Magnuson-Stevens Act Definitions and Required Provisions

Amendment 6 to the Bottomfish and Seamount Groundfish Fisheries Management Plan
Amendment 8 to the Pelagic Fisheries Management Plan
Amendment 10 to the Crustaceans Fisheries Management Plan
Amendment 4 to the Precious Corals Fisheries Management Plan
September 1998

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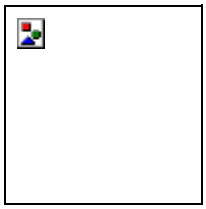

A publication of the Western Pacific Regional Fishery Management Council pursuant to National Oceanic and Atmospheric Administration Award Nos. NA87FC0006 and NA87FC0014

Summary

This amendment adds new Magnuson-Stevens Act definitions to the fishery management plans (FMPs) of the western Pacific region and addresses the requirement of the Act that any FMP contain provisions regarding bycatch, fishing sectors, essential fish habitat (EFH), fishing communities and overfishing. The amendment compiles the best available scientific information pertaining to each of these new provisions and incorporates it directly or by reference into the Western Pacific Council's FMPs for bottomfish and seamount groundfish, pelagics, crustaceans and precious corals fisheries. In addition, the amendment identifies other scientific data that are needed to more effectively address the new provisions. A summary of the Council's response to each provision follows.

Establish Reporting Methodology for Bycatch (Section 4.1)

The combination of information collected from National Marine Fisheries Service (NMFS) observer programs and research cruises and the various catch reporting systems that comprise the Western Pacific Fishery Information Network (WPacFIN) is sufficient to estimate with some confidence the amount and type of bycatch in FMP fisheries. Although the current focus of catch reporting systems is on monitoring the volume and disposition of landed target species, detailed discard information on target catches is reported by certain vessel types, such as Hawaii-based longline vessels and Northwestern Hawaiian Islands (NWHI) bottomfish vessels. Modification of survey methodologies or catch report forms may enhance the ability of existing catch reporting systems to monitor discards for other gear types. However, it will continue to be important to supplement bycatch information collected by catch reporting systems with

bycatch data gathered from observer programs or research cruises conducted by NMFS and other agencies, such as the Secretariat for the Pacific Community (SPC).

Scientific Data Needs:

Field testing of modified creel surveys or catch reporting forms to determine if additional information on the amount and type of bycatch in FMP fisheries can be collected without imposing an excessive reporting burden on fishermen.

Continued and, if possible, expanded research cruises and observer programs to provide estimates of the type and amount bycatch that occurs with various gear types.

Minimize Bycatch and Bycatch Mortality (Section 4.1)

The prevalent gear types used in the region are variations of hook and line (with a small amount of trapping for lobster in Hawaii) that tend to be fairly selective. However, the amount of bycatch in the region's fisheries can be further reduced by developing and promoting uses for the fish that are generally discarded. For example, NMFS is currently sponsoring a study to determine whether markets exist (or can be developed) for the meat, hides, etc. of the sharks caught by domestic longline vessels. With regard to minimizing bycatch mortality, it would be difficult to reduce mortality with the gear types currently used in FMP fisheries.

Scientific Data Needs:

Research on potential uses of and markets for fish that are currently discarded in order to minimize waste and encourage full utilization.

Survival rate studies of live discards in order to more accurately estimate bycatch mortality.

Specify Data on Commercial, Recreational and Charter Fishing and Quantify Trends in Landings in These Sectors (Section 4.2)

Information contained in the FMPs and amendments is supplemented and updated by the annual reports prepared by the Council for each fishery. Included in the annual reports are data on total weight of fish landed by species, weight of fish sold, fishing effort, average price, revenue and annual catch per unit effort (CPUE). Such detailed information is collected for both the commercial and charter sectors in all four island areas except for the Northern Mariana Islands, where the fishery data collection system has been significantly reduced. Information on the size and composition of recreational catches of pelagic and bottomfish species in Hawaii is not collected by any ongoing data collection programs. Furthermore, no recreational fishing surveys have been recently conducted in the Pacific Insular Areas to supplement information collected by current creel surveys. Currently, the unsold portion of reported catches is considered to be the recreational catch.

Scientific Data Needs:

Marine recreational fishing surveys in order to more accurately quantify landings in the recreational sector.

Assistance to the Northern Mariana Islands Division of Fish and Wildlife (DFW) to re-establish the creel survey program.

Describe Essential Fish Habitat and Minimize Adverse Effects (Section 4.3)

Because there are large gaps in scientific knowledge about the life histories and habitat requirements of many FMP species, the Council has adopted a precautionary approach in designating essential fish habitat (EFH). With the exception of the EFH for precious corals, the designations consist of the depth ranges within the exclusive economic zone

(EEZ) of certain life stages of some FMP species. In addition, the Council identified habitat areas of particular concern (HAPC). For adult and juvenile bottomfish species, the water column and all bottom habitat from the shorelines of all islands to a depth of 400 m are designated EFH. For bottomfish eggs and larvae, the shoreline to the outer limit of the EEZ to a depth of 400 m are designated EFH. Slopes and escarpments at a depth of 40 to 280 m and three known areas of juvenile bottomfish habitat are designated HAPC. EFH for the adult life stage of the seamount groundfish complex is all waters and bottom habitat bounded by latitude 29 –35 N and longitude 171 E–179 W between 80–600 m. EFH for eggs, larvae and juveniles is the epipelagic zone of all waters bounded by latitude 29 –35 N and longitude 171 E–179 W. Pelagic species EFH is the shoreline to the outer limit of the EEZ to a depth of 1,000 m. In addition, areas outside the EEZ are considered important habitat. HAPC are all seamounts and banks around islands from the shoreline to the outer limit of the EEZ down to 2,000 m. Crustacean larvae EFH is the shoreline to the outer limit of the EEZ down to a depth of 150 m; adult and juvenile crustacean EFH extends to a depth of 100 m. HAPC are Maro Reef, Necker Island, Gardner Pinnacles and all other banks in the NWHI with summits less than or equal to 30 m deep. Precious corals EFH is confined to the Established, Conditional and Refugia Beds and three known beds for black corals. Precious corals HAPC include the Makapuu bed, Wespac bed, Brooks Bank bed and Auau Channel.

Scientific Data Needs:

See Appendix 6.

Include Impacts on Fishing Communities (Section 4.4)

Given the reference in the Magnuson-Stevens Act to the economic importance of fishery resources to the island areas within the western Pacific region and taking into account these islands' distinctive geographic, demographic and cultural attributes, the Council concluded that it is appropriate to characterize each of the island areas within its region as a fishing community. The accompanying regulatory impact reviews for FMPs and amendments submitted to the Secretary after October 1, 1990, adequately address the effects of management measures on fishing communities in the western Pacific region.

Scientific Data Needs:

Additional research on the economic and social importance of fishery resources in each island area in order to improve the depth and scope of impact statements for future proposed management measures. Specific areas where research is required include an estimation of the value of shark-fin landings in the western Pacific region; identification of economic or other barriers that have prevented full participation by indigenous island residents in western Pacific fisheries; and cost-earnings analyses of small-scale fishing enterprises in the Pacific Insular Areas.

Specify Overfishing Criteria and Include Preventive Measures (Section 4.5)

The main control rule in the NWHI bottomfish fishery is a limited entry system. Minimum stock size threshold was determined by SPR proxy to range from 20% to 33% for bottomfish, based on an analysis of common Hawaiian species. Maximum fishing mortality threshold for MSY was determined as F=0.17-0.69 for bottomfish. Information is insufficient to quantify a value for OY at this time, however, a precautionary approach could be to allow a buffer for these MSY threshold values by setting a target level slightly higher until the precision and accuracy of the proxy estimator, and information

on social, economic and ecological factors are better known. Results from recent genetic analyses and related studies, supporting archipelagic stock ranges, indicate that no BMUS are overfished based on either a recruitment-based or MSY-based definition of overfishing. Concurrent with the required change in definition of overfishing from a SPR-based threshold to a MSY-based threshold, overfishing (based on MSY or its SPR proxy) is now calculated based on the stock as a unit throughout its range, as determined by the best available information. Existing measures in the FMP are also sufficient to prevent overfishing at this time.

The Council manages its pelagic fisheries to prevent overfishng and achieve OY, as defined in Amendments 1 and 7, to the extent practicable. Any control rules to prevent overfishing for PMUS will require full international cooperation in assessment and management by Pacific fishing nations with the US. Methods to objectively measure MSY and assess overfishing for pelagics must all be applied on a Pacific-wide basis and be based on sufficient data. For only a few species are reasonable MSY estimates available. The threshold for F_{MSY} or MFMT, while unknown for most PMUS stocks, is estimated to be 0.2–1.5 per year, based on F_{MSY}=M. The threshold level for MSST, also not known for most pelagic stocks, is estimated by the proxy SPR=20–30% (35–45% for oceanic sharks). The Council maintains that MSY-related definitions of overfishing cannot be applied to the US Pacific island EEZs given the Pacific-wide distribution of most pelagic stocks and the current highly uncertain estimates of stock-wide MSYs. Information is also insufficient to quantify a value for OY at this time, until social, economic and ecological factors are better known. Existing measures in the FMP are sufficient to prevent overfishing and no pelagic stocks are known to be overfished at this time. The Council asserts that the new overfishing provision can best be addressed through US participation in international management initiatives in the Pacific.

The NWHI lobster fishery operates under a constant risk of overfishing with associated constant harvest rate control rule, through a fleet-wide harvest guideline, that has been effective in producing harvest levels that probably approach OY. The strategy is conservative and risk averse. Measures contained in the FMP are sufficient to prevent overfishing, and no stocks are currently overfished.

The precious corals fishery is already managed based on OY quotas (i.e., control rule), calculated by downwardly adjusting MSY estimates. Values for OY quotas are listed as regulations for the main species of precious corals. The SPR proxy for minimum stock size threshold that corresponds to MSY is SPR=30%, and is already defined as such in the FMP. If one assumes F_{MSY}=M then the maximum fishing mortality threshold for MSY is F=0.066. As no harvesting has occurred for 20 years, and nearly full recovery has been attained, no species of precious coral is currently overfished in the western Pacific's EEZ.

Scientific Data Needs (Bottomfish Fishery):

CPUE data for species targeted trips in the NWHI fishery.

Improved estimates of the size at entry and natural mortality rate to obtain a more reliable MSY proxy.

Estimates of MSY-based overfishing thresholds, or proxies, for BMUS in American Samoa, Guam and the Northern Mariana Islands.

Monitoring and evaluation of the State of Hawaii's management plan to restore locally depleted bottomfish in the Main Hawaiian Islands (MHI).
Detailed information on economic, social and ecological factors to quantify OY.
Scientific Data Needs (Pelagics Fishery):
International assessments of PMUS stocks in the Pacific and improved estimates of parameters to determine MSY or proxies thereof, in order to prevent overfishing.
More complete and accurate population dynamics data on PMUS.
Determination of limiting or threshold values and the robustness of biological reference points that define overfishing through simulation models.
Estimates of MSY from results of tagging studies in the Pacific.
Improved database of time-series information to estimate SPR for PMUS Pacific-wide.
Detailed information on economic, social and ecological factors to quantify OY.
Scientific Data Needs (Crustaceans Fishery):
Rerunning the population dynamics simulation model using updated parameter values and a revised model structure based on current NWHI lobster fishery information.
Studies of the stock-recruitment relationship in the NWHI lobster fishery.
Studies on the feasibility of species-specific and area-specific modeling.
Studies on economic and social factors in the fishery to improve the estimate of OY.
Scientific Data Needs (Precious Corals Fishery):
Research on the distribution, abundance and status of precious corals in the Pacific Insular Areas.
MSY estimates for Conditional Beds and Exploratory Areas.
MSY estimates for black corals.
Surveys of Makapuu bed to better define the bed's boundaries, monitor the recovery of corals (particularly gold coral) and determine the impacts of fishing activity should it occur.
Improved and updated information on economic, social and ecological factors to better quantify OY.

Contents

Appendices

1.0 INTRODUCTION

1.1 Responsible Agencies

The Council was established by the Magnuson Fishery Conservation and Management Act to develop fishery management plans for fisheries operating in the US exclusive economic zone (EEZ) around American Samoa, Guam, Hawaii, the Northern Mariana Islands and the other US Pacific Islands.1. Howland Island, Baker Island, Jarvis Island, Johnston Atoll, Midway Island, Kingman Reef, Palmyra Atoll and Wake Island. Once an FMP is approved by the Secretary of Commerce, it is implemented by Federal regulations that are enforced by the National Marine Fisheries Service (NMFS) and the US Coast Guard, in cooperation with state, territorial and commonwealth agencies. For further information, contact:

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1.2

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B Spawning biomass
BMUS Bottomfish management unit species
C Catch (in numbers)
CFR Code of Federal Regulations

CMUS Crustacean management unit species
CPUE Catch per unit effort
DAWR Guam Division of Aquatic and Wildlife Resources
DAH Domestic allowable harvest
DFW Northern Mariana Islands Division of Fish and Wildlife
DMWR American Samoa Department of Marine and Wildlife Resources
EEZ Exclusive economic zone
F Fishing mortality
FL Fork length
FMP Fishery management plan
HAPC Habitat areas of particular concern
HDAR Hawaii Division of Aquatic Resources
HR Harvest rate
M Natural mortality rate
MFMT Maximum fishing mortality threshold
MHI Main Hawaiian Islands
MSST Minimum stock size threshold
MSY Maximum sustainable yield
MUS Management unit species
MYPR Maximum yield per recruit
SE-NHR southern Emperor-northern Hawaiian Ridge
NMFS National Marine Fisheries Service
NWHI Northwestern Hawaiian Islands
OY Optimum yield
PCMUS Precious coral management unit species
PIAO NMFS Pacific Islands Area Office
PMUS Pelagic management unit species
RAIOMA Resource Assessment and Investigation of the Mariana Archipelago
RSB Relative spawning biomass
SPC Secretariat of the Pacific Community (South Pacific Commission)
SPR Spawning potential ratio
TALFF Total allowable foreign fishing
UFA United Fish Agency
WpacFIN Western Pacific Fisheries Information Network
WPRFMC Western Pacific Regional Fishery Management Council
Y Yield or catch (in weight)
YPR Yield per recruit

1.4 Managed Species in the Western Pacific Region

Bottomfish

Scientific Name	Common Name (*local name*)
Aphareus rutilans	red snapper/silvermouth (*lehi*)
Aprion virescens	gray snapper/jobfish (*uku*)
Caranx ignobilis	giant trevally/jack (*ulua*)
C. lugubris	black trevally/jack (*ulua*)
Epinephelus fasciatus	blacktip grouper
E. quernus	sea bass (*hapuupuu*)

Etelis carbunculus	red snapper (*ehu*)
E. coruscans	red snapper (*onaga*)
Lethrinus amboinensis	ambon emperor
L. rubrioperculatus	redgill emperor
Lutjanus kasmira	blueline snapper (*taape*)
Pristipomoides auricilla	yellowtail snapper (yellowtail *kalekale*)
P. filamentosus	pink snapper (*opakpaka*)
P. flavipinnis	yelloweye snapper (yelloweye *opakapaka*)
P. sieboldii	pink snapper (*kalekale*)
P. zonatus	snapper (*gindai*)
thicklip trevally	*Seriola dumerili* amberjack
Variola louti	lunartail grouper

Seamount Groundfish

Scientific Name	Common Name (*local name*)
Beryx splendens	alfonsin
Hyperoglyphe japonica	ratfish/butterfish
Pseudopentaceros richardsoni	armorhead

Pelagic Species

Scientific Name	Common Name (*local name*)
Coryphaena spp.	mahimahi
Acanthocybium solandri	wahoo
Makaira mazara; M. indica	Indo-Pacific blue marlin; black marlin
Tetrapterus audax	striped marlin
T. angustirostris	shortbill spearfish
Istiophorus platypterus	sailfish
Xiphias gladius	swordfish
Lampris spp.	moonfish
Ruvettus pretiosus; Lepidocybium flavobrunneum	oilfishes
Bramidae	pomfret
Alopiidae; Carcharinidae; Lamnidae; Sphyrnidae	oceanic sharks
Thunnus alalunga	albacore
T. obesus	bigeye tuna
T. albacares	yellowfin tuna
T. thynnus	northern bluefin tuna
Katsuwonus pelamis	skipjack tuna
Euthynnus affinis	kawakawa
Gymnosarda unicolor	dogtooth tuna
Auxis spp.; *Scomber* spp.; *Allothunnus*	spp. other tuna relatives

Crustaceans

Scientific Name	Common Name (*local name*)
Panulirus marginatus, Panulirus pencicillatus, *Panulirus sp*.	spiny lobsters
Scyllaridae sp.	slipper lobster
Ranina ranina	Kona crab

Precious Corals

Scientific Name	Common Name (*local name*)
Corallium secundum	pink coral
Corallium regale	red coral
Corallium laauense	red coral
Gerardia sp.	gold coral
Narella sp.	gold coral
Calyptrophora sp.	gold coral
Callogorgia gilberti	gold coral
Lepidisis olapa	bamboo coral
Acanella sp.	bamboo coral
Antipathes dichotoma	black coral
Antipathes grandis	black coral
Antipathes ulex	black coral

2.0 BACKGROUND AND PURPOSE OF AMENDMENT

2.1.1 Bottomfish fishery

The FMP for bottomfish and seamount groundfish fisheries in the western Pacific region became effective in 1986. 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 NWHI. The plan also establishes a management framework that includes adjustments 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 includes the establishment of limited access systems for bottomfish fisheries in the EEZ surrounding American Samoa and Guam within the framework measures of the FMP.

Amendment 2 was developed to diminish 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. Access to the Mau Zone remains 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 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 requires vessel owners or operators to notify NMFS at least 72 hours before leaving port if they intend to fish in a 50 nm "study zone" 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.

2.1.2 Pelagics fishery

The management plan for the pelagic fisheries of the western Pacific region was published in 1987. The FMP includes initial estimates of MSY for the stocks and set OY for these fisheries in the EEZ. The MUS 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 Guidelines for the Magnuson Act National Standards requiring a measurable definition of recruitment overfishing for each species or species complex in a FMP. 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 requires domestic longline 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. It also includes under the FMP pelagic fisheries in the EEZ around the Northern Mariana Islands.

Amendment 3 creates a 50 nm longline exclusion zone around the NWHI to protect endangered Hawaiian monk seals. It also contains framework provisions for establishing a mandatory observer program to collect information on interactions between longline fishing and turtles.

Amendment 4 establishes a three-year moratorium on new entries into the Hawaii-based domestic longline fishery. It also adds a provision for establishing a mandatory vessel monitoring system for domestic longline vessels fishing in the western Pacific region.

Amendment 5 creates a domestic longline vessel exclusion zone around the MHI ranging from 50 to 75 nm and a similar 50 nm exclusion zone around Guam and its offshore banks. The zones are intended to prevent gear conflicts and vessel safety issues arising form 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 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 MHI to foreign vessels.

Amendment 7 institutes a limited entry program for the Hawaii-based domestic longline fishery. The number of vessels allowed into the fishery is limited to 167, and the length of these vessels is limited to 94 feet or less.

2.1.3 Crustaceans fishery

2.1.4 Precious corals fishery

The management plan for the precious corals fishery of the western Pacific region was implemented in 1983. In the FMP, precious coral beds are treated as distinct management units because of their widely separated, patchy distribution and the sessile nature of individual colonies. The beds are classified as Established, Conditional, Refugia or Exploratory. Established Beds are ones for which appraisals of MSY are reasonably precise. To date, only Makapuu bed has been studied adequately enough to be classified as Established. Conditional Beds are ones for which estimates of MSY have been calculated by comparing the size of the beds to that of the Makapuu bed and

then multiplying the ratio by the yield from the Makapuu bed. It is assumed that ecological conditions at the Makapuu bed are representative of conditions at all other beds. Five beds of precious corals are classified as Conditional, all of which are located in the EEZ around Hawaii. Refugia Beds are areas set aside for baseline studies and possible reproductive reserves. No harvesting of any type is allowed in those areas. The single Refugia Bed that has been designated—the Westpac bed—is also located in the EEZ surrounding Hawaii. Exploratory Areas are the unexplored portions of the EEZ. Separate Exploratory Permit Areas are established for Hawaii, American Samoa and Guam.

The FMP permits the use of only selective gear in the EEZ around the MHI, i.e., south and east of a line midway between Niihau and Nihoa Islands. Use of both selective and nonselective gear is permitted on the Conditional Beds of Brooks Bank and the 180 Fathom Bank and throughout the Exploratory Area of the NWHI. Quotas are established for pink, gold and bamboo coral populations in the Makapuu bed and in the Conditional Beds. Pink coral harvested from the Makapuu bed, the Keahole Point bed and the Kaena Point bed must have attained a minimum height of 10 inches. If tangle net dredges are employed, the weight quota is only 20% of that allowed for selective harvesting.

The FMP establishes a procedure for redesignating coral beds from Exploratory to Conditional and from Conditional to Established as new beds are located and more catch/effort data become available that will allow more precise determinations of sustainable yields.

Amendment 1 applies the management measures of the FMP to the Pacific Insular Areas other than Guam, American Samoa and the Northern Mariana Islands by incorporating them into a single Exploratory Permit Area; expands the managed species to include Midway deep-sea coral; and outlines provisions for experimental fishing permits designed to stimulate the domestic fishery.

Amendment 2 defines overfishing with respect to Established Beds as follows: An Established Bed shall be deemed overfished with respect to recruitment when the total spawning biomass (all species combined) has been reduced to 20% of its unfished condition. This definition applies to all species of precious corals and is based on cohort analysis of the pink coral, *Corallium secundum*.

The Magnuson-Stevens Act requires that FMPs contain provisions regarding bycatch, fishing sectors, EFH, fishing communities and overfishing. This amendment compiles the best available scientific information pertaining to each of these new provisions and incorporates it directly or by reference into the Western Pacific Council's management plans for bottomfish and seamount groundfish, pelagics, crustaceans and precious corals fisheries. In addition, the amendment identifies other scientific data that are needed to more effectively address the new provisions.

The Magnuson-Stevens Act also contains a number of new definitions. This amendment adds those definitions that are pertinent to western Pacific fisheries to the Council's four management plans.

2.3 Amendment Coordination

This amendment was prepared through an iterative process consisting of a series of meetings of the Council, SSC, FMP teams and fishing industry advisory panels. In addition, the Council worked in close cooperation with scientists in the NMFS Southwest

Fisheries Service Center, Honolulu Laboratory, Pacific Islands Area Office and Southwest Regional Office. Notice of the availability of a draft amendment for public review and comment was published in the Federal Register on July 15, 1998. Public meetings and hearings at which this amendment was discussed are listed below:

Public Hearing on Amendment: July 20, 1998

Council: August 19–21, 1997; Nov. 12–14, 1997; April 13–17, 1998; July 27–29, 1998

SSC: August 5–7, 1997; Nov. 10–11, 1997; March 24–26, 1998; July 21–23, 1998

Bottomfish and Seamount Groundfish Fishery Plan Team: July 28, 1997; March 11–13, 1998

Pelagics Fishery Plan Team: July 30–31, 1997; May 6–7, 1998

Precious Corals Fishery Plan Team: July 29, 1997; Jan. 30, 1998; June 4, 1998

Crustaceans Fishery Plan Team: July 24–25, 1997; March 17–19, 1998

Ecosystem and Habitat Advisory Panel: July 29, 1997; March 20, 1998

Pelagics Fishery Advisory Panel: July 30–31, 1997

Bottomfish and Seamount Groundfish Fishery Advisory Panel: July 28, 1997

3.0 NEW DEFINITIONS

Bycatch means fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards. Such term does not include fish released alive under a recreational catch and release fishery management program.

Charter fishing means fishing from a vessel carrying a passenger for hire (as defined in section 2101(21a) of title 46, United States Code) who is engaged in recreational fishing. Commercial fishing means fishing in which the fish harvested, either in whole or in part, are intended to enter commerce or enter commerce through, sale, barter or trade. Recreational fishing means fishing for sport or pleasure.

Economic discards mean fish which are the target of a fishery, but which are not retained because they are of an undesirable size, sex or quality or for other economic reasons. Regulatory discards mean fish harvested in a fishery which fishermen are required by regulation to discard whenever caught or are required by regulation to retain but not sell.

Essential fish habitat means those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity.

Fishing community means a community which is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators and crews and US fish processors that are based in such community.

Individual fishing quota means a Federal permit under a limited access system to harvest a quantity of fish, expressed by a unit or units representing a percentage of the total allowable catch of a fishery that may be received or held for exclusive use by a person.

Optimum, with respect to the yield from a fishery, means the amount of fish that (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 as such on the basis of the MSY from the fishery, as reduced by any relevant economic, social or ecological factor; and (c) in the case of

an overfished fishery, provides for rebuilding to a level consistent with producing the MSY in such fishery.
Overfishing and Overfished mean a rate or level of fishing mortality that jeopardizes the capacity of a stock or stock complex to produce the MSY on a continuing basis.
Pacific Island Area means American Samoa, Guam, the Northern Mariana Islands, Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Midway Island, Wake Island or Palmyra Atoll, as applicable, and includes all islands and reefs appurtenant to such island, reef or atoll.

4.0 NEW FISHERY MANAGEMENT PLAN PROVISIONS

4.1 Establish Reporting Methods to Assess Bycatch and Minimize Bycatch and Bycatch Mortality

> *Establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority—*
>
> *(A) minimize bycatch; and*
>
> *(B) minimize the mortality of bycatch which cannot be avoided.*

This section presents an overview of the type and amount of bycatch in each managed fishery and assesses the adequacy of bycatch reporting in terms of the required provision. It also examines existing and possible new measures to minimize bycatch and mortality of bycatch in each FMP fishery.
This fishery is managed under the Bottomfish and Seamount Groundfish FMP, implemented in 1986. Commercial and recreational bottomfish fishing occurs in the EEZ around all of the occupied islands in the Council's area

Gear Types

In Hawaii commercial and recreational bottomfish fishing are conducted with handlines that are set and hauled on electric-, hydraulic- or hand-powered reels. Vessels are usually equipped with depth sounders, fish echo sounders and satellite navigational devices. Two separately managed bottomfish fisheries occur in Hawaii. In the NWHI all participants fish commercially on a full- or part-time basis while in the MHI fishery there are also recreational fishermen. Available data suggests that the magnitude of the effort in the MHI fishery has been declining since the late 1980s. In American Samoa small skiffs and *alia* catamarans equipped with handlines and hand-powered reels fish on the deep outer-reef slope. As in Hawaii, this method is relatively selective, targeting a mix of snappers, groupers, jacks and emperors. In the EEZ around Guam and the Northern Mariana Islands deep-water bottomfish fishing is conducted mainly by commercial vessels equipped with electric-powered reels. Shallow-water BMUS are also caught on seamounts using rod and reel.

Data Collection

In Hawaii landings data for the commercial bottomfish fishery in the MHI and in the EEZ around the uninhabited islands in the Pacific Insular Areas are collected on the Fish Catch Report
(referred to as the C3 form) administered by the HDAR. (See Appendix 1 for a description of regional data collection systems and Appendix 2 for copies of the data forms. The C3 form is reproduced on p. A2-17). The form requires commercial marine

license holders to report the number and weight of each species caught and the weight of each species sold. The form does not require fishermen to provide information on the disposition of unsold catch.

Participants in the NWHI fishery are required to complete the HDAR NWHI Bottomfish Trip Daily Log (p. A2-22). The daily log requires fishermen to report the number and weight of various bottomfish and non-bottomfish species kept, the number released and the number damaged or stolen by marine mammals and sharks. There is also limited space provided for recording the type and number of other fish kept, released or stolen.

In American Samoa landings data are collected from creel surveys administered by the DMWR. The Offshore Survey form (p. A2-1) used in the creel surveys records the numbers and weight of each species caught during a trip as well as the disposition of the catch. However, fishermen have not been specifically asked to provide information on the disposition of fish that are not sold.

In Guam landings data are collected from creel surveys administered by the DAWR. The Offshore Creel Census (p. A2-4) form records the number and weight of each species caught during a trip and percentage of the total catch that is kept or sold. However, fishermen have not been specifically asked to provide information on the disposition of fish that are not sold.

In the Northern Mariana Islands from 1988 to 1996 the DFW collected landings data in a creel survey program. The CNMI Offshore Creel Census and CNMI Inshore Creel Census forms (p. A2-25 and A2-27) recorded the number and weight of each species caught during a trip and percentage of the total catch that was kept or sold. However, fishermen were not specifically asked to provide information on the disposition of fish that were not sold. Commercial bottomfish landings in the Northern Mariana Islands are currently recorded in the DFW's Commercial Purchase Database (p. A2-29).

Several research cruises in the Hawaiian Islands and other parts of the western Pacific conducted by NMFS and other fishery agencies have collected detailed information on bottomfish stocks. These fishery-independent records are also useful in providing information on the likely volume of bycatch.

Bycatch

In all cases bottomfish are caught on gear that is relatively selective, targeting the snapper/grouper/emperor complex on outer reef slopes and seamounts. However, the ability to target particular species varies widely depending on the skill of each captain. Experienced bottomfish fishermen have the capability to catch desired species with little bycatch or incidental catch. However, it is impossible to completely avoid non-target species.

Table 4.1.a presents HDAR logbook data on the number of fish caught and kept, the number of fish discarded and number of fish discarded during 1997. Releases and damaged fish might reasonably be designated bycatch; these amounted to only 8% of the total catch of NWHI handline-caught bottomfish. No details were provided about the numbers of fish stolen, as these are usually grouped in the 'damaged' category by fishermen. Sharks, oilfish, snake mackerel, pufferfish and moray eels are important bycatch species, discarded because they are normally not considered food fish. In contrast, ulua (Caringidae) and kahala are discarded despite being palatable (Kasaoka 1990). Ulua are discarded because of their short shelf-life and low market value. Kahala, once a major component of commercial and recreational landings, are now

seldom retained as they have been implicated in incidents of ciguatera. In Hawaii a recent increase in the market demand for shark fins has meant that more sharks are being "finned" (the practice of cutting off a shark's fins and returning the remainder of the fish to the sea) and fewer are being discarded as bycatch.

Data collected during NMFS research cruises in Hawaii indicate that species generally regarded as bycatch represent about 19% of the total catch (Figure 4.1.a).

Fishery independent data collected during surveys in American Samoa in 1978 and 1988 by the SPC suggest that the catch of non-target species amounts to less than 1% of the total catch and consists mainly of snake mackerel (*Promethichthys prometheus*).

Information gathered during the NMFS Resource Assessment and Investigation of the Mariana Archipelago (RAIOMA) project suggest that in Guam and the Northern Mariana Islands pufferfish, gurnards, beardfish and sharks are the main bycatch species (Figure 4.1.b). Total potential bycatch comprises only about 1% of the total catch.

Hawaiian Name	Scientific Name	Number Kept	Number Released	Number Damaged
Misc Shark	*Carcharhinidae*	0	166	0
Tiger Shark	*Galeocerdo Cuvier*	0	5	0
Kahala	Seriola dumerilli	25	2,114	6
Ahi	Thunnus alabacares	16	7	0
Ulua butaguchi	Caranx ignobilis	4,396	1,177	121
Uku	Aprion virescens	3,500	16	50
Hapuupuu	Epinephelus quernus	4,586	17	97
Kalekale	Pristopomoides auricilla	6,312	12	7
Opakapaka	Pristopomoides filamentosus	16,554	2	213
Ehu, ulaula	Etelis carbunculus	6,070	0	98
Gindai	Pristipomoides zonatus	2,133	0	98
Onaga	Aprion virescens	8,207	0	37
Ulua	Carangidae	231	0	7
Lehi	Aphareus rutilans	123	0	2
Kawakawa	Euthynnus affinis	29	0	0
Mahimahi	Corphaena hippurus	16	0	0
Omilu	Carangidae	49	0	0
Misc. ulua/papio	Carangidae	1	0	0
Wekw ula,	Labridae	9	0	0
Aawa	Labridae	9	0	0
Aweoweo	Labridae	4	0	0
Wahanui	Labridae	23	0	0
Kaku	Sphyraenidae	10	0	0
Kamano	Elegatis bipnnulatis	3	0	0
Kumu	Mullidae	1	0	0
Mu	Mullidae	2	0	0
Nohu,	Scorpaenidae	1	0	0
Ulua kagami	Carangidae	5	0	0
Opelu	Decapterus spp	5	0	0
Taape	Lutjanus kasmira	24	0	0

Pomfret	Bramidae	17	0	0
Ulua dobe	Carangidae	2	0	0
Ulua gunkan	Carangidae	46	0	0
Ulua papa	Carangidae	224	0	0
Hogo	Scorpaenidae	193	0	0
others		4	0	0
Total		52,832	3,516	736

Table 4.1.a: Logbook estimates of disposition of catches in the NWHI bottomfish fishery, 1997 (Source: NMFS Honolulu Laboratory)

4.1.2 Pelagics fishery

Pelagic fish species are managed under the FMP for pelagic fisheries, implemented in 1986. Commercial pelagic fisheries are found primarily in Hawaii, but there are recreational, subsistence and small-scale commercial fisheries in the other island areas. PMUS are caught by longline, troll and handline, pole- and-line and purse seine.

The number of longline vessels based in Hawaii are restricted by a license limitation program to 167. Currently, about 105 vessels are active. These vessels are typically 50–100 ft in length and employ a monofilament mainline 18–60 nm long, with 400–2,000 baited hooks. Longline fishing is prohibited in a 50–75 nm exclusion zone around the MHI to prevent competition and gear conflicts with troll and handline vessels and in a 50 nm exclusion zone around the NWHI to prevent interactions with protected species. In American Samoa the domestic longline fleet mainly consists of small (28–32 ft) catamarans from which a 300-hook longline is set and retrieved by hand. In Guam and the Northern Mariana Islands there is no commercial longline fleet.

Hand troll gear is used by commercial, recreational and charter vessels to fish for pelagic species throughout Hawaii. Commercial albacore troll vessels occasionally fish in the waters around Hawaii. In American Samoa, Guam and the Northern Mariana Islands trolling with baited hooks and lures is conducted from catamarans and other small commercial, recreational and charter vessels in coastal waters, near seamounts or around fish aggregating devices. Handline fishing from stationary or drifting vessels is also common in Hawaii.

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

US purse seine vessels operating in the central and western Pacific occasionally fish in the EEZ around the uninhabited islands of the Pacific Insular Areas.

Data Collection

Longline vessels based in Hawaii and American Samoa and those fishing in the waters of Guam, the Northern Mariana Islands and the uninhabited islands of the Pacific Insular Areas are required to record catches in the NMFS Western Pacific Daily Longline Fishing Log (p. A2-18). Vessels are required to record the number of various PMUS kept during a set and the number not kept/released. The form also requires longline fishermen to report the number of sharks finned, kept whole and not kept/released. There is also limited space for recording the number of non-PMUS kept or not kept/released.

In addition, Hawaii-based longline vessels are required to complete the HDAR Longline Trip Report (p. A2-19), which records the number and weight of particular pelagic

species caught and the weight of each type sold. There is also limited space for reporting the number and weight of
other species caught and the weight of those sold. Fishermen are not required to report the disposition of unsold fish. Finally, the form requires fishermen to record the number of dolphins, monk seals, humpback whales, turtles (by species), albatrosses and other protected species released alive, injured or dead.

Since 1994, NMFS observers have also been deployed on Hawaii-based longline vessels, principally to document the interactions between longline gear and marine turtles. The Magnuson-Stevens Act classifies turtles that are captured and discarded as bycatch. The observers record whether each turtle is alive or dead when released. They have also fitted a number of live released turtles with satellite tags that transmit information on the location and depth of the animal. This information is also being used to determine the post-hooking mortality rate of turtles. Observers also record the type and number of all fish captured in a set.

Landings data for commercial troll and handline vessels in Hawaii are collected on the state's Fish Catch Report (refer to Section 4.1.1 and see p. A2-17). Holders of Hawaii commercial marine fishing licenses fishing in the uninhabited islands and landing their catch in Hawaii are also required to used this form. Some charter and recreational vessels also routinely participate in the NMFS Cooperative Billfish Tagging Program on a voluntary. The troll fleet in American Samoa employs the Offshore Survey (p. A2-1) to record catches, while in Guam the Offshore Creel Census, which includes an Offshore Vehicle Trailer Participation Census (p. A2-4 and A2-5), is used. The Offshore Creel Census, which included both interview and participation forms, was also used in the Northern Mariana Islands from 1988 until it was discontinued in 1996 (refer to Section 4.1.1.2 and see p. A2-24 and A2-25). Commercial troll landings in the Commonwealth are currently recorded on the DFW's Commercial Sales Data form (p. A2-29).

Commercial albacore troll vessels that land their catch in Hawaii are required to complete the HDAR Albacore Trolling Trip Report (p. A2-21). This form requires fishermen to report the number and weight of albacore, skipjack, yellowfin and bigeye tuna, yellowtail snapper and mahimahi caught during a trip and the weight of each type sold. There is also limited space for recording the number and weight of other species caught and the weight of those sold. The form does not require fishermen to report on the disposition of unsold fish.

Pole-and-line catches are recorded on the HDAR Aku Catch Report (p. A2-20). The form requires fishermen to report the number and weight of skipjack tuna and mahimahi caught and the weight of these species that are sold. The form also requires fishermen to record the number and weight of other fish species caught and the weight of these species sold. There is no space for reporting how unsold fish are disposed of.

Purse-seine vessels complete the South Pacific Regional Purse-Seine Logsheet (p. A2-30) developed under the Multilateral Treaty on Fisheries between Pacific Island States and the United States. The form requires fishermen to report the number of yellowfin, skipjack and bigeye tuna and other species caught during each set and the number of tuna, marlin and other species discarded. In addition, observers on US purse seiners from member nations of the South Pacific Forum complete the South Pacific Regional Purse Seine Observer Set Details form (p. A2-31), which records details of the catch including species and condition of discards.

Bycatch

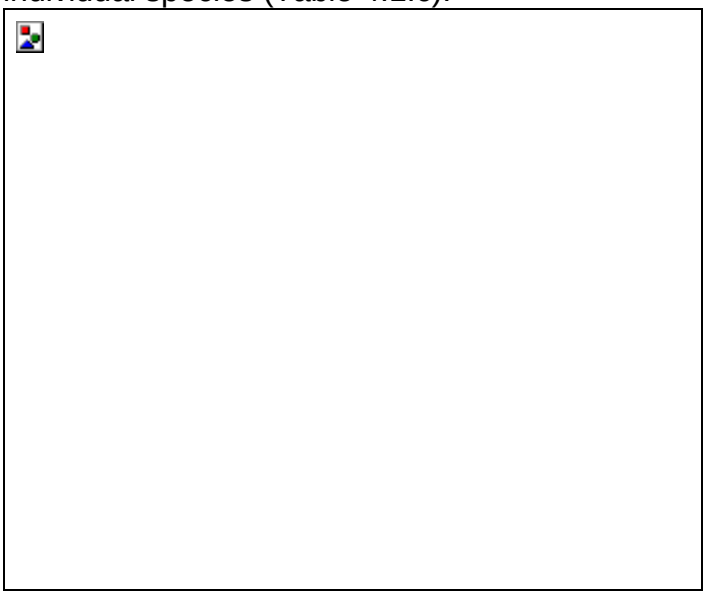
NMFS observers recorded more 60 different species caught by the Hawaii-based longline fleet between 1994 and 1997. Data collected on the catch and discards of PMUS by Hawaii-based longline fleet in 1997 are presented in Table 4.1.b. Of significance are the 85,523 sharks, of which the majority were blue sharks, caught by the fleet. Up until about five years ago, most sharks caught by longline gear were released alive. However, as a result of the growing demand for shark fins in Asian markets the practice of shark finning has increased. Presently, more than half of the caught sharks, including species other than the blue shark, are finned. About 1% of the sharks, mainly mako and thresher, are headed and gutted and retained for later sale. However, the majority of longline vessels do not retain blue shark carcasses because they cannot be profitably sold. Aside from sharks, there is a small fraction of the total catch that could be sold but is not retained for economic reasons. For example, marlins are often discarded at the beginning of a trip to leave hold space for more valuable species. Most of these economic discards are released alive.

Species	**Number Caught**	**Number Finned**	**Number Kept**	**Number Released**	**Discards as %of Total Catch**
Blue Marlin	8249		8032	217	2.63
Spearfish	7302		7028	274	3.75
Striped Marlin	12614		11925	689	5.46
Swordfish	39500		38164	1336	3.38
Other billfish	1708		1587	121	7.08
Blue Sharks	79712	45608	217	33887	42.51
Mako Sharks	1164	523	344	297	25.52
Thresher sharks	2321	550	212	1559	67.17
Other Sharks	2326	1769	16	541	23.26
Albacore	71051		66424	4627	6.51
Bigeye	79602		77220	2382	2.99
Bluefin	242		221	21	8.68
Skipjack	12058		11760	298	2.47
Yellowfin	28983		28281	702	2.42
Mahimahi	49311		40995	8316	16.86
Moonfish	8241		8068	173	2.10
Oilfish	1746		637	1109	63.52
Pomfret	10423		10345	78	0.78
Wahoo	8304		8132	172	2.07
Non-PMUS	1152		1073	79	6.86

Table 4.1b: Logbook astimates of catch and discards of PMUS by Hawaii-based longline vessels (Source: NMFS Honolulu Laboratory)

Non-PMUS species captured by the longline fleet are mostly discarded and represent about 6% of the total number of fish caught. Based on NMFS observer data for 1994–1997, which amounts to between 4% and 5% of the annual total number of longline fishing trips, the discarded non-PMUS species include lancet fish, pelagic stingray, snake mackerel, escolar, remora, crocodile shark and mola mola,, among others (Figure 4.1.c).

NMFS observers report that loggerhead, olive ridley, leatherback and green turtles are caught by longline gear, and about 40 turtle interactions are recorded per year. These encounters can be expanded statistically to estimate fleet-wide take and kill for individual species (Table 4.1.c).



The use of a statistically stratified expansion process to generate kill and take estimates means that variables obtained from logbook data prior to the implementation of the observer program can be used to estimate kill and take levels for those years.

As for the the troll and handline fishery, there is relatively little information on the nature and amount of bycatch because of current reporting requirements. However, as the gear 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 Northern Mariana Islands are either sold or kept for personal consumption. In recent years, fishing tournaments, such as the Hawaii International Billfish Tournament, have provided various incentives for participants to release their catch. These catch-and-release tournament fish are not part of a recreational catch and release fishery management program within the FMP and should be considered bycatch.

The albacore troll fishery occurring in the North and South Pacific outside the EEZ has reported incidental catches of skipjack tuna, striped marlin, mahimahi and louvars. However, the largest bycatch component in this fishery is probably small (< 60 cm) albacore, which are discarded for economic reasons (N. Bartoo, NMFS SW Fisheries Science Center, pers. comm.). The volume of discards is estimated to be about 10% of the catch.

The pole-and-line gear used by that fishery in Hawaii is highly selective. Non-target species that are occasionally caught, such as kawakawa, blue and striped marlin and

rainbow runner, are usually either sold or retained for personal consumption by the crew.

According to Catch Report Form data collected by purse-seine vessels in US EEZ waters in 1997 (Table 4.1.d), discards amounted to less than 0.5% of the total volume of catch. Purse-seine logbooks indicate that skipjack tuna forms the largest fraction of the discard volume by weight. This data is confirmed by the weight and numbers of discards recorded by observers aboard US purse seiners operating within the US EEZ waters between 1994 and 1997 (Table 4.1.e). Rainbow runner, triggerfish and mackerel also make significant contributions to purse-seine discards in terms of numbers.

Quantity Discarded (mt)

Species	**Howland and Baker**	**Jarvis**	**Palmyra**	**All Islands**	**Percent of Total Discards**
Skipjack Tuna	68.19	18.72	1.00	87.91	63.64
Yellowfin Tuna	1.55	1.92		3.47	2.51
Mixed	13.89	1		14.89	10.78
Marlin	3.07	0.7		3.77	2.73
Blue Marlin	0.35			0.35	0.35
Sailfish	0.05			0.05	0.04
Swordfish		0.09		0.09	0.07
Shark	9.8	1.79		11.59	8.39
Albacore	0.02			0.02	0.01
"Baitfish"	7.66	0.56		8.22	5.95
Barracuda	0.05			0.05	0.04
Dolphinfish	0.03	0.13		0.16	0.12
Mackerel	0.46	0.52		0.98	0.71
Manta ray	0.15			0.15	0.11
Mixed species		0.07		0.07	0.05
Rainbow runner	1.02	5.1		6.12	4.43
Wahoo	0.05			0.05	0.04
Unknown Species	0.19			0.19	0.14
Total	**106.53**	**30.6**	**1.00**	**138.13**	**100**

Species	Weight (mt)	Numbers	% wt	% no
Skipjack Tuna	124.50	1765	82.33	36.07
Rainbow runner	7.91	1672	5.23	34.17
Triggerfish	2.65	661	1.75	13.51
Mackerel	3.27	365	2.16	7.46
Bigeye Tuna	1.48	149	0.98	3.05
Yellowfin Tuna	7.07	130	4.67	2.66
Mahimahi	0.09	73	0.06	1.49
Black marlin	0.22	14	0.14	0.29
Shark	0.22	14	0.14	0.29

Blue marlin	1.73	12	1.14	0.25
Wahoo	0.00	8	0.00	0.16
Sailfish	0.03	2	0.02	0.04
Manta ray	0.13	1	0.09	0.02
Other Tuna	1.84	0	1.21	0.00
Barracuda	0.02	27	0.01	0.55
Unspecified species	0.08	0	0.05	0.00

Table 4.1.e: Observer estimates of volume of discards by US purse seiners operating in the EEZ around the uninhabited islands of the Pacific Insular Areas, 1994–1997 (Source: Forum Fisheries Agency, Honiara)

Magnuson-Stevens Act Definitions and Required Provisions

Amendment 6 to the Bottomfish and Seamount Groundfish Fisheries Management Plan
Amendment 8 to the Pelagic Fisheries Management Plan
Amendment 10 to the Crustaceans Fisheries Management Plan
Amendment 4 to the Precious Corals Fisheries Management Plan
September 1998

Western Pacific Regional Fishery Management Council
1164 Bishop Street, Suite 1400
Honolulu, Hawaii 96813

A publication of the Western Pacific Regional Fishery Management Council pursuant to National Oceanic and Atmospheric Administration Award Nos. NA87FC0006 and NA87FC0014

Summary

This amendment adds new Magnuson-Stevens Act definitions to the fishery management plans (FMPs) of the western Pacific region and addresses the requirement of the Act that any FMP contain provisions regarding bycatch, fishing sectors, essential fish habitat (EFH), fishing communities and overfishing. The amendment compiles the best available scientific information pertaining to each of these new provisions and incorporates it directly or by reference into the Western Pacific Council's FMPs for bottomfish and seamount groundfish, pelagics, crustaceans and precious corals fisheries. In addition, the amendment identifies other scientific data that

are needed to more effectively address the new provisions. A summary of the Council's response to each provision follows.

Establish Reporting Methodology for Bycatch (Section 4.1)

The combination of information collected from National Marine Fisheries Service (NMFS) observer programs and research cruises and the various catch reporting systems that comprise the Western Pacific Fishery Information Network (WPacFIN) is sufficient to estimate with some confidence the amount and type of bycatch in FMP fisheries. Although the current focus of catch reporting systems is on monitoring the volume and disposition of landed target species, detailed discard information on target catches is reported by certain vessel types, such as Hawaii-based longline vessels and Northwestern Hawaiian Islands (NWHI) bottomfish vessels. Modification of survey methodologies or catch report forms may enhance the ability of existing catch reporting systems to monitor discards for other gear types. However, it will continue to be important to supplement bycatch information collected by catch reporting systems with bycatch data gathered from observer programs or research cruises conducted by NMFS and other agencies, such as the Secretariat for the Pacific Community (SPC).

Scientific Data Needs:

Field testing of modified creel surveys or catch reporting forms to determine if additional information on the amount and type of bycatch in FMP fisheries can be collected without imposing an excessive reporting burden on fishermen.

Continued and, if possible, expanded research cruises and observer programs to provide estimates of the type and amount bycatch that occurs with various gear types.

Minimize Bycatch and Bycatch Mortality (Section 4.1)

The prevalent gear types used in the region are variations of hook and line (with a small amount of trapping for lobster in Hawaii) that tend to be fairly selective. However, the amount of bycatch in the region's fisheries can be further reduced by developing and promoting uses for the fish that are generally discarded. For example, NMFS is currently sponsoring a study to determine whether markets exist (or can be developed) for the meat, hides, etc. of the sharks caught by domestic longline vessels. With regard to minimizing bycatch mortality, it would be difficult to reduce mortality with the gear types currently used in FMP fisheries.

Scientific Data Needs:

Research on potential uses of and markets for fish that are currently discarded in order to minimize waste and encourage full utilization.

Survival rate studies of live discards in order to more accurately estimate bycatch mortality.

Specify Data on Commercial, Recreational and Charter Fishing and Quantify Trends in Landings in These Sectors (Section 4.2)

Information contained in the FMPs and amendments is supplemented and updated by the annual reports prepared by the Council for each fishery. Included in the annual reports are data on total weight of fish landed by species, weight of fish sold, fishing effort, average price, revenue and annual catch per unit effort (CPUE). Such detailed information is collected for both the commercial and charter sectors in all four island areas except for the Northern Mariana Islands, where the fishery data collection system has been significantly reduced. Information on the size and composition of recreational catches of pelagic and bottomfish species in Hawaii is not collected by any ongoing

data collection programs. Furthermore, no recreational fishing surveys have been recently conducted in the Pacific Insular Areas to supplement information collected by current creel surveys. Currently, the unsold portion of reported catches is considered to be the recreational catch.

Scientific Data Needs:

Marine recreational fishing surveys in order to more accurately quantify landings in the recreational sector.

Assistance to the Northern Mariana Islands Division of Fish and Wildlife (DFW) to re-establish the creel survey program.

Describe Essential Fish Habitat and Minimize Adverse Effects (Section 4.3)

Because there are large gaps in scientific knowledge about the life histories and habitat requirements of many FMP species, the Council has adopted a precautionary approach in designating essential fish habitat (EFH). With the exception of the EFH for precious corals, the designations consist of the depth ranges within the exclusive economic zone (EEZ) of certain life stages of some FMP species. In addition, the Council identified habitat areas of particular concern (HAPC). For adult and juvenile bottomfish species, the water column and all bottom habitat from the shorelines of all islands to a depth of 400 m are designated EFH. For bottomfish eggs and larvae, the shoreline to the outer limit of the EEZ to a depth of 400 m are designated EFH. Slopes and escarpments at a depth of 40 to 280 m and three known areas of juvenile bottomfish habitat are designated HAPC. EFH for the adult life stage of the seamount groundfish complex is all waters and bottom habitat bounded by latitude 29 –35 N and longitude 171 E–179 W between 80–600 m. EFH for eggs, larvae and juveniles is the epipelagic zone of all waters bounded by latitude 29 –35 N and longitude 171 E–179 W. Pelagic species EFH is the shoreline to the outer limit of the EEZ to a depth of 1,000 m. In addition, areas outside the EEZ are considered important habitat. HAPC are all seamounts and banks around islands from the shoreline to the outer limit of the EEZ down to 2,000 m. Crustacean larvae EFH is the shoreline to the outer limit of the EEZ down to a depth of 150 m; adult and juvenile crustacean EFH extends to a depth of 100 m. HAPC are Maro Reef, Necker Island, Gardner Pinnacles and all other banks in the NWHI with summits less than or equal to 30 m deep. Precious corals EFH is confined to the Established, Conditional and Refugia Beds and three known beds for black corals. Precious corals HAPC include the Makapuu bed, Wespac bed, Brooks Bank bed and Auau Channel.

Scientific Data Needs:

See Appendix 6.

Include Impacts on Fishing Communities (Section 4.4)

Given the reference in the Magnuson-Stevens Act to the economic importance of fishery resources to the island areas within the western Pacific region and taking into account these islands' distinctive geographic, demographic and cultural attributes, the Council concluded that it is appropriate to characterize each of the island areas within its region as a fishing community. The accompanying regulatory impact reviews for FMPs and amendments submitted to the Secretary after October 1, 1990, adequately address the effects of management measures on fishing communities in the western Pacific region.

Scientific Data Needs:

Additional research on the economic and social importance of fishery resources in each island area in order to improve the depth and scope of impact statements for future proposed management measures. Specific areas where research is required include an estimation of the value of shark-fin landings in the western Pacific region; identification of economic or other barriers that have prevented full participation by indigenous island residents in western Pacific fisheries; and cost-earnings analyses of small-scale fishing enterprises in the Pacific Insular Areas.

Specify Overfishing Criteria and Include Preventive Measures (Section 4.5)

The main control rule in the NWHI bottomfish fishery is a limited entry system. Minimum stock size threshold was determined by SPR proxy to range from 20% to 33% for bottomfish, based on an analysis of common Hawaiian species. Maximum fishing mortality threshold for MSY was determined as F=0.17-0.69 for bottomfish. Information is insufficient to quantify a value for OY at this time, however, a precautionary approach could be to allow a buffer for these MSY threshold values by setting a target level slightly higher until the precision and accuracy of the proxy estimator, and information on social, economic and ecological factors are better known. Results from recent genetic analyses and related studies, supporting archipelagic stock ranges, indicate that no BMUS are overfished based on either a recruitment-based or MSY-based definition of overfishing. Concurrent with the required change in definition of overfishing from a SPR-based threshold to a MSY-based threshold, overfishing (based on MSY or its SPR proxy) is now calculated based on the stock as a unit throughout its range, as determined by the best available information. Existing measures in the FMP are also sufficient to prevent overfishing at this time.

The Council manages its pelagic fisheries to prevent overfishng and achieve OY, as defined in Amendments 1 and 7, to the extent practicable. Any control rules to prevent overfishing for PMUS will require full international cooperation in assessment and management by Pacific fishing nations with the US. Methods to objectively measure MSY and assess overfishing for pelagics must all be applied on a Pacific-wide basis and be based on sufficient data. For only a few species are reasonable MSY estimates available. The threshold for F_{MSY} or MFMT, while unknown for most PMUS stocks, is estimated to be 0.2–1.5 per year, based on F_{MSY}=M. The threshold level for MSST, also not known for most pelagic stocks, is estimated by the proxy SPR=20–30% (35–45% for oceanic sharks). The Council maintains that MSY-related definitions of overfishing cannot be applied to the US Pacific island EEZs given the Pacific-wide distribution of most pelagic stocks and the current highly uncertain estimates of stock-wide MSYs. Information is also insufficient to quantify a value for OY at this time, until social, economic and ecological factors are better known. Existing measures in the FMP are sufficient to prevent overfishing and no pelagic stocks are known to be overfished at this time. The Council asserts that the new overfishing provision can best be addressed through US participation in international management initiatives in the Pacific.

The NWHI lobster fishery operates under a constant risk of overfishing with associated constant harvest rate control rule, through a fleet-wide harvest guideline, that has been effective in producing harvest levels that probably approach OY. The strategy is conservative and risk averse. Measures contained in the FMP are sufficient to prevent overfishing, and no stocks are currently overfished.

The precious corals fishery is already managed based on OY quotas (i.e., control rule), calculated by downwardly adjusting MSY estimates. Values for OY quotas are listed as regulations for the main species of precious corals. The SPR proxy for minimum stock size threshold that corresponds to MSY is SPR=30%, and is already defined as such in the FMP. If one assumes F_{MSY}=M then the maximum fishing mortality threshold for MSY is F=0.066. As no harvesting has occurred for 20 years, and nearly full recovery has been attained, no species of precious coral is currently overfished in the western Pacific's EEZ.

Scientific Data Needs (Bottomfish Fishery):

CPUE data for species targeted trips in the NWHI fishery.

Improved estimates of the size at entry and natural mortality rate to obtain a more reliable MSY proxy.

Estimates of MSY-based overfishing thresholds, or proxies, for BMUS in American Samoa, Guam and the Northern Mariana Islands.

Monitoring and evaluation of the State of Hawaii's management plan to restore locally depleted bottomfish in the Main Hawaiian Islands (MHI).

Detailed information on economic, social and ecological factors to quantify OY.

Scientific Data Needs (Pelagics Fishery):

International assessments of PMUS stocks in the Pacific and improved estimates of parameters to determine MSY or proxies thereof, in order to prevent overfishing.

More complete and accurate population dynamics data on PMUS.

Determination of limiting or threshold values and the robustness of biological reference points that define overfishing through simulation models.

Estimates of MSY from results of tagging studies in the Pacific.

Improved database of time-series information to estimate SPR for PMUS Pacific-wide.

Detailed information on economic, social and ecological factors to quantify OY.

Scientific Data Needs (Crustaceans Fishery):

Rerunning the population dynamics simulation model using updated parameter values and a revised model structure based on current NWHI lobster fishery information.

Studies of the stock-recruitment relationship in the NWHI lobster fishery.

Studies on the feasibility of species-specific and area-specific modeling.

Studies on economic and social factors in the fishery to improve the estimate of OY.

Scientific Data Needs (Precious Corals Fishery):

Research on the distribution, abundance and status of precious corals in the Pacific Insular Areas.

MSY estimates for Conditional Beds and Exploratory Areas.

MSY estimates for black corals.

Surveys of Makapuu bed to better define the bed's boundaries, monitor the recovery of corals (particularly gold coral) and determine the impacts of fishing activity should it occur.

Improved and updated information on economic, social and ecological factors to better quantify OY.

Contents

Appendices

1.0 INTRODUCTION

1.1 Responsible Agencies

The Council was established by the Magnuson Fishery Conservation and Management Act to develop fishery management plans for fisheries operating in the US exclusive economic zone (EEZ) around American Samoa, Guam, Hawaii, the Northern Mariana Islands and the other US Pacific Islands.1. Howland Island, Baker Island, Jarvis Island, Johnston Atoll, Midway Island, Kingman Reef, Palmyra Atoll and Wake Island. Once an FMP is approved by the Secretary of Commerce, it is implemented by Federal regulations that are enforced by the National Marine Fisheries Service (NMFS) and the US Coast Guard, in cooperation with state, territorial and commonwealth agencies. For further information, contact:

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B Spawning biomass
BMUS Bottomfish management unit species
C Catch (in numbers)
CFR Code of Federal Regulations
CMUS Crustacean management unit species
CPUE Catch per unit effort
DAWR Guam Division of Aquatic and Wildlife Resources
DAH Domestic allowable harvest
DFW Northern Mariana Islands Division of Fish and Wildlife
DMWR American Samoa Department of Marine and Wildlife Resources
EEZ Exclusive economic zone
F Fishing mortality
FL Fork length
FMP Fishery management plan
HAPC Habitat areas of particular concern
HDAR Hawaii Division of Aquatic Resources
HR Harvest rate
M Natural mortality rate
MFMT Maximum fishing mortality threshold
MHI Main Hawaiian Islands
MSST Minimum stock size threshold
MSY Maximum sustainable yield
MUS Management unit species
MYPR Maximum yield per recruit
SE-NHR southern Emperor-northern Hawaiian Ridge
NMFS National Marine Fisheries Service
NWHI Northwestern Hawaiian Islands
OY Optimum yield
PCMUS Precious coral management unit species
PIAO NMFS Pacific Islands Area Office
PMUS Pelagic management unit species
RAIOMA Resource Assessment and Investigation of the Mariana Archipelago
RSB Relative spawning biomass
SPC Secretariat of the Pacific Community (South Pacific Commission)
SPR Spawning potential ratio

TALFF Total allowable foreign fishing
UFA United Fish Agency
WpacFIN Western Pacific Fisheries Information Network
WPRFMC Western Pacific Regional Fishery Management Council
Y Yield or catch (in weight)
YPR Yield per recruit

1.4 Managed Species in the Western Pacific Region

Bottomfish

Scientific Name	Common Name (*local name*)
Aphareus rutilans	red snapper/silvermouth (*lehi*)
Aprion virescens	gray snapper/jobfish (*uku*)
Caranx ignobilis	giant trevally/jack (*ulua*)
C. lugubris	black trevally/jack (*ulua*)
Epinephelus fasciatus	blacktip grouper
E. quernus	sea bass (*hapuupuu*)
Etelis carbunculus	red snapper (*ehu*)
E. coruscans	red snapper (*onaga*)
Lethrinus amboinensis	ambon emperor
L. rubrioperculatus	redgill emperor
Lutjanus kasmira	blueline snapper (*taape*)
Pristipomoides auricilla	yellowtail snapper (yellowtail *kalekale*)
P. filamentosus	pink snapper (*opakpaka*)
P. flavipinnis	yelloweye snapper (yelloweye *opakapaka*)
P. sieboldii	pink snapper (*kalekale*)
P. zonatus	snapper (*gindai*)
thicklip trevally	*Seriola dumerili* amberjack
Variola louti	lunartail grouper

Seamount Groundfish

Scientific Name	Common Name (*local name*)
Beryx splendens	alfonsin
Hyperoglyphe japonica	ratfish/butterfish
Pseudopentaceros richardsoni	armorhead

Pelagic Species

Scientific Name	Common Name (*local name*)
Coryphaena spp.	mahimahi
Acanthocybium solandri	wahoo
Makaira mazara; M. indica	Indo-Pacific blue marlin; black marlin
Tetrapterus audax	striped marlin
T. angustirostris	shortbill spearfish
Istiophorus platypterus	sailfish
Xiphias gladius	swordfish
Lampris spp.	moonfish
Ruvettus pretiosus; Lepidocybium flavobrunneum	oilfishes
Bramidae	pomfret
Alopiidae; Carcharinidae; Lamnidae; Sphyrnidae	oceanic sharks

Thunnus alalunga	albacore
T. obesus	bigeye tuna
T. albacares	yellowfin tuna
T. thynnus	northern bluefin tuna
Katsuwonus pelamis	skipjack tuna
Euthynnus affinis	kawakawa
Gymnosarda unicolor	dogtooth tuna
Auxis spp.; *Scomber* spp.; *Allothunnus*	spp. other tuna relatives

Crustaceans

Scientific Name	Common Name (*local name*)
Panulirus marginatus, Panulirus pencicillatus, *Panulirus sp*.	spiny lobsters
Scyllaridae sp.	slipper lobster
Ranina ranina	Kona crab

Precious Corals

Scientific Name	Common Name (*local name*)
Corallium secundum	pink coral
Corallium regale	red coral
Corallium laauense	red coral
Gerardia sp.	gold coral
Narella sp.	gold coral
Calyptrophora sp.	gold coral
Callogorgia gilberti	gold coral
Lepidisis olapa	bamboo coral
Acanella sp.	bamboo coral
Antipathes dichotoma	black coral
Antipathes grandis	black coral
Antipathes ulex	black coral

2.0 BACKGROUND AND PURPOSE OF AMENDMENT

2.1.1 Bottomfish fishery

The FMP for bottomfish and seamount groundfish fisheries in the western Pacific region became effective in 1986. 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 NWHI. The plan also establishes a management framework that includes adjustments 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 includes the establishment of limited access systems for bottomfish fisheries in the EEZ surrounding American Samoa and Guam within the framework measures of the FMP.

Amendment 2 was developed to diminish 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. Access to the Mau Zone

remains 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 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 requires vessel owners or operators to notify NMFS at least 72 hours before leaving port if they intend to fish in a 50 nm "study zone" 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.

2.1.2 Pelagics fishery

The management plan for the pelagic fisheries of the western Pacific region was published in 1987. The FMP includes initial estimates of MSY for the stocks and set OY for these fisheries in the EEZ. The MUS 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 Guidelines for the Magnuson Act National Standards requiring a measurable definition of recruitment overfishing for each species or species complex in a FMP. 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 requires domestic longline 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. It also includes under the FMP pelagic fisheries in the EEZ around the Northern Mariana Islands.

Amendment 3 creates a 50 nm longline exclusion zone around the NWHI to protect endangered Hawaiian monk seals. It also contains framework provisions for establishing a mandatory observer program to collect information on interactions between longline fishing and turtles.

Amendment 4 establishes a three-year moratorium on new entries into the Hawaii-based domestic longline fishery. It also adds a provision for establishing a mandatory vessel monitoring system for domestic longline vessels fishing in the western Pacific region.

Amendment 5 creates a domestic longline vessel exclusion zone around the MHI ranging from 50 to 75 nm and a similar 50 nm exclusion zone around Guam and its offshore banks. The zones are intended to prevent gear conflicts and vessel safety issues arising form 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 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 MHI to foreign vessels.
Amendment 7 institutes a limited entry program for the Hawaii-based domestic longline fishery. The number of vessels allowed into the fishery is limited to 167, and the length of these vessels is limited to 94 feet or less.

2.1.3 Crustaceans fishery

2.1.4 Precious corals fishery

The management plan for the precious corals fishery of the western Pacific region was implemented in 1983. In the FMP, precious coral beds are treated as distinct management units because of their widely separated, patchy distribution and the sessile nature of individual colonies. The beds are classified as Established, Conditional, Refugia or Exploratory. Established Beds are ones for which appraisals of MSY are reasonably precise. To date, only Makapuu bed has been studied adequately enough to be classified as Established. Conditional Beds are ones for which estimates of MSY have been calculated by comparing the size of the beds to that of the Makapuu bed and then multiplying the ratio by the yield from the Makapuu bed. It is assumed that ecological conditions at the Makapuu bed are representative of conditions at all other beds. Five beds of precious corals are classified as Conditional, all of which are located in the EEZ around Hawaii. Refugia Beds are areas set aside for baseline studies and possible reproductive reserves. No harvesting of any type is allowed in those areas. The single Refugia Bed that has been designated—the Westpac bed—is also located in the EEZ surrounding Hawaii. Exploratory Areas are the unexplored portions of the EEZ. Separate Exploratory Permit Areas are established for Hawaii, American Samoa and Guam.
The FMP permits the use of only selective gear in the EEZ around the MHI, i.e., south and east of a line midway between Niihau and Nihoa Islands. Use of both selective and nonselective gear is permitted on the Conditional Beds of Brooks Bank and the 180 Fathom Bank and throughout the Exploratory Area of the NWHI. Quotas are established for pink, gold and bamboo coral populations in the Makapuu bed and in the Conditional Beds. Pink coral harvested from the Makapuu bed, the Keahole Point bed and the Kaena Point bed must have attained a minimum height of 10 inches. If tangle net dredges are employed, the weight quota is only 20% of that allowed for selective harvesting.
The FMP establishes a procedure for redesignating coral beds from Exploratory to Conditional and from Conditional to Established as new beds are located and more catch/effort data become available that will allow more precise determinations of sustainable yields.
Amendment 1 applies the management measures of the FMP to the Pacific Insular Areas other than Guam, American Samoa and the Northern Mariana Islands by incorporating them into a single Exploratory Permit Area; expands the managed species to include Midway deep-sea coral; and outlines provisions for experimental fishing permits designed to stimulate the domestic fishery.
Amendment 2 defines overfishing with respect to Established Beds as follows: An Established Bed shall be deemed overfished with respect to recruitment when the total spawning biomass (all species combined) has been reduced to 20% of its unfished

condition. This definition applies to all species of precious corals and is based on cohort analysis of the pink coral, *Corallium secundum*.

The Magnuson-Stevens Act requires that FMPs contain provisions regarding bycatch, fishing sectors, EFH, fishing communities and overfishing. This amendment compiles the best available scientific information pertaining to each of these new provisions and incorporates it directly or by reference into the Western Pacific Council's management plans for bottomfish and seamount groundfish, pelagics, crustaceans and precious corals fisheries. In addition, the amendment identifies other scientific data that are needed to more effectively address the new provisions.

The Magnuson-Stevens Act also contains a number of new definitions. This amendment adds those definitions that are pertinent to western Pacific fisheries to the Council's four management plans.

2.3 Amendment Coordination

This amendment was prepared through an iterative process consisting of a series of meetings of the Council, SSC, FMP teams and fishing industry advisory panels. In addition, the Council worked in close cooperation with scientists in the NMFS Southwest Fisheries Service Center, Honolulu Laboratory, Pacific Islands Area Office and Southwest Regional Office. Notice of the availability of a draft amendment for public review and comment was published in the Federal Register on July 15, 1998. Public meetings and hearings at which this amendment was discussed are listed below:

Public Hearing on Amendment: July 20, 1998

Council: August 19–21, 1997; Nov. 12–14, 1997; April 13–17, 1998; July 27–29, 1998

SSC: August 5–7, 1997; Nov. 10–11, 1997; March 24–26, 1998; July 21–23, 1998

Bottomfish and Seamount Groundfish Fishery Plan Team: July 28, 1997; March 11–13, 1998

Pelagics Fishery Plan Team: July 30–31, 1997; May 6–7, 1998

Precious Corals Fishery Plan Team: July 29, 1997; Jan. 30, 1998; June 4, 1998

Crustaceans Fishery Plan Team: July 24–25, 1997; March 17–19, 1998

Ecosystem and Habitat Advisory Panel: July 29, 1997; March 20, 1998

Pelagics Fishery Advisory Panel: July 30–31, 1997

Bottomfish and Seamount Groundfish Fishery Advisory Panel: July 28, 1997

3.0 NEW DEFINITIONS

Bycatch means fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards. Such term does not include fish released alive under a recreational catch and release fishery management program.

Charter fishing means fishing from a vessel carrying a passenger for hire (as defined in section 2101(21a) of title 46, United States Code) who is engaged in recreational fishing. Commercial fishing means fishing in which the fish harvested, either in whole or in part, are intended to enter commerce or enter commerce through, sale, barter or trade. Recreational fishing means fishing for sport or pleasure.

Economic discards mean fish which are the target of a fishery, but which are not retained because they are of an undesirable size, sex or quality or for other economic reasons. Regulatory discards mean fish harvested in a fishery which fishermen are required by regulation to discard whenever caught or are required by regulation to retain but not sell.

Essential fish habitat means those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity.
Fishing community means a community which is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators and crews and US fish processors that are based in such community.
Individual fishing quota means a Federal permit under a limited access system to harvest a quantity of fish, expressed by a unit or units representing a percentage of the total allowable catch of a fishery that may be received or held for exclusive use by a person.
Optimum, with respect to the yield from a fishery, means the amount of fish that (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 as such on the basis of the MSY from the fishery, as reduced by any relevant economic, social or ecological factor; and (c) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the MSY in such fishery.
Overfishing and Overfished mean a rate or level of fishing mortality that jeopardizes the capacity of a stock or stock complex to produce the MSY on a continuing basis.
Pacific Island Area means American Samoa, Guam, the Northern Mariana Islands, Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Midway Island, Wake Island or Palmyra Atoll, as applicable, and includes all islands and reefs appurtenant to such island, reef or atoll.

4.0 NEW FISHERY MANAGEMENT PLAN PROVISIONS

4.1 Establish Reporting Methods to Assess Bycatch and Minimize Bycatch and Bycatch Mortality

> *Establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority—*
>
> *(A) minimize bycatch; and*
>
> *(B) minimize the mortality of bycatch which cannot be avoided.*

This section presents an overview of the type and amount of bycatch in each managed fishery and assesses the adequacy of bycatch reporting in terms of the required provision. It also examines existing and possible new measures to minimize bycatch and mortality of bycatch in each FMP fishery.
This fishery is managed under the Bottomfish and Seamount Groundfish FMP, implemented in 1986. Commercial and recreational bottomfish fishing occurs in the EEZ around all of the occupied islands in the Council's area
Gear Types
In Hawaii commercial and recreational bottomfish fishing are conducted with handlines that are set and hauled on electric-, hydraulic- or hand-powered reels. Vessels are usually equipped with depth sounders, fish echo sounders and satellite navigational devices. Two separately managed bottomfish fisheries occur in Hawaii. In the NWHI all participants fish commercially on a full- or part-time basis while in the MHI fishery there

are also recreational fishermen. Available data suggests that the magnitude of the effort in the MHI fishery has been declining since the late 1980s. In American Samoa small skiffs and *alia* catamarans equipped with handlines and hand-powered reels fish on the deep outer-reef slope. As in Hawaii, this method is relatively selective, targeting a mix of snappers, groupers, jacks and emperors. In the EEZ around Guam and the Northern Mariana Islands deep-water bottomfish fishing is conducted mainly by commercial vessels equipped with electric-powered reels. Shallow-water BMUS are also caught on seamounts using rod and reel.

Data Collection

In Hawaii landings data for the commercial bottomfish fishery in the MHI and in the EEZ around the uninhabited islands in the Pacific Insular Areas are collected on the Fish Catch Report
(referred to as the C3 form) administered by the HDAR. (See Appendix 1 for a description of regional data collection systems and Appendix 2 for copies of the data forms. The C3 form is reproduced on p. A2-17). The form requires commercial marine license holders to report the number and weight of each species caught and the weight of each species sold. The form does not require fishermen to provide information on the disposition of unsold catch.

Participants in the NWHI fishery are required to complete the HDAR NWHI Bottomfish Trip Daily Log (p. A2-22). The daily log requires fishermen to report the number and weight of various bottomfish and non-bottomfish species kept, the number released and the number damaged or stolen by marine mammals and sharks. There is also limited space provided for recording the type and number of other fish kept, released or stolen.

In American Samoa landings data are collected from creel surveys administered by the DMWR. The Offshore Survey form (p. A2-1) used in the creel surveys records the numbers and weight of each species caught during a trip as well as the disposition of the catch. However, fishermen have not been specifically asked to provide information on the disposition of fish that are not sold.

In Guam landings data are collected from creel surveys administered by the DAWR. The Offshore Creel Census (p. A2-4) form records the number and weight of each species caught during a trip and percentage of the total catch that is kept or sold. However, fishermen have not been specifically asked to provide information on the disposition of fish that are not sold.

In the Northern Mariana Islands from 1988 to 1996 the DFW collected landings data in a creel survey program. The CNMI Offshore Creel Census and CNMI Inshore Creel Census forms (p. A2-25 and A2-27) recorded the number and weight of each species caught during a trip and percentage of the total catch that was kept or sold. However, fishermen were not specifically asked to provide information on the disposition of fish that were not sold. Commercial bottomfish landings in the Northern Mariana Islands are currently recorded in the DFW's Commercial Purchase Database (p. A2-29).

Several research cruises in the Hawaiian Islands and other parts of the western Pacific conducted by NMFS and other fishery agencies have collected detailed information on bottomfish stocks. These fishery-independent records are also useful in providing information on the likely volume of bycatch.

Bycatch

In all cases bottomfish are caught on gear that is relatively selective, targeting the snapper/grouper/emperor complex on outer reef slopes and seamounts. However, the ability to target particular species varies widely depending on the skill of each captain. Experienced bottomfish fishermen have the capability to catch desired species with little bycatch or incidental catch. However, it is impossible to completely avoid non-target species.

Table 4.1.a presents HDAR logbook data on the number of fish caught and kept, the number of fish discarded and number of fish discarded during 1997. Releases and damaged fish might reasonably be designated bycatch; these amounted to only 8% of the total catch of NWHI handline-caught bottomfish. No details were provided about the numbers of fish stolen, as these are usually grouped in the 'damaged' category by fishermen. Sharks, oilfish, snake mackerel, pufferfish and moray eels are important bycatch species, discarded because they are normally not considered food fish. In contrast, ulua (Caringidae) and kahala are discarded despite being palatable (Kasaoka 1990). Ulua are discarded because of their short shelf-life and low market value. Kahala, once a major component of commercial and recreational landings, are now seldom retained as they have been implicated in incidents of ciguatera. In Hawaii a recent increase in the market demand for shark fins has meant that more sharks are being "finned" (the practice of cutting off a shark's fins and returning the remainder of the fish to the sea) and fewer are being discarded as bycatch.

Data collected during NMFS research cruises in Hawaii indicate that species generally regarded as bycatch represent about 19% of the total catch (Figure 4.1.a).

Fishery independent data collected during surveys in American Samoa in 1978 and 1988 by the SPC suggest that the catch of non-target species amounts to less than 1% of the total catch and consists mainly of snake mackerel (*Promethichthys prometheus*).

Information gathered during the NMFS Resource Assessment and Investigation of the Mariana Archipelago (RAIOMA) project suggest that in Guam and the Northern Mariana Islands pufferfish, gurnards, beardfish and sharks are the main bycatch species (Figure 4.1.b). Total potential bycatch comprises only about 1% of the total catch.

Hawaiian Name	**Scientific Name**	**Number Kept**	**Number Released**	**Number Damaged**
Misc Shark	*Carcharhinidae*	0	166	0
Tiger Shark	*Galeocerdo Cuvier*	0	5	0
Kahala	Seriola dumerilli	25	2,114	6
Ahi	Thunnus alabacares	16	7	0
Ulua butaguchi	Caranx ignobilis	4,396	1,177	121
Uku	Aprion virescens	3,500	16	50
Hapuupuu	Epinephelus quernus	4,586	17	97
Kalekale	Pristopomoides auricilla	6,312	12	7
Opakapaka	Pristopomoides filamentosus	16,554	2	213
Ehu, ulaula	Etelis carbunculus	6,070	0	98
Gindai	Pristipomoides zonatus	2,133	0	98
Onaga	Aprion virescens	8,207	0	37
Ulua	Carangidae	231	0	7
Lehi	Aphareus rutilans	123	0	2

Kawakawa	Euthynnus affinis	29	0	0
Mahimahi	Corphaena hippurus	16	0	0
Omilu	Carangidae	49	0	0
Misc. ulua/papio	Carangidae	1	0	0
Wekw ula,	Labridae	9	0	0
Aawa	Labridae	9	0	0
Aweoweo	Labridae	4	0	0
Wahanui	Labridae	23	0	0
Kaku	Sphyraenidae	10	0	0
Kamano	Elegatis bipnnulatis	3	0	0
Kumu	Mullidae	1	0	0
Mu	Mullidae	2	0	0
Nohu,	Scorpaenidae	1	0	0
Ulua kagami	Carangidae	5	0	0
Opelu	Decapterus spp	5	0	0
Taape	Lutjanus kasmira	24	0	0
Pomfret	Bramidae	17	0	0
Ulua dobe	Carangidae	2	0	0
Ulua gunkan	Carangidae	46	0	0
Ulua papa	Carangidae	224	0	0
Hogo	Scorpaenidae	193	0	0
others		4	0	0
Total		52,832	3,516	736

Table 4.1.a: Logbook estimates of disposition of catches in the NWHI bottomfish fishery, 1997 (Source: NMFS Honolulu Laboratory)

4.1.2 Pelagics fishery

Pelagic fish species are managed under the FMP for pelagic fisheries, implemented in 1986. Commercial pelagic fisheries are found primarily in Hawaii, but there are recreational, subsistence and small-scale commercial fisheries in the other island areas. PMUS are caught by longline, troll and handline, pole- and-line and purse seine.

The number of longline vessels based in Hawaii are restricted by a license limitation program to 167. Currently, about 105 vessels are active. These vessels are typically 50–100 ft in length and employ a monofilament mainline 18–60 nm long, with 400–2,000 baited hooks. Longline fishing is prohibited in a 50–75 nm exclusion zone around the MHI to prevent competition and gear conflicts with troll and handline vessels and in a 50 nm exclusion zone around the NWHI to prevent interactions with protected species. In American Samoa the domestic longline fleet mainly consists of small (28–32 ft) catamarans from which a 300-hook longline is set and retrieved by hand. In Guam and the Northern Mariana Islands there is no commercial longline fleet.

Hand troll gear is used by commercial, recreational and charter vessels to fish for pelagic species throughout Hawaii. Commercial albacore troll vessels occasionally fish in the waters around Hawaii. In American Samoa, Guam and the Northern Mariana Islands trolling with baited hooks and lures is conducted from catamarans and other small commercial, recreational and charter vessels in coastal waters, near seamounts or around fish aggregating devices. Handline fishing from stationary or drifting vessels is also common in Hawaii.

A small pole-and-line fleet, which principally targets surface schools of skipjack tuna, operates in Hawaii.
US purse seine vessels operating in the central and western Pacific occasionally fish in the EEZ around the uninhabited islands of the Pacific Insular Areas.

Data Collection

Longline vessels based in Hawaii and American Samoa and those fishing in the waters of Guam, the Northern Mariana Islands and the uninhabited islands of the Pacific Insular Areas are required to record catches in the NMFS Western Pacific Daily Longline Fishing Log (p. A2-18). Vessels are required to record the number of various PMUS kept during a set and the number not kept/released. The form also requires longline fishermen to report the number of sharks finned, kept whole and not kept/released. There is also limited space for recording the number of non-PMUS kept or not kept/released.
In addition, Hawaii-based longline vessels are required to complete the HDAR Longline Trip Report (p. A2-19), which records the number and weight of particular pelagic species caught and the weight of each type sold. There is also limited space for reporting the number and weight of
other species caught and the weight of those sold. Fishermen are not required to report the disposition of unsold fish. Finally, the form requires fishermen to record the number of dolphins, monk seals, humpback whales, turtles (by species), albatrosses and other protected species released alive, injured or dead.
Since 1994, NMFS observers have also been deployed on Hawaii-based longline vessels, principally to document the interactions between longline gear and marine turtles. The Magnuson-Stevens Act classifies turtles that are captured and discarded as bycatch. The observers record whether each turtle is alive or dead when released. They have also fitted a number of live released turtles with satellite tags that transmit information on the location and depth of the animal. This information is also being used to determine the post-hooking mortality rate of turtles. Observers also record the type and number of all fish captured in a set.
Landings data for commercial troll and handline vessels in Hawaii are collected on the state's Fish Catch Report (refer to Section 4.1.1 and see p. A2-17). Holders of Hawaii commercial marine fishing licenses fishing in the uninhabited islands and landing their catch in Hawaii are also required to used this form. Some charter and recreational vessels also routinely participate in the NMFS Cooperative Billfish Tagging Program on a voluntary. The troll fleet in American Samoa employs the Offshore Survey (p. A2-1) to record catches, while in Guam the Offshore Creel Census, which includes an Offshore Vehicle Trailer Participation Census (p. A2-4 and A2-5), is used. The Offshore Creel Census, which included both interview and participation forms, was also used in the Northern Mariana Islands from 1988 until it was discontinued in 1996 (refer to Section 4.1.1.2 and see p. A2-24 and A2-25). Commercial troll landings in the Commonwealth are currently recorded on the DFW's Commercial Sales Data form (p. A2-29).
Commercial albacore troll vessels that land their catch in Hawaii are required to complete the HDAR Albacore Trolling Trip Report (p. A2-21). This form requires fishermen to report the number and weight of albacore, skipjack, yellowfin and bigeye tuna, yellowtail snapper and mahimahi caught during a trip and the weight of each type sold. There is also limited space for recording the number and weight of other species

caught and the weight of those sold. The form does not require fishermen to report on the disposition of unsold fish.

Pole-and-line catches are recorded on the HDAR Aku Catch Report (p. A2-20). The form requires fishermen to report the number and weight of skipjack tuna and mahimahi caught and the weight of these species that are sold. The form also requires fishermen to record the number and weight of other fish species caught and the weight of these species sold. There is no space for reporting how unsold fish are disposed of.

Purse-seine vessels complete the South Pacific Regional Purse-Seine Logsheet (p. A2-30) developed under the Multilateral Treaty on Fisheries between Pacific Island States and the United States. The form requires fishermen to report the number of yellowfin, skipjack and bigeye tuna and other species caught during each set and the number of tuna, marlin and other species discarded. In addition, observers on US purse seiners from member nations of the South Pacific Forum complete the South Pacific Regional Purse Seine Observer Set Details form (p. A2-31), which records details of the catch including species and condition of discards.

Bycatch

NMFS observers recorded more 60 different species caught by the Hawaii-based longline fleet between 1994 and 1997. Data collected on the catch and discards of PMUS by Hawaii-based longline fleet in 1997 are presented in Table 4.1.b. Of significance are the 85,523 sharks, of which the majority were blue sharks, caught by the fleet. Up until about five years ago, most sharks caught by longline gear were released alive. However, as a result of the growing demand for shark fins in Asian markets the practice of shark finning has increased. Presently, more than half of the caught sharks, including species other than the blue shark, are finned. About 1% of the sharks, mainly mako and thresher, are headed and gutted and retained for later sale. However, the majority of longline vessels do not retain blue shark carcasses because they cannot be profitably sold. Aside from sharks, there is a small fraction of the total catch that could be sold but is not retained for economic reasons. For example, marlins are often discarded at the beginning of a trip to leave hold space for more valuable species. Most of these economic discards are released alive.

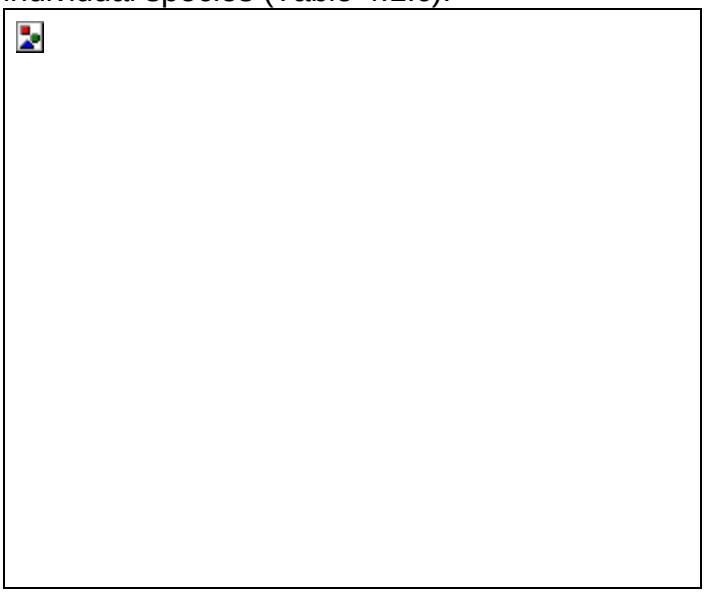
Species	**Number Caught**	**Number Finned**	**Number Kept**	**Number Released**	**Discards as %of Total Catch**
Blue Marlin	8249		8032	217	2.63
Spearfish	7302		7028	274	3.75
Striped Marlin	12614		11925	689	5.46
Swordfish	39500		38164	1336	3.38
Other billfish	1708		1587	121	7.08
Blue Sharks	79712	45608	217	33887	42.51
Mako Sharks	1164	523	344	297	25.52
Thresher sharks	2321	550	212	1559	67.17
Other Sharks	2326	1769	16	541	23.26
Albacore	71051		66424	4627	6.51
Bigeye	79602		77220	2382	2.99
Bluefin	242		221	21	8.68
Skipjack	12058		11760	298	2.47

Yellowfin	28983	28281	702	2.42
Mahimahi	49311	40995	8316	16.86
Moonfish	8241	8068	173	2.10
Oilfish	1746	637	1109	63.52
Pomfret	10423	10345	78	0.78
Wahoo	8304	8132	172	2.07
Non-PMUS	1152	1073	79	6.86

Table 4.1b: Logbook astimates of catch and discards of PMUS by Hawaii-based longline vessels (Source: NMFS Honolulu Laboratory)

Non-PMUS species captured by the longline fleet are mostly discarded and represent about 6% of the total number of fish caught. Based on NMFS observer data for 1994–1997, which amounts to between 4% and 5% of the annual total number of longline fishing trips, the discarded non-PMUS species include lancet fish, pelagic stingray, snake mackerel, escolar, remora, crocodile shark and mola mola,, among others (Figure 4.1.c).

NMFS observers report that loggerhead, olive ridley, leatherback and green turtles are caught by longline gear, and about 40 turtle interactions are recorded per year. These encounters can be expanded statistically to estimate fleet-wide take and kill for individual species (Table 4.1.c).



The use of a statistically stratified expansion process to generate kill and take estimates means that variables obtained from logbook data prior to the implementation of the observer program can be used to estimate kill and take levels for those years.

As for the the troll and handline fishery, there is relatively little information on the nature and amount of bycatch because of current reporting requirements. However, as the gear 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 Northern Mariana Islands are either sold or kept for personal consumption. In recent years, fishing tournaments, such as the Hawaii International Billfish Tournament, have provided various incentives for participants to release their catch. These catch-and-release tournament fish are not part of a recreational catch and release fishery management program within the FMP and should be considered bycatch.

The albacore troll fishery occurring in the North and South Pacific outside the EEZ has reported incidental catches of skipjack tuna, striped marlin, mahimahi and louvars. However, the largest bycatch component in this fishery is probably small (< 60 cm) albacore, which are discarded for economic reasons (N. Bartoo, NMFS SW Fisheries Science Center, pers. comm.). The volume of discards is estimated to be about 10% of the catch.

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

According to Catch Report Form data collected by purse-seine vessels in US EEZ waters in 1997 (Table 4.1.d), discards amounted to less than 0.5% of the total volume of catch. Purse-seine logbooks indicate that skipjack tuna forms the largest fraction of the discard volume by weight. This data is confirmed by the weight and numbers of discards recorded by observers aboard US purse seiners operating within the US EEZ waters between 1994 and 1997 (Table 4.1.e). Rainbow runner, triggerfish and mackerel also make significant contributions to purse-seine discards in terms of numbers.

Quantity Discarded (mt)

Species	Howland and Baker	Jarvis	Palmyra	All Islands	Percent of Total Discards
Skipjack Tuna	68.19	18.72	1.00	87.91	63.64
Yellowfin Tuna	1.55	1.92		3.47	2.51
Mixed	13.89	1		14.89	10.78
Marlin	3.07	0.7		3.77	2.73
Blue Marlin	0.35			0.35	0.35
Sailfish	0.05			0.05	0.04
Swordfish		0.09		0.09	0.07
Shark	9.8	1.79		11.59	8.39
Albacore	0.02			0.02	0.01
"Baitfish"	7.66	0.56		8.22	5.95
Barracuda	0.05			0.05	0.04
Dolphinfish	0.03	0.13		0.16	0.12
Mackerel	0.46	0.52		0.98	0.71
Manta ray	0.15			0.15	0.11
Mixed species		0.07		0.07	0.05
Rainbow runner	1.02	5.1		6.12	4.43
Wahoo	0.05			0.05	0.04
Unknown Species	0.19			0.19	0.14

Total **106.53** **30.6** **1.00** **138.13** **100**

Species	Weight (mt)	Numbers	% wt	% no
Skipjack Tuna	124.50	1765	82.33	36.07
Rainbow runner	7.91	1672	5.23	34.17
Triggerfish	2.65	661	1.75	13.51
Mackerel	3.27	365	2.16	7.46
Bigeye Tuna	1.48	149	0.98	3.05
Yellowfin Tuna	7.07	130	4.67	2.66
Mahimahi	0.09	73	0.06	1.49
Black marlin	0.22	14	0.14	0.29
Shark	0.22	14	0.14	0.29
Blue marlin	1.73	12	1.14	0.25
Wahoo	0.00	8	0.00	0.16
Sailfish	0.03	2	0.02	0.04
Manta ray	0.13	1	0.09	0.02
Other Tuna	1.84	0	1.21	0.00
Barracuda	0.02	27	0.01	0.55
Unspecified species	0.08	0	0.05	0.00

Table 4.1.e: Observer estimates of volume of discards by US purse seiners operating in the EEZ around the uninhabited islands of the Pacific Insular Areas, 1994–1997 (Source: Forum Fisheries Agency, Honiara)

Amendment 6 to the FMP states: "Lobster stocks shall be deemed overfished with regard to recruitment when the spawning potential ratio (SPR, measured for a specific fishing area) is 20% or below." FMP regulations are based on the principles of OY, i.e., MSY as modified by relevant ecological and socio-economic considerations. MSY is defined in the FMP as the largest average annual catch of fish that can be taken from an area on a continuing basis. Amendment 6 defines OY as a SPR of 50%. For a fishing level such that SPR is 50%, the increased egg production and survival of young lobsters at the fished density must be twice the level in the absence of fishing, if overfishing is to be avoided (Goodyear 1989). The lobster fishery annual report also addresses the status of the stocks relative to overfishing for both the NWHI as a whole and for specific banks. The fishery currently operates with a SPR level of about 70%.
Rosenberg et al. (1994) reviewed the overfishing definition for CMUS and concluded that a SPR of 20% was a reasonable threshold for the lobster fishery in the absence of stock recruitment

information. However, the report stated that it may not be possible to accurately estimate the SPR for these stocks with available data. In the late 1980s and early 1990s, an environmental regime shift caused SPR to approach the 20% threshold level.

Amendment 9 incorporated a new constant harvest rate strategy (control rule) to minimize the risk of overfishing. The annual harvest guideline is determined by the product of *N* times *r*, where *N* is the number of exploitable lobsters in the population (derived from a population model with parameters for natural mortality, catch and recruitment) and *r* is a "constant harvest rate" (or portion of the population that can be exploited). The Council accepted a 10% (maximum) risk of overfishing, which corresponds to a *r* of 13% (i.e., only once every 10 years will this strategy result in a SPR less than 20%). A SPR less than 50% indicates a warning level.

MSY Determination Criteria

The FMP states that, in theory, a fishery can be managed to generate MSY by controlling the time, location and manner of fishing. Conventional stock assessment methods are typically used to derive MSY for established fisheries, using parameters such as catch, effort, size distribution, sex ratio of catch, natural mortality, fecundity and growth rates. Because information on many of these factors was not available when the FMP was prepared, MSY could not be reliably estimated. However, by accepting a number of assumptions and extrapolating across the NWHI chain, crude estimates were generated. It was concluded that MSY for the NWHI spiny lobster stock may be 200,000–435,000 lobsters per year. The most productive banks were thought to be Maro (MSY=68,000), Necker (MSY=53,000), Gardner (MSY=26,000) and Raita (MSY=8,000). For the 1998 season, bank specific harvest guidelines were determined to be 80,000 lobsters for Maro, 70,000 lobsters for Necker and 20,000 lobsters for Gardner.

As noted above, Amendment 9 incorporated a constant harvest rate strategy, where annual yield is 13% of estimated exploitable stock size. Harvest strategies were compared by varying the allowable catch target level and assessing the risk of overfishing and other performance statistics (e.g., average catch, CPUE, catch variability and SPR). The constant harvest rate strategy produced the highest average annual catches and SPRs (well above the threshold, even at the 10% level of risk). Other control rules considered were constant escapement (where all individuals above an "optimum" population size are harvested) and constant catch (where annual yield is constant). As new data become available the harvest strategy will be revised, as necessary.

Revised Model Analysis

DiNardo and Wetherall (1998) reevaluated a lobster population dynamics and harvest simulation model to identify biological reference points, including MSY, based on data from the NWHI fishery. The report describes the equilibrium relationships among the annual fishing mortality coefficient (F), relative spawning biomass (RSB), spawning potential ratio (SPR), harvest rate (HR),

catch in numbers (C) and catch in weight (Y), assuming various degrees of dependence between recruitment and spawning biomass (R-SB function). In addition, assuming a 13% harvest rate (as stipulated in Amendment 9), estimates of the risk of exceeding the levels of F associated with the various reference points are provided. Risk is defined as the probability that SPR will fall below 20% due to fishing.

The structure and parameterization of the model are the same as those underpinning the 1995 analysis of Amendment 9 harvest guidelines, which is currently the best available data for determining MSY. Maintaining consistency with the key harvest guideline decisions made in Amendment 9 is also necessary at this time. An analysis is planned for the near future that will modify the model structure, update model parameter estimates and rerun the model. In Amendment 9 the estimate of long-term yield considered recruitment as being constant and independent of stock size, as no relationship was known. In the current assessment parameters for varied recruitment are included.

The model used in Amendment 9 to simulate population dynamics and test harvest policy alternatives was expanded to incorporate biological reference points relative to overfishing. This age-based, sex-structured, auto-regressive model simulates population dynamics and mimics monthly stock dynamics and fishery dynamics, given a set of assumptions about growth, natural mortality, maturation, recruitment and fishing mortality. The model pools spiny and slipper lobster as one species-complex and implies no spatial structure in fishing. The model also assumes that population parameters and fishing characteristics are specific to spiny lobster (as time-series of data on slipper are lacking). Four biological reference points are defined for evaluating lobster harvest levels: 1) Amendment 9 target level (10% risk of a 20% SPR); 2) Amendment 9 warning level (50% SPR); 3) MSY (the maximum equilibrium yield) level; and 4) MSST—one-half of the equilibrium spawning biomass corresponding to MSY) level.

With several assumptions about the dependence of recruitment on spawning biomass, equilibrium values of RSB (the ratio of equilibrium spawning biomass for a given value of F to the equilibrium spawning biomass in the absence of fishing), SPR (the ratio of the equilibrium spawning biomass per recruit for a given value of F to the equilibrium spawning biomass per recruit in the absence of fishing), HR (the ratio of the annual catch of lobster (in numbers) to the July 1 exploitable lobster population size), C (the annual harvest of lobster in numbers) and Y (the annual catch of lobster in weight) were computed over a range of F values from 0 to 2.0. A retain-all fishery was assumed. With additional assumptions about systematic, process and measurement error, as well as auto-correlation in recruitment innovations, the model was used in a Monte Carlo harvest simulation to estimate risks of overfishing. In the Monte Carlo simulation, the model mimics the monthly dynamics of the lobster stock, the annual stock assessment process upon which harvest guidelines are

based and the dynamics of the fishery. From these results equilibrium values of F, RSB, SPR, HR, C, Y and Y/MSY were identified, corresponding to the four biological reference points for lobster harvest levels.

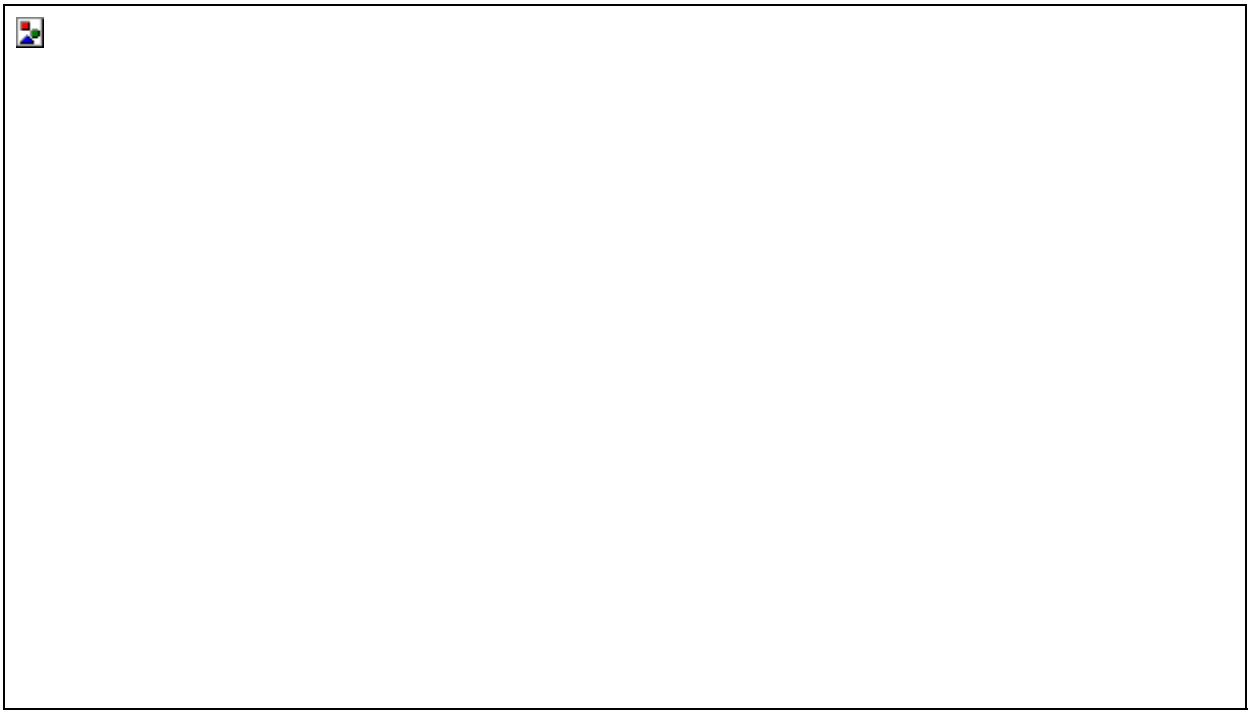
Except for the stock-recruitment relationship, all model processes were density independent. Annual lobster recruitment was modeled using a power function: $R/R_{MAX} = (SB/SB_{MAX})$, where R is recruitment; R_{MAX} is maximum equilibrium recruitment in the absence of fishing; SB is spawning biomass;, SB_{MAX} is the spawning biomass corresponding to $R_{MAX;}$ and is a parameter controlling the strength of the dependence between recruitment and spawning biomass. If = 0, recruitment is independent of spawning biomass. As increases, the dependence of recruitment on spawning biomass also increases. The R-SB relationships assumed in the analyses are depicted in Figure 4.5.e. The actual R-SB relationship for NWHI lobsters is unknown. Until it is better understood, a reasonable (and conservative) assumption might be that = 0.10, approximately. As shown below, when = 0.10 the SPR associated with harvesting at MSY is approximately 20%, which is consistent with the overfishing definition effected when the Council established the 13% constant harvest rate control rule. In other words, under these conditions the MSY overfishing reference point is the same as the SPR overfishing reference point under Amendment 9.

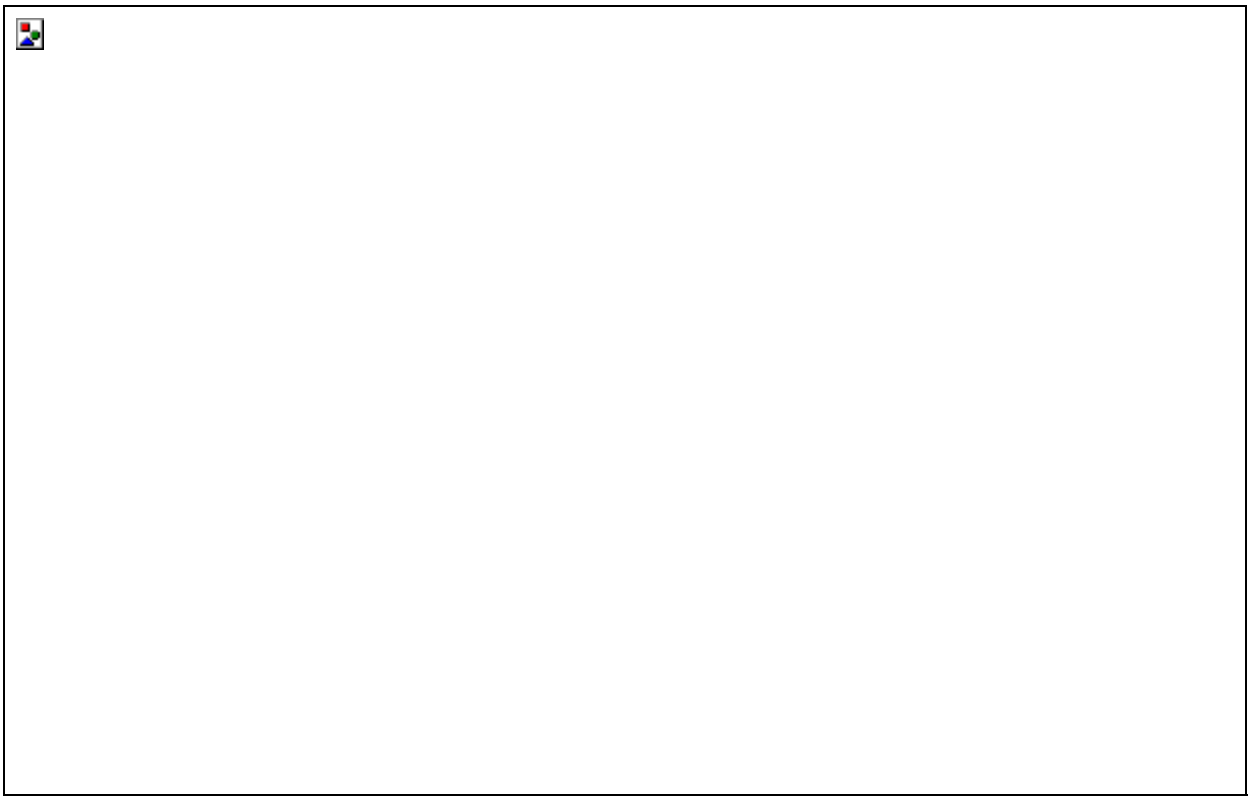
The present analysis is consistent with the Council's preferred harvest rate of 13%. Accordingly, risks of overfishing with respect to the four reference points defined above, assuming a 13% harvest rate, were computed. Overfishing risk is defined as the probability that in a given year F will exceed the value of F consistent with the reference point.

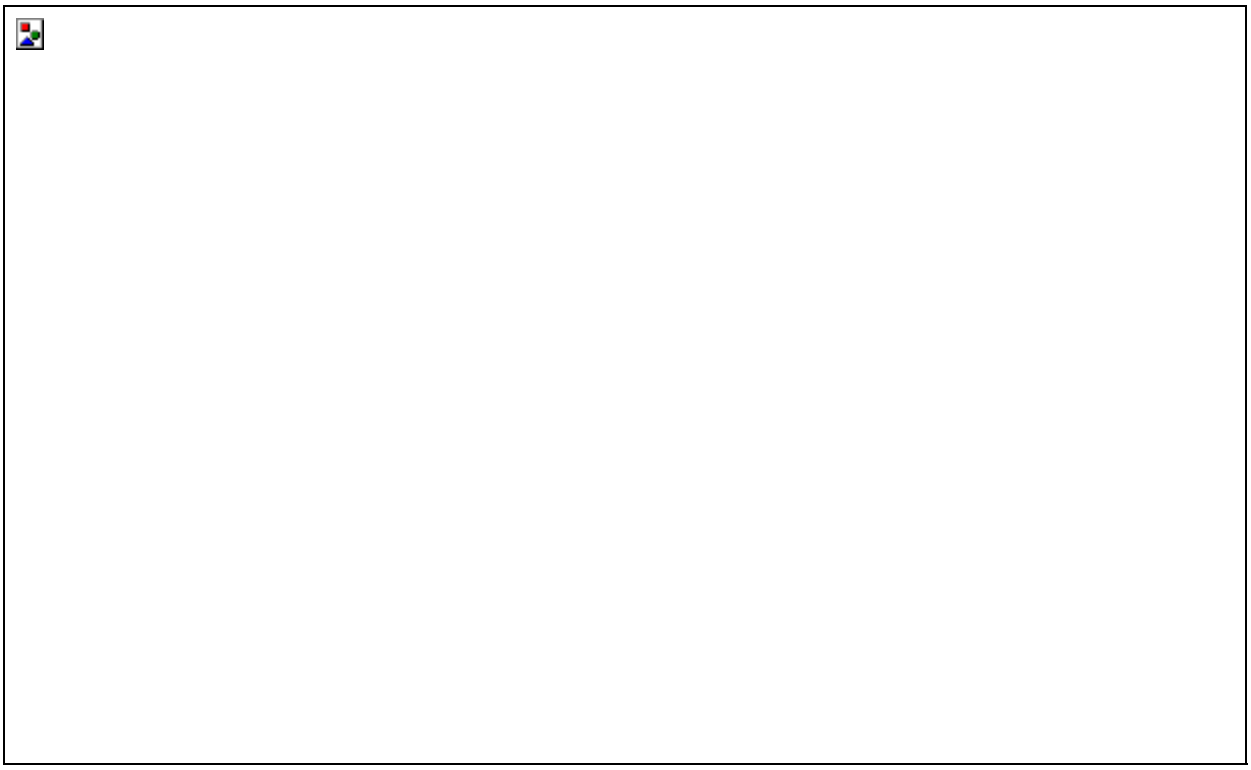
The extracted values of F, RSB, SPR, HR, C, Y, and Y/MSY for the four reference points, corresponding to the various values of , are given in Table 4.5.e. The equilibrium relationships between F, HR, SPR, and Y for a range of values of are shown in Figures 4.5.f–l. Estimates of overfishing risk for each of the reference points at a 13% harvest rate are presented in Table 4.5.f. As increases the overfishing risks associated with the MSY and MSST status determination criteria increase. However, does not affect the risk with regard to the Amendment 9 target and warning level reference points.

If a level of 0.10 is assumed for the R-SB relationship, then the maximum F_{MSY} would be 0.72 and the proxy for MSST would be SPR=11% (or conservatively default back to the current 20% SPR level for recruitment overfishing) (Table 4.5.e). A harvest rate of 58% of the exploitable population, which would produce a equilibrium catch of 461,260 lobsters, would be expected at these threshold levels. Under the 13% constant harvest rate control rule, under which the fishery currently operates, F_{MSY}=0.14 and SPR=65%, which are conservatively above the threshold values. Risk of overfishing by exceeding the maximum F_{MSY} or MSST thresholds is no greater than 10%, as it is under the current management strategy

(Table 4.5.f). For =0.10, the equilibrium relationship between F, HR, SPR and Y can be described as follows (Figure 4.5.h). A harvest rate of 0–13%, corresponds to a fishing mortality rate of 0–0.14, as yield increases to about 130,000 kg of lobster, and SPR declines from 100% to about 65%. As F further increases, SPR continues to decline exponentially, reaching 20% at about F=0.7, while yield increases exponentially and then exhibits a slight decline at F greater than 0.7. Equilibrium relationships for less than 0.10 are similar but differ mainly in that slightly higher yields can be obtained as the strength of the R-SB relationship diminishes, for comparable levels of F (Figures 4.5.f–g). Conversely, for equilibrium relationships where is greater than 0.10, the main difference can be seen as a diminishing yield curve, especially at higher levels of F, as recruitment becomes more dependent on spawning stock biomass (Figures 4.5.i–l).
The Magnuson-Stevens Act stipulates that the target of fishery management should be OY, a harvesting objective that takes into account not only biological criteria but social and economic factors as well. However, NMFS has not established standards for the incorporation of socioeconomic data, nor is such information presently available. The Council may choose to consider the average annual yield associated with a 13% harvest rate as a provisional estimate of OY, and the current harvest guidelines as an OY harvest policy, until a full analysis of economic and social factors is available. If a value of 0.10 is assumed, the risk characteristics of the OY policy would be indicated by the third row in Table 4.5.f. The Council selected a 10% risk level of exceeding overfishing, with which the level of 0.10 is most consistent. Under the current control rule of a 13% harvest rate, the expected SPR is 65%, significantly more conservative than the MSY threshold.







Measures to Prevent Overfishing

Existing measures to prevent overfishing in the crustaceans FMP include gear design restrictions, catch report requirement, limited access system, maximum traps per vessel, 6-month closed season, annual maximum harvest guideline based on constant harvest rate strategy (13%) and specific risk of overfishing (10%) and area closures encompassing about 16% of NWHI lobster habitat. The Council approved a framework regulatory measure for bank-specific harvest guidelines for the 1998 season to prevent depletion of individual banks. The measure is in the process of being formalized as an annual bank-specific determination, for banks with adequate data to estimate exploitable population.

Measures to Rebuild Overfished Stocks

No CMUS is listed as being overfished or approaching an overfished condition, as suitably precautionary measures to prevent such from occurring are well established. Amendment 9 established a framework procedure to efficiently implement new measures to further prevent overfishing or to rapidly rebuild overfished stocks.

Preferred Alternative

The NWHI lobster fishery operates under a constant risk of overfishing with associated constant harvest rate control rule, through a fleet-wide harvest guideline, that has been effective in producing harvest levels that probably approach OY. The strategy is conservative and risk averse.

Data Needs

Additional scientific data needs for the crustaceans fishery may include 1) rerunning the population dynamics simulation model using updated

parameter values and a revised model structure based on current NWHI lobster fishery information, 2) studies of the stock-recruitment relationship in the NWHI lobster fishery, 3) studies on the feasibility of species-specific and area-specific modeling and 4) studies on economic, social and ecological factors in the fishery to improve the estimate of OY.

Review of Overfishing

According to the FMP, OY is determined by estimating MSY and then downwardly adjusting the harvest level based on economic, social or ecological considerations. A strategy of 2-year pulse fishing, where continuous fishing pressure is applied until the target level is acquired then stopped, was determined to be the best compromise between minimizing biological risks and maximizing economic benefits. OYs for the Makapuu bed are set as 2-year quotas.

Pink, gold and bamboo corals occur in all six known beds, although only the "Established" Makapuu bed has been quantitatively surveyed. While it is believed that harvestable quantities of precious corals may exist in other areas of the western Pacific region, no information exists on their distribution, abundance or status.

The current (Amendment 2) definition of overfishing for all species of precious corals is when the total spawning biomass is less than or equal to 20% of its unfished condition (SPR$\leq$20%), based on cohort analysis of the pink coral, *Corallium secundum*. This definition takes into account the mean survivorship, yield, age at maturity, reproductive potential and MSY of the coral populations. It also protects 20% of the spawning stock biomass. For beds other than the "Established" Makapu'u bed more information is needed before the overfishing definition can be applied.

MSY Determination Criteria

According to the FMP, if recruitment is constant or independent of stock size, then MSY can be determined from controlling the fishing mortality rate (F) to maximize the yield per recruit (MYPR), i.e., MSY = MYPR(g/recruit) x R(recruits/yr)). MYPR is a function of area of the bed, average colony density and natural mortality. If a stock-recruitment relationship exists, recruitment is reduced as a function of reduced stock size, and MSY will also be reduced. The assumption of constant recruitment appears to be reasonable based on the robust recovery and verification of annual growth rings from a recent resurvey (Grigg 1977).

Alternatively, the Gulland (1969) method to estimate MSY is especially useful for gold and bamboo coral, where information on population dynamics is lacking. MSY is 40% of the natural mortality rate times virgin stock biomass (estimated from the product of area of the bed, average colony density and weighted average weight of a virgin colony; MSY = 0.4 x M x B). The mortality rate for pink coral (M=0.066) is used as a proxy for other species. Values for species with sufficient information to estimate MSY are summarized in Table 4.5.g.

Species (common name)	MSY (kg/yr)	MSY (rounded)	Method of calculation
Corallium secundum (pink)	1,185	1,000	Cohort production model
Corallium secundum (pink)	1,148	1,000	Gulland model
Gerardia sp. (gold)	313	300	Gulland model
Lepidisis olapa (bamboo)	285	250	Gulland model

Table 4.5.g: Estimates of MSY of precious corals in the Makapuu Bed

The MSY for pink, gold and bamboo from the six beds in the Hawaii EEZ is about 3,000 kg/yr. The estimated MSY for the Makapuu bed is 1,000 kg/yr. A recent resurvey, which

used a newer technology enabling deeper dives, found the Makapuu bed to be about 15% larger than previously estimated,; however, no increase in the MSY or quota was suggested (Grigg 1997). MSY for conditional beds has been extrapolated, based on size, by comparison with that of the established beds. Amendment 2 set MSY at 1,000 kg/yr for each American Samoa and Guam (Exploratory Areas). No quotas or MSY estimates have been determined for species of black corals. MSY values have been estimated for a number of the permit areas. A summary of quotas, based on MSY estimates, occurs in the code of Federal regulations (Table 4.5.h).
MSY has also been estimated to correspond to a 30% SPR level to maintain 30% of the spawning stock biomass. The Council currently manages at the MSY level. From the mid-1960s to late 1970s, annual landings from the Makapuu bed averaged 685 kg (below the MSY of 1,000 kg). No known harvesting of precious corals has occurred in the U.S. EEZ for the past 20 years. The 1997 resurvey found that pink coral in the Makapuu bed has recovered to 74-90% of its pristine biomass, while recruitment of gold coral is low.

Name of Coral Bed	Type of Bed	Harvest Quota	Number of Years	Gear Restriction
Makapuu Bed, main Hawaiian Islands	Established	Pink 2,000 kg Gold 600 kg Bamboo 600 kg	2	Selective only
Ke-ahole Point, main Hawaiian Islands	Conditional	Pink 67 kg Gold 20 kg Bamboo 17 kg	1	Selective only
Kaena Point, main Hawaiian Islands	Conditional	Pink 67 kg Gold 20 kg Bamboo 17 kg	1	Selective only
Brooks Bank, Northwest Hawaiian Islands	Conditional	Pink 17 kg Gold 133 kg Bamboo 111 kg	1	Selective or Non-Selective (see Note 1 below)
180 Fathom Bank, Northwest Hawaiian Islands	Conditional	Pink 222 kg Gold 67 kg Bamboo 56 kg	1	Selective or Non-Selective (see Note 1 below)
Wespac Bed, Northwest Hawaiian Islands	Refugia	0 kg	N/A	N/A
Hawaii, American Samoa, Guam,	Exploratory	1,000 kg per area, all species	1	Selective or Non-Selective (see Note 1

other US Pacific Islands		combined (except black corals)		and 2 below)

Note 1: Only 1/5 of the indicated quota amount is allowed if non-selective gear is used; that is, the non-selective harvest will

be multiplied by 5 and counted against the quota. If both selective and non-selective methods are used, the bed will be closed when S + 5N = Q, where S = selective harvest amount, N = non-selective harvest amount and Q = total harvest quota, for any single species on that bed.

Note 2: Only selective gear may be used to harvest coral from the EEZ seaward of the main Hawaiian Islands.

Table 4.5.h: Precious coral quotas based on MSY estimates

Measures to prevent overfishing

Provisions of the FMP, as amended, are already sufficient to prevent overfishing. Precious coral beds are classified as Established (with fairly accurate estimated harvest levels), Conditional (with extrapolated MSY estimates) and Refugia (reproductive reserves or baseline areas). Exploratory Areas are grounds available for exploratory harvesting with an Exploratory Permit.

Fishing in the EEZ of the MHI is limited to selective gear. If fishing is by non-selective methods, the allowable quota is reduced by 80% and the bed is closed when the quota for any one species is taken. Other provisions that help prevent overfishing are fishing seasons;, annual quotas (based on MSY);, restrictions on size, harvest area and gear, incidental catches and permit conditions; and an annual report that identifies possible overfishing and recommends rebuilding measures. Private interests can assess the production potential of newly discovered and unsurveyed beds prior to the determination of OY and allowable quotas.

Measures to rebuild overfished stocks

No stocks are overfished at this time. If a precious corals stock is overexploited, a long time period of zero or reduced fishing mortality will be required for recovery to the MSY level due to life-history characteristics of precious corals, such as slow growth and long generation time.

Preferred Alternative

The precious corals fishery is already managed based on OY quotas (i.e., control rule), calculated by downwardly adjusting MSY estimates. Values for OY quotas are listed in the Code of Federal Regulations for the main species of precious corals. The SPR proxy for minimum stock size threshold that corresponds to MSY is SPR=30%, and is already defined as such in the FMP. If one assumes F_{MSY}=M then the maximum fishing mortality threshold for MSY is F=0.066.

Rebuilding Plans

As no harvesting has occurred for the past 20 years, nearly full recovery has been attained. The Council determined that the existing FMP has sufficient measures to prevent overfishing of precious corals and that no stocks are overfished, thus no further action is required at this time. If any stock would in the future be determined to be overfished the Council would implement measures to rebuild the stock. A rebuilding plan would consider estimates of B_{MSY}, a maximum rebuilding time-frame, a rebuilding trajectory and transition to post-rebuilding management.

Data Needs

Scientific data needs for precious corals include 1) research on the distribution, abundance and status of precious corals in the Pacific Insular Areas; 2) MSY estimates for Conditional Beds and Exploratory Areas; 3) MSY estimates for black corals; 4) surveys of Makapuu bed to better define the bed's boundaries, monitor the recovery of corals (particularly gold coral) and determine the impacts of fishing activity should it occur; and 5) improved and updated information on economic, social and ecological factors to better quantify OY.

5.0 REGULATORY IMPACT REVIEW

In preparing this amendment the Council determined that no regulatory actions are necessary in order for its FMPs to be in compliance with the new provisions required by the Magnuson-Stevens Act. The information compiled for this amendment may be used as a basis for fishery management measures proposed in the future. While significant ecological, economic and social impacts could result from future management actions, this amendment itself has no such impacts.

6.0 OTHER APPLICABLE LAWS

6.1 National Environmental Policy Act

6.1.1 NEPA compliance

This amendment adds new Magnuson-Stevens Act definitions to the FMPs of the western Pacific region and addresses the requirement of the Act that any FMP contain provisions regarding bycatch (Section 4.1), fishing sectors (Section 4.2), essential fish habitat (Section 4.3), fishing communities (Section 4.4) and overfishing (Section 4.5). The amendment compiles the best available scientific information pertaining to each of these new provisions and incorporates it directly or by reference into the Western Pacific Council's management plans for bottomfish and seamount groundfish, pelagics, crustaceans and precious corals fisheries. In addition, the amendment identifies other scientific data which are needed to more effectively address the new provisions.

In preparing this amendment the Council determined that no regulatory actions are necessary for its FMPs to be in compliance with the new provisions required by the Magnuson-Stevens Act. However, the Council concluded that actions related to compliance with the provision concerning EFH could lead to future environmental impacts. Therefore, an environmental assessment was prepared for the EFH provision.

6.1.2 Environmental assessment

<u>Purpose and Need</u>

Fisheries are an important economic, social and natural resource, both nationally and regionally. Despite Federal action in many parts of the United States, fish stocks have declined due to a variety of factors including loss of habitat. Effective management to protect EFH is necessary to ensure the long term productivity of fish stocks. The Council regards the EFH mandate of the Magnuson-Stevens Act as a significant opportunity to make a difference in improving the success of sustainable fisheries and healthy ecosystems.

The Act directs the Council to include descriptions of EFH in its FMPs, outline feasible measures to minimize adverse impacts and identify measures to conserve and enhance to these areas. In addition, the Act establishes a consultation process for Federal agency actions that may adversely affect the habitat, including EFH, of a fishery resource under the Council's authority.

The Act also requires the Council to identify adverse impacts to EFH but does not mandate any regulatory action pursuant to the description of non-fishing and cumulative impacts. The Council addresses this requirement in Sections 4.3.3 and 4.3.4 of the amendment. Because no regulatory action is contemplated by the Council at this time, this aspect of EFH description is not separately considered in the environmental assessment.

Affected Environment

Detailed descriptions of the biological and physical environment in which the managed fisheries of the western Pacific region take place are presented in Section 1.1 (bottomfish), Section 2.1 (pelagics), Sections 3.1–3.3 (precious corals) and Section 4.1 (crustanceans) of Appendix 3.

Alternatives Considered to Describe and Designate EFH

With regard to the description and identification of EFH for FMP fisheries, four alternatives were considered: (1) designate EFH based on the best available scientific information (preferred alternative); (2) designate all waters EFH; (3) designate a minimal area as EFH; and (4) no action.

Preferred Alternative: Designate EFH based on observed habitat utilization patterns in localized areas

The unavailability of information on geographic variation in the density of managed species or relative productivity of different habitats, and to a lesser degree species' habitat preferences, precluded precise designations of EFH. However, as outlined in regulations (50CFR600.815(2)(c)), EFH can be inferred based on observed habitat utilization patterns in localized areas. This data represents the best scientific information available.

The preferred depth ranges of specific life stages were used to designate EFH for bottomfish (Section 4.3.1.1) and crustaceans (Section 4.3.1.3). In the case of crustaceans, the designation was further refined based on productivity data. Water temperature was a useful indicator for the distribution of pelagic species' EFH (Section 4.3.1.2). Temperature also expresses a depth range; many species are confined to mesopelagic waters above a permanent thermocline. However, it is recognized that certain species make extensive vertical migrations, in some cases below the thermocline, to forage. The precious corals designation combines depth and bottom type as indicators, but it is further refined based on the known distribution of the most productive areas for these organisms (Section 4.3.1.4). Species were grouped into complexes because available information suggests that many of them occur together and share similar habitat.

This alternative is preferred by the Council for three reasons. First, it adheres to the intent of the Magnuson-Stevens Act provisions and to the guidelines that have been set out through regulations and expanded on by NMFS. The best available scientific data were used to make carefully considered designations. Second, it results in more precise designations of EFH at the species complex level than would be the case if Alternative 2 (see below) was chosen. At the same time it does not run the risk of being arbitrary and capricious as would be the case if Alternative 3 was chosen. Finally, this alternative recognizes that EFH designation is an ongoing process and will set out a procedure for reviewing and refining EFH designations as more information on species' habitat requirements becomes available.

Alternative 2: Broad designation of EFH

The Council recognizes that for some managed species even information on distribution is incomplete. Consequently, the Council chose to add a fifth data level, Level 0, to the four outlined in the regulations (Section 4.3.). Given the paucity of data for certain species, a conservative approach would be to designate all EEZ waters and the benthos from the shoreline to the outer EEZ boundary as EFH.

This alternative was rejected because it does not use the best available scientific information, as required by the Magnuson-Stevens Act and regulations.

Alternative 3: Narrow designation of EFH

The regulations (50CFR600.815 (1) (C)) encourage Councils to obtain data at the highest level of detail. As already noted, data at this level are generally not available for fisheries in the western Pacific region. However, the inference process described above could be used to extend the limited highest level data that is available. The resulting EFH designation would be confined to those habitats or areas that have been shown to generate the highest known level of production.

This alternative was rejected because it exceeds a scientifically justifiable threshold for extending known results to unknown conditions. Furthermore, it may not identify sufficient habitat to sustain the long-term productivity of managed fisheries.

Alternative 4: No action

The Council's FMPs include substantial information on the habitat requirements of MUS. However, the Council rejected the alternative of taking no action because the original habitat descriptions did not adequately address the requirements of the Magnuson-Stevens Act provision regarding EFH. EFH is not described in detail nor is its geographic extent precisely delineated.

Impacts of the Preferred Alternative

Biological impacts

The designation of EFH in and of itself will not have any biological impact. However, the proposed NMFS consultation process should have an overall beneficial effect on habitats important to managed fisheries in the western Pacific region. A direct benefit of the amendment is the compilation of information (Appendix 3) on the habitats and life history characteristics of managed species. This baseline information should facilitate the efforts of the Council and NMFS to assess cumulative impacts to EFH and propose measures to mitigate or avoid adverse impacts. Additionally, the review and compilation of the best available scientific data will serve to guide future research necessary to further describe and protect EFH. Second, EFH designation establishes a framework for NMFS and the Council to cooperatively comment on state and Federal agency actions affecting EFH. The comments of these agencies will, in turn, provide more specific guidance on how adverse impacts to EFH can be avoided or mitigated.

Social and economic impacts

Designation of EFH will not directly result in significant social and economic impacts. To the degree that designation, in combination with the NMFS consultation process, enhances and conserves EFH by minimizing adverse impacts, fisheries may benefit from higher production. In addition, healthier marine habitats may benefit other economic sectors, such as marine recreation and tourism.

Relationship between Short-Term Uses and Long-Term Productivity

The overall purpose of the amendment is to conserve, protect and restore fisheries and coastal environments and thus to enhance

the long-term health of all living marine resources. The amendment will not include any short-term uses of the environment that may reduce long-term productivity.

Irreversible and Irretrievable Commitment of Resources

The amendment will not cause any irreversible or irretrievable commitment of resources as a result of its implementation. The amendment required the compilation of information on and preparation of maps of the general distribution and geographic limits of EFH for each life stage for specific managed species. This requirement may result in the conservation of natural resources.

Summary of Environmental Consequences

The amendment implemented the requirements of the Magnuson-Stevens Act to describe, identify, conserve and enhance EFH for the western Pacific region's FMPs. The establishment of a regional information base for making decisions about the management of fish habitat should improve coordination and consultation among Federal and State agencies and the Council in the management of EFHs. Implementation of the amendment should result in an improvement in the conservation and restoration of fish habitat and fish stocks, which should result in improved stability for the fishing industry.

Finding of No Significant Impact

Based on the information contained in the environmental assessment and other sections of this document, I have determined that the proposed alternative would not significantly affect the quality of the human environment, and, therefore, preparation of an environmental impact statement is not required under the National Environmental Policy Act or its implementing regulations. Therefore, a finding of no significant impact is appropriate.

_____ _____

Rolland Schmitten Date

6.2 Paperwork Reduction Act

The Paperwork Reduction Act requires Federal agencies to minimize paperwork and reporting burdens whenever collecting information form the public. This amendment will not create any additional record-keeping and reporting requirements.

6.3 Coastal Zone Management Act

Section 307(c)(1) of the Coastal Zone Management Act of 1972 requires all Federal activities which directly affect the coastal zone be consistent with approved state coastal zone management programs to the maximum extent practicable.

6.4 Endangered Species Act

This amendment will not have any effect on any listed endangered or threatened species or their habitats.

6.5 Marine Mammal Protection Act (MMPA)

All fisheries in the western Pacific region are designated as Category 3, meaning that fishermen must report interactions with marine mammals, but they are not required to obtain exemption certificates in order to fish. This amendment does not require a MMPA category redesignation.

6.6 Regulatory Flexibility Act

In preparing this amendment the Council determined that no regulatory actions are necessary in order for its FMPs to be in compliance with the new provisions required by the Magnuson-Stevens Act. The information compiled for this amendment may be used as a basis for fishery management measures proposed in the future. While significant impacts on small businesses could result from future management actions, this amendment itself has no such effect. Therefore, a regulatory flexibility analysis was not prepared.

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