catches), the level of any such impacts can be assumed to be largely a function of fishing effort. The likely effects of the alternatives on fishing effort are discussed below.

The trans-boundary nature of the pelagic stocks would limit the effects of the two action alternatives relative to the no-action scenario. The overfishing thresholds proposed in Alternatives 2 and 3 may be more conservative than under Alternative 1, and the specifications proposed under Alternative 3, which include target reference points, may be more conservative (i.e., risk-averse with respect to the overfishing thresholds) than those under Alternative 2. However, the U.S. has very little control over stock-wide fishing mortality, and the only action the U.S. is likely to take in response to the stock-wide target control rule is to participate in international management frameworks. At least in the near term, it is therefore unlikely that there would be any substantial differential effects among the three alternatives in terms of fishing mortality and effort in any of the fisheries managed under the pelagics FMP fisheries. In the longer term, the specifications in Alternatives 2 and/or 3 could serve as models for international management agreements that could eventually lead to conservative effects on fishing mortality and effort in these fisheries.

In summary, it is unlikely that Alternatives 2 or 3 would result in greater levels of fishing effort in the pelagic fisheries than the no-action alternative, and any differential impacts between Alternatives 2 and 3 would likely be small. It is therefore unlikely that either of the action alternatives would adversely impact any ESA-listed species.

8.5.3 Crustaceans FMP

To the extent that fishing activity impacts listed species and/or their critical habitat (e.g., through incidental catches), the level of any such impacts can be assumed to be largely a function of fishing effort. The likely effects of the alternatives on fishing effort are discussed below.

It is not known whether the overfishing threshold specifications proposed in Alternatives 2 and 3 would be more precautionary with respect to the fish stocks than the existing SPR-based thresholds under the no-action alternative. No stock assessments relative to the proposed criteria have been performed, so comparisons cannot be made. Although the rebuilding control rule of Alternative 3 would provide an explicit trigger (MSST) for closing the fishery, it is not possible to predict whether the fishery would be managed more or less conservatively under these alternatives than under the no-action alternative (in which fishing mortality is prescriptively controlled each year and managers are allowed to close the fishery at any time).

Target control rules can serve to reduce the risk of stock depletion. Because the target control rule under Alternative 3 is based on the existing harvest strategy, there is unlikely to be a substantial difference between the effects of Alternatives 1 and 3. Under Alternative 2, the existing harvest strategy would probably continue to be applied, so the impact of Alternative 2 on lobster stocks is unlikely to be substantially different than those of Alternatives 1 or 3.

In summary, it is unlikely that Alternatives 2 or 3 would result in greater levels of fishing effort in the crustaceans fisheries than the no-action alternative, and any differential impacts between Alternatives 2 and 3 would likely be small. It is therefore unlikely that either of the action alternatives would adversely impact any ESA-listed species.

8.6 Marine Mammal Protection Act (MMPA)

All U.S.-managed fisheries in the Western Pacific Region are classified as Category III under Section 118 of the Marine Mammal Protection Action of 1992 (MMPA), meaning that the fisheries were determined by NMFS "to have a remote likelihood of, or no known incidental mortality and serious injury of marine mammals" (50 CFR 229.2). Vessel owners and crew that are engaged only in Category III fisheries may incidentally take marine mammals without registering or receiving an Authorization Certificate under the MMPA, but they are required to: 1) report all incidental mortality and injury of marine mammals to NMFS, 2) immediately return to the sea with minimum of further injury any incidentally taken marine mammal, 3) allow vessel observers if requested by NMFS, and 4) comply with guidelines and prohibitions under the

MMPA when deterring marine mammals from gear, catch, and private property (50 CFR 229.5, 229.6, 229.7).

Any species listed as endangered or threatened under the ESA is considered to be depleted under the MMPA, and any incidental take of that species must be authorized under Section 101(a)(5) of the MMPA, subject to a determination by the Secretary of Commerce that any incidental mortality or serious injury will have a negligible impact on the affected species or stock and that a recovery plan has been developed or is being developed under the ESA for the species or stock. Such incidental take for the Hawaiian monk seal has not yet been authorized for the bottomfish fisheries, and there is no need for such authorization in any of the fisheries for any other ESA-listed marine mammals.

Species of marine mammals that are protected under the MMPA but not listed as threatened or endangered and that occur in the areas where the four FMP fisheries operate include the following:

Pacific white-sided dolphin (*Lagenorhynchus obliquidens*)
Rough-toothed dolphin (*Steno bredanensis*)
Risso's dolphin *(Grampus griseus*)
Bottlenose dolphin (*Tursiops truncatus)*
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 *(Globicephala melas*)
Blainsville's beaked whale *(Mesoplodon densirostris*)
Cuvier's beaked whale (*Ziphius cavirostris*)
Pygmy sperm whale (*Kogia breviceps*)
Dwarf sperm whale (*Kogia simus*)
Bryde's whale (*Balaenoptera edeni*)

Marine mammals in the affected region and their relationships to the three FMP fisheries are discussed in Sections 5.1.4 (bottomfish), 5.2.5 (pelagics), and 5.3.4 (crustaceans). Further information is available in recent NEPA documents, including the Final EIS for the pelagics fisheries (NMFS 2001b), the Preliminary Draft EIS for the bottomfish fisheries (WPRFMC 2001b), and the Preliminary Draft Supplement EIS for the crustaceans fisheries (WPRFMC 2001d).

Following is a brief description of the management alternatives (see Section 4 for more details.)

Alternative 1 (no action) would propose no new management measures. The stocks in the three FMP fisheries would continue to be assessed using the existing overfishing definitions, which apparently fail to meet the requirements of the MSA with respect to the inclusion of objective and measurable overfishing criteria in FMPs.

Alternative 2 would specify new overfishing thresholds (for stock biomass and fishing mortality) and a warning reference point (for stock biomass) for the managed stocks. These reference points and associated control rules would be dependent on the estimated value of the natural mortality rate (M) of a given stock. That value would be periodically re-estimated using the best available information. For the bottomfish and seamount groundfish stocks, a secondary, species-specific control rule would also be established to prevent recruitment overfishing of particular species. This alternative would not specify target or rebuilding control rules for the managed stocks. This alternative would establish a process for determining the status of stocks, which would include periodic re-estimations of M.

Alternative 3 would specify new overfishing thresholds and warning reference points identical to those in Alternative 2 except the value of M for a given stock would be specified in these amendments and remain fixed instead of being periodically re-estimated. Like Alternative 2, a secondary, species-specific control rule would also be established for the bottomfish and seamount groundfish stocks to prevent recruitment overfishing of particular species. Unlike Alternative 2, this alternative would specify target (optimum yield) and rebuilding control rules for the managed stocks. Like Alternative 2, this alternative would establish a process for determining the status of stocks, but it would not include a process for periodically re-estimating the value of M for a given stock since it would be treated as a fixed value.

The alternatives' likely impacts on marine mammals are described below for each of the FMPs.

8.6.1 Bottomfish and seamount groundfish FMP

To the extent that fishing activity impacts marine mammal species (e.g., through incidental catches), the level of any such impacts can be assumed to be largely a function of fishing effort. The likely effects of the alternatives on fishing effort are discussed below.

It is not known whether the overfishing threshold specifications proposed in Alternatives 2 and 3 would be more precautionary with respect to fishing mortality (and effort) than the existing SPR-based thresholds that would be used under the no-action alternative. No stock assessments relative to the proposed criteria have been performed, so comparisons cannot be made.

The specifications proposed under Alternative 3, which include target reference points, would probably have the effect of being more precautionary (i.e., risk-averse with respect to the overfishing thresholds) than those under Alternative 2, but the effect would depend on how closely fishery managers control fishing mortality to the target. In other words, the target reference points proposed in Alternative 3 would act as a precautionary guide, with the potential of safeguarding stocks more effectively than under Alternatives 1 and 2, but being targets rather than limits, the "influence" of the targets on management decisions may be limited.

Even in the absence of target reference points (e.g., Alternatives 1 and 2), there is a mechanism that serves to reduce the risk of breaching either of the two thresholds. Under the MSA, the Council must take remedial action if either of the two overfishing thresholds is being "approached" – that is, if it is projected that either threshold will be reached within two years. It is not clear whether the specification of a risk-averse target control rule such as the one proposed in Alternative 3 would provide any additional caution in terms of fishing mortality (and effort).

In summary, it is unlikely that Alternatives 2 or 3 would result in greater levels of fishing effort in the bottomfish fisheries than the no-action alternative, and any differential impacts between Alternatives 2 and 3 would likely be small. It is therefore not likely that either of the action alternatives would adversely impact any marine mammal species.

8.6.2 Pelagics FMP

To the extent that fishing activity impacts marine mammals (e.g., through incidental catches), the level of any such impacts can be assumed to be largely a function of fishing effort. The likely effects of the alternatives on fishing effort are discussed below.

The trans-boundary nature of the pelagic stocks would limit the effects of the two action alternatives relative to the no-action scenario. The overfishing thresholds proposed in Alternatives 2 and 3 may be more conservative than under Alternative 1, and the specifications proposed under Alternative 3, which include target reference points, may be more conservative (i.e., risk-averse with respect to the overfishing thresholds) than those under Alternative 2. However, the U.S. has very little control over stock-wide fishing mortality, and the only action the U.S. is likely to take in response to the stock-wide target control rule is to participate in international management frameworks. At least in the near term, it is therefore unlikely that there would be any substantial differential effects among the three alternatives in terms of fishing mortality and effort in any of the fisheries managed under the pelagics FMP fisheries. In the longer term, the specifications in Alternatives 2 and/or 3 could serve as models for international management agreements that could eventually lead to conservative effects on fishing mortality and effort in these fisheries.

In summary, it is unlikely that Alternatives 2 or 3 would result in greater levels of fishing effort in the pelagic fisheries than the no-action alternative, and any differential impacts between Alternatives 2 and 3 would likely be small. It is therefore not likely that either of the action alternatives would adversely impact any marine mammal species.

8.6.3 Crustaceans FMP

To the extent that fishing activity impacts marine mammals (e.g., through incidental catches), the level of any such impacts can be assumed to be largely a function of fishing effort. The likely effects of the alternatives on fishing effort are discussed below.

It is not known whether the overfishing threshold specifications proposed in Alternatives 2 and 3 would be more precautionary with respect to the fish stocks than the existing SPR-based thresholds under the no-action alternative. No stock assessments relative to the proposed criteria have been performed, so comparisons cannot be made. Although the rebuilding control rule of Alternative 3 would provide an explicit trigger (MSST) for closing the fishery, it is not possible to predict whether the fishery would be managed more or less conservatively under these alternatives than under the no-action alternative (in which fishing mortality is prescriptively controlled each year and managers are allowed to close the fishery at any time).

Target control rules can serve to reduce the risk of stock depletion. Because the target control rule under Alternative 3 is based on the existing harvest strategy, there is unlikely to be a substantial difference between the effects of Alternatives 1 and 3. Under Alternative 2, the existing harvest strategy would probably continue to be applied, so the impact of Alternative 2 on lobster stocks is unlikely to be substantially different than those of Alternatives 1 or 3.

In summary, it is unlikely that Alternatives 2 or 3 would result in greater levels of fishing effort in the crustaceans fisheries than the no-action alternative, and any differential impacts between Alternatives 2 and 3 would likely be small. It is therefore not likely that either of the action alternatives would adversely impact any marine mammal species.

8.7 Executive Order 13089

Executive Order 13089 on Coral Reef Protection directs federal agencies to use their authorities to protect coral reef ecosystems and, to the extent permitted by law, prohibits them from authorizing, funding or carrying out any action that will degrade these ecosystems.

All three of the alternatives considered in these amendments are consistent with the objectives and recommendations of this Executive Order for the following reasons. Some of the affected fisheries operate in, or in close proximity to, coral reef ecosystems, and all of them have the potential to affect coral reef ecosystems through ecosystem links. To the extent that fishing activity has the potential to affect coral reef ecosystems (e.g., through the capture of coral reef-associated species, vessel groundings, pollutant spills from fishing vessels, or anchor damage), the level of any such impacts can be assumed to be largely a function of fishing effort. The two action alternatives would specify criteria to be used to assess stock status and trigger remedial action. The relative effects of each of the alternatives on fishing effort are difficult to predict. However, it is unlikely that Alternatives 2 or 3 would result in greater levels of fishing effort in any of the FMP fisheries than the no-action alternative, and any differential impacts between Alternatives 2 and 3 would likely be small. It is therefore unlikely that either of the action alternatives would degrade coral reef ecosystems.

8.8 Paperwork Reduction Act (PRA)

The purpose of the Paperwork Reduction Act of 1995 is to minimize the paperwork burden on the public. The Act requires federal agencies to ensure that information collected from the public is needed and is collected in an efficient manner (44 U.S.C. 3501 (1)). None of the alternatives considered in these amendments would impose new record keeping or reporting requirements on the public.

8.9 Traditional Indigenous Fishing Practices

The Magnuson-Stevens Act requires the Western Pacific Council to take into account traditional fishing practices in preparing any FMP or amendment. No management measures proposed in this document will adversely affect traditional indigenous fishing practices in the western Pacific.

Section 305(i) of the Magnuson-Stevens Fishery Conservation and Management Act provides for the establishment of a Western Pacific Community Development Program for any fishery under the authority of the Council. This provision results from concern that communities consisting of descendants of indigenous peoples in the Council's area have not been appropriately sharing in the benefits from the area's fisheries. The Council and the Secretary, respectively, have discretion to develop and to approve programs for eligible communities for the purpose of enhancing access to the fisheries under the authority of the Council. The range of acceptable content of these programs will be determined by the Council and the Secretary working together through the FMP process.

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