UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
PROGRAM PLANNING AND INTEGRATION
Silver Spring, Maryland 20910

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Dear Reviewer:

In accordance with provisions of the National Environmental Policy Act of 1969, we enclose for your review the Draft Environmental Impact Statement (DEIS) for the Bottomfish and Seamount Groundfish Fisheries in the Western Pacific Region.

The Western Pacific Fishery Management Council(Council) has submitted the DEIS for the Bottomfish and Seamount Groundfish Fisheries for public review. The Council has the responsibility to prepare a fishery management plan for any fishery requiring conservation and management in the U.S. Exclusive Economic Zones around the State of Hawaii, the Territories of American Samoa and Guam, the Commonwealth of the Northern Mariana Islands and the various islands and atolls known as the U.S. Pacific remove island areas. In 1986, a fishery management plan for the bottomfish and seamount groundfish fisheries in the Western Pacific Region was approved by the Secretary of Commerce. The plan has been amended six times, but until now there has not been a comprehensive environmental impact statement to assess the issues and management options for these fisheries. This environmental impact statement presents an overall picture of the environmental effects of existing fishery activities as conducted under the fishery management plan. It also evaluates the impacts of a range of reasonable management alternatives in order to characterize their relative environmental effects and provide a clear basis for choice among options by the public, the Council and the National Marine Fisheries Service. The analyses include assessments of the biological, economic and social impacts that would result from alternative regulatory regimes for management of the bottomfish and seamount groundfish fisheries in the Western Pacific Region.

Any written comments or questions you have should be submitted to Samuel Pooley, Acting Regional Administrator, Pacific Islands Regional Office, National Marine Fisheries Service 808-973-2937, or faxed to 808-973-2941, by the end of the 45-day comment period on December 1, 2003. Also, one copy of your comments should be sent to me at the NOAA Office of Strategic Planning, Room 15603, 1315 East-West Highway, Silver Spring, Maryland 20910.

Sincerely,

for Joyce Wood
NEPA Coordinator

Enclosure

DRAFT ENVIRONMENTAL IMPACT STATEMENT
BOTTOMFISH AND SEAMOUNT GROUNDFISH FISHERIES
IN THE WESTERN PACIFIC REGION

August 2003

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Abstract:
The Western Pacific Regional Fishery Management Council has the responsibility to prepare a fishery management plan for any fishery requiring conservation and management in the U.S. Exclusive Economic Zones around the State of Hawaiʻi, the Territories of American Samoa and Guam, the Commonwealth of the Northern Mariana Islands and the various islands and atolls known as the U.S. Pacific remote island areas. In 1986, a fishery management plan for the bottomfish and seamount groundfish fisheries in the Western Pacific Region was approved by the Secretary of Commerce. The plan has been amended six times, but until now there has not been a comprehensive environmental impact statement to assess the issues and management options for these fisheries. This environmental impact statement presents an overall picture of the environmental effects of existing fishery activities as conducted under the fishery management plan. It also evaluates the impacts of a range of reasonable management alternatives in order to characterize their relative environmental effects and provide a clear basis for choice among options by the public, the Council and the National Marine Fisheries Service. The analyses include assessments of the biological, economic and social impacts that would result from alternative regulatory regimes for management of the bottomfish and seamount groundfish fisheries in the Western Pacific Region.

Draft
Environmental Impact Statement

Bottomfish and Seamount Groundfish Fisheries in the Western Pacific Region

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25 August 2003

ABBREVIATIONS AND ACRONYMS

APA	Administrative Procedure Act
ASG	American Samoa Government
BMUS	Bottomfish Management Unit Species
BO	Biological Opinion
CFR	Code of Federal Regulations
cm	Centimeters
CNMI	Commonwealth of the Northern Mariana Islands
CPUE	Catch Per Unit Effort
CVM	Contingent Valuation Method
CZMA	Coastal Zone Management Act
DAWR	Division of Aquatic and Wildlife Resources, Government of Guam
DBEDT	Department of Business, Economic Development and Tourism, State of Hawaiʻi
DFW	Division of Fish and Wildlife, CNMI
DMWR	Department of Marine and Wildlife Resources, American Samoa Government
DOD	United States Department of Defense
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
FCZ	Fishery Conservation Zone
FFS	French Frigate Shoals
FLPMA	Federal Land Policy and Management Act
fm	Fathoms
FMP	Fishery Management Plan
FOIA	Freedom of Information Act
FR	Federal Register
FRFA	Final Regulatory Flexibility Analysis
ft	Feet
FWCA	Fish and Wildlife Coordination Act
GATT	General Agreement on Tariffs and Trade
GPS	Global Positioning System
HAPC	Habitat Areas of Particular Concern
HDAR	Division of Aquatic Resources, State of Hawaiʻi
HINWR	Hawaiian Islands National Wildlife Refuge
HIR	Hawaiian Islands Reservation
HMSRT	Hawaiian Monk Seal Recovery Team
ICB	Information Collection Budget
IRFA	Initial Regulatory Flexibility Analysis
kg	Kilograms
km	Kilometers
lb	Pounds
LOF	List of Fisheries
LORAN	Long Range Aid to Navigation
m	Meters
MBTA	Migratory Bird Treaty Act
MHI	Main Hawaiian Islands
MMPA	Marine Mammal Protection Act
MPA	Marine Protected Area
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSST	Minimum Stock Size Threshold
MSY	Maximum Sustainable Yield
NAFTA	North American Free Trade Agreement
NDSA	Naval Defense Sea Areas
NEPA	National Environmental Policy Act
nm	Nautical Miles
NMFS	National Marine Fisheries Service
NMFS-HL	NMFS, Southwest Fisheries Center, Honolulu Laboratory
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NWHI	Northwestern Hawaiian Islands
NWR	National Wildlife Refuge
NWRSAA	National Wildlife Refuge System Administration Act
OMB	Office of Management and Budget
OSP	Optimum Sustainable Population
PBR	Potential Biological Removal
PIAO	Pacific Islands Area Office (NMFS)
PRA	Paperwork Reduction Act
PRIA	Pacific Remote Island Area
RFA	Regulatory Flexibility Act
RIN	Regulatory Identifier Number
RIR	Regulatory Impact Review
SBREFA	Small Business Regulatory Enforcement Fairness Act

SEIS	Supplemental Environmental Impact Statement
SFA	Sustainable Fisheries Act
SPR	Spawning Potential Ratio
SWR	State Wildlife Refuge
TSLA	Territorial Submerged Lands Act
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
VMS	Vessel Monitoring System
WpacFIN	Western Pacific Fisheries Information Network
WPRFMC	Western Pacific Regional Fishery Management Council

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SUMMARY

This summary reviews in brief the background, context, scope, and issues to be resolved in this environmental impact statement (EIS), the alternatives analyzed, the major conclusions reached, and the remaining areas of controversy.

Background and Overview

In 1986, the Council prepared, and the Secretary approved, an FMP for the bottomfish and seamount groundfish fisheries in the Western Pacific Region. Seeking to provide an updated and comprehensive view of emerging issues and management options for the bottomfish and seamount groundfish fisheries, on August 16, 1999, NOAA Fisheries announced its intention to prepare a comprehensive environmental impact statement. Public scoping meetings were conducted at various locations that year. The draft environmental analysis presented here has evolved from that initial EIS project start, is regional in scope, has been refined based on additional public input and discussion at Council and other public meetings, and effectively identifies and analyzes concerns associated with the bottomfish and seamount groundfish fisheries in the Western Pacific Region.

While the document addresses the broad range of issues associated with the entire fishery managed under the FMP, immediate environmental concerns are highlighted in the analysis. These include impacts on the Hawaiian monk seal and the NWHI coral reef ecosystem. With respect to NWHI coral reef ecosystem issues, significant developments include President Clinton’s 2000 Executive Order (EO) 13178 establishing the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve (Reserve). Subsequently, in 2001, E.O. 13196 revised portions of E.O. 13178 and completed establishment of the Reserve.

Relationships with Other Applicable Law

As described in this analysis, the FMP management measures presently in place co-exist consistently with a number of restrictions imposed under other applicable legal authorities, including those establishing and imposing restrictions for the Reserve.

For example, FMP management measure presently in place relevant to the NWHI include gear prohibitions, a limited access system, and various notification and reporting requirements. Although there are no specific closed areas in the NWHI under the existing FMP and its implementing regulations (No Action Alternative), the Reserve does impose area and other restrictions. As the EOs establishing the Reserve overlaid new restrictions on existing FMP rules, regulated individuals must comply with the most restrictive applicable measures. Consequently, there is no conflict between the No Action Alternative and the Reserve. This analysis incorporates discussions of the Bottomfish FMP under the Magnuson-Stevens Act, as well as regulations imposed under such varied authorities as the National Wildlife Refuge Administration Act, Coast Guard regulations, and state law. The FMP does not require or encourage any activity in contravention of Federal or State law. NOAA Fisheries and NOAA

Enforcement recognize that fishing under the FMP must be conducted in accordance with, not only the Bottomfish FMP, but also other Federal law such as the management regimes of the Reserve and the Hawaiian Islands and Midway Atoll National Wildlife Refuges.

Issues

With issuance of the Notice of Intent to prepare an EIS for the management plan for the bottomfish and seamount groundfish fisheries in the Western Pacific Region (64 FR 44476), NOAA Fisheries formally initiated the process of determining the scope of issues to be addressed in this EIS. Issues identified during the public scoping process and considered in developing the alternatives described in Chapter 2 included the impacts of the bottomfish and seamount groundfish fisheries and management regime on the following elements of the human environment:

- Target Species
- Non-target Species
- Threatened and Endangered Species
- Non-endangered Marine Mammals
- Essential Fish Habitat, Biodiversity and Ecosystems
- Commercial, Recreational and Charter Fishing Sectors
- Regional Economy
- Fishing Community
- Native Hawaiian Community
- Administration and Enforcement

These components of the existing environment are described in Chapter 3, and potential impacts to them arising from implementation of each of the management alternatives are described in Chapter 4.

Alternatives

The Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries in the Western Pacific Region became effective by a final rule published on August 27, 1986 (51 FR 27413). The fishery management plan established a moratorium on the commercial harvest of seamount groundfish stocks at the Hancock Seamounts, the only exploitable seamount habitat in the management area. This moratorium remains in effect, and therefore there is no seamount groundfish fishery in the region. All of the alternatives assume this moratorium will remain in effect for the foreseeable future.

There are bottomfish fisheries in island areas throughout the region, but nearly all of these take place in nearshore waters managed by state or territorial agencies (i.e., generally waters 0-3 nautical miles from shore). Only in Hawaiʻi are there significant bottomfish fisheries in waters managed by federal agencies (i.e., generally waters 3-200 nautical miles from shore). The vast majority of Hawaiʻi's waters under federal jurisdiction are located in the Northwestern Hawaiian

Islands, that largely uninhabited portion of the archipelago extending to the northeast of the Main Hawaiian Islands. The Northwestern Hawaiian Islands are home to the endangered Hawaiian monk seal, the threatened green turtle, numerous species of seabirds, as well as pristine coral reefs and unique terrestrial resources. Although the Northwestern Hawaiian Islands have been protected as National and State Wildlife Refuges, recent concern for the national and global degradation of coral reef ecosystems resulted in several Executive Orders designed to further protect the Nations's reefs and specifically the reefs around the Northwestern Hawaiian Islands. In addition, in accordance with statutory guidance, the Secretary of Commerce has initiated the process to designate the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve as a National Marine Sanctuary. Because fishing activities have the potential to negatively impact both marine and terrestrial resources in this area, many of the scoping comments focused on the compatibility of bottomfish fishing with protection of these resources. The alternatives analyzed in this EIS, therefore, are designed to explore various potential management regimes for bottomfish fishing in the Northwestern Hawaiian Islands. Under each of the alternatives, the very limited amount of bottomfish fishing in federal waters in other island areas of the region would continue as currently managed.

Four alternatives for bottomfish fishing in the Northwestern Hawaiian Islands were analyzed. Alternative 1, the no-action alternative, is a continuation of the management measures of the current fishery management plan. Alternative 2 prohibits harvesting of bottomfish management unit species in the exclusive economic zone surrounding the Northwestern Hawaiian Islands. Harvesting of bottomfish in other island areas in the region under the existing fishery management plan would be unaffected. Alternative 3 limits harvesting of bottomfish management unit species in the exclusive economic zone surrounding the Northwestern Hawaiian Islands to the lifetimes of fishermen with a recurring and recent history of participation in the fishery. Eligibility criteria would be based on participation in the fishery within a qualifying period. Again, harvesting of bottomfish in other island areas in the region under the fishery management plan would be unaffected. Alternative 4 establishes zones in waters surrounding the Northwestern Hawaiian Islands to reduce the risk of damage to resources and habitat, while allowing uses that are compatible with resource and habitat protection. The zones defined for Alternative 4 include the General Use Zone (least restrictive), the Special Use Zone (for scientific research, and customary and traditional uses by Native Hawaiians), the Eco-tourism Zone (for current permitted uses in the Midway Atoll National Wildlife Refuge), and the Preservation Zone (most restrictive). Two variations of the zoning approach are analyzed in this EIS. In Alternative 4A, the Preservation Zone includes the waters around French Frigate Shoals and Laysan Island only, while in Alternative 4B the Preservation Zone also includes the waters around Pearl and Hermes Reef, Lisianski Island and Kure Atoll.

Major Conclusions

The draft EIS indicates that the impacts of the current management plan for the bottomfish and seamount groundfish fisheries in the Western Pacific Region and a range of alternatives include both positive and negative impacts on the human environment. Table 2-3 at the end of Chapter 2 presents in comparative form the environmental impacts of the alternatives, including the alternative of no action. Chapter 4 presents a detailed discussion of the environmental impacts of the alternatives. The major conclusions with respect to the issues identified in scoping are summarized as follows:

- Target Species - Bottomfish species managed under the bottomfish and seamount groundfish fisheries management plan are currently not overfished. None of the alternatives would result in overfishing of these species. The various alternatives would result in effects ranging from a continuation of current target species harvest levels (Alternative 1) to cessation of all harvest in the Northwestern Hawaiian Islands (Alternative 2).
- Non-target Species - Bottomfish fishing gear and operational practices are relatively selective for target species. Alternatives involving continued fishing in the Northwestern Hawaiian Islands (Alternatives 1, 3, and 4) would result in low levels of non-target species mortality.
- Threatened and Endangered Species - Direct interactions between the Northwestern Hawaiian Islands bottomfish fishery and threatened and endangered species consist of infrequent hookings of Hawaiian monk seals. Indirect interactions through competition between the bottomfish fishery and the Hawaiian monk seal for seal prey species are minimal and are unlikely to affect the recovery of the monk seal population. None of the alternatives would increase the level of fishery interactions with endangered or threatened species. Alternatives that eliminate or reduce fishing in the Northwestern Hawaiian Islands (Alternatives 2, 3 and 4) would mitigate to varying degrees potential direct and indirect effects of the fishery on threatened and endangered species.
- Non-endangered Marine Mammals - Interactions between the bottomfish fishery and non-endangered marine mammals generally take the form of theft of bait or catch by dolphins. These interactions are unlikely to harm individuals or populations. None of the alternatives would increase the level of interactions. Alternatives that eliminate or reduce fishing in the Northwestern Hawaiian Islands (Alternatives 2, 3 and 4) would mitigate to varying degrees the potential direct and indirect effects of the fishery on non-endangered marine mammals.
- Essential Fish Habitat, Biodiversity and Ecosystems - All alternatives involving continued fishing have the potential to affect habitat through anchor damage or vessel grounding. Alternatives that eliminate or reduce fishing (Alternatives 2, 3 and 4) would mitigate to varying degrees the potential effects of the bottomfish fishery on bottom habitat and the Northwestern Hawaiian Islands coral reef ecosystem.
- Commercial, Recreational and Charter Fishing Sectors - Alternatives that eliminate or reduce bottomfish fishing effort in the Northwestern Hawaiian Islands (Alternatives 2, 3 and 4) would result in reduced income for fishery participants and ancillary businesses. Some portion of lost revenues may be recovered if fishermen switch to other fisheries. The displacement of fishing effort from the Northwestern Hawaiian Islands could increase competition in other bottomfish fishing areas (e.g., Main Hawaiian Islands).
- Regional Economy - All of the alternatives would have a negligible effect on the Hawaiʻi economy. The maximum annual loss potentially resulting from closure of the

Northwestern Hawaiian Islands bottomfish fishery is $1,382,747 of output (production), $482,218 of household income and the equivalent of 25 full-time jobs.

- Fishing Community - Alternatives involving continued fishing in the Northwestern Hawaiian Islands (Alternatives 1, 3 and 4) would promote social and economic stability within the community of fishermen in Hawaiʻi and help preserve elements of local fishing culture. Alternatives that eliminate bottomfish fishing in the Northwestern Hawaiian Islands (Alternatives 2 and, eventually, 3) could have a disproportionately high and adverse effect on minority populations, as minorities constitute a high proportion of bottomfish fishery participants and bottomfish consumers.
- Native Hawaiian Community - Participation of Native Hawaiians in the Northwestern Hawaiian Islands bottomfish fishery is currently low. Alternatives involving continued fishing (Alternatives 1, 3 and 4) have the potential to encourage participation of Native Hawaiians in the fishery. A Community Development Program that allocates twenty percent of the Mau Zone (southeastern portion of the Northwestern Hawaiian Islands) permits to Native Hawaiians has been approved by the Secretary of Commerce. In addition, the zoning schemes of Alternative 4 would provide Native Hawaiians preferential access to certain areas for subsistence, cultural and religious purposes.
- Administration and Enforcement - Closure of the Northwestern Hawaiian Islands bottomfish fishery would reduce or eliminate most of the administrative costs associated with managing the bottomfish fishery in the region. Enforcement costs would be less affected because other threats to biological resources and habitats would remain. Zoning alternatives (Alternative 4) would increase administrative and enforcement costs.

At the November 28 - December 1, 2000 meeting of the Council, the Council identified Alternative 1 (No Action) as its preferred alternative.

Areas of Controversy or Continuing Coordination

In the NEPA context, areas of controversy are issues where material facts are in dispute. Such issues may be raised by the public or agencies in scoping, review of the draft document or at public hearings. There are several controversial issues surrounding the bottomfish fishery and fisheries in general in the Northwestern Hawaiian Islands, as well as fisheries in other areas of the region. The first area of controversy concerns the possible impact of the Northwestern Hawaiian Islands bottomfish fishery on populations of the Hawaiian monk seal through competition for the bottomfish resource. Monk seals are opportunistic feeders, consuming a wide variety of prey items. There does not appear to be any geographic correlation between areas heavily fished for bottomfish and declining monk seal populations. On the other hand, the relative importance of bottomfish in the monk seal diet is poorly understood. This EIS summarizes the status of knowledge regarding this question, but additional research is required to resolve the issue.

A second area of coordination involves the relationship between fisheries in the Northwestern Hawaiian Islands managed under the Bottomfish FMP and restrictions on fishing imposed by the Executive Orders creating the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve.

The Reserve was established by E.O. 13178 of December 7, 2000, and is currently in effect, including certain conservation measures and Reserve Preservation Areas that are either completely closed to fishing or within which fishing is curtailed. Further, the Secretary of Commerce was directed by the National Marine Sanctuaries Act Amendments of 2000 to initiate the process to designate the Reserve as a National Maine Sanctuary and as required has initiated the process. As regulated individuals must comply with the most restrictive measures, none of the alternatives considered in this EIS attempts to mimic the Reserve management regime. However, an extensive comparison of the Reserve regime with the zoning alternative (Alternative 4) may be found in Chapter 4.

Another controversial issue is the conflicting jurisdictional claims of various state, territorial and federal agencies to waters around some of the islands in the region. As pointed out in Appendix C, points of contention exist between the State of Hawaii and the U.S. Fish and Wildlife Service regarding ownership of submerged lands surrounding the Northwestern Hawaiian Islands; between the Fish and Wildlife Service and the Western Pacific Fishery Management Council regarding primary fishery management authority in federal waters within National Wildlife Refuge boundaries; between the State of Hawaii and the federal government regarding the State's claim of archipelagic status; between the Commonwealth of the Northern Mariana Islands and the federal government regarding the Commonwealth's claim to a 12-mile territorial sea; and between the Government of Guam and the Fish and Wildlife Service regarding transferral of the Ritidian Unit from the Navy. For the purposes of this EIS, federal waters are assumed to extend from three to 200 nautical miles around all of the islands in the region except the Pacific remote island areas, where federal waters extend from the shoreline to 200 nautical miles.

Finally, a controversial issue is the unresolved claims of Native Hawaiians to the natural resources throughout the exclusive economic zone around the Hawaiian archipelago. This EIS assumes that if there are available Northwestern Hawaiian Islands limited access bottomfish permits, not restricted to Native Hawaiians by the Community Development Program, anyone meeting the criteria specified in the fishery management plan amendments can apply for such a permit and that such permits will be granted according to the established point system.

CHAPTER 1: PURPOSE AND NEED FOR THE ACTION

1.1 INTRODUCTION

Under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the United States has exclusive fishery management authority over all fishery resources found within its Exclusive Economic Zone (EEZ). For purposes of the MSA, the inner boundary of the EEZ extends from the seaward boundary of each coastal state to a distance of 200 nautical miles from the baseline from which the breadth of the territorial sea is measured. The management of these fishery resources is vested in the Secretary of Commerce (Secretary) and in eight Regional Fishery Management Councils. The Western Pacific Regional Fishery Management Council (Council) has the responsibility to prepare a fishery management plan (FMP) for any fishery requiring conservation and management in the EEZ surrounding the State of Hawaiʻi, Territory of American Samoa, Territory of Guam, the Commonwealth of the Northern Mariana Islands and the U.S. Pacific remote island areas (PRIAs) of the Western Pacific Region.[1]

Under the MSA, FMPs, in addition to other requirements, must contain measures necessary and appropriate for the conservation and management of the fishery to prevent overfishing and rebuild overfished stocks, and to protect, restore and promote the long-term health and stability of the fishery. These measures must be consistent with national standards set forth in the MSA, regulations implementing recommendations by international organizations in which the U.S. participates and any other applicable law.

In 1986, the Council prepared, and the Secretary approved, a FMP for the bottomfish and seamount groundfish fisheries in the Western Pacific Region. Regulations for the fishery issued under the authority of the MSA appear at 50 CFR Part 660.

1.2 NEED FOR THE PROPOSED ACTION

The National Environmental Policy Act (NEPA) requires preparation of environmental impact statements (EISs) for major federal actions significantly impacting the quality of the human environment. Generally, when developing a new FMP for a previously unregulated fishery, an EIS is conducted on the proposed plan. However, in the case of the action implementing the Bottomfish and Seamount Groundfish FMP an environmental assessment (EA) determined that the action would have no significant impact. An EA was prepared for five of six amendments to the FMP.[2] All five EAs determined that the proposed fishery management actions would not

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[1]The remote island areas include Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Wake Island, Palmyra Atoll, and Midway Islands. Midway is considered part of the PRIAs because it is not a part of the State of Hawaiʻi.

[2]A NEPA environmental document was not prepared for Amendment 1 (1987) because the proposed action was considered to be a "minor adjustment" of the framework measures of the FMP.

have significant environmental impacts. Biological Opinions (BiOps) concerning the impacts of the bottomfish and seamount fisheries of the Western Pacific Region on the threatened and endangered species of the Northwestern Hawaiian Islands (NWHI) have been prepared by the National Marine Fisheries Service (NMFS) pursuant to Section 7 of the Endangered Species Act (ESA). The most recent BiOp (Appendix D) was released on March 8, 2002. It concludes that "the proposed action is not likely to jeopardize the continued existence of any threatened or endangered species under NMFS' jurisdiction or destroy or adversely modify critical habitat that has been designated for them." This BiOp anticipates take[3] of endangered Hawaiian monk seals by the bottomfish fishery, but does not provide an incidental take statement pending completion of a take authorization under section 101(a)(5) of the Marine Mammal Protection Act (MMPA). The BiOp will be amended once the MMPA authorization is granted.

The NEPA analyses for the FMP amendments focused on discrete management actions proposed over a period of several years, and no single document provides a comprehensive view of issues and management options for the bottomfish and seamount groundfish fisheries. One of the functions of this EIS is to address that need. The EIS presents an overall picture of the environmental effects of existing fishery activities as conducted under the FMP. It also includes a range of reasonable management alternatives and an analysis of their impacts in order to define environmental concerns and provide a clear basis for choice among options by the public, the Council and the NMFS. The analyses include assessments of the biological, economic and social impacts that result from regulation of the bottomfish and seamount groundfish fisheries, including license limitation, controls on effort, harvest levels, location, timing, and methods of fishing. Impacts on the human environment associated with status quo management (i.e., continuation of fishing as currently conducted) are presented and compared to situations simulating changes in limits on fishing areas, fishing gear and/or other measures in the management area.

Recently a number of environmental concerns relating to the bottomfish fishery have come to the attention of the Council. One concern pertains to fishing interactions with protected species. Such interactions have become some of the leading issues in fishery management in the United States. Species protected under the MMPA, the ESA, and the Migratory Bird Treaty Act (MBTA) may be present in areas where fisheries are conducted, and conflicts may arise between protection of such species and conduct of the fisheries. With specific regard to the bottomfish fisheries in the Western Pacific Region, the concerns are focused on fishing interactions with the

[3]Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in such conduct. Harm is further defined to include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity.

endangered Hawaiian monk seal. In a court action directly related to this issue, the Earthjustice Legal Defense Fund filed a complaint on behalf of the Greenpeace Foundation, Center for Biological Diversity and Turtle Island Restoration Network alleging that the U.S. Department of Commerce and NMFS, in connection with their authorization of the bottomfish and crustacean fisheries in the NWHI, have violated and are in continuing violation of the ESA, NEPA, and the Administrative Procedure Act (APA) (Greenpeace Foundation, et al. v. William M. Daley, et al. (D. Haw.) Civ. No. 00-00068 (SPK) (FIY)). In March 2001, Federal Judge Samuel King denied the plaintiffs motion for a permanent injunction of the NWHI botttomfish fishery.

A second environmental concern developed from a series of directives from former President Clinton that focused public attention on protection of U.S. coral reef ecosystems. Executive Order (EO) 13089, Coral Reef Protection, issued in June 1998, requires agencies to (a) identify actions that may affect U.S. coral reef ecosystems, (b) utilize their programs and authorities to protect and enhance the condition of such ecosystems, and (c) ensure that any actions they authorize, fund or carry out will not degrade the conditions of coral reef ecosystems. Agencies whose actions affect U.S. coral reef ecosystems must provide for implementation of measures needed to research, monitor, manage and restore affected ecosystems, including, but not limited to, measures reducing impacts from pollution, sedimentation and fishing. The EO also established the U.S. Coral Reef Task Force composed of the heads of 11 federal agencies and the Governors of seven states, territories or commonwealths with responsibilities for coral reefs. In March 2000, the Task Force issued the National Action Plan to Conserve Coral Reefs, which presents a cohesive national strategy to implement EO 13089.

In May 2000, the President issued a Memorandum stating that it is time to implement the Coral Reef Task Force's recommendations to ensure the comprehensive protection of the coral reef ecosystem of the Northwestern Hawaiian Islands (NWHI).[4] The Memorandum directed the Secretaries of Interior and Commerce, in cooperation with the State of Hawaiʻi and in consultation with the Council, to develop recommendations for a new, coordinated management regime to increase protection for the NWHI coral reef ecosystem and provide for sustainable use. Upon consideration of their recommendations and comments received during the public visioning process on this initiative, President Clinton issued EO 13178 on December 4, 2000, establishing the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, pursuant to the National Marine Sanctuaries Amendments Act of 2000 (NMSA). The EO was revised and finalized by EO 13196, issued January 18, 2001. In establishing the Reserve, the Executive

[4] The President's directive coincided with Executive Order 13158, which requires federal agencies to establish a comprehensive national network of marine protected areas (MPAs) throughout U.S. marine waters. The executive order calls for expansion of the nation's MPA system to include examples of all types of U.S. marine ecosystems. According to the executive order, a MPA means any area of the marine environment that has been reserved by federal, state, territorial, tribal or local laws or has regulations to provide lasting protection for part or all of the natural and cultural resources therein.

Orders set forth a number of conservation measures, including the creation of Reserve Preservation Areas in which fishing is restricted. Pursuant to EO 13178 and the NMSA, the National Oceanic and Atmospheric Administration (NOAA) is initiating the process to designate the Reserve as a national marine sanctuary (66 FR 5509, January 19, 2001).

These actions to protect the coral reef ecosystem of the NWHI and provide for sustainable use of the area underscore the immediate need for a comprehensive assessment of the impacts of fishing activity on this ecosystem. The NWHI have historically been important fishing grounds for the bottomfish fishery and other fisheries in the Western Pacific Region (Appendix A).

Given these evolving concerns regarding the effects of the bottomfish fishery and current management measures on the environment, and that NEPA recommends taking a fresh look periodically when changes have occurred in the status of the action or the environment, NMFS announced its intention to prepare a comprehensive EIS for the management plan for the bottomfish and seamount groundfish fisheries in the Western Pacific Region (64 FR 44476, August 16, 1999).

1.3 SCOPE OF THIS ENVIRONMENTAL ANALYSIS

1.3.1 The Scoping Process

The Council held scoping meetings for the EIS to provide for public input into the range of actions, alternatives and impacts that the EIS should consider. The first public meetings were held in July and August 1999 in Guam, the CNMI and American Samoa. Additional meetings were held in those areas in December 1999. Another series of meetings was conducted in Hawaiʻi on the islands of Oʻahu, Maui, Hawaiʻi, Lānaʻi, Molokaʻi and Kauaʻi. Meeting dates and times were published in various newspapers, and relevant meeting notices were circulated to the Council; Department of Commerce, Guam; Division of Fish and Wildlife, Department of Land and Natural Resources, CNMI; and the Department of Marine and Wildlife Resources, American Samoa. A complete list of meetings, locations and dates is contained in Chapter 6.

1.3.2 Issues Addressed in this Environmental Impact Statement

The immediate environmental concerns associated with the bottomfish and seamount groundfish fisheries in the Western Pacific Region direct that this EIS focus on bottomfish fishing impacts on the Hawaiian monk seal and NWHI coral reef ecosystem. However, the environmental consequences section of the EIS (Chapter 4) also describes the impacts of bottomfish harvest accruing with present management regulations and under a range of representative alternative management regulations on other Western Pacific ecosystem issues. These issues include: (1) target species; (2) bycatch; (3) endangered and threatened species other than the Hawaiian monk seal; (4) other protected species; and (5) ecosystems and marine habitat other than coral reefs. In addition, the environmental consequences section examines socio-economic impacts associated with conduct of the bottomfish fisheries on the following individuals: (1) those who participate in commercially harvesting the bottomfish resources; (2) those who rely on living marine resources in the management area either for subsistence needs or for recreational benefits; (3) those who process and market the fish and fishery products; (4) those who are involved in allied support industries; (5) those who consume fishery products;(6) those who benefit from non-consumptive uses of living marine resources; (7) those who are descended from the aboriginal peoples indigenous to areas of the Western Pacific; and (8) those involved in managing and monitoring fisheries.

1.3.2.1 Related Ongoing Federal Actions

In December 2000, President Clinton issued E.O. 13178 establishing the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve. This E.O. was revised and finalized by E.O. 131196, issued January 18, 2001. Executive Order 13196 made permanent the Reserve Preservation Areas, with certain modification set out in the E.O. and completed establishment of the Reserve. The E.O. also directed the Secretary of Commerce to manage the Reserve pursuant to the E.O.s, including establishing specified fishing, permit and effort caps. Additionally, the Secretary was directed to initiate the process to designate the Reserve as a National Marine Sanctuary as required by the E.O.. Pursuant to the E.O.s and the NMFS, NOAA has initiated the process to designate the Reserve as a National Marine Sanctuary and will examine the management, boundary and regulatory alternatives associated with sanctuary designation (66FR5509, January 19, 2001). Given the ongoing nature of the sanctuary designation process, this EIS does not address the outcome of that process or possible impacts of the proposed sanctuary on all components of the human environment. However, two alternatives considered by this EIS (4A and 4B, described in Chapter) are consistent with the concepts embodied in the establishment of the Reserve Preservation Areas in the NWHI as described in the Executive Order 13196. The full range of alternatives considered includes no action and a complete ban on bottomfish fishing in the EEZ waters around the NWHI.

A comparison of the Preservation Areas of the NWHI Reserve, the marine protected areas of the Coral Reef Ecosystem FMP, and the alternatives evaluated in this EIS is presented in Section 4.5.1. In any case, any fishing allowed under the Bottomfish FMP must also be conducted in accordance with all restrictions that are applicable in the NWHI Reserve.

1.3.3 Actions and Issues Considered But Not Addressed in this Environmental Impact Statement

On September 24, 2002, NMFS published a proposed rule (67 FR 59813) that would implement those provisions of the Coral Reef Ecosystems that were approved by NMFS. The Coral Reef Ecosystems FMP proposed to 1) establish fishing permit and reporting requirements; 2) specify allowable fishing gear and methods; 3) designate marine protected areas, including “no-take” marine reserves and areas zoned for specific fishing activities; and 4) establish a framework procedure to allow for future regulatory adjustments to the FMP. Because a separate EIS was been prepared for the Coral Reef Ecosystems FMP, the present EIS does not address the environmental consequences of that action. However, two alternatives (4A and 4B described in Chapter 2) considered by the present EIS are consistent with the preferred alternative of establishing “no-take” marine reserves in the NWHI as described in the final EIS for the Coral Reef Ecosystems FMP.

As described above in 1.3.2.1, Related Ongoing Federal Actions, pursuant to E.O. 13178, E.O. 13196 and the NMSA, NOAA has initiated the process to designate the Reserve as a National Marine Sanctuary. As NOAA will examine the management, boundary and regulatory alternatives associated with sanctuary designation (66 FR 5509, January 19, 2001) in detail in the process of sanctuary designation, this EIS does not address the possible impacts of the sanctuary measures.

1.4 RELEVANT LAWS AND EXECUTIVE ORDERS

The conservation and management of living marine resources in the U.S. is entrusted to NMFS, along with other state and Federal partners. NMFS carries out its responsibilities under many laws, treaties, and legislative mandates from the U.S. Congress and the President. The most relevant of these to the current action are briefly summarized in Appendix B.

CHAPTER 2: DESCRIPTION OF THE ALTERNATIVES

2.1 INTRODUCTION

This chapter describes a variety of alternative actions ranging from continuation of bottomfish fishing as it has been conducted under the existing FMP, to an immediate cessation of bottomfish fishing in the NWHI. Issues identified in the scoping process focused on interactions of the fishery with protected species and coral reef ecosystems in the NWHI, and consequently the range of alternatives was selected to provide various degrees of mitigation of potential impacts to these two environmental resources. None of the alternatives affect bottomfish fishing in other management areas of the Western Pacific Region, as scoping did not identify serious environmental concerns in those areas.

2.2 ALTERNATIVE DESCRIPTIONS

2.2.1 Alternative 1 (Preferred Alternative): No Action

This alternative includes all of the management measures of the current FMP. "No action" refers to "no change" from present management. No change, however, does not imply an entirely static management regime, as amendments and framework adjustments to improve the FMP are constantly evaluated in the Council process. The regulations under which the fishery currently operates are described in Sections 2.3.1 through 2.3.4; currently pending changes to the management regime are described in Section 2.3.5. Alternative 1 is the Council's preferred alternative.

2.2.2 Alternative 2: Immediate Cessation of Bottomfish Fishing in the NWHI

This alternative requires that fishing for bottomfish management unit species in the EEZ surrounding the NWHI immediately cease. Fishing conducted in the main Hawaiian Islands (MHI) and other island areas of the Western Pacific Region under the existing Bottomfish and Seamount Groundfish FMP and its implementing regulations would be unaffected.

2.2.3 Alternative 3: Phase-out of Bottomfish Fishing in the NWHI

This alternative limits continued fishing for bottomfish management unit species in the EEZ surrounding the NWHI to the lifetimes of current permit holders with a recurring and recent history of participation in the fishery. Eligibility criteria would be based on participation in the fishery within a qualifying period (e.g., one year of participation within the last five years). All permits would be non-transferable. Again, fishing conducted in the MHI and other island areas of the Western Pacific Region under the existing Bottomfish and Seamount Groundfish FMP and its implementing regulations would be unaffected.

2.2.4 Alternative 4: Adaptive Management Through Zoning

This alternative establishes zones, including protected areas where fishing is prohibited, in waters surrounding the NWHI to reduce risk of damage to biological resources and habitats, while allowing uses there and elsewhere that are compatible with resource protection. Other areas within the Western Pacific Region could be zoned later, as needs arise.

The zoning approach to fisheries management requires looking at a marine protected area not as one homogenous unit, but as an interconnected system of multiple heterogeneous spatial units or zones. With such a system in place, only those activities inherently incompatible with an area's sustainability are banned throughout (Sobel 1993). Other activities may be limited to portions of the protected area or otherwise restricted to ensure compatibility.

In recent years zoning has acquired increased acceptance as an effective tool for managing marine resources. The MSA includes a discretionary provision that allows for the designation of zones where fishing time and/or fishing practices can either be limited or eliminated (Sec. 303). The U.S. Coral Reef Task Force (2000) identified the application of marine zoning as one of the "Core Conservation Principles" to implement Executive Order 13089, Coral Reef Protection, and the National Action Plan to Conserve Coral Reefs. The Ecosystem Principles Advisory Panel (1999), a panel of experts convened by NMFS to recommend how best to integrate ecosystem principles into future fisheries management and research, stated that Regional Fishery Management Councils should use information from Fisheries Ecosystem Plans to develop zone-based management regimes. Alternative 4 would help to implement EO 13089.

Executive Order 13158, Marine Protected Areas, directs the Department of Commerce and the Department of the Interior to jointly develop a national system of marine protected areas (MPAs). The purpose of the system is to strengthen the management, protection, and conservation of existing protected areas and establish new or expanded MPAs. The MPA system is to be scientifically based, representing diverse U.S. marine ecosystems, and the nation's natural and cultural resources. Establishing such a system is intended to reduce the possibility that MPAs are harmed by federally-approved or funded activities. Alternative 4 would help to implement EO 13158.

Perhaps the best known example of a multiple-use marine protected area largely based on the concept of zoning, such as proposed here for Alternative 4, is the Great Barrier Reef Marine Park in Australia. The Park covers approximately 350,000 km^2 and is the largest system of corals and associated organisms in the world. Commercial fishing, tourism, recreational activities (including fishing and diving) and scientific research are all practiced in specifically designated zones under various levels of protection, including some zones where no activity at all is permitted.

With adaptive management, the zoning restrictions applied to specific areas can be modified as needed. In the case of the Great Barrier Reef Marine Park, management decisions are flexible and adaptable to the Park's changing short-term priorities and patterns of use. This requires regularly revising zoning plans and management regimes, both in order to reflect changing public demands and advances in the scientific understanding of sustainable ecosystems.

Descriptions of the zones selected for Alternative 4 in this EIS are as follows:

- General Use Zone - The least restrictive of the zones, this provides for commercial, charter and recreational fishing activities, consistent with current federal regulations developed pursuant to the FMP and its amendments (see Section 2.3).
- Special Use Zone - Entry is prohibited except to conduct justifiable scientific research or to exercise Native Hawaiian customary and traditional rights for subsistence, cultural or religious purposes.
- Eco-tourism Zone - Provides for appreciation and enjoyment by the general public of marine areas in their relatively undisturbed state. Permitted activities include sport diving, limited recreational fishing, justifiable scientific research and the exercise of Native Hawaiian customary and traditional rights for subsistence, cultural or religious purposes. Commercial fishing is prohibited.
- Preservation Zone - Provides for the preservation of the area in an undisturbed state. All entry is prohibited, except in an emergency, with the exception of permitted scientific research that cannot be conducted elsewhere.

These zones would include waters under the jurisdiction of various state and federal agencies that have conservation and management responsibilities (Appendix C). The development of a zoning plan would require the coordination of these legislative and institutional responsibilities across jurisdictional lines, as well as the appropriate involvement of all stakeholders in the planning process.

Two variations of the zoning approach are analyzed in this EIS, as described below.

2.2.4.1 Description of Alternative 4A

General Use Zone: All waters around the NWHI out to 200 nautical miles except for waters designated as an Eco-Tourism Zone, Special Use Zone or Preservation Zone.

Special Use Zone: Waters shallower than 10 fathoms (fm) around the NWHI except for waters designated as an Eco-tourism Zone or Preservation Zone. The 10 fm contour was chosen as a boundary because that is the putative seaward boundary of the Hawaiian Islands National

Wildlife Refuge.[5] Under this alternative, however, the boundary of the refuge may be adjusted during development of the proposed zoning plan.

Eco-tourism Zone: Waters around Midway Islands between the parallels of 28° 5' and 28° 25' N latitude and between the meridians of 177° 10' and 177° 30' W longitude. These boundaries were chosen because they are the current boundaries of the Midway Atoll National Wildlife Refuge.[6]

Preservation Zone: Federal waters within a radius of 20 nautical miles[7] of the geographic centers of the islands and reefs in the NWHI as follows: French Frigate Shoals, 23° 45' N latitude, 166° 15' W longitude; and Laysan Island, 25° 45' N latitude, 171°45' W longitude.

2.2.4.2 Description of Alternative 4B

General Use Zone: All waters around the NWHI out to 200 nautical miles except for waters designated as an Eco-Tourism Zone, Special Use Zone or Preservation Zone.

Special Use Zone: Waters shallower than 10 fathoms around the NWHI except for waters designated as an Eco-tourism Zone or Preservation Zone. The 10 fathom contour was chosen as a boundary because that is the putative seaward boundary of the Hawaiian Islands National Wildlife Refuge. Under this alternative, however, the boundary of the refuge may be adjusted during development of the proposed zoning plan.

Eco-tourism Zone: Waters around Midway Atoll between the parallels of 28° 5' and 28° 25' N latitude and between the meridians of 177° 10' and 177° 30' W longitude. These boundaries were chosen because they are the current boundaries of the Midway Atoll National Wildlife Refuge.

Preservation Zone: Waters within a radius of 20 nautical miles of the geographic centers of the islands and reefs in the NWHI as follows: French Frigate Shoals, 23° 45' N latitude, 166° 15' W longitude; Laysan Island, 25° 45' N latitude, 171°45' W longitude; Pearl and Hermes Reef, 27°

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[5]According to the USFWS (1999), the boundaries of the Hawaiian Islands National Wildlife Refuge include the Northwestern Hawaiian Islands, with the exception of Midway and Kure Atolls, and extend seaward to 10 fathoms, except for around Necker Island, where the boundary extends to 20 fathoms. However, the boundaries of the refuge with respect to submerged lands are not clearly defined statutorily and have historically been a point of contention between the federal government and the State of Hawaiʻi (Yamase 1982).

[6]The boundaries of the Midway Atoll National Wildlife Refuge were established by Executive Order 13022 (USFWS 1997).

[7]A 20 nm radius encompasses the depths at which the NWHI bottomfish fishery occurs. A circle rather than a depth contour was chosen as a boundary because it facilitates compliance and enforcement.

50' N latitude, 175° 50' W longitude; Lisianski Island, 26° 00' N latitude, 173° 55' W longitude; and Kure Atoll, 28° 25' N latitude, 178° 20' W longitude.

Figures 2-1 through 2-6 show the boundaries of the special use, eco-tourism and preservation zones identified for Alternatives 4A and 4B. Bathymetric data for the NWHI are limited and in some areas suspect. The following figures are composites of several data sets and thus the inconsistencies in depth units shown. Bottomfish fishing generally takes place between 30 and 150 fm. Ralston and Polovina (1982) have shown that the 100-fm contour is a valid measure of available bottomfish habitat. The figures below show the 10 fathom and 400 meter contours to visually bracket the bottomfish habitat. The precise center locations of the island masses were identified in the NMFS final rule pertaining to lobster vessels transiting Crustaceans Permit Area 1 VMS Subarea (63 FR 20539, April 27, 1998). It is not stated how these points were derived. Further, the charted coordinates may not match current reference systems or global positioning system (GPS) readings, and hence should not be used for navigational purposes.

FIGURE 2-1: Preservation Zone Around French Frigate Shoals - Alternatives 4A and 4B

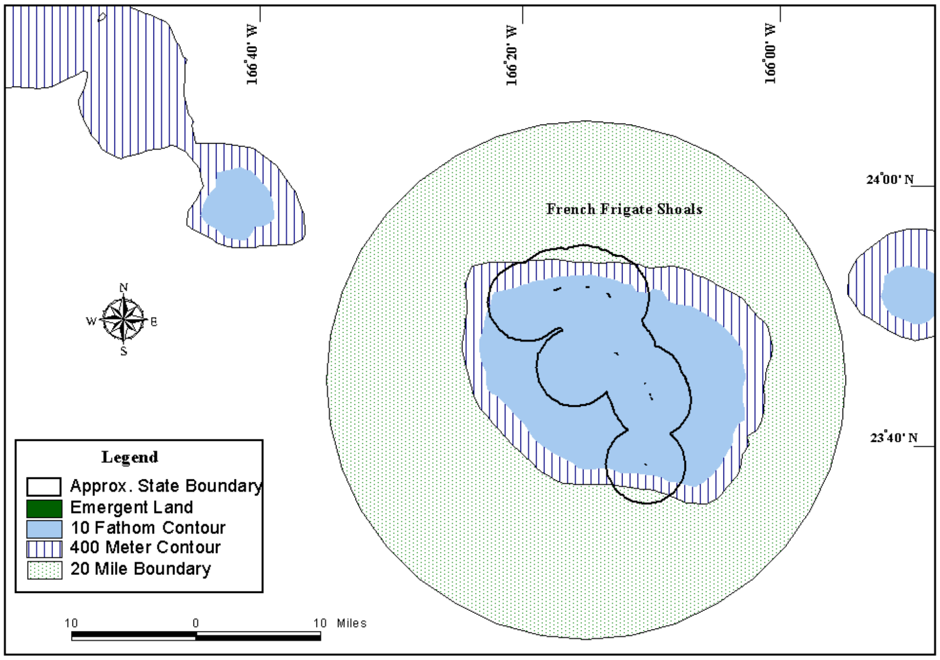


FIGURE 2-2: Preservation Zone Around Laysan Island - Alternatives 4A and 4B

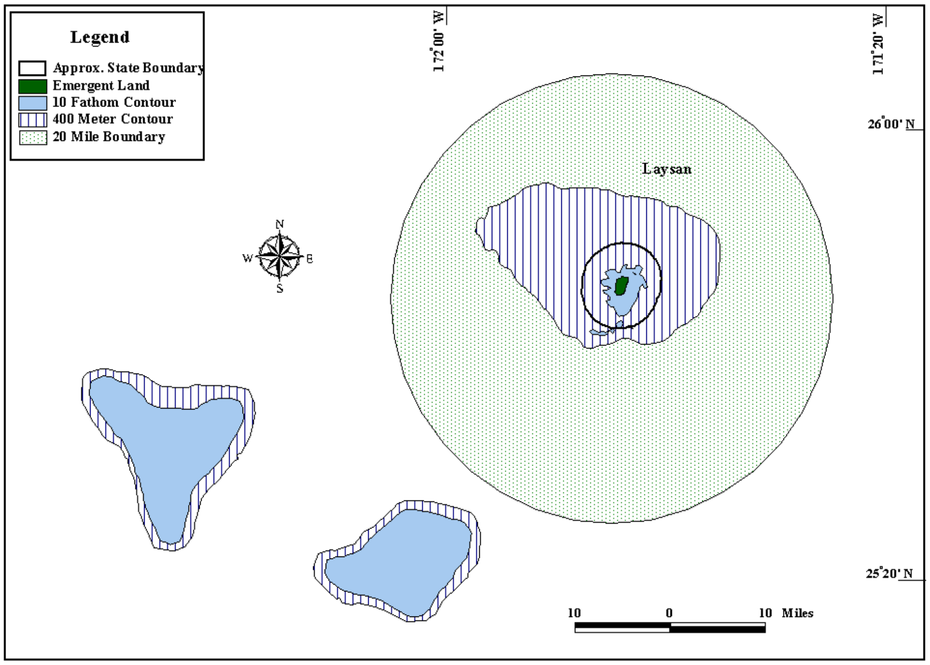


FIGURE 2-3: Preservation (Alternative 4B) and Special Use (Alternative 4A) Zones Around Pearl and Hermes Reef

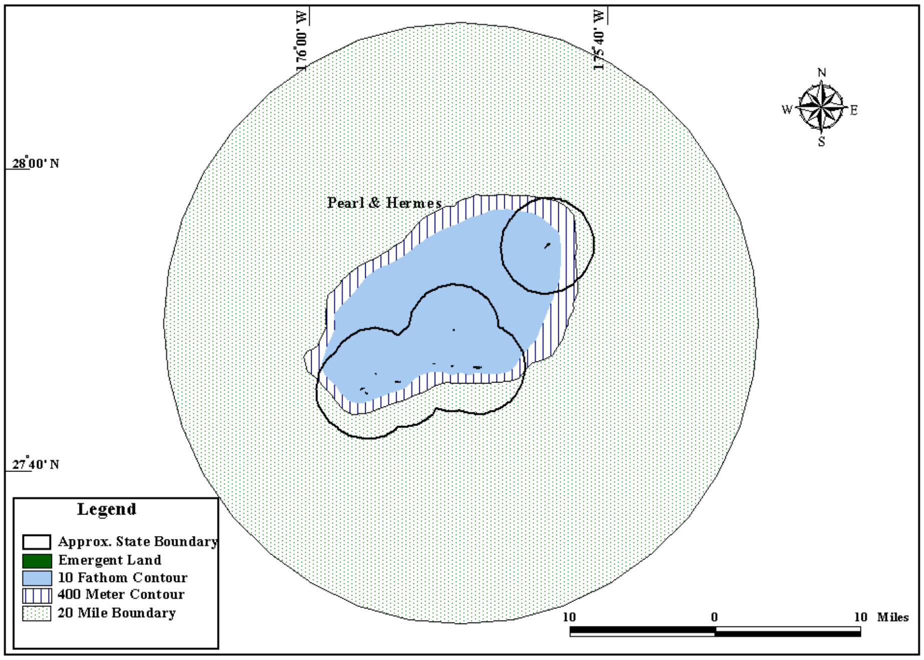


FIGURE 2-4: Preservation (Alternative 4B) and Special Use (Alternative 4A) Zones Around Lisianski Island

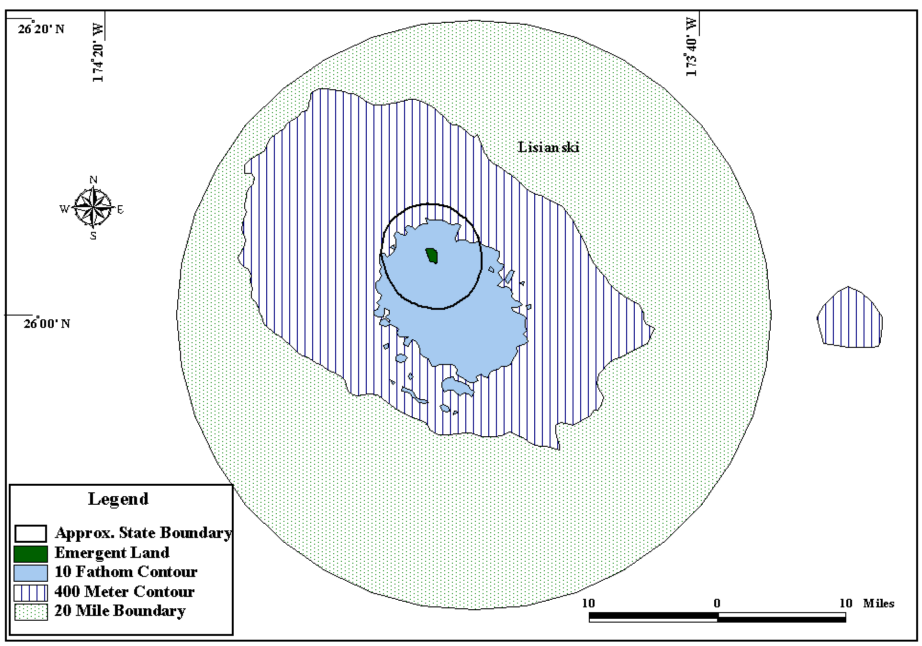


FIGURE 2-5: Eco-tourism Zone Around Midway Atoll

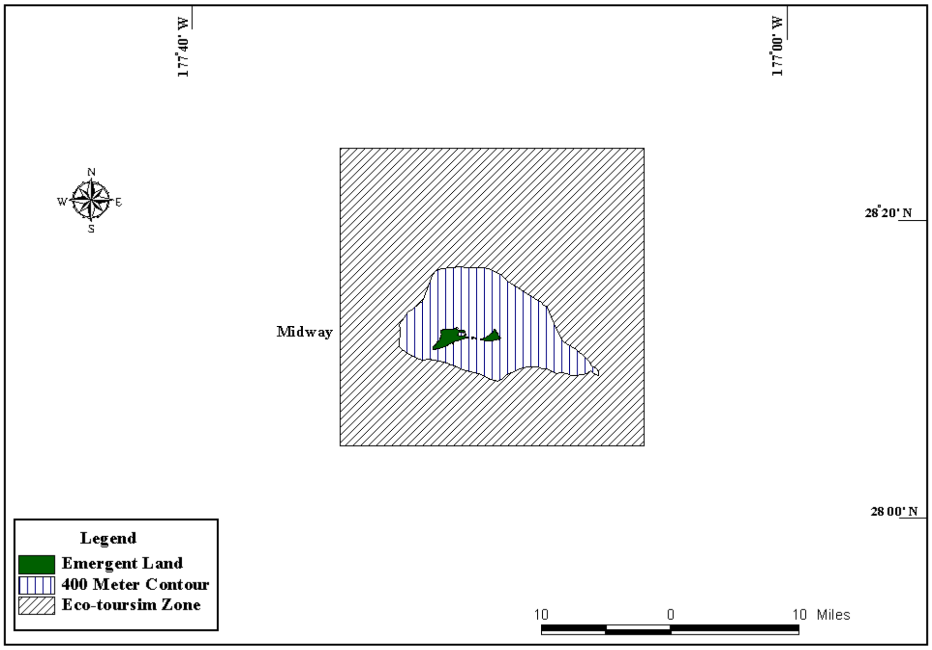
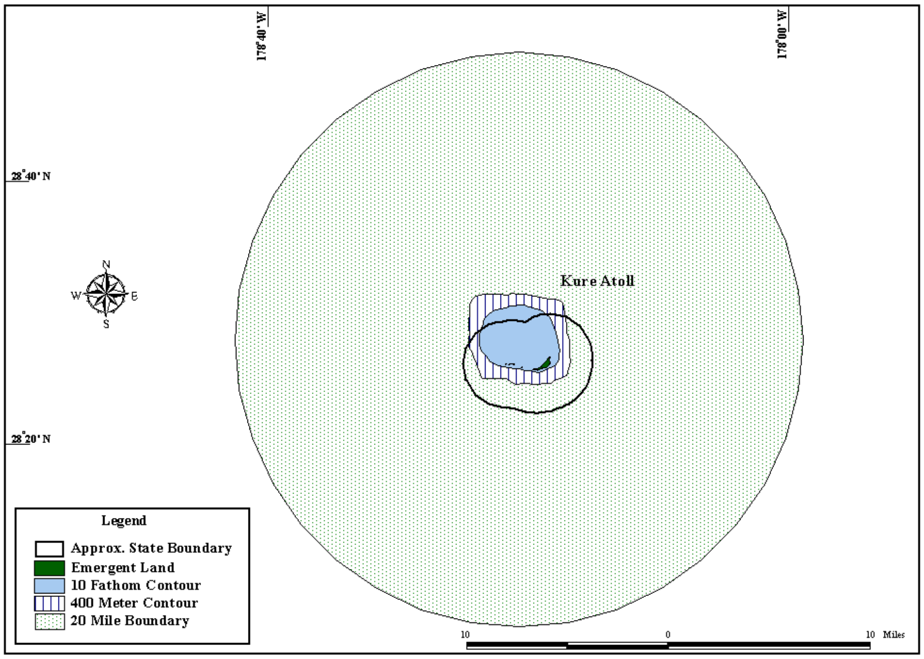


FIGURE 2-6: Preservation (Alternative 4B) and Special Use (Alternative 4A) Zones Around Kure Atoll



2.3 CURRENT BOTTOMFISH AND SEAMOUNT GROUNDFISH FISHERY MANAGEMENT REGIME

2.3.1 Overview of the FMP and Amendments

The Bottomfish and Seamount Groundfish FMP was implemented in 1986. It 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 moratorium on the commercial harvest of seamount groundfish stocks at the Hancock Seamounts, the only exploitable seamount habitat in the management area, remains in effect, and therefore there is no seamount groundfish fishery in the region.) 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.

The FMP has been amended five times since 1986. Implemented in 1987, 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 (1988) divides the EEZ around the NWHI into two zones: the Hoʻomalu Zone to the northwest and the Mau Zone to the southeast. The amendment also establishes a limited access system for the Hoʻomalu Zone. Amendment 3 (1991) 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 percent. Amendment 3 also delineates the process by which overfishing is monitored and evaluated. Amendment 4 (1990) requires vessel owners or operators to notify NMFS at least 72 hours before leaving port if they intend to fish in a 50 nm “protected species 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. Amendment 5 (1999) establishes a limited access system for the Mau Zone. Amendment 6 (1999) identifies and describes essential fish habitat for managed species of bottomfish, discusses measures to minimize bycatch and bycatch mortality in the bottomfish fishery, provides criteria for identifying when overfishing has occurred in the fishery and describes fishing communities in the Region. Amendment 6 was only partially approved, with the provisions for bycatch, overfishing and fishing communities in Hawaiʻi disapproved. The disapproved provisions are currently being rewritten and the expected forms of the revised provisions are summarized in Section 2.3.5.

2.3.2 Management Unit Species

Bottomfish management unit species (BMUS) means the fish listed in Table 2-1.

TABLE 2-1: Bottomfish Management Unit Species

COMMON NAME	LOCAL NAME	SCIENTIFIC NAME
Snappers:		
Silver jaw jobfish	*Lehi* (H); *palu-gustusilvia* (S)	*Aphareus rutilans*
Grey jobfish	*Uku* (H); *asoama* (S)	*Aprion virescens*
Squirrelfish snapper	*Ehu* (H); *palu-malau* (S)	*Etelis carbunculus*
Longtail snapper	*Onaga*, *ʻulaʻula* (H); *palu-loa* (S)	*Etelis coruscans*
Blue stripe snapper	*Taʻape* (H); *savane* (S); *funai* (G)	*Lutjanus kasmira*
Yellowtail snapper	*Palu-iʻ lusama* (S); yellowtail, *kalekale* (H)	*Pristipomoides auricilla*
Pink snapper	*ʻŌpakapaka* (H); *palu-ʻtlenaʻlena* (S); *gadao* (G)	*Pristipomoides filamentosus*
Yelloweye snapper	*Palusina* (S); yelloweye *ʻōpakapaka*, *kalekale* (H)	*Pristipomoides flavipinnis*
Snapper	*Kalekale* (H)	*Pristipomoides sieboldii*
Snapper	*Gindai* (H,G): *palu-sega* (S)	*Pristipomoides zonatus*
Jacks:		
Giant trevally	White *ulua* (H); *tarakito* (G); *sapo-anae* (S)	*Caranx ignoblis*
Black jack	Black *ulua* (H); *tarakito* (G); *tafauli* (S)	*Caranx lugubris*
Thick lipped trevally	Pig *ulua*, *butaguchi* (H)	*Pseudocaranx dentex*
Amberjack	*Kāhala* (H)	*Seriola dumerili*
Groupers:		
Blacktip grouper	*Fausi* (S); *gadau* (G)	*Epinephelus fasciatus*
Sea bass	*Hāpuʻupuʻu* (H)	*Epinephelus quernus*
Lunartail grouper	*Papa* (S)	*Variola louti*
Emperor fishes:		
Ambon emperor	*Filoa-gutumumu* (S)	*Lethrinus amboinensis*

COMMON NAME	LOCAL NAME	SCIENTIFIC NAME
Redgill emperor	*Filoa-paʻloʻomumu* (S); *mafuti* (G)	*Lethrinus rubrioperculatus*
Seamount groundfish:		
Alfonsin		*Beryx splendens*
Ratfish/butterfish		*Hyperoglyphe japonica*
Armorhead		*Pseudopentaceros richardsoni*

Notes: G--Guam; H--Hawaiʻi; S--American Samoa.

2.3.3 Management Area and Subareas

The inner boundary of the fishery management area is a line coterminous with the seaward boundaries of the State of Hawaiʻi, the Territory of American Samoa, and the Territory of Guam (the "3 mile-limit"). The Commonwealth of the Northern Mariana Islands is currently not included in the management area of the FMP. The outer boundary of the fishery management area is a line drawn in such a manner that each point on it is 200 nautical miles from the baseline from which the territorial sea is measured, or is coterminous with adjacent international maritime boundaries. The outer boundary of the fishery management area north of Guam will extend to those points which are equidistant between Guam and the island of Rota in the Commonwealth of the Northern Mariana Islands.

The fishery management area is divided into five subareas (Figure 2-7) with the following designations and boundaries:
(1) Main Hawaiian Islands (MHI) means the EEZ of the Hawaiian Islands Archipelago lying to the east of 161°20' W longitude.
(2) Northwestern Hawaiian Islands (NWHI) means the EEZ of the Hawaiian Islands Archipelago lying to the west of 161°20' W. Midway Island is treated as part of the Northwestern Hawaiian Islands Subarea.
(i) Hoʻomalu Zone means that portion of the EEZ around the NWHI west of 165°W. longitude.
(ii) Mau Zone means that portion of the EEZ around the NWHI between 161°20' W longitude and 165° W longitude.
(3) Hancock Seamount means that portion of the EEZ in the Northwestern Hawaiian Islands west of 180°00' W longitude and north of 28°00' N latitude.
(4) Guam means the EEZ seaward of the Territory of Guam.
(5) American Samoa means the EEZ seaward of the Territory of American Samoa.

FIGURE 2-7: Western Pacific Bottomfish Fishery Management Areas

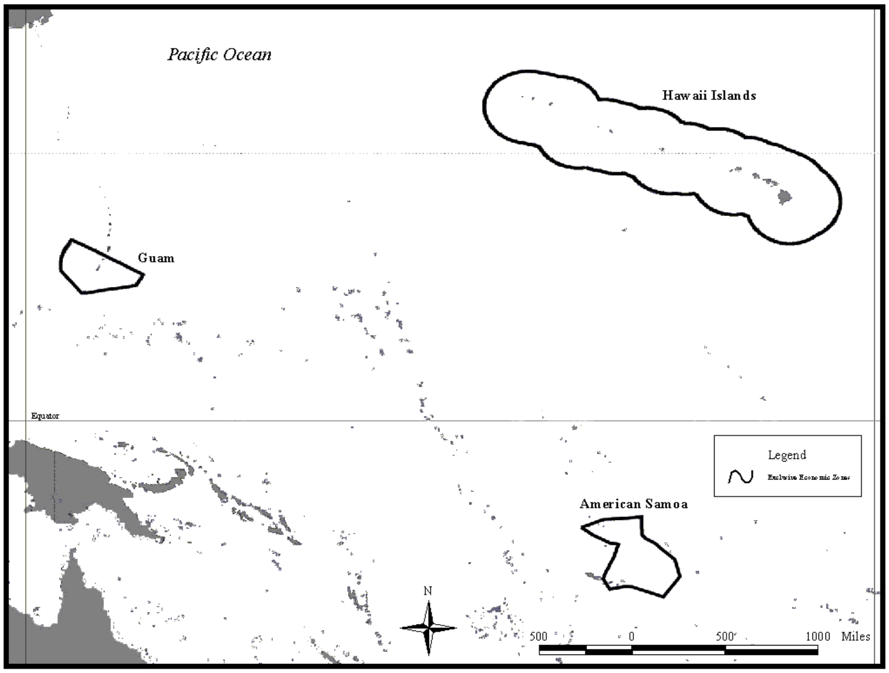
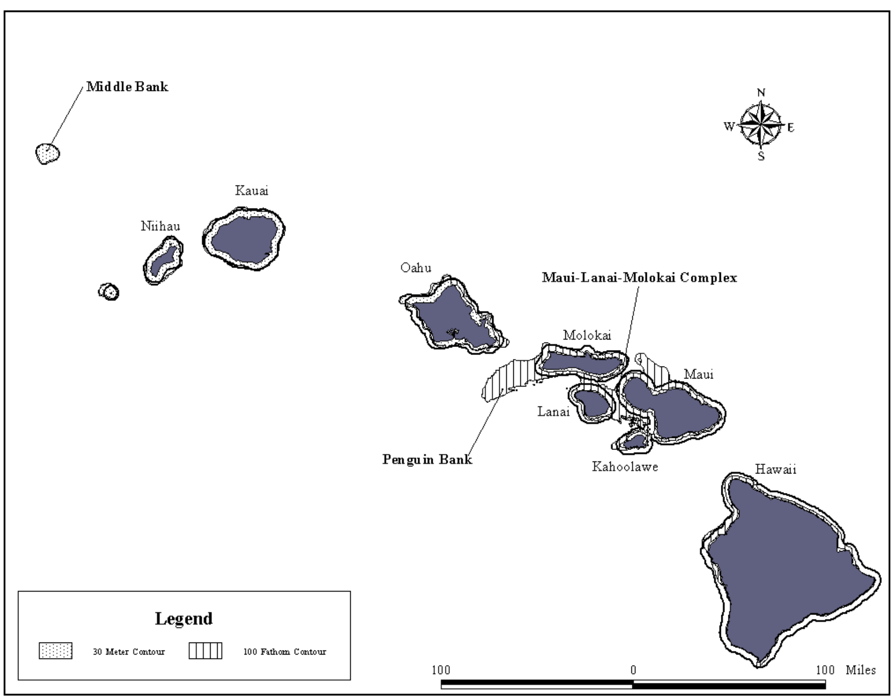


FIGURE 2-8: Bottomfish Habitat in the Main Hawaiian Islands



2.3.4 Regulations

Gear restrictions
(1) Fishing for bottomfish and seamount groundfish with bottom trawls and bottom set gillnets is prohibited.
(2) Possession of a bottom trawl and bottom set gillnet by any vessel having a Hoʻomalu Zone permit or Mau Zone permit or otherwise established to be fishing for bottomfish or seamount groundfish in the management subareas is prohibited.
(3) The possession or use of any poisons, explosives, or intoxicating substances for the purpose of harvesting bottomfish and seamount groundfish is prohibited.

Permits
(1) The owner of any vessel used to fish for bottomfish management unit species in the Northwestern Hawaiian Islands Subarea must have a permit and the permit must be registered for use with the vessel. A single vessel can not be registered for use with a Hoʻomalu Zone permit and a Mau Zone permit at the same time.
(2) Hoʻomalu Zone limited access permit:

(i) A Hoʻomalu zone permit may not be sold or otherwise transferred to a new owner. A Ho'omalu zone permit or permits may be held by a partnership or corporation. If 50 percent or more of the ownership of the vessel passes to persons other than those listed in the original application, the permit will lapse and must be surrendered to the NMFS Regional Administrator.

(ii) Upon application by the owner of a permitted vessel, the NMFS Regional Administrator will transfer that owner's permit to a replacement vessel owned by that owner, provided that the replacement vessel does not exceed 60 ft (18.3 m) in length. The replacement vessel must be put into service no later than 12 months after the owner applies for the transfer, or the transfer shall be void. An owner of a permitted vessel may apply to the Regional Administrator for transfer of that owner's permit to a replacement vessel greater than 60 ft (18.3 m) in length. The Regional Administrator may transfer the permit upon determining, after consultation with the Council and considering the objectives of the limited access program, that the replacement vessel has catching power that is comparable to the rest of the vessels holding permits for the fishery, or has catching power that does not exceed that of the original vessel, and that the transfer is not inconsistent with the objectives of the program. The Regional Administrator shall consider vessel length, range, hold capacity, gear limitations, and other appropriate factors in making determinations of catching power equivalency and comparability of the catching power of vessels in the fishery.

(iii) Hoʻomalu Zone limited access permit renewal-- A qualifying landing for Hoʻomalu Zone permit renewal is a landing of at least 2,500 lb (1,134 kg) of bottomfish management unit species from the Hoʻomalu Zone or a landing of at least 2,500 lb (1,134 kg) of fish from the Hoʻomalu Zone, of which at least 50 percent by weight was bottomfish management unit species. A permit is eligible for renewal for the next calendar year if the vessel covered by the permit made three or more qualifying landings during the current calendar year.

(iv) The NMFS Regional Administrator may issue new Hoʻomalu Zone limited access permits if the Regional Administrator determines, in consultation with the Council that bottomfish stocks in the Hoʻomalu Zone are able to support additional fishing effort. When the Regional Administrator has determined that new permits may be issued, they shall be issued to applicants based upon eligibility, determined as follows:

(a) Point system:

Two points will be assigned for each year in which the applicant was owner or captain of a vessel that made three or more of any of the following types of landings in the NWHI: Any amount of bottomfish management unit species, regardless of weight, if made on or before August 7, 1985; at least 2,500 lb (1,134 kg) of bottomfish management unit species, if made after August 7, 1985; or at least 2,500 lb (1,134 kg) of any fish lawfully harvested from the NWHI, of which at least 50 percent by weight was bottomfish, if made after August 7, 1985. One point will be assigned for each year in which the applicant was owner or captain of a vessel that landed at least 6,000 lb (2,722 kg) of bottomfish from the main Hawaiian Islands. For any one year, points will be assigned for landings in the Northwestern Hawaiian Islands Subarea or main Hawaiian Islands Subarea, but not in both subareas. New permits shall be awarded to applicants in descending order, starting with the applicant with the largest number of points. If two or more persons have an equal number of points, and there are insufficient new permits for all such applicants, the new permits shall be awarded by the Regional Administrator through a lottery.

(b) Before the NMFS Regional Administrator issues an Hoʻomalu zone permit to fish for bottomfish, the primary operator and relief operator named on the application form must have completed a protected species workshop conducted by NMFS.

(c) An applicant must own at least a 25-percent share in the vessel that the permit would cover, and only one permit will be assigned to any vessel.

(3) Mau Zone limited access permit:

(i) Eligibility for new Mau Zone limited access permits:

(a) The NMFS Pacific Islands Area Office (PIAO) will issue an initial Mau Zone permit to a vessel owner who qualifies for at least three points under the following point system: An owner who held a Mau Zone permit on or before December 17, 1991, and whose permitted vessel made at least one qualifying landing of bottomfish management unit species on or before December 17, 1991, shall be assigned 1.5 points; an owner whose permitted vessel made at least one qualifying landing of bottomfish management unit species during 1991, shall be assigned 0.5 point; an owner whose permitted vessel made at least one qualifying landing of bottomfish management unit species during 1992, shall be assigned 1.0 point; an owner whose permitted vessel made at least one qualifying landing of bottomfish management unit species during 1993, shall be assigned 1.5 points; an owner whose permitted vessel made at least one qualifying landing of bottomfish management unit species during 1994, shall be assigned 2.0 points; an owner whose permitted vessel made at least one qualifying landing of bottomfish management unit species during 1995, shall be assigned 2.5 points; an owner whose permitted vessel made at least one qualifying landing of bottomfish management unit species during 1996, shall be assigned 3.0 points. A "qualifying landing" means any amount of bottomfish management unit species lawfully harvested from the Mau Zone and offloaded for sale. No points shall be assigned to an owner for any qualifying landings reported to the State of Hawaiʻi more than 1 year after the landing.

(b) More than one Mau Zone permit may be issued to an owner of two or more vessels, provided each of the owner's vessels for which a permit will be registered for use has made the required qualifying landings for the owner to be assigned at least three eligibility points.

(c) A Mau Zone permit holder who does not own a vessel at the time initial permits are issued must register the permit for use with a vessel owned by the permit holder within 12 months from the date the permit was issued. In the interim, the permit holder may register the permit for use with a leased or chartered vessel. If within 12 months of initial permit issuance, the permit holder fails to apply to the NMFS PIAO to register the permit for use with a vessel owned by the permit holder, then the permit expires.

(d) Before the NMFS PIAO issues a Mau Zone permit to fish for bottomfish, the primary operator and relief operator named on the application form must have completed a protected species workshop conducted by NMFS.

(e) A Mau Zone permit may be held by an individual, partnership, or corporation. No more than 49 percent of the underlying ownership interest in a Mau Zone permit may be sold, leased, chartered, or otherwise transferred to another person or entity. If more than 49 percent of the underlying ownership of the permit passes to persons or entities other than those listed in the original permit application supplemental information sheet, then the permit expires and must be surrendered to the NMFS PIAO. A Mau Zone permit holder may apply to the NMFS PIAO to register the permit for use with another vessel if that vessel is owned by the permit holder, and is no longer than 60 ft (18.3 m). If a Mau Zone permit holder sells the vessel, for which the permit is registered for use, the permit holder must within 12 months of the date of sale apply to the NMFS PIAO to register the permit for use with a vessel owned by the permit holder. If the permit holder has not applied to register a replacement vessel within 12 months, then the permit expires. If a permitted vessel owned by the permit holder is sold or becomes unseaworthy, the Mau Zone permit with which the vessel was registered may be registered for use with a leased or chartered vessel for a period not to exceed 12 months from the date of registration of the leased or chartered vessel. If by the end of that 12-month period the permit holder fails to apply to the NMFS PIAO to register the permit for use with a vessel owned by the permit holder, then the permit expires.

(ii) A Mau Zone permit will be eligible for renewal if the vessel for which the permit is registered for use made at least five separate fishing trips with landings of at least 500 lb (227 kg) of bottomfish management unit species per trip during the calender year. Only one landing of bottomfish management unit species per fishing trip to the Mau Zone will be counted toward the landing requirement. If the vessel for which the permit is registered for use fails to meet the landing requirement, the owner may apply to the NMFS Regional Administrator for a waiver of the landing requirement. Grounds for a waiver are limited to captain incapacitation, vessel breakdowns, and the loss of the vessel at sea if the event prevented the vessel from meeting the landing requirement. Unprofitability is not sufficient for waiver of the landing requirement.

Prohibitions

It is unlawful for any person to do any of the following:

(1) Fish for bottomfish or seamount groundfish using prohibited gear.

(2) Fish for, or retain on board a vessel, bottomfish management unit species in the Hoʻomalu Zone or Mau Zone without the appropriate permit, registered for use with that vessel.

(3) Serve as primary operator or relief operator on a vessel with a Mau or Hoʻomalu Zone permit without completing a protected species workshop conducted by NMFS.

(4) Fail to notify the USCG at least 24 hours prior to making any landing of bottomfish taken in the Hoʻomalu Zone.

(5) Fish within any protected species study zone in the NWHI without notifying the NMFS PIAO of the intent to fish in these zones. Protected species study zones means the waters within 50 nm around the following islands of the NWHI and as measured from the following coordinates: Nihoa Island 23°05' N latitude, 161°55' W longitude; Necker Island 23°35' N latitude, 164°40' W longitude; French Frigate Shoals 23°45' N latitude, 166°15' W longitude; Gardner Pinnacles 25°00' N latitude, 168°00' W longitude; Maro Reef 25°25' N latitude, 170°35' W longitude; Laysan Island 25°45' N latitude, 171°45' W longitude; Lisianski Island 26°00' N latitude, 173°55' W longitude; Pearl and Hermes Reef 27°50' N latitude, 175°50' W longitude; Midway Island 28°14' N latitude, 177°22' W longitude; and Kure Island 28°25' N latitude, 178°20' W longitude.

Notification

(1) The owner or operator of a fishing vessel must inform the NMFS PIAO at least 72 hours (not including weekends and holidays) before leaving port, of his or her intent to fish within the protected species study zones. The notice must include the name of the vessel, name of the operator, intended departure and return date, and a telephone number at which the owner or operator may be contacted during the business day (8 a.m. to 5 p.m.) to indicate whether an observer will be required on the subject fishing trip.

(2) The operator of a fishing vessel that has taken bottomfish in the Hoʻomalu Zone must contact the USCG, by radio or otherwise, at the 14th District, Honolulu, HI; Pacific Area, San Francisco, CA; or 17th District, Juneau, AK, at least 24 hours before landing, and report the port and the approximate date and time at which the bottomfish will be landed.

At-sea observer coverage

All fishing vessels must carry an observer when directed to do so by the NMFS Regional Administrator.[8]

Reporting and recordkeeping

Any person who is required to do so by applicable state law or regulation must make and/or file all reports of management unit species landings containing all data and in the exact manner required by applicable state law or regulation.

Framework for regulatory adjustments

By June 30 of each year, a Council-appointed bottomfish monitoring team will prepare an annual report on the fishery by area covering the following topics: fishery performance data; summary of recent research and survey results; habitat conditions and recent alterations; enforcement activities and problems; administrative actions (e.g., data collection and reporting, permits); and state and territorial management actions. Indications of potential problems warranting further investigation may be signaled by the following indicator criteria: mean size of the catch of any species in any area is a pre-reproductive size; ratio of fishing mortality to natural mortality for any species; harvest capacity of the existing fleet and/or annual landings exceed best estimate of MSY in any area; significant decline (50 percent or more) in bottomfish catch per unit of effort from baseline levels; substantial decline in ex-vessel revenue relative to baseline levels; significant shift in the relative proportions of gear in any one area; significant change in the frozen/fresh components of the bottomfish catch; entry/exit of fishermen in any area; per-trip costs for bottomfishing exceed per-trip revenues for a significant percentage of trips; significant decline or increase in total bottomfish landings in any area; change in species composition of the

[8] In the early 1990s, NMFS placed observers on some bottomfish fishing vessels, but funding for this lapsed. Recently funds have again become available and NMFS is finalizing an operations plan for this activity.

bottomfish catch in any area; research results; habitat degradation or environmental problems; and reported interactions between bottomfishing operations and protected species in the NWHI.

The team may present management recommendations to the Council at any time. Recommendations may cover actions suggested for federal regulations, state/territorial action, enforcement or administrative elements, and research and data collection. Recommendations will include an assessment of urgency and the effects of not taking action. The Council will evaluate the team's reports and recommendations, and the indicators of concern. The Council will assess the need for one or more of the following types of management action: catch limits, size limits, closures, effort limitations, access limitations, or other measures. The Council may recommend management action by either the state/territorial governments or by Federal regulation.

If the Council believes that management action should be considered, it will make specific recommendations to the NMFS Regional Administrator after requesting and considering the views of its Scientific and Statistical Committee and Bottomfish Advisory Panel and obtaining public comments at a public hearing. The Regional Administrator will consider the Council's recommendation and accompanying data, and, if he or she concurs with the Council's recommendation, will propose regulations to carry out the action. If the Regional Administrator rejects the Council's proposed action, a written explanation for the denial will be provided to the Council within 2 weeks of the decision. The Council may appeal denial by writing to the Assistant Administrator, who must respond in writing within 30 days.

2.3.5 Pending Management Measures

2.3.5.1 Permit Renewal Requirements and Transferability Restrictions

Participation in the NWHI bottomfish fishery is controlled through limited access programs in each of the two management zones, the Hoʻomalu Zone to the west of 165°00' W and the Mau Zone between 165°00' W and 161°21' W. These zones were established to reduce the risk of biological overfishing and to improve the economic health and stability of the bottomfish fishery in the NWHI. The programs provide for a limited number of fishing permits to be issued each calendar year. Permits may not be sold, leased, or chartered. Based on the biological, economic, and social characteristics of the bottomfish fisheries in the two zones, the long-term target fleet sizes for the Hoʻomalu and Mau Zones have been determined by the Council to be seven vessels and 10 vessels, respectively (in the Mau Zone, two permits are reserved for a pending Community Development Program, as described below).

Prior to establishment of the limited entry regime for the Mau Zone (Amendment 5, 1999), access was open in that zone and it was there that fishermen gained experience and qualifying points toward a Hoʻomalu Zone permit. Open access to the Mau Zone did not lead to overfishing, but did result in economically marginal performance for participants. Consequently, an economic study of the optimal number of vessels in the NWHI bottomfish fishery was undertaken (Pooley 1996). Various scenarios were modeled, including a continuation of average vessel catch rates, harvesting at MSY without increasing effort (often part-time) by vessel, and harvesting at MSY by all full-time equivalent operations. The results showed that there were substantially more than the optimal number of vessels in the Mau Zone, but that the Hoʻomalu Zone could support one or two more vessels than were then fishing (five). The Council, consequently, established a two-year moratorium on new entrants into the Mau Zone, effective March 27, 1997. While the moratorium was in effect, the Council began the process of establishing limited access for the Mau Zone, with 10 being the target number of permits.

In order to help reduce the fleet sizes to the target levels and, once the targets are reached, to possibly allow opportunities for new entry, the two limited access programs include "use-it-or-lose-it" provisions. Permits are renewable only if the permit holder meets requirements that consist of a minimum number of landings in a given year, each with a minimum weight of bottomfish management unit species. The annual renewal requirements for the Hoʻomalu Zone are three landings of at least 2,500 pounds each and for the Mau Zone, five landings of at least 500 pounds each. The Hoʻomalu Zone limited access program allows entry by new participants using a point-based qualification system. Applicants are assigned points according to their level of historical participation and landings of bottomfish. Any available new permits (the target level less the number of renewals) are issued according to the number of points assigned to each applicant, in descending order. Similar provisions for allowing new entry into the Mau Zone have been developed by the Council but regulatory adjustment has not yet been approved (see below).

Fleet attrition in the Mau Zone occurred rapidly. The number of permits issued decreased from 25 in 1997 to only nine in 2000, the first full year in which the limited access program operated. Six of the nine permitted vessels made their minimum landings and in 2001 the number of permitted vessels consequently dropped to six, all of which were used. In the Hoʻomalu Zone, the target level of seven permitted vessels was reached in 1997, dropping to six in 1999 through 2001. Five vessels were active there in 2000 and 2001.

Excess capacity is no longer a problem in either zone and the risk of overfishing has been substantially reduced. However, there remain the challenges of allowing adequate opportunities for participation in the two zones (with the objective of maintaining participation at the target levels) and continuing to allocate those opportunities fairly and equitably. Now that participation has dropped below the target levels, the use-it-or-lose-it provisions can be relaxed, affording more flexibility in fishing operations and effectively giving permit holders more durability and security in their permits. While this measure increases the preference that is given to existing permit holders relative to prospective participants, the Council makes this recommendation in the context of, and partly in response to, the uncertain regulatory environment associated with establishment of the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve. The ambiguity of the NWHI Reserve restrictions on fishing and the uncertain outcome of the ongoing process to designate the NWHI Reserve as a National Marine Sanctuary make both the immediate and long-term future of the NWHI bottomfish fishery unclear. Of particular concern are the uncertain limitations that the NWHI Reserve and/or Sanctuary may put on the number of allowable participants in the fishery and on who is eligible to participate. Thus the Council has recommended that the landing requirements for permit retention be removed at least until completion of the Sanctuary designation process, and that this change be retroactive to the date of establishment of the NWHI Reserve, 4 December 2000 (WPRFMC 2002a). The existing prohibitions on permit sale, lease, and charter would remain in effect.

2.3.5.2 Procedure for Issuance of New Mau Zone Limited Access Permits

The Council has recommended to the Secretary of Commerce a weighted point system for issuance of new Mau Zone limited access permits (WPRFMC 2002b). The point system being considered is as follows:
(1) One point will be assigned for each year in which the applicant was owner or captain of a vessel that landed at least 2,500 lbs. of bottomfish management unit species from the main Hawaiian Islands.
(2) Two points will be assigned for each year between 1994 and 1999 in which the applicant was owner or captain of a vessel that made five qualifying landings of bottomfish management unit species. One point will be assigned for each year before 1994 in which the applicant was owner or captain of a vessel that made five qualifying landings of bottomfish management unit species. A "qualifying landing'" means at least 500 lbs. of bottomfish management unit species lawfully harvested from the NWHI and offloaded for sale.

2.3.5.3 Western Pacific Community Development Program

The Magnuson-Stevens Act provides for the establishment of a Western Pacific community development program for any fishery under the authority of the Council (Sec. 305(i)(2)). This provision was added to the Act to address concerns that communities consisting of descendants of indigenous peoples in the Council's area have not been appropriately sharing in the benefits from the area's fisheries. The Council and the Secretary of Commerce, respectively, have discretion to develop and to approve programs for eligible communities for the purpose of enhancing access to the fisheries under the authority of the Council. In 1999, the Council developed, and the Secretary of Commerce approved, an allocation of approximately one-fifth (20 percent) of the target number of Mau Zone permits to a community development program. The rationale for allocating 20 percent of the permits for the community development program was that Hawaiians make up about 20 percent of the State's population. The NMFS published eligibility criteria for the Community Development Program on April 16, 2002. Currently, the

Council, in consultation with NMFS, is developing a framework adjustment to the Bottomfish FMP to establish regulations for issuing CDP pemrits.

2.3.5.4 Revisions of Bycatch and Overfishing Provisions and Fishing Community Definitions

On October 11, 1996 the Magnuson-Stephens Fishery Conservation and Management Act (MSA) was re-authorized and amended by the Sustainable Fisheries Act. As a result, the MSA contains new requirements, making it necessary for Fishery Councils to amend all of their existing FMPs to incorporate these requirements. The Council developed amendments to its four FMPs to address these requirements, which were published in September 1998 and submitted to the NMFS for review and approval. NMFS only partially approved the amendments, as described in a *Federal Register* notice published on April 19, 1999 (64 FR 19067). Disapproved elements of the amendments included the bycatch provisions, the overfishing provisions, and the definitions of fishing communities in Hawaii. The Council developed supplements to Amendment 6 of the Bottomfish and Groundfish Fisheries Management Plan that will provide acceptable provisions for bycatch, overfishing and fishing communities (WPRFMC 2002c, d and e). These revised provisions are based on accepted models used in other jurisdictions, and are expected to be approved by NMFS. The overfishing provisions are described in Section 3.1, Target Species; the bycatch provisions in Section 3.2, Bycatch, and the fishing community provisions in Section 3.7, Fishing Communities.

2.3.5.5 Inclusion of the Commonwealth of the Northern Mariana Islands and U.S. Pacific Remote Island Areas in the Bottomfish and Seamount Groundfish FMP

As noted in Section 1.1, the Council has the responsibility to prepare a FMP for any fishery requiring conservation and management in the EEZ around the CNMI and the PRIAs. Currently, neither area is included under the Bottomfish and Seamount Groundfish FMP. The reasons for this vary between the two areas. As described in Appendix C, the EEZ around the CNMI extends from shore out to 200 nm, but the CNMI maintains that its territorial seas extend out to 12 nm from the archipelagic baseline. This dispute kept the CNMI from participating in the Council process for some years. More recently, the CNMI has chosen to participate in the Council process, and the Council has agreed to defer management of fisheries in waters 0-3 nm from shore to the CNMI while retaining management authority in waters 3-200 nm from shore.

Federal jurisdiction around the PRIAs extends from shore out to 200 nm. Historically, however, little bottomfishing has taken place around these isolated islands. With the recent increased federal emphasis on protection of coral reefs and associated marine resources, it is deemed prudent to initiate permitting and recordkeeping requirements for these areas so that basic catch and effort data will be available should additional management actions be warranted in the future.

Consequently, at its June 14-16, 2000 meeting, the Council approved a recommendation to the Secretary that includes the Commonwealth of the Northern Mariana Islands and U.S. Pacific remote island areas (Wake, Howland, Baker and Jarvis Islands, Johnston and Palmyra Atolls, Kingman Reef and Midway Islands) under the Bottomfish and Seamount Groundfish FMP, Crustaceans FMP and Precious Corals FMP for the Western Pacific Region. This FMP amendment would extend existing management measures in the Bottomfish and Seamount Groundfish FMP to bottomfish fisheries occurring in the EEZ around the CNMI and remote island areas. In addition, federal permit and reporting requirements would be established for the bottomfish fishery in the remote island areas.

The CNMI and PRIA amendment also provides for the inclusion of additional bottomfish species as management unit species (MUS). The species to be added are all primarily members of the shallow-water bottomfish species complex. These species and their distribution within the region are described in Table 2-2.

2.3.5.6 Fifty Mile Area Closure and 50 Foot Size Limit for Vessels Targeting Bottomfish within EEZ Waters Surrounding Guam

New bottomfish fishing activity on the offshore banks of Guam has prompted concerns about:1) information on the fishery being inadequate for effective management; 2) the potential for local catch rates to decline to levels that are not viable for the small-vessel component of the fishery; 3) threats to sustained community participation in the fishery; and 4) disruptions to traditional patterns of supply of bottomfish products to the local market. After considering a wide range of preliminary management options, many of them suggested through a public scoping process, the Council analyzed the likely effects of four management alternatives: 1) no action; 2) require federal permitting and logbook reporting for all vessels greater than 50 feet in length ("large vessels") that land bottomfish management unit species in Guam and close all federal waters within 50 nautical miles of Guam to bottomfish fishing by large vessels; 3) impose a 250-pound-per-trip landing limit on *onaga* in federal waters around Guam; and 4) establish a limited access program for the bottomfish fishery in federal waters around Guam.

At its 118th meeting in June 2003, the Council took final action and endorsed the preferred alternative to require federal permits and reports from all vessels greater that 50 feet in length that land bottomfish in Guam and close federal waters within 50 nautical miles of Guam to bottomfishing by large vessels. Documents are being prepared for transmittal to the Secretary of Commerce for review and decision making.

2.4 SUMMARY AND COMPARISON OF IMPACTS BY ALTERNATIVE

The impacts of each alternative on the environmental resources likely to be affected by the action are summarized for comparative purposes in Table 2-3. These alternatives and analyses of their impacts are discussed in greater detail in Chapter 4.

TABLE 2-2: Pending Additions to Bottomfish Management Unit Species

SPECIES	ENGLISH NAME	COMPLEX	AS	GUAM	HI	CNMI	PRIAS
Carangid spp.	misc. and unidentified	S	X	X	X	X	X
Carangoides orthogrammus	yellow-spotted trevally	S/D?	X	X	X	X	
Caranx melampygus	bluefin trevally	S/D?	X	X	X	X	X
Caranx sexfasciatus	bigeye trevally	S	X	X	X	X	X
Grouper spp.	misc. and unidentified	S	X	X	X	X	X
Cephalopholis sonnerati	peacock/tomato grouper	S/D?	X	X		X	X
Cephalopholis urodeta	flagtail grouper	S	X	X	X	X	X
Epinephalus hexagonatus	starspotted grouper	S	X	X	X	X	X
Epiinephalus howlandi	blacksaddle grouper	S	X	X			X
Epinephalus macrospilos	snubnose grouper	S	X	X		X	X
Epinephalus merra	honeycomb grouper	S	X	X	X	X	X
Epinephelus octofasciatus	eightbar grouper	?		X		X	
Epinephelus polyphekadion	camouflaged grouper	S	X	X		X	X
Lethrinid spp.	misc. and unidentified	S	X	X		X	X
Gnathodentex aurolineatus	yellowspot emperor	S	X	X		X	X

SPECIES	ENGLISH NAME	COMPLEX	AS	GUAM	HI	CNMI	PRIAS
Gymnocranius grandoculis	blue-line large eye bream	S	X	X		X	
Lethrinus atkinsoni	pacific yellowtail emperor	S	X	X		X	
Lethrinus erythacanthus	orange-spotted emperor	S	X	X		X	
Lethrinus harak	thumbprint emperor	S	X	X		X	
Lethrinus obsoletus	yellowstripe emperor	S	X	X		X	
Lethrinus olivaceus	longnose emperor	S	X	X		X	
Lethrinus xanthochilus	yellowlip emperor	S		X		X	X
Monotaxis grandoculus	bigeye emperor	S	X	X	X	X	X
Lutjanis spp.	misc. and unidentified	S	X	X		X	X
Aphareus furcatus	brown/blue smalltooth jobfish	S/D?	X	X	X	X	X
Lutjanus bohar	twinspot/red snapper	S/D?	X	X	X	X	X
Lutjanus fulvus	blacktail snapper	S	X	X	X (Introduced)	X	X
Lutjanus gibbus	humpback snapper	S/D?	X	X	X	X	X
Lutjanus monostigmus	onespot snapper	S	X	X		X	X
Pristipomoides argyrogrammicus	blue-lined gindai	S/D?	X	X		X	X

S - Shallow water species complex; D - Deep water species complex.

TABLE 2-3: Summary and Comparison of Impacts by Alternative

ENVIRONMENTAL RESOURCE CATEGORY	ALTERNATIVE 1 (Preferred Alternative): NO ACTION - CONTINUATION OF CURRENT MANAGEMENT REGIME	ALTERNATIVE 2: IMMEDIATE CESSATION OF BOTTOMFISH FISHING IN THE NWHI	ALTERNATIVE 3: PHASE-OUT OF BOTTOMFISH FISHING IN THE NWHI	ALTERNATIVE 4: ADAPTIVE MANAGEMENT THROUGH ZONING
Target Species	Threat of overfishing in NWHI minimized through fishing effort control, but localized depletion in MHI may occur.	NWHI populations would rebuild and recruitment to MHI may increase. However, the increase may be offset to some extent if fishing effort is redistributed from the NWHI to the MHI by displaced vessels.	Short-term impacts same as Alt.1. After the phase-out the impacts would be the same as Alt.2	Reduced fishing mortality would result in localized stock rebuilding if effort is reduced. Increased recruitment to MHI may occur. Alt. 4B would reduce fishing mortality in more areas (6) than Alt. 4A (2).
Bycatch Species	Catch of bycatch species would continue, but at low levels due to selectivity of bottomfish fishing gear.	Fishing mortality on bycatch species would be reduced in the NWHI. MHI mortality could increase if fishing effort is redistributed from the NWHI to the MHI by displaced vessels.	Short-term impacts same as Alt.1. After the phase-out the impacts would be the same as Alt.2.	If effort is reduced, reduction of fishing mortality would have a positive impact, but may not be detectable against natural population fluctuations. Alt. 4B would reduce fishing mortality in more areas (6) than Alt. 4A (2).

ENVIRONMENTAL RESOURCE CATEGORY	ALTERNATIVE 1 (Preferred Alternative): NO ACTION - CONTINUATION OF CURRENT MANAGEMENT REGIME	ALTERNATIVE 2: IMMEDIATE CESSATION OF BOTTOMFISH FISHING IN THE NWHI	ALTERNATIVE 3: PHASE-OUT OF BOTTOMFISH FISHING IN THE NWHI	ALTERNATIVE 4: ADAPTIVE MANAGEMENT THROUGH ZONING
Hawaiian Monk Seal	Continued bottomfish fishing would expose seals to minimal risk of hooking, entanglement, behavioral disturbance and removal of prey.	Interactions between monk seals and NWHI bottomfish fishery would end.	Short-term impacts same as Alt.1. After the phase-out the impacts would be the same as Alt.2.	Interactions between monk seals and NWHI bottomfish fishery would be eliminated near breeding areas (the two most significant areas in Alt. 4A; the six most significant areas in Alt. 4B). Overall reduced risk of hooking, entanglement, behavioral disturbance and food competition.
Sea Turtles	No impact on adults. Hatchlings may be attracted to vessel lights and experience increased mortality.	Interactions between sea turtles and NWHI bottomfish fishery would end.	Short-term impacts same as Alt.1. After the phase-out the impacts would be the same as Alt.2.	Risk of hatchling mortality eliminated near major nesting area at French Frigate Shoals (Alts. 4A and 4B). Overall risk of impact reduced slightly.
Seabirds	Continued bottomfish fishing would expose seabirds to minimal risk of hooking.	Interactions between seabirds and NWHI bottomfish fishery would end.	Short-term impacts same as Alt.1. After the phase-out the impacts would be the same as Alt.2	To the extent that fishing effort decreases (likely greater for Alt. 4B than Alt. 4A), effects of fishing on seabirds in NWHI would be reduced.

ENVIRONMENTAL RESOURCE CATEGORY	ALTERNATIVE 1 (Preferred Alternative): NO ACTION - CONTINUATION OF CURRENT MANAGEMENT REGIME	ALTERNATIVE 2: IMMEDIATE CESSATION OF BOTTOMFISH FISHING IN THE NWHI	ALTERNATIVE 3: PHASE-OUT OF BOTTOMFISH FISHING IN THE NWHI	ALTERNATIVE 4: ADAPTIVE MANAGEMENT THROUGH ZONING
Cetaceans	Continued bottomfish fishing would expose cetaceans to minimal risk of hooking, collision and behavioral disturbance.	Interactions between cetaceans and NWHI bottomfish fishery would end.	Short-term impacts same as Alt.1. After the phase-out the impacts would be the same as Alt.2.	To the extent that fishing effort decreases (likely greater for Alt. 4B than Alt. 4A), effects of fishing on cetaceans in NWHI would be reduced.
Essential Fish Habitat, Biodiversity, Ecological Function	Continued bottomfish fishing would expose coral reefs and other habitat to low-level risk of anchor damage, exposure to marine pollution and vessel groundings.	Effects of bottomfish fishing on coral reefs and other habitat in NWHI would end.	Short-term impacts same as Alt.1. After the phase-out the impacts would be the same as Alt.2.	Risk of fishing impacts reduced (in two areas for Alt. 4A and for six areas in Alt 4B), particularly to coral reefs within closed areas.

ENVIRONMENTAL RESOURCE CATEGORY	ALTERNATIVE 1 (Preferred Alternative): NO ACTION - CONTINUATION OF CURRENT MANAGEMENT REGIME	ALTERNATIVE 2: IMMEDIATE CESSATION OF BOTTOMFISH FISHING IN THE NWHI	ALTERNATIVE 3: PHASE-OUT OF BOTTOMFISH FISHING IN THE NWHI	ALTERNATIVE 4: ADAPTIVE MANAGEMENT THROUGH ZONING
Commercial, Recreational and Charter Fishing Sectors	About a dozen permit holders in the commercial NWHI bottomfish fishery would continue to annually harvest about 300,000 lb of bottomfish in the NWHI with an ex-vessel value of about $1M .	Economic impacts would be negative, as revenues from the harvest of bottomfish in the NWHI would be eliminated. Some portion of lost revenues may be recovered by switching to other fisheries, but net income is likely to remain lower. If displaced fishing effort shifts to MHI, increased competition will have a negative economic effect on commercial, recreational and charter fishing sectors in MHI.	Harvest and participation in the NWHI fishery would gradually decline to zero as fishermen depart from the fishery. Younger fishermen that remain in the fishery may experience a gradual increase in catch rates in response to the gradual effort reduction.	Closed areas under Alt. 4A could reduce annual landings of bottomfish in the NWHI fishery by 69,000 lbs. and gross revenues by $221,000. Closed areas under Alt. 4B could reduce annual landings of bottomfish in the NWHI fishery by 117,000 lbs. and gross revenues by $374,000. Some portion of lost revenues may be recovered by switching to other fishing grounds or fisheries, but net income is likely to remain lower.
Regional Economy	NWHI bottomfish fishery would continue to contribute $1,382,747 of output (production) and $482,218 of household income to state economy and create the equivalent of 25 full-time jobs.	Impacts on Hawaiʻi's economy would be minimal, as the contribution of the NWHI bottomfish fishery to overall economic activity in Hawaiʻi is small.	Short-term impacts same as Alt.1. Long-term impacts same as Alt.2.	Impacts of Alts. 4A and 4B on Hawaiʻi's economy would be negligible.

ENVIRONMENTAL RESOURCE CATEGORY	ALTERNATIVE 1 (Preferred Alternative): NO ACTION - CONTINUATION OF CURRENT MANAGEMENT REGIME	ALTERNATIVE 2: IMMEDIATE CESSATION OF BOTTOMFISH FISHING IN THE NWHI	ALTERNATIVE 3: PHASE-OUT OF BOTTOMFISH FISHING IN THE NWHI	ALTERNATIVE 4: ADAPTIVE MANAGEMENT THROUGH ZONING
Fishing Community	Would promote social and economic stability within the (proposed) fishing communities of Kauaʻi and Oʻahu and help preserve elements of local fishing culture.	Impacts to the (proposed) fishing communities of Kauaʻi and Oʻahu would be negative, as it would cause a loss of earning potential, investment value and lifestyle among some fishery participants. If displaced fishing effort shifts to MHI, increased competition will have a negative social effect. Could have a disproportionately high and adverse effect on minority populations.	Minimal impacts in the short term, but negative long-term impacts because future generations of fishermen would have one less option to draw on to make fishing a more financially secure occupation. Could have a disproportionately high and adverse effect on minority populations.	Some impacts as described in Alt. 2 may occur, although they would be mitigated by permitting fishermen continued access to other productive fishing grounds in the NWHI. Impacts of Alt 4B could be greater than for Alt 4A if the former results in greater effort reduction.

ENVIRONMENTAL RESOURCE CATEGORY	ALTERNATIVE 1 (Preferred Alternative): NO ACTION - CONTINUATION OF CURRENT MANAGEMENT REGIME	ALTERNATIVE 2: IMMEDIATE CESSATION OF BOTTOMFISH FISHING IN THE NWHI	ALTERNATIVE 3: PHASE-OUT OF BOTTOMFISH FISHING IN THE NWHI	ALTERNATIVE 4: ADAPTIVE MANAGEMENT THROUGH ZONING
Native Hawaiian Community	Participation of Native Hawaiians in NWHI bottomfish fishery is currently low. Additional participation of Native Hawaiians in fishery is encouraged through a community development program.	Native Hawaiian participants in fishery would experience a reduction in income and lose access to customary fishing grounds.	Short-term impacts same as Alt.1 except community development program would be terminated. After the phase-out the impacts would be similar to those of Alt.2.	Economic hardship that area closures impose on Native Hawaiian participants in fishery (potentially greater for Alt. 4B than for Alt. 4A if the former results in greater effort reduction) may be mitigated by community development program. Zoning plan could provide Native Hawaiians preferential access to certain areas for subsistence, cultural and religious purposes.

ENVIRONMENTAL RESOURCE CATEGORY	ALTERNATIVE 1 (Preferred Alternative): NO ACTION - CONTINUATION OF CURRENT MANAGEMENT REGIME	ALTERNATIVE 2: IMMEDIATE CESSATION OF BOTTOMFISH FISHING IN THE NWHI	ALTERNATIVE 3: PHASE-OUT OF BOTTOMFISH FISHING IN THE NWHI	ALTERNATIVE 4: ADAPTIVE MANAGEMENT THROUGH ZONING
Administration and Enforcement	Current administrative and enforcement procedures and associated costs would not change.	Administrative costs would be reduced by removing the need to maintain separate fisheries data collection system and administering limited access programs.	Short-term impacts same as Alt.1. After the phase-out the impacts would be the same as Alt.2.	Development of required interagency, intergovernmental and public-private relationships is likely to be time-consuming and costly. Enforcement costs likely to increase, but costs may be moderated with VMS. Differences between Alts. 4A and 4B would be minimal.

CHAPTER 3: AFFECTED ENVIRONMENT

This description of the affected environment focuses on how the existing conditions of key resources, ecosystems and human communities have been altered by human activities. Where possible, trends in the condition of resources, ecosystems and human communities have been identified. This information provides the baseline and historical context needed to evaluate, in Chapter 4, the potential environmental consequences of each of the alternatives considered herein.

3.1 TARGET SPECIES

3.1.1 Life History Overviews

3.1.1.1 Bottomfish

The bottomfish fisheries in the region target an assemblage of species from the taxonomic groups Lutjanidae (Snappers), Serranidae (Groupers), Carangidae (Jacks), and Lethrinidae (Emperors). The seamount groundfish fishery when extant targeted the armorhead *(Pseudopentaceros richardsoni*) and the alfonsin (*Beryx splendens*). Bottomfish management unit species (BMUS) are listed in Section 2.3.2.

Commercially important deepwater bottomfish inhabit the deep slopes of island coasts and banks at depths of 100 to 400 m. Throughout their spatial and depth range, deepwater snappers are typically distributed in a clumped pattern, and are often associated with underwater headlands and areas of high relief. Although deepwater snappers are generally thought of as top level carnivores, several snapper species in the Pacific are known to incorporate significant amounts of zooplankton in their diets (Haight et al. 1993a).

Relatively little is known about the reproduction and early life history of deepwater bottomfish in the region. Spawning occurs over a protracted period, and peaks from July to September (Haight et al. 1993b). The eggs are released directly into the water column. The eggs hatch in 3 to 4 days, and the planktonic larval phase is thought to last at least 25 days (Leis 1987). For some species this phase may be considerably longer. For example, the pelagic stage for ʻō*pakapaka* is thought to be as long as six months (Moffit and Parrish 1996). Larval advection simulation research indicates that larval exchange may occur throughout the Hawaiian archipelago (generally from the more healthy northwestern areas toward the more depleted MHI areas) and that the amount of larval exchange between the NWHI and the MHI is correlated with the duration of the larval phase, the highest larval exchange occurring with the longest larval phase durations (Kobayashi

1998). Data on actual exchange rates, however, are lacking. Preliminary genetic work corroborates the notion of single archipelago-wide stocks of bottomfish.

Little is known of the life history of the juvenile fish after settling out of the plankton, but research on *P. filamentosus* indicates the juveniles utilize nursery grounds well away from the adult habitat (Parrish 1989). Most of the target species have a relatively high age at maturity, long life span, and slow growth rate. These factors, combined with considerable variation in larval recruitment, make these species highly susceptible to overfishing (Haight et al. 1993b).

3.1.1.2 Seamount Groundfish

Three species of seamount groundfish are included as BMUS in the FMP. These deepwater species primarily occur at depths of 275 - 500 m at Hancock Seamount, which is located 2,800 km northwest of Honolulu. The seamount species generally occur at higher latitudes, and below the depth range of the snapper-grouper bottomfish species complex. The armorhead and alfonsin spawn free-floating eggs which are dispersed by the North-equatorial and Kuroshio currents. Juvenile fish remain in the pelagic environment for up to a year, and then descend to seamount summits and begin a demersal existence. These species feed on species associated with the deep-scattering layer (euphausids, copepods, shrimps, myctophids, etc.) and make vertical migrations at night to follow their prey.

3.1.2 Status of the Stocks

3.1.2.1 Bottomfish

3.1.2.1.1 Maximum Sustainable Yield

The maximum sustainable yield (MSY) of BMUS from the NWHI as a whole was estimated by Kobayashi (1996) at 586,000 pounds. This is the greatest quantity of bottomfish that could be harvested annually on a sustainable basis by average NWHI bottomfish fishing vessels. Using average operational characteristics for these vessels, Pooley (1996) partitioned the MSY into 131,000 pounds for the Mau Zone and 455,000 pounds for the Hoʻomalu Zone. In the most recent year for which data are available (2000) 49,000 pounds of bottomfish were harvested from the Mau Zone and 213,000 pounds of bottomfish were harvested from the Hoʻomalu Zone. These landings represent 37 and 47 percent, respectively, of the Mau and Hoʻomalu Zone's MSYs. During the same year, total landings from the MHI were 478,424 pounds, but the MHI MSY is not known. Bottomfish landings, participation in the fisheries, and economic performance of the participants are discussed in greater detail in Section 3.6.

3.1.2.1.2 Spawning Potential Ratio

Amendment 3 to the Bottomfish FMP 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 absense of fishing (termed spawning potential ratio, or SPR) is equal to or less than 20 percent. SPR has been used by the Council as a proxy for MSY. The 1996 re-authorization of the MSA by the Sustainable Fisheries Act (SFA) resulted in new requirements for monitoring for potential overfishing, among other things. In 1998, the Council submitted to NMFS for approval Amendment 6 to the FMP, which was intended to bring the FMP into compliance with the new provisions of the SFA concerning overfishing, bycatch, fishing sectors, essential fish habitat, and fishing communities. The portion of the amendment dealing with overfishing was disapproved as not providing a measure of stock biomass as required. The next section (3.1.2.1.3) describes the portion of the Council's supplement to Amendment 6 (WPRFMC 2002c) that will rectify that problem. The methods presented there will allow calculation of MSY and other reference parameters, however, those calculations have not yet been completed. In the meantime, however, the Council has amassed 15 years of SPR data for Hawaii's bottomfish fisheries, and the values are illustrative of the status of the bottomfish stocks in the three Hawaiʻi management zones.

An advance copy was obtained of the Hawaiʻi module of the Stock Assessment and Fishery Evaluation (SAFE) report, which is the Council's Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Annual Report (WPRFMC in prep.). The report evaluates data through calendar year 2000. Table 3-1 extracts from that report an historical summary of SPRs for combined BMUS in the three Hawaiʻi bottomfish management areas.

TABLE 3-1: Historical Annual SPR for BMUS in the MHI and NWHI

YEAR	MHI	MAU ZONE	HOʻOMALU ZONE
1986	33	41	75
1987	25	50	113
1988	37	37	66
1989	40	91	70
1990	27	77	64
1991	24	42	82
1992	25	38	98
1993	24	36	109

YEAR	MHI	MAU ZONE	HOʻOMALU ZONE
1994	24	68	64
1995	22	45	73
1996	21	53	78
1997	20	61	65
1998	20	42	66
1999	25	51	62
2000	21	42	68
Average	26	52	77

Source: WPRFMC in. prep.

In 2000, none of the management areas had an average SPR value below the 20% critical threshold that defines recruitment overfishing under the FMP. SPR values from the Mau and Hoʻomalu Zones as well as information on percent immature individuals in the catch show no localized depletion problems for any BMUS stock in the NWHI, and stocks remain relatively healthy. The SPR for the MHI, however, is close to the 20% threshold, and other measures indicate that certain stocks of BMUS in that zone are clearly under stress. For example, each of the stocks evaluated has a CPUE below 50% of the original value (see Section 3.5.1.3 for additional discussion of CPUE). In addition, *onaga* and *ehu* stocks are severely depleted on a local basis as the MHI SPR values for these species are at or below 20% (7% and 8% for *onaga* and *ehu*, respectively). To address the issue of localized depletion of bottomfish stocks in the MHI, in 1998 the State of Hawaiʻi implemented Hawaiʻi Administrative Rule (HAR) Chapter 13-94. This rule establishes, for the deep-sea bottomfish fishery managed by the state, gear restrictions, non-commercial bag limits, 19 areas closed to bottomfish fishing, fishing registration and identification of bottomfish fishing vessels, and a control date for possible future implementation of a limited access management regime.

As indicated above, evidence from larval drift simulation and genetic studies, however, supports the conclusion that bottomfish stocks are archipelago-wide with substantial larval transport between zones. Consequently, despite the evidence of localized overfishing in the MHI, archipelago-wide SPR estimates are the best method available to assess the status of Hawaiʻi's bottomfish stocks (WPRFMC in prep.). Table 3-2 summarizes the archipelago-wide SPR values for the most important BMUS.

TABLE 3-2: Historical Annual Archipelago-wide SPRs by BMUS Stock

YEAR	*Ehu*	*Hāpuʻupuʻu*	*Onaga*	*ʻŌpakapaka*	*Uku*
1986	41	55	53	51	58
1987	61	71	61	69	65
1988	37	56	42	49	62
1989	51	70	38	69	68
1990	44	57	36	57	52
1991	44	58	42	57	53
1992	51	67	41	68	61
1993	54	65	53	67	73
1994	38	51	39	53	52
1995	41	48	33	54	56
1996	45	51	40	53	60
1997	42	49	25	53	54
1998	40	47	23	49	51
1999	37	48	34	46	55
2000	40	49	27	52	52
Average	44	56	39	56	58

Source: WPRFMC in. prep.

SPR values in 2000 for the five most important BMUS stocks are all above the 20% critical threshold that the FMP defines as recruitment overfishing. The onaga value of 27% is the lowest, and coupled with other data showing the low SPR from the MHI and recent declines in mean weight of the *onaga* landed from both the Mau and Hoʻomalu Zones, suggest that this stock is under some stress throughout the archipelago. The Council's bottomfish annual report concludes that future trends in the *onaga* SPR should be watched closely to determine if additional management measures are appropriate for this species (WPRFMC in prep.).

3.1.2.1.3 Overfishing Criteria

Re-authorization of the MSA brought with it new requirements for the quantification of fish stock status with respect to numerical overfishing criteria. The Council has completed a supplement to Amendment 6 (WPRFMC 2002c) specifying how it intends to comply with the new requirements. Because of the paucity of data for all species and island areas managed under the Bottomfish FMP, the Council's control rules and overfishing thresholds are specified for multi-species complexes. Secondary reference points and control rules will be applied to individual species where possible. Standardized values of catch per unit effort and fishing effort will be used as proxies for biomass and fishing mortality, respectively. The stock status determination criteria are specified for those proxies using defaults recommended in the NMFS technical guidance for implementing National Standard 1. A process has been established for making stock status determinations.

Once the Council's methodology is approved, the values of natural mortality and the reference points for overfishing and overfished stocks will be estimated annually for each of the island groups in the region, and the status of the stocks will be determined.

3.1.2.2 Seamount Groundfish

Southeast Hancock Seamount, 1,400 nm northwest of Honolulu, is the only area in the U.S. EEZ that has supported a seamount groundfish fishery. The Russians and Japanese began this trawl fishery in the late 1960s and made large catches for about 10 years until the stocks of the target species, alfonsin and armorhead, collapsed. The Bottomfish FMP, approved in 1986, placed a moritorium on this fishery. The status of the groundfish stocks at Southeast Hancock Seamount was evaluated using as an indicator the catch-per-unit-effort (CPUE) and SPR estimates from NMFS research longline catches by Honolulu Laboratory personnel aboard the NOAA ship R/V *Townsend Cromwell*. Data were collected from 1985 through 1991, and in 1993. SPR values from these cruises were always around 2.5, indicating no recovery of the stocks. Monitoring of the stocks ceased in 1993. Because of its similarity in size and depth, values at the Colahan Seamount, outside the U.S. EEZ, currently are used as a proxy for the status of the Hancock Seamount groundfish. The most recent available SPR values for the Colahan Seamount were 0.6 (1996) and 1.1 (1997), indicating seriously depressed stock levels. There was a sharp peak in CPUE and SPR in the 1992 data indicating that episodic pulses of recruitment may be the product of environmental factors rather than a typical stock-recruitment relationship.

Effective September 1, 1998, the fishing moratorium on seamount groundfish at the Hancock Seamounts was extended for a third 6-year period until August 31, 2004.

3.2 BYCATCH

Most fisheries have both non-target species (not the target of fishing, but kept for consumption or sale) and bycatch (discards). If the fish, or any part of it, is used or sold, it is incidental catch of non-target species, not bycatch. Thus, for example, in years past, when there was no prohibition on finning sharks, the discarded shark carcass was not bycatch. It is also important to note that the MSA includes turtles as bycatch, but not marine mammals or seabirds. The discussion below focuses on bycatch of fish species. Turtles are discussed later, in the protected species section.

3.2.1 MSA Definitions and Requirements

Bycatch is defined as follows in the MSA (§3(2, 12, 9, and 33)):

> *The term "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.*
>
> *The term "fish" means finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds.*
>
> *The term "economic discards" means 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.*
>
> *The term "regulatory discards" means 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.*

The National Standard Guidelines (50 CFR 600.350(c)) extend the definition of bycatch to include:

> *fishing mortality due to an encounter with fishing gear that does not result in capture of fish (i.e., unobserved fishing mortality).*

The 1996 SFA amendments to the MSA added two key requirements of FMPs regarding bycatch. First, the new National Standard 9 (MSA §301(a)(9)) requires that:

> *Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.*

Second, MSA §303(a)(11) requires that FMPs:

> *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.*

3.2.2 Available Estimates of Catch and Mortality

With the moratorium on the seamount groundfish fishery there is no bycatch or bycatch mortality in that fishery. Bottomfish fisheries exist throughout the management area, but with the exception of the Hawaiʻi fisheries, these are shallow-water fisheries that take place almost exclusively in state and territorial waters, and consequently are not subject to federal management.

In Hawaiʻi, there are two separately managed bottomfish fisheries: a strictly commercial fishery in the NWHI, and a mixed commercial, recreational and subsistence fishery in the MHI. While these fisheries use the same gear and operational methods, the motivation of the fishermen is different between the commercial operators and recreational or subsistence fishermen. This results in different bycatch characteristics. The NWHI commercial fishermen seek the highest economic return on their catch and therefore may discard lower valued species, especially early in a trip, thereby conserving both ice and hold space. Recreational or subsistence fishermen, on the other hand, are more inclined to retain a greater variety of species for home consumption or distribution to relatives and friends. For this reason, the bycatch of the NWHI commercial fleet is likely the largest and most diverse of the Region's bottomfish fisheries, and will be used to conservatively characterize bottomfish bycatch. In addition, because Hawaiʻi has no permit, logbook, or catch reporting system for non-commercial marine fishermen, there are no data on bycatch by this sector. Data on bycatch in the NWHI commercial fishery is available from the logbook program, from limited observer data, and from NMFS research cruises in the NWHI.

Bottomfish gear types and fishing strategies are highly selective for desired species and sizes. Measures that serve to further reduce bycatch in the botomfish fishery include prohibitions on the use of bottom trawls, bottom gillnets, explosives and poisons.

Logbook data (State of Hawaiʻi), and observer programs conducted by NMFS indicate that total discards (including damaged target species) account for approximately 8 to 23% of the total catch in bottomfish fisheries in the Hawaiian archipelago (Nitta 1999, WPRFMC 1998a). Carangids, sharks, and miscellaneous reef fish (pufferfish, moray eels, etc.) are the most numerous discard species. Two species in particular, *kāhala* (*Seriola dumerili*) and *butaguchi* (*Pseudocaranx dentex*), make up the majority of the bycatch. Most species are not kept by vessels because of their unpalatability, however some carangids (large jacks and amberjacks) are also discarded because of concerns of ciguatera poisoning[9]. *Butaguchi*, which commands a low price in the Hawaiʻi market, may be discarded in the early days of a fishing trip to avoid reducing vessel hold space for more valuable bottomfish and because this species has a poor on-board "shelf-life." The major discard species in the NWHI bottomfish fishery are given in Table 3-3. It should be noted that a large percentage of the snappers and the grouper listed there are included as bycatch because of damage from sharks.

In bottomfish fishing operations the largest proportion of lost fish and gear is attributable to interactions with sharks (Nitta 1999). Some fishing areas are so plagued with sharks that a majority of hooked fish are either stolen or damaged. The estimated economic losses experienced by fishermen as a result of shark interference with fishing operations are substantial (Kobayashi and Kawamoto 1995). In the NWHI the gray reef shark (*Carcharhinus amblyrhnchos*) is the worst offender. When shark interactions become a problem, some fishermen will attempt to kill sharks by catching and/or shooting them. During the late 1990s, an increase in the market demand for shark fins resulted in some bottomfish vessels "finning"[10] the sharks that were killed. In 2000 however, both the State of Hawaiʻi and the federal government implemented legislation that required the entire shark carcass to be landed along with the fins (Hawaii State House of Representatives, 20th Legislature, HB 1947, 2000; U.S. House of Representatives, 106th Congress, Second Session, HR 5461, 2000). This legislation has curtailed shark-finning in the bottomfish fishery. Limitations in hold space and limited marketability preclude most bottomfish vessels from retaining shark carcasses.

TABLE 3-3: Percent Discards from Bottomfish Fishing Trips with NMFS Observers, 1990-1993

SPECIES	NO. CAUGHT	NO. DISCARDED	% DISCARDED
Kāhala	2438	2266	92.9
Kalekale (yellowtail)	40	22	55.0
Sharks	176	92	52.3
Misc. fish	115	59	51.3

[9]Ciguatera fish poisoning results from eating a fish containing a neurological toxin produced by a microscopic dinoflagellate algae. The algae grow epiphytically on benthic macroalgae (seaweeds) and are ingested by herbivorous fish which in turn are eaten by larger carnivorous fish, with each step concentrating the toxin. In humans, ciguatera poisoning may cause severe illness or even death.

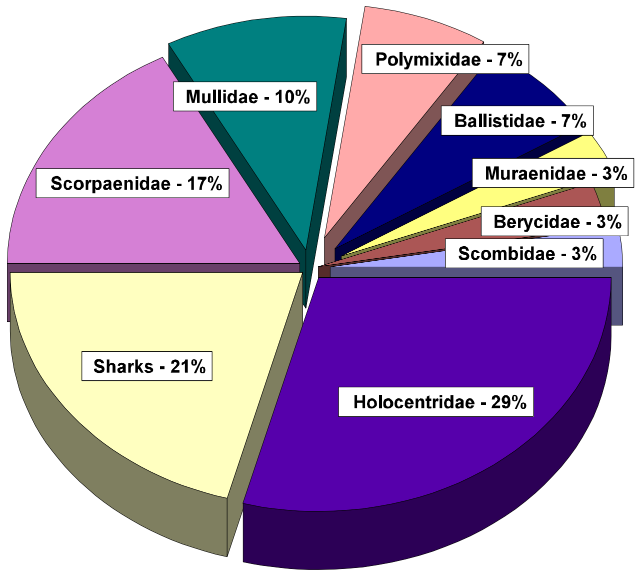
[10]"Finning" is the practice of removing the fins from a shark and discarding the remainder of the carcass at sea.

SPECIES	NO. CAUGHT	NO. DISCARDED	% DISCARDED
Ulua (white)	127	62	48.8
Misc. snapper/jack	189	91	48.1
Butaguchi	3430	1624	47.3
Ulua (black)	23	10	43.5
Ta'ape	110	40	36.4
Misc. fish unidentified	174	26	14.9
Kalekale	874	52	6.0
'ō*pakapaka*	5092	107	2.1
Ehu	1185	20	1.7
Uku	2209	28	1.3
Hāpu'upu'u	1593	19	1.2
Gindai	459	3	0.7
Onaga	1141	8	0.7
Alfonsin	1	0	0.0
Armorhead	1	0	0.0
Lehi	3	0	0.0

Source: Nitta 1999

Data collected by NMFS during research bottomfish fishing cruises indicate the potential species composition of bycatch in the NWHI bottomfish fishery (Figure 3-1). Research bottomfish fishing is less likely to exclusively successfully target commercial species, however the following figure indicates the other species that may be caught in association with bottomfish fishing operations.

FIGURE 3-1: NMFS Research Cruise Estimates of Composition of Bottomfish Bycatch in Hawaiʻi (Percent of total number; Source: WPRFMC 1998a)



Reliable bycatch data are not yet available for the bottomfish fisheries in the MHI, American Samoa, the CNMI or Guam, but because of the high proportion of recreational and subsistence bottomfish fishing, bycatch rates in those areas are believed to be substantially less than in the purely commercial NWHI bottomfish fishery.

3.2.3 Anticipated Improvements to Management Measures

The Council's supplement to the bycatch provisons of Amendment 6 (WPRFMC 2002d) includes four types of non-regulatory measures aimed at further reducing bycatch and bycatch mortality and improving bycatch reporting: 1) outreach to fishermen and engagement of fishermen in management, including research and monitoring, in order to raise their awareness of bycatch issues and of options to reduce bycatch, 2) research into fishing gear and method modifications to reduce bycatch and bycatch mortality, 3) research into the development of markets for discarded fish species, and 4) improvement of data collection and analysis systems to better measure bycatch.

3.3 PROTECTED SPECIES

Protected species include those species listed as endangered or threatened under the ESA, all marine mammals, listed or not, as they are protected under the MMPA, and seabirds, listed or not, as they are protected under the MBTA. Each of these laws is described in Appendix B.

Appropriate information on the species' life history, habitat and distribution, and other factors necessary to its survival, is included to provide background for analyses in other sections of this document. The Hawaiian monk seal (monk seal), the only listed species which may be adversely affected by the proposed activities, and its critical habitat are considered in detail in section 3.3.1.3.

In March 2002, NMFS completed a formal consultation under ESA Section 7 and released its Biological Opinion (BiOp) for the Bottomfish FMP. The BiOp concluded that the bottomfish fisheries of the Western Pacific Region are not likely to jeopardize the continued existence of any threatened or endangered species under NMFS' jurisdiction or destroy or adversely modify critical habitat that has been designated for them. The full text of the BiOp is included as Appendix D.

3.3.1 Marine Mammals

Protected marine mammals fall into two categories: species listed under the ESA and those species which are not listed, but otherwise protected under the MMPA. Cetaceans and pinnipeds are discussed separately in the sections below.

<u>3.3.1.1 Listed Cetaceans</u>

There are six species of cetaceans listed under the ESA that occur within the area of operation of the bottomfish fishery of the Western Pacific Region. These species are the blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), sei whale (*Balaenoptera borealis*), sperm whale (*Physeter macrocephalus*), and right whale (*Eubalaena glacialis*).

Although these whales may be found within the action area and could interact with the U.S. fisheries of the Western Pacific Region, no reported or observed incidental takes of these species have occurred in the bottomfish fishery. Therefore, NMFS determined that there is no impact to these cetaceans from the bottomfish fishery.

<u>3.3.1.2 Other Cetacea</u>

Species of marine mammals that are not listed under the ESA but are protected under the MMPA and occur in the areas of the Western Pacific Region where bottomfish fisheries operate are as follows:

- Blainsville beaked whale *(Mesoplodon densirostris*)
- Bottlenose dolphin (*Tursiops truncatus)*
- Bryde's whale (*Balaenoptera edeni*)

- Cuvier's beaked whale (*Ziphius cavirostris*)
- Dwarf sperm whale (*Kogia simus*)
- False killer whale (*Pseudorca crassidens*)
- Killer whale (*Orcinus orca*)
- Melon-headed whale (*Peponocephala electra*)
- Pilot whale *(Globicephala melas*)
- Pygmy killer whale (*Feresa attenuata*)
- Pygmy sperm whale (*Kogia breviceps*)
- Risso's dolphin *(Grampus griseus*)
- Rough-toothed dolphin (*Steno bredanensis*)
- Short-finned pilot whale (*Globicephala macrorhynchus*)
- Spinner dolphin (*Stenella longirostris*)
- Spotted dolphin (*Stenella attenuata*)
- Striped dolphin (*Stenella coeruleoalba*)

Of the above species, the bottomfish fishery has been documented to interact or take only one species, the bottlenose dolphin (*Tursiops trucatus*) (Nitta and Henderson 1993). Although the other species listed above may be found within the action area and could interact with bottomfish fisheries in the Western Pacific Region, no reported or observed incidental takes of these species have occurred in these fisheries. There is no current expectation of future interactions between these species and the bottomfish fisheries and therefore, they will not be considered further in this document.

Bottlenose dolphins are widely distributed throughout the world in tropical and warm-temperate waters (Reeves et al. 1999). Average size at birth is 0.9 to 1.2 m and 8 - 9 kg. Maximum size reported is 3.9 m and 275 kg. Males are sexually mature at 10 - 12 years of age, females between 5 and 12 years. Once reproductively active, females bear a single calf every second or third year. Gestation is about 12 months. Calves are nursed for a year or more. Maximum age appears to be 46 - 48 years, based on tooth growth analysis of both wild and captive dolphins.

The bottlenose dolphin is primarily coastal, but populations also occur in offshore waters. The species is common throughout the Hawaiian archipelago, usually within five miles of emergent land or shallow banks (Shallenberger 1981). School sizes range from single animals and small groups (3-10 individuals) to aggregations of more than 100 individuals. A combined aerial and vessel survey indicated at least 430 individuals in the shallow waters around the MHI (Nitta and Henderson 1993). Data suggest that the bottlenose dolphins in Hawai'i belong to a separate stock from those in the eastern tropical Pacific (Scott and Chivers 1990). The status of bottlenose dolphins in Hawaiian waters relative to their optimum sustainable population (OSP) is unknown, and there are insufficient data to evaluate trends in abundance or carrying capacity of the region (Forney et al. 2000).

3.3.1.3 Listed Pinniped: The Hawaiian Monk Seal

In 1976, the Hawaiian monk seal was listed as endangered under the ESA following a 50% decline in beach counts from the late 1950s to the mid-1970s (41 FR 33922). It was also designated a depleted species in 1976 under the MMPA, and its population status is considered to be below sustainable levels. The Hawaiian monk seal is the most endangered pinniped in U.S. waters and is second only to the northern right whale as the nation's most endangered marine mammal (Marine Mammal Commission 1999). The Hawaiian monk seal is also the only endangered marine mammal that exists wholly within the jurisdiction of the United States.

The first Hawaiian Monk Seal Recovery Team (HMSRT), appointed pursuant to the ESA in 1980, is a forum, supported by NMFS, in which issues involving recovery planning and implementation are discussed and recommendations for actions forwarded to NMFS. In 1982, the HMSRT completed the Hawaiian Monk Seal Recovery Plan. The highest priority activities identified by the HMSRT are those that support the following recovery-related objectives:1) Determine the ultimate and proximate factors influencing population dynamics at each of the six major breeding locations; 2) Enhance survival of female Hawaiian monk seals and their pups to maximize reproductive potential and population growth; 3) Facilitate recovery of the depleted populations; and 4) Mitigate human impacts (HMSRT 1999).

Under the ESA, critical habitat may be designated to afford protection or special management consideration to physical or biological features essential to the conservation of a listed species. In May 1988, NMFS designated critical habitat for the Hawaiian monk seal out from shore to 20 fathoms in 10 areas of the Northwestern Hawaiian Islands. Critical habitat for this species includes "all beach areas, sand spits and islets, including all beach crest vegetation to its deepest extent inland, lagoon waters, inner reef waters, and ocean waters out to a depth of 20 fathoms around the following: Pearl and Hermes Reef, Kure Atoll, Midway Islands, except Sand Island and its harbor, Lisianski Island, Laysan Island, Maro Reef, Gardner Pinnacles, FFS, Necker Island, and Nihoa Island" (53 FR 18990, May 26, 1988, 50 CFR § 226.201).

Critical habitat was designated in order to enhance the protection of habitat used by Hawaiian monk seals for pupping and nursing, areas where pups learn to swim and forage, and major haul-out areas where population growth occurs. The Bottomfish FMP manages areas included in the critical habitat for the Hawaiian monk seal (i.e., ocean waters out to 20 fathoms depth), although the fisheries operating pursuant to the Bottomfish FMP do not adversely affect the physical features identified as critical habitat, such as the substratum, waters, or nesting beaches.

3.3.1.3.1 Biology and Distribution

Monk seals are phocids, and are one of the most primitive genera of seals. They are brown to silver in color, depending upon age and molt status, and can weigh up to 270 kg. Adult females are slightly larger than adult males. Monk seals are solitary, and it is thought they can live up to 30 years. Females reach breeding age at about 5 to 10 years of age, depending on their condition, and can give birth about once every year. An estimated 40-80% of adult females give birth in a given year (NMFS unpub. data. 2001). After birth, pups nurse for 5-6 weeks, during which time the mother rarely, if at all, leaves the pup to feed. At weaning, the mother leaves and the pup must subsequently forage independently. Newly weaned pups tend to stay in the reef shallows, entering into more diverse and deeper waters to forage as they gain experience. Monk seals may stay on land up to about two weeks during their annual molt. Hawaiian monk seals are nonmigratory, but recent studies show their home ranges may be extensive (Abernathy and Siniff 1998). Counts of individuals on shore compared with enumerated subpopulations at some of the NWHI indicate that Hawaiian monk seals spend about one-third of their time on land and about two thirds in the water (Forney et al. 2000).

The Hawaiian monk seal breeds only in the Hawaiian Archipelago, with most monk seals inhabiting the remote, largely uninhabited atolls and surrounding waters of the NWHI. More than 90 percent of all pups are born at six major breeding colonies located at French Frigate Shoals, Laysan Island, Pearl and Hermes Reef, Lisianski Island, Kure Atoll and Midway Atoll. A few births also occur annually at Necker, Nihoa, and Niʻihau Islands and in the main Hawaiian Islands. NMFS researchers have also observed Hawaiian monk seals at Gardner Pinnacles and Maro Reef. Although Hawaiian monk seals occasionally move between islands, females generally return to their natal colony to pup. Since 1990, there has been an apparent increase in the number of Hawaiian monk seal sightings and births in the main Hawaiian Islands (HMSRT 1999; Johanos 2000). Additional sightings and at least one birth have occurred at Johnston Atoll, excluding eleven adult males that were translocated to Johnston Atoll (nine from Laysan Island[11] and two from FFS) over the past 30 years.

Hawaiian monk seals feed on a wide variety of teleosts, cephalopods and crustaceans, indicating that they are highly opportunistic feeders (Rice 1964; MacDonald 1982; Goodman-Lowe 1998). Research to identify prey species is currently underway using several methods: collection of potential prey items and blubber samples for fatty acid analysis; Crittercam[12] recording of

[11]Nine adult male Hawaiian monk seals that had been identified as participating in mobbing behavior were translocated to Johnston Atoll by the NMFS in 1984. This was an attempt to reduce the frequency and/or severity of mobbing incidents involving injury or death of female seals, not to equalize the sex ratio at Laysan Island.

[12]A Crittercam is a self-contained video camera that has been mounted on a Hawaiian monk seal to record its foraging behavior.

foraging behavior; correlation of dive/depth/location profiles with potential prey species habitat; and analysis of Hawaiian monk seal scat and spew samples for identifiable hard parts of prey. To date, completed studies indicate little or no overlap between Hawaiian monk seal prey items and the target and bycatch/incidental catch species of the bottomfish fishery. Table 3-4 identifies adult male Hawaiian monk seal prey families as indicated by Crittercam studies at FFS.

TABLE 3-4: Crittercam study: Prey Items Eaten by Free Swimming Adult Male Hawaiian Monk Seals at FFS

FAMILY	NUMBER SEEN	BOTTOMFISH TARGET SPECIES: Y = Yes, ? = Maybe, N = No	BOTTOMFISH BYCATCH SPECIES: Y = Yes, ? = Maybe, N = No
Anthiinae	2	N	N
Balistidae	1	N	N
Bothidae	1	N	N
Cheilinninae	2	N	N
Congridae	1	N	?
Pentacerotidae (groundfish)	1	N	N
Pomacentridae	1	N	N
Tetradontidae	1	N	N
Unidentified Eels	2	N	?
Unidentified fish	8	?	?
Octopus	2	N	?

(Source: Parrish et al. 2000; WPRFMC 2000a)

In a study at five of the principle breeding sites for the Hawaiian monk seal (FFS, Laysan Island, Lisianski Island, Pearl and Hermes Reef, and Kure Atoll) focused on identifying items eaten by Hawaiian monk seals, Goodman-Lowe (1998) analyzed scat and spew samples to identify prey, and to obtain size estimates of the more common cephalopod prey species.[13] This study also examined the temporal differences in diet among years. The frequency of occurrence (FO) was

[13]Scat and spew analysis is known to be biased due to differential digestion of various prey types. However, scat and spew analysis is, at this time, the best available scientific information for investigating Hawaiian monk seal diets.

calculated as the number of samples in which an identified prey type was found. The percent frequency of occurrence (percent FO) was calculated as the FO divided by the total number of scat and spew samples analyzed (n=940)(Table 3-5).

TABLE 3-5: Goodman-Lowe Results of Prey found in Scat and Spew samples Referenced to Bottomfish MUS and Bycatch Families

FAMILY	FO/%FO n=940	BOTTOMFISH TARGET FAMILY: Y = Yes, ? = Maybe, N = No	BOTTOMFISH BYCATCH FAMILY: Y = Yes, ? = Maybe, N = No
Labridae	194/20.6	N	N
Balistidae	123/13.1	N	N
Scaridae	99/10.5	N	N
Acanthuridae	71/7.6	N	?
Pomacentridae	44/4.7	N	N
Tetradontidae	41/4.4	N	N
Kyphosidae	32/3.4	N	N
Monacanthidae	29/3.1	N	N
Synodontidae	25/2.7	N	N
Pomocanthidae	17/1.7	N	N
Kuhliidae	14/1.5	N	N
Cirrhitidae	12/1.3	N	N
Chaetodontidae	10/1.1	N	N
Diodontidae	10/1.1	N	N
Bothidae	9/0.9	N	N
Cheilodactylidae	6/0.6	N	N
Scorpaenidae	5/0.5	N	N
Ostraciidae	1/0.1	N	N
Unidentified Eels	207/22.0	N	?
Holocentridae	135/14.4	N	Y

FAMILY	FO/%FO n=940	BOTTOMFISH TARGET FAMILY: Y = Yes, ? = Maybe, N = No	BOTTOMFISH BYCATCH FAMILY: Y = Yes, ? = Maybe, N = No
Muraenidae	53/5.6	N	Y
Congridae	52/5.5	N	?
Priacanthidae	40/4.3	N	Y
Apogonidae	9/0.9	N	N
Opichthidae	6/0.6	N	N
Mullidae	58/6.2	N	Y
Lutjanidae	24/2.6	Y	Y
Carangidae	11/1.1	Y	Y
Polymixiidae	9/1.0	N seamount groundfish	?
Serranidae	5/0.5	N	Y
Belonidae	1/0.1	N	N
Unidentified remains	330	?	?

Source: Goodman-Lowe 1998

The results indicated that Hawaiian monk seals are opportunistic predators that feed on a wide variety of available prey as compared to the case of other seals in which the bulk of the diet is made up of only a few species (Goodman-Lowe 1998). The analysis revealed that teleosts (bony fish) were the most represented prey (78.6%) followed by cephalopods (15.7%) and crustaceans (5.7%). The most common teleost families found were marine eels (22.0%), Labridae (20.6%), Holocentridae (14.4%), Balistidae (13.1%) and Scaridae (10.5%). All teleost families found include common, shallow-water reef fishes, except for the beardfish family, Polymixiidae (1.0%), which is recognized to consist of deep-water benthic fish. The deep-water Polymixiidae are not caught in the bottomfish fishery either as target or bycatch species. Evidence of target species such as snapper and grouper appeared infrequently in fecal and regurgitate samples.

Both the Crittercam data and the scat and spew analyses indicate little overlap with the target and bycatch fish families of the bottomfish fishery. Moreover, overlap at the family level may not reflect an overlap at the species level because many species within families occur in both deep and shallow waters.

An ongoing study contracted by NMFS is using quantitative fatty acid signature analysis to identify which prey items are most important to the various age and sex components of the several island populations of Hawaiian monk seals (Iverson 2000). Initial estimates of diet suggest an array of prey species that are in some cases comparable to that found in the analysis of fecal and regurgitate samples. To date, the study has not focused specifically on the fish species most commonly targeted by the NWHI bottomfish fishery.

More information about the foraging activities of Hawaiian monk seals is available through the additional analysis of dive/depth/location profiles and the correlation with the habitat of potential prey families. Recent information suggests Hawaiian monk seals may forage in beds of precious corals, some of which are habitat for known Hawaiian monk seal prey items such as eels (Parrish et al. 2002).

The foraging and dive patterns of Hawaiian monk seals and the availability of prey items to Hawaiian monk seals are important to understand when determining the potential impact of the bottomfish fishery in terms of areas fished, potential for gear interactions, and prey competition. The foraging range of the Hawaiian monk seal extends to areas managed under the Bottomfish FMP. Various studies have been undertaken to determine the habitat use patterns of Hawaiian monk seals (Schlexer 1984; DeLong et al. 1984; Abernathy and Siniff 1998; Stewart 1998; Parrish et al. 2000). These studies used various technologies, including radio tags, dive depth recorders, Crittercams, and satellite telemetry, to study the foraging behavior of Hawaiian monk seals. The results of these studies vary by location.

DeLong et al. (1984) instrumented seven Hawaiian monk seals at Lisianski Island with radio transmitters and multiple depth of diving recorders and recorded movements for an aggregate of 94 days in which 4,817 dives were recorded. Most dives (59 percent) were in the 10-40 m depth range, and the remainder of dives were to deeper depths. Thirteen dives were recorded to depths of at least 121 m. The outer edge of the reef around Lisianski Island is generally delineated by the 40 m isobath. The study concluded that during breeding season at Lisianski Island males depend entirely upon the food resources on the coral reefs, sandy beach flats and deeper reef slopes around that island.

Schlexer (1984) also recorded diving patterns of Hawaiian monk seals at Lisianski Island. In that study, eight Hawaiian monk seals (five adult males, one juvenile male, one subadult female, and one juvenile female), tracked with radio transmitters and multiple depth of diving recorders, were recorded diving within the 0 - 70 m range. One subadult female and one juvenile female dove in the shallow range of 10 - 40 m, with some dives recorded from 150 - 180 m. None of the adult males instrumented dove to depths greater than 70 m.

Stewart (1998) investigated diving patterns of 24 Hawaiian monk seals at Pearl and Hermes Reef using satellite-linked radio transmitters to record dive depth and duration. That study concluded that the Hawaiian monk seals at Pearl and Hermes Reef foraged in relatively shallow waters, and that foraging activity was different for males and females and among age classes. At Pearl and Hermes Reef, juveniles foraged almost exclusively within the fringing reef, adult males foraged mostly on the inside and outer edge of the fringing reef, and adult females foraged mostly within the center of the atoll and near the atoll's southwestern opening (Stewart 1998). Adult males generally dove within the 8 - 40 m range, with a secondary mode at 100 - 120 m. Male juveniles generally dove within the 8 - 40 m range. Adult females rarely dove deeper than 40 m, although one female made a number of dives to 60 - 140 m.

Abernathy and Siniff (1998) instrumented adult seals at FFS with satellite-linked time depth recorders. Data showed that instrumented adult male Hawaiian monk seals appeared to utilize the banks to the northwest, with a daytime diving range between 50 - 80 m and a nighttime range between 110 - 190 m. The study also suggested that seals that did not leave the vicinity of FFS rarely dove deeper than 80 m during the day, but made more dives closer to 80 m at night. The study also identified a few seals that were extremely deep divers. These seals' daytime dives reached depths > 300 m on a ridge to the east of the atoll. The researchers modeled the home range of individuals and concluded that the average home range was 6,467 km^2 (n=28, SE=3,055 km^2). For example, individuals were documented traveling between FFS and Gardner Pinnacles, St. Rogatien Bank, Brooks Bank, and Necker Island. The conclusion was that Hawaiian monk seals forage on benthic and epibenthic species, and on other prey items in the fringing reef complex.

Parrish et al. (2000) provided further information that Hawaiian monk seal foraging behavior and range are extensive. Twenty-four Hawaiian monk seals were outfitted with Crittercams. The Crittercam recorded the habitat depth and bottom type at locations where Hawaiian monk seals were identified as successful in the capture of prey items. It was found that the diurnal pattern of foraging by male adults occurred mainly at the 60 m isobath. A few seals foraged at depths >300 m. Some of these areas were outside the critical habitat area and overlapped with areas fished by both lobster and bottomfish fisheries.

Since 1995, the abundance of shallow water (<20 m) reef fish has been surveyed at FFS and Midway. The data are checked as a potential indicator of changes in the abundance of Hawaiian monk seal prey. The surveys are conducted annually by NMFS and are designed to detect changes of 50 percent or greater in fish densities (Laurs 2000). So far, surveys have not indicated any statistically significant changes in prey abundance at either site (DeMartini et al. 1996; DeMartini et al. 1999).

3.3.1.3.2 Population Status and Trends

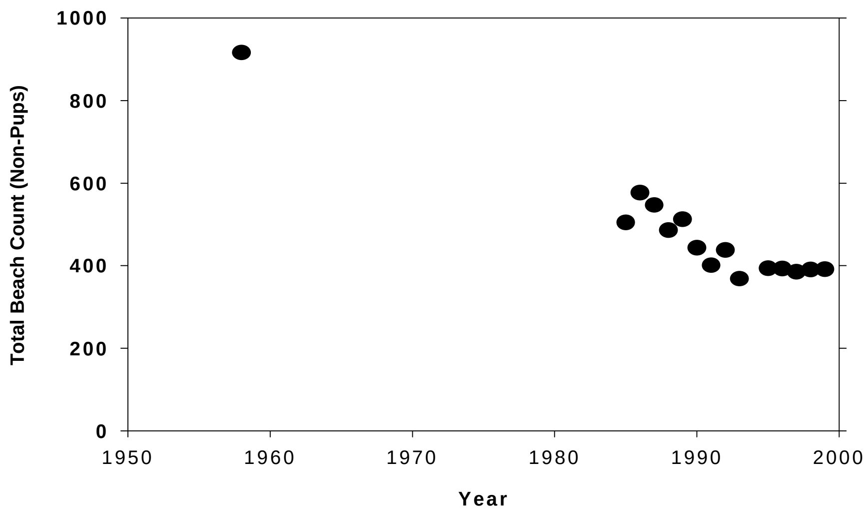
Little is known about Hawaiian monk seals or their population status before the 1950s. As a result of natural constraints, the species was probably never very abundant, presumably numbering, at most, in the thousands (as opposed to hundreds of thousands) (Ragen and Lavine 1999). The arrival of humans in the Hawaiian Islands may have reduced the range of the Hawaiian monk seal largely to the NWHI and contributed to its current endangered status. In historic times, human-related mortality appears to have caused two major declines of the Hawaiian monk seal (NMFS 1997; Marine Mammal Commission 2000). It generally is acknowledged that the species was heavily exploited in the 1800s during a short-lived sealing venture. Several island populations may have been completely eliminated during that period. The second major decline occurred after the late 1950s and appears to have been determined by the pattern of human disturbance from military activities at Kure Atoll, Midway Atoll and French Frigate Shoals. Such disturbance caused pregnant females to abandon prime pupping habitat and nursing females to abandon their pups. The result was a decrease in pup survival, which led to poor reproductive recruitment, low productivity and population decline (NMFS 1997; Marine Mammal Commission 2000).

When monk seal population measurements were taken in the 1950s, the population was already considered to be in a state of decline. The minimum population estimate (N_{MIN}) for monk seals is 1378 individuals (based on a 2001 enumeration of individuals of all age classes at each of the subpopulations in the NWHI, derived estimates based on beach counts for Nihoa and Necker, and estimates for the MHI) (Draft 2003 Stock Assessment Report). The NMFS Southwest Fisheries Science Center - Honolulu Laboratory estimates the population to be 1300 to 1400 individuals (Laurs, 2000). Figure 3-2 illustrates the long-term trend in total non-pup population size.

Monk seals are found at six main breeding sites in the NWHI: Kure Atoll, Midway Island, Pearl and Hermes Reef, Lisianski Island, Laysan Island and FFS. Smaller subpopulations also occur on Necker Island, and Nihoa Island, and to a lesser extent at Gardner Pinnacles and Maro Reef. Monk seals are also found in the MHI,; a 2001 aerial survey determined a minimum abundance of 52 seals in the MHI (Baker and Johanos, in press). Additional sightings and at least one birth have occurred at Johnston Atoll, excluding eleven adult males that were translocated (9 from Laysan Island[14] and 2 from FFS) over the past 30 years.

[14]Nine adult male monk seals that had been identified as participating in mobbing behavior were translocated to Johnston Atoll by the NMFS in 1984. This was an attempt to reduce the frequency and/or severity of mobbing incidents involving injury or death of female seals, by reducing the unequal sex ratio at Laysan Island.

FIGURE 3-2: Historical Trend in Beach Counts (non-pups) of the Six Main Reproductive Subpopulations of Hawaiian Monk Seals (Source: Laurs 2000)



Various surveys of the islands and atolls in the NWHI that support the main monk seal breeding subpopulations indicate that the NWHI non-pup population (juveniles, sub-adults and adults) declined 60% between the years 1958 and 1999. Trends in subpopulations are measured by beach counts for each of these subpopulations. Trends vary within the NWHI. For example, from 1990 to 1998, the subpopulation at Lisianski Island decreased slightly, and the Laysan Island subpopulation increased slightly. The subpopulation at Kure Atoll increased at about 5% per year from1983 to 1998. The subpopulation at Pearl and Hermes Reef experienced the highest increase of 7% per year between 1983 and 1998. Researchers have been able to establish the minimum count of individuals in the main breeding subpopulations, and in 2001 the count of monk seals was 182 at Lisianski Island, 300 at Laysan Island, 122 at Kure Atoll, 322 at FFS, 259 at Pearl and Hermes Reef and 64 at Midway Atoll (NMFS, unpub. data). Figure 3-3 illustrates historical trends in beach counts (a relative measure of population size) of Hawaiian monk seals for each of the principle Hawaiian monk seal breeding areas in the NWHI. The overall population decline is primarily attributable to low reproductive recruitment and high juvenile mortality at the largest of the subpopulations at FFS. At this site, the average beach count of animals older than pups is now less than half the count in 1989. Poor survival of pups has resulted in a relative paucity of young seals, so that further decline is expected for this subpopulation as adults die and there are few immature seals to replace them. Also, survival from weaning to age 2 at FFS has declined to as low as 14% in 1997 from almost 90% in the mid-1980s (Laurs, 2000) (Fig. 3.4).

FIGURE 3-3: Recent Trends in Beach Counts of Hawaiian Monk Seals at the Major NWHI Breeding Areas (Source: Laurs 2000)

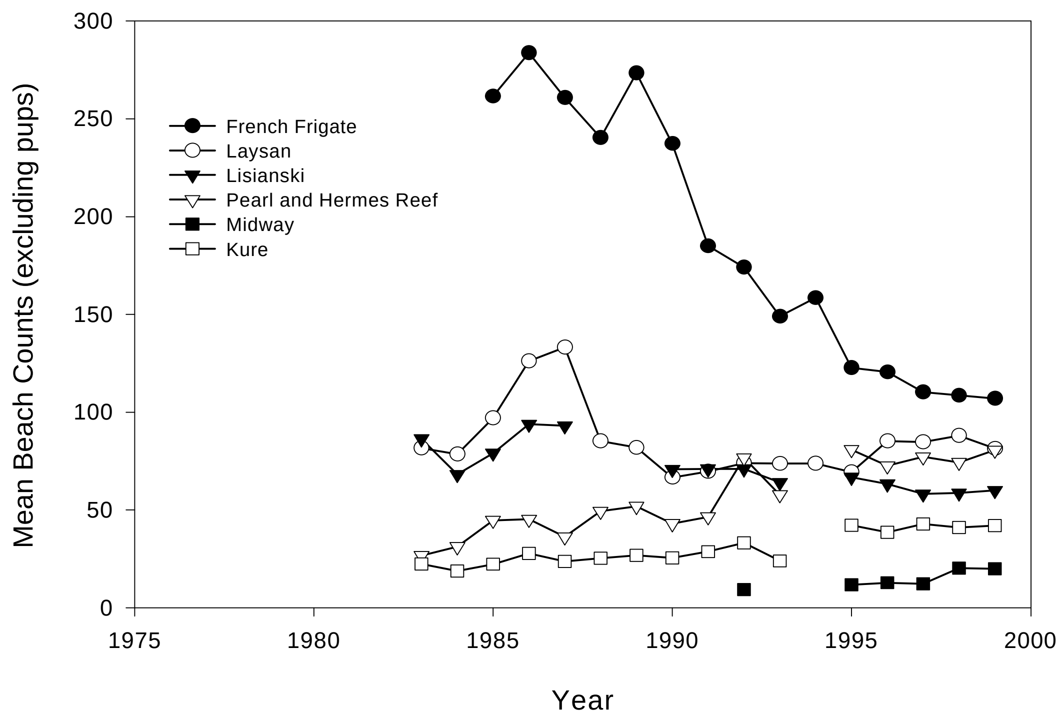
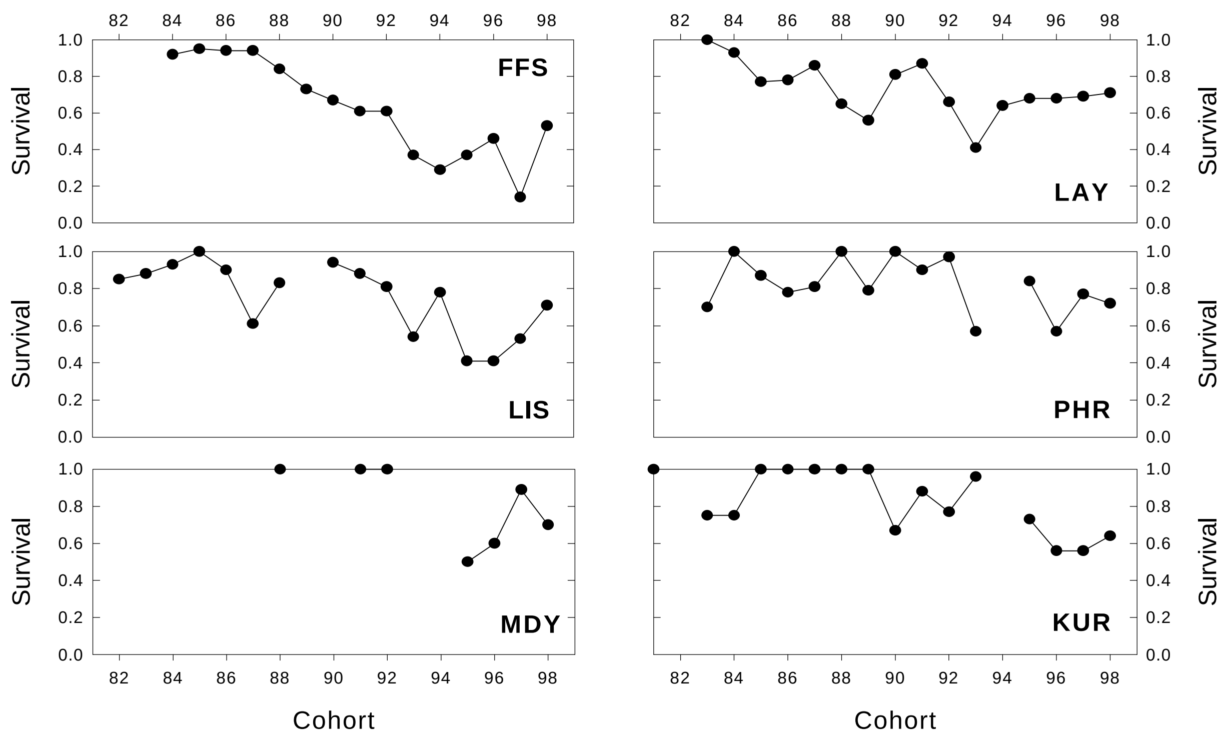
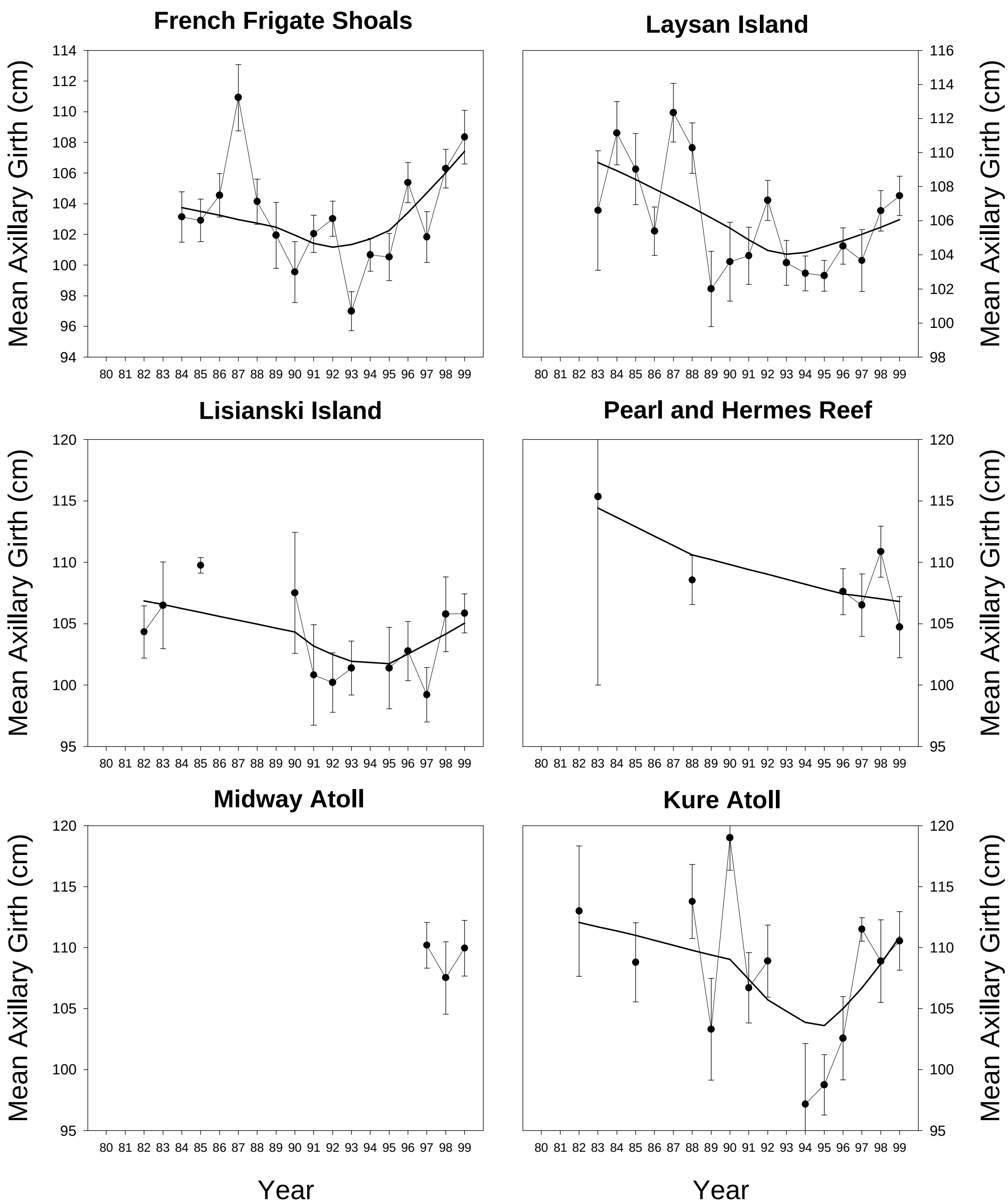


FIGURE 3-4: Survival of Hawaiian Monk Seals from Weaning to Age 1 Year at the Major NWHI Breeding Areas (Source: Laurs 2000)



Over the last decade, the causes of the poor survival for these age classes at FFS have been related to poor condition from starvation, shark predation, and male aggression. A decrease in prey availability may be the result of decadal scale fluctuations in productivity and corresponding or other changes in local carrying capacity for seals at FFS or a combination of factors (Craig and Ragen, 1999; Polovina et al., 1994; Polovina and Haight, 1999). While other subpopulations of monk seals in the Northwestern Hawaiian Islands are stable, increasing or declining slightly, the overall population status is being driven by the FFS population, which comprises about 25% of the total monk seal population. However, the girth of weaned pups at FFS (Figure 3-5), which may correlate with prey availability to females during gestation and resulting increased ability to nourish pups, has increased in recent years (Laurs 2000).

FIGURE 3-5: Trends in Axillary Girth of Hawaiian Monk Seal Pups Measured Within Two Weeks of Weaning at the Major NWHI Breeding Areas (Source: Laurs 2000)Ñ



In sum, beach counts of monk seals have declined by 60% since the late 1950s, and current abundance is estimated at 1300 to 1400 seals. On the basis of systematic beach counts and analyses reported in the draft 2003 SAR, two population trends are evident. From 1985 to 1993 the population declined 4.3% per year. From 1994 to 2001 the population trend was - 0.7% per year (95% confidence bounds: - 2.1% to +0.8% per year). The 0.7% decline is not statistically different from stability. The recent trend results in large part from low beach counts in 2001.

Population trends for this species are determined by the highly variable dynamics of the six main reproductive subpopulations. At the species level, demographic trends over the past decade have been driven primarily by the dynamics of the FFS subpopulation. The subpopulation at FFS is likely to continue to decline for at least 5-8 years (Harting, 2002). In the near future, total population trends for the species will depend on the sum of continued losses at FFS and any gains at other breeding locations.

3.3.1.3.3 Factors Influencing Population Size

This section is a summary of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including designated critical habitat) and ecosystem within the NWHI and the MHI, together with Johnston Atoll the only areas within the Western Pacific Region harboring Hawaiian monk seals. This section does not include the effects of the preferred and other alternatives considered in this analysis. Past effects and expected future effects of the activities conducted under the Bottomfish FMP are described in Chapter 4: Environmental Consequences.

During the past four decades the Hawaiian monk seal population has been affected by human and natural factors (Marine Mammal Commission 1999). Natural factors have included shark predation, disease, attacks by aggressive adult male Hawaiian monk seals on females and immature seals of both sexes (called "mobbing"), and reduced prey availability. Human factors have included various types of interactions with humans, their structures, contaminants and debris, fishing operations and vessel traffic. At each colony, differing combinations of these factors likely have contributed to local trends in abundance, with the relative importance of individual factors changing over time (Marine Mammal Commission 2000). The reported causes of relatively recent changes in Hawaiian monk seal abundance are described in greater detail below.

Mobbing: Male aggression, including singular or multiple adult males attacking another seal (mobbing), can lead to Hawaiian monk seal injury and death. The deaths can be a direct result of injuries inflicted by the aggressive males or as a result of later shark attacks on wounded seals or pups chased into the water by aggressive males. Mobbing of females and immature seals by adult males is a source of mortality at French Frigate Shoals, Laysan Island and Lisianski Island.

Evidence suggests that during the mid- to late-1990s, male Hawaiian monk seal aggression and shark predation contributed significantly to the mortality of weaned and pre-weaned pups at French Frigate Shoals (HMSRT 1999). At FFS, individual adult males have presented more of a problem than groups of males. Individuals which were directly observed injuring or killing pups were removed, either by translocation or euthanasia. At Laysan Island, injuries and deaths have tended to result from massed attacks, or mobbings, by large numbers of adult males. The primary cause of mobbing is thought to be an imbalance in the adult sex ratio, with males outnumbering females (NMFS 1998). Males that were removed from Laysan Island included seals which had been observed participating in mobbings, as well as other animals whose behavioral profile matched that of known "mobbers." Removal was effected either by translocation or by transfer into permanent captivity. Ten males were removed in 1984, 5 in 1987, and 22 in 1994.

Removal of individual male seals from FFS markedly decreased the number of injuries and deaths attributable to adult male aggression (Table 3-6). The results of removing adult males from Laysan Island are less clear. Injuries and deaths from adult male aggression at Laysan Island have diminished, but it is not known how much male removal has contributed to this decline.

TABLE 3-6: Hawaiian Monk Seal Removals and Pre- and Post-Removal Mobbing Injuries and Mortalities

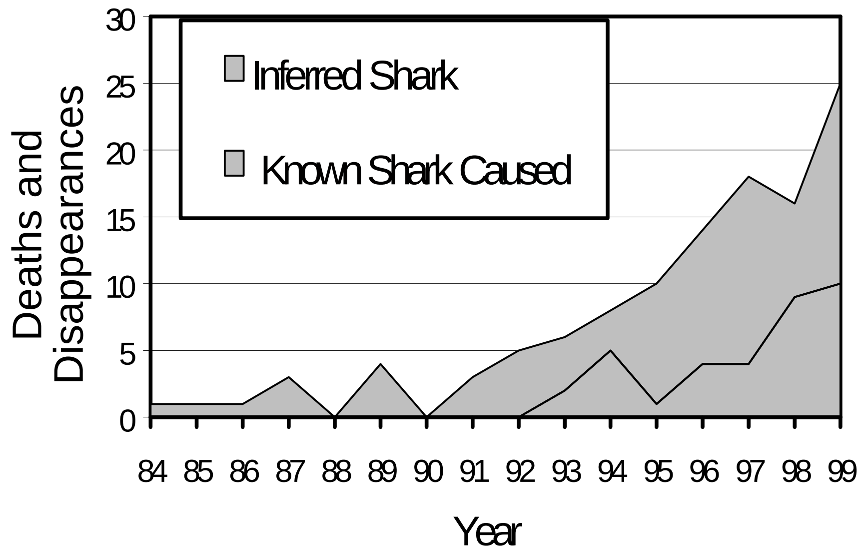
LOCATION AND YEAR OF REMOVAL	NO. OF INJURIES/ MORTALITIES CAUSED BY ADULT MALE ATTACKS IN YEAR BEFORE REMOVAL	NO. OF MALES REMOVED	NO. OF INJURIES/ MORTALITIES CAUSED BY ADULT MALE ATTACKS IN YEAR AFTER REMOVAL
1984 Laysan	1983: 12 injuries; 3 mortalities	10 removed (9 translocated to Johnston, 1 died)	11 injuries; 5 mortalities
1987 Laysan	1986: 12 injuries; 5 mortalities	5 removed (translocated to permanent captivity)	1988: 25 injuries; 11 mortalities
1991 FFS	9 injuries; 4 mortalities (all mortalities attributable to single male) (as tallied from 1991, prior to male removal)	1 (euthanized)	5 injuries; 1 mortality
1994 Laysan	1993: 1 injury; 0 mortalities , plus an undetermined number of injuries before removal in 1994 for a total pre-removal: 6 injuries; 3 mortalities.	22 (21 translocated to MHI, 1 died)	1995: 3 injuries; 1 mortality

LOCATION AND YEAR OF REMOVAL	NO. OF INJURIES/ MORTALITIES CAUSED BY ADULT MALE ATTACKS IN YEAR BEFORE REMOVAL	NO. OF MALES REMOVED	NO. OF INJURIES/ MORTALITIES CAUSED BY ADULT MALE ATTACKS IN YEAR AFTER REMOVAL
1998 FFS	6 injuries; 11 mortalities	2 (translocated to Johnston Atoll)	2 injuries; 1 mortality

Source: 2002 Biological Opinion

Shark Predation: Predation by Galapagos sharks (*Carcharhinus galapagensis*) and perhaps tiger sharks (*Galeocerdo cuvieri*) of Hawaiian monk seal pups seems to be increasing in occurrence, as 17 (18%), 16 (15%) and 25 (27%) pup mortalities or disappearances were believed to be associated with shark attacks at French Frigate Shoals in 1997, 1998 and 1999, respectively (HMSRT 1999). In 1999, shark predation may have accounted for the deaths of 51% (23 of 45) of the pups born at Trig Island in French Frigate Shoals (2002 Biological Opinion). Overall, 9.4 percent (25 out of 244) of pups born in the NWHI were inferred or known to be preyed upon by sharks in 1999 (Figure 3-6). NMFS Honolulu Laboratory infers shark related mortality whenever a newborn to approximately three week old pup disappears at FFS, especially during periods when large sharks are observed patrolling near pupping beaches. Shark predation is inferred to be the primary cause of disappearance of these pups because attacks by male adults (the other possible primary cause of mortality) are unlikely because nursing pups are defended by their mothers. However, sharks have been observed killing pups in this age category despite their mother's defense tactics against shark predation. According to the HMSRT (1999), a preliminary analysis of the impacts of shark predation on the recovery of the French Frigate Shoals population of Hawaiian monk seals indicates that the mitigation of this interaction is essential to the recovery of this population. The HMSRT recommended that NMFS undertake a program to remove Galapagos and/or tiger sharks observed patrolling beaches where Hawaiian monk seal pups are present within the French Frigate Shoals atoll. One shark was removed pursuant to a shark removal plan implemented by NMFS in 2000 to improve pup survival and possibly slow the FFS population decline.

FIGURE 3-6: Trends in Number of Known and Inferred Shark-caused Deaths of Hawaiian Monk Seal Pups at FFS (Source: Laurs 2000)



The dramatic increase in deaths and disappearances from shark attacks at FFS has been the result of an increased number of Galapagos sharks (*Carcharhinus galapagensis*) in the immediate vicinity of Hawaiian monk seal pupping areas. The occurrence and escalation of Galapagos shark predation on pups may be related to an episode of adult male Hawaiian monk seal aggression against pups, which resulted in pup deaths and the presence of carcasses remaining in the waters surrounding the pupping area. These carcasses may have attracted sharks to the new prey resource of nursing seal pups. Also, the disappearance of Whale-Skate Island, which had been a large pupping site, may have resulted in more pups being born at Trig Island where sharks can easily approach the shoreline.

Disease: Although some information concerning medical conditions affecting the Hawaiian monk seal is available, the etiology and impact of disease on wild animals at the population level is far from clear. There are substantial data gaps regarding the prevalence of disease conditions in populations of Hawaiian monk seals in the wild, and thus their potential impact on population dynamics is unknown. In the wild, even massive epizootics in remote locations may pass undetected (Aguirre 2000).

There have been periods of unusually high mortalities in subpopulations located in the NWHI. A die-off occurred in 1978 at Laysan Island (Johnson and Johnson 1981). More than 50 seal carcasses were found in an advanced state of decomposition, and although the cause of the mortality was not identified, it may have been disease related. Also, survival of immature seals severely declined at FFS after 1987, and the reproductive potential of the species was being seriously compromised by the loss of young females. The cause has been attributed to emaciation/starvation; however, the role of endoparasites or disease is unknown. During 1992-93, undersized pup and juvenile seals from FFS were rehabilitated and released at Midway Atoll with poor success.

Health assessment and collection of baseline information on diseases is considered important to the recovery of the Hawaiian monk seal population (Gilmartin 1983; Aguirre et al. 1999). Banish and Gilmartin (1992) summarized pathological conditions found in 42 carcasses recovered from 1981 to 1985. Frequent findings included parasites, trauma, cardiovascular disease, and respiratory infections. Emaciation was a common condition. Banish and Gilmartin (1992) did not assess causes of death from any of their samples, but nonetheless concluded that there was no evidence of any disease phenomenon affecting the population in a manner which would significantly hinder recovery of the species. A series of examinations of 23 dead seals collected from 1989 to 1995 (Work unpubl. data) ascribed causes of death as follows: emaciation (7); emaciation compounded by senescence (1); trauma (2); foreign body aspiration (1); and euthanasia(1). Cause of death was not determined in 11 animals.

The relative significance of disease and related factors and their effect on population trends are poorly understood. Disease processes may be important determinants of population trends through long-term low levels of mortality, or through episodic die-offs. Table 3-7 describes the findings of health and disease studies on Hawaiian monk seals between 1925 and 1997.

TABLE 3-7: Health and Disease Studies in Hawaiian Monk Seals

YEAR	HEALTH CONDITION AND REFERENCE
1925	Internal parasites were first reported (Chapin 1925).
1952	Diphyllobothriid cestodes were first reported (Markowski 1952).
1959	The Acanthocephalan *Corynosoma* sp. was first reported (Golvan 1959).
1969	Diphyllobothriid cestodes were reported (Rausch 1969).
1978	Known as the Laysan epizootic, $\geq$50 Hawaiian monk seals were found dead. Specimens from 19 dead and 18 live seals were collected. All carcasses found with stomach ulceration and heavy parasite burdens and in severe state of emaciation. Livers from two carcasses tested positive to ciguatoxin and maitotoxin. There was serologic evidence of caliciviruses but serum specimens were negative for *Leptospira. Salmonella sieburg* was isolated from a rectal swab. Many parasite ova and products in coprologic exams were identified. Diagnosis was inconclusive (Johnson and Johnson 1981; Gilmartin et al. 1980).
1979	*Contracecum* ulceration of a young seal was first reported (Whittow et al. 1979).

YEAR	HEALTH CONDITION AND REFERENCE
1980	Lung mites from the family Halarechnidae were first reported (Furman and Dailey 1980).
1980	The Hawaiian monk seal die-off response plan was developed with the support of the Marine Mammal Commission (Gilmartin 1987).
1983	The Recovery Plan for the Hawaiian Monk Seal addressed the importance of disease investigations (Gilmartin 1983).
1988	A coprologic survey for parasites was performed from field scats collected in 1985 (Dailey et al. 1988).
1988	The hematology and serum biochemistry of 12 weaned pups collected between 1984 and 1987 for their rehabilitation in Oahu were reported (Banish and Gilmartin 1988).
1992	Pathology of 42 seals collected between 1981-85 was summarized (Banish and Gilmartin 1992).
1992	The FFS relocation of 19 immature seals was initiated. Basic hematology, serum biochemistry, serology for leptospirosis and calicivirus infection, virus isolation, fecal culture for *Salmonella* and coproparasitoscopic examination were performed for their disease evaluation. Two of seven seals died of bacterial and aspiration pneumonia on Oahu, with positive titers to *Leptospira*. Detection of calicivirus by cDNA hybridization probe in 13 seals with viral particles seen by electron microscopy occurred in five seals. It was concluded that endemic disease agents identified in those seals were *Salmonella* and endoparasites (Gilmartin 1993a; Poet et al. 1993).
1993	Inoculation of four Hawaiian monk seals with a killed virus distemper vaccine was experimentally performed on three seals at the Waikiki Aquarium (Gilmartin 1993b; Osterhaus unpubl. data 1997).
1995	An eye disease of unknown etiology was first diagnosed in 12 female Hawaiian monk seal pups that were transported to Oahu for rehabilitation. To date the cause remains unknown (NMFS files 1995-97 unpubl. data).
1996	Histopathology of selected tissues collected from 23 seals between 1989 and 1995 was performed by personnel of the National Wildlife Health Research Center, Honolulu Station (Work unpubl. data 1996).
1997	Two captive seals died of causes unrelated to the eye disease. One seal was diagnosed with *Clostridium* septicemia and another seal with hepatic sarcocystosis (Yantis et al. 1998).
1997	The Monk Seal Captive Care Review Panel developed recommendations to evaluate the health assessment and future disposition of 10 captive seals and the future of captive care and release efforts to enhance the recovery of the species (NMFS unpubl. data 1997).

Source: Aguirre et al. 1999

In April, 2001, an "Unusual Mortality Event[15]" was declared on the basis of four juvenile Hawaiian monk seal deaths within nine days at Laysan Island, a death of a yearling at Midway, discovery of three decomposed carcasses (one subadult, one pup, and two juveniles) and one

[15]The MMPA defines an Unusual Mortality Event (UME) to be an occurrence which: 1) is unexpected; 2) involves a significant die-off of a marine mammal population; and 3) demands an immediate response. In addition to the above conditions, an immediate response is warranted under two other circumstances: 1) mass stranding of an unusual species of cetacean; and 2) small numbers of a severely endangered species of marine mammal are affected.

fresh dead carcass at Lisianski Island, a death of a yearling at FFS, and lethargic, thin juvenile Hawaiian monk seals observed at Laysan and Midway Islands. The relationship of these deaths and observed conditions of the seals is not known at this time (NMFS unpub. data 2001). The Working Group on Unusual Mortality Events (WGUME) reviewed the available information and recommended on February 5, 2002, to close the event. Necropsies and sample analyses have revealed no unusual findings, and there have been no new reports of juveniles exhibiting abnormal behavior or thin body conditions. The WGUME also recommended that measures should be taken so that field teams are fully trained in proper sample collection techniques should any dead seals be found in 2002, to ensure that all possible information can be collected and preserved. The group also recommended performing as many necropsies as possible on fresh carcasses to collect essential data. A report summarizing the event and the results of the subsequent investigation are expected in the near future.

Reduced Prey Availability: One of the potential explanations of the poor juvenile survival at French Frigate Shoals from 1989 to the mid-1990s is limited prey availability and subsequent effects on both adults and juveniles. There are two factors related to food that influence weaned pup survival: 1) the amount of food (milk) pups acquire from their mothers prior to weaning and 2) the amount of food available to pups immediately after weaning (G. Antonelis pers. comm. 2000. NMFS-HL). The first factor is related to the mother's condition and ability to forage successfully prior to parturition and may be viewed as an indicator of prey availability during gestation. The second factor is related to the pup's ability to forage successfully after weaning. Evidence of limited prey availability at French Frigate Shoals included small and, in some cases, emaciated pups, juveniles that were smaller and thinner than those at other colonies and delayed sexual maturity of adult females (Craig and Ragen 1999; Marine Mammal Commission 2000).

Further evidence of limited prey availability at French Frigate Shoals has been provided by satellite-linked, time-depth recorders that have been used to track movements and record diving patterns of Hawaiian monk seals at various locations. All but one of the six juvenile and 18 adult Hawaiian monk seals tracked at Pearl and Hermes Reef foraged either within the fringing reef or just outside the reef (Stewart 1998). Most dives were to depths of 8 to 40 m, though there was a secondary mode at 100 to 120 m. In contrast, Hawaiian monk seals studied at French Frigate Shoals, where the population of seals is considerably larger, exhibited more variation in their habitat use (Abernathy and Siniff 1998; Parrish et al. 2000; Parrish et al. 2002). Abernathy and Siniff (1998) recorded that the most prevalent pattern, particularly among males, was utilization of the banks to the northwest (some of which are more than 200 km from FFS), with daytime diving in the 50 to 80 m range and a nocturnal or crepuscular shift to the 110-190 m range. The next most common group included seals that did not leave the vicinity of French Frigate Shoals and rarely dived deeper that 80 m. Finally, a small number of seals made many dives greater than 300 m. Abernathy and Siniff (1998) suggested that reduced prey availability could account for the greater variety of foraging patterns at French Frigate Shoals as some individuals are forced to venture to new areas and alter their prey base.

The decrease in prey at French Frigate Shoals may have been the result of large-scale natural perturbations in ecosystem productivity and corresponding or other changes in local carrying capacity for seals at French Frigate Shoals or a combination of factors. From the mid-1970s to late 1980s, the central North Pacific experienced increased vertical mixing, with a deepening of the wind-stirred surface layer into nutrient-rich lower waters and probable increased injection of nutrients into the upper ocean. Resulting increased primary productivity likely provided a larger food base for fish and animals at higher trophic levels. In the NWHI changes of 60 to 100% over baseline levels in productivity for lobsters, seabirds, reef fish and Hawaiian monk seals were observed and attributed to deeper mixing during 1977-1988 (Polovina et al. 1994). The variation in the geographical position of this vertical mixing is in turn related to the position of the Aleutian low-pressure system.[16] As this system deviates from its long-term average position, productivity may be more or less affected in the waters around the NWHI.

Polovina et al. (1994) suggested that the average position of the Aleutian low-pressure system moved northward in the mid- to late-1980s. Thus, the “declines” in productivity observed at Midway and French Frigate Shoals after 1988 may actually represent returns to more “normal,” lower levels of productivity (Mundy undated). Productivity may have been most affected at French Frigate Shoals, the southernmost reproductive colony of Hawaiian monk seals (Craig and Ragan 1999). Furthermore, the adverse impact of a return to less productive oceanographic conditions on Hawaiian monk seal reproduction and survival could presumably have been greater at French Frigate Shoals because that island’s Hawaiian monk seal population was closer to carrying capacity (Ragen and Lavigne 1999).

Goodman-Lowe (1998) examined inter-island variation in the diet of mature and juvenile Hawaiian monk seals and concluded that Hawaiian monk seals are opportunistic foragers. The fact that seals at French Frigate Shoals were apparently unable to find sufficient prey during the late 1980s and early 1990s suggests the occurrence of a phenomenon capable of affecting the seals’ entire prey base. For example, changes in the sizes of NWHI populations of reef fish, a known prey of Hawaiian monk seals (Goodman-Lowe 1998), may be linked to the interdecadal changes in ecosystem productivity in the central Pacific (DeMartini et al. 1996). In 1992-1993, there was a general decrease in reef fish abundance observed at Midway Atoll and French Frigate Shoals. In 1995, however, a dramatic increase in recruitment and availability of reef fish was detected at the two sites (DeMartini and Parrish 1996). No further increase in apparent

[16]There are also considerable biological data showing higher fish and zooplankton densities in the Gulf of Alaska during the 1970s and 1980s compared to earlier decades, as well as correlations between biological indices and an index of the strength of the Aleutian low-pressure system (Polovina et al. 1995).

abundance of reef fish since that time has been found (DeMartini and Parrish 1998), but from the mid- to late-1990s there was an improvement in the condition of Hawaiian monk seal pups at weaning and in pup births at French Frigate Shoals and other major island populations. Trends in pup girth measurements indicate that prey resources may have increased during the early 1990s, most notably at Laysan Island, Lisianski Island and French Frigate Shoals (HMSRT 1999).

Fisheries may also affect the forage base of Hawaiian monk seals. Hawaiian monk seals have the capability to dive to depths at which many species targeted by the bottomfish fishery occur. In addition, Hawaiian monk seals are known to remove hooked bottomfish from handlines and consume them (Nitta 1999). Seals appear to prefer ʻō*pakapaka* but will also steal and eat *onaga*, *butaguchi* and *k*ā*hala*. However, the results of dietary studies suggest that these species do not constitute a significant component of the natural diet of Hawaiian monk seals (see Section 3.3.1.3.1).

Human Interactions: Human interactions with Hawaiian monk seals range from unintentional disturbances at haul-out sites to inflicting intentional injuries on seals, and include a variety of interactions by scientists and resource managers. Human disturbance was probably the principal cause of Hawaiian monk seal population declines before the 1980s. Between 1958 and the mid-1970s, Hawaiian monk seal colonies at the western end of the archipelago between Kure Atoll and Laysan Island declined by at least 60 percent, and the colony at Midway Atoll all but disappeared (Marine Mammal Commission 1999). Most human activity was concentrated at the westernmost atolls of the chain during this period, suggesting that human disturbance contributed to the decline. The Navy undertook a major expansion of its air facility on Midway Atoll during the 1950s, and in 1960 the Coast Guard established a LORAN station at Kure Atoll that was occupied year-round. Ownership of Midway Atoll was transferred from the Navy to the U.S. Fish and Wildlife Service in 1996, and the atoll is now managed as the Midway Atoll National Wildlife Refuge. The Coast Guard closed the LORAN station at Kure Atoll in 1992 and removed most of the manmade structures by 1993.

The human population at Midway Atoll has decreased substantially in the last two decades, but year-round human habitation of the atoll has continued. From 1996 until 2001, there was limited eco-tourism and public use within the Midway Atoll National Wildlife Refuge in the form of charter boat and shore fishing, diving and wildlife observation. A privately-owned business was awarded a concession to develop and manage the tourist facilities in the refuge. The number of visitors allowed on the atoll at any one time was limited to reduce impacts to wildlife. A dispute between the contractor and the USFWS has suspended the visitor program. Nevertheless, the HMSRT (1999) indicated that it supports the efforts of the USFWS to provide compatible visitor opportunities and educational programs at the refuge. It is also important to note that the Midway Atoll Hawaiian monk seal population has increased since the atoll was transferred to the

USFWS. However, some Hawaiian monk seal researchers have expressed concern about the possible long-term impacts of developing Midway Atoll as a tourist destination:

> *Such developments will of course yield benefits to the management bureaucracy, providing continued support for the Fish and Wildlife Service station on the island. It will also ease the logistical problems for scientists who wish to study the animals on the islands, and it will provide an opportunity for public education. But the conservation benefits of tourism for monk seals at Midway will not be measured by the numbers of visitors or their vacation experience, only its effects on the seals. Although these remain to be determined, one can only wonder what would happen if humans simply vacated Midway entirely* (Lavigne 1999:260).

Similarly, NMFS (1997) noted that as tourism ventures develop, so does a potential conflict of interest. The economic success of the venture may depend on the nature and variety of human activities permitted on the island. Importantly, those activities that are intended to enhance the Midway experience may be disruptive or detrimental to the refuge and its wildlife.

As Hawaiian monk seal haul-outs increase in the MHI, human interactions are becoming more frequent (Ragen 1999). Hawaiian monk seals hauled-out on beaches are viewed by tourists and residents who are often unfamiliar with the take prohibitions and/or the normal behavior of Hawaiian monk seals. NMFS receives at least two reports per week of "stranded" Hawaiian monk seals. Some people attempt to haze the animal back into the water. Most often, the animal reported is exhibiting normal haul-out behavior. Another common harassment is people approaching too closely to take photographs of the seal on land or in the water. One female Hawaiian monk seal was intentionally harassed when a resident threw coconuts at it (Henderson pers. comm. 2001). On Kauai, a Hawaiian monk seal was bitten by a pet dog (Honda pers. comm. 2001). Disturbance to Hawaiian monk seals may result in modified behavior making them more susceptible to predators when forced to enter the water or causing an unnecessary expenditure of energy required for thermal homeostasis or catching prey.

Hawaiian monk seal research activities have also inadvertently resulted in some seal mortality. Since 1982, Hawaiian monk seals have been removed from the wild or translocated between locations by the Marine Mammal Research Program (MMRP) of the NMFS-HL as part of research and management to facilitate recovery of the species.

Pups which wean prematurely from their mothers may be in poor condition, and are known to have a minimal probability of surviving their first year. Some of these animals, as well as emaciated juvenile Hawaiian monk seals, have been collected for rehabilitation and release back into the wild. A total of 104 seals (mostly females) have been so taken: 68 were successfully rehabilitated and released into the wild, 22 died during rehabilitation, and 14 were judged to be unsuitable for release and were placed into public aquaria and oceanaria for research. Of the 68 Hawaiian monk seals which were rehabilitated and released from 1984 through 1993, 19 were alive as of 1999. Some of the surviving 19, most of which are located at Kure Atoll, are pupping. However, the precise number of pups born to these released Hawaiian monk seals is unknown (NMFS unpub. data, 2001; Johanos and Baker 2001).

Of the remaining 49 Hawaiian monk seals that were rehabilitated and released, the following information has been gathered: 5 were found dead within one year of release, 29 disappeared within one year of release, and 15 disappeared from 2-11 years after release.

Adult male Hawaiian monk seals have been documented to injure and kill other Hawaiian monk seals, including adult females, immature Hawaiian monk seals of either sex, and weaned pups. Some of the attacks have been made by groups of adult males, while others were by individual males. To reduce injuries and mortalities, NMFS has removed aggressive adult males from some sites. A total of 40 adult male seals have been taken. Thirty-two were translocated to locations distant from the site where the attacks had occurred (21 were moved to the MHI in 1994 and 11 were moved to Johnston Atoll - 9 in 1984 and 2 in 1998). Five were placed into permanent captivity. Two died while being held in temporary pens for translocation. One was euthanized. Although there is no systematic sighting effort for the 21 adult males translocated to the MHI, one sighting was made on Kauai in April, 2001.[17] None of the adult Hawaiian monk seals translocated to Johnston Atoll have been resighted since the year in which they were translocated.

Hawaiian monk seals have been moved between populations for reasons other than mitigation of adult male attacks. A total of ten seals have been so taken; five healthy female weaned pups were translocated from FFS to Kure Atoll in an effort to bolster the population and increase the reproductive potential at Kure, and four healthy seals born in the MHI were translocated, after having weaned, to areas less utilized by humans to minimize the potential of human harassment.

Of the five Hawaiian monk seals translocated from FFS to Kure Atoll in 1990, two were known to be alive at Kure as of 1999. Of the four Hawaiian monk seals relocated from sites in the MHI, one was observed alive at Kure Atoll in 1999, two were observed alive on Kauai in 2000, and one that was translocated to Niihau was reported to have been killed sometime after 1994 by a boat propellor, although this report is unconfirmed (Henderson, pers. comm., 2001).

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[17]Salt Pond County Beach Park, Kauai. A Hawaiian monk seal with a red tag # 4A0 was reported acting aggressively toward another Hawaiian monk seal (Freeman pers. comm. 2001). That tag number was confirmed by NMFS to be the tag number of an adult Hawaiian monk seal relocated from Laysan in 1994 (Henderson pers. comm. 2001).

In addition to using unsuccessfully rehabilitated Hawaiian monk seals or aggressive males as captive research animals, some Hawaiian monk seals have been collected from the wild and placed directly into captivity. From 1983 to 1991 a total of four animals were taken; two Hawaiian monk seals were collected from the NWHI, and two Hawaiian monk seals found badly injured in the MHI were treated and placed into permanent captivity (NMFS unpub. data 2001).

In 1995, twelve Hawaiian monk seal pups were taken into captivity by NMFS for the purposes of rehabilitation and eventual return to the wild population. At the time of capture, some of the pups exhibited clinical signs associated with conjunctivitis, red eyes, blepharism, blepharospasm, and photosensitivity. Of the twelve Hawaiian monk seals pups, nine later developed corneal opacities and subsequent cataracts, and one developed cataracts (with no corneal opacities), and two of these total of ten Hawaiian monk seals later died (due to causes unrelated to blindness) (NMFS unpub. data). The remaining 10 Hawaiian monk seals (eight blind and two sighted) were transferred to Sea World of Texas where they are research animals.

The MMRP handles Hawaiian monk seals in the wild as part NMFS' research to monitor the population and facilitate recovery. Takes have included tagging, instrumentation, and sampling for health assessment. The MMRP has handled seals 3,343 times as part of its research activities since 1981. Three seals died during research handling. All three individuals were adult males. Results of necropsies on these seals varied, but in general all three were older seals whose health had been compromised by chronic illness.

Some researchers have expressed concern that continuous human habitation of research field camps in the NWHI could have an adverse effect on Hawaiian monk seals if not carefully controlled (Spalding 2000). Currently, all Hawaiian monk seal research is monitored and regulated under several federal permit systems. A recent assessment of the possible impact of field research activities on Hawaiian monk seals evaluated 4,800 seals handled between 1982 and 1999 and found no significant deleterious effects on the seals' health or behavior (Baker and Johanos 2000).

There is no recent evidence of intentional injuries from acts such as clubbing or shooting of Hawaiian monk seals in the NWHI. The MMRP annually monitors all major breeding populations of Hawaiian monk seals, and collects data on any injuries or other events which could affect the survival of individual seals. The program has not documented any injuries or mortalities in the NWHI that could be attributed to clubbing, shooting, or other intentional wounding of Hawaiian monk seals since the establishment of the Protected Species Zone in 1991 by Amendment 3 to the Pelagics FMP (Johanos and Ragen, 1996a, 1996b, 1997, 1999a, 1999b;

Johanos and Baker 2000). Although a Court Order[18] has found that intentional acts to Hawaiian monk seals occur, NMFS' monitoring of Hawaiian monk seal populations thus far indicates that intentional acts in the NWHI are not occurring.

Tern Island Sea Wall Entrapment: Hawaiian monk seals at Tern Island, FFS, have been entrapped behind a deteriorating sea wall. During World War II, the Navy enlarged Tern Island, one of several small islets at French Frigate Shoals, from its original 4.5 hectares (11 acres) to about 16.2 hectares (40 acres) to accommodate a landing strip (Marine Mammal Commission 1999). To do so, the Navy constructed a sheet metal bulkhead around most of the island and backfilled behind the structure with dredged spoil and coral rubble from the surrounding lagoon. The Coast Guard took over the island from 1952 to 1979 to operate a LORAN station. Since then, it has been used by the U.S. Fish and Wildlife Service as a field station for the Hawaiian Islands National Wildlife Refuge.

The continued existence of the runway and field station at Tern Island – in fact, the integrity of the entire island – is in doubt because the sheet metal bulkhead, now more than 50 years old, is badly deteriorated (Marine Mammal Commission 1999). If the bulkhead fails, the airstrip would be lost, the field station would have to be abandoned, most of the island would erode away, buried debris would be exposed and create entanglement hazards to wildlife, and erosion pockets behind the rusted-out seawall would become serious entrapment hazards for Hawaiian monk seals and other wildlife.

Since recordkeeping began in 1988, a number of Hawaiian monk seals have been entrapped behind the seawall (Table 3-8). Most of these Hawaiian monk seals have been redirected to the water by FWS and NMFS personnel. Two subadult male Hawaiian monk seals have died as a result of becoming entrapped behind the sea wall.

TABLE 3-8: Incidence of Hawaiian Monk Seal Entrapments and Deaths on Tern Island from 1988-2000

#	YEAR												
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
E	1	3	1	6	4	2	3	3	0	0	5	4	4
M	1	0	0	1	0	0	0	0	0	0	0	0	0

Notes: E - entrapped; M - mortalities; Source: USFWS 2001

[18] The Order Granting in Part and Denying In Part Plaintiffs' Motion for Summary Judgement, Granting in Part and Denying in Part Defendants' Cross-Motion for Summary Judgement, and Granting in Part Plaintiffs' Motion for a Permanent Injunction Motion for Summary Judgement in Greenpeace Foundation, *et. al.*, v. Norman Mineta, *et. al.* Civil No. 00-00068SPKFIY. U.S. District Court of Hawaii, November 15, 2000, p. 30.

In 1999, the U.S. Fish and Wildlife Service received $1 million as an initial investment for sea wall construction at Tern Island. The total cost of the project is estimated to be about $15 million (Marine Mammal Commission 1999). The restoration of the Tern Island sea wall is currently in progress. NMFS has conducted an ESA Section 7 consultation on the project and, together with the FWS, has devised monitoring and other measures designed to avoid any take by harassment or otherwise of Hawaiian monk seals and other protected species during the construction activities. The completed restoration of the sea wall is expected to eliminate any future entrapment hazards to Hawaiian monk seals and turtles (USFWS 2001).

Contaminants:

Contaminants in the marine and terrestrial environment also pose a potential but unknown risk to monk seal recovery and survival. Effects on monk seals are unknown at this time. However, the analysis of tissue samples from monk seals at French Frigate Shoals indicate that PCB levels and specific forms (congeners) known to be toxic are lower than other pinnipeds, and the values at French Frigate Shoals are below similar samples obtained from monk deals at Midway Islands (MNFS unpub. Preliminary data, 1999). The significance of these levels to monk seals health is unknown at this time. However, the ecological effects of clean-up and containment operations at Tern Island (French Frigate Shoals), Johnston Atoll, and Midway Island may have short-term adverse effects on the surrounding corals, fish and invertebrates. Reductions in prey abundance due to clean-up efforts could reduce foraging success and survival rates of monk seals near these areas.

Fisheries: Several fisheries operate or have operated in the areas utilized by the Hawaiian monk seal. Some of the fisheries are federally managed. These are: the bottomfish fishery, the pelagic longline fishery (transit only), the crustacean fishery (currently suspended), and the deep water precious corals fishery (no participants currently). Other fisheries that operate in areas utilized by the Hawaiian monk seal include fisheries managed by the State of Hawaii. These fisheries include the state-managed MHI bottomfish fishery, commercial and recreational nearshore fisheries, *akule* fishery, collection for the aquarium trade, and commercial and recreational gillnet fisheries.

The Hawaii-based pelagic longline fishery targets pelagic species of tunas (and formerly swordfish). Under the Fishery Management Plan for the Pelagic Fisheries in the Western Pacific Region (Pelagics FMP), NMFS permits up to 164 vessels, but only 118 permitted vessels are currently active.

There was some evidence in the early 1990s that longline operations were adversely affecting the Hawaiian monk seals, as indicated by the sighting of a few animals with hooks and other non-natural injuries. Amendment 2 to the Pelagics FMP required longline permit holders to notify NMFS if intending to fish within 50 miles of any NWHI and required all vessel operators to attend a training session. These measures were later deemed insufficient. In 1991, Amendment 3 established a permanent 50-mile Protected Species Zone around the NWHI that closed the area to longline fishing. Establishment of this zone appears to have eliminated Hawaiian monk seal interactions with the longline fleet. Since 1993, no interactions with Hawaiian monk seals in the pelagic longline fishery have been reported. Longline observers recorded only one sighting of a Hawaiian monk seal during transit through the Protected Species Zone near Nihoa Island in 1995 (NMFS unpubl. data).

The NWHI lobster fishery is managed under the Fishery Management Plan for the Crustacean Fishery in the Western Pacific Region (Crustaceans FMP). The lobster fishery began in the 1970s and annual landings peaked at 1.92 million lobsters in 1985. Since then, landings have decreased. The number of vessels participating in the lobster fishery has ranged from 0 to 17, with only five and six vessels participating during 1998 and 1999, respectively (A. Katekaru pers. comm. 2001. NMFS-PIAO).

Historically, effort has been concentrated near the islands and atolls of the NWHI where Hawaiian monk seals occur. Observer reports[19] show no Hawaiian monk seal entanglements or other interactions. However, in 1986 near Necker Island, one Hawaiian monk seal died as a result of entanglement with a bridle rope from a lobster trap. In 1983 a precautionary measure was taken to redesign the entrance cone to ensure that Hawaiian monk seals could not get caught in lobster trap entrances.[20]

Lobster is a known prey item of the Hawaiian monk seal, but the importance of lobster in their diet has not been quantified. Ongoing foraging and prey identification studies will help understand the effect, if any, of the lobster fishery on Hawaiian monk seal populations in the NWHI.

The lobster fishery was closed in 1993 based on the harvest quota set for the fishery under Amendment 7 of the Crustaceans FMP. The fishery re-opened in 1994 with five vessels

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[19]The lobster fishery was “observed” on a voluntary basis starting in 1997. NMFS scientific data collectors were dispatched on each of the lobster trips during 1997 through 1999. In 2000 and 2001 the lobster fishery was closed.

[20]Plastic dome-shaped single-chambered traps with two entrance funnels or cones located on opposite ends are employed in the lobster fishery. All traps are required to have escape vents (for smaller lobster). The traps are usually set in strings of about one hundred, with several strings fished at a time.

participating in the fishery. In 1995 the fishery was again closed; however, one vessel was allowed to fish under an experimental fishing permit issued by NMFS to obtain scientific information on the lobster stock. From 1996 through 1999 the fishery had five, nine, five, and six vessels participating, respectively. Although the lobster fishery was not overfished, NMFS closed the fishery in 2000 through 2001 because of an increased level of uncertainty in the model assumptions used to estimate the lobster harvests (65 FR 39314). Harvest guidelines for the 2001 through 2003 fisheries were not issued by NMFS (66 FR 11156, Feb. 22, 2001; 67FR 11678, March 15, 2002; 68FR 8490, Feb. 21, 2003).

Precious corals are harvested under the Fishery Management Plan for Precious Corals Fisheries of the Western Pacific Region (Precious Corals FMP). NMFS has determined that the harvest would not adversely affect the Hawaiian monk seal (NMFS 2000). Regulatory changes to the Precious Corals FMP recommended by the WPRFMC in 2000 are intended to, among other things, protect precious coral beds that provide foraging habitat for some Hawaiian monk seals in the NWHI (65 FR 53692).

The contribution of coral beds to prey aggregation and prey availability for Hawaiian monk seals remains unclear. As discussed previously, Hawaiian monk seal diet studies indicate that Hawaiian monk seals are opportunistic and feed on a wide variety of prey (Goodman-Lowe 1998). Research from Parrish et al. (in press) and Abernathy and Siniff (1998) indicate that some seals forage at depths where precious coral beds occur. However, the absence of deep diving activity at Pearl and Hermes Reef suggests that Hawaiian monk seals at FFS may vary their foraging behavior depending on the availability of prey resources.

Until recently, a U.S. Fish and Wildlife Service concessionaire operated an ecotourism station at Midway Island. Recreational fishing was allowed in the lagoon and waters around the island. No adverse interactions (e.g., entanglements or hookings) with Hawaiian monk seals in this recreational fishery have been reported. However, a study conducted in 1998 recorded Hawaiian monk seal interactions at six locations during fishing activities (Bonnet and Gilmartin 1998). Inquisitive, newly weaned pups sometimes approach fishing activities, presumably to investigate human activity (Shallenberger pers. comm. 2001. FWS). However, three Hawaiian monk seals were reported to have been hooked as a result of recreational fishing during the operation of the U.S. Coast Guard station at Kure Atoll, which closed in 1993 (Forney et al. 2000).

In the MHI, the state regulated bottomfish fishery operates off-shore of shoreline areas where Hawaiian monk seals are sometimes observed. There have been no reported interactions between Hawaiian monk seals and this fishery. Some areas off-shore of regularly utilized Hawaiian monk seal haul-out areas have been closed to bottomfish fishing operations due to concerns about local depletion.

The fisheries for big game (*ulua*) and small game (*papio* and other smaller fish) are two of the largest components of the shore-based recreational fisheries in Hawaii. The term *ulua* mainly refers to two species: the White *ulua* (*Caranx ignobilis*) and the Black *ulua* (*C. lugubris*). *Ulua* can also be used to refer to any larger *Caranx* (ten or more lbs). The term *papio* can refer to *Caranx ignoblis* and *C. lugubris* under 10 lbs as well as to six to eight other smaller Carangids commonly found in near-shore waters. The two fisheries differ more in the gear used than the target species. Any of the species can be and are taken in both fisheries. The two predominant fishing methods employed are the “slide-bait” and “shore casting” fisheries.

Big game shorefishing, primarily targeting large *ulua* (jacks), usually utilizes slide-baiting techniques. Slide bait rigs have a large hook tied or crimped to a short length of wire or heavy monofilament leader which is in turn tied or crimped to a “slide bait” swivel. The slide-bait fishery almost exclusively employs circle hooks of sizes corresponding to Mustad #14/0 and larger. This leader and hook set up is independent of the wired weight set up. These two independent sets of gear combine to make a whole slide bait rig. The weight is cast out and anchored before the slide bait hook rig is attached to the mainline and allowed to “slide” down and out to its final fishing position. The preferred baits are moray eels, “white eel” or “tohei” (conger eel), and octopus. Live reef fish of all kinds are also among the preferred baits.

The mainline (line on the fishing reel) used in slide baiting varies according to the individual, but is generally heavy line in the 80-100 lb plus test weight. The fishing weights generally have 4-5 inch soft wires extending from the terminal end. These wires are bent into a grapnel shape to snag onto rocks and coral to provide a solid anchoring point from which to suspend the large baits off the bottom and prevent the rig from moving with the current or swell. The limited movement prevents tangling with other rigs. The wires used are malleable enough to be straightened with pressure from the rod. The line connecting the weight to the swivel is of a lesser strength than the mainline and designed to break should the weight become inextricably stuck on the bottom.

Small game fishing uses a rig in which a hook(s) and lead is attached to a swivel and is cast as a single unit. It uses smaller hooks and lighter leaders. The major differences between big game fishing and small game fishing are the kind of rig used, the size of the gear, and the general kinds of areas that are preferred by each. The slide-bait fishery is generally associated with close proximity of deep water (20-100 ft) because the technique depends on gravity or the live bait to take the bait down the mainline to the strike zone. Shorecasting for small game is done anywhere along the shoreline.

The third shore based fishery is locally referred to as “whipping.” Whipping involves standing on the shore, usually a rocky area, and casting and quickly retrieving an artificial lure into breaking waves headed towards shore. The lure usually has treble or double hooks attached. Fishing line in the 20-50 lb test weight range is commonly used in this fishery. Often the leader, the first few feet of line directly attached to the lure, is a thicker line for protection from chafing on the fish's teeth or the reef and rocks. Whipping is also successfully done from boats.

Ulua are also fished from boats. A variety of gear may be employed; typical are the trolling set-up, with down riggers or trolling planes, and surface plugs or casting jigs. Artificial lures, e.g., plugs and lead-head jigs, are used just outside the breaking surf.

The gear used in these recreational fisheries varies, but the most popular gear composition is a circle hook with a slide bait swivel on a wire leader. There is some overlap with the type of hook used (circle hooks) in the bottomfish fishery although the size of the *ulua* circle hook tends to be larger than that used in the bottomfish fishery. Some of the hooks embedded in Hawaiian monk seals have been identified as gear used in the state *ulua* fishery based on gear, size of hook, and location of the Hawaiian monk seal when discovered, while other hooks have been identified as bottomfish fishery hooks. Table 3-9 compiles all available information of Hawaiian monk seal hookings and net entanglements from all fisheries. Table 4-1 in Section 4.1.3.1.1 extracts those incidents that may be attributable to the bottomfish fishery. There is only one report of a hooking of a Hawaiian monk seal on bottomfish gear being actively fished.

TABLE 3-9: List of Hooks and Net Entanglements as a Source of Information on Fishery Interactions

DATE AND LOCATION	DESCRIPTION	OUTCOME
1976 MHI - Kauai	Seal drowned in nearshore gillnet	Mortality
1982 FFS	Adult female was observed with bottomfish hook in mouth.	Resighted without hook at FFS.
1985 NWHI - Kure Atoll	Female weaned pup hooked in lip.	Hook removed by NMFS personnel; small hook and rig characteristic of on-site recreational fishery.
1986 NWHI - Necker	Monk seal caught in bridle rope of lobster trap.	Carcass not retrieved
1990 MHI - Kauaʻi	Juvenile observed with hook.	NMFS response included capture and hook removal. Hook identified as type used in the *ulua* shore-based fishery.
1991 NWHI - FFS	Adult male observed with hook, trailing monofilament line, in chest.	Hook removed,. Reported to be a longline hook.
1991 NWHI - FFS	Adult male observed with hook, trailing monofilament line, in lower jaw.	Hook removed by NMFS personnel. Hook identified as a longline hook.
1991 NWHI - Kure Atoll	Weaned female pup observed with hook in lip.	NMFS personnel captured seal and removed hook. Hook was small, characteristic of on-site recreational fishery.
1991 NWHI - Kure Atoll	Subadult female observed with hook in corner of mouth.	Seal subsequently seen without hook; hook never recovered or identified.
1993 MHI - Kauai	Adult male observed with ulua hook, trailing monofiliament line and swivel, in mouth	Seal later seen to have lost hook without intervention.
1994 NWHI- FFS	Pregnant female with hook.	Hook stated by observers to be a swordfish fishery hook. No confirmation of report.
1994 NWHI	Seal reported taken and released injured.	Reported in longline logbook..
1994 MHI, Kauai	Seal observed with hook, trailing monofilament line, in mouth.	Outcome unknown.

DATE AND LOCATION	DESCRIPTION	OUTCOME
1994 MHI - Oʻahu	Dead seal found entangled by gillnet off Waianae.	Necropsy conducted, condition of lungs consistent with drowning.
1994 NWHI-"No Name Bank"	Active hooking of adult seal during bottomfishing; seal had stolen catch and had become hooked.	Fisherman pulled seal to boat and cut leader 12"-18" from the seal.
1995 MHI - Kauaʻi	Juvenile male found dead, necropsy revealed fishhook in lower esophagus.	Mortality; hook was a "slide rig" characteristic of shore-based *ulua* fishery.
1996 MHI - Oʻahu (Ala Moana Beach) (first sighted on Maui)	Adult male observed with hook in base of tongue.. The seal was identified as a seal that had been translocated from Laysan Island, NWHI.	Hook removed by NMFS. Hook identified as from slide rig, shore based *ulua* fishery.
1996 NWHI - FFS	Adult male observed with hook in mouth.	Independent researchers identified hood as ulua or bottomfish hook. No identifying gear attached to hook.
1996 MHI - Maui	Adult hooked during fishing tournament.	Cut loose, probably with hook in mouth or jaw.
1996 MHI Oahu	Weaned male pup born on Kaneohe Marine Corps Base observed with 1" long hook in foreflipper.	Hook removed by bystander; hook not retained.
1998 MHI - Maui	Hooked seal reported to NMFS; Juvenile female. Observers stated it was a #7 or #9 *ulua* hook.	NMFS response included capture and physical exam, No hook was found, but some minor trauma was observed in mouth where hook had been present.
2000 MHI - Molokaʻi	Juvenile male observed with 2 hooks and line embedded in chest (ventral) area.	NMFS response included capture and physical exam of seal. No hooks or line present, but slight injury was documented by veterinarian.
2000 MHI - Kauaʻi (Haʻena Beach)	Adult female observed with hook in mouth.	NMFS response included capture and hook removal. Hook identified as type used in the *ulua* shore-based fishery.
2001 MHI - Kauaʻi (Mahaulepu Beach)	Juvenile female with hook in lower lip and base of jaw.	Hook removed by DLNR personnel. Hook and leader determined to be from shore casting ulua fishery.
2001 MHI - Kahoʻolawe	Adult male with hook, trailing line, in abdomen or front flipper.	Sightings ceased. Seal disappeared or hook lost.

DATE AND LOCATION	DESCRIPTION	OUTCOME
2001 MHI - Hawaiʻi (South Point)	Weaned pup from Kau area reported hook on back.	NMFS dispatched personnel but could not locate seal. Seal later located when hooked in lip and showed no signs of hook injury to back.
2001 MHI - Hawaiʻi (South Point)	Weaned pup from Kau hooked in lip.	NMFS removed hook; Hook identified as type used in the *ulua* shore-based fishery.
2002 MHI - Oʻahu (Ewa)	Seal hooked in lip by ulua hook, trailing line.	NMFS removed hook, treated, and released seal. Seal later resighted on the Southeast shore of Oahu.
2002 MHI - Oʻahu	Seal tangled in nearshore gillnet.	Seal released by recreational divers.
2002 MHI - Kauaʻi	Seal hooked in neck, line trailing.	DLNR sighed seal.

Source: NMFS unpub. data 2003

NMFS researchers and veterinarians have responded to some of the above reports and have treated the Hawaiian monk seals and provided descriptions of the wounds caused by the hook. Based on these descriptions and outcome (when known), the injuries sustained by Hawaiian monk seals from embedded hooks have been classified into injuries or serious injuries. An embedded hook was considered a serious injury if it hooked in the mouth deeper than the lip. Thus, hooks embedded inside the mouth, in the tongue, the mandible or upper jaw, throat, or deeper are classified as serious injuries, whereas “lip hookings” and other shallow embedded hooks are considered nonserious. The rationale for this division is that foraging would likely be impeded by the serious injuries. Hooks embedded in the lip or shallowly embedded hooks in other body areas would most likely fall out and would not impair feeding or other activities. Considering the information available, the above classification approach is consistent with the views expressed by researchers and veterinarians in a workshop held to discuss the serious injury guidelines.[21]

Marine Debris: Marine debris, particularly derelict fishing nets, poses a serious risk of injury and death to Hawaiian monk seals. The inquisitive nature of seals, particularly pups and juveniles, tends to make them attracted to debris. Subsequent interactions can lead to

[21]“Injury of pinnipeds: A brief discussion of injuries reported for pinnipeds indicated that an animal hooked in the mouth (internally) or trailing gear should be considered seriously injured. Some participants felt that an animal hooked in its body would likely not be seriously injured.” (Differentiating Serious and Non-Serious Injury of Marine Mammals Taken Incidental to Commercial Fishing Operations: Report of the Serious Injury Workshop held in Silver Spring, MD, April 1-2, 1997).

entanglement and, unless they are able to free themselves quickly, entangled seals risk drowning or death through injuries caused by the entangling gear. Between 1982 (the year NMFS first began to collect information on marine debris entanglement) and 2000 a total of 204 entanglements were documented. In 1999, a record 25 Hawaiian monk seals were reported to have been found entangled in marine debris (HMSRT 1999). Most of the net debris in the NWHI appears to be trawl webbing. Although its origin is unclear, no trawl or gillnet fishing occurs in the NWHI, and it is assumed that virtually all of this debris has been transported by ocean currents from distant fisheries around the rim of the North Pacific Ocean (Marine Mammal Commission 2000).

In 1998, NMFS organized a multi-agency cleanup effort to remove derelict fishing nets and other debris from the reefs surrounding French Frigate Shoals and Pearl and Hermes Reef. NMFS was able to remove only a small proportion of this debris and estimated that 38,000 pieces of netting remained in the waters surrounding each of these locations (Marine Mammal Commission 2000). In 1999 the NMFS-HL led a multi-agency effort to survey and remove derelict fishing gear from Lisianski Island and Pearl and Hermes Atoll (Donohue et al. 2001). Reef debris density ranged from 3.4 to 62.2 items/km^2. Fourteen tons of debris were removed from these two islands. Data from subsequent multi-agency marine debris research cruises (October/November 2000, 2001) are currently under analysis. The 2000 data include the first examination of marine debris at Kure Atoll, as well as estimations of accumulation rates at Lisianski Island and Pearl and Hermes Atoll. These three locations were resurveyed in 2001 allowing refinement of accumulation rate estimates. Additionally, in 2001 a fleet of three chartered vessels again worked to clean the reefs around Kure Atoll and Pearl and Hermes Atoll. About 62 tons of debris was removed from the two sites, with Kure essentially cleaned of derelict fishing gear during this effort (Laurs 2002).

Information on marine debris entanglement and injuries, including mortalities, has been collected by NMFS since 1982, and is summarized in the recent Biological Opinion for the bottomfish fishery (Appendix D). Seven categories of debris were defined: nets (of fishery origin), lines or ropes (not necessarily of fishery origin), net/line combinations (of fishery origin), cones (from hagfish traps), rings (circular items of unknown origin), plastic packing straps (of fishery and non-fishery origin), and other /unknown. A total of 204 entanglements was documented, 96 by fishery items (5.05 per year), 96 by non-fishery items (5.05 per year), and 12 by unknown items (0.64 per year). From the total number of entanglements, 47 serious injuries were documented, including 27 by fishery items (1.42 per year), 8 by non-fishery items (0.42 per year), and 12 by unknown items (0.64 per year). Seven mortalities from entanglement were documented: 6 from fishery items (0.32 per year) and 1 from a non-fishery item (0.05 per year) (Table 3-10). Five of the six debris-related mortalities were caused by trawl netting and the other from unidentified line. Trawl fishing does not occur in areas under Council jurisdiction. Assigning the unknown items to either the fishery or non-fishery categories on a proportional basis results in a minimum estimated rate of 2.48 serious injuries and mortalities per year attributable to fishery-related marine debris.

TABLE 3-10: Known Marine Debris Related Monk Seal Mortalities: 1982-2000

YEAR AND LOCATION	DESCRIPTION
1986– FFS	Weaned male tangled in wire which was relic of USCG or Navy occupation; in water
1987–Lisianski Is.	Pup (uncertain if nursing or weaned) dead in aggregate of trawl net and line on shore
1987–FFS	Juvenile dead in aggregate of trawl net and line on shore
1988–Lisianski Is.	Weaned pup dead in large trawl net on shore
1995–Pearl and Hermes Reef	Bones of adult found scattered in line awash on shore
1997-FFS	Subadult dead in trawl net on reef
1998–Laysan Island	Weaned pup dead in trawl net on nearshore reef

Source: NMFS unpub. data 2001

Vessels: Hawaiian monk seals may be injured by collisions with vessels or indirectly by vessel groundings that result in the release of hazardous or toxic chemicals or gear that creates an entanglement hazard. Collisions are much more likely with small high-powered vessels. For example, a pup born at the Pacific Missile Range Facility on Kauai was reported dead in 1999. There was an anonymous and unconfirmed report that the pup may have been hit by a zodiac-type vessel employed in the tourist industry.

In August 1998, Tesoro Hawaii Corporation tanker offloading operations resulted in a spill of about 5,000 gallons of bunker fuel off Barber's Point, leeward Oʻahu. The waters and shoreline of Kauaʻi were affected, and oiled Hawaiian monk seals were reported in the area. During September 1998, up to five oiled Hawaiian monk seals were observed. One Hawaiian monk seal had its entire oral mucosa coated with red, blood-like fluid. This Hawaiian monk seal was later resighted and exhibited signs of a respiratory infection. Another Hawaiian monk seal exhibited "gagging behavior." As there were no physical exams conducted on the animals observed, the wildlife resource agencies could not reach a conclusion about the effects of the oil on the Hawaiian monk seals (Natural Resources Trustees 2000).

In April 1999, a longline vessel (*F/V Van Loi*) grounded on a reef off of Kapaʻa, Kauaʻi. The vessel had 60,000 gallons of diesel fuel on board and was carrying three tons of bait and gear. All fuel, bait and gear (including monofilament line and hooks) went overboard into the marine environment. Monk seals and sea turtles were observed in the area, but no adverse interaction with fuel or gear was reported by wildlife resource managers on scene.

3.3.1.4 Other Pinniped: The Northern Elephant Seal

Although uncommon in the action area of the bottomfish fishery, the northern elephant seal (*Mirounga angustirostris*) has been observed in the MHI and the NWHI. In 2002 a yearling appeared on the island of Hawaiʻi, was captured, and transported to the Marine Mammal Center in California for rehabilitation and reintroduction to the wild.

Although this species may occasionally be found within the action area and could interact with the U.S. fisheries of the Western Pacific Region, no reported or observed incidental takes of this species have occurred in the bottomfish fishery. There is no current expectation of future interactions between this species and the bottomfish fishery, and, therefore, this species will not be considered further in this document.

3.3.2 Sea Turtles

All sea turtles are designated as either threatened or endangered under the Endangered Species Act. The five species of sea turtles known to be present in the region in which bottomfish vessels operate are: the leatherback (*Dermochelys coriacea*), the olive ridley (*Lepidochelys olivacea*), the hawksbill *(Eretmochelys imbricata*), the loggerhead (*Caretta caretta*), and the green turtle (*Chelonia mydas*).

Leatherback turtles and hawksbill turtles are classified as endangered. The breeding populations of Mexico olive ridley turtles are currently listed as endangered, while all other olive ridley populations are listed as threatened. The loggerhead turtles and the green turtles are listed as threatened (note that the green turtle is listed as threatened under the ESA throughout its Pacific range, except for the endangered population nesting on the Pacific coast of Mexico).

Leatherbacks have the most extensive range of any living reptile and have been reported circumglobally from latitudes 71°N to 42°S in the Pacific and in all other major oceans. The diet of the leatherback turtle generally consists of cnidarians (i.e., medusae and siphonophores) in the pelagic environment. They lead a completely pelagic existence, foraging widely in temperate waters except during the nesting season, when gravid females return to beaches to lay eggs. Typically, leatherbacks are found in convergence zones and upwelling areas in the open ocean, along continental margins, and in archipelagic waters.

The loggerhead turtle is a cosmopolitan species found in temperate and subtropical waters and inhabiting continental shelves, bays, estuaries and lagoons. Major nesting grounds are generally located in warm temperate and subtropical regions, generally north of 25°N or south of 25°S latitude in the Pacific Ocean. For their first several years of life, loggerheads forage in open ocean pelagic habitats. Both juvenile and subadult loggerheads feed on pelagic crustaceans, mollusks, fish and algae. As they age, loggerheads begin to move into shallower waters, where, as adults, they forage over a variety of benthic hard and soft bottom habitats.

The olive ridley is one of the smallest living sea turtles (carapace length usually between 60 and 70 cm) and is regarded as the most abundant sea turtle in the world. Since the directed take of sea turtles was stopped in the early 1990s, the nesting populations in Mexico seem to be recovering, with females nesting in record numbers in recent years. The olive ridley turtle is omnivorous and identified prey include a variety of benthic and pelagic items such as shrimp, jellyfish, crabs, snails and fish, as well as algae and sea grass.

The hawksbill turtle is rapidly approaching extinction in the Pacific, primarily due to the harvesting of the species for its meat, eggs and shell, as well as the destruction of nesting habitat. Hawksbills have a relatively unique diet of sponges.

Green turtles in Hawaiʻi are genetically distinct and geographically isolated which is uncharacteristic of other regional sea turtle populations. Both nesting and foraging populations of green turtles in Hawaiʻi appear to have increased over the last 20 years. In Hawaiʻi, green turtles nested historically on beaches throughout the archipelago, but now nesting is restricted for the most part to beaches in the NWHI. More than 90% of the Hawaiian population of the green turtle nests at French Frigate Shoals. Satellite tagging of these animals indicates that most of them migrate to the MHI to feed and then return to breed. The four other species of sea turtles are seen in the waters of the NWHI only on rare occasions.

3.3.3 Seabirds

Although there are several seabird colonies in the MHI, the NWHI colonies harbor more than 90% of the total Hawaiian Archipelago seabird population. The NWHI provide most of the nesting habitat for more than 14 million Pacific seabirds. More than 99% of the world's Laysan albatross (*Phoebastria immutabilis*) and 98% of the world's black-footed albatross (*P. nigripes*) return to the NWHI to reproduce. Of the 18 species of seabirds recorded in the NWHI, only the short-tailed albatross (*P. albatrus*) is listed as endangered under the ESA. The short-tailed albatross population is the smallest of any of the albatross species occurring in the North Pacific. Land-based sighting records indicate that 15 short-tailed albatrosses have visited the NWHI over the past 60 years. Five of these visits were between 1994 and 1999 (NMFS 1999).

3.3.4 Value of Threatened and Endangered Species

Most of the information in this section pertains only to the value of the Hawaiian monk seal, as it is the potential interaction between this endangered species and the bottomfish fishery that was identified as a particular environmental concern during scoping (Section 1.2).

3.3.4.1 Categories of Economic Values

Preserving an environmental asset such as an ecosystem or particular species may generate a range of potential benefits for humans. The Endangered Species Act acknowledges this fact with respect to the preservation of wildlife, noting that at-risk species "...are of aesthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people… ." (Sec. 2(a)(3)). Resource economists have developed a similar taxonomy of wildlife preservation values, although there are divergent opinions in the definitions of some benefits. Moreover, categories of benefits within a given list may overlap. Typically, economists divide the total value an environmental asset may generate into use values and non-use values. Use values are generated when management decisions affect the enjoyment people get from current use of the environmental asset. They involve either *in situ* contact with the resource in question or personal consumption of products derived from the resource (Bishop 1987). Use values include consumptive values, non-consumptive use values, indirect use values and option values (Table 3-11). Consumptive direct use values can be subdivided into commercial value if the purpose of the extractive activity is to sell products to others; recreational value if the purpose is recreational enjoyment; and subsistence value if the purpose is to provide one's family, or others, with food and no remuneration is involved.

Non-use values, also referred to as passive-use values, may include bequest or existence values (Table 3-11). These values do not involve personal consumption of derived products nor *in situ* contact. They are generated when management decisions impinge on people's inter-generational altruistic concerns or affect the utility people receive from simply knowing that a particular asset exists or is being preserved (Bishop 1987).

TABLE 3-11: Categories of Economic Values Attributed to Environmental Assets Such as a Species or Ecosystem.

ECONOMIC VALUE	DESCRIPTION
Consumptive direct use value	Value derived from extractive activities
Non-consumptive direct use value	Value gained through activities such as observing a species or ecosystem

ECONOMIC VALUE	DESCRIPTION
Secondary value	Value obtained by viewing or hearing about a species or ecosystem via a communication medium
Scientific value	Value stemming from new information about medicine, genetics or other areas of scientific research resulting from the study of a species or ecosystem
Indirect value	Value of the ecological functions and services of a species or ecosystem that indirectly provides support and protection to people, economic activity and property
Option value	The premium that individuals are willing to pay for retaining an option for future use of a species or ecosystem
Quasi-option value	Value of additional information on which to base decisions about preserving a species or ecosystem
Bequest value	Value derived from the knowledge that a species or ecosystem will be preserved for future generations
Existence value	Value emanating from the satisfaction of just knowing that a particular species or ecosystem survives in a natural state

Sources: Cocheba 1987; Mendelsohn 1985; Mitchell and Carson 1989; Pearce and Moran 1994; Randall 1986

Option and quasi-option values exist under conditions of uncertainty about the future demand and availability of an environmental asset or uncertainty about the future benefits of preserving the asset. The application of these values will tend to support postponement of a management decision if the possible negative effects of the decision are irreversible. For example, recovery from a decision that results in extinction of a species is not possible. The foregone benefits of that species will effectively be irreplaceable and further benefits that are as yet unknown or not well understood, will be lost. The MSA implicitly acknowledges the significance of option and quasi-option values by stating that the term conservation and management refers, in part, to measures designed to assure that "...irreversible or long-term adverse effects on fishery resources and the marine environment are avoided; and there will be a multiplicity of options available with respect to future uses of these resources...." (Sec. 3(5)).

While it is important to recognize that the opportunity costs of management decisions that result in irreversible species or ecosystem losses may be particularly high, it is also important to note that some individuals may hold a positive value for avoiding losses of part of a species' population even if recovery is fairly rapid (Bishop and Welsh 1992) – witness the opposition by some members of the public to the recent gray whale (*Eschrichtius robustus*) hunt by the Makah people of the Pacific Northwest, despite the fact that NMFS deemed the gray whale stock to be in good condition and capable of withstanding a restricted harvest. It is likely that for some opponents to the whale hunt the harvest of even a single whale is one too many because of the value of the special qualities they ascribe to a living whale or because of the sympathy or empathy they hold for animals in general.

3.3.4.2 Possible Economic Values Attributed to the Hawaiian Monk Seal

3.3.4.2.1 Consumptive Direct Use Value

Although there are some exceptions, most populations of endangered species have little or no consumptive direct use value because of their low numbers. In the early nineteenth century, Hawaiian monk seals experienced mass hunting for their oil and pelts. Within a few years, the population had been reduced to the point that the seal hunt was no longer profitable. Perhaps the last year Hawaiian monk seals were killed for commercial purposes was in 1859, when the Hawaiian bark *Gambia* spent three and a half months fishing around the NWHI and returned with a large quantity of seal oil and skins (Kenyon and Rice 1959). Unless the population of Hawaiian monk seals was to increase dramatically, the consumptive value of this population is likely to remain negligible.

3.3.4.2.2 Non-consumptive Direct Use Value

Hawaiian monk seals usually reside on the remote and essentially uninhabited atolls and islands that comprise the NWHI. Furthermore, access to these areas has been limited by a very restrictive permit process (USFWS 1986). Consequently, generally there have been limited opportunities for people other than a few military personnel and scientists to observe a live Hawaiian monk seal in the wild. However, the number of Hawaiian monk seals occurring in the main Hawaiian Islands increased in the 1990s, and sightings of Hawaiian monk seals in these islands by residents and tourists have become more common. On Kauaʻi’s south shore, for example, Hawaiian monk seals are seen almost daily, and several of them may haul out at a time (Johanos 2000; G. Antonelis, pers. comm. 2000. NMFS-HL). Certain beachfront hotel staff and “monk seal watch” volunteers have begun to rope off and place educational signs around areas where seals haul out (Ching 1994; G. Antonelis pers. comm. 2000. NMFS-HL).

In addition, from 1996 to 2001, there was limited eco-tourism and public use within the Midway Atoll National Wildlife Refuge in the form of charter fishing, diving and wildlife observation. Midway Phoenix Corporation, a privately-owned company, was awarded a concession to develop and manage the tourist facilities. Midway Atoll was the only remote island National Wildlife Refuge open to public visitation. The number of visitors allowed on the atoll at any one time was limited to reduce impacts to wildlife. Midway Phoenix Corporation's agreement with the USFWS allowed a maximum of 100 visitors to reside on the atoll per week. The company advertised wildlife tours that let visitors "...gain first hand knowledge of the albatross, resident seabirds, migrant shorebirds, threatened green turtles and endangered Hawaiian monk seals...." (Midway Phoenix Corporation undated). The most common way for visitors to access the Midway Atoll National Wildlife Refuge was by air service from Honolulu. However, the Midway Phoenix Corporation also arranged for cruise ships to make stopovers at the Refuge.

As the chances of viewing a Hawaiian monk seal in its natural habitat improve, one would expect its non-consumptive value to increase (at least up to the point that a sighting becomes mundane). An example of the non-consumptive value that direct encounters with the Hawaiian monk seal might generate is described by Ching (1994:36):

> *Events like those …are precious indeed as many people are experiencing the joy of watching monk seals in the wild without causing them stress. Something magical happens when people actually get to see an endangered animal in real life. It instills within them a sense of protective enthusiasm, thus strengthening conservation efforts.*

3.3.4.2.3 Secondary Value

Opportunities for accruing secondary value from the Hawaiian monk seal may also have significantly increased over the past few years. A book for the lay reader has been published describing the natural history and endangered status of the Hawaiian monk seal (Ching 1994). Dozens of Web sites have been created by government and private organizations to provide Internet users with detailed information about the Hawaiian monk seal. Information about the Hawaiian monk seal was also conveyed to the public when the U. S. Postal Service issued a new postage stamp and post card honoring the Hawaiian monk seal as part of its 1996 endangered species series.

3.3.4.2.4 Scientific Value

The Hawaiian monk seal may have scientific value for its evolutionary characteristics. Some of the anatomical features of the Hawaiian monk seal have been unchanged by evolution for 15 million years, and this species is the oldest and most primitive of all living seals (Kenyon 1980). It is sometimes referred to as a "living fossil" because of the retention of several primitive skeletal features.

In addition, the Hawaiian monk seal may be perceived by some as having some yet unrealized biomedical value that renders it worth preserving (i.e., the Hawaiian monk seal has a quasi-option value). Several current lines of research indicate that seals may be useful in human medicine. To cite some examples – an examination of the physiological factors that render the internal organs of seals resistant to anoxia may improve human organ transplants (Kooyman 1981); studies of the Weddell seal's (*Leptonychotes weddelli*) ability to routinely recover from near total lung collapse during deep dives may prove useful in understanding sudden infant death syndrome (Kooyman 1981); and investigations of what are apparently normal sleep apneas in the northern elephant seal (*Mirounga angustirostris*) may provide insights into similar but more pathological events seen in humans (Castellini 1994). These potential benefits suggest that the Hawaiian monk seal could also have some valuable biomedical use in the future.

3.3.4.2.5 Indirect Value

Due to the complex nature of ecosystem relationships, the removal or disturbance of one part of the ecosystem could affect the functioning of many other components of the ecosystem. The role that the Hawaiian monk seal plays in maintaining the integrity of the ecosystem is uncertain. Such uncertainty is not unusual; knowledge of ecosystem relationships is often incomplete, and the results of disturbance are thus to some extent unpredictable. To have indirect value the Hawaiian monk seal does not necessarily have to be a "keystone species" on which the persistence of a large number of other species in the ecosystem depends. As Ehrlich and Ehrlich (1981) have noted, the removal of any particular species may in itself not be catastrophic, but its occurrence increases the likelihood that the next extinction could unravel the whole ecosystem.

3.3.4.2.6 Existence Value

Non-use values may be the most important benefit derived from some endangered species, simply because species become endangered because they are few in number which means that many people are unlikely to have seen them or to have had very much tangible experience regarding them. People demonstrate their existence values in the marketplace by donating funds to private organizations that support activities to preserve endangered species. However, whether people enjoy existence values of resources is not contingent upon whether they donate money to support a cause. The fact that some individuals are willing to donate money is just the most obvious manifestation of these existence values.

The discussion by Metrick and Weitzman (1996) of the possible components of existence value can be used as a basis for speculating about the nature and relative magnitude of the existence value of the Hawaiian monk seal. First, the authors note that people often speak of the large amount of attention paid to "charismatic megafauna." Presumably, therefore, the existence value of a species may be a function of its charisma. Metrick and Weitzman were unable to identify a satisfactory measure of charisma in the context of endangered species, but they note that eye-size or eye-body ratio have been suggested. Based on these eye-related criteria the Hawaiian monk seal would be rated as highly charismatic by some people if one accepts Ching's (1994:36) statement that "…one look into those big, dark eyes and you, too, could become an incurable monk seal *groupie*." In any case, the Hawaiian monk seal is a large mammal with a "cute and furry" visage that is typical of some high-profile threatened and endangered species that people are willing to protect.

Another possible component of existence value is the degree to which a species is considered to be a higher form of life and possibly possess (anthropomorphic) capabilities for feeling, thought and pain (Metrick and Weitzman 1996; Kellert 1986). Ching (1994) and others describe the close maternal care that the female Hawaiian monk seal provides for her pup, the playful behavior of young monk seals, the ability of the seals to vocalize and communicate with each other and the curiosity of adult monk seals. While none of these attributes proves that the Hawaiian monk seal possesses human-like intelligence or emotions, it is likely that many people would "identify" with these characteristics and interpret them to mean that monk seals do, in fact, represent a relatively advanced form of life.

Finally, Metrick and Weitzman argue that, since we may have existence value for biodiversity as a whole, some measure of the amount that a species adds to this diversity may play a role in deciding how much people are willing to pay to preserve it. With regard to the taxonomic uniqueness of the Hawaiian monk seal, Kretzmann (1998:5) states: "If one assigns conservation value to species based on their evolutionary distinctiveness, then the Hawaiian monk seal … seems likely to represent an especially worthy cause." The Hawaiian monk seal is endemic to the Hawaiian Islands. Furthermore, the Hawaiian monk seal and the Mediterranean monk seal (*Monachus monachus*), which is also in danger of going extinct, are the sole representatives of an entire genus. Although monk seals as a group are closely related to other Phocidae or "true seals," they are genetically distinct and represent the only genus of seals found in tropical waters (Kenyon and Rice 1959).

<u>3.3.4.3 Estimate of the Economic Value of the Hawaiian Monk Seal</u>

Market prices express the value of environmental assets in monetary terms if these assets were bought and sold. However, other benefits of environmental assets are less readily translated into dollar values. Resource economists have developed an array of valuation techniques that do not rely on market data. One such technique is the contingent valuation method (CVM). CVM allows for the estimation of the full range of species and ecosystem preservation values set forth in Table 3-11, and it is the only method available for estimating non-use values directly.

CVM employs survey techniques to ask people about the values they would place on certain environmental assets or other non-market commodities if markets did exist or if other means of payment were in effect. When individuals are asked in CVM studies to evaluate an environmental asset they make a holistic judgment based on the configuration of benefits they believe will accrue to them (Mitchell and Carson 1989). Consequently, it may not be possible to identify the value of each separate type of benefit. It is also important to note that a valuation of a particular species may include implicit valuation of the components of the ecosystem that support that species (Loomis and White 1996).

A 1986 CVM study estimated the total economic value of the Hawaiian monk seal (Hollyer 1987; Samples and Hollyer 1990). The hypothetical market in the study was for the "purchase" of the continued existence of the Hawaiian monk seal population. Individuals were asked their willingness to pay to provide one-time emergency assistance to prevent a complete loss of the Hawaiian monk seal population. The study employed a dichotomous choice CVM format administered through in-person interviews to a stratified sample of Hawaiʻi residents living on Oʻahu.

The study found that the value of preserving the Hawaiian monk seal was positive and substantial. Estimates of the benefit of Hawaiian monk seal preservation ranged from $81.17 to $232.54 per household, with an overall mean of $148.65 (all values adjusted for inflation to 1999 dollars using the Honolulu consumer price index). If the one-time payment is amortized over a 20-year period at a 7% discount rate the estimated mean annual value per Hawaiʻi household is $14.03. Extrapolating this value estimate across the total number of households in Hawaiʻi as reported in DBEDT (1999) results in an estimated gross preservation benefit of $5.45 million.

Hollyer (1987) also estimated the net preservation value by subtracting the costs of Hawaiian monk seal preservation efforts from the gross preservation value. Cost data were collected from both government agencies and private organizations. The highest costs were those incurred by the Marine Mammal Research Program at the NMFS Honolulu Laboratory. In FY 2000, the budget of this program for Hawaiian monk seal conservation was about $1.9 million for NMFS research and additional "in-kind" support for logistics (e.g., use of NOAA R/V *Townsend Cromwell*) and from other agencies (e.g., U.S. Coast Guard) for marine debris removal from Hawaiian monk seal habitat (G. Antonelis pers. comm. 2000. NMFS-HL). In the absence of a current estimate of the contributions of private organizations and other government agencies to Hawaiian monk seal preservation activities, the estimate provided by Hollyer for 1986 can be used after adjusting for inflation. The inflation-adjusted estimate is $258,000. Therefore, the total public and private sector costs of Hawaiian monk seal preservation are estimated to be about $2.16 million per year. Subtracting this value from the estimated gross preservation benefit of $5.45 million yields an annual net benefit to the nation of $3.29 million.

This net annual economic value estimate of preserving the Hawaiian monk seal may be conservative for at least two reasons. First, the valuation responses were treated as household responses rather than individual responses. Treating the responses as individual responses would increase net benefits substantially. Secondly, because the benefits of preserving federally listed threatened and endangered species are national in scope, both the value per household (or individual) and number of households to aggregate over should include all U.S. households (Loomis and White 1996). However, it may be inappropriate to extrapolate the estimated values obtained by Hollyer to this much wider population. Hawaiʻi residents may value the Hawaiian monk seal appreciably more than the average U.S. resident because it is Hawaiʻi's only pinniped and one of only two endemic mammals (the other being the Hawaiian Hoary Bat (*Lasirus cinereus semotus*)). On the other hand, it is likely that many individuals residing on the U.S. mainland attach at least some positive value to preserving the Hawaiian monk seal.

Economists acknowledge that questions of validity, bias and reliability persist in the use of CVM to evaluate environmental assets. In 1992, NOAA commissioned a "blue ribbon" panel to advise the agency on the use of CVM for measuring non-use values (Arrow et al. 1993). The panel concluded that CVM studies can produce estimates reliable enough to be the starting point for a judicial or administrative determination of natural resource damages, including loss of non-use values, as long as certain sampling and survey design guidelines are adhered to. It is beyond the scope of this EIS to critique the methodology employed by Hollyer (1987) to evaluate the benefits of preserving the Hawaiian monk seal, but that study's use of personal interviews and a willingness-to-pay and dichotomous choice format are consistent with guidelines set forth by Arrow et al. (1993).

3.3.4.4 Alternative Value Paradigms

Apart from debates about the technical acceptability of CVM with respect to its validity and reliability, there are criticisms of the economic-utilitarian paradigm underlying the economic valuation of at-risk species and ecosystems. A number of these criticisms contend that economic valuation methods such as CVM are inherently inadequate because they capture only the instrumental value to current members of society.

For example, Berrens et al. (1998) note that irreversible species or ecosystem losses involve inter-generational equity issues since they constrict the choice sets of future generations. Economic valuations are based on the preferences of the current generation and neglect the ethical issue of the inter-generational allocation of natural endowments. Preserving species where positive net benefits are to be earned is obviously a good idea, but preserving species only when doing so meets economic efficiency criteria may place future generations in a disadvantaged position (Bishop 1993).

Other critics focus on the fact that economic valuations are rooted in anthropocentric or human-centered benefits. Albers et al. (1996), for instance, note that some would argue that human uses and the values to which they give rise are not deserving of any special consideration when it comes to a decision on whether to preserve a species and its habitat. According to one interpretation of this view, nature has rights; to exploit nature is just as wrong as to exploit people (Nash 1989). Another interpretation is that non-human species are intrinsically valuable, independent of any use they may be to humans (Callicott 1986). The latter conviction may be related to religious principles, such as a belief in the sacredness of all or certain life forms.

All of these "moral arguments" are inconsistent with the economic paradigm of trade-offs between money and wildlife species or ecosystems because they present individuals with the moral imperative that we ought to preserve plants and animals (Stevens et al. 1991). As Costanza et al. (1997) and Pearce and Moran (1994) note, concerns about the preferences of future generations or ideas of intrinsic value translate the valuation of environmental assets into a set of dimensions outside the realm of economics.

It is difficult to gauge how prevalent such ethically motivated values are among members of the general public. For example, according to a 1997 public opinion poll conducted in the U.S., only 6% of the respondents who advocated an end to the harvest of the Minke whale (*Balaenoptera acutorostrata*) indicated that their opposition to whaling stemmed from animal rights concerns (Aron et al. 2000). On the other hand, when a recent Gallup poll asked Americans to indicate the degree to which they agree or disagree with the goals of the animal rights movement, 29% expressed strong agreement, 43% indicated some agreement and only 25 % were strongly or somewhat opposed (The Gallup Organization 2000). Additional in-depth public surveys are needed before we can better understand people's motivations for supporting efforts to protect the Hawaiian monk seal and other species.

3.4 ESSENTIAL FISH HABITAT, BIODIVERSITY AND ECOSYSTEMS

3.4.1 Essential Fish Habitat for Bottomfish Management Unit Species

The MSA identifies essential fish habitat (EFH) as those waters and substrate necessary to fish for spawning, breeding, feeding, and growth to maturity. This includes the marine and aquatic areas and their chemical and biological properties that are utilized by the organism. Substrate includes sediment, hard bottom, and other structural relief underlying the water column along with their associated biological communities.

NMFS produced guidelines to assist in the implementation of the EFH requirements of the MSA. These guidelines state that the quality of the available life history data for management unit species (MUS) should be rated using a four level system, as follows:

Level 1: All that is known is the occurrence of a species based on distribution data for all or part of the geographic range of the species.

Level 2: Data on habitat-related densities or relative abundance of the species where available.
Level 3: Data on growth, reproduction, or survival rates within habitats where available.
Level 4: Data on production rates by habitat.

At present there are not enough data on relative productivity of various habitats for bottomfish species within the region to develop EFH designations based on Level 3 or Level 4 data. To address the requirements in Section 305 (b)(1)(A) of the MSA, the Council drafted Amendment 6 to the Bottomfish FMP. The recommendation of EFH by the Council to NMFS was based on the best available scientific information, which was obtained through an iterative process consisting of a series of public meetings, and through scientific, industry, and FMP panel meetings. The Council worked in close cooperation with scientists in the NMFS Southwest Fisheries Science Center, the NMFS Honolulu Laboratory, the NMFS-PIAO and the NMFS Southwest Region Office (WPRFMC 1998a). To reduce the complexity and number of EFH identifications required for individual species and life stages, the Council proposed EFH for bottomfish species assemblages. The definition of these assemblages is based on the ecological relationships among species and their preferred habitats. The bottomfish species are separated into shallow-water and deep-water assemblages based on known depth distributions of the individual species. The seamount groundfish are included in a separate assemblage because of their similar habitat requirements. The species included in each assemblage are summarized in Table 3-12.

TABLE 3-12: Species Assemblages for Bottomfish Management Unit Species

SPECIES ASSEMBLAGE	INCLUDED SPECIES
Shallow-water bottomfish (0-100m)	*Aprion virescens, Pseudocaranx dentex, Variola louti, Epinephilus fasciatus, Lethrinus amboinensis, L. rubrioperculatus, Caranx ignobilis, C. lugubris, Seriola dumerili, Lutjanus kasmira*
Deep-water bottomfish (100-400m)	*Etelis carbunculus, E. coruscans, Pristipomoides filamentosus, P. auricilla, P. flavipinnis, P. sieboldii, P. zonatus, Epinephelus quernus, Aphareus rutilans*
Seamount Groundfish (seamounts 80-600m)	*Pseudopentaceros richardsoni, Hyperoglyphe japonica, Beryx splendens*

Source: WPRFMC 1998a

The distribution of adult bottomfish in the region is correlated with suitable physical habitat. Because of the volcanic nature of the islands within the region, most bottomfish habitat consists of steep slope areas on the margins of the islands and banks. The habitat of the six most important bottomfish species tend to overlap to some degree, as indicated by the depth range where they are caught. Within the overall depth range, however, individual species are more common at specific depths. Depth alone, however, does not assure satisfactory habitat. Both the quantity and quality of habitat at depth are important. Bottomfish are typically distributed in a non-random patchy pattern, reflecting bottom habitat and oceanographic conditions. Much of the habitat within the depths of occurrence of bottomfish is a mosaic of sandy low-relief areas and rocky high relief areas. An important component of the habitat for many bottomfish species appears to be the association of high-relief areas with water movement. In the Hawaiian Islands and at Johnston Atoll, bottomfish density is correlated with areas of high-relief and current flow (Haight 1989; Haight et al. 1993b; Ralston et al. 1986). Although the water depths utilized by bottomfish may overlap somewhat, the available resources may be partitioned by species-specific behavioral differences. In a study of the feeding habitats of the commercial bottomfish in the Hawaiian Archipelago, Haight et al. (1993a) found that ecological competition between bottomfish species appears to be minimized through species specific habitat utilization. Species may partition the resource through both the depth and time of feeding activity, and through different prey preferences.

The Council used the best available scientific information to propose EFH for each life stage (egg, larvae, juvenile, adult). Careful judgment was used in determining the extent of EFH that should be designated to ensure that sufficient habitat in good condition is available to maintain a sustainable fishery and the managed species contribution to a healthy ecosystem. Because there are large gaps in scientific knowledge about life histories and habitat requirements of many of the managed species in the Western Pacific Region, the Council adopted a precautionary approach in proposing EFH to ensure that enough habitat is protected to sustain the managed species. Under this precautionary approach the Council proposed EFH for bottomfish as extending from the shoreline to a depth of 400 m, encompassing steep slope areas and drop-offs.

The eggs and larvae of all the bottomfish MUS are pelagic, and are subject to advection by prevailing ocean currents. Very little information exists on the advection process and distribution of bottomfish larvae. Because of this uncertainty the Council proposed EFH for larval bottomfish as the water column from the shoreline to the outer limit of the EEZ to a depth of 400 m.

Because of the lack of information other than the general distribution of adult seamount groundfish, the Council proposed EFH for these species as the waters surrounding the seamount where they occur. A summary of the Council's proposed EFH for bottomfish and seamount groundfish is presented in Table 3-13.

TABLE 3-13: Essential Fish Habitat for Bottomfish Management Unit Species

LIFE STAGE	HABITAT	EFH
Bottomfish - Larval	Pelagic	Shoreline to EEZ boundary, water column 0-400m
Bottomfish - Juvenile, Adult	Water Column, Benthos	Shoreline to EEZ boundary, water column and bottom habitat which encompass steep-slope and high relief habitat 0-400 m
Seamount Groundfish - Larval, Juveniles	Water Column, Benthos	Epipelagic zone at ~200m in all waters bounded by 29° - 35°N, 171°E - 179°W
Seamount Ground fish - Adult	Water Column, Benthos	Water column and benthos between 80-600m bounded by 29° - 35°N, 171°E - 179°W

3.4.2 Habitat Areas of Particular Concern for Bottomfish Management Unit Species

In addition to the EFH, the Council proposes Habitat Areas of Particular Concern (HAPC) based on the following criteria: ecological function of the habitat is important, habitat is sensitive to anthropogenic degradation, development activities are or will stress the habitat, or the habitat type is rare.

The HAPC for adult bottomfish is based on the known distribution of the species and the associated habitat requirements. The Council proposed all escarpments and slopes between 40 and 280 m as HAPC for adult bottomfish in the region. Juvenile *P. filamentosus* have been found to utilize nursery areas well away from the adult habitat. The juveniles occupy flat, open bottom, of primarily soft substrate with depths of 40 to 73 m. Juvenile densities in these areas are correlated with the proximity of transport mechanisms (current outflow) from island runoff. In a comprehensive survey of the low relief, nearshore areas in the MHI, NMFS found high concentrations of juvenile *P. filamentosus* restricted to two areas off Oʻahu, and one off Molokaʻi.

Because of the rarity of these habitats and their susceptibility to human-induced degradation, the two areas near the Island of Oʻahu, and the one area near the Island of Molokaʻi are proposed as HAPC for juvenile *Pristipomoides filamentosus.*

3.4.3 Coral Reef Ecosystems in the Western Pacific Region

In October 2001, the Council released a final EIS for its Coral Reef Ecosystems (CRE) FMP, the first ecosystem-based FMP in the United States. In June 2002, NMFS approved the CRE-FMP except for those measures governing fishing activities in the EEZ waters surrounding the NWHI. The CRE FMP proposes a flexible, precautionary approach for management of coral reef ecosystems in the Western Pacific Region. Its holistic approach provides for better understanding of impacts due to natural environmental changes, other FMP-managed fisheries, and non-fishing anthropogenic impacts such as dredging. Although many nearshore reefs around settled areas have been heavily exploited, this is not generally the case for reef ecosystems in the EEZ. However, there is potential for fisheries to expand in these areas. These potential expansions include current nearshore fisheries for coral reef species, new fisheries for the live fish markets in Southeast Asia, expanded fisheries for coral and “live rock” for the aquarium trade, and developing fisheries for pharmaceutical uses. The Council, therefore, established as objectives for the CRE FMP promotion of sustainable use of coral reef resources, implementation of an adaptive management approach based on fishery-dependent and fishery-independent research, establishment of marine protected areas (MPAs) for resource and habitat conservation, promotion of cooperative and coordinated management, development of educational programs, encouragement of surveillance and enforcement activities, and encouragement of sustainable participation of fishing communities in coral reef fisheries (WPRFMC 2000a).

Significant management measures proposed to achieve the FMP’s objectives include:

- Marine Protected Areas - EEZ coral reefs in unpopulated areas (the PRIAs, the NWHI, Guam’s Southern Banks and Rose Atoll in American Samoa) are designated MPAs out to the 50-fm isobath. The MPAs are zoned as no-take or low-use. In the no-take MPAs, no fishing is allowed, including that by existing FMP fisheries. (Thus the CRE FMP supercedes in some aspects the Council’s other FMPs for activities occurring in coral reef ecosystems, defined as federal waters less than 100m deep.) No-take MPAs are delineated by the 10-fm isobath except in certain ecologically sensitive areas where the boundary is extended to the 50-fm isobath. These areas are French Frigate Shoals, Laysan Island, the northern half of Midway Atoll, Jarvis Island, Howland Island, Baker Island, Kingman Reef, Palymyra Atoll and Rose Atoll. All other areas within the 50-fathom isobath would be low-use MPAs where fishing is tightly controlled by a special permit requirement and other conditions for fishing. The bottomfish FMP is amended by the CRE FMP[22] to prohibit take of bottomfish MUS from no-take MPAs. In low-use MPAs existing fishing activities, certain new fishing activities and recreational fisheries by residents on certain remote islands would be allowed under special permits. In low-use MPAs, existing FMP

[22]The CRE FMP includes Amendment 7 to the Bottomfish FMP, Amendment 11 to the Crustaceans FMP, Amendment 5 to the Precious Corals FMP, and Amendment 10 to the Pelagics FMP.

fisheries such as the bottomfish fishery would be regulated under the existing FMPs and no additional permits would be required.

- Permits and Monitoring - A framework process established under the CRE FMP would allow rapid development of a general permit system if it became necessary. Special permits would regulate fishing and other types of fishing-related resource use around unpopulated areas. Harvesting of live rock and coral would be prohibited except by special permit for harvest by indigenous people for traditional uses, aquaculture seedstock collection and scientific activities. Incidental catch of coral reef taxa by permit-holders in other FMP-managed fisheries would not require an additional permit.
- Fishing Gears and Methods - The CRE FMP includes lists of allowable and prohibited gears, and conditions on their use.
- Other Management Measures - The FMP establishes a framework process for simplified amendment of the plan, and allows for implementation by the Council of certain non-regulatory measures outside of the FMP amendment process.

Section 4.5.1 compares the areas designated Preservation Zones in Alternative 4 of this EIS with the MPAs of the CRE FMP.

About 70% of the world's coral reefs and 94% of the coral reefs under U.S. jurisdiction are located in the Pacific Ocean. Coral reefs cover an estimated 15,852 km^2 of the shallow ocean bottom around U.S. Pacific island areas served by the Council. Some 90% of coral reefs in the region's EEZ are found in remote areas, away from fishing communities (WPRFMC 2000a).

Coral reefs and reef-building organisms are confined to the shallow upper photic zone and are normally restricted to depths less than 50 to 100 m (25-50 fm) (Maragos and Holthus 1995). Although maximum reef growth and productivity occurs between 5 and 15 m, maximum diversity occurs at 10 to 30 m (Hunter 1995). Even within a thriving coral reef habitat, not all space is occupied by corals or coralline algae; reefs are typically patchworks of coral, algae and sand. For example, Grigg and Dollar (1980) estimated that coral cover at sites within the Hawaiian Archipelago ranged between 8 and 98%. The following sections describe the coral reef ecosystems in the Western Pacific Region.

3.4.3.1 Hawaiʻi

Reefs in Hawaiʻi constitute the vast majority (89%) of coral reef area in the U.S. Pacific islands. By far the largest coral reef area in the EEZ is located in Hawaiʻi (10,004 km^2), of which 90% is in the NWHI (9,124 km^2). The EEZ around the MHI also includes a sizeable area of coral reef (880 km^2), almost all of which is located on Penguin Bank, between the islands of Molokaʻi and Oʻahu.

The MHI represent the young portion of the Hawaiian Archipelago. Consequently, they have less well-developed fringing reefs that have not subsided as far below sea level as those in the NWHI (Green 1997). The best reef development and highest live coral cover in the MHI are found in areas sheltered or partially sheltered from open ocean swell (Grigg 1997). The Hawaiian nearshore marine community includes numerous species of fish (557 including BMUS), algae (~400), molluscs (~1,000) and other invertebrates (~1,350) (WPRFMC 2000a; USFWS 1986). Furthermore, the isolation of the Hawaiian Islands has produced a large proportion of endemic coral reef species (Fielding and Robinson 1987). It is estimated that 20 to 30% of the fish, 18% of the algae, 20% of the molluscs and 20% of the seastars and brittlestars are endemic to Hawaiʻi. Hawaiʻi's coral reefs are also unique in that some species that are relatively uncommon in other areas are quite abundant in Hawaiʻi (Fielding and Robinson 1987).

Coral reef resources in Hawaiʻi are characterized by relatively low biological diversity. Only 47 species of reef-building corals belonging to 16 genera have been recorded (Grigg 1983). This compares to about 65 genera in the Indo-West-Pacific region. On the other hand, Hawaiʻi's isolation has produced a large proportion of endemic coral reef species. It is estimated that 20 to 30% of the fish, 18% of the algae and 20% of the molluscs are endemic to Hawaiʻi (Fielding and Robinson 1987). Hawaiʻi's coral reefs are also unique in that some species that are relatively uncommon in other areas of the Pacific are quite abundant in Hawaiʻi.

Coral species richness tends to be higher in the NWHI, where the genus *Acropora*, not found in the MHI, is present. A peak in coral species diversity occurs in the middle of the Hawaiian Archipelago at French Frigate Shoals and Maro Reef (Grigg 1983). Many reefs in the NWHI are comprised of calcareous algae (Green 1997). In general, fish species diversity appears to be lower in the NWHI than in the MHI. Although the inshore fish assemblages of the two regions are similar, fish size, density and biomass is higher in the NWHI. Fish communities in the NWHI are dominated by apex predators (sharks and jacks), whereas those in the MHI are not. Some fish species are common in parts of the NWHI that are rare elsewhere in the archipelago (Green 1997).

Perhaps the most important factor in the population dynamics of many coral reef species in the NWHI and the ecosystem as a whole are cyclical oceanographic events which affect productivity over large areas and may account for large fluctuations in population abundance. In a study of recent climatic and oceanographic events and their effect on productivity in the NWHI, Polovina et al. (1994) found that declines of 30 to 50% in a number of species from various trophic levels, from the early 1980s to the present, could be explained by a shift in oceanographic conditions. Prior to this time period, oceanographic conditions that lasted from the late 1970s until the early 1980s moved nutrient-rich deep ocean water into the euphotic zone, resulting in higher survival of reef fish, crustaceans, Hawaiian monk seals and seabirds.

3.4.3.2 American Samoa

Coral reefs are limited in area (296 km^2) and only a small fraction is located within the EEZ (25 km^2), mostly on offshore banks (Green 1997). The main islands are volcanic mountains that descend steeply below sea level. They are fringed by narrow reef flats (50-500 m) that drop to a depth of 3 to 6 m and descend gradually to 40 m. From this depth, the ocean bottom drops rapidly, reaching depths of 1,000 m within 1 to 3 km from shore (Craig et al. in press). Almost 300 coral species occur in American Samoa (Green 1997). The reefs also support a diverse assemblage of nearly 900 fish species. Dominant families are damselfish, surgeonfish, wrasse and parrotfish. Spawning for some, and perhaps most, species occurs year-round, although peak spawning may be seasonal (Craig et al. in press).

Little is known about the biological assemblages on offshore banks in the EEZ around American Samoa. Species composition on the offshore reefs may be similar to that on the outer reef slopes, although species diversity may be less because of the absence of estuarine, reef flat and shallow lagoon habitats (Green 1997).

3.4.3.3 Guam

Guam is largely a raised limestone island on a volcanic base. Approximately half of the shoreline is bordered by well-developed coral reefs with reef flats as wide as 600 m. A broad barrier reef encloses Cocos Lagoon at the southwest tip of the island. A raised barrier reef, a greatly disturbed barrier reef and a coral bank enclose the deep lagoon of Apra Harbor. Coral reefs on offshore banks in the EEZ (110 km^2) account for about 60% of the total reef area in Guam (Green 1997).

Over 250 stony coral species have been recorded in the Southern Mariana Islands (Birkeland 1997). Guam’s reefs also support a diverse assemblage of about 800 fish species. Fish families with the most species that are important in coral reef fisheries are wrasses, groupers, surgeonfish, jacks, squirrelfish, snappers, parrotfish, emperors and goatfish (Green 1997).

Little is known about the biological assemblages on offshore banks in the EEZ around Guam. The tops of these banks are relatively deep (20-40 m) (Green 1997). Myers (1997) has suggested species composition on these banks may be similar to that on the outer reef slope around the island of Guam, although the relative abundance of species would probably be different because of the isolation of the banks from continuous reef tracts and from heavy fishing pressure.

3.4.3.4 Northern Mariana Islands

In nearshore areas (0-3 nm)of the Northern Mariana Islands, Saipan has the best developed reefs, including fringing reefs, inshore and offshore patch reefs and a well-developed barrier reef-lagoon system along most of the leeward coast. In contrast, the northern islands (Anatahan, Sarigan, Guguan, Alamagan, Pagan, Agrihan, Asuncion, Maug and Uracas) are geologically young volcanic islands having steep seaward slopes. In general, reef development there is poor to non-existent. In addition, there are numerous shoals along the island chain (Green 1997). A chain of small shallow banks topped with coral reefs lie in a parallel arc 240 to 320 km to the west of the Marianas (Myers 1997).

The number of stony coral and reef fish species in the southern portion of the CNMI is similar to that of Guam. Diversity drops markedly off the northern volcanic islands, where only 159 species of stony coral and only about 360 species of reef fish have been recorded (Birkeland 1997). Dominant fish families are the same as in Guam.

3.4.3.5 U.S. Pacific Remote Island Areas

The total reef area around the U.S. Pacific remote island areas is 620 km^2, of which 112 km^2 is offshore (3-200 nm). The biological diversity of coral reef ecosystems in these areas varies considerably from island to island. Fish densities and biomass are higher than around the populated islands in the region. Rare species occur in some areas. For example, giant clams are prolific throughout the lagoon at Wake Atoll (Green 1997).

Johnston Atoll has a unique mix of coral reef species not duplicated elsewhere in the Pacific. Invertebrates from both the western and central Pacific are present, indicating that the atoll serves as a bridge connecting distributions of Polynesian and Micronesian invertebrate fauna. The coral fauna has a strong affinity with that of Hawaiʻi but the appearance of the reef is quite different. This is due to the dominance of *Acropora*, not found in the main Hawaiian Islands, and the lack of the common Hawaiian species, *Porites compressa*.

3.4.4 Value of Ecosystems and Biodiversity

Most of the information in this section pertains only to the value of the coral reef ecosystem around the NWHI, as it is the impact of the bottomfish fishery on this ecosystem that has been identified as a particular environmental concern in scoping (Section 1.2).

3.4.4.1 Categories of Economic Values

As noted in Section 3.3.4, preserving an environmental asset such as an ecosystem or particular species may generate a range of use and non-use values for humans. Categories of benefits arising from the conservation of ecosystems and components of biological diversity are listed in Table 3.11. In this section those categories are used as a framework to examine the economic value of the coral reef ecosystem around the NWHI.

3.4.4.2 Possible Economic Values Attributed to the Coral Reef Ecosystem of the NWHI

3.4.4.2.1 Consumptive Direct Use Value

Potential consumptive direct uses of the coral reef ecosystem include harvesting reef species for commercial purposes, including food, the aquarium trade, construction materials, curios, jewelry, pharmaceuticals and traditional medicines. At present, the only consumptive commercial use of the coral reef ecosystem in the NWHI is the harvest of bottomfish resources. This fishery occurs in waters deeper than 20 m. Most of the shallow reefs of the NWHI lie within the boundaries of the Hawaiian Islands National Wildlife Refuge where fishing is prohibited. Recreational fishing occurs within the Midway Atoll National Wildlife Refuge but is largely limited to "catch-and-release" fishing.

3.4.4.2.2 Non-consumptive Direct Use Value

As a result of the rise in tourism-related ocean recreation in Hawaiʻi, a premium has been placed on non-consumptive direct uses of near-shore marine resources (Pooley 1993a). This emphasis on the recreational benefits of coral reefs is not limited to Hawaii. Constanza et al. (1997) reported that the highest valued use of coral reefs world-wide is recreation. Because the coral reef ecosystem around parts of the NWHI is arguably among the most pristine in the world, the non-consumptive value of this ecosystem is likely to be substantial. Historically, the recreational use of the coral reefs around the NWHI has been negligible due to the remoteness of the islands, lack of visitor facilities and legal restrictions. However, as discussed in Section 3.3.4.2.2, public access to the NWHI was, for a time, improved by the establishment of an eco-tourism operation in the Midway Atoll National Wildlife Refuge. Tourist activities in the refuge included sport fishing, diving and wildlife observation. Additional outdoor recreational activities for the public are included in the public use plan for the refuge and may be offered to visitors in the future (USFWS 1997). Among these activities are shoreline fishing, lobstering, night diving, night fishing, kayaking tours and glass-bottom boat excursions.

3.4.4.2.3 Secondary Value

Opportunities for the public to acquire information about the marine and terrestrial ecosystems of the NWHI are provided by various books, brochures, films, interpretive exhibits and other communication media that have been produced by public and private sector organizations. Considering the visual beauty of the relatively pristine coral reefs around parts of the NWHI, it is likely that the value of viewing this ecosystem in books or on film and television is high.

3.4.4.2.4 Scientific Value

The potential biochemical and genetic benefits of coral reef ecosystems are generally considered to be significant due to their high species diversity. In fact, coral reefs are considered to be the primary source of new medicines and biochemicals in the twenty-first century (The Working Groups of the U.S. Coral Reef Task Force 1999). A number of bio-prospecting ventures are currently collecting samples from coral reef areas around the Pacific. For example, the U.S. National Cancer Institute has contracted the Coral Reef Research Foundation, a non-profit organization based in the Republic of Belau, to collect and identify coral reef and other marine organisms for anti-cancer and anti-AIDS screening tests (Coral Reef Research Foundation undated). In addition, the Marine Laboratory of the University of Guam is seeking new examples of the chemical deterrents that coral reef organisms possess to deter predators (Guyer undated). That study is being conducted in collaboration with researchers at the University of Hawaiʻi who are examining the properties of these chemical deterrents. Some of these substances could have biomedical uses - they might kill cancer cells, halt inflammatory responses, or deter microbes and viruses - and others may be effective insecticides for use in agriculture.

In addition to their value as a reservoir of genetic material, the marine and terrestrial ecosystems of the NWHI provide unique opportunities for study, both as undisturbed areas and as sites whose history of human intrusion is well documented (Shallenberger 1980). For example, pristine areas can provide environmental baselines against which the extent of impacts elsewhere can be measured.

3.4.4.2.5 Indirect Value

Coral reef ecosystems world-wide play an important role in climate regulation, nutrient storage and cycling, shoreline erosion inhibition and storm protection (WPRFMC 2000a). Additionally, coral reefs may serve important ecological functions that support offshore commercial and recreational fisheries (WPRFMC 2000a). For example, the larvae of many coral reef organisms contribute to the diets of tuna and other pelagic species. Several types of bottomfish, including snapper and grouper, use the coral reef habitat as juveniles.

3.4.4.2.6 Existence Value

The following excerpt from the HINWR Master Plan/EIS suggests that the marine and terrestrial ecosystems of the NWHI may have significant existence value due to their distinctive qualities:

> *Many concerned individuals and groups have acknowledged the desirability of measures to limit public access to the HINWR (including their own) if, as a result, the unique values of the area are preserved. For these people, the "quality of life"*

> *is enhanced by simply knowing this unique resource is protected, whether or not they experience it first hand* (USFWS 1986:3.35).

The uniqueness of the coral reef ecosystem in the NWHI is related, in part, to the fact that such relatively pristine marine areas are quite rare in the U.S. The remote geographic location of the NWHI has helped protect its resources from the impacts of humans. It is likely that a significant number of people derive pleasure from the contemplation of the varied life forms existing in Hawaiʻi's coral reef ecosystem.

3.4.4.3 Estimate of the Economic Value of the NWHI Coral Reef Ecosystem

A recent analysis of the economic value of the coral reefs around U.S. Pacific Islands roughly estimated the net value (consumer surplus) of recreational fishing for coral reef species in the Midway Atoll National Wildlife Refuge to be $8,000 to $38,000 per year while it operated (WPRFMC 1999). The analysis assumed that in the commercial coral reef fisheries fishermen as a group are earning a net economic return (producer surplus) of zero because of excess fishing effort in those fisheries. The annual net value of marine-based tourism in the State of Hawaiʻi was calculated to be between $0.34 billion and $1.35 billion. It was estimated that recreational SCUBA diving accounted for 3 to 4% of this value. The analysis noted that the potential for marine-based tourism in the NWHI is low compared to the rest of the state because of the limited accessibility of the NWHI. However, the analysis also noted that the option value of preserving the relatively pristine reefs in the NWHI for SCUBA diving and other recreational uses may be very high.

A management regime that preserves sufficient area of habitat to conserve the ecosystem of which the endangered Hawaiian monk seal is a part would tend to enhance the monk seal population and increase the probability of species survival. Consequently, an implicit value of protecting the NWHI coral reef ecosystem may be the value that people assign to preservation of the Hawaiian monk seal (Section 3.3.4.3). Of course, preserving habitat would also help safeguard populations of other types of plants and animals, and one would expect this habitat protection to be worth more than just the benefits provided to a single endangered species.

3.4.4.4 Alternative Value Paradigms

As discussed in Section 3.3.4.4, some individuals may hold religious or philosophical convictions that humankind has an ethical obligation to preserve species and ecosystems, notwithstanding any utilitarian benefits. While these moral arguments may be relevant to conservation decisions, it is difficult to gauge how prevalent such convictions are among Americans. Additional surveys and polls are needed to better understand the motives underlying public support of activities that protect species and ecosystems.

3.5 COMMERCIAL, RECREATIONAL AND CHARTER FISHING SECTORS

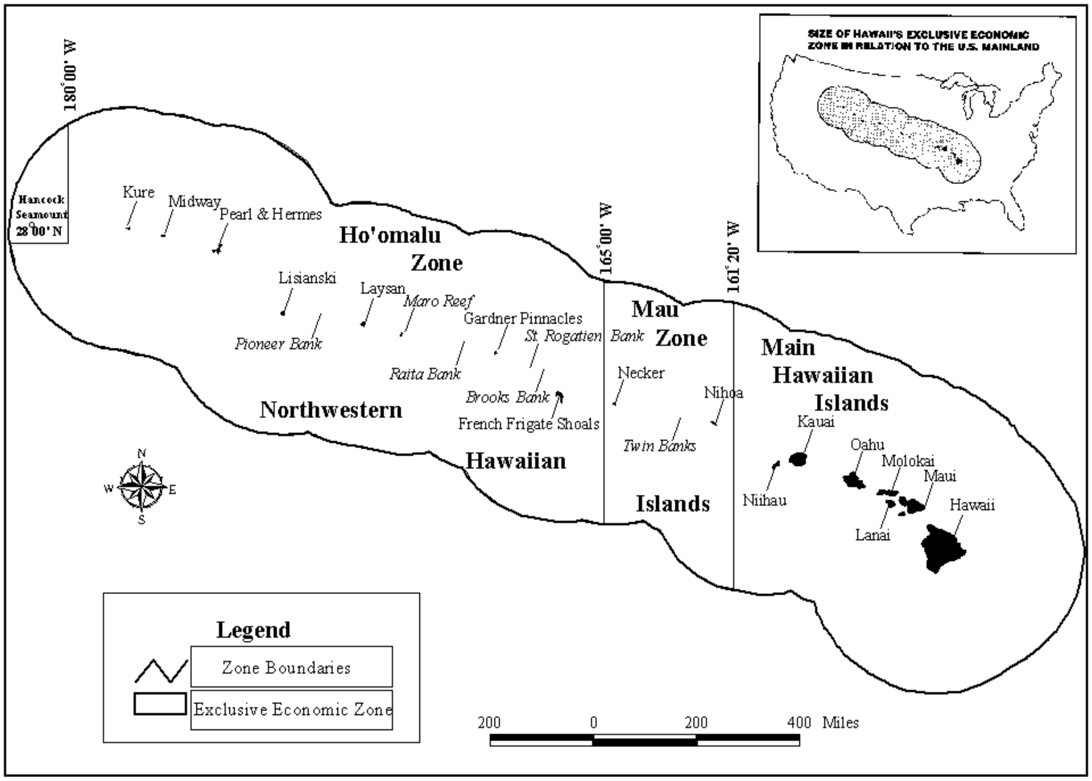
3.5.1 Hawaiʻi

The deep-slope bottomfish fishery in Hawaiʻi concentrates on species of eteline snappers, carangids and a single species of grouper concentrated at depths of 30-150 fm. The fishery can be divided into two geographical areas (Figure 3-7): the inhabited main Hawaiian Islands (MHI) with their surrounding reefs and offshore banks; and the Northwestern Hawaiian Islands (NWHI), a chain of largely uninhabited islets, reefs and shoals extending 1,200 nm across the North Pacific. In the MHI approximately 80% of the bottomfish habitat lies in state waters. Bottomfish fishing grounds within federal waters around the MHI include Middle Bank, most of Penguin Bank and approximately 45 nm of 100-fathom bottomfish habitat in the Maui-Lānaʻi-Molokaʻi complex (see Figure 2-8). For management purposes the NWHI fishery has been separated into the Mau Zone, closer to the MHI, and the Hoʻomalu Zone.

In addition to the deep-slope fisheries in the MHI and NWHI, there is a potential seamount groundfish fishery in the Hawaiian Islands. A trawl and bottom longline fishery targeting alfonsin and armorhead at the southeast Hancock Seamount in the NWHI was started by Russian and Japanese fishing vessels in the late 1960s (Okamoto 1982). Large catches were made by foreign fishing vessels for about 10 years until overfishing caused the fishery to collapse. A moratorium on the harvest of alfonsin and armorhead on the Hancock Seamounts has been in effect since 1986 in an effort to rebuild the stocks (63 FR 35162, June 29, 1998). The moratorium is in effect until 2004 and may be extended. Because periodic reviews of the stocks indicate that no recovery has occurred and it is unlikely that the moratorium will be lifted in the near future, the seamount groundfish fishery will not be further discussed in this section.

Bottomfish fishing also occasionally occurs in the waters around the U.S. Pacific remote island areas, but the catches have been small. The last recorded commercial harvest was in 1999 when a vessel from Hawaiʻi harvested 40,000 lbs. of spot snapper at Kingman Reef. The vessel ceased fishing in the area after part of the catch tested positive for ciguatera poisoning. Because the bottomfish fisheries occurring around the remote islands are very limited and sporadic, they will not be further discussed in this section.

FIGURE 3-7: Bottomfish Fishery Management Subareas in the Hawaiian Archipelago



3.5.1.1 History

Bottomfish fishing was a part of the economy and culture of the indigenous people of Hawai‘i long before European explorers first visited the islands. Descriptions of traditional fishing practices indicate that Native Hawaiians harvested the same deep-sea bottomfish species as the modern fishery and used some of the same specialized gear and techniques employed today (Iversen et al. 1990). The *po*‘*o lawai*‘*a* (expert fishermen) within the community knew of dozens of specific *ko*‘*a* (fishing areas) where bottomfish could be caught (Kahaulelio 1902). As Beckley (1883:10) noted, each *ko*‘*a* could be precisely located:

> *Every rocky protuberance from the bottom of the sea for miles out, in the waters surrounding the islands, was well known to the ancient fishermen, and so were the different kinds of rock fish likely to be met with on each separate rock….[They] took their bearing for the purpose of ascertaining the rock which was the habitat of the particular fish they were after, from the positions of the different mountain peaks.*

European colonization of the Hawaiian Islands during the early nineteenth century and the introduction of a cash economy led to the development of a local commercial fishery. As early as 1832, fish and other commodities were sold near the waterfront in Honolulu (Reynolds 1835). Other fish markets were established on the islands of Maui and Hawaiʻi. John Cobb (1902), who investigated Hawaiʻi's commercial fisheries in 1900 for the U.S. Fish Commission, reported that the bottomfish *ʻulaʻula*, *uku* and *ulua* were three of the five fish taken commercially on all the Hawaiian Islands.

Initially, the commercial fishing industry in Hawaiʻi was monopolized by Native Hawaiians, who supplied the local market with fish using canoes, nets, traps, spears and other traditional fishing devices (Jordan and Evermann 1902; Cobb 1902). However, the role that Native Hawaiians played in Hawaiʻi's fishing industry gradually diminished during the latter half of the nineteenth century as successive waves of immigrants of various races and nationalities arrived in Hawaiʻi. Between 1872 and 1900, the non-indigenous population increased from 5,366 to 114,345 (OHA 1998). Kametaro Nishimura, credited by some to be the first Japanese immigrant to engage in commercial fishing in Hawaiʻi, began his fishing career in the islands in 1885 harvesting bottomfish such as *ʻōpakapaka*, *ulua* and *uku* (Miyaski 1973). By the turn of the century, Japanese immigrants to Hawaiʻi dominated the bottomfish fishery using wooden-hulled "sampans" propelled by sails or oars (Cobb 1902). The sampan was brought to Hawaiʻi by Japanese immigrants during the late nineteenth century, and over time Japanese boat-builders in Hawaiʻi adapted the original design to specific fishing conditions found in Hawaiʻi (Goto et al. 1983). The bottomfish fishing gear and techniques employed by the Japanese immigrants were imitations of those traditionally used by Native Hawaiians, with slight modifications (Konishi 1930).

During the early years of the commercial bottomfish fishery, vessels restricted their effort to areas around the MHI. Cobb (1902) records that some of the best fishing grounds were off the coasts of Molokaʻi and notes that large sampans with crews of 4 to 6 men were employed in the fishery. Typically, the fleet would leave Honolulu for the fishing grounds on Monday and return on Friday or Saturday. The fishing range of the sampan fleet increased substantially after the introduction of motor powered vessels in 1905 (Carter 1962). Fishing activity was occurring around the NWHI at least as early as 1913, when one commentator recorded: "Fishing for *ulua* and *kāhala* is most popular, using *bonito* for bait, fishermen seek this [sic] species in a 500 mile range toward Tori-Jima [NWHI]" (Japanese Consulate 1913, as cited in Yamamoto 1970:107). Within a few years more than a dozen sampans were fishing for bottomfish around the NWHI (Anon. 1924; Konishi 1930). Fishing trips to the NWHI typically lasted 15 days or more, and the vessels carried seven to eight tons of ice to preserve their catch (Nakashima 1934). The number of sampans traveling to the more distant islands gradually declined due to the limited shelter the islands offered during rough weather and the difficulty of maintaining the quality of the catch during extended trips (Konishi 1930). However, during the 1930s, at least five bottomfish fishing vessels ranging in size from 65 to 70 ft continued to operate in the waters around the NWHI (Hau 1984). In addition to catching bottomfish, the sampans harvested lobster, reef fish, turtles and other marine animals (Iversen et al. 1990).

During World War II the bottomfish fishery in Hawaiʻi virtually ceased operations, but it recommenced shortly after the war ended (Haight et al. 1993b). The late 1940s saw as many as nine vessels fishing around the NWHI, but by the mid-1950s, vessel losses and depressed fish prices resulting from large catches had reduced the number of fishery participants. During the 1960s, only one or two vessels were operating around the NWHI.

There was renewed interest in harvesting the bottomfish resources of the NWHI in the late-1970s following a collaborative study of the marine resources of the region by state and federal agencies (Haight et al. 1993b). The entry of several modern boats into the NWHI fishery and the resultant expanding supply of high-valued bottomfish such as ʻō*pakapaka* and *onaga* made possible the expansion of the tourism-linked restaurant market by allowing a regular and consistent supply of relatively fresh fish (Pooley 1993a). Markets for Hawaiʻi bottomfish further expanded after wholesale seafood dealers began sending fish to the U.S. mainland. By 1987, 28 vessels were active in the NWHI bottomfish fishery, although only 12 were fishing for bottomfish full time. Some of the non-full time vessels also engaged in the pelagic or lobster fisheries (Iversen et al. 1990). In 1989, the Council developed regulations that divided the fishing grounds of the NWHI bottomfish fishery into the Hoʻomalu Zone and Mau Zone. Limited access programs were established for the Hoʻomalu Zone and Mau Zone in 1988 and 1999, respectively, to avoid economic overfishing (Pooley 1993b; WPRFMC 1998b).

The 1970s also saw major changes in the composition and operations of the bottomfish fishery around the main Hawaiian Islands. The fishery changed from one dominated, in terms of catch and effort, by a relatively small number of full-time professional fishermen to one dominated by hundreds of part-time commercial and recreational fishermen. This change was the result of a number of factors. The popularity of offshore fishing increased in Hawaiʻi with the increase in the availability of locally-built and imported small fiberglass boats. In addition, the rise in fuel prices during the 1970s made fishing for bottomfish particularly attractive to fishermen as it consumed less fuel than trolling and generated higher-value fish catches to offset fuel costs. Finally, as navigation systems, bottom-sounders and hydraulic or electric powered reels became more affordable, the skill level and experience necessary to fish bottomfish successfully was reduced and the labor associated with hauling up the long lines was considerably lightened.

During the early 1980s, with the development of a much larger market for bottomfish, bottomfish fishermen fishing around the main Hawaiian Islands were able to obtain premium prices for their catches, and thus were motivated to increase their landings (Pooley 1993a). However, the number of vessels participating in the MHI fishery declined after reaching a peak of 583 in 1985. The decrease in fishing effort suggests that some bottomfish fishermen perceived a growing shortage of bottomfish in the MHI fishery and switched to other fisheries. In 1998, concerns about decreasing catch rates led the State of Hawaiʻi to close certain areas around the MHI to bottomfish fishing, including areas of Penguin Bank within the EEZ[23]. In addition, new state rules established a recreational bag limit of five *onaga* or *ehu*, or a mix of both, per person.

Hawaiʻi's sportfishing charter boat fleet began to develop during the early 1950s as Hawaiʻi became an increasingly popular tourist destination (Markrich 1994). What started as a few charter boats operating out of harbors such as Kewalo Basin and Kona has evolved into a highly competitive industry involving nearly 200 vessels state-wide (Hamilton 1998; Walker 1996). The charter boat fleet mainly targets pelagic game fish such as billfish and tuna. However, a few charter boats take bottomfish fishing trips if patrons are interested (Hamilton 1998). Most of the charter boats engaged in bottomfish fishing are based on the islands of Maui and Kauaʻi.

3.5.1.2 Fishing Methods and Current Use Patterns

The basic design of the handline gear used in Hawaiʻi's bottomfish fisheries has remained essentially unchanged from gear used by early Native Hawaiians (Haight et al. 1993b). The gear consists of a main line with a 2-4 kg weight attached to the terminus. Several 40-60 cm sidelines with circle hooks are attached above the weight at 0.5-1 m intervals. A chum bag containing chopped fish or squid may be suspended above the highest of these hooks. The gear is pulled after several fish are hooked.

Circle hooks used in the bottomfish fishery are flat by design. "Kirbed" hooks (bent or offset to the side) are also available but are not generally used. The flat circle hooks are designed to be self setting and work well for fish that engulf the bait and move off with it in their mouth. As a fish moves off with the baited hook, the line will trail out of the corner of the fish's mouth. The hook will be drawn into the corner of the mouth where the motion of the fish in relation to the pull of the line will rotate the hook through the corner of the jaw. Circle hooks, unlike "J" type hooks, are generally not effective for fish that pick at the bait or mouth the bait and spit it out (Kawamoto pers. comm.).

Fishermen use the circle hooks for its self setting ability and for its curved design with its long inward pointing hook point that makes it difficult for the fish to rid itself of the hook once it is

[23]The State of Hawaiʻi claims the authority to manage and control the marine, seabed and other resources within "archipelagic waters." These archipelagic waters encompass a number of bottomfish fishing grounds, such as parts of Penguin Bank, that lie inside the EEZ. An October 24, 1997 memorandum from NOAA/General Counsel Southwest Region to the Council Chairman declared that, despite any contentions by the State of Hawaiʻi to the contrary, for purposes of federal fishery management, state waters do not extend beyond three miles from the coast.

embedded. The circle hook shank is typically thicker and round in cross section(unlike the thinner straight J type hooks) which tends to minimize ripping or wearing a hole in the fish's jaw. The additional characteristic of the circle hook design that appeals to fishermen is its tendency of being less prone to snagging on rocky or hard substrate bottoms and being very difficult to snag flat or smooth surfaces. This characteristic minimizes the loss of gear. (Kawamoto pers. comm.).

All bottomfish fishermen in Hawaiʻi target the same assemblage of bottomfish species. The ability to target particular species varies widely depending on the skill of each captain. Electronic navigation and fish-finding equipment greatly aid fishermen in returning to a particular fishing spot and catching desired species with little incidental catch (Haight et al. 1993). According to Hau (1984), ʻō*pakapaka* is one of the primary target species due to the relatively high price it commands as a result of its constant demand at the fish auction. *Hāpuʻupuʻu* and white *ulua* are sought because of their sturdiness and ability to retain good flesh quality. In addition, white *ulua* can be caught in rough sea conditions when other species are difficult to capture. *Kāhala* are one of the least valuable bottomfish because large specimens have a reputation for carrying ciguatera toxin.

3.5.1.2.1 MHI

In the small boat fishery around the MHI the distinction between "recreational" and "commercial" fishermen is extremely tenuous (Pooley 1993a). A state-wide survey of small boat fishermen conducted in 1995-96 indicated that of the 42 fishermen interviewed who predominately use bottomfish fishing gear, 80 percent sell a portion of their catch (WPRFMC 1996). However, most of those selling fish are just trying to cover fishing trip expenses and do not expect a profit from their operation.

The individuals participating in the MHI fishery that take trips longer than 24 hrs are mostly full-time commercial fishermen. They typically operate larger boats than the part-time commercial/recreational fishermen and are able to fish during rough weather and venture further from port to fish less-exploited areas off Kauaʻi, Niʻihau and east Maui that are less accessible to the small boat fishermen.

The majority of participants in the MHI fishery shift from species group to species group and from the bottomfish fishery to other fisheries, primarily the pelagics fishery, in response to seasonal fish abundance or fluctuations in price. Except for those individuals who fish commercially on a full-time basis, most fishermen usually fish for bottomfish no more than 60 days a year (WPRFMC 1996). Seasonal price variability causes part-time commercial fishermen to concentrate their bottomfish fishing effort during December, when they can take advantage of the year-end holiday demand for red snappers. Pelagic species are often an important secondary target during bottomfish fishing trips regardless of the season.

Data from various surveys indicate that the importance of the MHI fishery varies significantly among fishermen of different islands. According to a 1987 survey of boat fishing club members, bottomfish represented roughly 13% of the catch of Hawaiʻi fishermen, 25% of the catch of Oʻahu and Kauaʻi fishermen and 75% of the catch of Maui fishermen (Meyer Resources 1987). A survey of licensed commercial fishermen conducted about the same time indicated that the percentage of respondents who used bottomfish fishing methods was 25% on Hawaiʻi, 28% on Kauaʻi, 29% on Oʻahu, 33% on Lānaʻi, 50% on Molokaʻi and 51% on Maui (Harman and Katekaru 1988). Presumably, the differences among islands relate to the proximity of productive bottomfish fishing grounds.

Favored grounds in the MHI include banks off Molokaʻi, Maui, Lānaʻi and Kauaʻi. These grounds account for more than about two-thirds of the bottomfish harvested in the MHI. Specific bottomfish fishing locales favored by fishermen vary seasonally according to sea conditions and the availability and price of target species. Historically, Penguin Bank is one of the most important bottomfish fishing grounds in the MHI, as it is the most extensive shallow shelf area in the MHI and within easy reach of major population centers. Penguin Bank is particularly important for the MHI catch of *uku*, one of the few bottomfish species available in substantial quantities to Hawaiʻi consumers during summer months. For the period 1991 to 1995, 8% of the licensed commercial fishermen who participated in the MHI bottomfish fishery reported catches from Penguin Bank (WPRFMC 1996). A comparison of the percentage of the total commercial landings of five major bottomfish species in the MHI represented by Penguin Bank from 1980 to1984 and 1991 to 1995 shows that the bank has increased in importance over the years (Table 3-14).

TABLE 3-14: Average Percentage of Total MHI Commercial Catch of Major Bottomfish Species Harvested from Penguin Bank, 1980-1984 and 1991-1995

SPECIES	AVERAGE ANNUAL PERCENT OF TOTAL MHI CATCH	
	1980-1984	1991-1995
ʻŌpakapaka	9.63	16.11
Uku	12.06	44.04
Onaga	14.87	20.24
Ehu	12.15	17.60
Hāpuʻupuʻu	4.31	6.64

Source: WPRFMC 1996

Data for 1995 indicate that the importance of Penguin Bank and other bottomfish fishing areas may vary among fishermen of different islands. If it is assumed that the port of landing is also the vessel's home port, Table 3-15 indicates that Penguin Bank is frequented mostly by bottomfish fishermen residing on Oʻahu, while Middle Bank is especially popular among fishermen living on Oʻahu and Kauaʻi. The Maui-Lānaʻi-Molokaʻi complex is frequented mostly by bottomfish fishermen residing on Maui, Molokaʻi and Oʻahu.

3.5.1.2.2 NWHI

In contrast to the MHI fishery, bottomfish fishing in the NWHI is conducted solely by part-time and full-time commercial fishermen. The vessels venturing into the NWHI tend to be larger than those fishing around the MHI, as the distance to fishing grounds is greater (Haight et al. 1993b). As the number of vessels participating in the NWHI fishery increased during the 1980s, the fleet characteristics of the fishery became more diverse. Pooley and Kawamoto (1990) divided the fleet into three groups based on size and mode of propulsion: motor sailors, medium-sized powered vessels and large-sized powered vessels. The motor sailors are 46 to 66 ft long and are more streamlined in hull design than the standard powered vessels. The sail can be used to save on fuel costs, but it also limits the hold capacity compared with powered vessels of similar length. The powered vessels generally share one characteristic: a large working area on the back deck. The medium-sized powered vessels are 42 to 49 ft long. Because their smaller size limits fishing range and hold capacity, they usually operate in the lower (southeastern) end of the NWHI or in the MHI. The larger powered vessels are 47 to 64 ft long. With an average fuel capacity of 1,500 gallons, the vessels have a maximum range (round-trip) of 1,800 miles. The average maximum hold capacity is 4,000 pounds.

TABLE 3-15: Number of Vessels Harvesting Bottomfish by Fishing Area and Port of Landing, 1995.

FISHING AREA	PORT OF LANDING							
	Hawaiʻi	Maui	Lānaʻi	Molokaʻi	Oʻahu	Kauaʻi	Unknown	Total
Penguin Bank	0	3	0	1	64	0	0	67
Middle Bank	0	0	0	0	4	6	0	9
Hawaiʻi	315	1	0	0	4	0	0	317
Maui-Lānaʻi-Molokaʻi	0	174	12	26	16	0	0	286
Oʻahu	0	0	0	0	208	0	2	210
Kauaʻi	0	0	0	0	2	169	0	180

FISHING AREA	PORT OF LANDING							
	Hawaiʻi	Maui	Lānaʻi	Molokaʻi	Oʻahu	Kauaʻi	Unknown	Total
NWHI	0	0	0	0	13	4	1	16
Other	0	1	0	0	7	4	2	12
Total	315	178	12	27	271	176	3	963

Note: Columns and rows may not sum due to multiple ports of landing and fishing areas for individual license holders.
Source: WPRFMC 1996

Many of the boats that fish in the Mau Zone switch to different fisheries and move to other fishing grounds during the year. The majority of vessels fish in the Mau Zone during a season that generally extends from November to April.

A 1993 survey of participants in the NWHI fishery found that vessels fishing in the Mau Zone made an average of 12.7 trips to the area to target bottomfish and 3.4 trips to target pelagic fish or a mixture of pelagic species and bottomfish (Hamilton 1994). In addition, during that year an average of 5.6 trips were made by these vessels to bottomfish fishing grounds around the MHI. Although bottomfish fishing in the Mau Zone is not the only activity of these boats, it may be vital to the year-round operations of some fishermen.

The fishing strategies and catch levels of vessels fishing in the Hoʻomalu Zone tend to be fairly uniform (Pan 1994). The 1993 survey referred to above found that all boats fishing in the Hoʻomalu Zone were engaged exclusively in commercial bottomfish fishing (Hamilton 1994). They averaged 9 trips per year to the zone, and the average trip length was about three weeks.

Popular fishing grounds in the Mau Zone include the waters around Nihoa Island and Necker Island (Table 3-16). Especially productive fishing areas in the Hoʻomalu Zone are Brooks Bank, Laysan Island and Gardner Pinnacles. During rough sea conditions bottomfish fishing vessels that take refuge in the relatively sheltered waters around French Frigate Shoals may fish on relatively shallow (10-50 fm) reefs (WPRFMC 2000a).

TABLE 3-16: Approximate Percentage of Total Catch in NWHI Bottomfish Fishery from Selected Areas Based on Historical Fishing Data

AREA	PERCENT OF TOTAL CATCH
Nihoa Island and Twin Banks	16.6
Brooks Bank and St. Rogatien Bank	14.2

AREA	PERCENT OF TOTAL CATCH
Laysan Island	13.6
Necker Island	13.0
Gardner Pinnacles	12.9
Lisianski Island	6.8
French Frigate Shoals	5.6
Kure Atoll	4.4
Maro Reef	4.2
Pioneer Bank	4.0
Raita Bank	2.6
Pearl and Hermes Reef	2.1
Midway Atoll	0.0

Note: Percentages from NMFS landings data for 1997-1999.
Source: M. Mitsuyasu pers. comm. 2000. WPRFMC

3.5.1.3 Harvest

3.5.1.3.1 MHI

Only commercial landings data are available for the MHI fishery because the State of Hawaiʻi does not require a saltwater recreational fishing license and there are no state or federal reporting requirements for recreational fishing in the waters around Hawaiʻi (Section 3.9.1). It is estimated that the recreational/subsistence catch in the MHI bottomfish fishery is about equal to the commercial catch (WPRFMC 1999). Charter boat operators are considered to be commercial fishermen under Hawaiʻi statute and therefore are required to submit monthly catch reports. Consequently, charter boat catches are included in estimates of commercial landings.

Based on recent (1995-2000) harvest data, commercial bottomfish catches in the MHI fishery represent approximately 60 percent of the total commercial bottomfish harvest in Hawaiʻi (WPRFMC in prep.). The annual bottomfish harvest in the MHI has been fairly stable for the past 10 years (Figure 3-8; Table 3-17). However, the catch per unit effort (CPUE, in pounds landed per trip) in the MHI fishery shows a long-term decreasing trend, with current values approximately 25% that of the first recorded estimates (Figure 3-9; Table 3-18). MHI CPUE values decreased in 2000 by nine percent from the 1999 level, but remained above the 1995-1998 values, which were the lowest on record. The 1999 increase in MHI CPUE was due primarily to a large increase in *uku*, and to a lesser degree *onaga*, catches and catch rates. This relative peak in CPUE is similar to that of the late 1980s, which was due to increased *uku* catch rates alone, and may not indicate an increase in abundance of other species in either case. Rapid decreases in CPUE from the 1989-90 *uku*-derived peaks appear to be a return to the prevailing slow decline (WPRFMC in prep.).

TABLE 3-17: Commercial Bottomfish Landings in the MHI and NWHI, 1984-2000 (1000 lb)

YEAR	MAU	HOʻOMALU	TOTAL NWHI	MHI[2]
1984	NA	NA	661	807
1985	NA	NA	922	763
1986	NA	NA	869	810
1987	NA	NA	1015	783
1988	NA	NA	625	1164
1989	118	184	303	1006
1990	249	173	421	646
1991[1]	103	283	387	548
1992[1]	71	353	424	587
1993[1]	98	287	385	348
1994[1]	160	283	443	458
1995[1]	166	202	369	440
1996[1]	135	176	311	440
1997[1]	105	241	346	513
1998[1]	66	266	332	479
1999[2]	54	269	323	455
2000[2]	49	213	262	478[3]
mean	114.50	244.17	494.00	884.12
s.d.	57.16	55.50	236.28	1028.90

Notes: 1. NWHI data from combination NMFS and HDAR; 2. Data from HDAR; 3. Preliminary data not expanded for full year estimate
Source: WPRFMC in prep.

TABLE 3-18: Bottomfish CPUE in the MHI and NWHI, 1948-2000 (lb/trip)

YEAR	MHI	MAU	HOʻOMALU	YEAR	MHI	MAU	HOʻOMALU
1948	614	5968	14635	1975	430	5439	NA
1949	713	6788	4614	1976	485	4653	NA
1950	677	4966	6072	1977	527	4387	4000
1951	621	4980	8228	1978	635	4753	3550
1952	577	7407	4766	1979	380	5361	4951
1953	645	8937	7627	1980	421	6210	6687
1954	887	6158	8613	1981	416	1336	8167
1955	755	4659	9336	1982	307	NA	7953
1956	784	2523	5202	1983	214	2242	3025
1957	789	3958	1535	1984	220	4308	4085
1958	533	NA	6254	1985	230	4239	5909
1959	519	NA	5897	1986	274	2206	5301
1960	630	6379	8139	1987	237	2889	8187
1961	496	6999	7978	1988	329	2136	4702
1962	491	4641	NA	1989	361	5412	5328
1963	518	6410	NA	1990	245	4454	4793
1964	619	8028	8390	1991	202	2413	5928
1965	503	6656	NA	1992	228	2092	7388
1966	536	4413	NA	1993	213	1992	8040
1967	602	14749	NA	1994	218	3748	4651
1968	478	6055	NA	1995	193	2460	5544
1969	480	11484	NA	1996	172	2823	5870
1970	433	7111	NA	1997	170	3294	5234
1971	433	4784	NA	1998	185	2518	5198
1972	514	2386	NA	1999	216	2926	4605
1973	421	3224	NA	2000	196	2525	5259
1974	329	3367	NA	mean	440	4797	6196
				s.d.	190	2513	2238

Source: WPRFMC in prep.

FIGURE 3-8: Commercial Landings of Bottomfish in the MHI and NWHI Bottomfish Fisheries, 1984-2000

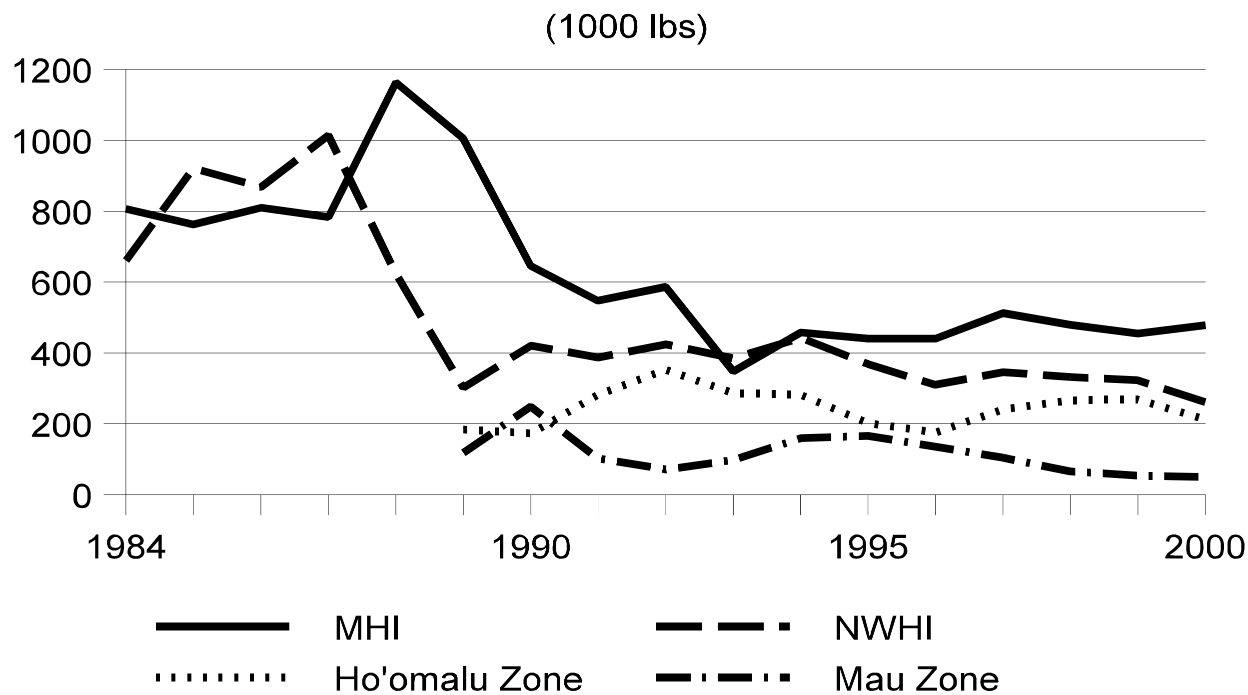
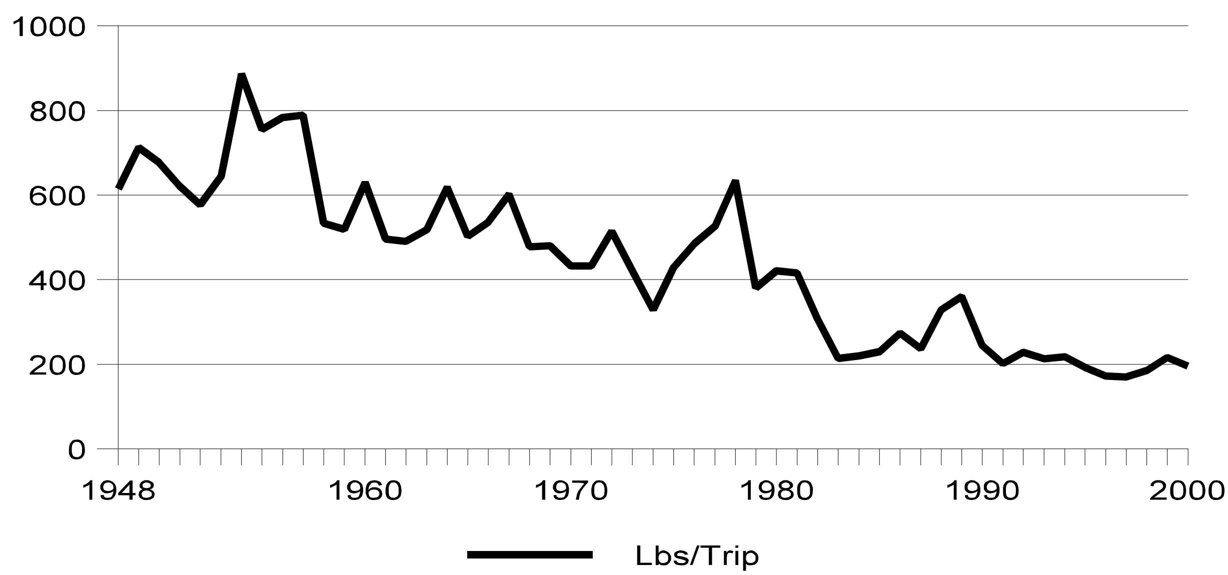


FIGURE 3-9: Catch Per Unit Effort in the MHI Bottomfish Fishery, 1948-2000



3.5.1.3.2 NWHI

Virtually all of the bottomfish caught in the NWHI fishery are sold, and therefore are required to be reported under State of Hawaiʻi law (Section 3.9.1). NWHI bottomfish landings grew dramatically in the mid-1980s and then tailed off, stabilizing in the 1990s at a level slightly below the MHI bottomfish landings (Figure 3-8; Table 3-17).

The 2000 NWHI BMUS landings decreased 19 percent from the prior year. The largest decrease occurred in the Hoʻomalu Zone where there was a 21 percent drop. This decrease was due mainly to a decrease in the number of trips made, as the average BMUS landings per trip rose by five percent (Figure 3-10). There were two vessels that made the minimum trips and landings required to maintain their permits.

The Mau Zone landings decreased 9 percent, mainly due to the exit of one full-time bottomfishing vessel. The decline is related to the decreasing participation of full-time bottomfish fishing operations and highlights the multipurpose, multi-fishery type of operations that comprise the majority of Mau Zone participants. Mau Zone vessels are now primarily part-time and combination troll/bottomfish multi-fishery vessels. There are very few, if any, full-time bottomfish fishing vessels working in the Mau Zone. Prior to 2000, an example of the effects of a full-time highliner[24] vessel entering the fishery can be seen in the landings from 1994-97. In 1994, a full-time commercial bottomfish fisherman entered the Mau Zone fishery and immediately made a large impact on the total landings for the duration of its participation through mid-1997. The same highliner vessel then entered the Hoʻomalu Zone fishery late in 1997 and made an immediate impact on the volume of landings (WPRFMC in prep.)

The 2000 Hoʻomalu Zone landings by species show an increase in the percentage of *onaga* and *uku*, perhaps indicating that fishermen are targeting the more abundant *uku* or higher priced *onaga*.

In the Mau Zone, trip CPUE dropped 14 percent from 1999 values to about 42 percent of early values. On a catch-per-day basis[25] (Figure 3-11; Table 3-19), the 2000 Mau Zone CPUE dropped 23 percent to 61 percent of earliest values. Declines in CPUE for this zone may be largely due to the departure of highliners and greater concentration on other fishing methods, e.g., trolling, by participants.

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[24] A highliner is one of the most successful vessels in the fleet.

[25] Data collected by HDAR and used for the MHI CPUE estimates do not include trip length. The NWHI bottomfish trip logs collected by NMFS include trip length, and this provides a more standardized measure of CPUE.

In the Hoʻomalu Zone, on the other hand, the 2000 CPUE increased 13-14 percent over 1999 values on both a daily and trip basis. This may be due to the recent entry of a highliner vessel from the Mau Zone.

FIGURE 3-10: Catch Per Unit Effort of Vessels Fishing in the Mau Zone and Hoʻomalu Zone, 1948-2000 (HDAR Data)

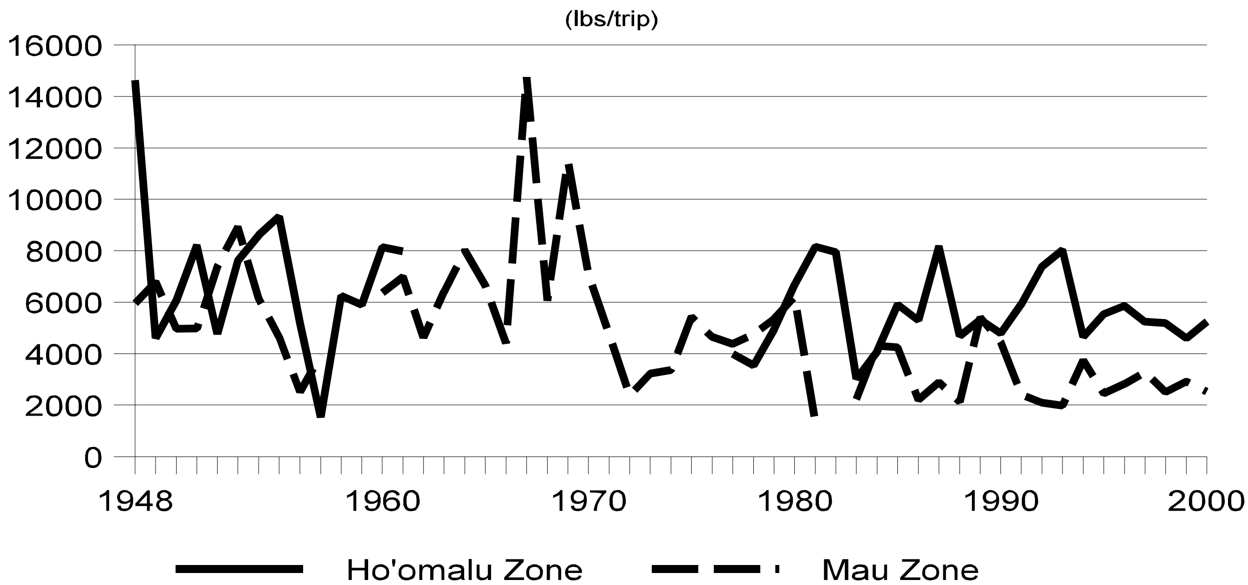
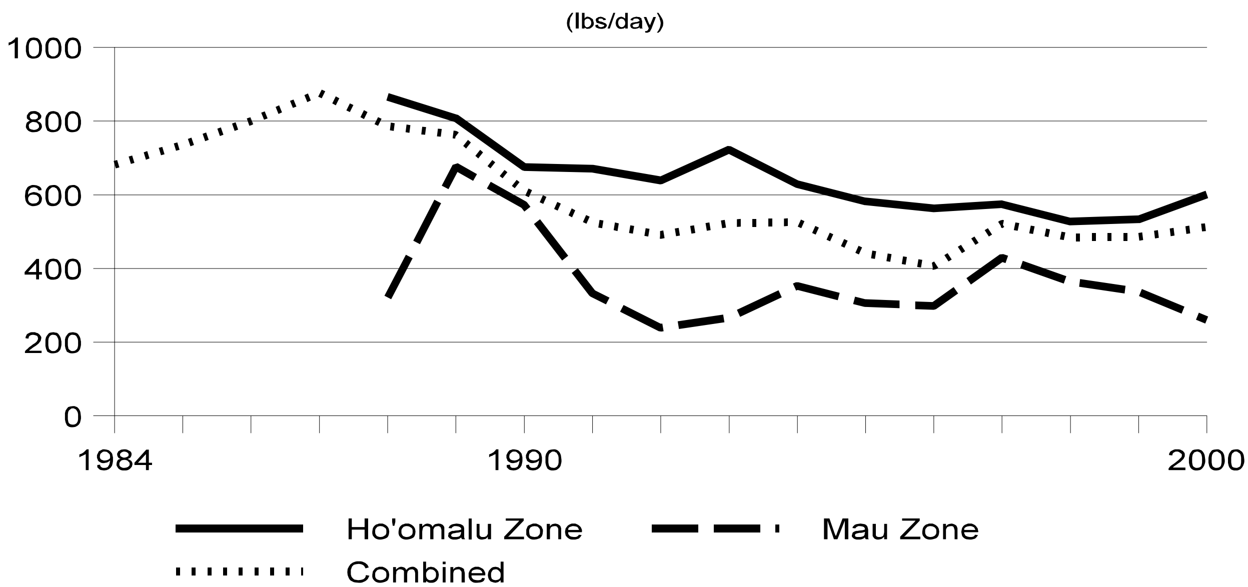


TABLE 3-19: Bottomfish CPUE in the MHI and NWHI, 1984-2000 (lb/day)

YEAR	MAU	HOʻOMALU	COMBINED	YEAR	MAU	HOʻOMALU	COMBINED
1984	NA	NA	682	1993	267	723	523
1985	NA	NA	736	1994	353	629	526
1986	NA	NA	800	1995	306	582	442
1987	NA	NA	877	1996	298	563	407
1988	322	866	786	1997	429	574	521
1989	677	808	763	1998	364	527	484
1990	573	675	611	1999	337	534	486
1991	333	671	525	2000	260	601	513
1992	239	639	491	mean	366.00	645.54	602.24
				s.d.	126.81	102.99	140.02

Source: WPRFMC in prep.

FIGURE 3-11: Catch Per Unit Effort of Vessels Fishing in the Mau Zone and Hoʻomalu Zone, 1984-2000 (NMFS Data)



3.5.1.4 Participation

3.5.1.4.1 MHI

The number of fishermen engaged in bottomfish fishing in the MHI increased dramatically in the 1970s but then declined in the early-1990s (Figure 3-12; Table 3-20). The decline in vessels and fishing effort may be due to the long-term decrease in catch rates in the bottomfish fishery and a shift of fishing effort towards tuna and other pelagic species. Effort and participation in the bottomfish fishery rose slightly during the late-1990s.

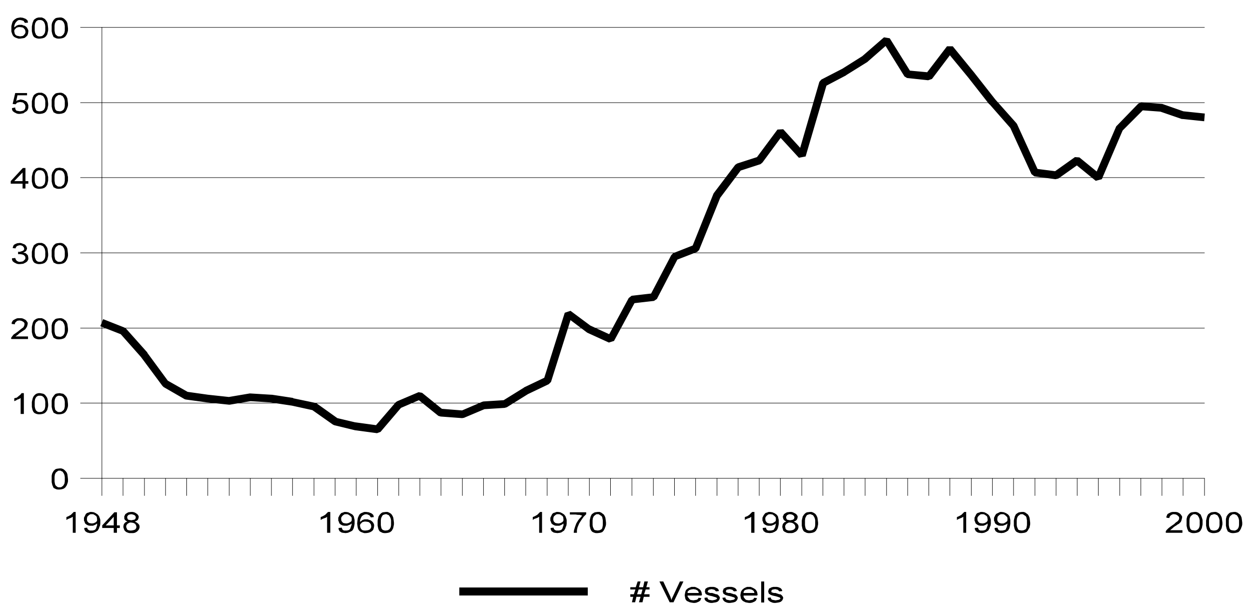
TABLE 3-20: Number of Commercial Vessels in the MHI Bottomfish Fishery, 1948-2000

YEAR	# VESSELS	YEAR	# VESSELS	YEAR	# VESSELS
1948	207	1966	97	1984	558
1949	196	1967	99	1985	583
1950	164	1968	116	1986	538
1951	126	1969	130	1987	535
1952	110	1970	219	1988	572
1953	106	1971	198	1989	537

YEAR	# VESSELS	YEAR	# VESSELS	YEAR	# VESSELS
1954	103	1972	185	1990	501
1955	108	1973	238	1991	469
1956	106	1974	241	1992	407
1957	102	1975	295	1993	403
1958	96	1976	306	1994	423
1959	76	1977	377	1995	400
1960	69	1978	414	1996	466
1961	65	1979	423	1997	495
1962	98	1980	461	1998	493
1963	110	1981	430	1999	483
1964	87	1982	526	2000	480
1965	85	1983	541	mean	295
				s.d.	181

Source: WPRFMC in prep.

FIGURE 3-12: Number of Vessels Participating in the MHI Bottomfish Fishery, 1948-2000



3.5.1.4.2 NWHI

Since the NWHI bottomfish fishing grounds were divided into the Mau Zone and Hoʻomalu Zone in 1988, the Mau Zone has generally seen a greater share of the fishing effort as access to the Hoʻomalu Zone was restricted under a limited access program (WPRFMC 1999). Only five vessels harvested bottomfish in the Mau Zone in 1989, but during the 1990s an average of ten vessels fished in the area (Figure 3-13; Table 3-21). The amount of effort (fishing days) expended in the Mau Zone has fluctuated along with the number of active vessels. Mau Zone activity levels peaked in 1994 with a total of 594 fishing days as a result of a combination of relatively large fleet size and intensive activity by each vessel.

FIGURE 3-13: Number of Vessels Fishing in the Mau Zone and Hoʻomalu Zone, 1984-2000

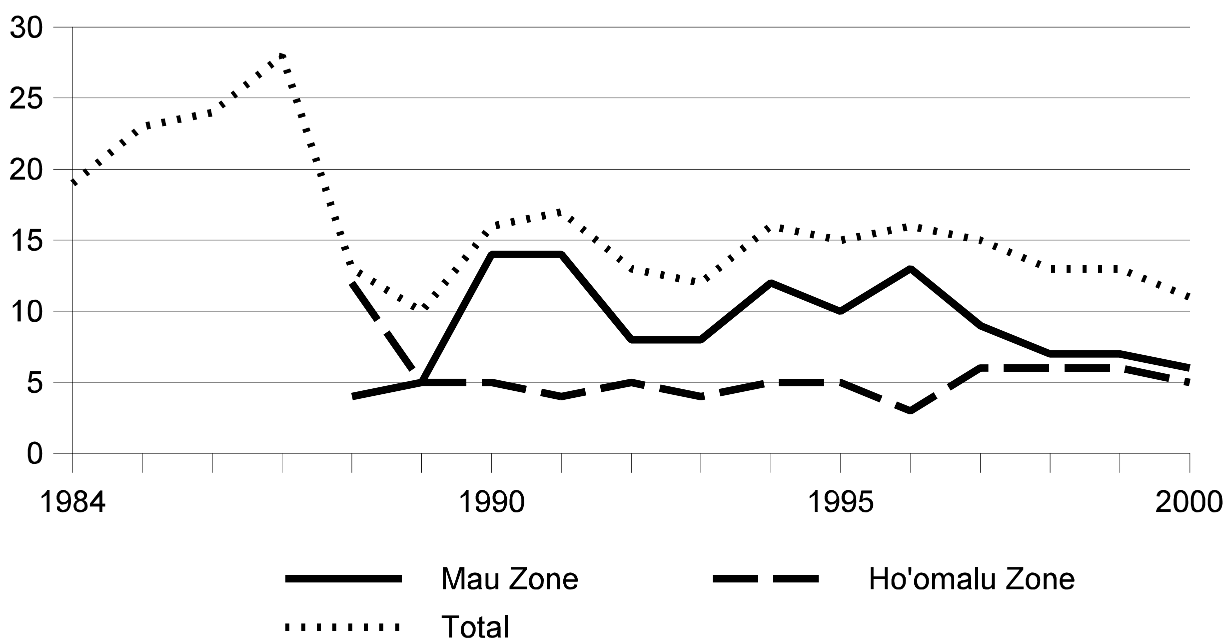


TABLE 3-21: Number of Vessels in the NWHI Bottomfish Fishery, 1984-2000

YEAR	MAU	HOʻOMALU	TOTAL	YEAR	MAU	HOʻOMALU	TOTAL[2]
1984	NA	NA	19	1993[1]	8	4	12
1985	NA	NA	23	1994[1]	12	5	16
1986	NA	NA	24	1995[1]	10	5	15

YEAR	MAU	HOʻOMALU	TOTAL	YEAR	MAU	HOʻOMALU	TOTAL[2]
1987	NA	NA	28	1996[3]	13	3	16
1988	4	12	13	1997[3]	9	6	15
1989	5	5	10	1998[2]	7	6	13
1990	14	5	16	1999[3]	7	6	13
1991[1]	14	4	17	2000[3]	6	5	11
1992[1]	8	5	13	mean	9.00	5.46	16.12
				s.d.	3.37	2.15	4.88

Notes: 1. Based on a combination of NMFS and HDAR data; 2. Total may not match sum of areas due to vessel participation in both areas; 3. Based on HDAR data; Source: WPRFMC in prep.

Eighty-one permits to fish in the Mau Zone have been issued since 1989, but only 37 of the permits were actually used. The turn-over rate has been high, with only 38% of the 37 active vessels fishing in the Mau Zone for more than two years (Table 3-22). A limited access program was established for the Mau Zone in 1999, and currently ten vessels are allowed to fish in the area. Permits to fish in the Mau Zone are non-transferable and subject to a use-it-or-lose-it requirement. At present, there is no procedure for issuance of new Mau Zone limited access permits. However, the Council is considering recommending to the Secretary of Commerce that a procedure be established based on a point system (see Section 2.3.5).

TABLE 3-22: Entry and Exit Pattern of Vessels Fishing in the Mau Zone, 1989-1999

Permit Holder/Vessel	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1				x	x	x	x	x	x	x	x
2						x				x	x
3					x	x	x				
4		x		x		x	x				
5		x				x					
6		x									
7				x							
8			x	x		x					
9			x								
10			x		x	x					x

Permit Holder/Vessel	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
11		x									
12					x			x		x	
13			x	x	x	x	x				
14							x	x	x		
15			x	x							
16							x	x	x	x	x
17		x									
18		x	x								
19						x	x	x	x		
20	x										
21		x	x								
22								x		x	
23			x	x							
24		x	x								
25		x									
26	x	x	x								
27		x	x	x	x	x	x	x			
28			x								
29	x										
30						x	x	x	x	x	x
31	x										
32								x			
33								x			x
34								x	x		
35									x		
36									x		
37									x		

[1] An "x" appears in those years in which the permit holder fished in the Mau Zone.

Source: A. Katekaru, pers. comm. 2000. NMFS-PIAO

A limited access program was established for the Hoʻomalu Zone in 1989. Since 1995, the number of vessels allowed to fish in the area has been set at seven. Permits to fish in the Hoʻomalu Zone are non-transferable and subject to a use-it-or-lose-it requirement. New Hoʻomalu Zone limited access permits are issued based on a point system (see Section 2.3.4).

Since 1989, 17 permits to fish in the Hoʻomalu Zone have been issued, of which 15 have been used. In comparison to the Mau Zone, the Hoʻomalu Zone exhibits more continuity in participation, but the turnover has still been fairly high. Only about half of the active vessels fished in the Hoʻomalu Zone for more than two years. (Table 3-23).

TABLE 3-23: Entry and Exit Pattern of Vessels Fishing in the Hoʻomalu Zone, 1989-1999

Permit Holder/Vessel	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1	x										
2	x	x	x	x	x	x	x	x	x	x	
3	x	x	x	x	x						
4									x	x	x
5						x	x				
6										x	
7	x	x	x	x	x	x	x	x	x	x	x
8			x	x	x	x	x	x	x	x	x
9	x										
10									x	x	x
11							x				
12											x
13	x			x					x		
14						x	x				
15											x

[1] An “x” appears in those years in which the permit holder fished in the Hoʻomalu Zone.
Source: A. Katekaru, pers. comm. 2000. NMFS-PIAO.

3.5.1.5 Economic Performance

3.5.1.5.1 MHI

Inflation-adjusted gross revenue in the MHI bottomfish fishery grew steadily in the 1980s (Figure 3-14; Table 3-24) as a result of increases in both real prices and landings (WPRFMC in prep.). However, between 1988 and 1993, revenue in the MHI fishery decreased sharply as both MHI bottomfish prices and landings declined. Historically, bottomfish catches from the MHI have tended to command higher aggregate prices than those caught in the NWHI (Table 3-24), reflecting a larger proportion of preferred species and greater freshness. In the late 1990s, however, the prices appeared to converge, perhaps due to the softness of the upscale part of the Hawaiʻi market as the state's economic recession continued (WPRFMC 1999). In recent (1995-2000) years, the annual ex-vessel value of bottomfish landings in the MHI fishery has averaged about $1.7M.

As noted above, the recreational/subsistence catch in the MHI bottomfish fishery is estimated to be about equal to the commercial catch. The majority of participants in the MHI fishery appear to be small boat fishermen who for several years have relied on the bottomfish fishery for a portion of their subsistence needs or household earnings or simply to earn enough money to cover their fishing expenses. No data on the profitability of commercial operations in the MHI fishery are available, nor is there information on the non-market value of subsistence or recreational bottomfish fishing activity around the MHI. However, it is likely that without the supplement to basic incomes obtained from subsistence or part-time commercial fishing, many of these fishermen would face economic hardships in Hawaiʻi's expensive economic climate.

As the result of an influx of new charter boat operators over the past two decades Hawaiʻi's charter boat industry has become highly competitive (Hamilton 1998; Walker 1996). In harbors such as Honokōhau the charter fleet has become so large that it is extremely difficult for any one operation to succeed.

3.5.1.5.2 NWHI

As shown in Figure 3-14 and Table 3-24, the inflation-adjusted gross revenue in the NWHI fishery grew dramatically in the mid-1980s and then declined as landings fell. Gross revenue in 2000 was only 27% of the 1987 peak. In recent (1996-2000) years, the annual ex-vessel value of bottomfish landings in the NWHI fishery has averaged about $1.05M.

FIGURE 3-14: Inflation-adjusted Gross Revenue in the MHI and NWHI Bottomfish fisheries, 1984-2000

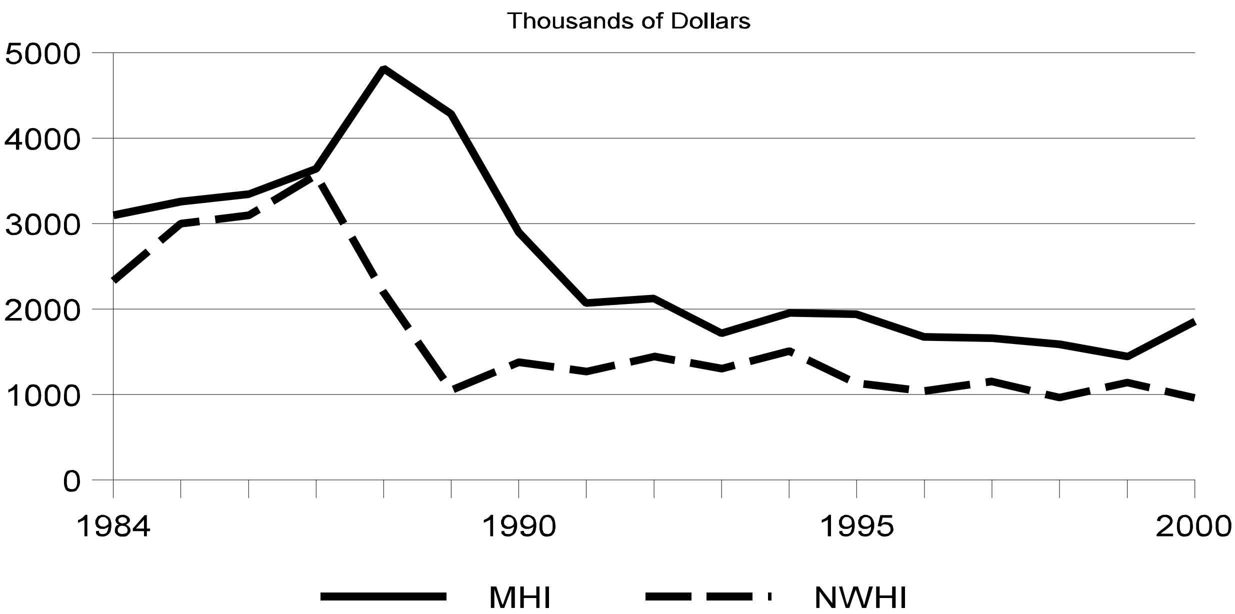


FIGURE 3-15: Inflation-adjusted Gross Revenue per Trip of Vessels Bottomfish Fishing in the Mau Zone and Hoʻomalu Zone, 1989-2000

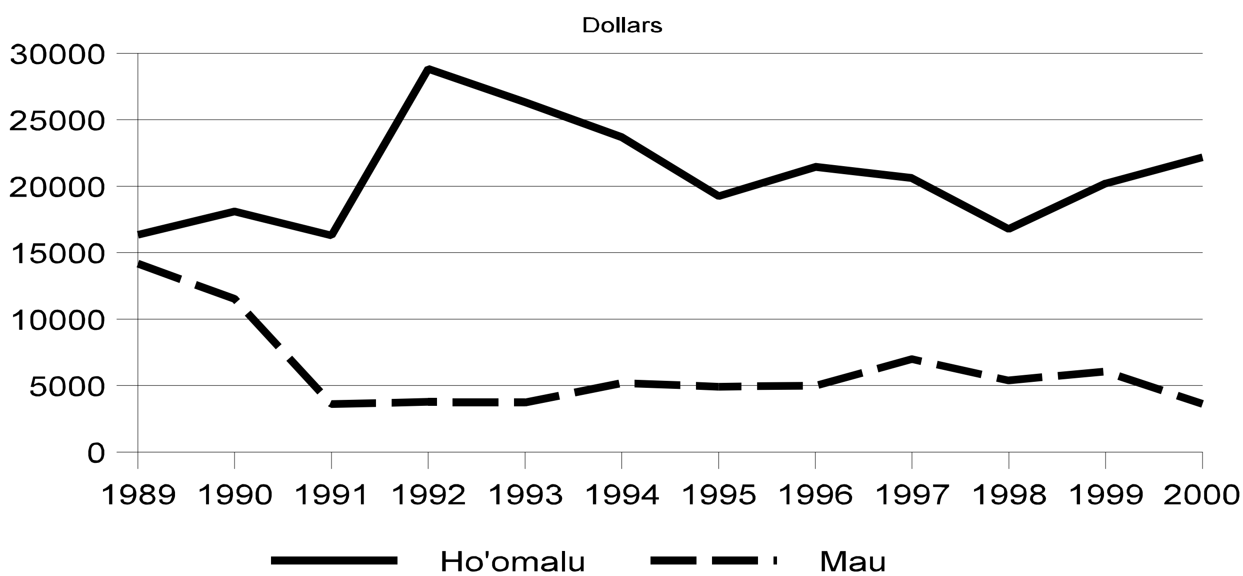


TABLE 3-24: Inflation-adjusted BMUS Revenue and Price, MHI and NWHI, 1984-2000

YEAR	MHI REVENUE (1,000$)	NWHI REVENUE (1,000$)	MHI PRICE	NWHI PRICE
1984	3100	2329	4.11	3.52
1985	3258	3001	4.54	3.25
1986	3347	3099	4.42	3.57
1987	3640	3570	4.87	3.52
1988	4817	2197	4.35	3.52
1989	4286	1049	4.56	3.47
1990	2904	1381	4.87	3.26
1991	2070	1272	4.05	3.29
1992	2126	1448	3.92	3.42
1993	1718	1303	4.03	3.38
1994	1958	1510	3.99	3.41
1995	1942	1132	3.72	3.07
1996	1676	1040	4.12	3.37
1997	1660	1155	3.54	3.34
1998	1590	969	3.64	3.11
1999	1445	1143	2.85	3.55
2000	1858	964	3.68	3.68

Note: 2000 data are preliminary. Source: WPRFMC in prep.

TABLE 3-25: Inflation-adjusted Revenue per Trip, Mau and Hoʻomalu Zones, 1989-2000

YEAR	MAU ZONE ($)	HOʻOMALU ZONE ($)
1989	14,182	16,357
1990	11,545	18,120
1991	3,595	16,319
1992	3,782	28,838

YEAR	MAU ZONE ($)	HOʻOMALU ZONE ($)
1993	3,736	26,353
1994	5,182	23,707
1995	4,897	19,273
1996	5,000	21,462
1997	7,000	20,632
1998	5,385	16,780
1999	6,067	20,208
2000	3,636	22,188

Notes: Data are compiled from NMFS shoreside market monitoring for 1984-95 and then combined with HDAR data for 1996-97. Since 1998, data are compiled from HDAR figures. Revenue is adjusted for inflation to the current base year by the Honolulu consumer price index. 2000 data are preliminary. Source: WPRFMC in prep.

Independent, owner-operator fishing operations prevail in both zones of the NWHI bottomfish fishery. In 1988, a limited access program was established for the Hoʻomalu Zone, the primary motivation for which was avoidance of economic overfishing (Pooley 1993b). When the limited access program provisions began to take effect in 1989-91, the revenue per trip for Hoʻomalu Zone vessels rose dramatically (Figure 3-15; Table 3-25). Since that period the revenue per trip in the Hoʻomalu Zone has consistently been higher than that of the Mau Zone.

Estimates of annual net revenue for vessels operating in the Mau Zone and Hoʻomalu Zone were first presented in a 1993 cost-earnings profile of the NWHI bottomfish fishery (Hamilton 1994). The study revealed that on average Hoʻomalu Zone vessels realized a positive return of $2,238 per vessel in 1993 while Mau Zone vessels averaged a loss of $21,947 per vessel. The principal factor explaining the disparity in the economic performance of vessels operating in the two zones was the difference in catch rates (Pan 1994). In comparison to boats fishing in the Mau Zone, boats operating in the Hoʻomalu Zone caught more fish per fishing day and more of their catch consisted of high-valued bottomfish such as *onaga* and ʻō*pakapaka* was larger.

Since 1993, however, the revenues of Hoʻomalu Zone vessels have shown a downward trend due to decreasing catch rates for some species, particularly the high-priced ʻō*pakapaka* (Figure 3-14). As a result of this decrease in revenues, in recent years the average vessel fishing in the Hoʻomalu Zone has failed to cover its total annual costs through bottomfish fishing (WPRFMC in prep.). In 2000, Hoʻomalu vessels averaged a loss of $38,047 per vessel (Table 3-26). The average vessel earned a positive return on operations, and presumably vessel owners derive sufficient income from other economic activities to cover fixed costs.

TABLE 3-26: Average Income Statement for Vessels Fishing in the Mau Zone and Hoʻomalu Zone, 2000 (Source: WPRFMC in prep.)

CATEGORY	MAU ZONE VESSELS	HOʻOMALU ZONE VESSELS
Revenue	**$38,639**	**$148,522**
Fixed Costs:		
Capital	$4,093	$18,056
Annual Repair	$4,840	$12,694
Vessel Insurance	$2,833	$31,516
Administrative	$1,535	$7,441
Other	$0	$1,970
Total	**$13,301**	**$71,678**
Operating Costs:		
Fuel and Oil	$4,158	$9,958
Ice	$1,094	$2,298
Bait	$1,641	$5,253
Handling	$3,900	$14,900
Provisions	$1,751	$7,113
Gear and Supplies	$2,407	$8,426
Other (trip basis)	$3,283	$10,943
Crew's Income	$6,100	$35,000
Captain's Income	$8,800	$21,000
Total	**$33,134**	**$114,892**
Net on Operations	**$5,505**	**$33,631**
Total Cost	**$46,435**	**$186,569**
Net Revenue	**- $7,796**	**- $38,047**

Updated cost-earnings data for vessels operating in the Mau Zone indicate that the net revenue of the average boat is still negative (Table 3-26). The poor economic performance of a substantial number of Mau Zone vessels has resulted in a considerable turnover pattern of entry and exit (Hamilton 1994). Between 1989 and 1997, over 15 vessels entered and left the fishery (Table 3-

22). Because access to the Mau Zone was unrestricted, economic failure of vessels in the fishery did not reduce fishing effort to more appropriate levels (WPRFMC 1998b). Bankrupt vessels were sometimes bought for a fraction of their initial capital cost and returned to the Mau Zone with new owners who believed that reduced capital servicing obligations would give them a competitive edge over other fishermen. In addition, vessels displaced from overfished U.S. mainland fisheries arrived in Hawaiʻi at a steady rate on a "look-see" basis. These owners and captains were largely unaware of the economic performance of those vessels already fishing in the Mau Zone.

In 1999, a limited access program was established for the Mau Zone to support long-term productivity of bottomfish resources in the zone and to improve the economic stability of the fishery (WPRFMC 1998b). The limited access program is intended to decrease the large reserve of potential effort that could threaten the resources and allow attrition due to market forces and freedom of choice to reduce the Mau Zone fleet to more economically rational levels. It is too early to determine the success of the limited access program in improving economic operating conditions in the Mau Zone.

3.5.1.6 Markets

A market for locally caught bottomfish was well-established in Hawaiʻi by the late nineteenth century (see Section 3.7). Today, fresh bottomfish continues to be an important seafood for Hawaiʻi residents and visitors. Nearly all bottomfish caught in the NWHI fishery are sold through the Honolulu fish auction (United Fishing Agency, Ltd.). Prices received at the auction change daily, and the value of a particular catch may even depend on the order in which it is placed on the floor for bidding (Hau 1984). Bottomfish caught in the MHI fishery are sold in a wide variety of market outlets (Haight et al. 1993b). Some are marketed through fish auctions in Honolulu and Hilo and intermediary buyers on all islands. Sales of MHI bottomfish also occur through less formal market channels. For example, local restaurants, hotels, grocery stores and individual consumers are important buyers for some fishermen. In addition to being sold, MHI bottomfish are consumed by fishermen and their families, given to friends and relatives as gifts, and bartered in exchange for various goods and services.

Historically, the demand for bottomfish in Hawaiʻi has been largely limited to fresh fish. Seventy years ago Hamamoto (1928) remarked on the fact that fish dealers in Honolulu refused to buy fish that had been harvested in the NWHI and frozen on-board because the demand for this product was so low. In the last few years the price differential between frozen and fresh product has narrowed for some species of bottomfish, but it remains substantial for *onaga* and *ehu*, the two highest priced fish. Until the market for frozen bottomfish develops, participants in the NWHI fishery will be caught in the same on-going dilemma – they must stay out long enough to cover trip expenses, but keep the trips short enough to deliver a readily saleable, high-quality product (Pan 1994). In the past, bottomfish catches from the MHI have tended to command higher aggregate prices than those caught in the NWHI, reflecting a larger proportion of preferred species and greater freshness. Bottomfish caught around the MHI are iced for only one to two days before being landed, whereas NWHI fresh catches may be packed in ice for ten days or more. By the late 1990s, however, the prices appeared to converge, perhaps due to the softness of the upscale part of the Hawaiʻi market as the state's economic recession continued (WPRFMC 1999).

Catches of bottomfish around the MHI typically consist of plate-sized fish preferred by household consumers in Hawaiʻi and by restaurants where fish are often served with the head on. Bottomfish caught around the NWHI tend to be the medium to large fish (over 5 pounds) preferred for the restaurant fillet market. Because the percent yield of edible material is high, handling costs per unit weight are lower and more uniform portions can be cut from the larger fish.

Pooley (1987) showed that Hawaiʻi auction market prices increase when MHI landings drop. However, during the 1990s the relationship between price and volume faltered, perhaps due to an increase in imported fresh fish that competed in the market with locally-caught bottomfish (WPRFMC 1999). Since 1996, the average annual amount of fresh snapper imported into Honolulu has been 460,343 lbs., with a f.a.s. (free alongside ship) value of $1,238,548 (NMFS Fisheries Statistics and Economics Division undated). Not only has the quantity of foreign-caught fresh fish increased during the last few years, but the number of countries exporting fresh fish to Hawaiʻi has also increased. A decade ago, for example, fresh snapper was exported to Hawaiʻi mainly from within the South Pacific region. In recent years fresh snapper has also been received from nations as far away as Viet Nam, Chad and Madagascar.

3.5.2 American Samoa

3.5.2.1 History

Long before the arrival of Europeans in the islands of Samoa the indigenous people of those islands had developed specialized techniques for catching bottomfish from canoes. Some bottomfish, such as *ulua*, held a particular social significance and were reserved for the *matai* (chiefs) (Severance and Franco 1989).

By the 1950s, many of the small boats in American Samoa were equipped with outboard engines, steel hooks were used instead of ones made of pearl shell, and monofilament fishing lines had replaced hand woven sennit lines. However, bottomfish fishing remained largely a subsistence practice. It was not until the early 1970s that the bottomfish fishery developed into a commercial venture (Ralston 1979). Surveys conducted around Tutuila Island from 1967 to 1970 by the

American Samoa Office of Marine Resources indicated that the potential existed for developing a small-scale commercial bottomfish fishery. Four major fishing grounds were identified around the island of Tutuila: Taputapu, Matatula, Leone West Banks and Steps Point (Severance and Franco 1989). In 1972, a government-subsidized boat building program was initiated to provide local fishermen with gasoline and diesel powered 24 ft wooden dories capable of fishing for bottomfish in offshore waters. Twenty-three boats were eventually built and used by fishermen. By 1980, however, mechanical problems and other difficulties had reduced the dory fleet to a single vessel (Itano 1996).

In the early 1980s, the 28-ft FAO-designed *alia* catamaran was introduced into American Samoa, and local boat builders began constructing these inexpensive but seaworthy fishing vessels. A recovery in the size of the fishing fleet, together with a government-subsidized development project aimed at exporting deep-water snapper to Hawaiʻi, caused another notable increase in bottomfish landings (Itano 1996). Between 1982 and 1988, the bottomfish fishery comprised as much as half of the total catch of the local commercial fishery. However, since 1988, the nature of American Samoa's fisheries has changed dramatically, with a shift in importance from bottomfish fishing to trolling and longlining for pelagic species (WPRFMC 1999). Landings trends in the bottomfish fishery have also been periodically adversely impacted by hurricanes. The 1987 hurricane, in particular, damaged or destroyed a large segment of American Samoa’s small boat fishing fleet.

3.5.2.2 Fishing Methods and Current Use Patterns

The bottomfish fishery of American Samoa is typically commercial overnight jigging on 28-foot aluminum catamarans using skipjack tuna as bait (WPRFMC 1999). The fishing technology employed by the small boat fleet continues to be relatively unsophisticated. Many of the boats are outfitted with wooden hand reels that are used for both trolling and bottomfish fishing. Less than 10% of the boats carry a depth recorder, electronic fish finder or global positioning system (Severance et al. 1999). Because few of the small boats carry ice they typically fish within twenty miles of shore. In recent years, however, a growing number of fishermen in American Samoa have been acquiring larger (>35 ft) vessels with capacity for chilling or freezing fish and a much greater fishing range. For example, a local non-profit organization recently purchased a 53-ft vessel with a grant from the Administration for Native Americans. The boat will be equipped to catch bottomfish and is to be used to train young American Samoans for fishing occupations (WPRFMC 2000b).

3.5.2.3 Harvest

In recent (1990-98) years, the commercial landings of bottomfish accounted for 96% of the total bottomfish catch. The amount of bottomfish caught for recreational or subsistence purposes was relatively small. The commercial catch declined significantly in 1987, recovered slightly in 1988, but then decreased dramatically again during the early 1990s (Figure 3-16; Table 3-26). The overall decline was due to the effects of hurricanes that struck the territory in 1987, 1990, and 1991, the departure of several highliners from the fishery and a shift by the fleet from bottomfish fishing to trolling for pelagic species (WPRFMC 1999). In addition, fishermen began to experience competition in local markets from fresh bottomfish imported from Samoa and Tonga. In 1991, bottomfish imports exceeded local landings of bottomfish. The significantly greater 1994 total landings, when compared to previous years, occurred primarily because of improved catch recording, an increase in effort by highline vessels and a high fish demand for government and cultural events. However, the 1998 harvest was only 25% of the 17-year average and was the smallest catch since 1982. This recent decline was primarily due to a shift by highliners in the local fleet from bottomfish fishing to fishing for pelagic species with longline gear.

FIGURE 3-16: Total Landings of Bottomfish in the American Samoa Bottomfish Fishery, 1982-2000

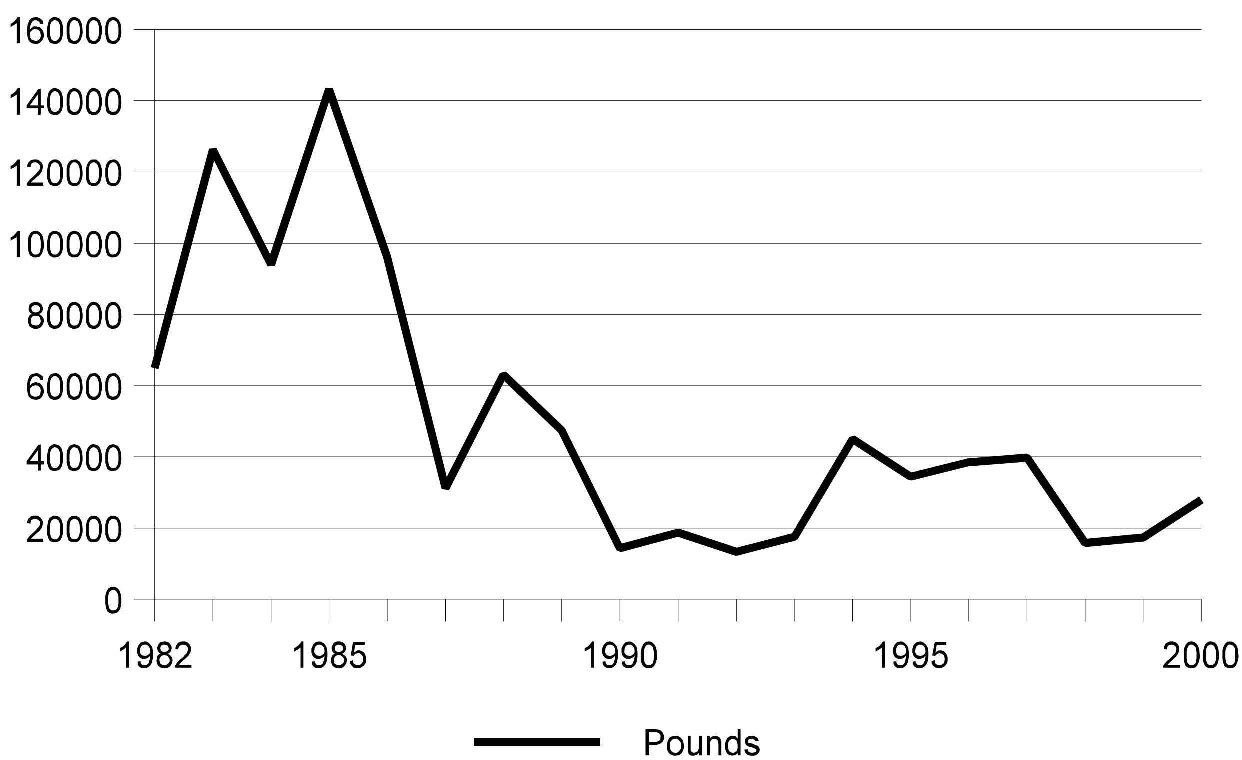


TABLE 3-27: American Samoa Bottomfish Participation, Landings and CPUE, 1982-2000

YEAR	# VESSELS	# TRIPS	LANDINGS (lb)	CPUE (lb/trip-hr)
1982	27	548	64,942	8.5
1983	38	621	126,327	10.0
1984	48	468	94,104	10.7
1985	47	1116	143,225	8.1
1986	34	698	95,978	8.8
1987	20	222	31,148	11.7
1988	26	352	63,064	17.3
1989	29	313	47,482	16.7
1990	19	122	14,303	9.2
1991	20	145	18,677	9.1
1992	14	101	13,316	9.3
1993	22	141	17,518	7.3
1994	19	341	44,982	7.7
1995	25	270	34,414	9.8
1996	26	265	38,522	14.8
1997	24	290	39,863	14.7
1998	16	100	15,862	14.0
1999	19	122	17,392	12.9
2000	17	241	27,949	10.2
mean	25.8	341	49,951	11.1
s.d.	9.48	251	37,840	3.0

Note: Data are from the DMWR Offshore Creel Survey and reflect all bottomfish caught, not just BMUS.
Source: WPRFMC in prep.

TABLE 3-28: American Samoa Inflation-adjusted Bottomfish Revenue and Price, 1982-2000

YEAR	REVENUE ($)	PRICE ($/lb)	REVENUE/TRIP ($)
1982	189,388	3.05	308
1983	445,063	3.56	564
1984	270,739	2.92	436
1985	227,382	2.22	243
1986	221,953	2.33	294
1987	69,335	2.27	274
1988	140,375	2.33	333
1989	77,239	2.13	226
1990	26,684	2.13	206
1991	39,319	2.22	201
1992	33,625	2.53	226
1993	34,871	2.23	185
1994	98,843	2.39	209
1995	71,642	2.11	267
1996	79,247	2.09	247
1997	87,706	2.29	210
1998	40,133	2.79	191
1999	40,202	2.66	205
2000	53,416	2.06	208
mean	118,272	2.44	265
s.d.	105,750	0.38	92

Note: Data are from the DMWR Offshore Creel Survey and reflect all bottomfish caught, not just BMUS.
Source: WPRFMC in prep.

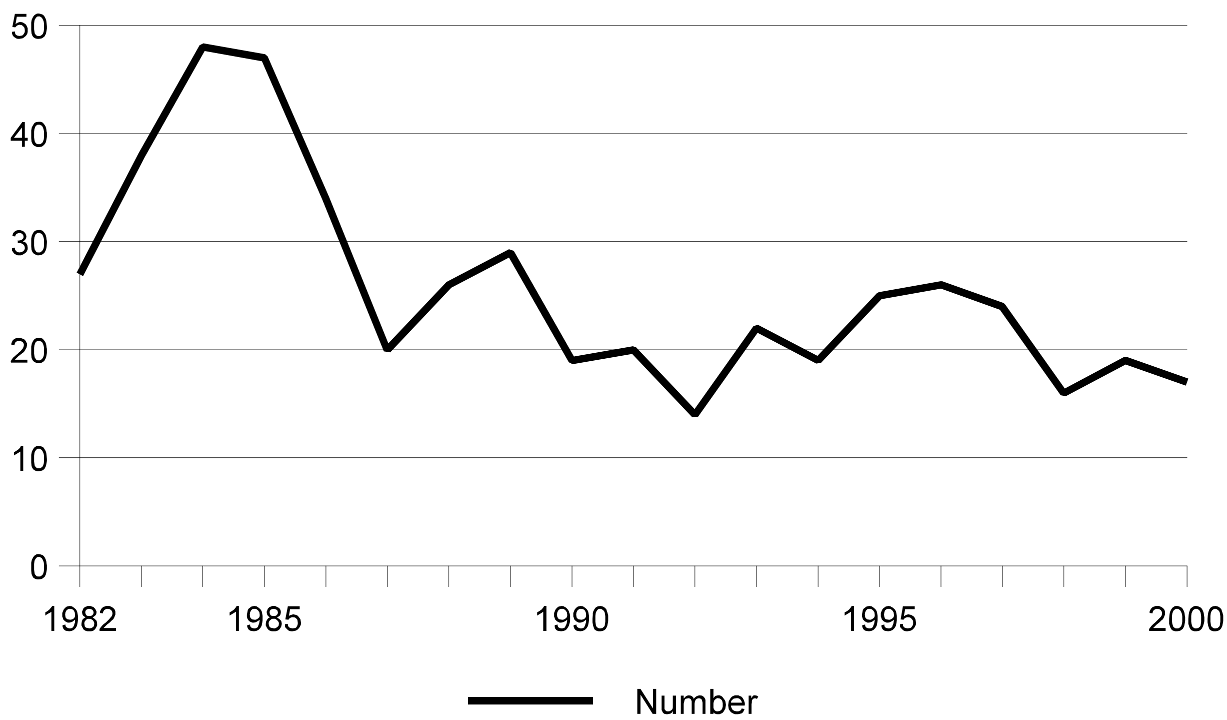
During 2000, a total of 17 boats landed an estimated 27,800 pounds of bottomfish. This was an increase of about 60 percent over 1999 landings, but still less than 20 percent of the peak 1985 landings. The 2000 data represent commercial landings only, as no recreational or charter trips were recorded for that year. Despite a new field for bycatch being added to the DMWR Offshore Creel Survey Interview Form, no bycatch was recorded in 2000.

CPUE (measured by pounds landed per trip-hour) has shown no significant change over the 19 years of record, with four of the last five most recent years being above the long-term average (Table 3-27).

3.5.2.4 Participation

The number of boats participating in the American Samoa bottomfish fishery fell from 26 to 17 between 1996 and 2000 (Figure 3-17; Table 3-27). Rather than indicating a problem with the resource, the decrease in effort was primarily caused by highliners redirecting their effort from the bottomfish fishery to the more lucrative pelagics fishery (WPRFMC in prep.).

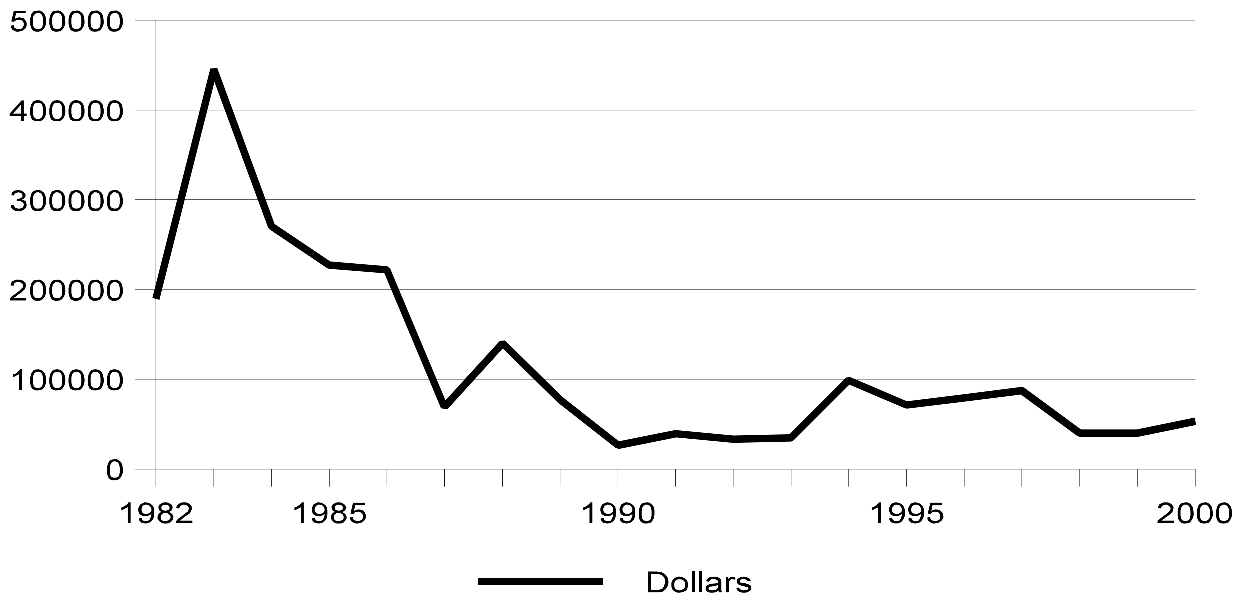
FIGURE 3-17: Number of Vessels Participating in the American Samoa Bottomfish Fishery, 1982-2000



3.5.2.5 Economic Performance

In recent (1996-2000) years, the inflation-adjusted, annual ex-vessel value of commercial landings of bottomfish has averaged about $60,140 (Figure 3-18). Since 1985, the adjusted gross revenue per fishing trip has varied between about $200 and $300 with no consistent trend evident (Figure 3-19; Table 3-28). Information on the net revenue of vessels targeting bottomfish is unavailable.

FIGURE 3-18: Inflation-adjusted Gross Revenue in the American Samoa Bottomfish Fishery, 1982-2000

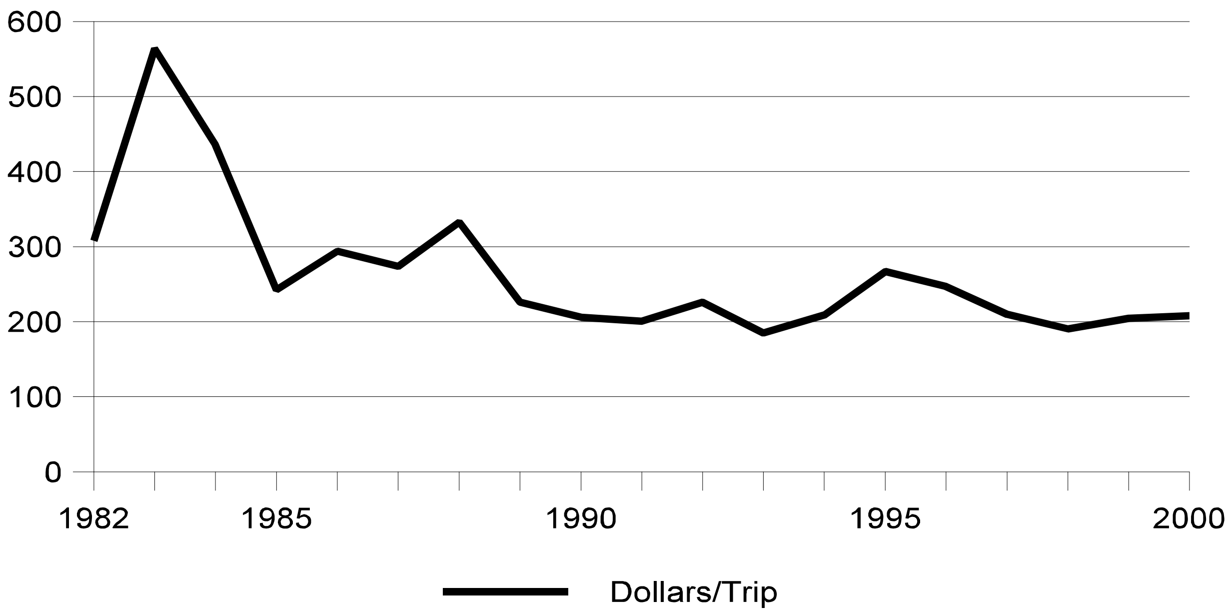


No data on the profitability of commercial bottomfish fishing operations are available, nor is there information on the non-market benefits of subsistence or recreational bottomfish fishing activity.

3.5.2.6 Markets

Prices for bottomfish in the American Samoa market were relatively high during the early 1980s (Table 3-28) when a large portion of the bottomfish catch was exported to Hawaiʻi (WPRFMC 1999). Prices fell in 1985 when exporting ceased, but have been fairly constant since then. Bottomfish imported mainly from the neighboring independent country of Samoa has assisted in satisfying the local demand for fresh bottomfish and maintaining a stable price (WPRFMC 1999). However, the imported bottomfish is considered to be of lower quality than locally-caught fish.

FIGURE 3-19: Inflation-adjusted Gross Bottomfish Revenue per Trip in the American Samoa Bottomfish Fishery, 1982-2000



3.5.3 Guam

Guam's bottomfish fishery has two distinct components that can be separated by depth and species. The deep-water component (500-700 ft) consists primarily of snappers and groupers of the genera *Pristipomoides*, *Etelis*, *Aphareus*, *Epinephelus*, and *Cephalopholis*. The shallow-water component (100-500 ft) makes up a larger portion of the total bottom fish harvest and is comprised of reef-dwelling snappers, groupers and jacks of the genera *Lutjanus*, *Lethrinus*, *Aprion*, *Epinephelus*, *Variola*, *Cephalopholis* and *Caranx*. The shallow-water component occurs mainly in waters under the jurisdiction of the Territory of Guam.

3.5.3.1 History

Prior to the arrival of Europeans in Guam and the other Mariana Islands in the sixteenth century, the Chamorros, as the original inhabitants of those islands were called, possessed large sailing canoes that enabled them to fish on offshore banks and sea mounts (Amesbury and Hunter-Anderson 1989). The manufacture of these canoes was monopolized by the *matua* (noble caste) who were also the deep-sea fishermen and inter-island traders within Chamorro communities (Jennison-Nolan 1979). In the early seventeenth century a Spanish priest described the Chamorros as "…the most skilled deep-water fishing people yet to have been discovered" (Driver 1983:208). However, during the 1700s the large, oceangoing canoes of the Chamorros were systematically destroyed by the Spanish colonizers of the Mariana Islands in order to concentrate the indigene population in a few settlements, thereby facilitating colonial rule as well as religious conversion (Amesbury and Hunter-Anderson 1989). After the enforced demise of the sailing canoes, fishing for offshore species was no longer possible. By the mid-nineteenth century, there were only 24 outrigger canoes on Guam, all of which were used only for fishing inside the reef (Meyers 1993). Another far-reaching effect of European colonization of Guam and other areas of the Mariana archipelago was a disastrous decline in the number of Chamorros, from an estimated 40,000 persons in the late seventeenth century to approximately 1,500 persons a hundred years later (Amesbury and Hunter-Anderson 1989).

After the U.S. acquired Guam in 1898 following the Spanish-American War, the U.S. colonial government held training programs to encourage local residents to participate in offshore commercial fishing (Amesbury and Hunter-Anderson 1989). However, the residents were deterred from this endeavor by a lack of capital to purchase and maintain boats of sufficient size and a reticence to be at sea overnight or longer. Shortly after the end of World War II the U.S. military assisted several villages in developing an inshore commercial fishery using nets and traps (Anon. 1945). Post-World War II wage work enabled some fishermen to acquire boats with outboard engines and other equipment for offshore fishing (Amesbury and Hunter-Anderson 1989).

In the late 1970s, the Guam Fishermen's Cooperative Association began operations. After the co-op established a small marketing facility at the Public Market in Agaña, fishermen were no longer forced to make their own individual marketing arrangements after returning from fishing trips (AECOS, Inc.1983). In 1980, the co-op acquired a chill box and ice machine, and emphasis was placed on wholesaling. Today, the co-op's membership includes over 100 full-time and part-time fishermen, and it processes and markets (retail and wholesale) an estimated 80% of the local commercial catch (Duenas undated).

As Guam's tourism industry grew in the1980s a fleet of marina-berthed charter vessels developed that were used by tourists and residents for bottomfish fishing (Meyers 1993). The charter boats made multiple 2-hour to 4-hour trips daily. Two types of charter bottomfish fishing trips were organized. The more typical charter boats involved 3 to 6 patrons, while the larger "party-boat" vessels carried as many as 30 patrons on a single trip. Most of these bottomfish charters operate out of the Agat Marina and primarily target the shallow water complex of bottomfish. Since most of the charter fishing trips are of short duration, it is unlikely that many of the trips are conducted in federal waters (WPRFMC 1999).

3.5.3.2 Fishing Methods and Current Use Patterns

For the past two decades bottomfish fishing around Guam has been a highly seasonal, small-scale commercial, subsistence and recreational fishery. The majority of the participants in the bottomfish fishery operate vessels less than 25 feet long and primarily target the shallow-water bottomfish complex because of the lower expenditure and relative ease of fishing close to shore (Meyers 1993). Participants in the shallow-water component seldom sell their catch as they fish mainly for recreational or subsistence purposes (WPRFMC 1999). Some of the charter boats practice “catch and release” fishing, whihc tends to artifically depress CPUE values. The commercially-oriented highliner vessels tend to be longer than 25 feet, and their effort is usually concentrated on the deep-water bottomfish complex.

Small spincasting reels are often used for catching the species occurring in the shallower waters, and electric reels, which may have multiple hooks per line, are used to catch deeper-dwelling fish (Meyers 1993). Lines may be baited with pieces of skipjack tuna and chumming is practiced (Amesbury and Hunter-Anderson 1989).

Bottomfish fishing effort is largest during the summer months (May to September) when sea conditions are generally much calmer. Most of the offshore banks are only accessible during this period. Galvez Bank is fished most heavily as it is closest to shore. Other banks, such as White Tuna, Santa Rosa and Rota, can only be fished during exceptionally good weather conditions (Green 1997).

Nearly all participants in the bottomfish fishery also troll for pelagic species, and most participate in both fisheries on the same trip (Meyers 1993). For example, fishermen might fish for bottomfish in the morning when the water is calm and then switch to trolling in the afternoon, or as they return to shore (Amesbury and Hunter-Anderson 1989).

3.5.3.3 Harvest

Table 3-29 summarizes Guam’s landings of all bottomfish and BMUS by commercial, charter and the recreational/subsistence sectors. Total bottomfish landings include the shallow-water reef species. Prior to 1994, total harvest consisted of more than 50 percent BMUS. Since 1994, that trend has been reversed, with BMUS comprising less than 50 percent of the total bottomfish harvested. Within the BMUS category, recent data (1997-2000) show that about two-thirds of the landed BMUS is caught by the recreational/subsistence sector (Figure 3-20). Annual fluctuations of BMUS landings on Guam, however, are usually due to highliners entering or leaving the fishery during a given year. The 1985 peak followed by the apparent crash in 1986 of BMUS harvests was the result of a few highliner fishermen who fished in 1985 and then left the fishery the following year.

The increase in total bottomfish and total BMUS in 1999 was due to fishermen concentrating on the dep-water complex. The significant increase in *onaga* landings in 1999 was due to a single fisherman fishing that complex. In 2000, an increase in BMUS landings was due to significant increases in *lehi*, the red-gilled emperor, the yellowtail *kalikali*, and jacks landings (280, 180, 200, and 256 percent, respectively). This may be due to fishermen fiahing the boundary between shallow and deep water (WPRFMC in prep.).

The harvest of total bottomfish and BMUS from the charter sector, however, decreased significantly in 2000, 38 and 49 percent, respectively. These boats tend to release a majority of their catch, although their catch tends to be juvenile goatfish and triggerfish (WPRFMC in prep.).

FIGURE 3-20: Total and Commercial Landings of BMUS in the Guam Bottomfish Fishery, 1980-2000

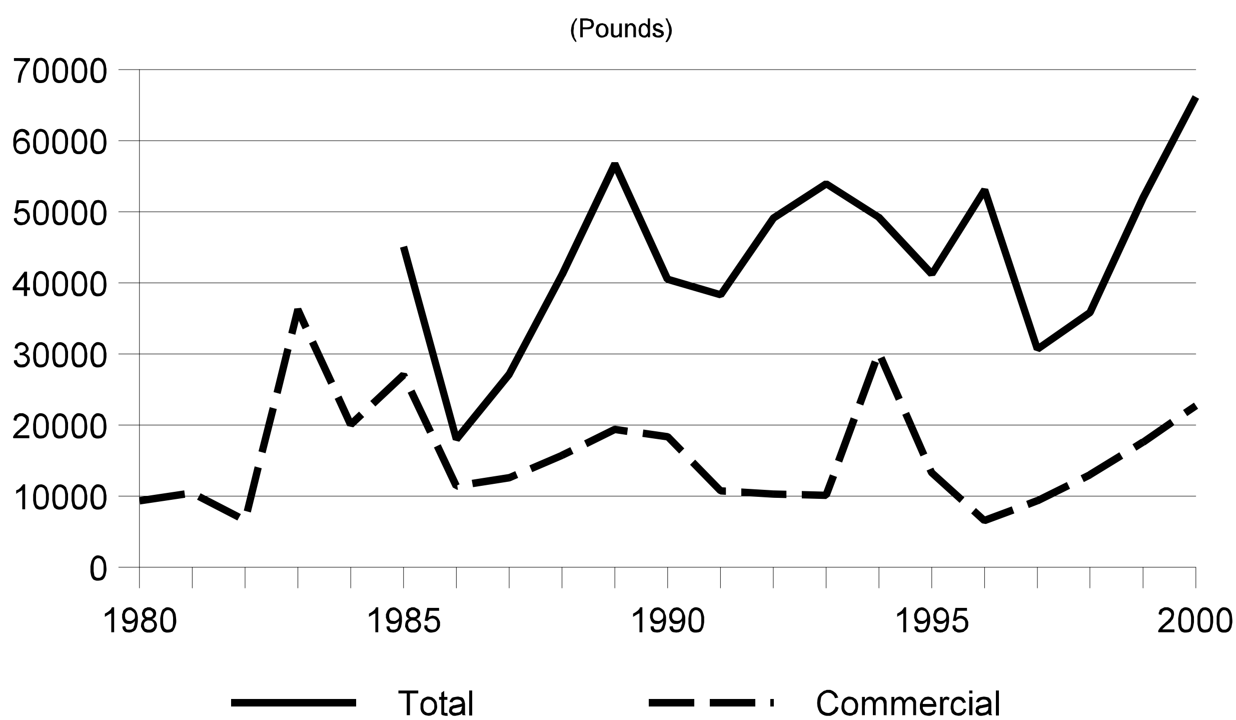


TABLE 3-29: Bottomfish and BMUS Landings by Sector in the Guam Bottomfish Fishery, 1980-2000

YEAR	TOTAL BOTTOMFISH (lb)	TOTAL BMUS (lb)	COMMERCIAL BMUS (lb)	CHARTER BOTTOMFISH (lb)	CHARTER BMUS (lb)
1980	NA	NA	9,381	NA	NA
1981	NA	NA	10,459	NA	NA
1982	NA	NA	6,617	NA	NA
1983	NA	NA	36,281	NA	NA
1984	NA	NA	20,115	NA	NA
1985	86,035	45,066	27,064	188	143
1986	36,839	18,034	11,482	1,475	1,442
1987	44,829	27,135	12,639	458	0
1988	67,777	41,148	15,792	931	372
1989	83,924	56,741	19,442	848	451
1990	77,367	40,485	18,390	384	148
1991	71,216	38,343	10,773	1,246	345
1992	86,911	49,169	10,344	2,334	552
1993	98,387	53,974	10,125	1,049	320
1994	109,050	49,235	30,237	755	304
1995	106,437	41,243	13,339	5,309	2,548
1996	153,123	53,133	6,578	5,402	2,470
1997	102,699	30,738	9,387	3,599	1,320
1998	97,779	35,868	13,011	5,441	2,199
1999	129,419	52,022	17,621	4,330	2,962
2000	146,481	66,151	22,775	2,673	1,501
mean	93,642	43,655	15,562	2,274	1,067
s.d.	32,017	12,150	6,644	1,930	1,015

Source: WPRFMC in prep.

3.5.3.4 Participation

The number of boats participating in this fishery has leveled off in recent years (Figure 3-21; Table 3-30). The 57 percent increase in participatin from 1992 and 1993 could be due to the inclusion of the Merizo Pier as a survey site in 1991, as well as a healthy economy that made it possible for more residnets to afford boats. The 57 percent increase that occurred in 1995 over the previous year could be due to the inclusion of the Agat Marina as an offshore creel survey site in October 1994. In general, most of the newcomers in the last five years are recreational and subsistence fishermen who bottomfish only part-time and primarily target the shallow-water bottomfish complex of non-BMUS species. A decrease in participation in 2000 may have been due to boats dropping out the fishery due to low catches in the shallow-water bottomfish complex (WPRFMC in prep.).

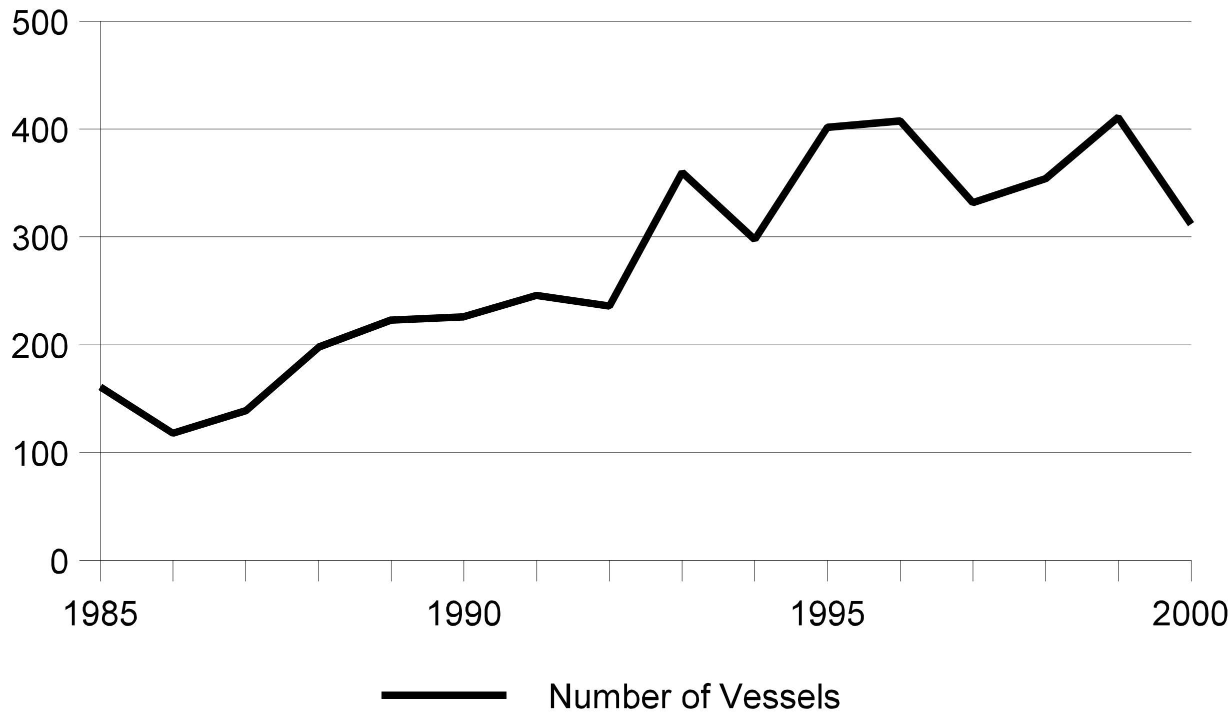
TABLE 3-30: Number of Vessels Participating in the Guam Bottomfish Fishery, 1985-2000

YEAR	# VESSELS	YEAR	# VESSELS
1985	161	1994	298
1986	118	1995	402
1987	139	1996	408
1988	198	1997	332
1989	223	1998	354
1990	226	1999	411
1991	246	2000	312
1992	236	mean	277
1993	360	s.d.	97

Source: WPRFMC in prep.

Guam’s charter fishing fleet of 20 to 25 vessels trolls for pelagic fish, but both deep-water and shallow-water bottomfish are also important target species. In 2000, charter fishing accounted for 21% of the total number of bottomfish trips but only 11 percent of the total hours fished (WPRFMC in prep.).

FIGURE 3-21: Number of Vessels Participating in the Guam Bottomfish Fishery, 1985-2000



3.5.3.5 Economic Performance

Highliners have generally been responsible for the peaks in the commercial BMUS landings, as was the case in 1983, 1985, 1994, 1998, and 1999. The nearly 300 percent increase in the 1994 commercial BMUS harvest (Figure 3-20; Table 3-29) and revenue (Figure 3-22; Table 3-31) compared with 1993 is the result of highliner vessels entering the fishery during 1994. The 39 percent reduction in BMUS harvest and 56 percent decline in commercial harvest for 1995 are best explained by the absence or reduced effort of about six highliners who combined landed an average of 18 percent of the total BMUS harvests between 1992 and 1996, and 68 percent of the unexpanded commercial landings for the same period. Harvest records for these six highliners indicate a 45 percent reduction in 1995 of their total bottomfish harvest, from 13,349 pounds in 1994 to 6,023 pounds in 1995. This decline in highliner landings accounts for about two-thirds of the 1995 reduction in commercial BMUS harvest.

In 1996, the commercial BMUS harvest and adjusted revenue dropped to its lowest point ever, partially due to an almost complete absence of highliner activity in that year. The slight increase in 1997 is attributed to a single highliner making several recorded trips to “Bank A,” a rarely fished bank located 117 miles west of Guam. The 1999 increase is likely the result of the activities of several highliners as well as an overall increase in participation and effort. A 25 percent decrease in revenue was observed in 2000 (WPRFMC in prep.).

As noted above, nearly all participants in the bottomfish fishery also troll for pelagic species, and most participate in both fisheries on the same trip. Estimates of the profitability of vessels involved in the commercial harvest of bottomfish are unavailable.

TABLE 3-31: Inflation-adjusted Guam Bottomfish Revenues and Prices, 1985-2000

YEAR	REVENUE ($)	REVENUE/TRIP ($)	PRICE ($/lb)
1980	41,559	281	4.43
1981	55,974	239	5.35
1982	36,525	204	5.52
1983	181,422	406	5.00
1984	102,289	222	5.09
1985	126,904	236	4.69
1986	50,794	186	4.42
1987	53,815	202	4.26
1988	64,222	190	4.07
1989	92,082	258	4.74
1990	83,957	263	4.57
1991	47,013	186	4.36
1992	41,527	190	4.01
1993	38,241	153	3.78
1994	116,882	385	3.87
1995	46,476	324	3.48
1996	17,632	122	2.68
1997	28,266	152	3.01
1998	43,009	163	3.31

YEAR	REVENUE ($)	REVENUE/TRIP ($)	PRICE ($/lb)
1999	108,165	266	3.61
2000	80,947	213	3.55
mean	69,414	231	4.18
s.d.	40,031	73	0.76

Source: WPRFMC in prep.

As noted above, the amount of bottomfish caught for recreational or subsistence purposes accounts for approximately two-thirds of the total catch. No information on the non-market value of this catch is available. Nearly all bottomfish fishermen hold jobs outside the fishery (Meyers 1993). However, fishing for bottomfish and other types of offshore fishing provide an important subsistence supplement to many Guam families (Amesbury and Hunter-Anderson 1989).

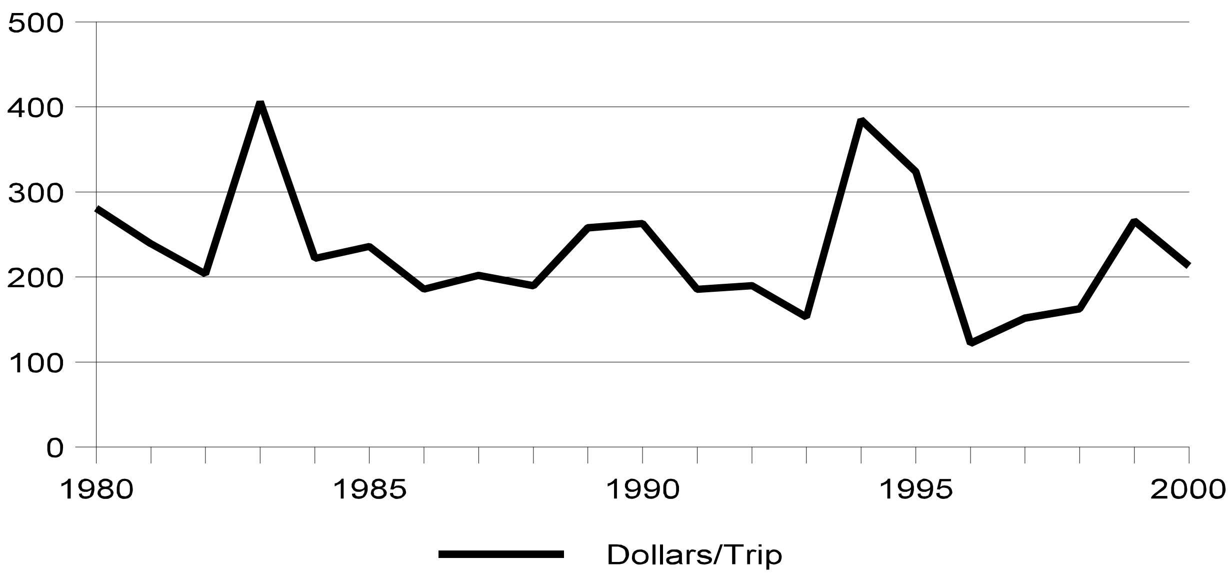
Most bottomfish fishing is done by Guam residents from owner-operated vessels, but occasionally tourists and residents also fish for bottomfish from charter boats (Meyers 1993). No information on the profitability of these charter fishing operations is available.

3.5.3.6 Markets

The importation of bottomfish from other islands throughout Micronesia has depressed the price of bottomfish in the Guam market (Meyers 1993; Table 3-31). Low wages in those areas enable importers to acquire fish at low cost (AECOS, Inc.1983). The Guam Fishermen's Cooperative Association has attempted to counter this price competition from imported fish by emphasizing the higher quality of fresh local fish landed by co-op members (AECOS, Inc. 1983). However, the competitive pricing and consistent availability of imported fish has discouraged local attempts to supplant foreign catches with Guam-caught fish.

FIGURE 3-22: Inflation-adjusted Gross Revenue for Commercial BMUS in the Guam Bottomfish Fishery, 1980-2000

FIGURE 3-23: Inflation-adjusted Gross Bottomfish Revenue per Trip in the Guam Bottomfish Fishery, 1980-2000



3.5.4 The Northern Mariana Islands

The bottomfish fishery in the CNMI is similar to that of Guam in that it can be separated into deep-water and shallow-water components. The deep-water component (>500 ft) targets primarily snappers of the genera *Pristipomoides* and *Etelis*, and the eight-banded grouper (*Epinephelus octofasciatus*). The shallow-water component (100-500 ft) targets the red-gilled emperor (*Lethrinus rubrioperculatus*).

3.5.4.1 History

Following the arrival of Europeans in 1521, the Northern Mariana Islands were colonies of Spain (1521-1898), Germany (1899-1914) and Japan (1915-1944). The Chamorros of the Northern Mariana Islands suffered the same deprivations under early Spanish colonial administration as those living on Guam. During the early 1800s people from the Caroline Islands were encouraged by the Spanish government to establish permanent settlements in the Mariana Islands (Amesbury et al. 1989). The Carolinians who settled in the Mariana Islands came with a well-developed sea-faring tradition. Their fishing activity largely centered on the harvest of lagoon and reef species, but small paddling canoes were sometimes used to fish a short distance outside the reef (Amesbury et al. 1989). Bottomfish fishing gear used by the Carolinians included coral sinkers and line made from hibiscus fiber.

Under Japanese rule the Northern Mariana Islands became a major fishing base, primarily for the harvest of skipjack tuna. However, the Chamorros or Carolinians of the Northern Marianas had little or no involvement in these industrial-scale fish harvesting or processing operations. According to Joseph and Murray (1951), the colonial policy of the Japanese prohibited the Chamorros and Carolinians from engaging in commercial fishing and most other remunerative enterprises. During this period the Chamorros and Carolinians presumably relied heavily on subsistence use of inshore marine resources (Amesbury et al. 1989). When the Americans assumed control of the islands at the end of World War II the fishing industry was left in the hands of Japanese civilian prisoners until their repatriation in 1946.

The post-World War II years saw a gradual involvement of the Chamorros and Carolinians of the Northern Marianas in commercial fishing. According to Orbach (1980), the Carolinians were the leaders in forming crews for fishing enterprises involving larger craft and offshore fishing. Orbach attributed the predominance of Carolinians in these initial offshore fishing ventures to the importance of fishing in traditional Carolinian culture and the closely-knit family and community structures within Carolinian settlements on Saipan that facilitated cooperative efforts in fishing.

By 1980, several boats over 25 feet in length were actively engaged in commercial fishing for bottomfish and pelagic species (Orbach 1980). One vessel was operated by a Carolinian company, one was owned and operated by the Tinian Fishing Cooperative whose membership was Chamorro and two other boats were skippered and crewed mainly by Japanese fishermen. In addition, some of the charter vessels that had been operating in the CNMI since 1978, catering to the Japanese tourists, were also being used to catch fish for sale to hotels and restaurants on Saipan (Orbach 1980).

Although many of the early offshore commercial fishing ventures received support from the CNMI government in the form of loans and fishing supplies (Orbach 1980), all of the enterprises failed within a few years because of inadequate markets, lack of management expertise and other factors. Eventually, other large vessels entered the bottomfish fishery, but they too dropped out. This pattern of frequent entry and exit of vessels into and out of the fishery has continued over the past two decades. In 1999, there were two major bottomfish fishing operations. One of the owners suspended his entire operation toward the end of the year because of financial problems. The downturn in the Asian economy has had a severe impact on the tourism industry in the CNMI, and the demand for bottomfish by local hotels has declined. However, another company has started its own fishing operation with two multi-purpose vessels. In addition, another individual is considering converting a deep-sea shrimp boat to bottomfish fishing (M. Trianni, pers. comm. 2000. Division of Fish and Wildlife, Saipan, CNMI).

<u>3.5.4.2 Fishing Methods and Current Use Patterns</u>

The CNMI bottomfish fishery consists mainly of small (<24 ft) boats engaged in commercial and subsistence fishing within a 20-mile radius around the islands of Saipan, Tinian, and Rota. However, larger vessels have periodically entered the fishery that are capable of traveling to the northernmost islands of the NMI. The larger vessels fish primarily for commercial purposes and target both deep-water and shallow-water bottomfish species, the latter primarily on the extensive banks and reefs surrounding Farallon de Medinilla (WPRFMC 1999). The smaller vessels fish both commercially and for subsistence, and target shallow water species.

Handlines, handmade hand reels and electric reels are the common gear used for small-scale fishing operations, and electric and hydraulic reels are the common gear used for the larger operations in the bottomfish fishery (WPRFMC 1999). Assorted types of bait are used, including tuna, squid and crabs, and some fishermen practice chumming by lowering a screen container of fish parts into the water (Amesbury et al. 1989).

Bottomfish fishing can still be described as "hit or miss" for most of the smaller size vessels (WPRFMC 1999). The majority of fishermen do not possess fathometers or even nautical charts and rely on land features for guidance to a fishing area. The larger vessels are generally equipped with a global positioning system (GPS), fathometer and other modern navigation and fish-finding equipment.

Fishing trips by the smaller vessels are generally restricted to daylight hours, with all vessels returning before or soon after sunset. Fishing trips to the northern end of the island chain by the large boats are usually limited to 10 days in order to preserve the quality of bottomfish held in ice. Although longer trips would be possible for vessels having on-board rapid-freezing equipment, such equipment may not be economical, particularly because consumer demand is for fresh fish rather than frozen product (AECOS, Inc. 1984).

The small boat participants switch between bottomfish fishing and trolling for pelagic species. Sea and weather conditions determine which type of fishing is undertaken. Bottomfish fishing is most successful during the summer months (May to September) when sea conditions are calmer. Fishermen often troll to and from a bottomfish fishing site, thus acquiring a mixed catch of pelagic species and bottomfish (WPRFMC 1999).

Amesbury et al. (1989) found that fishermen on Saipan slightly favored trolling for pelagic species over bottomfish fishing, as the success of the latter is dependent on calm sea conditions. However, bottomfish fishing is preferred by many fishermen on Tinian because it requires less fuel than trolling and bottomfish, especially *onaga*, bring a high price. In addition, Tinian is close to good bottomfish fishing grounds.

Presently, there are two charter vessels that target shallow-water bottomfish and reef fish (WPRFMC 2000a). The vessels typically take four two-hour long trips per day. Favored fishing grounds include the barrier reef off Chalan Kanoa and the Nikko Hotel.

3.5.4.3 Harvest

Landings data are available only for that portion of the catch that is sold to local commercial establishments (Section 3.9.4). The commercial catch of bottomfish declined during the late 1980s (WPRFMC 1999; Figure 3-24; Table 3-32). However, landings increased substantially between 1991 and 1996. The increase was due mainly to the entry of large (>50-ft) vessels that conducted regularly scheduled long trips to the islands north of Saipan, where bottomfish are more abundant (WPRFMC 1999).

Landings, revenues and adjusted revenues for 2000 are much less than in 1999. Landings of bottomfish were 18.2 percent less in 2000 than in 1999, which was 3.1 percent less than in 1998. Although bottomfish landings in 2000 were higher than the 18-year mean, they are considerably lower than the peak values from 1996-1997. Bottomfish landings in the CNMI have declined annually over the last five years. The causes of this decline are unknown, but two factors certainly contributed. These are changes in the highliners participating in the fishery and an increased number of local fishermen focusing on reef fishes in preference to bottomfish.

FIGURE 3-24: Commercial Landings of Bottomfish in the CNMI Bottomfish Fishery, 1983-2000

TABLE 3-32: CNMI Bottomfish Landings, Participation, Effort and CPUE, 1983-2000

YEAR	LANDINGS (lb)	# VESSELS	# TRIPS	CPUE (lb/trip)
1983	22,683	90	533	43
1984	33,924	102	492	69
1985	32,780	55	283	116
1986	23,929	54	229	104
1987	39,772	42	237	168
1988	37,850	29	211	179
1989	19,550	29	257	76
1990	10,903	29	129	85
1991	5,693	20	124	46
1992	8,148	38	140	58
1993	14,769	20	178	83

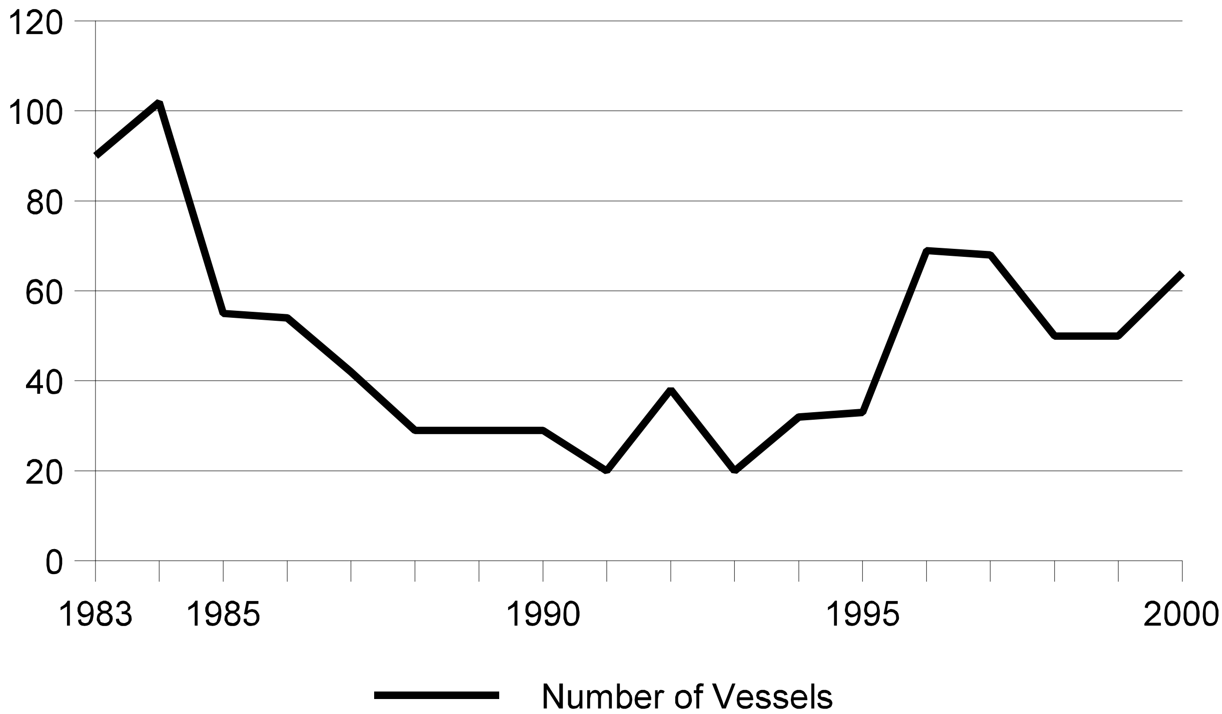
YEAR	LANDINGS (lb)	# VESSELS	# TRIPS	CPUE (lb/trip)
1994	20,363	32	275	74
1995	28,744	33	309	93
1996	52,967	69	445	119
1997	50,851	68	374	136
1998	45,835	50	317	145
1999	44,415	50	283	157
2000	36,343	64	632	58
mean	29,418	49	303	101
s.d.	14,540	23	143	42

Source: WPRFMC in prep.

3.5.4.4 Participation

Participation in the CNMI bottomfish fishery was fairly stable throughout the late 1980s and early 1990s, and then abruptly more than doubled in 1996 (Figure 3-25; Table 3-32). The increase was in vessels of all sizes, including large (>50-ft) vessels (WPRFMC 1999). However, over 60 percent of the vessels selling bottomfish in the past four years sold bottomfish in only one of those four years. Between 19 and 34 percent of these fishermen also made a limited number of sales (two) of any type of fish in any one of the years. Only six percent sold bottomfish in all four years. This represents a high rate of turnover, and seems to be a result of more of the smaller vessels focusing on reef fish in preference to bottomfish. During the 1997-2000 period, the number of fishermen selling both pelagic fish and bottomfish decreased from 11.1 to 3.0 percent, the number selling both pelagic and reef fish increased from 4.8 to 9.9 percent, and the number selling only reef fish increased from 10.3 to 36.2 percent.

FIGURE 3-25: Number of Vessels Participating in the CNMI Bottomfish Fishery, 1983-2000



3.5.4.5 Economic Performance

In recent (1995-1999) years, the annual ex-vessel value of commercial landings of bottomfish has averaged about $157,000 (Figure 3-26: Table 3-33). Revenues in 2000 are much reduced (35.7 precent less) from 1999. Although the unadjusted revenue for 2000 is greater than the mean for the last 18 years, the inflation-adjusted value for 2000 is the lowest of the last seven years and only 9.2 percent more than the mean for the last 18 years. This is a result of the combined effect of fewer pounds landed and a lower price per pound for almost all bottomfish species.

The gross revenue earned per trip increased markedly during the 1990s as a result of an increase in both the average catch rate and market price (Figure 3-27; Table 3-33). In 2000, however, revenue per trip dropped over 70 percent from its 1999 high to about half its long-term average.

The average price increased steadily from 1988 to 1991, where it reached what was once a record high of $2.83. In 1995, the price increased to a new record high of $3.34. This unadjusted price remained constant through 1997, increased to $3.41 in 1998, and has reached a new record high of $3.63 in 1999. The adjusted price continued to increase from 1997. Prices fell dramatically in 2000, to the lowest average price per pound (adjusted) in seven years. The mean price per pound for bottomfish dropped $0.78. Only two years in the last 18 have lower values. Prices fell for all groups (from $0.08 to $1.25 per pound) from last year, with the exception of emperor (mafute'), which increased by $0.14. *Onaga* still command the best prices, followed by *lehi* (silvermouth) and amberjack, but the range is narrowing. Demand for bottomfish does not appear to have lessened from past years among the general public. Although general economic principles would predict that smaller catches should result in higher prices (if demand is constant), it si possible that the continued decrease in tourism has affected sales. Most fishes are sold as whole fish (and very few as filets or steaks). These larger species are often purchased by the hotel restaurants, which are now seeing far fewer customers. In addition, it is possible that the local public show greater demand for reef fishes. This may be reflected in the high price commanded by reef fish such as parrotfish and rabbitfish (WPRFMC in prep.).

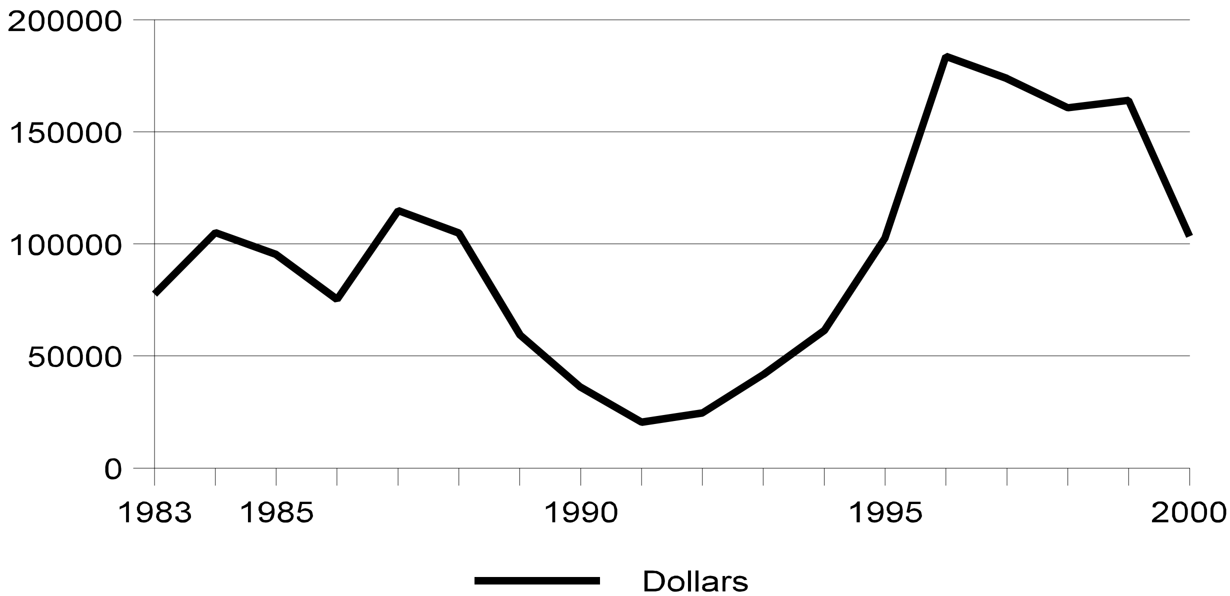
TABLE 3-33: CNMI Bottomfish Inflation-adjusted Revenues and Prices, 1983-2000

YEAR	REVENUE ($)	REVENUE/TRIP ($)	PRICE ($)
1983	77,606	146	3.42
1984	105,029	214	3.10
1985	95,281	337	2.91
1986	75,282	329	3.15
1987	114,989	485	2.89
1988	104,959	497	2.77
1989	59,586	232	3.05
1990	36,063	279	3.31
1991	20,470	165	3.6
1992	24,607	176	3.02
1993	41,787	235	2.83
1994	61,481	223	3.02
1995	102,827	333	3.58
1996	183,775	413	3.47
1997	173,957	466	3.42

YEAR	REVENUE ($)	REVENUE/TRIP ($)	PRICE ($)
1998	160,944	508	3.51
1999	164,227	580	3.70
2000	103,477	164	2.85
mean	94,797	321	3.20
s.d.	50,801	139	0.30

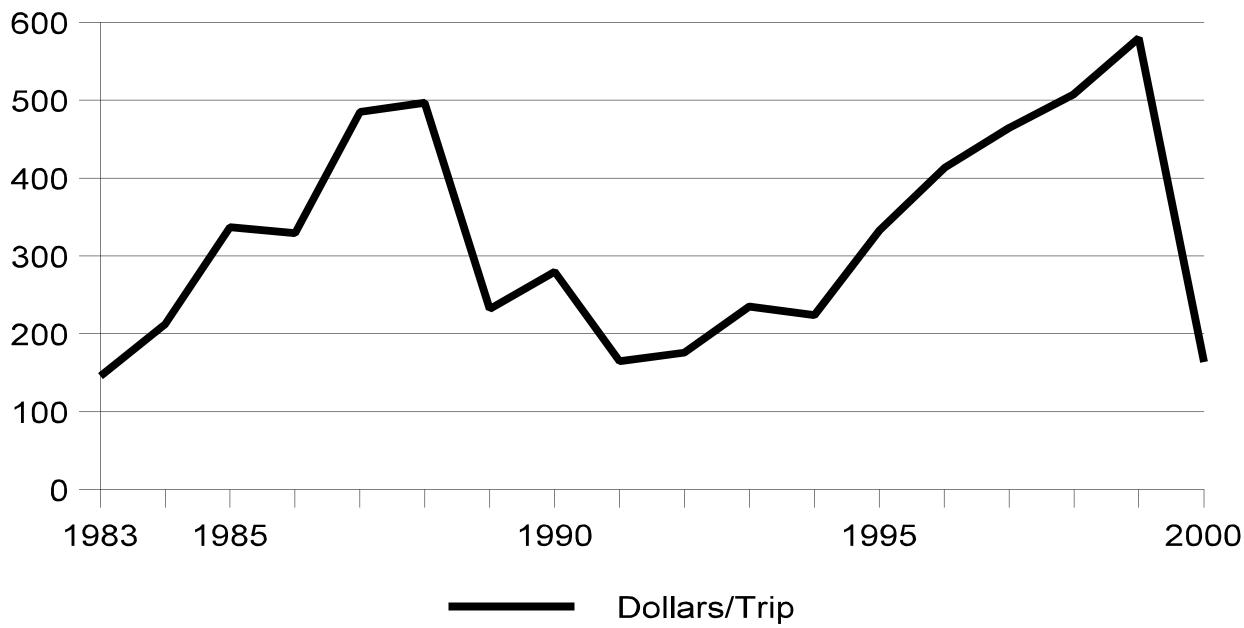
Source: WPRFMC in prep.

FIGURE 3-26: Inflation-adjusted Gross Revenue in the CNMI Bottomfish Fishery, 1983-2000



Estimates of the profitability of vessels involved in the commercial harvest of bottomfish are unavailable. Nor is there information on the quantity or non-market value of the bottomfish caught for recreational or subsistence purposes. According to a recent survey of fishermen in the CNMI, few fishermen depend on fishing for all of their income (Hamnett et. al. 1998). Two-thirds of those interviewed sold less than 75% of their catch. Eleven percent sold all of their catch, and an equal number sold no fish. Many fishermen try to sell enough fish to cover trip operating expenses, but the primary motivation for fishing is to catch fish for home consumption and to give away "extra" catch to friends and extended family members.

FIGURE 3-27: Inflation-adjusted Gross Revenue per Trip in the CNMI Bottomfish Fishery, 1983-2000



3.5.4.6 Markets

Because of the small scale of the harvesting sector, no system for handling large quantities of fresh fish landings has developed (AECOS, Inc. 1984). Although there have been some exports of fish to Guam and Hawaiʻi, nearly all of the domestic catch is consumed locally. The major commercial outlets for locally caught fish are small retail markets, resort hotels and restaurants on Saipan (Radtke and Davis 1995). Restricted market outlets curtail harvesting activities during the peak fishing season because of the difficulties in marketing catches. During other times of the year fishing activities are vulnerable to disruption by periods of even moderately rough seas because of the small size of many of the boats.

Bottomfish, particularly deep-water snappers and groupers, are in relatively high demand by the resort hotels. During the mid-1990s, however, consistent supply and quality were market requirements that were not being met by the local fishing industry (Radtke and Davis 1995). More recently, fishermen utilizing larger vessels have had greater access to deep-water bottomfish resources, especially those in the northern islands, and the supply of high-quality fish is expected to improve (WPRFMC 1999).

3.6 REGIONAL ECONOMY

3.6.1 Hawaiʻi

The State of Hawaiʻi lies 2,500 miles southwest of North America, the nearest continental land mass. The eight main islands are part of a 137-island archipelago stretching 1,523 miles from Kure Atoll in the northwest to the island of Hawaiʻi in the southwest. The total land area of the archipelago is 6,423 square miles. The main islands include Oʻahu, Maui, Kauaʻi, Niʻihau, Hawaiʻi, Molokaʻi, Kahoʻolawe and Lanaʻi. Hawaiʻi was established as a territory of the United States in 1900 and became the 50th state in 1959.

3.6.1.1 Overview of the Economy

Income generation in Hawaiʻi is characterized by tourism, federal defense spending and, to a lesser extent, agriculture (Table 3-34). Tourism is by far the leading industry in Hawaiʻi in terms of generating jobs and contributing to gross state product. The World Travel and Tourism Council (1999) estimates that tourism in Hawaiʻi directly generated 134,300 jobs in 1999. This figure represents 22.6 percent of the total workforce. Agricultural products include sugarcane, pineapples (which together brought in $269.2 million in 1997), nursery stock, livestock, and macadamia nuts.

TABLE 3-34: Statistical Summary of Hawaiʻi's Economy, 1994-1999

CATEGORY	UNITS	1994	1995	1996	1997	1998	1999
Civilian Labor Force	Number	580,150	576,400	590,200	592,000	595,000	594,800
Unemployment	Percent	6.1	5.9	6.4	6.4	6.2	5.6
Gross state product in 1996 dollars	$ Millions	38,328	37,963	37,517	37,996	38,015	NA
Manufacturing Sales	$ Millions	2,026.1	2,045.0	1,724.1	1,468.8	NA	NA
Agriculture (all crops and livestock)	$ Millions	503.8	492.7	494.6	486.5	492.6	NA
Construction completed	$ Millions	3,317.3	3,153.3	3,196.4	2,864.9	NA	NA
Retail sales	$ Millions	15,237.7	15,693.3	16,565.0	16,426.0	NA	NA
Defense expenditures	$ Millions	3,876.8	3,782.5	3,883.5	4,074.9	4,103.7	4,174.2

Source: DBEDT 1999; BOH 1999a

Median household income in Hawaiʻi was calculated to be $40,827 in 1990 rising to $48,540 in 1998. Statewide per capita income in 1989 was calculated to be $15,770, rising to $25,684 in 1995 and $27,544 in 1999. The poverty rate in Hawaiʻi grew more over the 1990s than in the nation as a whole. Despite this growth, Hawaiʻi's poverty rate, which increased from 11.2

percent in 1988-89 to 12.4 percent in 1997-98, remained lower than the national rate (13.0 percent in 1997-98). Hawaiʻi employment growth was virtually nil for most of the 1990s, continuing through to the end of 1998.

For several decades Hawaiʻi benefitted from the strength of regional economies around the Pacific that supported the state's dominant economic sector and principal source of external receipts – tourism (BOH 1999a). In addition, industries of long-standing importance in Hawaiʻi, such as the federal military sector and plantation agriculture, also experienced significant growth. However, Hawaiʻi's economic situation changed dramatically in the 1990s. The state's main tourist market, Japan, entered a long period of economic malaise that caused the tourism industry in Hawaiʻi to stagnate. The post-Cold War era brought military downsizing. Tens of thousands of acres of plantation lands, along with downstream processing facilities, were idled by the end of the decade due to high production costs. Employment in Hawaiʻi sugar production fell by 20% between 1990 and 1993 and by an additional 50% from 1994 to 1995 (Yuen et al. 1997). Net out-migration became the norm in Hawaiʻi, notwithstanding the state's appeal as a place to live. In 1998, the state-wide unemployment rate was 6.2%, and unemployment on the island of Molokaʻi reached 15% (DBEDT 1999).

As a consequence of the economic upheaval of the 1990s and the extensive bankruptcies, foreclosures and unemployment, Hawaiʻi never entered the period of economic prosperity that many U.S. mainland states experienced. Between 1998 and 2000, Hawaiʻi's tourism industry recovered substantially, mainly because the strength of the national economy promoted growth in visitor arrivals from the continental U.S. (Brewbaker 2000). However, efforts to diversify the economy and thereby make it less vulnerable to future economic downturns have met with little success. The events of September 11, 2001 and their negative effects on travel and tourism have halted Hawaiʻi's short-lived economic recovery. To date, economic development initiatives such as promoting Hawaiʻi as a center for high-tech industry have attracted few investors. It is unlikely that any new major industry will develop in Hawaiʻi in the near future to significantly increase employment opportunities and broaden the state's economy beyond tourism.

3.6.1.2 Fishing Related Economic Activities

The harvest and processing of fishery resources play a minor role in Hawaiʻi's economy. The most recent estimate of the contribution of the commercial, charter and recreational fishing sectors to the state economy indicated that in 1992, these sectors contributed $118.79 million of output (production) and $34.29 million of household income and employed 1,469 people (Sharma et al. 1999). These contributions accounted for only 0.25% of total state output ($47.4 billion), 0.17% of household income ($20.2 billion) and 0.19% of employment (757,132 jobs). However, in contrast to the sharp decline in some traditional mainstays of Hawaiʻi's economy such as large-scale agriculture the fishing industry has been fairly stable during the past decade.

Total revenues in Hawaiʻi's pelagic, bottomfish and lobster fisheries in 1998 were about 10% higher than 1988 revenues (adjusted for inflation) in those fisheries.

Hawaiʻi's commercial fishing sector includes a wide array of fisheries. The Hawaiʻi longline fishery is by far the most important economically, accounting for 73 percent of the estimated ex-vessel value of the total commercial fish landings in the state in 1999 (Table 3-35). As shown in that table, the NWHI and MHI bottomfish fisheries account for a relatively small share of the landings and value of the state's commercial fisheries.

TABLE 3-35: Volume and Value of Commercial Fish Landings in Hawaiʻi by Fishery, 1999

FISHERY	POUNDS LANDED (1,000s)	PERCENT OF TOTAL POUNDS LANDED	EX-VESSEL VALUE ($1,000s)	PERCENT OF TOTAL EX-VESSEL VALUE
Pelagic longline	28,300	75%	47,400	73%
Troll	2,960	8%	4,550	7%
Pelagic handline	2,340	6%	3,950	6%
Aku pole and line	1,450	4%	1,850	3%
MHI bottomfish handline	420	1%	1,300	2%
NWHI bottomfish handline	370	1%	1,210	2%
NWHI lobster trap	260	1%	1,040	2%
All other fisheries	1,650	4%	3,330	5%
Total	37,750	100%	64,630	100%

Source: Preliminary data compiled by NMFS Southwest Fisheries Science Center Honolulu Laboratory.

Estimates of the economic activity in the various sectors (commercial, charter and recreational) of Hawaiʻi's bottomfish fishery can be obtained from various published data. According to the WPRFMC (1999a), for the period 1994-1998, the ex-vessel value of annual commercial landings in the NWHI and MHI bottomfish fisheries averaged about $1,096,200 and $1,625,800, respectively. Based on data collected in a recent cost-earnings study of Hawaiʻi's charter fishing industry (Hamilton 1998), it is estimated that the charter boat fleet earns about $342,675 per year from taking patrons on bottomfish fishing trips. Finally, based on information gathered in a recent cost-earnings study of Hawaiʻi's small boat fishery (Hamilton and Huffman 1997), it is estimated that annual personal consumption expenditures for recreational vessels engaged in bottomfish fishing total about $2,827,096. Recreational vessels are fishing boats that do not sell any portion of their catch.

However, the above values reflect only the direct revenues and expenditures in the various sectors of the bottomfish fishery. They do not take into account that employment and income are also generated indirectly within the state by commercial, recreational and charter fishing for bottomfish. The fishery has an economic impact on businesses whose goods and services are used as inputs in the fishery such as fuel suppliers, chandlers, gear manufacturers, boatyards, tackle shops, ice plants, bait shops and insurance brokers. In addition, the fishery has an impact on businesses that use fishery products as inputs for their own production of goods and services. Firms that buy, process or distribute fishery products include seafood wholesale and retail dealers, restaurants, hotels and retail markets. Both the restaurant and hotel trade and the charter fishing industry are closely linked to the tourism base that is so important to Hawaiʻi's economy. Finally, people earning incomes directly or indirectly from the fishery make expenditures within the economy as well, generating additional jobs and income.

A more accurate assessment of current contributions of the bottomfish fishery to the economy can be obtained using the Type II output, income and employment multipliers calculated by Sharma et al. (1999) for Hawaiʻi's (non-longline) commercial, charter and recreational fishing sectors. Applying these multipliers to an approximation of the final demand in each of the sectors involved in bottomfish fishing, it is estimated that this fishing activity contributes $10.78 million of output (production) and $2.51 million of household income to the state economy and creates the equivalent of 113 full-time jobs (Table 3-36).[26]

[26]Several input-output models other than the one used here are available to study economic impacts. The model developed by Sharma et al. (1999) is based on data collected in Hawaiʻi over a number of years, and is believed to be the best available for analyzing Hawaiʻi's fisheries. It should be noted, however, that different practitioners may apply a model in different ways.

TABLE 3-36: Estimated Output, Household Income and Employment Generated by Bottomfish Fishing Activity in Hawaiʻi

FISHERY	SALES ($)	FINAL DEMAND ($)	OUTPUT ($)	HOUSEHOLD INCOME ($)	EMPLOYMENT (JOBS)[1]
NWHI bottomfish fishery					
Commercial vessels[2]	1,096,200	580,986	1,382,747	482,218	25
MHI bottomfish fishery					
Commercial vessels[2]	1,625,800	861,674	2,050,784	715,189	36
Charter vessels[3]	305,664	293,437	760,002	269,962	14
Recreational vessels[4]		2,827,096	6,587,134	1,046,026	38
Total			10,780,667	2,513,431	113

[1] Calculated as full-time jobs. The input-output model assumes that fishing accounts for 20% of the employment time of part-time commercial fishermen (Sharma et al. 1999).
[2] Average annual sales estimate for 1994-1998 from WPRFMC (1999a).
[3] Sales estimate based on the following assumptions: 199 active vessels; average annual sales of $76,800 per vessel from charter fees and mount commissions; and 2% of total sales attributed to bottomfish fishing trips (Hamilton 1998).
[4] Expenditure estimates based on the following assumptions (Hamilton and Huffman 1997; Pan et al. 1999):

Number of recreational boats	2490
Annual number of bottomfish fishing trips	3.81
Average trip costs	84.75
Average fixed costs: apportioned according to ratio of bottomfish fishing trips to total number of trips	213

3.6.2 American Samoa

The Territory of American Samoa is a group of islands with a total land area of 76 square miles lying approximately 2,300 miles southwest of Hawaiʻi. The islands of the territory include Tutuila, the three islands of Ofu, Olosega, and Taʻu of the Manuʻa group, Aunuʻu, Rose Atoll and Swain's Island. Formal annexation of Tutuila and Aunuʻu by the United States occurred in 1900, Manuʻa agreed to cede its authority to the United States in 1904, and Swain's Island was annexed in 1925. The islands remained under naval administration from 1900 to 1951, when the administration of American Samoa was transferred to the Secretary of the Interior.

3.6.2.1 Overview of the Economy

American Samoa has a small developing economy, dependent mainly on two primary income sources: the American Samoa Government, which receives income and capital subsidies from the federal government, and the two fish canneries on Tutuila (BOH 1997). These two primary income sources have given rise to a third: a services sector that derives from and complements the first two. In 1993, the latest year for which the ASG has compiled detailed labor force and employment data, the ASG employed 4,355 persons (32.2 percent of total employment), followed by the two canneries with 3,977 persons (29.4 percent) and the rest of the services economy with 5,211 persons (38.4 percent). An estimated 2,718 people were unemployed, giving a total labor force of 16,261, and an unemployment rate of 16.7 percent. Though higher than unemployment rates in the rest of the United States, it is not unusual when compared with unemployment rates throughout the Pacific.

A large proportion of the territory's work force is from Western Samoa (now officially called Samoa) (BOH 1997). While it would be true to say that Western Samoans working in the territory are legally alien workers, in fact they are the same people, by culture, history, and family ties.

Statistics on household income indicate that the majority of American Samoans live in poverty according to U.S. income standards. American Samoa has the lowest gross domestic product and highest donor aid per capita among the U.S.-flag Pacific islands (Adams et al. 1999). However, by some regional measures American Samoa is not a poor economy. It's estimated per capita income of $5,000 is almost twice the average for all Pacific island economies, although it is less than half of the per capita income in Guam, where proximity to Asia has led to development of a large tourism sector.

3.6.2.2 Fishing-Related Economic Activities

The excellent harbor at Pago Pago and certain special provisions of U.S. law form the basis of American Samoa's largest private industry, fish processing, which is now more than forty years old (BOH 1997). The territory is exempt from the Nicholson Act, which prohibits foreign ships from landing their catches in U.S. ports. American Samoan products with less than 50 percent market value from foreign sources enter the United States duty free (Headnote 3(a) of the U.S. Tariff Schedule). The parent companies of American Samoa's fish processing plants enjoy special tax benefits, and wages in the territory are set not by federal law but by recommendation of a special U.S. Department of Labor committee that reviews economic conditions every two years and establishes minimum wages by industry.

In 1998, Pago Pago received 208,300 tons of fish worth more than $200 million, making it the leading U.S. port in terms of the dollar value of fish landings. Furthermore, with a production increase of 50 percent over the past three years, Star-Kist Samoa, Inc. has become the largest tuna cannery in the world. Nearly all of the fish processed by the canneries is harvested by domestic and foreign industrial fishing fleets operating in areas of the Pacific far from American Samoa.

The ASG estimates that the tuna processing industry directly and indirectly generates about 15 percent of current money wages, 10 to 12 percent of aggregate household income and 7 percent of government receipts in the territory (BOH 1997). On the other hand, both tuna canneries in American Samoa are tied to multinational corporations that supply virtually everything but unskilled labor, shipping services and infrastructure facilities (Schug and Galeaʻi 1987). Even a substantial portion of the raw tuna processed by Star-Kist Samoa is landed by vessels owned by the parent company. The result is that few backward linkages have developed, and the fish-processing facilities exist essentially as industrial enclaves. Furthermore, most of the unskilled labor of the canneries is imported. Up to 90 percent of cannery jobs are filled by foreign nationals from Western Samoa and Tonga. The result is that much of the payroll of the canneries “leaks” out of the territory in the form of overseas remittances.

Harsh working conditions, low wages and long fishing trips have discouraged American Samoans from working on foreign longline vessels delivering tuna to the canneries. American Samoans prefer employment on the U.S. purse seine vessels, but the capital-intensive nature of purse seine operations limits the number of job opportunities for locals in that sector as well. Only about 16 American Samoans are employed on U.S. purse seiners (Gillette and McCoy 1997). However, the presence of the industrial tuna fishing fleet has had a positive economic effect on the local economy as a whole. Ancillary businesses involved in reprovisioning the fishing fleet generate a significant number of jobs and amount of income for local residents. Fleet expenditures for fuel, provisions and repairs in 1994 were estimated to be between $45 million and $92 million (Hamnett and Pintz 1996).

Despite the recent substantial increases in cannery production, the future of the tuna processing industry in American Samoa is uncertain (BOH 1997). The North American Free Trade Agreement (NAFTA) may result in competition from Mexican tuna processors. The General Agreement on Tariffs and Trade (GATT) may prevent preferential entry into the United States of processed tuna from American Samoa. Tax exemptions for the subsidiaries of American companies operating in U.S. territories are under pressure in Congress and are no longer assured for the cannery owners. Also, low labor costs in tuna canning operations in Thailand make for serious pressure from foreign competition.

The tuna processing industry has had a mixed effect on the commercial fishing activities undertaken by American Samoans. The canneries often buy fish from the small-scale domestic longline fleet based in American Samoa, although the quantity of this fish is insignificant compared to cannery deliveries by the U.S. purse seine, U.S. albacore and foreign longline fleets. The ready market provided by the canneries is attractive to the small boat fleet, and virtually all of the albacore caught by the *alia*-style vessels that fished with longline gear during the late 1990s was sold to the canneries. Nevertheless, local fishermen have long complained that a portion of the frozen fish landed by foreign longline vessels enters the American Samoa restaurant and home-consumption market, creating an oversupply and depressing the prices for fresh fish sold by local fishermen.

Although the domestic longline fleet in Pago Pago consists mainly of small vessels, five locally owned vessels larger than 50 ft are also engaged in the longline fishery. These latter vessels are outfitted with modern electronic equipment for navigation, communications and fish finding, and they are able to chill and freeze tuna catches. In addition, several other fishermen in American Samoa are acquiring larger (38-50 ft) boats with a greater fishing range and capacity for chilling fish. At least in the short-term, most of the tuna landed by these vessels will likely be sold for canning. Local fishermen have indicated an interest in participating in the far more lucrative overseas market for fresh fish. To date, however, inadequate shore-side ice and cold storage facilities in American Samoa and infrequent and expensive air transportation links have been restrictive factors.

Pago Pago Bay has the appearance of a “working harbor” dedicated to the landing, processing and export of vast quantities of fish. The harbor supports mostly large fishing vessels, tankers and container vessels, but some small fishing and cruising boats moor there as well. However, the shore-side support facilities for small vessels are minimal. The fisheries occurring in the waters around American Samoa are typically small boat, one-day fisheries. In recent (1994-1998) years, the annual ex-vessel value of commercial landings of bottomfish and pelagic species has averaged about $633,700 (WPRFMC 1999). The bottomfish catch accounts for only about 9% of the total revenues generated by local fisheries. Existing planning data for American Samoa are not suited to examining the direct and indirect contributions attributed to various inter-industry linkages in the economy. It is apparent, however, that bottomfish fishing plays a relatively minor role in the domestic small boat fishery, which itself represents only a small fraction of the economic activity in the territory.

3.6.3 Guam

The Territory of Guam is an island located at the southern end of the Mariana archipelago, which lies about 1,500 miles from Japan and 3,700 miles from Hawaiʻi. The land area of Guam is approximately 212 square miles. The island was ceded to the United States following the Spanish American War of 1898 and has been an unincorporated territory since 1949.

3.6.3.1 Overview of the Economy

The main income sources on Guam include tourism, national defense, and trade and services. Per capita income in Guam was calculated to be $12,028 in 1998, up from $10,152 in 1991. Median household income was calculated to be $39,484 in 1998, up from $31,118 in 1991.

The Guam Department of Labor estimated the number of employees on payroll to be 64,230 in 1998, a decrease of 3.8 percent from the 1997 figure. Of the 64,230 employees, 44,780 were in the private sector and 19,450 were in the public sector. The federal government employs 7.6 percent of the total work force, while the Government of Guam employs 22.7 percent. Guam had an unemployment rate of 15.2 percent in 1999.

The major economic factor in Guam for most of the latter part of the twentieth century was the large-scale presence of the U.S. military (BOH 1999b). In recent years, however, the military's contribution to Guam's economy has waned and been largely replaced by Asian tourism. Guam's macro-economic situation exhibited considerable growth between 1988 and 1993 as a result of rapid expansion of the tourist industry. In fact, Guam's economy has become so dependent on tourists from Asia, particularly Japan, that any significant economic, financial and foreign exchange development in the region has had an immediate impact on the territory (BOH, 1999b). During the mid- to late-1990s, as Japan experienced a period of economic stagnation and cautious consumer spending, the impact was felt just as much in Guam as in Japan. Visitor arrivals in Guam dropped 17.7 percent in 1998. Despite recent efforts to expand the tourist market, Guam's economy remains dependent on Japanese tourists.

The military presence on the island has diminished to the lowest level in decades and is still declining (BOH 1999b). The military is likely to remain a small part of the economy unless unexpected tensions arise in the region and cause a redeployment of forces. Nevertheless, the military remains a vital stabilizing economic factor for Guam, particularly in times of regional economic crises.

The Government of Guam has been a major employer on Guam for many years. However, recent deficits have resulted from a steady rise in government spending at the same time that tax bases have not kept up with spending demands. Many senior government workers have been offered and have accepted early retirement to reduce the payroll burden.

3.6.3.2 Fishing-Related Economic Activities

The importance of commercial fishing in Guam lies mainly in the territory's status as a major regional fish transshipment center and re-supply base for domestic and foreign tuna fishing fleets. Among Guam's advantages as a home port are well-developed and highly efficient port facilities in Apra Harbor; an availability of relatively low-cost vessel fuel; a well-established marine supply/repair industry; and recreational amenities for crew shore leave (Hamnett and Pintz 1996). In addition, the territory is exempt from the Nicholson Act, which prohibits foreign ships from landing their catches in U.S. ports. Initially, the majority of vessels calling in Apra Harbor to discharge frozen tuna for transshipment were Japanese purse seine boats and carrier vessels. Later, a fleet of U.S. purse seine vessels relocated to Guam, and since the late 1980s, Guam has become an important port for Japanese and Taiwanese longline fleets. The presence of the longline and purse seine vessels has created a demand for a range of provisioning, vessel maintenance and gear repair services.

By the early 1990s, an air transshipment operation was also established on Guam. Fresh tuna is flown into Guam from the Federated States of Micronesia and elsewhere on air cargo planes and out of Guam to the Japanese market on wide-body passenger planes (Hamnett and Pintz, 1996). A second air transshipment operation that began in the mid-1990s is transporting to Europe fish that do not meet Japanese *sashimi* market standards.

Currently, Guam is the most important re-supply and transshipment center for the international tuna longline fleet in the Pacific. However, the future of home port and transshipment operations in Guam depends on the island's ability to compete with neighboring countries that are seeking to attract the highly mobile longline fleet to their own ports. Trends in the number of port calls made in Guam by various fishing fleets reflect the volatility of the industry. The number of vessels operating out of Guam decreased by almost half from 1996 to 1997, and further declined in 1998 (Hamnett and Anderson 2000).

The Guam Department of Commerce reported that fleet expenditures in Guam in 1998 were about $68 million, and a 1994 study estimated that the home port and transshipment industry employed about 130 people (Hamnett and Pintz 1996). This industry constitutes an insignificant percentage of the gross island product, which was about $2.99 billion in 1996, and is of minor economic importance in comparison to the tourist or defense industries (Hamnett and Anderson 2000). Nevertheless, home port and transshipment operations make an important contribution to the diversification of Guam's economy (Hamnett and Pintz 1996). As a result of fluctuations in the tourism industry and cuts in military expenditures in Guam, the importance of economic diversification has increased.

Guam's local fishery also has limited economic importance relative to the economy as a whole. Offshore fishing typically involves small boats and 1 to 2-day fishing trips. In recent (1994-1998) years, the annual ex-vessel value of commercial landings of bottomfish and pelagic species has averaged about $616,500 (WPRFMC 1999). The bottomfish catch accounts for only about 8% of the total revenues generated by local fisheries. Existing planning data for Guam are not suited to examining the direct and indirect contributions attributed to various inter-industry linkages in the economy. However, it is apparent that bottomfish fishing plays a relatively minor role in the domestic fishery, which itself represents only a small fraction of the economic activity in the territory.

3.6.4 The Northern Mariana Islands

The Commonwealth of the Northern Mariana Islands consists of 14 islands, five of which are inhabited, with a total land area of 176.5 square miles spread over about 264,000 square miles of ocean. The Northern Mariana Islands became part of the Pacific Trust Territory administered by the United States under a mandate granted in 1947. The Covenant that created the commonwealth and attached it to the United States was fully implemented in 1986, pursuant to a Presidential Proclamation that terminated the Trust Territory of the Pacific Islands as it applied to the Northern Mariana Islands.

3.6.4.1 Overview of the Economy

Per capita income on Saipan in 1995 was $7,645, down from $7,721 in 1990 (figures for more recent periods are not available). For Saipan, the median household income was $19,698 in the first quarter of 1999, as compared to $21,457 in 1990. The commonwealth had an unemployment rate in 1999 of 5.5 percent.

The economy of the CNMI has historically benefitted substantially from financial assistance from the United States, but in recent years this assistance has declined as locally generated government revenues have grown. Between 1988 and 1996, tourism was the commonwealth's largest income source. During that period tourist traffic to the CNMI tripled from 245,505 to 736,117 (BOH 1999c). Total tourist expenditures in the CNMI were estimated to be a record $587 million in 1996. In 1997 and 1998, however, the loss of air service between the CNMI and Korea, together with the impact of the Asian financial crisis on both Korean and Japanese travelers, caused tourist arrivals in the CNMI to drop by one-third (BOH 1999c).

At present, garment production is the CNMI's fastest growing industry, with shipments of $1 billion to the United States under duty and quota exemptions (BOH 1999c). The garment industry is credited with preventing an economic depression in the commonwealth following the decline of its tourist industry, but the future of the CNMI's garment manufacturers is uncertain.

When the commonwealth was created it was granted an exemption from certain U.S. immigration, naturalization and labor laws. These economic advantages are now a matter of national political debate centered on what some regard as unfair labor practices in the CNMI's garment industry. The two main advantages for manufacturing garments in the CNMI are low-cost foreign labor and duty-free sale in the United States. The controversy over labor practices in the CNMI may cause the commonwealth to lose these unique advantages, forcing garment-makers to seek alternative low-cost production sites.

3.6.4.2 Fishing-Related Economic Activities

In the early 1980s, U.S. purse seine vessels established a transshipment operation at Tinian Harbor. The CNMI is exempt from the Jones Act, which requires the use of U.S.-flag and U.S.-built vessels to carry cargo between U.S. ports. The U.S. purse seiners took advantage of this exemption by offloading their catch at Tinian onto foreign reefer vessels for shipment to tuna canneries in American Samoa. In 1991, a second type of tuna transshipment operation was established on Saipan (Hamnett and Pintz 1996). This operation transships fresh tuna caught in the Federated States of Micronesia from air freighters to wide-body jets bound for Japan. The volume of fish flown into and out of Saipan is substantial, but the contribution of this operation to the local economy is minimal (Hamnett and Pintz 1996) .

With the exception of the purse seine support base on Tinian (now defunct), the CNMI has never had a large infrastructure dedicated to commercial fishing. The majority of boats in the local fishing fleet are small, outboard engine-powered vessels. In recent (1994-1998) years, the annual ex-vessel value of commercial landings of bottomfish and pelagic species has averaged about $473,900 (WPRFMC 1999). The bottomfish catch accounts for about 28% of the total revenues. Existing planning data for the CNMI are not suited to examining the direct and indirect contributions attributed to various inter-industry linkages in the economy. It is apparent, however, that fishing by the local small-boat fleet represents only a small fraction of the economic activity in the commonwealth.

3.7 FISHING COMMUNITY

The 1996 SFA amendments to the MSA added a definition of "fishing community" (MSA §(16)) and required that fishing communities be considered in the fishery impact statement (§303(a)(9)) and in certain other contexts, such as any proposal for limited access to a fishery (§303(b)(6)) and any plan to end overfishing (§304(e)(4)).

The MSA defines "fishing community" (§3(16)):

> *The term "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 included fishing vessel owners, operators, and crew and United States fish processors that are based in such community.*

The SFA also added National Standard 8 (§301(a)(8)), which states:

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

The National Standard Guidelines further specify that (50 CFR 600.345):

> *A fishing community is a social or economic group whose members reside in a specific location and share a common dependency on commercial, recreational, or subsistence fishing or on directly related fisheries-dependent services and industries (for example, boatyards, ice suppliers, tackle shops).*

And further:

> *The term "sustained participation" means continued access to the fishery within the constraints of the condition of the resource.*

To address the requirements of the SFA, the Council prepared a comprehensive document with amendments to all four of its FMPS. Amendment 6 to the Bottomfish FMP, Amendment 8 to the Pelagics FMP, Amendment 10 to the Crustaceans FMP, and Amendment 4 to the Precious Corals FMP were published in September 1998 and submitted to NMFS for review. NMFS only partially approved the amendments, as described in a *Federal Register* notice published on April 19, 1999 (64 FR 19067). Three components of the amendments were disapproved: the bycatch provisions (MSA §301(a)(9), §303(a)(11), and other sections) for the Bottomfish and Pelagics FMPs, the overfishing provisions (§303(a)(10) and other sections) for the Botomfish, Pelagics, and Crustaceans FMPs, and for all four FMPs, the description of the State of Hawaiʻi as a single fishing community (MSA §301(a)(8), §303(a)(9), and other sections).

Currently, the Council is finalizing supplements to the amendments to address the disapproved sections of Bottomfish FMP Amendment 6, Pelagic FMP Amendment 8, Crustaceans FMP Amendment 10, and Precious Corals Amendment 4 regarding the identification of fishing communities. The fishing communities supplement (WPRFMC 2002e) reconsiders the original identificatins and identifies a new set of fishing communities within Hawaiʻi. It provides additional background and analysis to justify those identifications. It does not modify the identification of American Samoa, the Northern Mariana Islands, and Guam as fishing communities, as these definitions were approved in the original SFA amendments.

With respect to Hawaiʻi, the findings indicate that fishing and related services and industries are important to all of Hawaiʻi's inhabited islands, that the social and economic cohesion of fishery participants is particularly strong at the island level, and that fishing communities are best not distinguished according to fishery or gear type. The most logical unit of analysis for describing the community setting and assessing community-level impacts is the island. In each of the four FMP amendments, each of the islands of Kauaʻi, Niʻihau, Oʻahu, Maui, Molokaʻi, Lānaʻi, and Hawaiʻi is identified as a fishing community for the purposes of assessing the effects of fishery conservation and management measures on fishing communities, providing for the sustained participation of such communities, minimizing adverse economic impacts on such communities, and for other purposes under the MSA.

For purposes of this EIS, it is assumed that the definition of each inhabited main Hawaiian Island as a fishing community will be approved by NMFS.

The social analysis provided in this section is driven, therefore, by the SFA requirement that impacts to fishing communities be considered in the context of fishery management decisions and by the NEPA requirement that the social and cultural effects of alternatives be discussed (40 CFR 1508.8). Section 3.6 of this EIS provided an overview of the standard socioeconomic variables typically found in an EIS, including a summary of income and employment data for the affected area. The present section includes data on population size and ethnicity and a description of the sociocultural setting of the bottomfish fisheries in the Western Pacific Region.

The sociocultural aspects of a fishery include the shared technology, customs, terminology, attitudes and values related to fishing. While it is the fishermen that benefit directly from the fishing lifestyle, individuals who participate in the marketing or consumption of fish or in the provision of fishing supplies may also share in the fishing culture. An integral part of this framework is the broad network of inter-personal social and economic relations through which the cultural attributes of a fishery are transmitted and perpetuated. The relations that originate from a shared dependence on fishing and fishing-related activities to meet economic and social needs can have far-reaching effects in the daily lives of those involved. For example, they may constitute important forms of social capital, i.e., social resources that individuals and families can draw on to help them achieve desired goals.

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

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

3.7.1 Hawai‘i

3.7.1.1 Population Size and Ethnicity

The 1990 census listed the population of Hawai‘i as 1,108,229. This figure rose to 1,179,198 in 1995 and to 1,185,497 in 1999. The population increased by a rate of 6.9 percent between 1990 and 1999.

The state of Hawai‘i is divided into five counties. The county of Maui includes the islands of Kaho‘olawe, Lana‘i, Maui and Moloka‘i. The county of Honolulu encompasses the island of O‘ahu and the Northwestern Hawaiian Islands excluding Midway Atoll. Kaua‘i County consists of the islands of Kaua‘i and Ni‘ihau. The population of each county is provided in Table 3-37.

TABLE 3-37: Hawai‘i Population by County

AREA	1990 CENSUS	JULY 1999 (est.)
Hawai‘i State	1,108,229	1,185,497
Honolulu County, HI	836,231	864,571
Hawai‘i County, HI	120,317	142,390
Kaua‘i County, HI	51,177	56,539
Maui County, HI	100,374	121, 939

Source: U.S. Census Bureau

The ethnicity of Hawaiʻi's population in 1998 was as follows: Caucasian (22 percent), Hawaiian/part Hawaiian (21 percent), Japanese (18 percent), Filipino (13 percent), Chinese (4 percent), and other (22 percent).

In 1995-1996, Hamilton and Huffman (1997) conducted a survey of small-boat owners who engage in Hawaiʻi's commercial and recreational fisheries, including the troll, pelagic handline and bottomfish handline fisheries. The survey found that the three largest ethnic groups represented in the sample were Japanese (33 percent), mixed with part-Hawaiian (16 percent) and Caucasian (12 percent). Hamilton and Huffman speculated that the high proportion of Japanese and part-Hawaiians in the sample reflects the traditional connections that these two ethnic groups have with the sea. These sociocultural connections are discussed further in the following section.

With specific regard to the NWHI bottomfish fishery, a 1993 survey of 15 owner-operators and hired captains who participate in the fishery found that 87 percent were Caucasian and 13 percent were part-Hawaiian (Hamilton 1994). However, it is likely that the ethnic composition of the deckhands aboard these vessels is much more mixed and reflects the highly diverse ethnic character of the state's total population

3.7.1.2 Sociocultural Setting

> *Blue sampans ride in the harbor at Kewalo*
> *under the copper brilliance of the sun;*
> *blue sampans reel and tilt into the trade wind*
> *on sea-paths traced by the Hawaiian moon;*
> *blue sampans stagger and rise gallantly out of chasms of sea*
> *in storms blowing out of the sultry south,*
> *in hurricanes howling over the barren isles*
> *far to the north, in a world of wind and foam.*
> Clifford Gessler/ Tropic Landfall: The Port of Honolulu, 1942, p.267

Over the past 125 years the sociocultural context of fishing in Hawaiʻi has been shaped by the multi-ethnicity of local fisheries. Although certain ethnic groups have predominated in Hawaiʻi's fisheries in the past and ethnic enclaves continue to exist within certain fisheries, the fishing tradition in Hawaiʻi is generally characterized by a partial amalgamation of multi-cultural attributes. An examination of the way in which the people of Hawaiʻi harvest, distribute and consume seafood reveals remnants of the varied technology, customs and values of Native Hawaiians and immigrant groups from Japan, China, Europe, America, the Philippines and elsewhere.

3.7.1.2.1 Social Aspects of Fish Harvest

Commercial fishing first became important in the Hawaiian Islands with the arrival of the British and American whaling fleets during the early nineteenth century. The whalers made the islands their provisioning and trading headquarters because of their central location in the Pacific (Nakayama 1987). This trade reached its zenith in the 1850s when more than 400 whaling vessels arrived in Honolulu annually (Shoemaker 1948). European- and American-owned trading concerns, called “factors,” were established to service the whalers and gradually became the dominant enterprises in Honolulu. The significance of whaling to Hawaiʻi’s economy waned considerably during the late-nineteenth century by which time plantation agriculture centered on sugar and pineapple production had grown in importance. A number of the trading companies that supported the whaling industry, however, adjusted to these economic changes and remained at the heart of Hawaiʻi’s industrial and financial structure (Shoemaker 1948).

The introduction of a cash economy into Hawaiʻi and the establishment of communities of foreigners in the islands also led to the development of a local commercial fishery. As early as 1832, it was the custom for fish and other commodities to be sold in a large square near the waterfront in Honolulu (Reynolds 1835). In 1851, the first regular market house for the sale of fishery products was erected (Cobb 1902). The territorial government replaced this market in 1890 with an elaborate structure that Cobb (1902:435) referred to as “one of the best [market houses] in the United States.” Other fish markets were established on the islands of Maui and Hawaiʻi. Locally caught bottomfish were in high demand at these markets. In Bryan’s (1915) list of seafood preferences by the various “nationalities” in Hawaiʻi, all of the bottomfish species listed (i.e., *hāpuʻupuʻu*, *kāhala*, *ʻōpakapaka* and *uku*) were among the types of fish purchased by all social groups. Bryan (p.371) noted that some of the “snappers” “…may be procured almost every day, there being more than a hundred thousand pounds sold annually in the Hawaiian markets.” Jordan and Evermann (1903:240) wrote of *uku*: “This fish is common about Honolulu, being brought into the market almost every day. It is one of the best of food-fishes.” *Gindai* is also referred to as “one of our best food fishes” by Brigham (1908:17). Cobb (1902) reported that *ʻulaʻula*, *uku* and *ulua* were among the five species of fish taken commercially on all the islands. Titcomb (1972) writes that *ʻōpakapaka* was one of the most common fish on restaurant menus prior to World War II.

Initially, commercial fishing in Hawaiʻi was monopolized by Native Hawaiians, who supplied the local market with fish using canoes, nets, traps, spears and other traditional fishing devices (Jordan and Evermann 1902; Cobb 1902; Konishi 1930). However, the role that Native Hawaiians played in Hawaiʻi’s fishing industry gradually diminished through the latter half of the nineteenth century. During this period successive waves of immigrants of various races and nationalities arrived in Hawaiʻi increasing the non-indigenous population from 5,366 in 1872 to 114,345 in 1900 (OHA 1998). The new arrivals included Americans, Chinese, Portuguese and

Filipinos, but particularly significant in terms of having a long-term impact on the fishing industry was the arrival of a large number of Japanese. The Japanese, like the majority of the early immigrants, were contracted to work on Hawaiʻi's sugar cane plantations. When contract terms expired on the plantations many of the Japanese immigrants who had been skilled commercial fishermen from the coastal areas of Wakayama, Shizuoka and Yamaguchi Prefectures in Japan turned to the sea for a living (Okahata 1971). Later, experienced fishermen came from Japan to Hawaiʻi for the specific purpose of engaging in commercial fishing. As noted in Section 3.5.1.1, the bottomfish fishing gear and techniques employed by the Japanese immigrants were slight modifications of those traditionally used by Native Hawaiians.

During much of the twentieth century Japanese immigrants to Hawaiʻi and their descendants were preeminent in Hawaiʻi's commercial fishing industry. The tightly knit communities that the first Japanese immigrants formed both helped ease the transition to American society and retarded the process of acculturation (Tamura, 1994). The Japanese were able to maintain their separate communities in Hawaiʻi more effectively than any other immigrant group. Among those Japanese communities of particular significance were the settlements of commercial fishermen and their families in the Palama, River Street and Kākāʻāko areas of Honolulu adjacent to the harbor (Lind 1980).

The adherence of Japanese immigrants to traditional cultural practices included Japanese religious observances, and many of the religious activities of communities such as Kākāʻāko were centered on fishing (Miyasaki 1973). Various traditional Japanese taboos and rituals directed how a new fishing boat was to be launched, when a vessel could leave or return to port, what items could be brought on board a boat and many other aspects of fishing behavior (Hamamoto 1928; Katamoto 1984). Over the years, succeeding generations of fishermen of Japanese ancestry in Hawaiʻi became more "Americanized," but many Japanese fishing traditions persisted. For example, Japanese immigrant fishermen brought from Japan the Shinto practice of building a *jinsha* (shrine) dedicated to a deity such as *Konpira-sama* or *Ebisu-sama* (Kubota 1984; Miyasaki 1973). Today, an *Ebisu jinsha* constructed at Maʻalaea on the island of Maui during the early 1900s still stands, and fishermen of Japanese ancestry as well as others who share a common bond in fishing continue each year to ceremonially bless individual fishing vessels (Kubota 1984; T. Arine, pers. comm. 2000. Maui *Jinsha*).[27]

In addition to ethnic and community ties, the physical danger of fishing as an occupation also engendered a sense of commonality among fishermen. Describing the captains and crews of the early sampan fleet in Hawaiʻi, Okahata (1971:208) wrote: "It is said that the fishermen were in a clan by themselves and were imbued with a typical seaman's reckless daring spirit of 'death lies

[27] In some communities in Japan *Ebisu* is regarded specifically as the god of fishing, farming and commerce (Tokihiko 1983). He is depicted holding a fishing rod in his right hand and a sea bream under his left arm.

only a floor board away.'" The extreme isolation of the NWHI and the limited shelter they offered during rough weather made fishing trips to these islands particularly hazardous. The perils of fishing in the NWHI for bottomfish and other species captured the attention of the public media (e.g., Inouye 1931; Lau 1936), and inspired one individual to compose the poem included in the preface to this section.

As late as the 1970s, the full-time professional fishermen in Hawaiʻi were predominately of Japanese descent (Garrod and Chong 1978). However, by that period hundreds of local residents of various ethnicities were also participating in Hawaiʻi's offshore fisheries as part-time commercial and recreational fishermen. In addition, a growing number of fishermen from the continental U.S. began relocating to Hawaiʻi. Many of the new arrivals came to the islands because declining catch rates in some mainland fisheries had led to increasingly restrictive management regimes.

Today, the people who participate in Hawaiʻi's bottomfish fishery and other offshore fisheries comprise an ethnically mixed and spatially dispersed group numbering several hundred individuals, although actual numbers are difficult to ascertain. Most are year-round residents of Hawaiʻi, but some choose to maintain principal residences elsewhere. Participants in the bottomfish fishery do not reside in a specific location and do not constitute a recognizable fishing community in any geographical sense of the term. There are a few rural villages in the state where most residents are at least partially economically dependent on fishing for pelagic species (Glazier 1999). In general, however, those who are dependent on or engaged in the harvest of fishery resources to meet social and economic needs do not include entire cities and towns, but subpopulations of metropolitan areas and towns. These subpopulations comprise fishing communities in the sense of social groups whose members share similar lifestyles associated with fishing.

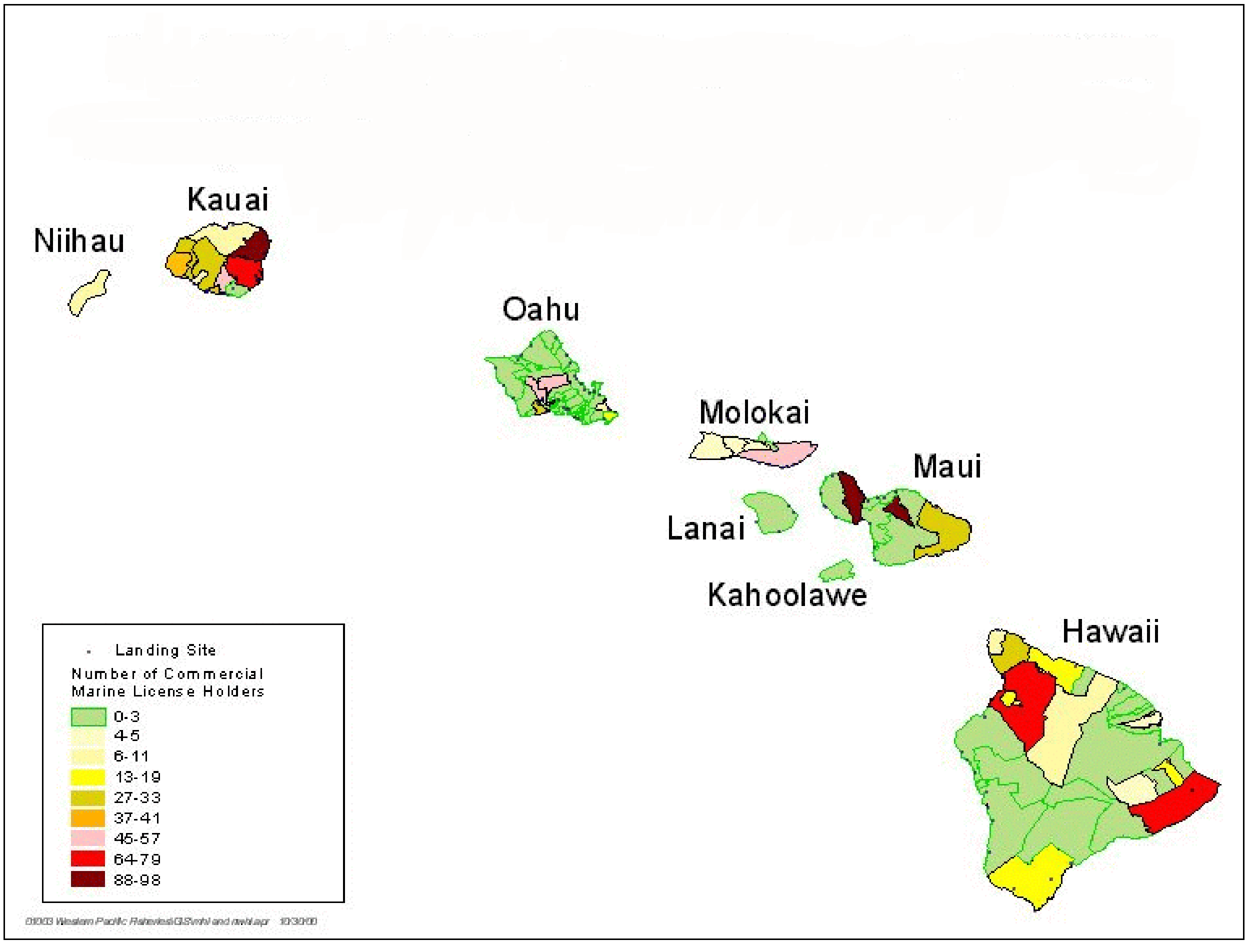
The dispersal of bottomfish fishery participants can be examined by mapping residence information from relevant fishery license or permit holders. The Hawaiʻi Division of Aquatic Resources (HDAR) administers a register of State of Hawaiʻi commercial marine license holders. State regulations require any person who "takes marine life for commercial purposes," whether within or outside of the state, to first obtain a commercial marine license from HDAR. For a particular vessel this regulation applies to each person aboard (captain or deckhand) who catches or attempts to catch a fish for commercial purposes. Figure 3-28 shows the distribution of the business or home mailing address zip codes of commercial marine license holders who indicate that their primary fishing gear is bottomfish handline gear. Each of the five larger main islands has significant concentrations of participants.

Another potential source of information on the distribution of participants in the MHI bottomfish fishery is the HDAR list of registered bottomfish fishing vessels. Hawaii Administrative Rule

Chap. 13-94 requires any vessel owner who fishes for certain bottomfish species to register their vessels for bottomfish fishing. To date, approximately 2,960 vessels have been registered (W. Ikehara, pers. comm. 2002. HDAR). The residences of the owners of these boats were not mapped, however, as the list contains many individuals who do not actually harvest bottomfish but who registered their vessels in anticipation of a future limited entry program for the MHI bottomfish fishery. There are currently no fees to register a vessel for bottomfish fishing, and many individuals may have registered, not because they intended to enter the bottomfish fishery at this time, but because they wanted to be ensured access to the fishery in the future.

Information on the residences of Mau Zone and Hoʻomalu Zone limited entry program permit holders is available from the register of permit holders administered by NMFS. The register indicates that eight permit holders reside in various communities on Oahu, three reside in two different communities on Kauaʻi, one resides on Maui, one resides on the island of Hawaiʻi and three have mailing addresses at separate locations on the U.S. mainland.

FIGURE 3-28: Distribution of Mailing Address Zip Codes of HDAR Commercial Maine License Permit Holders Who Participated in the Hawaii Bottomfish Fishery, 1998 (n=1,133)



Most of the vessels that comprise the NWHI bottomfish fishing fleet utilize harbor facilities at Kewalo Basin, a harbor located in the metropolitan Honolulu area. Three vessels operate from Port Allen Harbor on Kauai. Nearly all of the participants in the NWHI bottomfish fishery reprovision in Honolulu and offload their catch at Kewalo Basin because it is close to the fish auction. In addition, most of the large-volume, restaurant-oriented wholesalers that buy, process and distribute fishery products are located in the greater Honolulu area. Businesses whose goods and services are used as inputs in Hawai‘i’s offshore commercial fisheries, such as ice plants, marine rail ways, marine suppliers, welders and repair operations, are similarly concentrated in

Honolulu. However, the contribution of the harvesting and processing of fishery resources to the total economic fabric of Honolulu is negligible in comparison to other economic activities in the metropolitan area, such as tourism. In other words, Honolulu is the center of a major portion of commercial fishing-related activities in the state but is not a community substantially dependent upon or substantially engaged in fisheries in comparison to its dependence upon and engagement in other economic sectors.

The bottomfish fishing fleet that concentrates its effort in the waters around the MHI consists mainly of trailered vessels operating from numerous launching facilities scattered throughout the state (Hamilton 1997). Glazier (1999) identified 55 ramps and harbors used by commercial and recreational fishing boats. This number does not include several private boat mooring and launching facilities. Many of these harbors and ramps offer minimal shore-side support services, and even some of the large, well-developed harbors are remote from any central business district or residential area. However, the extensive network of launching sites provides fishermen living anywhere on a given island ready access to multiple fishing grounds (Glazier, 1999).

The motivations for fishing among contemporary Hawaiʻi fishermen tend to be mixed even for a given individual (Glazier 1999). In the small boat fishery around the MHI the distinction between “recreational” and “commercial” fishermen is extremely tenuous (Pooley 1993a). Hawaiʻi’s seafood market is not as centralized and industrialized as U.S. mainland fisheries, so that it has always been feasible for small-scale fishermen to sell any or all of their catch for a respectable price. Money earned from part-time commercial fishing is an important supplement to the basic incomes of many Hawaiʻi families.

It is also important to note that many people in Hawaiʻi who might be considered “commercial” fishermen hold non-fishing jobs that contribute more to their household income than does fishing (Pooley 1993a). For some fishermen non-fishing jobs are not a choice, but a necessity due to the inability to earn an adequate return from fishing. Many participants in Hawaiʻi’s offshore fisheries often catch insufficient fish to cover even fuel, bait and ice expenses, but they continue fishing simply for the pleasure of it. Some go so far as to pursue non-fishing occupations that allow them to maximize the time they can spend fishing regardless if it is profitable or not (Glazier 1999).

Even those fishermen who rely on fishing as their primary source of income have other reasons for their occupational choice besides financial gain. For example, a 1993 survey of owner-operators and hired captains who participate in the NWHI bottomfish fishery found that enjoyment of the lifestyle or work itself is an important motivation for fishing among fishery participants (Table 3-38).

TABLE 3-38: Motivations of 1993 Active Vessel Captains and Owners in the NWHI Bottomfish Fishery

MOTIVATION	**MAU ZONE**						**HOʻOMALU ZONE**	
	Owner-operated vessels N=5		Hired captain vessels N=3				All vessels N=4	
			Captain		Owner			
	Most Important	Somewhat Important	Most Important	Somewhat Important	Most Important	Somewhat Important	Most Important	Somewhat Important
Enjoy the lifestyle	20%	60%	67%	33%	N/A	N/A		50%
Enjoy the work		20%		67%	N/A	N/A	25%	25%
Primary source of income	60%	40%	33%				50%	25%
Source of additional income		20%				33%		
No other source of employment		20%						
Long term family tradition				33%				50%
Long term investment goals	20%	20%	N/A	N/A	33%	33%		50%
Tax write off			N/A	N/A		33%		
Cover a portion of fixed costs	20%		N/A	N/A				
Recreational purposes			N/A	N/A	33%			
Plan to operate it myself	N/A	N/A	N/A	N/A	33%			

Source: Hamilton (1994)

Fulfillment of social obligations may also at times be an important reason for fishing. Fish are an important food item among many of the ethnic groups represented in Hawaiʻi, especially during various social events. Fishermen are expected to provide fish during these occasions and may make a fishing trip especially for that purpose (Glazier 1999).

Finally, some Hawaiʻi fishermen feel a sense of continuity with previous generations of fishermen and want to perpetuate the fishing life style. The aforementioned 1993 survey of participants in the NWHI bottomfish fishery found that half of the respondents who fish in the Hoʻomalu Zone were motivated to fish by a long term family tradition (Table 3-38). This sense of continuity is also reflected in the importance placed on the process of learning about fishing from “old timers” and transmitting that knowledge to the next generation. A recent sociocultural survey of small trolling vessel captains in Hawaiʻi found that many of those interviewed either descend from long time fishing families or have worked in fishing or fishing-related work since they were in their teens (Glazier 1999). The average captain had almost 18 years of offshore fishing experience. The survey found that 35% of boat captains were taught how to fish by their fathers, grandfathers or uncles, while 32% reported being taught by friends (Glazier 1999). Only 14% indicated that they taught themselves. Most Hawaiʻi’ fishermen consider knowledge and experience to be more important factors in determining fishing success than “high-tech” gear. An example of the value placed on information passed down from previous generations of fishermen is the monument that one town on Oʻahu has recently proposed to commemorate the *kūpuna* (elders) of that area who are recognized for their fishing skills and knowledge (Ramirez 2000).

Whatever the motivations for fishing, the contributions of friends and family members to these efforts are often substantial. Small boat fishing in Hawaiʻi is almost always a cooperative venture involving friends or relatives as crew members (Glazier 1999). In addition, wives, in particular, often play an essential role in shore-side activities such as the transport of fish to markets, purchase of ice, vessel maintenance, bookkeeping and so forth (Glazier 1999).

In Hawaiʻi during the past several years there have been a number of highly publicized clashes between the owners of large and small fishing boats and between fishermen who are newcomers and those who are established residents (Glazier 1999). The reasons for these conflicts are complex, but the perception that the state’s marine resources are being damaged and depleted by certain groups of fishermen is a central factor. Fish landing statistics support the notion that catch rates in some fisheries are on the decline. Many fishermen have found that fishing is no longer a profitable enterprise and have dropped out of the industry (Glazier 1999). The situation is aggravated by a depressed state economy that has made it more difficult for many fishermen to find the financial resources to support marginal fishing operations.

In some cases, government regulations have helped alleviate competition among fishermen. In 1991, for example, a longline vessel exclusion zone ranging from 50 to 75 nm was established around the MHI to prevent gear conflicts between large longline vessels and small troll and handline boats. However, government regulations have also added to the level of tension and feelings of frustration among fishermen. For instance, many fishermen in Hawaiʻi have adjusted to natural variations in the availability of various types of fish by adopting a multi-species, multi-gear, highly flexible fishing strategy. However, this strategy is increasingly constrained by the implementation of limited access programs in Hawaiʻi’s major commercial fisheries (Pooley 1993a).

Despite this highly competitive and divisive environment fishermen have been able to develop and maintain networks of social relations that foster collaboration and mutual support. For example, fishermen’s attempts at organizing to promote their shared interests, whether in the market or lobbying government for changes in policy, have generally been fragmented. Nevertheless, some fishermen in Hawaiʻi are represented by a *hui* or organization, and these voluntary associations often facilitate coordination and cooperation for the mutual benefit of their members. A case in point is the Maui Cooperative Fishermen's Association, which is comprised of bottomfish fishermen many of whom are part-timers. The Association negotiates product prices with one or more seafood distributors who, in turn, supply local hotels and restaurants with fresh fish.

Glazier (1999) observed that membership in a Hawaiʻi fishing *hui* can instill a strong feeling of camaraderie and solidarity among fishermen. The cohesion within these organizations constitutes available social capital for both their members and the broader community. For example, fishing clubs often organize or participate in community service projects (Glazier 1999). Examples of more ad hoc forms of cooperation among fishermen are also common. For instance, fishermen may take turns trucking each other's fish from distant landing sites to the central fish auction in Honolulu, thereby reducing transportation costs (Glazier 1999).

Close social relationships also continue to be maintained between some fishermen and fish buyers. For example, small boat fishermen on Kauaʻi and the Kona side of the island of Hawaiʻi tend to sell their catch directly to local buyers who, in turn, sell it to restaurants or retail markets (Glazier 1999). By sending their fish directly to dealers fishermen not only avoid the commission charged by the auction but also enjoy the price stability over the long-term that comes with an established reciprocal relationship. As Peterson (1973:59) noted, "A fisherman feels that if he is 'good to the dealer' in supplying him with fish that he needs to fill his order, 'the dealer will be good to him' and give him a consistently fair price for his fish."

3.7.1.2.2 Social Aspects of Fish Distribution and Consumption

Archaeological evidence indicates that seafood was part of the customary diet of the earliest human inhabitants of the Hawaiian Islands (Goto 1986). An early European visitor to Hawaiʻi observed that, "There is no animal food which a Sandwich Islander esteems so much as fish" (Bennett 1840:214). Nineteenth century immigrants to Hawaiʻi from Asia also possessed a culture in which fish was an integral part of the diet. Despite the "exorbitant" fish prices that Hawaiʻi residents have often encountered in the markets, the level of consumption of seafood in the islands has historically been very high. One early commentator noted:

> *In the Honolulu market 2,000,000 pounds of fresh salt water fish valued at $5,000,000 are sold annually. These figures represent a high price for a food that abounds in the waters all around the Islands, yet the people of this community, who are great lovers of the products of the sea, will gratify their tastes even at this expense* (Anon. 1907:17).

Today, per capita seafood consumption in Hawaiʻi is still at least twice as high as the national average (Shomura 1987).

Because seafood was such a significant item in the diets of local residents, the fish markets themselves became important institutions in Hawaiʻi society. Dole (1920:20) noted that the fish market located in the busiest section of Honolulu was more than a commercial establishment, it was also "…Honolulu's political center where impromptu mass meetings were held …; it was, in a way, a social center also, especially on Saturdays for then business was at its height." Much of the retailing of fish now occurs through self-service supermarkets, but Honolulu's fish markets have endured and continue to be centers of social interaction for some island residents.

The fish markets are comprised of retail units the majority of which are single proprietorship-family type operations. Close social connections have developed between retailers and consumers, as the success of the dealers is largely a function of their ability to maintain good relations with their customers and maintain a stable clientele (Garrod and Chong 1978). One journalist wrote of the Oʻahu Market, where fresh fish and produce have been sold for nearly a century: "In the hustle and bustle of daily life in downtown Honolulu, many people are drawn to Oʻahu Market because of its informal charm and the feeling of family one gets while shopping there" (Chinen 1984:9).

Early in the last century Bryan (1915) developed a list of the various fish purchased in the Honolulu market by each of Hawaii's principal "nationalities." The ethnic identification of Hawaiʻi's *kama*ʻā*ina* (long-time residents) with particular species has continued to the present day. The large variety of fish typically offered in Hawaiʻi's seafood markets reflects the diversity of ethnic groups in Hawaiʻi and their individual preferences, traditions, holidays and celebrations.

Many of the immigrant groups that came to Hawaiʻi brought with them cultures in which fish are not only an integral part of the diet but given symbolic and even transformative connotations. Certain fish communicate messages of solidarity, favor, opulence and the like, or are believed to impart specific desirable traits to the diners (Anderson 1988; Baer-Stein 1999). For example, some types of bottomfish that are red in color have found acceptance within the Japanese community in Hawaiʻi as a substitute for red *tai* (sea bream, *Pagrus major*) – a traditional Japanese symbol of good luck and, therefore, an auspicious fish to be served on festive occasions (HDAR 1979; Shoji 1983). The red color of these fish also symbolizes prosperity and happiness.[28] The December peak in landings of ʻō*pakapaka*, *onaga*, *kalekale* and *ehu* reflect the demand for them as an important dish in feasts celebrating *Oshogatsu* (Japanese New Year's), considered the most important cultural celebration for people of Japanese ancestry in Hawaiʻi. Serving these fish is also important during non-seasonal events such as wedding and birthday banquets. For Hawaiʻi residents of Chinese descent fish or "*yu*" is an important item during feasts celebrating *Tin nien* (Chinese lunar New Year) and other ritual observances, as it is a homophone

[28]The reason *tai* is regarded as a celebratory fish among Japanese is thought to be due not only to its beauty of form and color but also because "*tai*" suggests the word "*medetai*," meaning auspicious (Shoji 1983)

for abundance (Choy 1989). Fish also symbolize regeneration and freedom because of their rapid ability to propagate as well as their speed and unconfined lifestyle (Baer-Stein 1999). Fish with white, delicately-flavored flesh are in particularly high demand by the Chinese community during New Year celebrations and other festive occasions (Peterson 1973).

An insistence on quality, as well as quantity and variety, has also long been a hallmark of Hawaiʻi's seafood markets. For example, the Japanese immigrants to Hawaiʻi came from a society in which fishermen, fish dealers and even cooks typically handle prized fish with considerable care (Joya 1985). Hawaiʻi seafood consumers continue to demand fresh fish. Both the discriminating tastes of local residents and the symbolic meaning with which some fish are imbued are linked to the importance of fish as gifts from one person or family to another. In Hawaiʻi various types of high-priced fish such as red snapper are highly regarded as gifts (Peterson 1973). Such sharing and gift giving may play an important role in maintaining social relations, as exemplified by the traditional Japanese obligation to engage in reciprocal exchanges of gifts according to an intricate pattern of established norms and procedures (Ogawa 1973). Those who neglect the obligation to reciprocate risk losing the trust of others and eventually their support.

The sharing of fish among members of the extended family and community is also an early tradition of the indigenous people of Hawaiʻi. The social responsibility to distribute fish and other resources among relatives and friends remains a salient feature of the lives of many Native Hawaiians that is enacted on both a regular basis and during special occasions (Glazier 1999). Among Native Hawaiians fish is considered a customary food item for social events such as a wedding, communion, school graduation, funeral or child's first birthday (baby *lū*ʻ*au*) (Glazier 1999).

3.7.1.2.3 Social Significance of Fishing to the Broader Community

Commercial fishing has been part of Hawaiʻi's economy for nearly two centuries. Long-established fishing-related infrastructure in Honolulu such as the fish markets and Kewalo Basin mooring area has helped define the character of the city. Moreover, for some major ethnic groups in Hawaiʻi such as the Japanese and Native Hawaiians the role that their forebears played in the development of commercial fisheries in the islands remains an important part of their collective memory. In 1999, for example, the Japanese Cultural Center of Honolulu organized an exhibition commemorating the past involvement of Japanese in Hawaiʻi's commercial fishing industry.

Given the historical significance of commercial fishing in Hawaiʻi, it likely that some local residents consider the fishing industry to be important in the cultural identity and heritage of the islands. Individuals who have never fished and do not intend to may nonetheless value the knowledge that others are fishing and that this activity is continuing to contribute to Hawaiʻi's social, cultural and economic diversity. This existence value may be expressed in various ways. For example, some individuals may engage in vicarious fishing through the consumption of books, magazines and television programs describing the fishing activities that others are pursuing in the waters around Hawaiʻi.

Just as Hawaiʻi's fishing tradition is an integral part of the islands' heritage and character, the image of Hawaiʻi has become linked with some types of locally caught seafood. Among the fish species that have become closely identified with Hawaiʻi are bottomfish such as ō*pakapaka* and *onaga*. The continued availability of these seafoods in Hawaiʻi has important implications for the mainstay of the state economy - tourism.[29] Many Japanese tourists visiting Hawaiʻi want to enjoy the traditional foods and symbols of prosperity of Japan while they vacation in Hawaiʻi, including various types of high quality fresh fish (Peterson, 1973). Hawaiʻi tourists from the U.S. mainland and other areas where fish is not an integral part of the customary diet typically want to eat seafood because it is perceived as part of the unique experience of a Hawaiʻi vacation. For both Japanese and U.S. mainland tourists, the experience of consuming fish in Hawaiʻi may be enriched if the fish eaten is actually caught in the waters around Hawaiʻi. Suryanata (2000) observes that markets within the state for "grown in Hawaiʻi" products have expanded in the past decade through the proliferation of gourmet restaurants that feature "Pacific Rim" and "Hawaiʻi Regional Cuisine." This marketing strategy eschews traditional symbols constructed by the tourism industry in favor of inciting an appreciation of the social relationships and physical environment that make Hawaiʻi an unique place.

Suryanata (2000) also notes that place-based speciality food can retain its appeal to buyers beyond a vacation period or even attract buyers who have never been to the place in question. Just as a consumption of organic food may signify a commitment to a certain environmental and social value, a consumption of products from Hawaiʻi can symbolize a partial fulfillment of a desire to experience or relive a Hawaiʻi vacation. According to a national seafood marketing publication, the power of this constructed value to influence prospective buyers has not been lost on Hawaiʻi's seafood dealers:

> *When it comes to selling seafood the Hawaiians have a distinct advantage. Their product comes with built-in aloha mystique, and while they've emphasized the high quality of the fish taken from their waters, they've also taken full advantage*

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[29]Suryanata (2000) notes that many attributes of Hawaiʻi have been constructed in the marketing of Hawaiʻi by the tourist industry, and unusual or exotic food complements the marketed image. In describing the current initiative to revive Hawaiʻi's agricultural sector by diversifying into high-value non-traditional export crops, such as tropical flowers, gourmet coffee and tropical speciality fruits, she writes "None of these products is unique to Hawaiʻi in a true sense to merit a higher price, but marketing strategies seek to define a strong place-association of these products with Hawaiʻi, to capitalize on Hawaiʻi's exotic image and to develop niche markets for speciality products from paradise." This statement is equally true for locally-produced seafood sold in Hawaiʻi.

> *of the aura of exotic Hawaii itself in promotion on the mainland and, now, in Europe* (Marris 1992:75).

Local production of food as opposed to a reliance on imports also creates opportunities to foster social connections between consumers and their food producers. As noted above, much of the retailing of fish in Hawaiʻi now occurs through supermarkets, and a large quantity of the seafood sold is imported. However, there still exists in Hawaiʻi personal connections between consumers and the individuals who harvest and retail fish. Such connections may have broad public value. For example, a recent article by agricultural researchers identified proximity as one of the key attributes of a sustainable food system:

> *A sustainable food system is one in which "food is grown, harvested, processed, marketed, sold, [and] consumed as close to home as possible." An emphasis on locally grown food, regional trading associations, locally owned processing, local currency, and local control over politics and regulation is found within a proximate system. A proximate food system will have "grocery stores close to home which carry local items with little or no corporately owned products to compete," and would provide "specialty items that characterize the bioregion"* (Kloppenburg et al. 2000:182).

3.7.2 American Samoa

3.7.2.1 Population Size and Ethnicity

The American Samoa Government estimated the total population in 1995 to be 56,350, up 20.5 percent from 1990, when the decennial census was conducted. Between 1990 and 1995, American Samoa's population grew at an annual rate of 3.8 percent, one of the highest growth rates in the Pacific Islands and the world. At this rate, total population will reach 67,900 persons in 2000. Ethnically, American Samoa can be broken down into three groups: Samoan (89 percent), Tongan (4 percent), and Caucasian (2 percent).

The large majority of participants in the fisheries occurring in the EEZ around American Samoa are of Samoan ancestry. A 1987 survey of 36 small vessel operators in American Samoa found that 72 percent were Samoan, 17 percent were Caucasian and 11 percent were some other ethnicity (Kasaoka 1989). It is likely that the percentage of those involved in off-shore fishing who are of Samoan ancestry has increased in recent years with the expansion of the domestic longline fleet.

3.7.2.2 Sociocultural Setting

The activity of fishing, including the preparatory rituals on shore, application of fishing skills at sea and distribution of the catch according to strict protocols, has been an integral part of Samoan culture since time immemorial. It shaped the traditional Samoan religion, diet, material culture, oral traditions and calendar (Severance and Franco 1989). Fishing and its products also played a fundamental role in the social structure. In traditional Samoan society every adult participated as a member of an extended family or *aiga* that shared resources and responsibilities. Each *aiga* was headed by a titled "chief" or *matai* who was the decision-maker and spokesperson for the family in many matters of village life. Untitled men and women had a myriad of obligations for service to the *aiga* and *matai* and were expected to contribute goods (including fish) and labor to important village ceremonies ranging from weddings to title investitures. Such service was expected of untitled individuals if they were to rise in status and perhaps achieve their own *matai* title and position. In addition, other, less formal exchanges of goods and services occurred among kinsmen and friends as expressions of a sustained relationship.

The introduction of a cash economy in American Samoa did not weaken this network of social obligations as much as provide new opportunities for customary exchange of goods and services within American Samoa's tightly held *aiga* system. Fishing has become increasingly commercialized, but fish, whether it be caught or purchased, remains a significant component of the customary exchange system. Fish supports the food needs of the extended family as well as the status of the family and the broader community.

Traditionally, *ulua* were accorded a high level of cultural importance and were reserved for consumption by members of the village elite (Severance and Franco 1989). Today, large specimens of *ulua* and other bottomfish are still occasionally ceremonially cut up for formal presentation to the *matai*, village pastor, village council members and others of high social status within the community. However, pelagic species, especially yellowfin and skipjack tuna, are the preferred offerings for village events (WPRFMC 2000b). The amount of bottomfish caught that is not sold is relatively small. But even the fish that is sold may be fulfilling obligations to friends and members of the extended family. A recent survey of American Samoan fishermen indicated that a significant portion of the catch that is sold is done so at a reduced price to friends and kinsmen as an expression of an established social relationship (Severance et al. 1999). Furthermore, commercial fishermen are expected to catch fish when village ceremonies are pending and to be generous in sharing their harvest. Some fishermen keep fish in freezers with the expectation they will be called upon to provide food for cultural purposes by their *matai*.

Fishing as a commercial activity not only contributes to the extended family's welfare, but also to social cohesion within the broader island community. It offers individuals an occupation that is consistent with Samoan cultural values and the island lifestyle. Furthermore, to the extent that unemployment among the younger population can cause both economic and social ills, commercial fishing provides an additional opportunity for young people to be economically productive and socially responsible.

The "community" of American Samoans involved in the small-scale offshore fisheries targeting pelagic and bottomfish species is not localized to any significant degree. A recent fisheries survey in American Samoa reported that small boat fishermen are found in nearly every village in the territory (Severance et al. 1999). The residential distribution of individuals who are substantially dependent on or substantially engaged in the harvest of offshore fishery resources approximates the total population distribution. These individuals are not set apart – physically, socially or economically – from the population of American Samoa as a whole.

3.7.3 Guam and the Northern Mariana Islands

3.7.3.1 Population Size and Ethnicity

Guam's population was estimated to have reached 163,373 in 1999. The annual population growth rate averaged 2.3 percent from 1990 to 1998. A continuation of this growth rate will increase Guam's total population to167,130 in 2000, nearly double the 1970 total of 84,996.

The total population of the CNMI increased from 16,780 in 1990 to 79,429 in the first quarter of 1999, yielding an annual growth rate of 8.5 percent. The development of a garment industry based on imported foreign labor accounts for this phenomenal population growth (BOH 1999c). Most of the population increase has been on Saipan, the commonwealth's commercial, governmental and civic center as well as its garment manufacturing capital.

Guam's indigenous Chamorros are the single largest ethnic group in the territory, representing 46.2 percent of the total resident population. Reflecting the large amount of immigration from the Philippines, Filipinos are Guam's second largest ethnic group, accounting for 30.6 percent of the population. Other groups include Micronesian (6.2 percent), Caucasian (4.7 percent), and Asian, including Japanese, Korean, Vietnamese, Thai, and Chinese (4.0 percent).

The ethnic breakdown of the population of the CNMI in descending order in 1995 was as follows: Filipino - 33.7 percent; Chamorro - 29.1 percent; Chinese - 11.6 percent; Micronesian - 8.2 percent; Saipan Carolinian - 5.2 percent; Korean - 3.9 percent; Caucasian - 3.4 percent; Japanese - 1.8 percent; and all others - 3.0 percent. The only group that registered a population decline between 1990 and 1995 was the Korean segment.

The majority of fishermen in the offshore commercial and recreational fisheries around Guam are Chamorros (Vaughn et al. 2000), while Chamorros and Carolinians dominate the offshore fisheries around the CNMI (Hamnett et al. 1998).

3.7.3.2 Sociocultural Setting

Over the centuries of acculturation beginning with the Spanish conquest in the late seventeenth century, many elements of traditional Chamorro and Carolinian culture in Guam and the Northern Mariana Islands were lost. But certain traditional values and attitudes were retained and have been melded with elements of Western culture that are now a part of local life and custom. Amesbury et al. (1989:48) note that the practice of sharing one's fish catch with relatives and friends during Christian holidays is rooted in traditional Chamorro and Carolinian culture:

> *A strongly enduring cultural dimension related to offshore fishing is the high value placed on sharing of the catch, and the importance of gifts of fish to relatives and friends. Such gifts are not limited to offshore fish; often they are made up of reef fish. Sometimes pelagic or bottomfish are sold in order to earn money to buy gifts for friends and relatives on important religious (Catholic) occasions such as novenas, births and christenings, and other holidays.*

In addition, the people of Guam and the CNMI participate in many banquets throughout the year associated with neighborhood parties, wedding and baptismal parties and especially the village fiestas that follow the religious celebrations of village patron saints. All of these occasions require large quantities of fish and other traditional foods (Orbach 1980; Hamnett et al. 1998; Vaughn et al. 2000).

The social obligation to share one's fish catch extends to part-time and full-time commercial fishermen. In Guam and the CNMI locally caught fish are often sold informally (Amesbury and Hunter-Anderson 1989; Amesbury et al. 1989). The buyers are mainly friends, neighbors, and relatives, especially in the CNMI. This non-anonymous, very personal "market" tends to restrain the price asked and paid.

Orbach (1980) notes that the fisheries in the CNMI are inextricably involved with the lifestyles and plural-occupational patterns of the participants. Part-time fishing performed in conjunction with other activities has a prominent place in the socioeconomic adaptations of local residents. People fish for bottomfish and pelagic species to supplement their family subsistence, which is gained by a combination of small scale gardening and wage work (Amesbury et al.1989). Orbach suggests that the availability of economic activities such as part-time fishing is among the major reasons that the CNMI has not experienced more of the problems of other island entities such as out-migration or high rates of crime and juvenile delinquency.

Fishing in Guam and the CNMI continues to be important not only in terms of contributing to the subsistence needs of the Chamorro and Carolinian people of the Mariana Islands but also in terms of preserving their history and identity. As noted above, many aspects of traditional Chamorro and Carolinian culture have been lost. Fishing has assisted Chamorros and Carolinians in keeping alive what remains of the maritime attributes of their traditional culture and helped them maintain their connection to the sea and its resources.

Participants in the small-scale offshore fisheries targeting pelagic and bottomfish species are not concentrated in specific locales. Recent surveys of fishery participants in Guam and the CNMI found that these individuals reside in towns throughout the islands (Hamnett et al. 1998; Vaughn et al. 2000). Given the small size of Guam and the Northern Mariana Islands, dispersal of fishery participants and extensive community networks for sharing locally caught fish, it likely that the social benefits of fishing are experienced by most of the islands' long-term residents.

3.8 NATIVE HAWAIIAN COMMUNITY

> *The challenge for the anthropologist and for the policy maker concerned with traditional Hawaiian social and religious beliefs is to resist the ethnocentrism that arises from the unquestioned assumption that one's own world view is somehow the only correct one. Only then can one begin to appreciate the social and religious significance of fish and fishing in Hawaii* (Iversen et. al. 1990:25).

Executive Order 12898, signed in 1994, requires federal agencies to address the environmental effects, including human health, economic and social effects, of federal actions on minority populations and low-income populations. This section describes environmental justice considerations and supplements the socio-economic analyses in other sections of the EIS. Opportunities for community input in the NEPA process, including identification of environmental justice issues, were provided during the scoping process described in Section 1.3.1 and Chapter 6.

As the current management regime for the bottomfish fishery in the Western Pacific Region and environmental concerns related to that fishery both focus on fishing activities in the waters around Hawaiʻi, environmental justice issues identified during the scoping process also tended to center on Hawaiʻi.

As discussed in Section 3.7.1, the individuals who participate in Hawaiʻi's bottomfish fishery and other offshore fisheries comprise an ethnically mixed group. A survey by Hamilton and Huffman (1997) of small-boat owners who engage in Hawaiʻi's commercial and recreational fisheries, including the troll, pelagic handline and bottomfish fisheries, found that the overall distribution of survey participants' ethnicities is similar to that found in Hawaiʻi's statewide population in that the three most common ethnicities are Japanese, part-Hawaiian and Caucasian.

Vessels used in the NWHI bottomfish fishery were not included in the Hamilton and Huffman (1997) survey, but information on the ethnicity of some participants in this fishery is available from a 1993 survey conducted by Hamilton (1994). This earlier survey of 15 owner-operators and hired captains who participate in the NWHI bottomfish fishery found that 87 percent were Caucasian and 13 percent were part-Hawaiian. However, it is likely that the ethnic composition of the deckhands aboard these vessels is much more mixed and reflects the highly diverse ethnic character of the state's total population (Section 3.8.1.).

With regard to the income levels of small-boat owners in Hawaiʻi, Hamilton and Huffman (1997) reported that the mean household incomes of the survey respondents are above the state average, although the income levels of full-time fishermen tend to be less than those of recreational fishermen. Information on the household income of participants in the NWHI bottomfish fishery is unavailable.

The public scoping process for this EIS identified people of Hawaiian ancestry as being both a minority population and low-income population with a particular interest in the use of the marine resources of the NWHI, including the bottomfish resources. These interests arise from complex historical and contemporary economic, social, cultural and political circumstances that are discussed below. Given the significance of these special circumstances, impacts on the Native Hawaiian community were made a separate impact topic in the Environmental Consequences section of this document.

3.8.1 *Mai Kīnohi Mai* (From the Very Beginnings)

The foundation of a people's culture is often revealed in the stories told about their origins. Native Hawaiians define their relationship to theʻā*ina* (land) as the relationship between younger sibling (*po*ʻ*e Hawai*ʻ*i* - Native Hawaiians) and elder sibling (ʻā*ina*) both of whom were descended from *Papa* (Earth mother) and *W*ā*kea* (Sky father) (Kameʻeleihiwa 1992). The relationship of *po*ʻ*e Hawai*ʻ*i* with the ocean was one defined in sacred terms as manifested by the embodiment of the ocean as the realm of *Kanaloa*, one of four primary *Akua* (Divine Beings) in the pantheon of Native Hawaiian *Akua*. The customary and traditional relationship of *po*ʻ*e Hawai*ʻ*i* to the fauna and flora of this oceanic realm was one of ʻ*ohana* (family) in which many of the naturally occurring plants and animals (including fish) were regarded as ancestors embodied in temporal form who acted as divine family guardians (Kamakau 1976; Malo 1951).

This spiritual connection was the foundation of the Hawaiian commitment to care for the land and sea and protect them for use by future generations. The understanding of Native Hawaiians in the interdependence of people and the natural resources that sustain them was preserved in the wisdom of *kūpuna* (ancestors) and articulated in *ʻōlelo noʻeau* (sayings of wisdom). The following sample of proverbs compiled by Pukuʻi (1983) illustrate the conservation ethic of Native Hawaiians.

E ʻai i kekahi, e kāpi kekahi.
Eat some now and save some for another time. (#252)

He pono ka pākiko ma mua o ka hoʻokelakela wale aku.
Better to be economical than too liberal. (#912)

Lilo akula ka nui a koe ka unahi.
Most [of the fish] are taken and only the scales are left.
Said after one has taken the "lion's share" for himself. (#2004)

The Hawaiian sense of stewardship was essential given the dense human population in Hawaiʻi and the islands' limited natural resources. Estimates of the population of Hawaiʻi prior to European contact vary. A recent analysis of the Hawaiian population by Stannard (1989) suggests that the population may have approached one million people prior to foreign penetration into the Pacific. Such a large population could also explain how it was that the Native Hawaiian people came to use the area now known as the Northwestern Hawaiian Islands. A population approaching the population that inhabits these islands today would have likely sought to expand its fishing territory as far as possible in order to survive and prosper.

It is part of the historic record that voyages between the MHI and the southern reaches of the NWHI were undertaken on a regular basis. There is also ample evidence that Native Hawaiians were skilled and prolific fishermen both in inshore waters, including the banks near the main islands and extending into the open ocean (e.g., Beckley 1883; Goto 1986; Kahaulelio 1902; Murakami and Freitas 1987; Scobie 1949). It is likely, therefore, that Native Hawaiians frequented the NWHI for ritual and food gathering. Physical evidence found on both Nihoa and Necker islands indicates that Native Hawaiians frequented these islands long enough to build a series of religious temples and agricultural terraces (Emory, 1928).

Evidence of Hawaiian habitation of the NWHI can also be found in the oral traditions of Native Hawaiians. Moses Keale, a recently deceased native of Niʻihau, related a tradition of Niʻihauans voyaging to Nihoa for extended periods of time in conjunction with changing weather patterns. These stays were long enough to plant sweet potatoes and harvest those that had been planted on the previous visits. Fish were also caught and preserved for transport back to the MHI (pers. comm. 1980). More recently, in answer to a question regarding extent of the aforementioned voyages, a *kūpuna* (elder) from Niʻihau stated that these voyages went beyond Nihoa (and possibly Necker) to "*mokupuni palahalaha*" (small flat islands) where one could see from one side of the island to the other (Malaki Kanahele, pers. comm. 2000).

Another example of Hawaiian familiarity with the Northwestern Hawaiian Islands found in the oral record is a section of the story of *Pele* and *Hiʻiaka* published in the Hawaiian language newspaper *Kūʻokoʻa Home Rula* (1911) in which *Pele* recites the wind names of Nihoa.

Na Makani o Nihoa
He Honouli ka makani o Nihoa
He Waialoha ka makani noho ana o Nihoa
He Lupekiikai ka makani kaapuni o Nihoa

Rauzon (2001) suggests that other *mele* (chants) and legends as well as accounts of the navigational assistance that Hawaiians provided to early European explorers indicate that Hawaiians were familiar with many of the NWHI.

3.8.2 *Komo Ka Poʻe Haole* (Penetration of Foreigners)

By the time Captain James Cook came upon the Hawaiian Islands in 1778, the sovereign line of Hawaiʻi had persisted for more than 23 generations - or more than 500 years - of a sustained, stable system of governance. In 1810, Kamehameha succeeded in establishing political control over all of the major islands. In order to cope with increasing foreign contacts, the Hawaiian Kingdom began adopting western legal systems such as a parliament, a constitution and treaties with other nations, including several with the United States. However, during the remainder of the century the succession of Hawaiian monarchs that followed Kamehameha were unsuccessful in warding off the increasing encroachment by various colonial powers. In 1883, the Kingdom of Hawaiʻi was overthrown by a group of mostly American businessmen backed by U.S. soldiers (Kuykendall, 1953). The provisional government sought annexation by the United States, and after passage of the "Newlands Resolution" in 1898, Hawaiʻi was considered a territory of the United States.

Today, a fundamental question for many Native Hawaiians and others is the legality of the methods used by the United States to acquire the Hawaiian Islands in the 19th century. In 1993, the U.S. Congress passed the Apology Bill which states that "…the indigenous Hawaiian people never directly relinquished their claims to their inherent sovereignty as a people over their national lands to the United States, either through their monarchy or through a plebiscite or referendum."

In the absence of any treaty or voluntary relinquishment, the lingering sovereign claim by Native Hawaiians may dictate that a higher right to the living marine resources within the U.S. EEZ surrounding the Hawaiian Islands might still be justified. Murakami and Freitas (1987) argue that legal claims of Native Hawaiians to the fishery have not been extinguished by the U.S. government. He notes that, "…Congressional enactments and the 1983 Presidential Proclamation to extend U.S. jurisdiction over mineral resources of the EEZ and the fisheries of the FCZ [200-mile Fishery Conservation Zone] would not affect the viability of this claim in the absence of any treaty or settlement act resolving the potential Hawaiian claim to the fishery, mineral and other natural resources of the FCZ and EEZ around the Hawaiian and Northwest Hawaiian Islands."

Murakami and Freitas (1987:27) summarize the legal aspects of U.S. participation in the conservation of fisheries around the Hawaiian Archipelago in regard to Native Hawaiian claims:

> *The U.S. government has the power to affect the Hawaiian claim to portions of the Hawaiian and Northwest Hawaiian Island FCZ and EEZ by either: 1) condemning the fisheries granted to Hawaiian commoners and their successors in the FCZ, which will require it to compensate the Hawaiian people for the taking of their fishing grounds; or 2) exercising its public trust duties to protect the aboriginal claims to the resources of the EEZ and FCZ, which will require it to determine what allocation of the revenues it will allow to Hawaiians and what form and extent of participation it will grant to protect the marine environment in which the communal right to fish and gather may take place. The resolution of these issues may have to involve a resolution of the Hawaiian claim for reparations or restitution linked to the 1893 overthrow.*
>
> *The legal uncertainty is rooted in the failure of the U.S. to resolve the potential aboriginal or other claims of Hawaiians for restitution or reparations as a domestic, dependent nation of people, as those of native Americans and Alaska natives have been, or are being resolved. There is ample precedent to support such a claim in Congress. So long as that claim is outstanding, Hawaiians will continue to have a defensible claim to the fishery resources of the FCZ and mineral and other resources of the EEZ.*

The aforementioned Apology Bill stated that

> *The Congress …(4) expresses its commitment to acknowledge the ramifications of the overthrow of the Kingdom of Hawaiʻi, in order to provide a proper foundation for reconciliation between the United States and the Native Hawaiian people; and (5) urges the President of the United States to also acknowledge the ramifications of the overthrow of the Kingdom of Hawaiʻi and to support reconciliation efforts between the United States and the Native Hawaiian people.*

Some progress has been made in resolving the Hawaiian claim for reparations or restitution linked to the 1893 overthrow. In December 1999, a series of reconciliation hearings attended by federal representatives, Native Hawaiians and the general public was conducted in Hawaiʻi. In addition, in July 2000, Hawaiʻi's congressional delegation introduced a bill to express the policy of the United States regarding the United States' relationship with Native Hawaiians, to provide a process for the reorganization of a Native Hawaiian government and the recognition by the United States of the Native Hawaiian government.

As these reconciliation efforts proceed, it is also likely that clarification of rights will be an outgrowth of litigation in the courts. The Hawaiʻi Supreme Court, for example, has addressed the nature of certain Hawaiian traditions and customs in a number of cases where it had been asked to address the protection of traditional and customary practices under state law. Most recently, in *Public Access Shoreline Hawaiʻi v. Hawaiʻi County Planning Commission* , 79 Hawaiʻi 425, 903 P.2d 1246 (1995), the court emphasized the obligation of a state agency to preserve and protect Native Hawaiian rights. In its consideration of an action by the Hawaiʻi Planning Commission arising under the Coastal Zone Management Act, the court concluded that the legitimate customary and traditional practices must be protected to the extent feasible in accordance with Article XII, Section 7 of the state constitution and that the state does not have the unfettered discretion to regulate the rights of ahupuaʻa tenants out of existence.[30] The court reiterated that the Native Hawaiian rights protected by the state constitution may extend beyond the *ahupuaʻa* in which a Native Hawaiian resides. Moreover, the rights remain intact "...notwithstanding arguable abandonment of a particular site, although this right is potentially subject to regulation in the public interest." Finally, the court went one step further in supporting traditional practices. It said that ancient practices can revive themselves and still have legal authority. In the words of the court, "...continuous exercise is not absolutely required to maintain the validity of a custom."

3.8.3 Current Socio-economic Conditions of Native Hawaiians

At present, people of Native Hawaiian ancestry comprise about 21% of Hawaiʻi's population (DBEDT 1999). By most statistical measures, they have the lowest incomes and poorest health of any ethnic group in the state. Native Hawaiians have long been among the most economically disadvantaged ethnic or racial group in Hawaiʻi in terms of standard of living, degree of unemployment, dependence on transfer payments and limited alternative employment opportunities. In recent years, Native Hawaiians have had the highest proportion of individuals living below the poverty line. In 1989, 6% of all the families in the state had incomes classified

[30] Article XII, Section 7 of the Hawaiʻi Constitution states: "The State reaffirms and shall protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by ʻ*ahupuaʻa* tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778, subject to the right of the State to regulate such rights."

below the federal poverty level (OHA 1998). During the same period, 14% of Native Hawaiians were below the poverty line. Nearly 15% of Native Hawaiian households receive public assistance income, compared to 6.8% of households in the State (OHA 1998). In several residential areas over a third of Native Hawaiian households receive public assistance.

For centuries Native Hawaiians relied on seafood as their principle source of protein. However, the availability of many traditional seafoods has been significantly diminished. Overfishing and ecological degradation of inshore areas by pollution has had a pronounced negative impact on Native Hawaiian marine subsistence practices. Shomura (1987), for instance, notes that between 1900 and 1986, the harvest of coastal fish species in Hawaiʻi declined by 80 percent, and catches of neritic-pelagic species declined by 40 percent. The changes in diet that resulted from loss of access to sea resources have contributed to the poor health of Native Hawaiians. Of all racial groups living in Hawaiʻi, Native Hawaiians are the group with the highest proportion of multiple risk factors leading to illness, disability and premature death (Look and Braun 1995).

As noted earlier, there is abundant historical and archaeological evidence of the social importance of fishing in traditional Hawaiian culture. With specific regard to bottomfish, this significance was of both an economic and ritual nature (Iversen et al. 1990). Bottomfish such as *kāhala*, *ulua* and *ʻulaʻula* (*onaga*) are specifically mentioned in traditional prayers used by fishermen, and fishing for these species was associated with religious rites. The cultural significance of bottomfish species to Hawaiian society is also indicated by the growth stage names for ʻō*pakapaka*, white *ulua*, *kāhala* and the varietal names for *ʻulaʻula* and *uku*.

There may continue to be a strong cultural and religious connection between contemporary Native Hawaiians and certain species of bottomfish (Iversen et al. 1990). Some present day Native Hawaiian consumers of these bottomfish may still associate these fish with traditional beliefs and with their dependence upon the fish for food. Because of the high cost of some bottomfish, they may be frustrated in maintaining such a traditional connection. Industry sources report that Native Hawaiians purchase proportionally less bottomfish than other ethnic groups, possibly because other types of fish cost less, and if Native Hawaiians have less disposable income to spend on fish, they would likely opt to purchase less costly species (Iversen et al. 1990).

3.9 ADMINISTRATION AND ENFORCEMENT

Enforcement costs are incurred by NMFS and USCG in dockside and at-sea (e.g., boardings and aerial surveillance) inspections. The USCG conducts surveillance of the NWHI utilizing C-130 aircraft and cutters.

Administrative costs are incurred in maintaining fisheries data collection systems and issuing limited access permits for the Mau and Hoʻomalu Zones. Brief descriptions of the fisheries data collection systems in Hawaiʻi, American Samoa, Guam and the Northern Mariana Islands are provided below.

3.9.1 Hawaiʻi

State of Hawaiʻi regulations require any person who takes marine life for commercial purposes, whether within or outside of the state, to first obtain a commercial marine license from the Hawaiʻi Division of Aquatic Resources (HDAR). Every holder of a commercial marine license must furnish to HDAR a monthly catch report commonly referred to as the “C3” form. Catches of bottomfish in the NWHI are reported separately to HDAR on the NWHI Bottomfish Trip Daily Log. A trip sales report is also completed by fishermen after the fish are sold. HDAR staff monitor the Honolulu Harbor and Kewalo Basin docks on a daily basis to collect logbooks and sales reports.

Every commercial marine dealer must furnish to HDAR a monthly report detailing the weight, number and value of each species of marine life purchased, transferred, exchanged or sold and the name and current license number of the commercial marine licensee from whom the marine life was obtained.

NMFS administers a fish market monitoring program. In a cooperative effort with HDAR, staff from both NMFS and HDAR visit the fish auction managed by the United Fishing Agency and obtain size frequency and economic data on pelagic fish and bottomfish sold.

3.9.2 American Samoa

Fish catch data are collected through creel surveys administered by the Department of Marine and Wildlife Resources (DMWR) of the American Samoa Government. Since 1985, the Offshore Creel Survey conducted on the island of Tutuila has examined both commercial and recreational boat trip catches at five designated sites. For two weekdays and one weekend day per week, DMWR data collectors sample offshore fishermen between 0500 and 2100 hours. Two DMWR data collectors also collect fishing data on the islands of Tau and Ofu.

Data on fish sold to outlets on non-sampling days or caught during trips missed by data collectors on sampling days are accounted for in a separate dealer invoice data collection system. A vessel inventory conducted twice a year provides data on vessel numbers and fishing effort.

3.9.3 Guam

An offshore creel survey program administered by the Division of Aquatic and Wildlife Resources (DAWR) of the Government of Guam provides estimates of island-wide catch and effort for all the major fishing methods used in commercial and recreational fishing. In 1982, the Western Pacific Fisheries Information Network (WPacFIN) began working with the Guam Fishermen's Cooperative Association to improve their invoicing system and obtain data on all fish purchases on a voluntary basis. Another major fish wholesaler and several retailers who make purchases directly from fishermen also voluntarily provide data to WPacFIN using invoices ("trip tickets") provided by DAWR.

3.9.4 Northern Mariana Islands

The Division of Fish and Wildlife (DFW) of the Commonwealth of the Northern Mariana Islands monitors the commercial fishery by summarizing sales ticket receipts from commercial establishments. DFW staff routinely distribute and collect invoice books from 80 participating local fish purchasers on the island of Saipan, including fish markets, stores, restaurants, government agencies and roadside vendors.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

For each alternative, the potential direct and indirect impacts (those that occur later in time or farther removed in distance) on each of the affected components of the human environment are described below in Sections 4.1 through 4.4.

The potential cumulative impacts of the alternatives are discussed and compared in Section 4.5. Concurrent with development of this EIS, two other management initiatives affecting the Western Pacific Region in general and the NWHI in particular were emerging. These result from President Clinton's establishment by Executive Order of a Northwestern Hawaiian Islands Coral Reef Reserve and the Council's development of a Coral Reef Ecosystem Fishery Management Plan. These developments and a comparison of their potential effects with those resulting from implementation of the alternatives described in this EIS are contained in Section 4.5.1.

4.1 IMPACTS OF ALTERNATIVE 1 (Preferred Alternative)

Alternative 1, the No Action alternative, continues the present management regime under the Bottomfish FMP.

4.1.1 Target Species

The harvest of bottomfish is a direct impact on the target species. The nature of the impact varies regionally. Bottomfish landings in American Samoa continue to be relatively low in comparison to their historic peaks in the early 1980s, mainly because of the departure of fisherman from the bottomfish fishery to the more lucrative pelagic longline fisheries. The most recent calculations of catch per unit effort (CPUE) and spawning potential ratio (SPR) indicate that the bottomfish fishery in American Samoa is not overfished (WPRFMC in prep.). In Guam, CPUE dropped significantly from 1997 to 1998, and calculations indicate that this fishery is in a "yellow light" condition, requiring further investigation or a management response. In the CNMI, bottomfish CPUEs showed an unexpected drop in 2000, but at this time it does not appear there is a need for additional management measures (WPRFMC in prep.). In Hawaii, a combination of fishing effort control through a limited entry system and control of harvest through biological reference points is used to maintain a sustainable fishery. The biological indicators in Hawaii are calculated on an archipelago-wide basis. The reference points are calculated in this manner based on research data which indicate that larval drift and genetic exchange supports a single stock approach. The current minimum stock size threshold (MSST) determined by SPR proxy ranges from 20 percent to 33 percent for bottomfish based on an analysis of common Hawaiian species. The maximum fishing mortality threshold for MSY is F=0.17-0.69 (WPRFMC 1998a). Archipelago-wide calculations of both recruitment-based and MSY-based definitions of overfishing for BMUS indicate that all species are above the critical threshold for overfishing (WPRFMC 1998a). On a regional basis, however, some of the species may be showing stress from fishing mortality. In the MHI, stocks of *onaga* (*Etelis coruscans*) and *ehu* (*E. carbunculus*) are locally depleted. It should be noted that eighty percent of the MHI bottomfish fishery occurs in state waters and measures, including gear restrictions, closed areas and non-commercial bag limits, have been implemented by the state to address localized depletion of bottomfish stocks. In the NWHI bottomfish stocks are relatively healthy. Calculations of SPR and percent immature fish in the catch indicate no localized depletion for any of the species managed in the NWHI (WPRFMC in prep.).

The maximum sustainable yield (MSY) of BMUS from the NWHI as a whole was estimated by Kobayashi (1996) at 586,000 pounds. This is the greatest quantity of bottomfish that could be harvested annually on a sustainable basis by average NWHI bottomfish fishing vessels. Using average operational characteristics for these vessels, Pooley (1996) partitioned the MSY into 131,000 pounds for the Mau Zone and 455,000 pounds for the Hoʻomalu Zone. In the most recent year for which data are available (2000) 49,000 pounds of bottomfish were harvested from the Mau Zone and 213,000 pounds of bottomfish were harvested from the Hoʻomalu Zone. These landings represent 37 and 47 percent, respectively, of the Mau and Hoʻomalu Zone's MSYs. Continuation of bottomfish fishing in the NWHI, as it has been practiced under the FMP (Alternative 1), is therefore sustainable and conservative of the health of the target stocks.

4.1.2 Bycatch

Commercial and recreational bottomfish fishing in the region is conducted with handlines that are set and hauled using electric, hydraulic or hand-powered reels. Vessels usually are equipped with electronic navigational devices to relocate fishing areas, and sonar devices to target productive habitat and fish aggregations. This gear is relatively selective, with the ability to successfully target particular species groups dependant upon the skill of the vessel captain. Experienced vessel crew have the ability to catch the desired species with little bycatch. It is, however, impossible to completely avoid bycatch and incidental catch of non-target species. Direct impacts are therefore catches of bycatch and non-target species, as described in Section 3.2. Indirect impacts could include habitat damage (discussed in Section 4.1.4) or changes in trophic dynamics such as alterations of relative predator-prey abundance. However, given the low level of NWHI bottomfish fishing effort, the large amount of bottomfish habitat in the NWHI, and the relatively small quantities of bycatch in the fishery, neither significant habitat damage, nor alterations of trophic dynamics are likely.

Current fisheries-dependent data collection programs provide only limited information on the amount and type of bycatch in the bottomfish fisheries (Section 3.9). The information collected on the mortality of bycatch species in the fisheries is insufficient to accurately assess the status of bycatch populations, however it is unlikely that the level of bycatch mortality in the bottomfish fishery significantly affects populations of these species.

4.1.3 Protected Species

This section includes an analysis of the direct and indirect effects of the preferred alternative on protected species and critical habitat. The factors considered in this section include: 1) the status of the affected populations of species; 2) the level of removals attributed to the proposed activities of the preferred alternative; and, 3) the impact of that removal on those populations in addition to all other direct and indirect human effects.

The recent BiOp prepared by NMFS for the Bottomfish FMP is reproduced in Appendix D. During the Section 7 consultation process, NMFS reviewed the observer data and other records to assess the impacts of the bottomfish fishery on listed species. The same information was reviewed to assess the interaction rate and impacts to non-listed marine mammals.

4.1.3.1 Marine Mammals

All fisheries in Hawaii, including the bottomfish fishery, are classified in Category III under section 118 of the Marine Mammal Protection Act of 1972 (62 FR 28657, May 27, 1997). Category III fisheries are those that have been determined to have a remote likelihood or no known incidental takings of marine mammals. The designation does not mean that there are no interactions; only that marine mammals would not normally be hooked, snagged, injured or killed during fishing operations. (See Appendix B for additional information on the MMPA.)

The most objective information available about interactions of the NWHI bottomfish fishery with protected species comes from observer programs implemented by the State of Hawaiʻi and NMFS. The State of Hawaii deployed observers on commercial bottomfish fishing vessels in 1981 and 1982. During that time, no interactions with Hawaiian monk seals or other marine mammals were recorded (Nitta 1999). Thus, the loss of catch or interactions with the gear were not considered to be a significant risk to Hawaiian monk seals or cetaceans (all fish loss was attributed to sharks on the observed trips). Also, the low level of commercial bottomfish fishing effort in the NWHI during that period contributed to the conclusion that interactions with protected marine mammals were minimal if any did occur.

From October 1990 through December 1993, NMFS conducted an observer program for the bottomfish fishery in the Protected Species Study Zone of the NWHI. Observer coverage began on a voluntary basis in October 1990, and became mandatory (i.e., vessels were required to carry observers on board as ordered by the Southwest Regional Administrator) in November of that same year due to the proximity of bottomfish fishing operations to Hawaiian monk seal habitat. The objectives of the observer program were to document and characterize any interactions of the bottomfish fishery with protected species and to collect catch and effort data for the bottomfish fishery (Nitta 1993).

The NMFS observer program recorded interactions between marine mammals (Hawaiian monk seals and bottlenose dolphins) characterized by removal of fish and bait from fishing lines without hooking or entanglement in the fishing gear (Nitta 1993). Analysis of observer reports indicate a Hawaiian monk seal interaction rate of one event per 67.7 hours of fishing and a bottlenose dolphin interaction rate of one event per 37.7 hours of fishing (Nitta 1993). Some Hawaiian monk seals and bottlenose dolphins seemed to exhibit an apparent familiarity with certain vessels.

Because direct information is scarce, the possible effects of individual monk seals following bottomfish fishing vessels and consuming catch or discards on the monk seal population area difficult to determine. Individual seals could have better growth rates and reproductive success when they rely upon the easy prey of hooked fish. On the other hand, reliance on fishing vessels for food could hinder the growth and reproductive success of individual seals when vessels move out of an are and seals must learn to forage on their own, or if the prey they obtained from the vessels is inadequate for the monk seals dietary needs. In addition, use of the vessels as a food source increases the likelyhood that an individual seal will become hooked or entangled in fishing gear. If juvenile seals are the primary component of the population that modifies normal behaviors to prey off of bottomfish fishing vessels, and if the low survival rates of this stage are affected more by starvation than shark predation, it is possible that these behavioral changes are having adverse effects on population survival (NMFS 2002).

NMFS is planning the reactivation of the observer program for the bottomfish fishery. However, the form of the program (e.g., period of coverage, coverage beyond the Protected Species Study Zone, possible use of video technology, etc.) has not yet been determined. The objectives of the reactivated program will be consistent with prior objectives. In short, the level and character of interactions with protected species and other information will be recorded for analysis and development of fishery management measures, as appropriate.

4.1.3.1.1 Cetacean: Bottlenose Dolphin

The NMFS observer data were analyzed to estimate rates of interactions between the bottomfish fishery and protected species. During a total of 1,546.1 hours of fishing during 26 trips, 41 bottlenose dolphin interaction events involving 327 individuals were recorded. The rate of interaction between the bottlenose dolphin and the bottomfish fishery was estimated to be one interaction every 37.7 hours of fishing (Nitta 1993). Bottlenose dolphins typically stayed with the vessel as long as fish were being retrieved. The bottlenose dolphins stole the fish off lines at depths of five to 10 fathoms during retrieval. It was noted that *kāhala* were not targeted by the bottlenose dolphins, as were other fish species.

An easily accessible artificial source of prey, such as fish stolen from handlines, may impact the bottlenose dolphin by disrupting normal feeding behavior. It is known that at least one wild dolphin has developed some dependency upon hand feeding (NMFS 1994). Thus, habituation to an easy source of prey may impact bottlenose dolphins by affecting their ability to hunt and forage in the wild. Other potential impacts to bottlenose dolphins are vessel collision and hooking/entanglement in fishing gear, although no such interactions have been documented.

No direct injury or mortality to bottlenose dolphins has been documented in the bottomfish fishery. Genetic studies suggest the Hawaiʻi population of bottlenose dolphins is discrete from the eastern Pacific bottlenose dolphin stock (Scott and Chivers 1990). However, the status of the bottlenose dolphin stock in Hawaiian waters relative to their optimum sustainable population (OSP) is unknown, as there are insufficient data to evaluate trends in abundance and carrying capacity of the region (Forney et al. 2000). Given the information available, it is unlikely that the bottomfish fishery is significantly affecting the bottlenose dolphin population, i.e., diminish the Hawaiʻi population of the species by reducing the reproduction, numbers, or distribution of the species.

4.1.3.1.2 Pinniped: Hawaiian Monk Seal

The Bottomfish FMP contains management measures intended to monitor and mitigate interactions between the fishery and Hawaiian monk seals (Section 2.3.4). The NMFS Regional Administrator has the authority to place federal observers on board bottomfish vessels to record interactions with Hawaiian monk seals or other protected species if this action is deemed necessary (50 CFR 660.65). In addition, before the NMFS Regional Administrator issues a Mau Zone or Hoʻomalu Zone limited access permit to fish for bottomfish, the primary operator and relief operator named on the application form must have completed a protected species workshop conducted by NMFS (50 CFR 660.61). Since 1989, when the NWHI bottomfish limited access permit fishery was established, NMFS has certified more than 40 vessel captains who have completed the requisite one-time protected species workshop program. The HMSRT (1999) has suggested that higher levels of direct interactions between Hawaiian monk seals and the NWHI bottomfish fishery can best be mitigated by continuing to educate fishermen through briefing materials and workshops. Recently, NWHI bottomfish fishermen as a group have agreed to attend annual protected species and regulatory workshops. The workshops, for all permit holders and vessel operators, would review Hawaiian monk seal life history, the status of interaction mitigation efforts, and relevant regulatory measures.

The current management regime includes measures that are intended to conserve bottomfish stocks or improve the economic performance of the fishery but which also mitigate interactions between the fishery and Hawaiian monk seals. Prohibitions on the use of explosives and chemicals reduce the potential for incidental harm to Hawaiian monk seals and help protect Hawaiian monk seal habitat. By reducing fishing effort, the limited access programs for the Mau Zone and Hoʻomalu Zone decrease the potential for direct impacts from Hawaiian monk seals approaching bottomfish fishing vessels and feeding on discarded fish or becoming hooked or entangled in fishing gear. The restriction on fishing effort also lowers the chance of vessel groundings or other accidents that could result in Hawaiian monk seal mortality or pollution of habitat.

The State of Hawaii Division of Aquatic Resources does not systematically collect information regarding protected species interactions. NMFS-PIAO Protected Species Program made available to the fishery participants reporting cards that could be used to anonymously report protected species interactions. To date, no cards have been returned to NMFS. In 2000, NMFS sent each bottomfish fishery permit holder marine mammal interaction reporting forms, but no reports of marine mammal injury or mortality have been received by NMFS. Therefore, the only information available to NMFS on Hawaiian monk seal interactions with the bottomfish fishery is the observer data from the two programs noted above, fisher self reports and investigations of hooks embedded in Hawaiian monk seals which NMFS has made its determination to the list of information available.

The NMFS observer data collected from 1991- 1993 documented interactions of Hawaiian monk seals with bottomfish fishery operations. An interaction typically consists of Hawaiian monk seals approaching vessels and stealing fish either from hooks or from a competing predator (dolphins). Hawaiian monk seals were not reported hooked or entangled, but were observed active in the "theft" of fish from handlines. Typically, they surfaced to consume the fish. Fish that were too large for consumption were abandoned. While some interactions involved a single fish, other interactions lasted as long as the retrieval of fish continued, with Hawaiian monk seals continually stealing fish.

The following paragraphs discuss ways in which the bottomfish fishery has interacted with or may potentially impact the Hawaiian monk seal.

Behavioral Modification: Observer data revealed that some Hawaiian monk seals may follow a vessel from station to station for several days. Some seals seem to have no fear of the vessels, approaching and remaining close to the vessels for long periods. These Hawaiian monk seals could steal an average of 20 fish per day. Some seals, more wary of vessels, typically did not approach closely nor did they steal fish directly from handlines, but they did sometimes consume discarded fish. Hawaiian monk seals also targeted shark-distracting lines baited with live bait.[31]

The effects of these interactions (Hawaiian monk seals stealing fish) on Hawaiian monk seal populations are unclear but represent a modification of Hawaiian monk seal feeding behavior.

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[31]Shark distracting lines are usually baited with *kāhala* or discard fish that are often associated with ciguatoxin or ciguatoxin-like conditions (Nitta 1993). However, it is unknown at this time whether Hawaiian monk seals are affected by this or other biotoxins.

Individual Hawaiian monk seals may habituate to the presence of fishing operations. The report, “Summary Report: Bottomfish Observer Trips in the Northwestern Hawaiian Islands October 1990 to December 1993" states that “(g)iven the artificial availability of these bottomfish species to seals and dolphins as a result of the fishing gear and technique, the proximity of populations of seals and dolphins to the fishing grounds, and the practice of discarding unwanted fish, it is likely that predation of catch by seals and dolphins will continue in the NWHI (Nitta 1993).”

Traveling with the vessel may displace effort on the part of Hawaiian monk seals to locate more permanent foraging locations. Hawaiian monk seals tracked by Abernathy and Siniff (1998) showed site fidelity to foraging locations. Finding suitable foraging locations may be a product of exploration, and may suggest that time spent following vessels that visit the same location intermittently may displace natural foraging habitat exploration and identification.

Observations of Hawaiian monk seals, and data from foraging behavior studies indicate that younger Hawaiian monk seals tend to forage nearer to shore, and adults, especially males, will forage at farther locations and deeper depths (Abernathy and Siniff 1998). This may suggest that juveniles are more susceptible than adults to fishery interactions in shallow water. However, more information is needed in order to determine which component of the Hawaiian monk seal population interacts with the fishery.

Because direct information is scarce, the possible effects of individual Hawaiian monk seals following bottomfish fishing vessels and consuming catch or discards on the Hawaiian monk seal population are difficult to determine. Individual seals could have better growth rates and reproductive success when they rely upon the easy prey of hooked fish. On the other hand, reliance on fishing vessels for food could hinder the growth and reproductive success of individual seals when vessels move out of an area and seals must learn to forage on their own, or if the prey they obtain from the vessels is inadequate for the Hawaiian monk seal’s dietary needs. In addition, use of the vessels as a food source increases the likelihood that an individual seal will become hooked or entangled in fishing gear.

To mitigate these interactions, at least those resulting from discarded fish, the members of the bottomfish fisherman’s association have recently agreed to a new voluntary retention program. Fishermen shall cease fishing and retain all gear on deck whenever a Hawaiian monk seal is sighted in an area within a 10 yard radius of where fishing operations are ongoing. If the Hawaiian monk seal remains in this designated area for more than two hours, the Master of the vessel shall relocate to other fishing grounds where there are no Hawaiian monk seals. All injured and/or dead bycatch will be retained on board the vessel. Discard of offal shall occur after fishing operations have ceased and only if there are no Hawaiian monk seals in the area.

Hookings and Entanglement: Accidental hookings of Hawaiian monk seals or other marine mammals in the bottomfish fishery have been reported or observed only rarely (Nitta 1999). As discussed above, no Hawaiian monk seals were observed hooked or entangled in fishing gear during the NMFS observer program for the bottomfish fishery. In the most recent BiOp (Appendix D), NMFS reviewed other sources of data on Hawaiian monk seal hookings, including reports from the public and researchers in the field (Table 4-1). This information is reviewed below. In assessing potential impacts of the federal bottomfish fishery on the Hawaiian monk seal, NMFS must apply a “worst case scenario” approach and attribute all hooks of unknown origin that are recovered or unrecovered to the federal bottomfish fishery even through they may have originated in other fisheries.

The positive attribution of observed hooks embedded in Hawaiian monk seals to a particular fishery is difficult. For example, similar types of fishing gear are used in the offshore bottomfish fishery and the MHI *ulua* fishery. The MHI *ulua* fishery, managed by the State of Hawaiʻi, is primarily shore-based and comprised mainly of recreational anglers. The circle hooks used in this fishery resemble those used in the offshore bottomfish fishery (both State of Hawaiʻi and Federal components), although the size of the *ulua* circle hooks employed in the recreational fishery tends to be larger. Some of the hooks embedded in Hawaiian monk seals have been positively identified by NMFS as those used during shoreline fishing for *ulua* based on gear type, size of hook and location of the Hawaiian monk seal when discovered, while other hooks have been identified as those used in the offshore bottomfish fishery. However, the origin of many of the hooks found embedded in Hawaiian monk seals is uncertain.

TABLE 4-1: Hookings of Monk Seals Since 1982 That May Be Attributable to the Bottomfish Fishery

DATE AND LOCATION	DESCRIPTION	OUTCOME	REPORT CONFIRMATION STATUS
1982 - French Frigate Shoals	Adult female was observed with bottomfish hook in mouth.	Resighted without hook at French Frigate Shoals.	Photograph of hooked seal reviewed by NMFS.to identify type of hook.
1990 - MHI - Kauai	Juvenile observed with hook.	NMFS response included capture and hook removal. Monk seal was released alive. Hook identified as type used in the *ulua* shore-based fishery.	NMFS researchers identified hook as *ulua* or bottomfish hook. No identifying gear attached to hook.
1991 - Kure Atoll	Subadult female observed with hook in corner of mouth.	Seal subsequently seen without hook.	Hook never recovered or identified.
1994 - NWHI, Hoʻomalu Zone	Monk seal hooked in lower jaw while stealing fish from line.	Line cut leaving 12-18 inch tailing line.	NMFS received a call from the fisherman.
1996 - French Frigate Shoals	Adult male observed with hook in mouth.	Hook removed by researchers. Monk seal released alive. Hook identified as type used in the ulua shore-based fishery and bottomfish fishery.	Independent researchers identified hook as *ulua* or bottomfish hook. No identifying gear attached to hook.

DATE AND LOCATION	DESCRIPTION	OUTCOME	REPORT CONFIRMATION STATUS
2000 - Molokai	Juvenile male observed with 2 hooks and line embedded in chest (ventral) area.	NMFS response included capture and physical exam of seal. No hooks or line present, but slight injury documented by veterinarian.	Fishery unknown.
2001 - Kahoʻolawe	Adult male with hook in abdomen or flipper.	Sightings ceased. Seal disappeared or hook lost.	Fishery unknown.

Source: NMFS unpub. data, 2002

The BiOp (NMFS 2002) identified the following instances of hookings that may be attributable to direct interactions with the bottomfish fishery: 1) In 1982, an adult female Hawaiian monk seal was observed at FFS with a hook in its mouth. A photograph was taken of the seal showing a portion of the hook shank extending from the corner of the seal's mouth. The hook was identified by NMFS as a bottomfish hook. However, independent review of the same photograph, suggests identification of the hook type to be inconclusive based solely on the visible portion of the hook shank. The seal was later resighted without the hook; 2) In 1990, NMFS researchers removed a hook of the type used in both the *ulua* shore-based fishery and bottomfish fishery from a Hawaiian monk seal on Kauaʻi. No line or gear was attached to the hook that would aid in further identification; and 3) In 1996, NMFS researchers removed a hook from an adult male seal at FFS. The hook was identified as a type used in both the *ulua* shore-based fishery and bottomfish fishery. No line or gear was attached to the hook that would aid in further identification.

Additionally, the following three reports of Hawaiian monk seal hookings could not be confirmed but were included by NMFS in the tally of hookings that may be attributable to the federal component of the bottomfish fishery: 1) In 1991, a Hawaiian monk seal was observed at Kure Atoll with a hook in its mouth. The seal was later resighted without the hook and thus the hook or gear was never recovered; 2) In 2000, an observation was made of a Hawaiian monk seal on Molokaʻi with two hooks embedded in its chest. A veterinarian dispatched by NMFS to inspect the seal found no hooks, but reported a non-serious injury where the hooks appeared to have been embedded. As discussed in Section 3.5.1.2, circle hooks, by design, are less prone to snagging on rocky or hard substrate bottoms and are very difficult to snag flat or smooth surface; and 3) In 2001, an adult male Hawaiian monk seal was observed with a hook and line at Kahoʻolawe. The hook was never recovered. Efforts by NMFS to locate the seal were unsuccessful.

Of the above seven incidents listed in Table 4-1, only one is conclusively attributable to the NWHI bottomfish fishery, and that was self-reported by the fisherman. In January, 1995 a fisherman from a commercial bottomfish fishing vessel reported to NMFS biologists that his vessel had hooked a Hawaiian monk seal at 'No-Name bank' in December, 1994. The adult-sized seal was pulled to the boat and the leader was cut, leaving about 12 - 18 inches trailing.

According to the fisherman, the seal had taken the catch (probably *uku*), and the hook was lodged in the lower jaw.

In the March 8, 2002 BiOp, NMFS found that the bottomfish fishery as managed under the FMP may incidentally hook Hawaiian monk seals. However, based on available information regarding fishing participation and landing caps, and current NWHI Reserve closed areas (all areas of critical habitat around areas where Hawaiian monk seals have been observed with hooks potentially attributable to the bottomfish fishery in the past), NMFS expects that the rate of incidental hooking will be very low, notably less than one Hawaiian monk seal per year. Consequently, the estimated rate of serious injury leading to mortality will be substantially lower. Based on the foregoing, it is reasonable to expect that few Hawaiian monk seals will be hooked and/or die as a result of interactions with the bottomfish fishery. This rate of take is unlikely to reduce the numbers, reproduction, or distribution of the Hawaiian monk seal population. The rate of serious injury leading to mortality of Hawaiian monk seals may be further reduced if fishermen remove hooks and/or disentangle Hawaiian monk seals from bottomfish gear coincident to the gear interaction.

In summary, hooking rates appear to be low; however, interaction rates could be much higher if Hawaiian monk seals are stealing large numbers of fish from the bottomfish fishery vessels. Although observer data have not been collected since 1993, and no reports have been submitted or collected from fishery participants, NMFS assumes an undetermined level of interaction persists. The distribution of these interactions is within both zones of the management area of the NWHI bottomfish fishery.

Intentional Injury to Hawaiian monk Seals: In 1990, there were allegations that some fishermen were intentionally killing or injuring Hawaiian monk seals in order to stop them from stealing fish and bait from hooks (Wagner 1990; NMFS 1991). At that time a number of dead Hawaiian monk seals were observed by NMFS researchers with head injuries of unknown origin. However, there was no evidence that the injuries were inflicted by bottomfish fishermen. The only documented case of an illegal killing of a Hawaiian monk seal occurred when a resident of Kaua‘i killed an adult female in 1989 (NMFS 1998). Since 1990, no additional Hawaiian monk seals have been sighted with injuries suspected of being intentionally inflicted by humans (G. Antonelis pers. comm. 2000). Indeed, there appears to be little incentive for bottomfish fishermen to intentionally harm Hawaiian monk seals during fishing operations, as studies such as that of Kobayashi and Kawamoto (1995) indicate that the incidence rate of bottomfish damaged by Hawaiian monk seals is low (0.45 per 1000 fish).

Discards and Biotoxin Poisoning: Hawaiian monk seals may feed on discards, including fish species associated with ciguatoxin, because fishery participants feed the Hawaiian monk seals and/or dump discards in the presence of Hawaiian monk seals. NMFS observers reported that fishery participants illegally fed discards to Hawaiian monk seals during hand line retrieval in order to distract the Hawaiian monk seals from stealing valuable catch. The prevalence of feeding discards as a means of distracting seals is unknown, but is not believed to be practiced routinely throughout the fishery (Katekaru pers. comm. 2001). Feeding of discards to Hawaiian monk seals is prohibited under both the ESA and the MMPA.

Discard availability may affect Hawaiian monk seals in several ways. As discussed above, the availability of discards to Hawaiian monk seals may modify normal Hawaiian monk seal foraging behavior. Concerns have been raised that bottomfish discarded by fishermen and consumed by Hawaiian monk seals may contain high levels of ciguatoxin or other biotoxins (Nitta 1999). In particular, *kāhala* are often discarded during bottomfish fishing operations because large specimens have a reputation for carrying ciguatoxin and, consequently, are not accepted for sale in the Honolulu fish auction. However, two studies in the NWHI found that *kāhala* tested positive for ciguatoxin much less frequently than shallow water species, such as wrasses, that are known to be common Hawaiian monk seal prey items (Ito et al. 1983; Goodman-Lowe 1998).

NMFS believes that it is unlikely that Hawaiian monk seals are or would be poisoned by consuming lost (fish that inadvertently come off gear while fishing) or discarded fish that are ciguatoxic. Hawaiian monk seals are known to commonly consume other species (e.g., moray eels) that contain high levels of ciguatoxin (Hokama 1980), and no Hawaiian monk seal sickness or death has been attributed to ciguatoxin poisoning (Work 1999; NMFS 2000; Gilmartin et al. 1980; Nitta 1993). The investigation of the mass die-off at Laysan Island in 1978 included necropsy and analysis of 18 Hawaiian monk seals. Of the 18 Hawaiian monk seals tested, only two tested positive for ciguatoxin and maitotoxin; reaction to these toxins was not proven to be the cause of death (Work 1999). Moreover, there is no information on the sensitivity of Hawaiian monk seals to ciguatera poisoning. However, fish that are frequently highly ciguatoxic, such as moray eels and wrasses, are known to comprise a portion of the diet of the Hawaiian monk seal with no apparent adverse effects.

Reduction of Prey Available to Hawaiian monk Seals: Available data on Hawaiian monk seal prey indicate that there is little overlap of the bottomfish management unit and bycatch species and the known prey items of Hawaiian monk seals. Tables 3-4 and 3-5 indicate that there is no evidence that Hawaiian monk seals depend on the species targeted or caught incidentally in the fishery, although some overlap between bycatch families and Hawaiian monk seal prey families are evidenced by reports of Hawaiian monk seals stealing catch and discarded fish from bottomfish fishing vessels. However, this overlap may be indicative of opportunistic feeding on bottomfish target/bycatch/incidental catch species and not evidence that these species are a component of the normal Hawaiian monk seal diet. Available information indicates that Hawaiian monk seals are not foraging on identifiable teleost prey in deep water in lieu of shallow water teleosts.

There is little or no information on the indirect effects of the bottomfish fishery on the Hawaiian monk seal through competition for prey or alteration of prey assemblages by removal of key predator fishes. It is thought that such effects would be minimal. The deep-slope bottomfish fishery in Hawaii concentrates on species of eteline snappers, carangids and a single species of grouper concentrated at depths of 30-150 fm. This depth range is outside NMFS' designated critical habitat for the Hawaiian monk seal, which extends out from shore to 20 fathoms in ten areas of the NWHI. In addition, research on the diet of Hawaiian monk seals indicates that the species commonly caught in the bottomfish fishery represent a small fraction of the total number of Hawaiian monk seal prey items (Section 3.3.1.3.1). Given the available information, it seems unlikely that the bottomfish fishery is competing directly or indirectly with Hawaiian monk seals for the same fish species.

Summary of Environmental Consequences to the Hawaiian Monk Seal: Contributing factors to the species' status over the past four decades include male aggression and mobbing behavior, shark predation, disease, climatological regime shifts affecting environmental carrying capacity, human interactions (disturbance) including research, sea wall entrapment, contaminants, fisheries, entanglement in marine debris and vessel groundings (Section 3.3.1.3.3). At each Hawaiian monk seal breeding subpopulation, differing combinations of these factors likely have contributed to local trends in abundance, with the relative importance of individual factors changing over time.

It appears that the overall population of Hawaiian monk seals has remained stable over the last 8 years. The species' population trend is determined by the highly-variable dynamics of the six main reproductive subpopulations. Demographic trends over the past decade have been driven primarily by the dynamics of the FFS subpopulation, where an increasingly inverted age structure indicates that recruitment of adult females and pup production may soon decrease. At FFS, the count of animals older than pups is now less than half the count in 1989. Poor survival of pups has resulted in a relative paucity of young seals, so that this population of Hawaiian monk seals is expected to experience further population declines as adults die and there are few juveniles to replace them. Because this subpopulation has the largest number of animals, declines in this subpopulation would cause the species' total abundance to decline (unless other subpopulations experience increases that are large enough to offset decreases at FFS).

Over the last decade, the causes of the poor survival for these age classes at FFS have been related to poor condition from starvation, shark predation, male aggression, habitat loss, and entanglement in marine debris. A decrease in prey availability may be the result of decadal scale fluctuations in productivity or other changes in local carrying capacity for seals at FFS or a combination of factors (Craig and Ragen 1999; Polovina et al. 1994; Polovina and Haight 1999). At this point it is speculative to indicate whether or not fishing effort in these areas has been intense enough to change the forage base.

Therefore, NMFS anticipates that changes in feeding behavior in response to fishing vessel activity may have negative consequences for individual seals, but these behavioral changes do not appear to affect the survival of seal populations. Population survival may be more affected by changes in forage base that are associated with phenomena like decadal shifts in productivity.

Given the expected low rates of hooking and the lack of evidence of competition for fishery resources from the bottomfish fishery, the bottomfish fishery is unlikely to have direct or indirect effects that would diminish the value of foraging areas within Hawaiian monk seal critical habitat. Nor is the bottomfish fishery likely to reduce appreciably the likelihood of both the survival and recovery of the Hawaiian monk seal in the wild by reducing the reproduction, numbers, or distribution of the species.

4.1.3.2 Sea Turtles

If the bottomfish fishery affects sea turtles, the green turtle is most likely the species to be affected because it occurs within the action area with more frequency than any other species. The recovery plan for the green turtle (NMFS and FWS 1998) lists the primary threats for Hawaiʻi as disease, nest predation, directed take, fisheries incidental take, and boat collisions. The latter two may be relevant to the bottomfish fishery; however, NMFS and State of Hawaii observer data for the bottomfish fishery contain no reports of these types of direct interactions between any species of sea turtle and the bottomfish fishery (Nitta 1999).

Indirect effects may persist from the bottomfish fishery. However, there is no evidence that effects from vessel lighting on females or hatchlings has or is occurring as a result of fishery operations. It is possible, however, that hatchlings may be adversely affected by fishing activities in the NWHI (NMFS 1991). It is well documented that shore-based artificial lighting may affect sea turtles by discouraging females from nesting and disorienting hatchlings away from the sea. Therefore, one could construct a scenario wherein vessels operating deck lights at night may attract and concentrate hatchling turtles off shore or disorient females during nesting activities. The effects could expose the hatchling turtles to predators such as sharks, snappers and barracuda and disrupt or prevent females from successful egg deposition.

About 5.6 percent of the bottomfish fishing effort takes place in the vicinity of FFS where most of the green turtle egg deposition and hatching takes place. In recent years, only six bottomfish vessels have fished in the entire Hoʻomalu zone. Given this dispersed and low level of fishing activity, it is expected that continued bottomfish fishing in the NWHI is expected to have no measurable effect on sea turtle adults or hatchlings in the NWHI.

4.1.3.3 Seabirds

The NMFS observer program for the NWHI bottomfish fishery conducted from October 1990 to December 1993 reported a moderate level of interactions between seabirds and the bottomfish fishery (Nitta 1999). Interactions were characterized by attempted bait theft. Although there is a possibility of accidental hooking, circle hooks used in the bottomfish fishery do not lend easily to snagging. No seabird injuries or mortalities were reported while fishermen were fishing for bottomfish. One interaction involving a Laysan albatross occurred while a bottomfish fishing vessel was trolling for pelagic species. The bird became hooked but was subsequently released alive. This low level of direct interactions between seabirds and the bottomfish fishery would continue under this alternative. While continued bottomfish fishing may affect a very limited number of individual seabirds, it is expected to have no effect on seabird distribution, survival or population structure. The potential for indirect interaction due to competition for prey is negligible, as seabirds do not prey upon bottomfish or bycatch from this fishery.

4.1.4 Essential Fish Habitat, Biodiversity and Ecosystems

Under NMFS guidelines, impacts of an action on EFH and HAPC must consider the EFH and HAPC of all managed species in the region. Therefore, the present assessment must consider impacts of bottomfish fishing to not only bottomfish EFH and HAPC, but also to pelagics, precious corals and crustaceans EFH and HAPC. Table 4-2 summarizes EFH and HAPC for the four approved Western Pacific FMPs.

TABLE 4-2: Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC) for all Western Pacific FMPs

FMP	EFH (Juveniles and Adults)	EFH (Eggs and Larvae)	HAPC
Pelagics	Water column down to 1,000 m	Water column down to 200 m	Water column above seamounts and banks down to 1,000 m
Bottomfish and Seamount Groundfish	Water column and bottom habitat down to 400 m	Water column down to 400 m	All escarpments and slopes between 40-280 m, and three known areas of juvenile ʻō*pakapaka* habitat
Precious Corals	Keāhole Point, Makapuʻu, Kaʻena Point, Westpac, Brooks Bank, 180 Fathom Bank deep water precious corals beds and Miloliʻi, Auʻau Channel and S. Kauaʻi black coral beds	Not applicable	Makapuʻu,Westpac, and Brooks Bank deep water precious corals beds and the Auʻau Channel black coral bed
Crustaceans	Bottom habitat from shoreline to a depth of 100 m	Water column down to 150 m	All banks within the NWHI with summits less than 30 m

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

As the above table shows, Western Pacific areas designated as EFH or HAPC fall into two categories: either the water column above the ocean bottom, or the ocean bottom itself. Water column EFH and HAPC have been designated for pelagic, bottomfish and crustacean MUS. Bottomfish fishing activities directly impact the water column only by the release of chum (*palu*). A bottomfish fishing handline rig typically consists of a terminal weight that hangs below a series of branch lines with baited hooks. Above the branch lines is a small bag containing a handful of chum, usually a mixture of chopped up fish parts and a filler such as oats. When the line is dropped, it's allowed to sink to the bottom, and then is pulled up several fathoms. The line is then jerked sharply to open the bag and release the chum over the baited hooks. The chum moves with the current while slowly sinking. The area affected is extremely localized and the effect is very transient. The constituents of the chum represent a small food subsidy to nearby demersal fish and benthic fauna. Water column EFH or HAPC is not significantly negatively impacted.

Indirect impacts to water column EFH or HAPC could occur through pollutant discharges from bottomfish fishing vessels. The day-to-day operations of a fishing vessel can produce a number of waste products, including oil, sewage and garbage, that can affect marine habitat (WPRFMC 1998a). The small number of vessels permitted to participate in the NWHI bottomfish fishery[32] and the low level of participation in bottomfish fishing in most other island areas minimizes this potential impact. Most bottomfish fishing around the MHI takes place in state waters inside three miles from shore.

Areas of ocean bottom have been designated EFH and HAPC for precious corals, crustaceans and bottomfish MUS. Regulations adopted in the Bottomfish FMP both directly and indirectly reduce the likelihood of damage to habitat caused by fishing gear and operations. The FMP prohibits the use of destructive gears such as explosives, poisons, trawl nets and bottom-set ground lines in the fishery.

Deep water precious corals beds designated as EFH or HAPC are well below the depths fished or anchored in by the bottomfish fishery. Neither direct nor indirect impacts from bottomfish fishing activities would be expected. Shallower black coral beds designated EFH or HAPC, however, occur within the depth range fished for bottomfish. Individual colonies of black coral could be damaged or destroyed by anchors or weights on the terminal end of the fishing line. Habitat damage, however, would be expected to be insignificant because of the hard substratum favored by these corals. Submersible-supported studies conducted in 2001 at bottomfishing banks in the

[32] Under the current limited access program for the NWHI bottomfish fishery, participation in the fishery is limited to 17 federally-permitted vessels, although this level of participation has not been reached since 1991. In 2000, only 11 vessels participated in the fishery.

NWHI have reported minimal evidence of fishing impacts to habitat (C. Kelly pers. comm. 2001).

Areas of EFH for crustacean MUS are relatively shallow compared with typical depths where bottomfish fishing takes place. However, crustacean EFH extends to 100 m, depths at which bottomfish fishing vessels may anchor and occasionally fish. When fishing in deeper waters fishermen may anchor their vessels in order to maintain a position over productive fishing areas. Anchoring is generally conducted at depths from 80 to 120 m (40-60 fathoms). At these depths anchor damage to EFH/HAPC is minimal, as much of the habitat consists of a mosaic of sandy low-relief areas and rocky high relief areas. It is also important to note that the anchor typically used to maintain a vessel's position over a rocky area is constructed of 3/4 in. steel reinforcing rod ("rebar") fashioned in the shape of a four-sided J-hook. Because the rebar is bendable, this design helps prevent the anchor from becoming inextricably lodged on the bottom and has the added benefit of reducing damage to habitat during recovery.

HAPC for crustacean MUS is quite shallow. Bottomfish fishing vessels would neither anchor nor fish at such shallow depths, and no direct impacts on these habitats would be expected. The accidental grounding of a fishing boat, however, can adversely affect shallow EFH and HAPC. The impact of a vessel striking the bottom can physically destroy habitat in the immediate area. The possible subsequent break-up of the vessel and release of fuel and oil can result in pollution of habitat and mortality of marine life. A grounding can also lead to the introduction of alien species, such as rodents or insects, which can have an adverse impact on terrestrial native fauna and flora in the area. Fishing vessel groundings are relatively rare events. For example, in the 1200 mile-long NWHI, only two fishing boats have run aground during the past 15 years – one was a swordfish longline vessel and the other a lobster boat. In both cases there was localized habitat damage under the hull, but no reported effects on surrounding areas.

Bottomfish EFH and HAPC are similar to those designated for crustaceans, but extend deeper. At depths where bottomfish vessels may anchor, potential impacts are as described above for crustacean EFH. To fish at greater depths (below about 120 m), bottomfish fishermen typically anchor upwind of the desired location in shallower water and drift downwind letting out anchor line scope until the desired depth is reached. Thus, impacts to benthic habitat at these greater depths are restricted to small fishing weights (typically 1-3 lb) hitting the bottom as lines are being deployed. Damage to either hard or soft bottom habitats would be minimal.

Continuation of the current bottomfish fishing management regime in the Western Pacific Region will not adversely affect EFH or HAPC for any managed species, as it is not likely to lead to substantial physical, chemical or biological alterations to the habitat, or result in loss of, or injury to, these species or their prey.

4.1.5 Commercial, Recreational and Charter Fishing Sectors

Assuming harvest and participation trends comparable to recent (1996-2000) years, 262,000 to 346,000 lb of bottomfish with an ex-vessel value of $964,000 to $1,155,000 would continue to be harvested by about 13 Mau Zone and Hoʻomalu Zone permit holders under this alternative. While these revenues are expected to have a positive direct economic impact on fishery participants, the profitability of the average bottomfish fishing operation in the NWHI has been marginal (WPRFMC in prep.; see Table 3-26). In 1988, a limited access program was established for the Hoʻomalu Zone in the NWHI, the primary motivation for which was avoidance of economic overfishing. However, in recent years the average vessel fishing in the Hoʻomalu Zone has failed to cover its total annual costs through bottomfish fishing (Section 3.5.1.5.2). The average vessel has earned a positive return on operations, and presumably vessel owners derive sufficient income from other economic activities to cover fixed costs.

In the Mau Zone, the poor economic performance of many vessels has resulted in a considerable turnover pattern of entry and exit. In 1999, a limited access program was established for the Mau Zone to support long-term productivity of bottomfish resources in the zone and to improve the economic stability of the fishery.

No data on the profitability of commercial bottomfishing fishing operations in the MHI are available, nor is there information on the non-market value of subsistence or recreational bottomfish fishing around the MHI. However, it is likely that without the supplement to basic incomes obtained from subsistence or part-time commercial fishing, many fishermen in Hawaiʻi would face economic hardship in the state's expensive economic climate.

There is also a lack of data on the economic performance of vessels harvesting bottomfish in American Samoa, Guam and CNMI. It is probable, however, that fishing for bottomfish and other types of offshore fishing provide an important subsistence or income supplement to many families in these island areas.

4.1.6 Regional Economy

This alternative would have a direct positive effect on Hawaiʻi's economy. Assuming revenue trends comparable to recent (1996-2000) years, the NWHI bottomfish would continue to generate annual revenues of about $1M (WPRFMC in prep.). Individuals and firms that directly or indirectly support and are supported by the fishery would be able to maintain current levels of output, income and employment. It is estimated that the NWHI bottomfish fishery contributes $1,382,747 of output (production) and $482,218 of household income to the state economy, and creates the equivalent of 25 full-time jobs (Section 3.6.1.2).

The contribution of Hawaiʻi’s bottomfish fishery to the state economy is small (Section 3.6.1.2). However, given the vulnerability of the economies of Hawaiʻi and other U.S. Pacific Islands to sharp and sudden economic downturns, as evidenced by negative changes in the economic condition of most of these island areas during the past several years, the importance of economic diversification is apparent (Section 3.6.1.1). Commercial fishing appears to be one of the few economic sectors outside the mainstay of tourism in which substantial economic growth is possible.

4.1.7 Fishing Community

Continued bottomfish fishing in the EEZ surrounding the NWHI would promote social and economic stability among fishery participants and help preserve elements of local fishing culture Section 3.7 describes the sociocultural importance of bottomfish fishing in Hawaiʻi. The bottomfish fishery provides direct and indirect social and cultural benefits for fishermen and their families, seafood consumers and the broader community. Direct benefits would accrue to the communities of Kauaʻi and Oʻahu, as vessels participating in the NWHI fishery are homeported in these communities.

4.1.8 Native Hawaiian Community

This alternative would have a positive economic impact on Native Hawaiians who are owners, captains or deck hands of bottomfish fishing vessels operating in the NWHI. No recent data on the ethnicity of participants in the NWHI bottomfish fishery are available, but the level of participation by Native Hawaiians in this fishery was reported to be low (Iversen et al. 1990). However, the current management regime is attempting to increase the participation of Native Hawaiians in the fishery through a community development program. The Magnuson-Stevens Act provides for the establishment of a Western Pacific community development program for any fishery under the authority of the Council (Sec. 305(i)(2)(A)). This provision was added to the Act to address concerns that communities consisting of descendants of indigenous peoples in the Council's area have not been appropriately sharing in the benefits from the area’s fisheries. The Council and the Secretary, respectively, have discretion to develop and to approve programs for eligible communities for the purpose of enhancing access to the fisheries under the authority of the Council.

In the case of the NWHI bottomfish fishery, the Council determined that a community development program should be incorporated in the Mau Zone limited access system to increase the economic benefits received by eligible communities from the fishery. Twenty percent of the target number of permits issued under the Mau Zone limited access system are reserved for the exclusive use by eligible communities. The Council reserved 20 percent of the permits because this figure reflects the proportion of Native Hawaiians in Hawaiʻi’s population. However, the number of permits reserved for the program may be periodically reviewed and changed. Permits issued under the community development program are not subject to the “use-it-or-lose it” requirement.

An allocation under a community development program is not based on customary or traditional fishing practices in eligible communities or on treaty rights related to fisheries. Rather, the legislative history of this provision suggests that allocations are mainly to be based on a concern that eligible communities have not been appropriately sharing in the benefits from the area’s fisheries. An allocation under a community development program does not establish for a participating community a perpetual entitlement to access and withdrawal rights. Each allocation is temporary and revokable.

It is also important to note that this provision does not provide a statutory basis for a conferral of rights to make decisions which effect management of a particular fishery resource or effect the allocation of access and withdrawal rights to other stakeholders. This point was emphasized by the National Resource Council Committee to Review Community Development Quotas (NRC 1999) with specific regard to the Magnuson-Stevens Act community development program in Alaska, where it is referred to as a community development quota (CDQ) program. The report of the Committee states, “Sharing in economic benefits is not the same as ... sharing in management responsibilities” (p.81). And further notes, “If ‘management’ is understood as management of the resource ..., then the Alaska CDQ program is not co-management (sharing of management with a higher governmental authority) and not yet community management (full devolution of resource management authority). The CDQ program assigns rights to economic benefits via a quota share of the TAC (total allowable catch) but there is no assignment of resource management authority ” (p.89).

4.1.9 Administration and Enforcement

This alternative would perpetuate the status quo for existing administrative and enforcement procedures without adding or reducing costs or responsibilities to management agencies (Section 3.9).

4.2 IMPACTS OF ALTERNATIVE 2

Alternative 2 is immediate cessation of bottomfish fishing in the NWHI.

4.2.1 Target Species

The cessation of bottomfishing fishing activities in the NWHI would remove anthropogenic sources of mortality from the target stocks. The direct effect of a total closure of the bottomfish fishery in the NWHI would be the gradual return of the NWHI bottomfish spawning biomass to equilibrium with sources of natural mortality. An indirect effect could be to enhance recruitment to the MHI portion of the target species populations. Localized depletions have been documented for several of these species in both federal and state waters around the MHI. However, the effect of an increase in recruitment to the MHI remains uncertain and may be offset to some extent if fishing effort is redistributed from the NWHI to the MHI by displaced vessels. Impacts in other areas of Council jurisdiction would be the same as for Alternative 1, as only the NWHI fishery would be affected by this alternative.

4.2.2 Bycatch

Bycatch in the NWHI bottomfish fishery is low because of the selective gear and fishing practices used. The amount of mortality of bycatch species in the NWHI bottomfish fishery is unknown, but if bycatch is low, bycatch mortality (in absolute numbers) must also be low. Although bottomfish fishing causes some mortality to bycatch species, the amount is likely to be far less than natural mortality. The cessation of bottomfish fishing in these zones would eliminate anthropogenic sources of mortality on these species, and allow a return to equilibrium with natural sources of mortality. However, the positive impact of this alternative likely would not be detectible against the background of natural population fluctuations.

4.2.3 Protected Species

4.2.3.1 Cetaceans, Sea Turtles and Seabirds

This alternative would eliminate the potential for impacts from behavioral disturbance, entanglement in fishing gear and other interactions between cetaceans, sea turtles and seabirds and the NWHI bottomfish fishery. Given the infrequency of these interactions, it is likely that the closure of the NWHI bottomfish fishery would have no measurable effects on the distribution or abundance of these species.

4.2.3.2 Hawaiian Monk Seal

The cessation of commercial bottomfish fishing in the NWHI would eliminate any potential direct or indirect negative impacts of bottomfish fishing operations on Hawaiian monk seal populations. These potential impacts include a low-level risk of accidental hooking, entanglement in bottomfishing fishing gear, behavioral disturbance and competition for food resources.

4.2.4 Essential Fish Habitat, Biodiversity and Ecosystems

The immediate closure of the NWHI bottomfish fishery would eliminate mechanisms by which bottomfish fishing activities potentially affect the marine environment such as pollution and physical habitat disturbance. Given the low density of bottomfish fishing operations in the

NWHI, the infrequency of fishing vessel groundings and the large natural perturbations in coral reef habitat, the added protection to the coral reef ecosystem, EFH and HAPC in the NWHI resulting from termination of the bottomfish fishery is likely to be minimal. Submersible-supported studies conducted in 2001 at bottomfishing banks in the NWHI have reported minimal evidence of fishing impacts to habitat (C. Kelly pers. comm. 2001). However, by eliminating any possible negative impact from bottomfish fishing operations in the NWHI, this alternative would help maintain the value associated with preservation of the coral reef ecosystem in the NWHI (Section 3.4.4). Potential impacts of bottomfish fishing activities to EFH or HAPC for any managed species outside the NWHI are not likely to lead to substantial physical, chemical, or biological alternations to the habitat, or result in loss of, or injury to, these species or their prey for the reasons described for Alternative 1.

4.2.5 Commercial, Recreational and Charter Fishing Sectors

Immediate closure of the NWHI bottomfish fishery would impose an economic hardship on fishery participants. This alternative would immediately prohibit bottomfish fishing in the EEZ surrounding the NWHI. It is estimated that up to 45 fishermen would be displaced by this action based on the current number of vessels (17) eligible to fish in the area under the limited access programs for the Mau and Hoʻomalu Zones and assuming that each Mau Zone vessel and Hoʻomalu Zone vessel has a crew of two and three, respectively, and one-fourth of the vessels are not owner-operated. Based on recent (1996-2000) landings data, about 300,000 lb of bottomfish with an ex-vessel value of about $1M would no longer be harvested from the NWHI fishery (WPRFMC in prep.).

The termination of the NWHI bottomfish fishery would force displaced fishermen to relocate their fishing activities to bottomfish grounds that are still open, shift to different fisheries or tie up their vessels. It is likely that displaced fishermen would have difficulty relocating their operations to bottomfish fishing grounds around the MHI. Respondents in a 1993 survey of participants in the NWHI fishery generally indicated that it is not worth their time to fish around the MHI because it takes too long to catch a full load of fish (Hamilton 1994). Closure of the NWHI fishery is likely to have less of an impact on Mau Zone permit holders than Hoʻomalu Zone permit holders, as most of the former tend to own smaller boats and currently utilize MHI bottomfish fishing grounds and/or participate in other fisheries (e.g., handlining or trolling for pelagic species). In contrast, Hoʻomalu Zone vessels require larger catches to be profitable and have few, if any, viable alternative fisheries. For the owners of these vessels, closure of the fishery would represent a sunk cost of $150,000 to $250,000 per vessel.

Transfer of effort from the NWHI to the MHI could also indirectly create economic hardship in the form of reduced profitability for fishermen already engaged in the MHI fishery. Bottomfish fishing grounds in the MHI are fully utilized with few, if any, unexploited areas. Recently implemented state regulations that close certain bottomfish fishing grounds have further increased competition for fishing locations around the MHI. If NWHI fishermen were to shift their effort to the MHI, catch per unit effort and individual harvest for both displaced and resident fishermen would likely decline substantially due to the intensified fishing pressure on bottomfish resources. Lower individual catches would mean a decrease in the incomes of part-time and full-time commercial fishermen and a reduction in the non-market value of the fishing experience to a number of recreational fishermen and charter fishing patrons. Total harvest in the MHI fishery would probably remain at current levels regardless of increased participation from displaced NWHI fishermen because nearly all MHI fishing grounds are fully utilized.

Those displaced fishermen who elect to target other species are likely to recover some portion of the revenue previously generated from bottomfish fishing in the NWHI, particularly if they pursue more widely distributed species like tuna. Many Mau Zone vessels are already outfitted to participate in fisheries on other stocks, but some boat owners may not be capable of shifting into other fisheries without significant additional capital outlays. Conversion to charter fishing may be a feasible option for some vessel owners. However, the charter fishing fleets in most of Hawaiʻi’s ports are already over-capitalized (Hamilton 1998).

Given that opportunities for displaced fishermen to recover their lost harvest and income would be limited and the fishery is already characterized by limited profitability (Section 3.5.1.5.2), it is likely that some displaced fishermen would be forced to sell out or retire. It is uncertain how active the Hawaiʻi or nationwide market is for the types of vessels, gear and other investment capital used in the NWHI bottomfish fishery. However, it is possible that the Hawaiʻi market for these assets could quickly be flooded. Closure of the NWHI bottomfish fishery would likely depress the immediate resale market for bottomfish fishing equipment and vessels as well as diminish the long-term investment value of the vessels owned by displaced fishermen who opt to continue fishing. This could create an economic hardship for those fishermen who are relying on money earned from selling their fishing assets to supplement their retirement funds.

It is possible that closure of the NWHI fishing grounds could help rebuild stocks in the MHI and sustain or increase harvests, thereby mitigating the revenue reductions from fishing restrictions. However, the ability of closed areas to increase yields has not been demonstrated for bottomfish fisheries in Hawaiʻi. It should also be noted that, even if a closed area has the potential to have a positive effect on fish populations and fishery productivity, it may take several years after the closure of the NWHI fishery occurs for this effect to be realized because of the high age of first reproduction for most bottomfish species. Given this time lag, it is unlikely that the potential economic benefits of an area closure would accrue to the current generation of bottomfish fishermen. Moreover, if fishing effort is allowed to increase in the MHI, any economic gains from a closed area will be dissipated over the long-run.

4.2.6 Regional Economy

The immediate cessation of bottomfish fishing in the EEZ surrounding the NWHI would result in a decrease in output, household income and jobs in Hawaiʻi. However, an input-output analysis indicates that the contribution of the NWHI bottomfish fishery to overall economic activity in Hawaiʻi is small (Section 3.6.1.2). It is estimated that the fishery contributes $1,382,747 of output (production) and $482,218 of household income to the state economy and creates the equivalent of 25 full-time jobs. The impact of the loss of the fishery would consist of a reduction in state output, income and employment by 0.00003 percent or less. Even this low figure may over-estimate the regional impacts as it does not consider the potentially off-setting impacts of the re-employment of the labor and capital that would be left idle as a result of closure of the NWHI fishery. For example, unemployed workers might find other jobs in Hawaiʻi that may or may not be fishing-related and fishing vessels could be used in other fisheries.

With the exception of American Samoa, it is difficult to argue that commercial fishing plays a pivotal role in the economies of any of the U.S. Pacific Islands (Section 3.7). In all of these island areas, moreover, other fisheries – particularly pelagic fisheries – are more important than bottomfish fishing. In no area does bottomfish fishing occupy a core part of the fishing industry. However, recent downturns in economic activity in Hawaiʻi and the other U.S. Pacific Islands brought on by outside forces underscore the importance of economic diversification in these small and isolated island areas. Commercial fishing broadens the base of Hawaiʻi's economy and is one of the few economic sectors in the state that has experienced significant growth. The termination of the NWHI bottomfish fishery would hamper further expansion of Hawaiʻi's commercial fishing industry and impede current efforts to diversify the state economy.

4.2.7 Fishing Community

Immediate cessation of fishing for bottomfish in the EEZ surrounding the NWHI would directly affect the (proposed) fishing communities of Kauaʻi and Oʻahu. As discussed in Section 3.7, the NWHI bottomfish fishing fleet and most of the other industrial-scale fishing fleets in Hawaiʻi are based in Honolulu. In addition, this urban area is the center of the state's fish marketing/distribution network. When examined from a community frame of reference, however, the economic contribution of the harvesting and processing of fishery resources to the total economy of Honolulu is diluted by the relative scale of other economic activities in the metropolitan area, such as tourism. In other words, Honolulu is the center of a major portion of commercial fishing-related activities in the state but is not a community "substantially dependent upon or substantially engaged in" fisheries in comparison to its dependence upon and engagement in other economic sectors.

Although closure of the NWHI bottomfish fishery would have no significant socioeconomic effects in the context of the economy of Honolulu or any other community, it would have a direct and significant negative impact on individual fishing enterprises. Fishery participants would suffer from a loss of earning potential, investment value and lifestyle. As indicated in Section 4.2.6, closure of the NWHI bottomfish fishery would result in the loss of the equivalent of 25 full-time jobs in Hawaiʻi. However, the finding that relatively few persons would be negatively impacted economically and the regional economy would be insignificantly affected does not lessen the economic hardship that reduced earnings or loss of a job would create for some fishermen and their families. This economic hardship would occur at a time when opportunities for shore-based jobs within fishing related fields (e.g., at marinas or dry dock facilities) as well as in other segments of Hawaiʻi's labor market where fishermen and their family members are likely to seek employment, have been constricting, and jobs in unskilled sectors of the state economy are increasingly staffed by temporary, casual, and immigrant workers who keep wages at minimum levels.

Hawaiʻi has suffered more than a decade of economic stagnation, and workers in both the public and private sectors have lost jobs (Section 3.6.1.1). A recent study of workers that were laid off following the shut down of the sugar industry on the island of Hawaiʻi found that more than a year after the loss of their jobs 35 percent of the interviewees were still unemployed and seeking work (DeBaryshe et al. undated). Moreover, anecdotal evidence suggests that many of those who had found employment were in temporary or seasonal jobs. Although three-quarters of the plantation workers who were laid off made use of state-sponsored job training services, use of these services did not increase the chance of finding a new job. Demographic characteristics such as age, former plantation job grade and education were also largely unrelated to the likelihood of re-employment. It is likely that individuals who lose their jobs as a result of closure of the NWHI bottomfish fishery would encounter similar difficulties in finding suitable alternative jobs.

Deckhands would arguably be the most severely impacted by termination of the NWHI bottomfish fishery – they will probably be the first to lose their jobs and they may have the greatest difficulty in finding alternatives. Pooley and Kawamoto (1990) indicate that the net revenue of a bottomfish fishing vessel operating in the NWHI is most sensitive to the crew share percentage and to changes in total fixed costs. If termination of the NWHI bottomfish fishery results in a reduction in net revenues, captain/owners may partly try to make do by decreasing the pay of deckhands or laying them off. Appropriate employment opportunities outside of fishing may be limited for affected individuals, and for many the income losses may be long-term.

Those who become unemployed would face the social and psychological costs of job loss. Individuals who lose their jobs typically experience heightened feelings of anxiety, depression, emotional distress and hopelessness about the future, increases in somatic symptoms and physical illness, lowered self-esteem and self-confidence and increased hostility and dissatisfaction with interpersonal relationships (DeBaryshe et al. undated). In addition, both spouses and children of such individuals are at risk of similar negative effects. The aforementioned study of workers displaced from the sugar industry found many families reported difficulty in paying bills and in affording transportation, health care and even food and clothing (DeBaryshe et al. undated). The results of this financial strain were high levels of psychological distress among some family members as well as an increase in physical health problems. It is probable that a similar level of stress would be experienced by individuals who lose their jobs as a result of an immediate closure of the NWHI bottomfish fishery.

Immediate closure of the bottomfish fishing grounds in the NWHI would also have a negative economic impact on local businesses that directly or indirectly support and are supported by the fishery. Included are individuals or firms that process, distribute and sell fishery products and enterprises that provide goods and services to the fish harvesting sector in Hawaiʻi such as chandlers, gear manufacturers, boatyards, tackle shops, bait shops and insurance brokers. While the percentage of business derived from the NWHI bottomfish fishery may be relatively small for some of these firms, any permanent loss of income during this extended period of stagnation in Hawaiʻi's economy could affect their economic viability.

It is likely that many families that depend on fishing and the seafood industry in Hawaiʻi are already economically, socially and psychologically stressed because of declining catch rates, increasing competition and unstable markets. In Hawaiʻi during the past several years, there have been a number of highly publicized clashes between the owners of large and small fishing boats and between fishermen who are newcomers and those who are established residents (Section 3.7.1.1). Contributing to this stress is the imposition of ever more restrictive state and federal regulations. Undoubtedly, many fishermen in Hawaiʻi have the sense that government regulations are "boxing them in" and reducing their ability to maintain their characteristic highly flexible fishing strategy (Pooley 1993a; Hamilton et al. 1996; Polovina and Haight 1999). This flexibility is important to the economic success of many smaller and medium-sized fishing vessels because of natural variations in the availability of various types of fish. Closure of the NWHI bottomfish fishing grounds would further confine fishermen and could jeopardize the long-term economic viability of their fishing operations.

In addition to potential economic losses associated with the cessation of bottomfish fishing in the NWHI, there would be the loss of lifestyle to contend with, assuming that displaced fishermen cannot find an equally satisfactory alternative way of life. A 1993 survey of owner-operators and hired captains who participate in the NWHI bottomfish fishery found that enjoyment of the lifestyle or work itself is an important motivation for fishing among fishery participants (Section 3.7.1.1). This survey also found that half of the respondents who fish in the Hoʻomalu Zone are motivated by a long-term family tradition. Some fishermen would be able to continue their fishing lifestyle by switching to other fisheries, but the aspects of the maritime culture associated specifically with fishing in the NWHI (place names, stories associated with the NWHI, fishing strategies, etc.) would be lost. Fishermen who have invested many years learning to fish in the area would lose the opportunity to connect with that landscape and apply their locale-specific fishing skills and knowledge.

Based on recent (1996-2000) harvest data, the bottomfish catch in the NWHI fishery represents about forty percent of the total commercial bottomfish harvest in Hawaiʻi (WPRFMC in prep.). Closure of the NWHI bottomfish fishery would have a direct negative impact on seafood consumers by significantly reducing the amount of fresh bottomfish available for sale. There may be substitution possibilities in the form of other sources and species. However, catch rates in the MHI bottomfish fishery have shown a general downward trend, and it is doubtful that yields in this fishery can be increased. The quantity of imported bottomfish has increased in recent years, but the quality of these imports is considered by some consumers to be lower than that of locally-caught fish.

Immediate closure of bottomfish fishing grounds in the NWHI would also likely have a negative impact on those who value the continued existence of Hawaiʻi's maritime tradition and culture. As discussed in Sections 3.5.1.1 and 3.7.1.1, Hawaiʻi's commercial fishing industry dates back nearly 200 years, and fishermen have engaged in commercial handline fishing for bottomfish in the MHI and NWHI since the early part of the last century. The bottomfish fishery is a historically important component of an industry that is deeply intertwined with Hawaiʻi's social and cultural resources (Section 3.7.1.3). By reducing the diversity and economic viability of the commercial fishing life way in Hawaiʻi, closure of the NWHI bottomfish fishery would diminish the influence of Hawaiʻi's maritime culture.

One possible way in which the negative economic and social effects of this alternative on participants in the NWHI bottomfish fishery could be mitigated is the implementation of a permit or vessel "buy-back" program. Some holders of a Mau Zone or Hoʻomalu Zone permit might be willing to sell their permit or vessel to the federal government or a third party for the sole purpose of retiring the permit or vessel. Subject to the availability of funds for this purpose, the government might be willing to buy these permits or vessels to enable and encourage fishermen who wish to pursue alternatives to fishing for bottomfish in the NWHI. Any such "buy-out" would require, at a minimum, a cooperative seller, a willing buyer and available funds.

A second possible way in which the negative economic and social effects of this alternative could be mitigated is through a fisheries disaster relief program. Federal payments to fishing communities and industry groups have been made increasingly frequently under Section 312(a) of the Magnuson-Stevens Act, the MSA provisions that deal with Fisheries Disaster Relief. In late 1998, for example, Congress appropriated five million dollars to NOAA to provide emergency disaster assistance to persons or entities in the New England multispecies groundfish fishery who were most affected by seasonal area closures. One-time cash payments were received by both crew members and permit holders (vessel owners). Close involvement of fishery participants is advisable to ensure that any such mitigation measures are appropriate.

This alternative could have environmental justice implications under Executive Order 12898, as it may result in disproportionately high and adverse human health or environmental effects on minority or low income populations. As discussed in Section 3.7.1.1, a survey by Hamilton and Huffman (1997) of small-boat owners who engage in Hawaiʻi's commercial and recreational fisheries, including the troll, pelagic handline and bottomfish fisheries, found that a high proportion of the survey respondents were members of minority groups. An informal survey of bottomfish fishing vessel owners and crews revealed that nine of 16 vessels are owned and/or captained by Caucasians, two by Portugese-Americans, three by Hawaiians, one by a Japanese-American and one by an Asian-American (specific ethnicity unknown). Less is known about the ethnicities of the crews, and these tend to change much more rapidly than vessel owners or captains. At the time of the informal survey, three vessels were crewed by Hawaiians, five by Caucasians, and two by a mixture of ethnicities. Regardless of ethnicity, fishermen, especially crew, are likely to be classified as low income.

Furthermore, as noted in Section 3.7.1.2.2, the Hawaiʻi seafood market includes a particular cultural interest in ʻō*pakapaka*, *onaga* and other species of bottomfish. Members of certain minority groups in the state consider these species to be showy and auspicious fish for festive occasions. A decrease in the availability of high quality bottomfish during culturally important events would cause a loss in well-being among these consumers, although an assessment of this loss is not possible with available data.

4.2.8 Native Hawaiian Community

From a Native Hawaiian perspective, there are two aspects of this alternative that need to be examined. The first pertains to outstanding aboriginal claims of Native Hawaiians. Immediate cessation of bottomfish fishing would enhance the ability of the NWHI bottomfish stocks to replenish themselves until such time as an equitable settlement is agreed upon and roles and responsibilities of Native Hawaiians with respect to the resource base are clarified.

The second issue pertains to the interests of Native Hawaiians who are owners, captains or deckhands of fishing vessels presently harvesting bottomfish in the NWHI. This alternative would deprive them of the means of a livelihood. In view of the historic and cultural importance of fishing over the last 2000 years for Native Hawaiians, this deprivation of the right to make a living fishing at *ko*ʻ*a* that they have been accustomed to frequent is an especially onerous penalty. The negative effects are exacerbated by the fact that annexation of Hawaiʻi by the U.S. opened the "icebox" (fishery resources) of the Native Hawaiians to any U.S. citizen (Kosaki 1954). Over the decades this competition for resources has made it much more difficult for Native Hawaiians to succeed in customary occupations like fishing.

4.2.9 Administration and Enforcement

This alternative would reduce administrative costs by removing the need to maintain the current separate fisheries data collection system for the NWHI bottomfish fishery. In addition, the administrative costs of managing the limited access permit programs for the Mau and Hoʻomalu Zones would be eliminated.

4.3 IMPACTS OF ALTERNATIVE 3

Alternative 3 is a phase-out of bottomfish fishing in the NWHI. With respect to impacts to biological components of the affected environment (Sections 3.1-3.5), the short-term impacts of a gradual phase-out program are the same as the impacts described for Alternative 1. That is, localized depletions of target species may occur in the MHI, and relatively small numbers of bycatch species would continue to be caught where bottomfish fishing occurs. Minor risks to protected species and habitats would remain while fishing continued. The long-term impacts are the same as for Alternative 2. Fishing pressure on stocks of target and bycatch species in the NWHI would be removed, but could increase in the MHI if fishing efforts are redirected there. Risks to protected species and habitats in the NWHI ultimately would be eliminated.

4.3.1 Commercial, Recreational and Charter Fishing Sectors

This alternative would permit harvest of bottomfish in the NWHI to continue during the life tenancy period of qualifying fishermen, thereby supporting fishing operations over the course of the current generation. The phase-out period would allow qualifying fishermen to adjust their fishing activities to areas outside the NWHI or continue fishing in the NWHI until retirement. Current investments in fishing vessels and gear could be amortized.

Over the short term, about 300,000 lb of bottomfish with an ex-vessel value of about $1M would continue to be harvested by about a dozen Mau Zone and Hoʻomalu Zone permit holders. However, harvest and participation in the NWHI fishery would gradually decline as fishermen depart from the fishery. Younger permit holders that remain in the fishery would likely experience a positive economic impact, as catch rates could increase in response to the gradual effort reduction.

The qualifying criteria may exclude some permit holders who once depended heavily on the fishery but have shifted their focus in recent years. For these individuals the option to return to the fishery would be lost.

4.3.2 Regional Economy

This alternative would have a minimal effect on economic activities in Hawaiʻi. Impacts of this alternative on the regional economy in the short-term would be similar to those of Alternative 1, which allows continued bottomfish fishing in the NWHI. The long-term impacts of this alternative would be as described in Alternative 2. Because of the very small contribution of this fishery to the regional economy, however, the difference between the impacts of Alternatives 1 and 2 is insignificant.

4.3.3 Fishing Community

In the short-term the impacts of this alternative on fishing communities (proposed) are most like those of Alternative 1, which allows continued bottomfish fishing in the NWHI. Over the long-term the effects of this alternative are similar to those described for Alternative 2. In addition to the impacts on communities and current fishery participants, future generations of fishermen in Hawaiʻi would be affected by having one less option to draw on to make fishing a financially secure occupation.

The gradual elimination of the NWHI bottomfish fishery and consequent decrease in the availability of high quality bottomfish during culturally important events would cause a loss in well-being among consumers. In addition, the resultant diminishment of the viability of the commercial fishing life way would have a negative effect on the well-being of members of the broader community in Hawaiʻi who value the contribution that the commercial fishing industry makes to the state's cultural, social and economic diversity.

4.3.4 Native Hawaiian Community

This alternative would provide Native Hawaiians currently participating in the NWHI bottomfish fishery an opportunity to adjust their bottomfish fishing activities to areas outside the NWHI or continue bottomfish fishing in the NWHI until their retirement. However, no other Native Hawaiians would be able to obtain a permit for the NWHI bottomfish fishery. The long-term impact in terms of allowing time for clarification of outstanding claims of Native Hawaiians is similar to that of Alternative 2.

4.3.5 Administration and Enforcement

A large portion of the enforcement of this alternative could presumably be met through existing levels of air and surface patrolling used to monitor compliance with current regulations. As participation in the fishery declines the impacts of this alternative would be similar to those of Alternative 2.

4.4 IMPACTS OF ALTERNATIVE 4

Alternative 4 is adaptive management through zoning. Four zones are established: General Use, Special Use, Eco-tourism and Preservation. Alternative 4A differs from 4B in that the Preservation Zone in the former includes only waters around French Frigate Shoals and Laysan Island, whereas the Preservation Zone in the latter adds waters around Pearl and Hermes Reef, Lisianski Island, and Kure Atoll to the previously noted areas.

4.4.1 Target Species

4.4.1.1 Alternative 4A

This alternative would immediately prohibit bottomfish fishing in the waters around French Frigate Shoals, Laysan Island and Midway Atoll (Eco-tourism Zone). NMFS NWHI landings data (see Table 3-16) indicate that these areas have historically accounted for 19.2 percent of the total bottomfish harvest in the NWHI fishery. The closure of these areas represents a reduction in fishing mortality for the target species, a positive direct impact. Currently the bottomfish stocks in the NWHI are classified as healthy, however, and are not stressed from fishing activities. Research studies on larval distribution and advection patterns along with genetic data indicate that larval and genetic exchange is distributed throughout the entire archipelago. Indirectly, the reduction in fishing mortality in the closed areas could allow localized rebuilding of stocks and an increased contribution to the spawning biomass throughout the archipelago. However, the effect of an increase in recruitment to the MHI may be offset to some extent if fishing effort is redistributed from the NWHI to MHI by displaced vessels.

4.4.1.2 Alternative 4B

This alternative would immediately prohibit bottomfish fishing in the waters around French Frigate Shoals, Laysan Island, Pearl and Hermes Reef, Lisianski Island, Kure Atoll and Midway Atoll. NMFS NWHI landings data (see Table 3-16) indicate that these areas have historically accounted for about 32.5 percent of the total bottomfish harvest in the NWHI fishery. Compared with Alternative 4A, the reduction of target species mortality in the NWHI would nearly double if effort were not redistributed to other NWHI grounds. The net effect on archipelagic stocks, however, would depend on the net reduction of effort in both the MHI and NWHI fisheries.

4.4.2 Bycatch

4.4.2.1 Alternative 4A

Bycatch in the NWHI bottomfish fishery is low because of the selective gear and fishing practices used. The amount of mortality of bycatch species in the NWHI bottomfish fishery is unknown, but if bycatch is low, bycatch mortality (in absolute numbers) must also be low. Although bottomfish fishing causes some mortality to bycatch species, the amount is likely to be far less than natural mortality. The cessation of bottomfish fishing in these zones would eliminate anthropogenic sources of mortality on these species, and allow a return to equilibrium with natural sources of mortality. However, the positive impact of this alternative likely would not be detectible against the background of natural population fluctuations. Indirect impacts are expected to be negligible.

4.4.2.2 Alternative 4B

The impacts of Alternative 4B are the same as described for Alternative 4A. Although additional Preservation Zones would be designated, the direct positive impact of this alternative likely would not be detectible against the background of natural population fluctuations, and indirect impacts are expected to be negligible.

4.4.3 Protected Species

4.4.3.1 Cetaceans, Sea Turtles and Seabirds

4.4.3.1.1 Alternative 4A

Laysan Island has the world's largest colony of black-footed albatrosses, and more than 90 percent of the Hawaiian population of the green turtle nests at French Frigate Shoals. Establishment of a Preservation Zone around French Frigate Shoals and Laysan Island would eliminate the potential for impacts to all protected species in those areas from the bottomfish fishery. Even outside the Preservation Zone, potential impacts to seabirds, sea turtles and cetaceans other than the bottlenose dolphin would not be expected. The low level of potential non-lethal impacts to the bottlenose dolphin from the bottomfish fishery would remain outside the Preservation Zone.

4.4.3.1.2 Alternative 4B

Impacts would be similar to those for Alternative 4A, but Preservation Zones would also include marine areas around Pearl and Hermes Reef, Lisianski Island and Kure Atoll. Establishment of a Preservation Zone around these areas would eliminate the potential for impacts to all protected species in those areas from the bottomfish fishery. Even outside the Preservation Zone, potential impacts to seabirds, sea turtles and cetaceans other than the bottlenose dolphin would not be expected. The low level of potential non-lethal impacts to the bottlenose dolphin from the bottomfish fishery would remain outside the Preservation Zone.

4.4.3.2 Hawaiian Monk Seal

4.4.3.2.1 Alternative 4A

Potential direct and indirect impacts of bottomfish fishing in the NWHI on Hawaiian monk seals include the low-level risk of accidental hooking, entanglement in bottomfish fishing gear, behavioral disturbance and competition for food resources. Under this alternative, the potential for direct and indirect negative impacts would be eliminated around French Frigate Shoals and Laysan Island, the two most important Hawaiian monk seal breeding areas.

4.4.3.2.2 Alternative 4B

This alternative would expand the positive impacts listed above to include all the major Hawaiian monk seal breeding and weaning areas in the NWHI.

4.4.4 Essential Fish Habitat, Biodiversity and Ecosystems

4.4.4.1 Alternative 4A

The added protection to the coral reef ecosystem, EFH and HAPC in the NWHI resulting from closure of areas around selected islands and atolls to bottomfish fishing is likely to be minimal and non-measurable given the low density of bottomfishing operations, the infrequency of fishing vessel groundings and the large natural perturbations in coral reef habitat. Submersible-supported studies conducted in 2001 at bottomfishing banks in the NWHI have reported minimal evidence of fishing impacts to habitat (C. Kelly pers. comm. 2001). However, to the extent that Alternative 4A results in an overall decrease in fishing effort in the NWHI bottomfish fishery, the possible impacts of fishing on coral reefs, EFH and HAPC would be reduced and the value associated with preservation of the coral reef ecosystem in the NWHI would be maintained (Section 3.4.4). In addition, the Preservation Zone of Alternative 4A would provide added protection to coral reefs around French Frigate Shoals and Laysan Island. French Frigate Shoals is the southern-most atoll in the NWHI and the largest coral reef area in Hawaiʻi. It has one of the highest diversities of hermatypic coral species in the Hawaiian Archipelago (Grigg 1983). Moreover, the expansive shallows enclosed by the barrier reef at French Frigate Shoals is a favorable habitat for certain Indo-West-Pacific fish species that are rare or absent from other areas of the Hawaiian chain (Hobson 1980). Laysan Island is of biological importance because it represents a reef ecosystem-type characteristic of the middle of the NWHI and because historically there has been little human activity on the island that would degrade the surrounding marine environment.

Research and subsistence/cultural activities in the Special Use Zone may result in habitat disturbance from anchoring as well as disturbance of the marine environment from noise and pollution associated with vessel traffic. Tourist activities in the Eco-tourism Zone could also result in the alteration or destruction of reef habitat and disturbance of the marine environment. Restrictions on the level of human activities in the Special Use and Eco-tourism Zones would mitigate these effects.

4.4.4.1 Alternative 4B

This alternative would expand the positive impacts described for Alternative 4A to include marine areas around Pearl and Hermes Reef, Lisianski Island and Kure Atoll.

4.4.5 Commercial, Recreational and Charter Fishing Sectors

4.4.5.1 Alternative 4A

This alternative would immediately prohibit commercial bottomfish fishing within 20 nm of Laysan Island, French Frigate Shoals and within the boundaries of the Midway Atoll National Wildlife Refuge. Little bottomfish fishing activity has historically occurred around Midway Atoll, but Laysan Island and French Frigate Shoals are familiar and productive fishing grounds. However, closure of these areas would likely have less effect on the catches and revenues of participants in the NWHI fishery than closure of other areas of the NWHI. NMFS NWHI landings data (see Table 3-16) indicate that the additional areas that would be closed to bottomfish fishing under this alternative have historically accounted for 19.2 percent of the total bottomfish harvest in the NWHI fishery (Section 3.5.1.2.2; Table 3-15). Applied to recent landings data (WPRFMC in prep.), this percentage represents about 58,000 lb of bottomfish with an ex-vessel value of about $190,000.

This alternative would affect fishermen as described in Alternative 2 except that displaced fishermen would have the additional option of relocating their fishing activities to bottomfish grounds in the NWHI that remain open. These open areas represent many of the most productive fishing grounds in the NWHI. However, the area closures may force some fishermen to travel farther, thereby making effort more costly. In addition, competition for remaining fishing locations would increase and catch rates could fall, translating into less harvesting revenue for any given effort level. Enterprises with high operating costs would be the first to feel the cost-revenue squeeze (Samples and Sproul 1988). Over the longer run, operations with high fixed costs would be disadvantaged by the reduced contribution margin of each fishing trip made. These negative economic effects are likely to cause some fishermen to exit the NWHI fishery. For those enterprises that weather the financial negative effects created by the initial reduction in net earnings, the long-term outlook would be brightened by a gradual increase in catch rates in response to the initial effort reduction. The final outcome for these enterprises may be a situation similar to the pre-regulatory situation, at least in terms of financial rewards.

It is possible that closed areas could serve as reservoirs to help augment stocks in surrounding fishing grounds and increase harvests, thereby mitigating the revenue reductions from fishing restrictions. However, the ability of closed areas to increase yields has not been demonstrated for bottomfish fisheries in Hawaiʻi. It should also be noted that, even if a closed area has the potential to have a positive effect on fish populations and fishery productivity, it may take several years after the closure of the NWHI fishery occurs for this effect to be realized because of the high age of first reproduction for most bottomfish species. Given this time lag, it is unlikely that the potential economic benefits of an area closure would accrue to the current generation of bottomfish fishermen. Moreover, if fishing effort is allowed to increase in the MHI, any economic gains from a closed area will be dissipated over the long-run.

4.4.5.2 Alternative 4B

This alternative would immediately prohibit commercial bottomfish fishing within 20 nm of French Frigate Shoals, Laysan Island, Pearl and Hermes Reef, Lisianski Island and Kure Atoll and within the boundaries of the Midway Atoll National Wildlife Refuge. NMFS NWHI landings data (see Table 3-16) indicate that these areas have historically accounted for about 32.5 percent of the total bottomfish harvest in the NWHI fishery (Section 3.5.1.2.2). Applied to recent landings data (WPRFMC in prep.), this percentage represents about 97,500 lb of bottomfish with an ex-vessel value of $325,000. The effect on fishermen would be as described in Alternative 4A except that displaced fishermen would have fewer alternative fishing grounds and, consequently, the negative impacts would be heightened.

4.4.6 Regional Economy

4.4.6.1 Alternative 4A

This alternative would not affect overall economic activity in Hawaiʻi to any significant degree. Closure of the waters around French Frigate Shoals, Laysan Island and Midway Atoll could reduce annual revenues in the fishery by about $190,000, resulting in a potential drop in output and income of $240,736 and $83,954, respectively, and the possible loss of the equivalent of four full-time jobs. These losses would have a negligible effect on the state's economy. Furthermore, these figures may overstate the regional impacts as they do not consider potential off-setting impacts. For example, fishing vessels may recover some portion of their lost revenues by moving to other bottomfish fishing grounds or shifting to other fisheries.

4.4.6.2 Alternative 4B

The impacts of this alternative on Hawaiʻi's economy would be similar to those described for Alternative 4A except that the loss in fishery revenue would be larger and, therefore, the impact on the regional economy would be greater. Closure of the waters around French Frigate Shoals, Laysan Island, Pearl and Hermes Reef, Lisianski Island, Kure Atoll and Midway Atoll could reduce annual revenues in the fishery by as much as $325,000, resulting in a potential drop in output and income of $411,765 and $143,598, respectively, and the possible loss of the equivalent of about seven full-time jobs. These losses would have a negligible effect on the state economy. Furthermore, these figures may overstate the regional impacts as they do not consider potential off-setting impacts. For example, fishing vessels may recover some portion of their lost revenues by moving to other bottomfish fishing grounds or shifting to other fisheries.

4.4.7 Fishing Community

4.4.7.1 Alternative 4A

Closure of the waters around French Frigate Shoals, Laysan Island and Midway Atoll to bottomfish fishing is likely to cause some displacement of fishermen from the NWHI fishery, which, in turn, is likely to result in the loss of earning potential, investment value and lifestyle among the displaced fishery participants. Some of the participants would be from Kauaʻi, but most would be from Oʻahu. Some of the impacts on consumers and the broader community as described for Alternative 2 may occur, although they would be mitigated by permitting fishermen continued access to other productive fishing grounds in the NWHI.

4.4.7.2 Alternative 4B

The socioeconomic impacts of this alternative would be similar to those described for Alternative 4A except that a larger number of fishermen are likely to be displaced from the NWHI fishery.

4.4.8 Native Hawaiian Community

Alternatives 4A or 4B would have the same economic effects on Native Hawaiians currently participating in the NWHI bottomfish fishery as they would on other fishery participants (Section 4.4.6). Some of these negative effects could be mitigated by the community development program. This program is intended to increase participation by Native Hawaiians in the NWHI bottomfish fishery (Section 4.1.8).

Like the other alternatives considered, this alternative does not directly address Native Hawaiian concerns regarding claims to the NWHI and marine resources in the surrounding waters. However, the zoning plan would provide Native Hawaiians preferential access to certain areas for subsistence, cultural and religious purposes. In recent years, Native Hawaiians in greater numbers have been regaining and practicing more traditional ancestral skills of voyaging, fishing, farming and resource management along with the more familiar customs of *hula*, chant, language and spirituality. Fishing is one facet in the maintenance of maritime attributes of traditional culture and reinforcing links to the sea. In addition, the development of a zoning plan provides an opportunity for greater inclusion of the native voice in the decision-making process. Participation in the planning and eventually in the management of the NWHI is essential to the exercise of traditional responsibility towards these ancestral territories.

4.4.9 Administration and Enforcement

4.4.9.1 Alternative 4A

The administrative costs associated with this alternative are expected to be significantly higher than the no action alternative, as the zoning approach differs substantially from the current federal fisheries management regime for the waters around the NWHI. Although this alternative may be practical and feasible from a technical and economic standpoint, potential jurisdictional concerns must also be considered. The ecosystem of the NWHI includes lands and waters managed by several local, state and federal agencies, and in some cases jurisdictional claims overlap (Appendix C). The formulation and application of a comprehensive zoning plan would require an unprecedented level of cooperation among agencies and levels of government as well as the development of new partnerships with non-government stakeholders. Separate jurisdictions and competing missions, together with disputes over ownership and control of land, submerged land masses and surrounding waters in the NWHI, could hinder or derail implementation of this alternative. It is likely that the process of developing the interagency, intergovernmental and public-private relationships required would be time-consuming and costly.

The collection of data on the results and efficacy of management actions is a necessary part of adaptive management. Costs would be incurred monitoring the impacts that zoning has on the health of the biological system and net economic welfare. Some of these costs may be reduced (or displaced) by involvement of the fishing industry and other parties such as university researchers and volunteers.

At-sea enforcement of zoning restrictions would likely require additional air and sea patrols. Additional patrols would cost as much as $100,000 per air patrol and $250,000 per surface patrol (WPRFMC 2000a). The costs of enforcing zoning restrictions could be moderated through use of a satellite-based, vessel monitoring system (VMS). A Honolulu-based VMS is currently operated by NMFS and USCG to monitor compliance in the pelagic longline and NWHI lobster fisheries. Costs would be incurred in expanding the existing VMS to accommodate the additional vessel and area coverage associated with a zoning management strategy.

4.4.9.2 Alternative 4B

This alternative would affect administration and enforcement costs as described for Alternative 4A.

4.5 CUMULATIVE IMPACTS

This section describes the magnitude and significance of the environmental consequences of each alternative in the context of cumulative effects. The Council on Environmental Quality's regulations for implementing NEPA define cumulative effects as the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR ~ 1508.7).

4.5.1 Introduction

The action that is likely to have the most significant environmental consequences, when combined with the effects of alternative measures in the management plan for the bottomfish and seamount groundfish fishery in the Western Pacific Region, is the establishment of the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve extending 50 nm around the NWHI. President Clinton issued Executive Order 13178 on December 4, 2000, establishing the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, pursuant to the National Marine Sanctuaries Amendments Act of 2000. The EO was revised and finalized by Executive Order 13196, issued January 18, 2001 (Appendix B). In establishing the Reserve, the Executive Orders set forth a number of conservation measures, including the creation of Reserve Preservation Areas in which commercial fishing is prohibited unless otherwise specified.[33] Where commercial fishing is permitted, it is subject to catch limitations based on catch history. Recreational fishing will be limited to prior participants. In Table 4-3, the Reserve Preservation Areas are summarized and compared with the boundaries of the marine zones proposed in Alternative 4 of this EIS. Generally, the Preservation Areas extend from the seaward boundary of State waters out to a mean depth of 100 fathoms. All of the Preservation Zones specified in Alternative 4 would have corresponding Preservation Areas under the Reserve management regime, but the Preservation Zones defined in Alternative 4 extend out 20nm, while the Reserve's Preservation Areas extend only to 100 fathoms. In addition to the Reserve's Preservation Areas that correspond with the Preservation Zones around Kure Atoll, Pearl and Hermes Reef, Lisianski Island, Laysan Island and French Frigate Shoals, the Reserve would have Preservation Areas around a number of other islands and banks as listed in Table 4-3. The effect of the Preservation Areas on bottomfishing would be similar to that of the Preservation Zones of Alternative 4 for Kure Atoll, Pearl and Hermes Reef and French Frigate Shoals because most bottomfishing takes place in depths less than 100 fathoms. For Lisianski and Laysan however, the Reserve regime would permit bottomfishing seaward of 25 and 50 fathoms, respectively. Thus, restrictions on bottomfishing around those islands would be less than under Alternative 4. However, under the Reserve

[33] The EO includes provisions that allow commercial bottomfish fishing and commercial and recreational trolling for pelagic species within portions of the Reserve Preservation Areas around certain islands and banks.

management regime, many more areas would be off limits to bottomfish fishing, as summarized in Table 4-3.

The State of Hawaiʻi is proposing to require permits for hook and line fishing within three miles of the NWHI islands under its jurisdiction, including Nihoa, Necker, Gardner Pinnacles, Maro Reef, Laysan, Lisianski, Pearl and Hermes Reef, and Kure Atoll, and prohibit all fishing at French Frigate Shoals.

The Council has developed an EIS and FMP for the Coral Reef Ecosystem (CRE) in the NWHI (WPRFMC 2001). The CRE FMP proposes a series of marine protected areas (MPAs) in the NWHI, some of which are classified “no take” and others are “low use.” The no-take MPAs extend from 0-10 fm in all areas, and from 0-50 fm in some areas. The areas designated Preservation Zones in Alternative 4 of this EIS may be compared with the MPAs of the CRE FMP as follows. Under the proposed CRE FMP management regime for Kure Atoll, federal waters shallower than 10 fathoms would be classified “no take.” The Bottomfish FMP would be amended to include this prohibition. Alternative 4A of this EIS places the waters shallower than 10 fathoms into the Special Use Zone where scientific research and Native Hawaiian traditional and customary practices are permitted uses. Some level of take would be allowable. The CRE FMP management regime would therefore be more restrictive than Alternative 4A, although the distinction is probably academic for the bottomfish fishery because bottomfish fishing is not conducted at these shallow depths. Alternative 4B of this EIS establishes a Preservation Zone extending out 20nm. This would eliminate bottomfish fishing from around Kure Atoll. The CRE FMP establishes a low use MPA in federal waters 10-50 fathoms deep. A special permit would be required to harvest coral reef resources in the low use MPA, but bottomfish fishing would not be affected. Alternative 4B, therefore, would be more restrictive of bottomfish fishing around Kure Atoll than would the CRE FMP. The same analysis applies to the waters around Lisianski Island.

At Pearl and Hermes Reef, the comparison between these two management regimes would be similar to the situation at Kure or Lisianski, except that the CRE FMP does not include a low use MPA at Pearl and Hermes. For bottomfish fishing, however, this is a moot point as there are no restrictions on this activity in the low use MPA. As at Kure and Lisianski, Alternative 4A would be less restrictive than the CRE FMP, but Alternative 4B would be more restrictive.

At Laysan Island and French Frigate Shoals, the CRE FMP establishes no-take MPAs in federal waters from 0-50 fathoms. The Bottomfish FMP would be so amended. Both Alternatives 4A and 4B in this EIS, however, would establish Preservation Zones extending out 20nm where bottomfish fishing is prohibited. Either of these alternatives would eliminate bottomfish fishing around these islands, and therefore this management regime would be more restrictive than that proposed in the CRE FMP.

Perhaps the biggest difference between the management regimes proposed in the CRE FMP and in this EIS, is that, like the NWHI Reserve regime, the CRE FMP management regime places use restrictions on waters around a number of islands and banks the use of which would not be restricted by the alternatives evaluated in this EIS. Except for the special case of Midway, where bottomfishing is already prohibited, these designations are all low use, and therefore would not affect activities conducted under the Bottomfish FMP.

TABLE 4-3: Comparison of the Alternative 4 Management Regime's Special Use and Preservation Zones with the No-take Marine Protected Areas of the Coral Reef Ecosystem FMP and with the NWHI Reserve Preservation Areas

ISLAND OR AREA	BOTTOMFISH EIS	CRE FMP	NWHI RESERVE	OTHER
Kure	Special Use Zone shoreline to 10 fathoms (Alt 4A). Preservation Zone to 20nm from geographic center (Alt 4B).	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms.	Preservation Area extends from the seaward boundary of Hawaii State waters (3nm) out to a mean depth of 100 fathoms.	State of Hawaiʻi Wildlife Refuge shoreline to 3 nm.
Midway	Ecotourism Zone coincident with the Midway Atoll NWR.	No-take zone 0-50 fathoms around north half of Midway. Low-use special permit zone0-50 fathoms around southern half of Midway.		Midway Atoll NWR between 28°5' and 28°25'; 177°10' and 177°30'.
Misc. banks in the vicinity of Kure, Midway and Pearl and Hermes (4).		Low-use special permit zone 10-50 fathoms.		HINWR to 10 fathoms.
Pearl and Hermes	Special Use Zone shoreline to 10 fathoms (Alt 4A). Preservation Zone to 20nm from geographic center (Alt 4B).	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms.	Preservation Area extends from the seaward boundary of Hawaii State waters (3nm) out to a mean depth of 100 fathoms.	HINWR to 10 fathoms.
Misc banks near (W of) Lisianski (2).		Low-use special permit zone 10-50 fathoms.		HINWR to 10 fathoms.

ISLAND OR AREA	BOTTOMFISH EIS	CRE FMP	NWHI RESERVE	OTHER
Lisianski	Special Use Zone shoreline to 10 fathoms (Alt 4A). Preservation Zone to 20nm from geographic center (Alt 4B).	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms.	Preservation Area extends from the seaward boundary of Hawaii State waters (3nm) out to a mean depth of 100 fathoms. Bottomfishing permitted seaward of 25 fathoms.	HINWR to 10 fathoms.
Pioneer Bank		Low-use special permit zone 10-50 fathoms.	Preservation Area to 12 nm from geographic center. Bottomfishing permitted.	HINWR to 10 fathoms.
Misc banks near (SW of) Laysan (4).		Low-use special permit zone 10-50 fathoms.		HINWR to 10 fathoms.
Laysan	Preservation Zone to 20nm from geographic center (Alts 4A and 4B).	No-take zone 0-50 fathoms.	Preservation Area extends from the seaward boundary of Hawaii State waters (3nm) out to a mean depth of 100 fathoms. Bottomfishing permitted seaward of 50 fathoms.	HINWR to 10 fathoms. Lobster fishing prohibited to 20 nm from geographic center (Crustaceans FMP).
Maro Reef		No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms.	Preservation Area extends from the seaward boundary of Hawaii State waters (3nm) out to a mean depth of 100 fathoms. Bottomfishing permitted seaward of 25 fathoms.	HINWR to 10 fathoms.
Raita Bank		Low-use special permit zone 10-50 fathoms.	Preservation Area to 12 nm from geographic center. Bottomfishing allowed for 5 years from order.	HINWR to 10 fathoms.

ISLAND OR AREA	BOTTOMFISH EIS	CRE FMP	NWHI RESERVE	OTHER
Gardner Pinnacles		Low-use special permit zone 10-50 fathoms.	Preservation Area extends from the seaward boundary of Hawaii State waters (3nm) out to a mean depth of 100 fathoms. Bottomfishing permitted seaward of 25 fathoms.	HINWR to 10 fathoms.
Unnamed bank between Gardner Pinnacles and St. Rogatien Bank		Low-use special permit zone 10-50 fathoms.	Preservation Area to 12 nm from geographic center. Bottomfishing allowed for 5 years from order.	HINWR to 10 fathoms.
St. Rogatien Bank		Low-use special permit zone 10-50 fathoms.	Preservation Area to 12 nm from geographic center, but not closer than 3 nm to the next bank east. Bottomfishing permitted.	HINWR to 10 fathoms.
Brooks Banks (2)		Low-use special permit zone 10-50 fathoms around three banks southeast of St. Rogatien including two Brooks Banks and one bank NW of St. Rogatien.	Preservation Area to 12 nm from geographic center of southeast Brooks Bank, but not closer than 3 nm to the next bank west (northwest Brooks Bank?).	HINWR to 10 fathoms.
French Frigate Shoals	Preservation Zone to 20nm from geographic center (Alts 4A and 4B).	No-take zone 0-50 fathoms.	Preservation Area extends from the seaward boundary of Hawaii State waters (3nm) out to a mean depth of 100 fathoms.	HINWR to 10 fathoms.
Unnamed bank east of French Frigate Shoals		Low-use special permit zone 10-50 fathoms.	Preservation Area to 12 nm from geographic center.	HINWR to 10 fathoms.
Necker		Low-use special permit zone 10-50 fathoms.	Preservation Area extends from the seaward boundary of Hawaii State waters (3nm) out to a mean depth of 100 fathoms. Bottomfishing permitted seaward of 25 fathoms.	HINWR to 20 fathoms.

ISLAND OR AREA	BOTTOMFISH EIS	CRE FMP	NWHI RESERVE	OTHER
Misc. banks around Nihoa and Necker (8).		Low-use special permit zone 10-50 fathoms.		HINWR to 10 fathoms.
Nihoa		Low-use special permit zone 10-50 fathoms around Nihoa and nearby banks.	Preservation Area extends from the seaward boundary of Hawaii State waters (3nm) out to a mean depth of 100 fathoms. Bottomfishing permitted seaward of 25 fathoms.	HINWR to 10 fathoms.

It is also important to note that natural (non-anthropogenic) factors can dramatically influence cumulative impacts on the species and environment of the NWHI. The greatest overall influence on the NWHI ecosystem is that of cyclical climate events which affect productivity and distribution of species at all trophic levels. These events affect the nature of regional oceanographic conditions, and have been identified as the cause of 30-50 percent changes in productivity for numerous species in the NWHI (Polovina et al. 1994; Polovina et al. 1995). The response of individual species, species guilds (e.g., bottomfish), and the NWHI ecosystem as a whole is as yet undeterminable.

4.5.2 Target and Bycatch Species

Productivity at all trophic levels in the NWHI appears to be the result of meso-scale oceanographic conditions which undergo cyclical changes. The structure of the ecosystem, patterns of recruitment, changes in species abundance and biodiversity, are driven by the combination of responses of all the organisms that make up the NWHI ecosystem. Further impacts accumulate from anthropogenic input from both local (vessel traffic and associated risks, marine debris, human habitation and disturbance, etc.) and allochthonous (high-seas marine debris) sources.

Bottomfish fishing in the NWHI began in the early 1900s and has continued at various levels until the present. Currently, bottomfish resources in the NWHI are classified as healthy, and well above overfishing thresholds. Exploitation rates have generally been higher in the MHI than in the NWHI, and localized depletions have been documented for several of these species in State of Hawaiʻi waters within the MHI. Genetic and larval advection research indicate a discernable mixing of the NWHI and MHI populations within the archipelago, and therefore these species are managed as single stocks throughout the archipelago, however localized depletions will affect overall recruitment within the archipelago. Under the no-action alternative (Alternative 1), continued bottomfish fishing in the NWHI is limited through effort control. This level of effort could have a discernable cumulative effect on bottomfish stocks in the archipelago. The magnitude of the effect would be correlated with the amount of recruitment that occurs from the NWHI to the MHI. This additive effect however, may not be discernable against the combined effects described above. A closure of the NWHI fishery (Alternative 2) would likely have a long-term positive cumulative impact on the population status of bottomfish stocks in Hawaiʻi by the gradual addition of spawning biomass which could mitigate MHI depletions. This alternative would also further reduce the risks from local negative anthropogenic effects from fishing activities which would accrue in the absence of a fishery closure. The gradual phase-out of fishing activities in the region as proposed under Alternative 3 would effectively mimic in the short-term the cumulative impacts as presented in Alternative 1. Over the long term, as the fishery is reduced through attrition of participants, the cumulative effects would be as described for Alternative 2. Under Alternatives 4A and 4B, reductions in fishing mortality would be less than under a total closure of the fishery, but the magnitude of the reduction could have a long-term positive impact on the population status of bottomfish stocks in the archipelago.

Further reductions in fishing effort through the creation of the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve have the potential for additional long-term positive effects on bottomfish stocks through gradual increases in spawning biomass. These positive effects of the Reserve, however, could be offset to some extent if the displacement of vessels from fishing grounds in the NWHI increases the fishing effort in other areas such as those fishing grounds in the MHI where bottomfish populations are locally depleted. Although the effect of natural cyclical oceanographic changes on the population status of these species has yet to be determined, reductions in fishing effort through the zoning process could result in increased recruitment within the entire archipelago that may be discernible against the background of cyclical oceanographic processes. This alternative would also further reduce the risks from local negative anthropogenic effects from fishing activities which would accrue in the absence of reductions in fishing effort.

4.5.3 Protected Species

For all federally protected species other than the Hawaiian monk seal, the cumulative effects under the no-action alternative are continued low-level risks of behavioral disturbance, collision, hooking, and entanglement in fishing gear. The effect of continued bottomfish fishing operations in the NWHI is likely to not alter the potential for impacts from other fishing activities and anthropogenic influences within their geographic distribution.

Scientific studies to determine the carrying capacity and equilibrium population of Hawaiian monk seals in the Hawaiian Archipelago are not likely to be available in the foreseeable future and it is uncertain that bottomfish operations have any appreciable effect on the status of the NWHI Hawaiian monk seal population. A low level of interaction could foreseeably occur from bottomfish fishing operations, and the risk associated with these operations would remain under this alternative. However, given the infrequency and general nature of interactions of the NWHI bottomfish fishery with protected species, continued bottomfish fishing in the NWHI is unlikely to have measurable effects on the distribution or abundance of marine mammals, sea turtles or seabirds.

Although the there is low level of risk to individuals, it is not likely that the species will be affected. An immediate cessation of fishing as proposed under Alternative 2 would eliminate even this minimal risk to individuals. For protected species other than the Hawaiian monk seal, anthropogenic influences from outside the NWHI have a much greater cumulative effect than NWHI bottomfish fishing operations. However, Alternative 2 would remove any current and future impacts that bottomfish fishing may add to the suite of factors that impact these populations.

A gradual phase out of fishing activities in the region as proposed under Alternative 3 would effectively mimic in the short term the cumulative impacts as presented in Alternative 1. Over the long term, as the fishery is reduced through attrition of participants, the cumulative effects would be as described in Alternative 2.

Reductions in fishing mortality through the creation of zones closed to commercial fishing as proposed under Alternative 4 would be less than under a total closure of the fishery, but the magnitude of the reduction could have a positive impact resulting from reductions in fishing effort and vessel traffic. Further reductions in fishing effort through the creation of the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve would be an additional factor which may reduce the potential for vessel impacts and interactions near Hawaiian monk seal breeding areas. The other factors influencing the health of the Hawaiian monk seal population as listed in Chapter 3 are likely to have the greatest additive effect, however the magnitude of positive impact from zonal closures may not be measureable, due to the minimal impacts bottomfish fishing may have on the Hawaiian monk seal.

4.5.4 Essential Fish Habitat and Ecosystems

Because productivity at all trophic levels in the NWHI appears to be the result of meso-scale oceanographic conditions which undergo cyclical changes, the structure of the ecosystem, patterns of recruitment, changes in species abundance and biodiversity, are driven by the combination of responses of all the organisms which make up the NWHI ecosystem. Further impacts accumulate from anthropogenic input from both local (vessel traffic and associated risks, marine debris, human habitation and disturbance, etc.) and allochthonous[34] sources. Fishing activities can produce various negative effects on the environment including lost oil, sewage, garbage and

[34]Allochthonous refers to something formed elsewhere than its present location. Its antonym, autochthonous, refers to something formed in its present location.

debris, and the potential for habitat damage through anchoring and grounding. These effects would be additive when combined with the large perturbations in coral reef habitat in the NWHI that occur during winter storms. Preliminary submersible surveys indicate that the effect of bottomfish operations on coral reef substrate in the NWHI are undetectable. However, as with any fishery in the region, bottomfish fishing activities increase the risk of cumulative negative environmental impacts when added to the other anthropogenic impacts that may occur through grounding which can damage coral reef structure, release fuel and oil, and perhaps introduce terrestrial alien species into a sensitive habitat. Under the no action alternative, the risks associated with events of this type happening, and the associated negative cumulative effects, would continue. An immediate closure of the fishery as proposed under Alternative 2 would eliminate any possible negative impact from bottomfish fishing operations, such as potential damage from lost oil, sewage, garbage and debris, and habitat damage through fishing, anchoring and grounding. A gradual phase out of fishing activities in the region as proposed under Alternative 3 would effectively mimic in the short-term the cumulative impacts as presented in Alternative 1. Over the long term, as the fishery is reduced through attrition of participants, the cumulative effects of Alternative 3 would be as described for Alternative 2. Reductions in fishing activity through the creation of zones closed to commercial fishing as proposed under Alternative 4 would be less than under a total closure of the fishery, but the magnitude of the reduction could have a long-term positive impact on the NWHI ecosystem through the reduction of risks associated with bottomfish fishing operations. Reductions in effort through this zoning process, or through the creation of the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, may have a positive impact, but the cumulative impact likely would not be discernible against the background of cyclical oceanographic processes. For example, considering the large perturbations in the shallow benthic habitat in the NWHI that result from the action of winter storms and associated storm surge and swell (Grigg 1983), the cumulative incremental impact of bottomfish fishing activities on this habitat is likely to be unmeasurable.

4.5.5 Human Community

It is likely that many families that depend on fishing and the seafood industry in Hawaiʻi are economically, socially and psychologically stressed because of declining catch rates, increasing competition and unstable markets. Also contributing to this stress is the imposition of ever more restrictive state and federal fishery management regulations. In the past several years a limited access program was established for the Mau Zone of the NWHI bottomfish fishery; the State of Hawaiʻi closed certain areas around the MHI to bottomfish fishing in an effort to rebuild local stocks; NMFS issued an emergency regulation that stopped commercial lobster fishing in the NWHI; and recent litigation concerning possible impacts of the Hawaiʻi-based longline fishery on sea turtles led a federal court to order NMFS to implement area closures, gear and effort restrictions and increased observer coverage for that fishery. Most recently, and most significantly in terms of direct effects on participants in Hawaiʻi's bottomfish fishery, the Northwestern

Hawaiian Islands Coral Reef Ecosystem Reserve was established by Executive Order 13178 (Appendix B).

Some of these management measures are specifically intended to promote sustainable fisheries and are expected to have positive economic impacts on fishery participants in the long-term. Nevertheless, it is likely that many fishermen in Hawaiʻi have the sense that government regulations are "boxing them in" and reducing their ability to maintain their characteristic highly flexible fishing strategy (Pooley 1993a; Hamilton et al. 1996; Polovina and Haight 1999). This flexibility is important to the economic success of many smaller and medium-sized fishing operations because of natural variations in the availability of various types of fish. Furthermore, the ability of fishermen to adapt to these regulatory changes by supplementing fishing incomes with shore-based employment is hampered by Hawaiʻi's depressed economy (Section 3.6.1). The labor market opportunities in construction and other economic sectors where fishermen have found employment in the past have not yet recovered to pre-1990 levels.

At the same time that some members of the public are expressing concern about the negative economic and social impacts that incremental regulations are having on the fishing community, some citizens who may or may not directly interact with fishery resources are voicing concern about the possible impacts of modern, large-scale fisheries on the marine environment when added to the impacts of non-fishing sectors of society (e.g., impacts of shipping, ocean recreation and coastal development). There is increasing apprehension that these cumulative impacts may be radically altering marine biological communities and ecosystems and leading to a loss of biological diversity. According to environmental advocates, these impacts will ultimately degrade the quality of human life and compromise ethical obligations to preserve the environment. Further, there is growing skepticism among those with an interest in fisheries management that current management processes can establish effective controls to protect marine ecosystems and biological diversity (Ecosystem Principles Advisory Panel 1999). The Council on Environmental Quality (1993) notes that biodiversity conservation must look beyond the species to the ecological units that sustain them. Such an ecosystem approach is necessary to ensure protection for a large number of species and their interrelationships and provide for the maintenance of natural processes.[35]

Concerns about the complicated regulatory environment and lack of an ecosystem-approach to marine resource management find common ground when the current institutional structure for

[35] The Council on Environmental Quality (1997:20) states that the "ecosystem approach espoused by IEMTF [Interagency Ecosystem Management Task Force] and a wide range of government, industry, and private interest groups is a method for sustaining or restoring natural systems in the face of the cumulative effects of many human actions. In addition to using the best science, the ecosystem approach to management is based on a collaboratively developed vision of desired future conditions that integrates ecological, economic and social factors."

management of the marine ecosystem in the NWHI is examined. The institutions involved in managing activities that affect this ecosystem include the U.S. Departments of Commerce and the Interior, the Hawaiʻi Department of Land and Natural Resources and other federal, state and local government agencies (Appendix C). This complicated institutional framework poses a significant challenge to ecosystem-based management, as jurisdictional boundaries do not match ecosystem boundaries.

4.5.5.1 Alternative 1

This alternative would help fishermen in Hawaiʻi maintain a flexible fishing strategy in an increasingly restrictive regulatory environment, thereby increasing the chances of economic success for some fishing operations. Economically successful fishing enterprises, in turn, would have a positive, albeit comparatively small, effect on Hawaiʻi's economy. Individuals and firms that directly or indirectly support and are supported by fisheries would be able to maintain current levels of output, income and employment. Economically viable fishing enterprises also contribute to social stability among fishery participants and their families and help preserve elements of local fishing culture.

However, the establishment of the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve will negate many of the positive effects on fishery participants that would result from Alternative 1. The Reserve closes large areas of the NWHI to commercial bottomfish fishing and limits the bottomfish harvest of holders of Mau Zone and Hoʻomalu Zone permits to an annual individual quota equal to the average amount the individual permit holder harvested annually over the five years preceding December 4, 2000. This harvest quota effectively limits continued commercial bottomfish fishing within the Reserve to current permit holders. Over time, as current permit holders retire and withdraw from the fishery, commercial bottomfish fishing within the waters of the Reserve will be phased out.

While there is some uncertainty in exactly how the boundaries of the Reserve will be drawn, it appears that the Reserve will result in a substantial reduction in the use of some of the most productive fishing grounds in the NWHI bottomfish fishery, including Necker Island, Brooks Bank, Gardner Pinnacles and Lisianski Island. Initial analyses conducted by the Council (M. Mitsuyasu, pers. comm. 2000. WPRFMC) estimate that the area closures established by the Reserve will decrease the aggregate catch of bottomfish in the Mau Zone and Hoʻomalu Zone by 67 percent and 57 percent, respectively. The total associated revenues that will be lost to fishery participants is estimated to be on the order of $600,000 annually. The State of Hawaii Department of Land and Natural Resources estimated "the area closures in the EO represents a range of impacts of over 12% and up to 30% of the catch, and a range of over 12% and up to 28% of the value (Coloma-Agaron, 2001)". The combined effects of closure of selected bottomfish fishing grounds in the NWHI and increasingly restrictive regulatory regimes for other fisheries would jeopardize the economic viability of some fishing operations and cause some participants in the

NWHI bottomfish fishery to give up fishing as an occupation. The situation would be aggravated by the depressed state economy which has reduced the availability of non-fishing jobs that cushion fishermen from fluctuations in fishing income.

The restrictions that the Reserve places on bottomfish fishing would allay public concerns about the potential negative effects of fishing on the NWHI coral reef ecosystem. However, the added protection to this coral reef ecosystem resulting from these restrictions may be minimal. Moreover, it is too early to determine if the Reserve will result in a coordinated management regime for this coral reef ecosystem. To the extent that fragmentation of legislative and institutional conservation and management responsibilities continue to impair implementation of an ecosystem-based approach to the management of the coral reefs in the NWHI, the value associated with preservation of these reefs may be reduced (Section 3.4.4).

4.5.5.2 Alternative 2

The combined effects of closure of the NWHI bottomfish fishing grounds and other actions, including the establishment of the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, would impose an economic hardship on fishermen in Hawaiʻi. Many fishing operations are already marginal, and hampering their ability to maintain their characteristic highly flexible fishing strategy would jeopardize the long-term economic viability of some fishing operations. As noted for Alternative 1, the situation would be aggravated by the depressed state economy which has made it more difficult for many fishermen to supplement fishing revenues with income from shore-based employment.

The added protection to the coral reef ecosystem in the NWHI resulting from termination of the bottomfish fishery is likely to be minimal. Furthermore, as noted in Alternative 1, it is too early to determine if the Reserve will result in a coordinated management regime for this marine ecosystem.

4.5.5.3 Alternative 3

The combined effects on fishery participants of this alternative and other actions, including the establishment of the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, would be similar to the effects described for Alternative 1. As noted above, commercial bottomfish fishing within the Reserve is limited to the lifetimes of current permit holders. This measure is consistent with Alternative 3.

4.5.5.4 Alternative 4

The combined effects on fishery participants of this alternative and other actions, including the establishment of the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, would be similar to the effects described for Alternative 1. The areas closed to bottomfish fishing by creation of the Reserve include those areas that would be closed under Alternative 4A or 4B.

The adoption of the zoning approach proposed under Alternative 4 would significantly alter the current institutional structure for management of the NWHI coral reef ecosystem. The established zones would include waters under the jurisdiction of various state and federal agencies that have conservation and management responsibilities (Appendix C). The development of a zoning plan would require the coordination of these legislative and institutional responsibilities across jurisdictional lines, as well as the appropriate involvement of all stakeholders in the planning process. Such coordination is consistent with an ecosystem-approach to marine resource management. The Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve also adopts a zoning approach and is intended to establish a coordinated management regime for this coral reef ecosystem. As noted in Alternative 1, however, the level of coordination that will be achieved by the Reserve is as yet uncertain.

4.6 COMPARISON OF THE ALTERNATIVES

Table 4-4 is a qualitative comparison of the effects of the alternatives evaluated in this EIS. The comparison begins by assuming that Alternative 1, the no action status quo, is the baseline against which the other alternatives are compared. Alternative 1, therefore, has neither positive nor negative impacts.

TABLE 4-4: Qualitative Comparison of the Effects of the Alternatives

RESOURCE OR ISSUE	ALT. 1	ALT. 2	ALT. 3	ALT. 4A	ALT. 4B
Target Species	o	c1p	dc1p	c1p	c1p
Bycatch	o	up	dup	up	up
Hawaiian Monk Seal	o	up	dup	up	up
Other Protected Species	o	up	dup	up	up
EFH/HAPC	o	up	dup	c2up	c2up
Fishing Sectors	o	nn	dnn	n	n
Regional Economy	o	un	dun	un	un
Fishing Communities	o	un	dun	un	un
Native Hawaiians	o	n	dn	p	p
Administration/ Enforcement	o	p	dp	nn	nn
NWHI Reserve	o	pp	dpp	p	p
CRE FMP	o	n	dn	p	p

Notes: o = status quo; p = positive impact; pp = highly positive impact; n = negative impact; nn = highly negative impact; d = delayed impact; c1 = impact contingent upon archipelago-wide effort reductions; c2 = impact contingent upon NWHI effort reductions; u = unmeasurably small

For target species, all of the action (non-status quo) alternatives would have a potential positive impact if there are archipelago-wide effort reductions. There is no guarantee this would occur, but under Alternatives 2 and 3, bottomfish fishing in the Hoʻomalu Zone would sooner or later stop. Vessels that fish in that zone tend to be larger, longer-range, and more expensive to operate than vessels that fish in the Mau Zone or the MHI. It is unlikely that operators of these vessels would employ them in the MHI bottomfish fishery. If, on average, they are not covering fixed costs in the Hoʻomalu Zone fishery, there is little likelihood of economic success in the MHI fishery. Under Alternatives 3 and 4, portions of the NWHI would remain open to bottomfish fishing, and effort displaced by creation of the Preservation Zones likely would be relocated to open areas. Therefore, Alternatives 2 and 3 would likely have the greatest positive impact on target species. It should be noted, however, that under Alternative 1, BMUS stocks, especially in the NWHI, are in a healthy condition and are not presently overfished.

For bycatch species, all of the action alternatives would have a potential positive impact. Again, Alternatives 2 and 3, which would result in effort reduction in the NWHI and likely archipelago-wide, would likely have the greatest benefits to bycatch species. These benefits, however, due to the small quantities of bycatch in the fishery and the consequent limited amount of bycatch mortality, would likely be unmeasurable.

For the Hawaiian monk seal, all of the action alternatives would have a potential positive impact by eliminating fishing effort and reducing vessel traffic from, in the case of Alternatives 2 and 3, the entire NWHI, and in the case of Alternatives 4A and 4B, from around some or all, respectively, of the major breeding subpopulations. Again however, this positive impact is likely unmeasurable due to the minimal impact of the existing fishery on the Hawaiian monk seal.

A similar analysis applies to the other protected species, cetaceans, sea turtles and seabirds, with which the NWHI bottomfish fishery may interact. All of the action alternatives would have a potential positive impact by eliminating fishing effort and reducing vessel traffic from all or highly productive portions of the NWHI. Once again however, this positive impact is likely unmeasurable because the minimal impact of the existing fishery on these species.

With respect to EFH, HAPC, and other ecosystems including coral reefs, as for all of the other biological resources, all of the action alternatives would have a potential positive impact by eliminating fishing effort and reducing vessel traffic and operations from, in the case of Alternatives 2 and 3, the entire NWHI, and in the case of Alternatives 4A and 4B, from around some of the most productive reef systems in the NWHI. Once again however, this positive impact is likely unmeasurably small because of the minimal impact of the existing fishery on these resources. The positive impact from Alternatives 4A and 4B is contingent upon a net reduction of effort in the NWHI. If effort is redirected to areas remaining open, the net benefit could be lost.

It can be seen from the above that for all of the biological resource categories, the analysis is similar. The potential positive impacts are directly related to the degree of restriction of fishing effort. However, only in the case of target species, might the impact actually be measurable.

The results of the analysis of the social and economic resources and issues contrast markedly with those of the biological resources. Impacts to fishermen would be most severely negative under Alternatives 2 and 3, and somewhat less negative under Alternatives 4A and 4B. Impacts of the action alternatives to the regional economy and to proposed fishing communities (Kauaʻi and Oʻahu) would be negative, but unmeasurable.

Native Hawaiians would benefit from the community development program for Mau Zone limited access permits under Alternatives 4A and 4B, and also from access to otherwise restricted areas for cultural and religious purposes. To the extent they participate in the fishery, impacts to them under Alternatives 2 and 3 would be negative.

Costs associated with administration and enforcement would decrease as bottomfish fishing vessels are eliminated from the NWHI under Alternatives 2 and 3. Under Alternatives 4A and 4B, however, costs would increase substantially.

With minor exceptions then, the impacts of the action alternatives on the social and economic resources and issues are negative to very negative. As noted above, this contrasts sharply with the positive impacts of the action alternatives on biological resources and issues.

The two final categories of comparison are the consistency of the alternatives with the objectives of the NWHI Reserve and the Council's CRE FMP. Alternatives 2 and 3, which eliminate bottomfish fishing from the NWHI, would be highly consistent with the Reserve's objectives to preserve biological resources. These alternatives, however, would be in conflict with the Council's CRE FMP, which supports sustainable resource utilization. Alternatives 4A and 4B contain elements of consistency with both the Reserve objectives and with the CRE FMP.

In its final analysis, the Council weighed impacts to the human resources, the fishermen, their communities and the economy, as the deciding factor in selecting Alternative 1 as its preferred alternative. This selection is only possible because of the insignificant negative impacts to biological resources resulting from the current conduct of the bottomfish fishery in the NWHI, and because of the healthy status of BMUS stocks in the NWHI.

CHAPTER 5: ENVIRONMENTAL MANAGEMENT ISSUES

5.1 ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL OF THE ALTERNATIVES AND MITIGATION MEASURES

The alternatives are distinguished by the amount and/or locations of permitted bottomfish fishing in the NWHI. The industry consumes energy in the form of petroleum-based fuels and electricity. Because they eliminate fishing in the NWHI, Alternative 2 and, in the long-term, Alternative 3 would therefore conserve the greatest amounts of energy. To the extent that the size of the fishing industry is reduced under Alternative 4, that alternative would consume less energy than Alternative 1.

5.2 NATURAL OR DEPLETABLE RESOURCE REQUIREMENTS AND CONSERVATION POTENTIAL OF THE ALTERNATIVES AND MITIGATION MEASURES

The fishery exists to harvest natural resources. Alternative 2 and eventually Alternative 3 would therefore represent the greatest conservation potential, if effort is not relocated from the NWHI to the MHI. If effort is relocated to the MHI, the localized depletions of *onaga* and *ehu* stocks in the MHI could be exacerbated. If and to the extent that fishing effort and harvest levels are reduced under Alternative 4, that alternative would have greater conservation potential than Alternative 1.

5.3 URBAN QUALITY, HISTORIC AND CULTURAL RESOURCES AND DESIGN OF THE BUILT ENVIRONMENT INCLUDING THE REUSE AND CONSERVATION POTENTIAL OF THE ALTERNATIVES AND MITIGATION MEASURES

None of the alternatives would have an appreciable effect on urban quality or design of the built environment because of the small size of the bottomfish fishing fleet and its shoreside supporting infrastructure.

Commercial bottomfish fishing has been occurring in the waters around the NWHI for nearly ninety years and is an important component of Hawaiʻi's fishing industry (Sections 3.5.1 and 3.7.1). In eliminating the NWHI bottomfish fishery Alternatives 2 and 3 would reduce the diversity and economic viability of the commercial fishing life way in Hawaiʻi and diminish the influence of Hawaiʻi's maritime culture.

The preservation of the endangered Hawaiian monk seal has social and cultural significance for some segments of the public (Section 3.3.4). Alternatives 2 and 3 would eliminate any effects that the NWHI bottomfish fishery may have on this species. Alternatives 4A and 4B would mitigate fishery effects by spatially separating bottomfish fishing operations from Hawaiian monk seal breeding areas.

Natural and energy resources conservation potentials of the alternatives are discussed above. The reuse potential of the alternatives is related to the potential for re-direction of asset use. To the extent that vessels and gear are inappropriate and inefficient in other applications, Alternatives 2 and 3 would have less reuse potential than Alternatives 1 and 4.

5.4 POSSIBLE CONFLICTS BETWEEN THE PROPOSED ACTION AND OTHER LAND USE PLANS

Each of the alternatives, to some extent or other, conflicts with certain of the conservation measures of the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve established in December 2000 through Executive Order 13178 (Appendix B). Alternative 1 does not recognize the closed areas or harvest caps established by creation of the reserve. Alternative 2 would conform most closely with the intent of the Reserve by simply eliminating bottomfish fishing in the NWHI. That alternative, however, would not recognize the open areas and the harvest levels that have been established for bottomfish fishing in the Reserve. Alternative 3 would initially have the same conflicts with the Reserve's closed areas and harvest levels as Alternative 1, but ultimately would conflict with the Reserve's plan in a manner similar to that of Alternative 2. Alternative 4 has conceptual elements in common with the Reserve, i.e., designation of areas where bottomfish fishing is prohibited, but differs significantly in the details.

5.5 ADVERSE IMPACTS THAT CANNOT BE AVOIDED

Alternative 1 would continue the low levels of risk of harm to protected species arising from the bottomfish fishery in the NWHI. Alternatives 2 and ultimately Alternative 3 would eliminate this risk to protected species, but substitute unavoidable impacts to human communities in the form of social, economic and cultural effects. Alternative 4 reduces risks of fishing interactions with protected species, while minimizing adverse impacts on the human community.

5.6 THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The elimination of bottomfish fishing in the NWHI under Alternative 2 or 3 would allow target and bycatch stocks in the NWHI to return to equilibrium with forces of natural mortality, and provide an increased opportunity for larval recruitment to parts of the archipelago with depleted stocks. The same would be true of Alternative 4, to the extent that the Preservation Zones decrease archipelago-wide effort. Given that bottomfish stocks are not overfished archipelago-wide, however, Alternative 1 (and Alternative 4 in the absence of effort reduction) would not compromise long-term productivity of these stocks for short-term uses.

5.7 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES INVOLVED IN THE PROPOSED ACTION

Non-renewable resources consumed in the industry include the energy used in fishing operations and ancillary businesses, and the materials used to construct the physical assets used in the industry, although some of the latter would be available for reuse if taken out of use in bottomfish fishing.

5.8 PERMITS, LICENSES AND APPROVALS NECESSARY TO IMPLEMENT THE PROPOSED ACTION

Alternative 1 is the current management regime under the Bottomfish and Seamount Groundfish FMP. A new Biological Opinion was released in March 2002; however, that BiOp does not authorize incidental taking of Hawaiian monk seals. NMFS is in the process of releasing its determination of negligible impacts under the MMPA § 101(a)(5)(E), after which incidental take may be authorized under the ESA. Alternatives 2 and 3 could be implemented through the FMP amendment process of the Council. The management, administration and enforcement of the zoning designations of Alternative 4 would require the cooperation of the State of Hawaiʻi and the U.S. Departments of the Interior and Commerce.

CHAPTER 6: SCOPING AND REVIEW COMMENTS

6.1 SCOPING

6.1.1 Notice of Intent to Prepare an EIS

Notice of Intent (NOI) to prepare an EIS for the management plan for the bottomfish and seamount groundfish fishery in the Western Pacific Region was issued on August 16, 1999 by the National Marine Fisheries Service (64 FR 44476).

6.1.2 Scoping Meetings

Scoping for the EIS began in December 1999 with public meetings in Guam, the Northern Mariana Islands, American Samoa, and Hawaiʻi. Written comments were solicited. The dates and locations of scoping meetings are as follows:

- 20 December 1999 — Pago Pago, American Samoa
- 28 December 1999 — Guam
- 28 December 1999 — Kona, Hawaiʻi
- 29 December 1999 — Saipan, Commonwealth of the Northern Mariana Islands
- 29 December 1999 — Hilo, Hawaiʻi
- 4 January 2000 — Kahului, Maui
- 5 January 2000 — Haleʻiwa, Oʻahu
- 6 January 2000 — Līhuʻe, Kauaʻi
- 10 January 2000 — Waiʻanae, Oʻahu
- 11 January 2000 — Lānaʻi City, Lānaʻi
- 12 January 2000 — Kaunakakai, Molokaʻi
- 13 January 2000 — Honolulu, Oʻahu

The Western Pacific Regional Fishery Management Council prepared a summary of comments received during the scoping meetings. The summarized comments are as follows:

- The fishing fleet could be used to collect Hawaiian monk seal interaction information.
- If the bottomfish fishery is closed or restricted, fisherman should be compensated by the government.
- No bottomfish fishery impacts on Hawaiian monk seal populations were reported in the early 1990s based on NMFS observer reports.
- The fishing rights of indigenous people need to be considered in the EIS process.
- The community development program permits in the Mau Zone should be subject to a use it or lose it provision.
- Copies of the draft EIS should be available at Lānaʻi and Molokaʻi public libraries.
- The current bottomfish management regime should not be changed.
- The use of longline gear should be restricted as is being done for the pelagic fishery.
- The impact of taʻape on bottomfish stocks should be studied.

- Formal scoping meetings should be held in Waiʻanae.
- The bottomfish population in the CNMI is reduced relative to 20-30 years ago. More information is needed to assess the stocks. NMFS should do a comprehensive bottomfish survey.
- Federal regulations for the bottomfish fishery do not apply to the CNMI.

During the scoping process written comments were received from Mr. Henry Okamoto of Honolulu and the U.S. Fish and Wildlife Service. Mr. Okamoto stated the FMP is not based on sound knowledge of the bottomfish fishery, and that the plan should be based on two primary species for which information is available, *onaga* and ʻō*pakapaka*. The U.S. Fish and Wildlife Service had the following comments:

- The purpose of the EIS should be to 1) identify the proposed and existing fishery activities and management measures, 2) assess the potential impacts of these activities and measures, and 3) specify measures to avoid unnecessary impacts and compensate for unavoidable significant impacts anticipated to result from the fishery activities.

- The EISs should address the impacts of the fisheries on endangered and threatened species, migratory birds, coral reefs, and rare native species and habitats.

- The EIS should identify federally protected resource areas that exist within or near EEZ waters. The cumulative impacts (e.g., increased boat traffic, marine debris, shipwrecks) on these protected areas should be addressed.

- The following should be consulted regarding native species and habitats: Hawaiʻi Department of Land and Natural Resources, Guam Division of Aquatic Resources, and the Northern Marianas Islands Division of Fish and Wildlife.

- The EIS should discuss the designations of the marine boundaries and summarize existing conservation regulations for the Hawaiian Islands National Wildlife Refuge (NWR), Midway Atoll NWR, Baker Island NWR, Howland Island NWR, Jarvis Island NWR, Johnston Island NWR, and Rose Atoll NWR.

- Discuss the risk of introducing marine and terrestrial alien species, oil spills and ship groundings, and describe how marine and terrestrial alien species will be controlled.

6.2 REVIEW OF THE DRAFT EIS

6.2.1 Distribution of the DEIS

The following agencies, organizations and individuals are being provided review copies of this DEIS.

Federal Agencies

Secretary	U.S. Department of Commerce
Secretary	U.S. Department of Interior
Secretary	U.S. Department of State
Secretary	U.S. Department of Transportation
Director	National Science Foundation
Administrators	National Marine Fisheries Service Regional Offices
Directors	National Marine Fisheries Service (NFMS) Science Centers
Administrator	National Oceanic and Atmospheric Administration
Deputy Assistant Secretary	National Oceanic and Atmospheric Administration
Director	NMFS Honolulu Laboratory
Chief	NMFS Office of Law Enforcement, Long Beach & Hawaiʻi
Administrator	NMFS Pacific Islands Area Office
Director	Office of Policy & Strategic Planning, NOAA
Executive Director	Science Advisory Board, NOAA
General Counsel	Southwest Region, NOAA
Director	U.S. Army Corps of Engineers
Admiral	U.S. Coast Guard (Hdqrts., 14th District & Public Affairs)
Administrator	U.S. Fish and Wildlife Service
Chairman	Marine and Fisheries Advisory Council

U.S. Congressional Delegation:

Representative	Commonwealth of the Northern Mariana Islands
Senators	State of Hawaiʻi
Representatives	State of Hawaiʻi
Representative	Territory of Guam
Representative	Territory of American Samoa

International Organizations

Director General	Food and Agriculture Organization
Director	Inter-American Tropical Tuna Commission
Director General	International Center for Living Aquatic Resource Management
Director	International Marine Life Alliance
Director General	Secretariate of the Pacific Community
Director	South Pacific Regional Environment Programme

State/Territory/Commonwealth Agencies/Organizations

Governor	Commonwealth of the Northern Mariana Islands
Governor	State of Hawaiʻi
Governor	Territory of American Samoa
Governor	Territory of Guam
Director	American Samoa Coastal Management Program
Director	American Samoa Department of Marine and Wildlife Resources
Director	American Samoa Department of Planning
Director	American Samoa Environmental Protection Agency
Director	CNMI Coastal Resources Management
Director	CNMI Department of Planning
Director	CNMI Division of Fish & Wildlife
Director	CNMI Division of Environmental Quality
Director	Division of Aquatic Resources, DLNR
Director	Division of Conservation & Resource Enforcement, DLNR
Director	Guam Bureau of Planning
Director	Guam Coastal Management Program
Director	Guam Division of Aquatic and Wildlife Resources
Director	Guam Environmental Protection Agency
Director	Hawaiʻi Coastal Zone Management Program
Director	Hawaiʻi Department of Health
Director	Hawaiʻi Department of Land and Natural Resources
Director	Hawaiʻi Office of Environmental Quality Control
Manager	Living Marine Resources, U.S. Coast Guard, Hawaiʻi
Director	Office of Hawaiian Affairs

Other Organizations

President	American Samoa Community College

Director	Center for Marine Conservation
Director	Earth Justice Legal Defense Fund
Director	Environmental Defense Fund
Director	EnviroWatch, Inc
President	Guam Fishermen's Cooperative Association
President	Hawaiʻi Audubon Society
President	Hawaiʻi Bottomfish Association
President	Hawaiʻi Fishermen's Foundation
President	Hawaiʻi Seafood Industry Association.
President	Hawaiʻi Sport Fishing Club
President	Kawaihae Fishing Club
President	Keʻehi Sport Fishing Club
Director	Living Oceans Program, National Audubon Society
President	Māʻalaea Boat & Fishing Club
Director	Natural Resources Defense Council
Director	Nature Conservancy, Hawaiʻi
President	Northern Marianas College
Director	Ocean Wildlife Campaign
Director	Sierra Club, Hawaiʻi
Director	United Fishing Agency, Hawaiʻi
Director	UH School of Law, Environmental Law Program
Director	University of Guam Marine Laboratory
Director	University of Hawaiʻi Institute of Marine Biology
Director	Western Pacific Fisheries Coalition
President	Windward Sport Fishing Club
Director	World Wildlife Fund

Individuals

Bill Bradford	Guam Fisherman's Cooperative Association
Tony Costa	Nearshore Commercial Fishing, Hawaiʻi
Ernest Kanehailua, Jr.	Native Hawaiian Fishing Council
George Krasnick	URS Corporation
Dave Raney	Sierra Club, Hawaiʻi
Jeff Walker	Fisherman, Hawaiʻi
Richard Tamashiro	Fisherman, Hawaiʻi

Council Groups

Executive Directors	Regional Fishery Management Councils
Council Members	Western Pacific Regional Fishery Management Council

Members	WPRFMC Bottomfish & Seamount Groundfish Plan Team
Members	WPRFMC Commercial Advisory Panel
Members	WPRFMC Coral Reef Ecosystem Plan Team
Members	WPRFMC Crustaceans Plan Team
Members	WPRFMC Demonstration Projects Advisory Panel
Members	WPRFMC Ecosystem & Habitat Advisory Panel
Members	WPRFMC Pelagics Plan Team
Members	WPRFMC Precious Corals Plan Team
Members	WPRFMC Recreational Advisory Panel
Members	WPRFMC Scientific and Statistical Committee
Members	WPRFMC Subsistence/Indigenous Advisory Panel
Federal Permit Holders	NWHI Bottomfish fishery

Media

News Editor	Associated Press, Hawaiʻi
Editor	Environment Hawaiʻi
Editor	Hawaiʻi Fishing News
Editor	Hawaiʻi Tribune-Herald
Editor	Honolulu Advertiser (Oʻahu, Kauaʻi and Maui offices)
Editor	Honolulu Star Bulletin (Oʻahu, Kauaʻi and Maui offices)
Editor	Honolulu Weekly
Editor	Kauaʻi Times
Editor	Marianas Variety
Editor	Maui News
Editor	Molokaʻi Advertiser-News
Editor	Pacific Daily News, Guam
Director	Public Libraries (Am. Samoa, Guam, Hawaiʻi, CNMI)
Editor	Samoa News
Editor	The Garden Island, Kauaʻi

6.2.2 Public Hearings and Oral Testimony

To be completed following the public review period.

6.2.3 Written Comments Received

To be completed following the public review period.

CHAPTER 7: LITERATURE CITED

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APPENDIX A:
OVERVIEW OF THE HISTORY OF COMMERCIAL FISHING AND RELATED ACTIVITIES IN THE NORTHWESTERN HAWAIIAN ISLANDS

The following excerpt from Cobb (1902:497-498) suggests that commercial fishing in the waters adjacent to the NWHI began with the establishment of a shark fishery:

> *During the latter half of the [nineteenth] century particularly, considerable shark fishing was done among the chain of islands to the westward of the main [Hawaiian Islands], and these islands in time came to achieve an unenviable notoriety from the number of wrecks which occurred upon their shores. The first record we have of this fishery was in 1859 when the bark Gambia returned from a three and one-half months' cruise amongst these islands with, among other things, a quantity of sharks' fins and oil. In 1872 the Henrietta made a cruise among the islands for the same purpose. In 1886 the schooner General Seigel, while on a shark-fishing cruise, parted her cables and went ashore at Midway Island…*

It appears that the usual practice during these early fishing trips to the NWHI was for a fishing vessel to leave a group of men on one or more islands to collect what marine products they could until the vessel returned to retrieve them and their harvest (Elschner 1915). The vessels employed were capable of trans-oceanic voyages and hailed from ports around the world. For example, the Japanese-owned, American-chartered schooner *Ada* working out of Yokohama visited French Frigate Shoals in 1882 (Amerson 1971). It left the shoals with a cargo of shark flesh, fins and oil, turtle shells and oil and *bêche-de-mer*. Shark products and *bêche-de-mer* harvested around the Hawaiian Archipelago were usually shipped to China or Chinese residents in California (Cobb 1902).

The fishing range of the Honolulu-based "sampan" fleet that became established in Hawaiʻi at the end of the nineteenth century increased substantially after the introduction of motor powered vessels in1905 (Carter 1962). The sampans began fishing around the NWHI at least as early as 1913, when one commentator recorded: "Fishing for ulua and kahala is most popular, using bonito for bait, fishermen seek this [sic] species in a 500 mile range toward Tori-Jima [NWHI]" (Japanese Consulate 1913, as cited in Yamamoto 1970:107). Within a few years more than a dozen sampans were fishing for bottomfish around the NWHI (Anon. 1924; Konishi 1930). Fishing trips to the NWHI typically lasted 15 days or more, and the vessels carried seven to eight tons of ice to preserve their catch (Nakashima 1934). The number of sampans traveling to the more distant islands gradually declined due to the limited shelter the islands offered during rough weather and the difficulty of maintaining the quality of the catch during extended trips (Konishi 1930). However, during the 1930s, at least five bottomfish fishing vessels ranging in size from 65 to 70 ft. continued to operate in the waters around the NWHI (Hau 1984). In addition to catching bottomfish, the sampans harvested lobster, reef fish, turtles and other marine animals (Iversen et al. 1990; Shinsato 1973).

During the early twentieth century a short-lived fishery for pearl oysters (*Pinctada galtsoffi*) also developed in the NWHI as described by Galtsoff (1933:3):

> *The honor for the discovery goes to Capt. William G. Anderson who in 1927, when fishing for a commercial concern, found a large pear oyster bed in Pearl and Hermes Reef… . In 1928 several tons of shells were brought to Honolulu and sold to manufacturers of pearl buttons in San Francisco and New York. The newly discovered beds were yielding considerable numbers of pearls which were offered at the local market in Honolulu and sent also to New York and Paris. During the years of 1927 and 1928 Hawaiian fishermen made several attempts to reach Pearl and Hermes Reef in their fishing boats (sampans), but with one exception the boats were either lost at sea or were forced to return home … . One successful Japanese fisherman brought back to Honolulu about six tons of shells. Intensive shelling operations were carried on, however, by the Hawaiian Sea Products Co. (Ltd.), which dispatched to Pearl and Hermes Reef the schooner Lanikai, … which was … equipped for fishing operations with various gear and a freezing apparatus. By permission of the Government of the Territory of Hawaii the company erected several buildings on one of the islands inside Pearl and Hermes lagoon.*

During the few years that the pearl shell fishery was active not less than 100 tons of shells were removed from the NWHI (Galtsoff 1933). The vessel *Lanikai* also used the fishing station at Pearl and Hermes Reef as a base for harvesting bottomfish, mullet, *moi*, turtles and other seafoods (Hamamoto 1928; Iversen et al. 1990). This vessel was the first to freeze fish harvested in the NWHI using on-board refrigeration facilities (Hamamoto 1928). The actual fishing was performed by Japanese immigrant fishermen aboard sampans that were towed by the *Lanikai* to the fishing grounds (Thurston 1927).

All fishing in the NWHI ceased during World War II but recommenced shortly after the war ended. In 1946, the Navy abandoned the military base that it had constructed on Tern Island during the war. Amerson (1971) recounts the events that followed:

> *The U.S. Navy, forgetting about French Frigate's status as a federal wildlife reservation and thinking they owned Tern Island, tried to hand over the disestablished base to the Territory of Hawaii. The Territory refused, but discussion on the issue continued. In early November 1948 the Territory's Hawaiian Aeronautics Commission notified the Commandant of the 14th Naval District, Pearl Harbor, that it was "in a position to take over the airstrip and other facilities…and…make them available…to the fishing industry.*

Amerson (1971) states that commercial fishermen began to use the Tern Island facilities, which included an airfield, barracks and wooden pier, as early as June 1946. Later that same year a chartered DC-3 cargo plane flew *akule* (*Selar crumenopthalmus*) caught near French Frigate Shoals to Honolulu for sale (Amerson 1971; Iversen et al. 1990). This venture lasted for only about three years, but various commercial fishing vessels continued to use the Tern Island facilities through the 1950s (Amerson 1971). In 1952, the U.S. Coast Guard renovated part of the facilities on Tern Island to serve as a LORAN station. When the station was decommissioned in 1979, the State of Hawaiʻi expressed an interest in establishing a fisheries base in the NWHI by mooring refrigerated barges and a floating dock near Tern Island (HDAR 1979). The state hoped that the base would support the development of bottomfish, shrimp, lobster and tuna fisheries in the NWHI. In 1981, the National Marine Fisheries Service rendered a biological opinion that concluded that the proposed fishery use of Tern Island was incompatible with the needs of the endangered Hawaiian monk seal (*Monachus schauinslandi*) and threatened green sea turtle (*Chelonia mydas*) (HDAR 1986). In 1984, the Hawaiʻi Division of Aquatic Resources produced a new proposal that involved basing a mothership near Tern Island to support a small fleet of multi-purpose fishing vessels. The concept of the fishing support base was incorporated into the Hawaiian Islands National Wildlife Refuge Master Plan/Environmental Impact Statement prepared by the U.S. Fish and Wildlife Service in 1986, but no further action was taken.

In 1953, the Territory of Hawaiʻi enacted fishing regulations pertaining specifically to the NWHI (Anon. 1953). Under the regulations, the Territorial Board of Agriculture and Forestry could authorize the taking of fish in the NWHI or the use of fishing gear which were otherwise illegal in the territory. Commercial fishermen wishing to take advantage of the rules were required to obtain a permit setting forth the species of fish which may be taken or the fishing gear to be used. The regulations specifically allowed the taking of lobsters and mullet in the NWHI during the legal closed season provided that the lobsters did not weigh less than one pound or carry eggs and that the mullet were not less than seven inches in length. The use of fish traps that were fixed or larger than those allowed to be used around the MHI was also permitted.

During the first half of the twentieth century Honolulu-based sampans equipped with longline gear occasionally fished for *ahi* (*Thunnus albacares* and *T. obesus*) as far as Midway Island (Norwood 1937). In addition, June (1950) reports that prior to World War II Japanese longline boats fished to the longitude of Midway. Rutka (1984) notes that the foreign vessels valued the fishing grounds around the NWHI and just north of them because of the abundance of bigeye tuna (*Thunnus obesus*), a premium species in Japan's *sashimi* market. The foreign longline fishery occurring within 200 miles of the NWHI ended in 1980 when U.S. restrictions were placed on the fishery (Rutka 1984). However, Japanese pole-and-line vessels continued to operate in the U.S. EEZ surrounding the NWHI through 1992 (Boggs and Kikkawa 1993).

To encourage American fishing vessels to compete against the Japanese distant water fleet for the pelagic fishery resources of the Central and North Pacific a number of resource assessments were conducted by various U.S. entities. In 1948, for example, the Pacific Exploration Company, under contract with the Reconstruction Finance Corporation, conducted exploratory tuna fishing operations along the NWHI from French Frigate Shoals to Kauaʻi (Eckles 1949). The survey also prospected for baitfish at French Frigate Shoals, and found "considerable quantities" of *iao* (*Hepsetia insularum*) (Smith and Schaefer 1949:3). The U.S. Fish and Wildlife Service researchers that participated in this investigation concluded that "the abundance of tuna is sufficient for considerable expansion of the present local fishery carried on by live-bait sampans for skipjack and 'flag-line' boats for yellowfin tuna, which is now well established in the waters adjacent to the main [Hawaiian] islands" (Eckles 1949:9). Additional tuna and baitfish surveys in the NWHI were made throughout the 1950s and 1960s (Uchiyama 1980).

From 1975 to 1978, the Pacific Tuna Development Foundation sponsored exploratory fishing surveys by West Coast albacore trolling vessels in areas northwest of Midway Island (Hida 1984). In 1979, the State of Hawaiʻi and a private seafood processor obtained a one-year use permit from the Navy to organize a mother ship operation at Midway Island supporting 20 albacore trollers (Hida 1984). The state proposed to establish a more permanent support operation at Midway during the early 1980s but no action was taken.

In 1975, the NMFS, U.S. Fish and Wildlife Service and Hawaiʻi Division of Aquatic Resources joined in a cooperative agreement to conduct a five-year assessment of the biotic resources of the NWHI (Grigg and Pfund 1980). The University of Hawaiʻi Sea Grant College Program joined the study in 1977. Some of the resource surveys conducted by NMFS during the “tripartite-Sea Grant” investigation concentrated on species of high commercial potential and led to the instigation of major fisheries. For example, a survey of the spiny lobster (*Panulirus marginatus*) resource was conducted at 26 sites, of which Necker Island and Maro Reef appeared to have sufficiently large stocks for commercial exploitation (Uchida and Tagami 1994). Shortly after the survey began five commercial vessels began full-scale lobster trapping operations. In 1986, the Council developed rules prohibiting lobster fishing within the EEZ landward of the 10 fm contour and within 20 nm of Laysan Island to reduce the risk of interactions with the Hawaiian monk seal. During the early 1980s, a rapid increase in landings occurred as more vessels entered the lobster fishery and markets developed (Polovina 1993). In 1991, however, the harvest level fell dramatically due to a climate-induced change in productivity (Polovina et al. 1994). The fishery was closed during all or part of 1993, 1994 and 1995 but was re-opened as a limited access fishery operating under a fleet wide seasonal quota in 1996.

The tripartite-Sea Grant investigation also played a role in the revitalization of the NWHI bottomfish fishery. Shortly after World War II as many as nine bottomfish boats were operating in the area, but the number of vessels declined during the 1950s because of vessel losses and low fish prices (Hau 1984). By the 1960s, only one large sampan continued to regularly operate in the NWHI, centering its activity near French Frigate Shoals (Hale 1964). However, during the late 1970s information from the tripartite-Sea Grant investigation on the bottomfish resource potential in the NWHI together with declining yields in the bottomfish fishery around the MHI encouraged many new vessels to enter the NWHI fishery (Haight et al. 1993b). By 1987, 28 vessels were active in the NWHI bottomfish fishery, although only 12 were fishing for bottomfish full time. The non-full time vessels also engaged in longlining for pelagic fish, albacore trolling or lobster trapping (Iversen et al. 1990). In 1989, the Council developed rules dividing the fishing grounds of the NWHI bottomfish fishery into the Hoʻomalu Zone and Mau Zone. Limited access programs were established for the two zones in 1989 and 1999, respectively, to improve the economic performance of the fishery.

In the late 1980s, declining catch rates in the NWHI bottomfish and lobster fisheries induced many participants in those fisheries to switch to fishing for pelagic species with longline gear (Pooley 1993a). A large number of the longline vessels that targeted broadbill swordfish (*Xiphias gladius*) fished in close proximity to the NWHI islands (Nitta and Henderson 1993). In 1991, the Western Pacific Regional Fishery Management Council developed rules prohibiting longline fishing within a 50 nm radius of the NWHI to reduce the risk of interactions with the Hawaiian monk seal.

In 1965, Japanese coral fishermen discovered a large bed of pink coral (*Corallium* spp.) on the Milwaukee Banks in the Emperor Seamount Chain near the northwestern end of the Hawaiian Archipelago (Grigg 1993). Intermittently, over the next two decades dozens of foreign vessels employed tangle-net dredges to harvest precious corals in the waters around the NWHI. In 1980, the Council developed harvest quotas for precious coral beds around the Hawaiian Islands. During the 1980s, however, Japanese and Taiwanese coral vessels frequently fished illegally in the U.S. EEZ near the Hancock Seamount (Grigg 1993). In 1985, Taiwanese vessels reportedly poached about 100 tons of pink coral from north of Gardner Pinnacles and Laysan Island (Grigg 1993). In 1988, the domestic vessel *Kilauea* used a dredge to harvest beds at Hancock Seamount, but the operation was soon discontinued because of insufficient harvests of high quality coral (Grigg 1993).

A trawl and bottom longline fishery targeting alfonsin (*Beryx splendens*) and armorhead (*Pseudopentaceros richardsoni*) at the Southeast Hancock Seamount was started by Russian and Japanese fishing vessels in the late 1960s (Okamoto 1982). Large catches were made for about 10 years until overfishing caused the fishery to collapse. A moratorium on the harvest of alfonsin and armorhead on the Hancock Seamounts has been in effect since 1986 in an effort to rebuild the stocks.

APPENDIX B:
RELEVANT LAWS AND EXECUTIVE ORDERS

The conservation and management of living marine resources in the U.S. is entrusted to the NMFS, which carries out its charge under many laws, treaties, and legislative mandates from the U.S. Congress and the President. The most relevant of these to the current action are briefly introduced in the following sections.

Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act)

The Magnuson-Stevens Act (MSA) is the principal federal statute that provides for the management of marine fisheries in the U.S. Originally enacted as the Fishery Conservation and Management Act in 1976 (Public Law 94-265), this law is arguably the most significant fisheries legislation in U.S. history. It has been amended frequently since 1976; most recently in 1996, by the Sustainable Fisheries Act (SFA) (Public Law 104-297). The basic concepts of the Magnuson-Stevens Act have not changed over the course of its amendment history. These include the preeminent concept that the biological conservation of a fishery resource has priority over use of that resource. A second basic concept of the law is that conservation and management decision-making must be based on the best available scientific information, and, moreover, that this information includes social, economic and ecological factors along with biological factors. The MSA's third basic concept is that the needs of fishery resource users vary across the nation, and regional participation in the policy making process should be maximized.

The Magnuson-Stevens Act (as amended in 1996) includes the following policy statement regarding the nation's fisheries [16 U.S.C. 1801, Sec. 2(c)]:

POLICY.--It is further declared to be the policy of the Congress in this Act--

(1) to maintain without change the existing territorial or other ocean jurisdiction of the United States for all purposes other than the conservation and management of fishery resources, as provided for in this Act;
(2) to authorize no impediment to, or interference with, recognized legitimate uses of the high seas, except as necessary for the conservation and management of fishery resources, as provided for in this Act;
(3) to assure that the national fishery conservation and management program utilizes, and is based upon, the best scientific information available; involves, and is responsive to the needs of interested and affected States and citizens; considers efficiency; draws upon federal, state, and academic capabilities in carrying out research, administration, management, and enforcement; considers the effects of fishing on immature fish and encourages development of practical measures that minimize bycatch and avoid unnecessary waste of fish; and is workable and effective;
(4) to permit foreign fishing consistent with the provisions of this Act;
(5) to support and encourage active United States efforts to obtain internationally acceptable agreements which provide for effective conservation and management of

fishery resources, and to secure agreements to regulate fishing by vessels or persons beyond the exclusive economic zones of any nation;
(6) to foster and maintain the diversity of fisheries in the United States; and
(7) to ensure that the fishery resources adjacent to a Pacific Insular Area, including resident or migratory stocks within the exclusive economic zone adjacent to such areas, be explored, developed, conserved, and managed for the benefit of the people of such area and of the United States.

The Magnuson-Stevens Act also established ten National Standards that serve as the overarching objectives for fishery conservation and management [16 U.S.C. 1851, Sec. 301(a).] and provide the foundation for development fishery management plans and their amendments:

(a) IN GENERAL.--Any fishery management plan prepared, and any regulation promulgated to implement any such plan, pursuant to this title shall be consistent with the following national standards for fishery conservation and management:

(1) Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.
(2) Conservation and management measures shall be based upon the best scientific information available.
(3) To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.
(4) Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.
(5) Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.
(6) Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.
(7) Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.
(8) Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

(9) Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.
(10) Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

The Magnuson-Stevens Act also mandates the Secretary of Commerce (Secretary) to develop advisory guidelines to assist in the development of FMPs. These guidelines serve primarily to interpret and aid compliance with the national standards. The national standards guidelines are codified at 50 CFR Part 600, and were most recently revised on May 1, 1998 (63 FR 24212).

National Environmental Policy Act (NEPA)

This Act, signed into law in 1970 (42 U.S.C. 4321 et seq.), has two principal purposes. One is to require federal agencies to evaluate the potential environmental effects of any major federal action being planned. The intent of this requirement is to assure that public officials make well-informed decisions about the potential impacts of the actions they are considering. The second principal purpose is to promote public awareness of potential impacts at the earliest planning stages of major federal actions. The intent of this requirement is to provide the public opportunity to be involved and influence decision making on federal actions. In short, NEPA ensures that environmental information is available to government officials and the public before decisions are made and before actions are taken.

Federal fishery management actions subject to NEPA requirements include the approval of FMPs and FMP implementing regulations. This requires preparation of either an environmental impact statement (EIS) or supplemental environmental impact statement (SEIS) for major fishery management actions that significantly affect the quality of the human environment and documents that finding for public consideration and comment before a decision is made, or an environmental assessment (EA) for fishery management actions that will not significantly affect the human environment. If an EA does not support a finding of no significant impact, then an EIS or DEIS must be prepared. In addition to NEPA implementing regulations (at 40 CFR 1500-1508), NEPA compliance by fisheries management actions is guided by NOAA Administrative Order 216-6.

Endangered Species Act (ESA)

The ESA (16 U.S.C. 1531 et seq.) provides for the protection and conservation of endangered and threatened species of fish, wildlife and plants. Section 7(a)(1) of the ESA requires federal agencies to “conserve” endangered and threatened species, however, “conservation” is broadly defined. Section 7(a)(2) of the ESA requires federal agencies to insure that any action authorized, funded, or carried out by such agencies is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species.

When the action of a Federal agency may affect a protected species, that agency is required to consult with either the National Marine Fisheries Service (NMFS) and/or the U.S. Fish and Wildlife Service, depending upon the protected species that may be affected. For the actions described in this document, the NMFS Southwest Region, Pacific Islands Area Office (Sustainable Fisheries Program) consulted with the Protected Resources Division, also of NMFS. Section 7(b) of the ESA requires that the consultation be summarized in a biological opinion detailing how the action may affect protected species. That consultation considered the potential impacts to listed species arising from the implementation of the Fishery Management Plan for the Bottomfish and Seamount Groundfish Fishery in the Western Pacific Region. The biological opinion resulting from this consultation was completed on March 8, 2002, and may be found in its entirety in Appendix D.

Marine Mammal Protection Act (MMPA)

The primary goal of the MMPA is to maintain the health and stability of marine ecosystems, and includes the goal to maintain at or restore to Optimum Sustainable Population (OSP) levels marine mammal stocks so that the populations are functioning elements of their ecosystems. To meet this goal, NMFS evaluates U.S. commercial fishing activities for their impacts on marine mammal populations and assesses the overall effect of commercial fishing activities on OSPs. NMFS has evaluated the bottomfish fishery as managed under the *Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region* (bottomfish fishery) for impacts on marine mammals. The product of this evaluation is a negligible impacts determination (2003 NID). The 2003 NID includes a review of the basis for granting an authorization for incidental take (if found appropriate), and a determination regarding the degree of impact(s) to the relevant marine mammal species/populations involved in the subject fishery. The 2003 NID for the federal bottomfish fishery considered the impacts of the bottomfish fishery on the monk seal due to its depleted status under the MMPA. Other marine mammal species were not considered in the 2003 NID.

Under section 118 of the MMPA, NMFS must publish, at least annually, a List of Fisheries (LOF) that places all U.S. commercial fisheries into one of three categories based on the level of incidental serious injury and mortality of marine mammals that occurs in the fishery. The categorization of a fishery in the LOF determines whether participants in that fishery are subject to certain provisions of the MMPA, such as registration, observer coverage, and take reduction plan requirements.

The fishery classification criteria consist of a two-tiered, stock-specific approach that first addresses the total impact of all fisheries on each marine mammal stock and then addresses the impact of individual fisheries on each stock. This approach is based on consideration of the rate, in numbers of animals per year, of incidental mortalities and serious injuries of marine mammals due to commercial fishing operations relative to the Potential Biological Removal (PBR) level for each marine mammal stock. The PBR level is defined to mean the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population.

Tier 1: If the total annual mortality and serious injury across all fisheries that interact with a stock is less than or equal to 10 percent of the PBR level of this stock, all fisheries interacting with this stock would be placed in Category III. Otherwise, these fisheries are subject to the next tier of analysis to determine their classification.

Tier 2, Category I: Annual mortality and serious injury of a stock in a given fishery is greater than or equal to 50 percent of the PBR level.

Tier 2, Category II: Annual mortality and serious injury of a stock in a given fishery is greater than 1 percent and less than 50 percent of the PBR level.

Tier 2, Category III: Annual Mortality and serious injury of a stock in a given fishery is less than or equal to 1 percent of the PBR level.

At present, all Hawaiʻi fisheries are classified Tier 2, Category III.

Section 118 of the Marine Mammal Protection Act (MMPA) provides an exception for commercial fishing vessel owners and operators from the general taking prohibitions of the MMPA.[36] Although Category III fisheries are not obliged to obtain an authorization for incidental take under §118 (§118 authorization) as are Category I and II fisheries, Category III fisheries, along with Category I and II fisheries, must fulfill reporting requirements under §118(e)[37].

In the case of the incidental taking of marine mammal species or stocks designated as depleted on the basis of their listing as threatened or endangered species under the ESA, an authorization for incidental take must be obtained under the MMPA §101(a)(5)(E) (§101 authorization). The §101 authorization applies to all categories of fisheries (Categories I, II, and III). NMFS must grant a §101 authorization for up to three consecutive years for the incidental take of marine mammals if the following conditions are met:

- the incidental mortality and serious injury from commercial fisheries will have a negligible impact on such species or stock;
- a recovery plan has been developed or is being developed for such species or stock pursuant to the ESA; and

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[36] In order to lawfully incidentally take marine mammals in a commercial fishery, the owner of a vessel engaging in a Category I or II fishery must obtain a marine mammal authorization from the National Marine Fisheries Service (NMFS), or its designated agent. Vessel owners must have a valid authorization certificate aboard the vessel before resumption of fishing each calendar year, report all incidental mortality and serious injury of marine mammals in the course of commercial fishing operations, and comply with any take reduction plan and emergency regulations.

[37] All vessel owners or operators, regardless of the category of fishery they participate in, must report all incidental injuries and mortalities of marine mammals that have occurred as a result of commercial fishing operations. Reports must be sent to NMFS, by mail or fax, within 48 hours of the end of a fishing trip in which the serious injury or mortality occurred, or, for non-vessel fisheries, within 48 hours of the occurrence.

- where required under §118 of the MMPA for Category I and II fisheries, a monitoring program is established, vessels are registered, and a take reduction team has been or is being developed for such species or stock.

For vessels required to register under §118 (Category I and II fisheries), NMFS must issue a permit for each §101 authorization.

The bottomfish fishery is a Category III fishery. As such, vessels are not subject to the requirements of obtaining an authorization under §118. However, the Hawaiian monk seal is considered depleted under the MMPA due to its status as endangered under the ESA. Since monk seals may be incidentally taken in the bottomfish fishery, the requirements of §101(a)(5)(E) must be met in order to fall under the exception of the prohibition on incidental take in commercial fisheries allowed under §118.

Under §101(a)(5)(E) of the MMPA there are several requirements which control whether or not a Negligible Impact Determination is appropriate. Requirements relevant to the bottomfish fishery for this determination are discussed below. These are (1) the determination that the incidental mortality and serious injury from commercial fisheries will have a negligible impact on such species or stock; and (2) the development of a recovery plan. Although not a requirement for the bottomfish fishery, a monitoring program was implemented for a few years and information gathered during the program conforms with the intent of monitoring requirements within the intent and process of the MMPA, generally.

Section 101(a)(5)(E) requires that a recovery plan has been developed or is being developed for species or stocks listed under the ESA. The Hawaiian monk seal recovery plan (final) was published in March 1983 (Gilmartin et al. 1983). NMFS is now in the process of revising the recovery plan documents for the Hawaiian monk seal.

NMFS' regulations implement a framework and process for the taking of endangered and threatened marine mammals incidental to commercial fishing operations established by §118 of the MMPA 1994 amendments (50 C.F.R. § 229.20). The regulations define negligible impact as "an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival" (50 CFR 216.103).

In order to determine whether serious injuries and mortalities incidental to U.S. commercial fishing activities are having a negligible impact on threatened or endangered stocks of marine mammals, NMFS evaluates the total number of all incidental serious injuries and mortalities due to commercial fishing for each such stock. For each species, NMFS will make a finding based on the best assessment of whether or not the estimated mortality and serious injury of endangered and threatened marine mammals incidental to commercial fishing operations will adversely affect the species or stock through effects on annual rates of recruitment or survival. 65 FR 45399 (August 31, 1995).

The criteria employed to determine whether a U.S. commercial fishery has a negligible impact on a species include:

1. The threshold for initial determination will be 0.1 PBR.
2. If total human related serious injuries and mortalities are greater than PBR, and fisheries-related mortality is less than 0.1 PBR, individual fisheries may be permitted if management measures are being taken to address non-fisheries-related serious injuries.
3. If total fisheries-related serious injuries and mortalities are greater than 0.1 PBR but less than PBR and the population is stable or increasing, fisheries may be permitted subject to individual review and certainty of data.
4. If the population abundance of a stock is declining, the threshold level of 0.1 PBR will continue to be used, and a more conservative criterion will be applied.
5. If total fisheries related serious injuries and mortalities are greater than PBR, permits may not be issued.

To apply these criteria, the PBR for the stock must be set. Under §117 of the MMPA, NMFS and the U.S. Fish and Wildlife Service are required to publish stock assessment reports for all stocks of marine mammals within U.S. waters, to review new information every year for strategic stocks and every three years for non-strategic stocks, and to update the stock assessment reports when significant new information becomes available. A marine mammal stock is considered strategic if it is:

1. A marine mammal species that is listed as endangered or threatened under the ESA;
2. A marine mammal stock for which the human-caused mortality exceeds the potential biological removal (PBR) level; or
3. A marine mammal stock which is declining and likely to become listed as a threatened species under the ESA.

The PBR level is the maximum number of animals, not including natural mortalities, that may be annually removed from a marine mammal stock while allowing that stock to reach or maintain its OSP. OSP means the number of animals which will result in the maximum productivity of the population or species, keeping in mind the carrying capacity of the habitat and the health of the ecosystem. The PBR level is the product of the following factors: 1) The minimum population estimate of the stock (N_{MIN}); 2) One-half the maximum theoretical or estimated net productivity rate of the stock at a small population size, where net productivity is the annual per capita rate of increase in a stock resulting from additions due to reproduction, less losses due to mortality (½ R_{MAX}); and 3) A recovery factor (R_F) or “safety factor” of between 0.1 and 1.0 to hasten the recovery of depleted populations and to account for additional uncertainties. The use of PBR as a management tool is a conservative approach that will allow populations to recover to or remain above OSP. To further the conservation and recovery of listed species, NMFS has implemented the recommendation of the Potential Biological Removal Workshop, June 27-29 1994 (Southwest Fisheries Science Center, La Jolla, California) that for endangered and threatened stocks, PBR levels should be negligible, and in no case should the incidental take levels delay recovery of endangered species by more than 10% of the estimated recovery time in the absence of any incidental take. (Barlow, 1995) This is sometimes termed “insignificant mortality”, and may be based on numerical estimates of mortality.

In making a negligible impact determination, the Assistant Administrator will publish an announcement in the Federal Register of a list of fisheries that take marine mammals listed under the ESA, including a summary of available information regarding the fisheries interactions with species listed. Any interested party may, within 45 days of such publication, submit to the Assistant Administrator written data or views with respect to the listed fisheries. As soon as practicable after the end of the 45 days, NMFS will publish in the Federal Register a list of the fisheries for which determinations are made. This publication will set forth a summary of the information used to make the determinations (50 CFR 229.20).

Section 112 of the MMPA provides that if impacts to rookeries, mating grounds, or other areas of similar ecological significance to marine mammals may be causing the decline or impeding the recovery of a strategic stock, the Secretary may develop and implement conservation or management measures to alleviate those impacts.

The Fish and Wildlife Coordination Act (FWCA)

The FWCA authorizes collection of fisheries data and coordination with other agencies for environmental decisions affecting living marine resources. Both formal and informal consultations, cooperative research, and data gathering programs are routinely pursued.

Coastal Zone Management Act (CZMA)

The CZMA (16 U.S.C. 1451 et seq.) is designed to encourage and assist states in developing coastal management programs, to coordinate state activities, and to safeguard regional and national interests in the coastal zone. Section 307(c) of the CZMA requires that any federal activity affecting the land or water uses or natural resources of a state’s coastal zone be consistent with the state’s approved coastal management program, to the maximum extent practicable.

A proposed fishery management action that requires an FMP amendment or implementing regulations must be assessed to determine whether it directly affects the coastal zone of a state with an approved coastal zone management program. If so, NMFS must provide the state agency having CZM responsibility with a consistency determination for review at least 90 days before final action of NMFS.

Administrative Procedure Act (APA)

The APA (5 U.S.C. 553) requires federal agencies to give the public prior notice of rulemaking and an opportunity to comment on proposed rules. General notice of proposed rulemaking must be published in the Federal Register, unless persons subject to the rule have actual notice of the rule. Proposed rules published in the Federal Register must include reference to the legal authority under which the rule is proposed and explain the nature of the proposal including what action is proposed, why, what is its intended effect, and any relevant regulatory history that provides the public with a well-informed basis for understanding and commenting on the proposal. The APA does not specify how much time the public must be given for prior notice and opportunity to comment; however, NOAA subscribes to 30 days as a reasonable period for the public to be informed and submit comments on proposed fishery management regulations. Exceptions to 30-day prior notice protocol include (a) proposed rules that would implement FMP amendments, in which case the Magnuson-Stevens Act indicates a 45-day period, and (b) emergency regulations that often require immediate implementation.

Some regulations (e.g. emergency or interim) may be implemented immediately under the APA when the agency for good cause finds that prior notice and opportunity for public comment are impractical, unnecessary, or contrary to the public interest. The "good cause" reason for waiving normal public procedure must be fully explained in the Federal Register notice which publishes the final rule. The Magnuson-Stevens Act (at section 305(c)) places further conditions and restrictions on the use of emergency or interim fishery regulations. For example, an emergency or interim fishery management measure may remain in effect for not more than 180 days and may be extended, by notice in the Federal Register only once for an additional 180-day period.

On August 21, 1997 (62 FR 44421), NOAA published further policy guidelines in the form of criteria and justification standards for using emergency rule authority to address marine fishery management issues. These criteria define the phrase in section 305(c) of the Magnuson-Stevens Act, "an emergency exists involving any fishery," as ...a situation that:

(1) Results from recent, unforeseen events or recently discovered circumstances; and
(2) Presents serious conservation or management problems in the fishery; and
(3) Can be addressed through emergency regulations for which the immediate benefits outweigh the value of advanced notice, public comment, and deliberative consideration of the impacts on participants to the same extent as would be expected under normal rulemaking process" (62 FR 44422).

The emergency rule guidelines also state that the normal public rulemaking process may be waived in an emergency if the emergency action might be justified under one or more of the following situations:

(1) Ecological -- (A) to prevent overfishing as defined in an FMP, or as defined by the Secretary in the absence of an FMP, or (B) to prevent other serious damage to the fishery resource or habitat; or
(2) Economic – to prevent significant direct economic loss or to preserve a significant economic opportunity that otherwise might be forgone; or
(3) Social – to prevent significant community impacts or conflict between user groups; or
(4) Public health – to prevent significant adverse effects to health of participants in a fishery or to the consumers of seafood products" (62 FR 44422).

Beyond these exceptions, a proposed rule is designed to give interested or affected persons opportunity to submit written data, views or arguments for, or against, the proposed action. After the end of a 30- or 45-day comment period, the APA requires comments received to be summarized and responded to in the final rule notice. Further, the APA requires the effective date of a final rule to be no less than 30 days after publication of the final notice in the Federal Register. This delayed effectiveness or "cooling off" period is intended to allow the affected public to become aware of and prepared to comply with the requirements of the rule. The 30-day delayed effectiveness period can be waived for a final rule only if it relieves a restriction, merely interprets an existing rule, or provides a statement of policy, or it must be made effective earlier than 30 days after publication for good cause. For fishery management regulations, the primary effect of the APA is to provide for public participation which, in combination with the Magnuson-Stevens Act, NEPA, and other statutes, limits the speed with which NMFS can implement non-emergency fishery regulations.

Regulatory Flexibility Act (RFA)

The RFA (5 U.S.C. 601 et seq.) requires federal agencies to assess the impacts of their proposed regulations on small entities and to seek ways to minimize economic effects on small entities that would be disproportionately or unnecessarily adversely affected. The most recent amendments to the RFA were enacted on March 29, 1996, with the Contract with America Advancement Act of 1996 (Public Law 104-121). Title II of that law, the Small Business Regulatory Enforcement Fairness Act (SBREFA), amended the RFA to require federal agencies to determine whether a proposed regulatory action would have a significant economic impact on a substantial number of small entities. For a federal agency, the most significant effect of SBREFA is that it made compliance with the RFA judicially reviewable.

The assessment requirement of the RFA is satisfied by a regulatory flexibility analysis, which applies to regulatory actions for which prior notice and comment is required under the APA. Emergency or interim rules that waive notice and comment are not required to have regulatory flexibility analyses. Further, regulatory flexibility analyses are required only when an action is expected to have a "significant economic impact" on a "substantial number of small entities".

For purposes of these analyses, "small entities" include (a) small businesses which, for commercial fishing or fish processing, are firms with receipts of up to $3 million annually or up to 500 employees, respectively, (b) small non-profit organizations, and (c) small governmental jurisdictions with a population of up to 50,000 persons. For Hawaiʻi-based fisheries, all fishing firms are considered to be small entities. "Substantial number" has been interpreted by NMFS to mean more than 20 percent of those small entities that would be affected by the proposed regulation. Likewise, NMFS has established criteria for determining whether a proposed action would have a "significant economic impact" based on potential decreases in annual gross revenues, increases in production costs, compliance costs and capital costs, and potential business failures caused by the proposal. Any one of these criteria determined to be "significant" results in the entire action being considered "significant" under RFA.

An initial regulatory flexibility analysis (IRFA) is prepared for any proposed regulatory action that meets the above criteria for having an anticipated "significant economic impact" on a "substantial number of small entities." In practice, NMFS has insufficient cost data on fishing and processing firms to determine with a high degree of confidence whether any particular regulation will not have a "significant economic impact." Hence, an IRFA is prepared routinely for most proposed fishery management measures. The IRFA usually is combined with the EA or (supplemental) EIS document required by NEPA. However, if an action is determined to not have a “significant economic impact on a substantial number of small entities”, then a statement to this effect including a factual basis for the statement must be published in the Federal Register and sent to the Small Business Administration in lieu of a IFRA.

If, following public comments on the proposed rule, the action is considered to meet the criteria for requiring RFA analysis, then a final regulatory flexibility analysis (FRFA) must be prepared. The FRFA contains most of the same descriptive information presented in the IRFA, but also must include (a) a summary of significant issues raised in public comment on the IRFA and the agency’s response to those comments, and (b) a description of the steps the agency has taken to minimize the significant economic impacts on small entities, including a statement of factual, policy, and legal reasons for selecting the alternative adopted in the final rule and why all other alternatives considered were rejected. Finally, the FRFA or a summary of it must be published in the Federal Register with the final rule.

In addition, SBREFA established two new requirements on agencies that publish rules. First, for each rule or group of related rules for which an agency is required to publish an FRFA, the agency is required to publish one or more guides to assist small entities in complying with the rule. These guides, called “small entity compliance guides,” must explain what a small entity is required to do to comply with the rule(s). The guide is to be written in sufficiently plain language likely to be understood by affected small entities. Second, each agency regulating the activities of small entities is required to establish a program for responding to inquiries from small entities concerning information on, advice about, and compliance with statutes and regulations, as well as interpreting and applying law to specific sets of facts supplied by small entities. Guidance given by an agency applying law to facts provided by a small entity may be considered as evidence of the reasonableness of any proposed fines, penalties, or damages sought against the small entity in any civil or administrative action.

Paperwork Reduction Act of 1995 (PRA)

The PRA (44 U.S.C. 3501 et seq., and 5 CFR part 1320) is designed “to minimize the paperwork burden for individuals, small businesses, educational and nonprofit institutions, federal contractors, state, local and tribal governments, and other persons resulting from the collection of information by or for the Federal Government.” In brief, this law is intended to ensure that the government is not overly burdening the public with requests for information. This is accomplished through an information collection budget (ICB). The ICB for each agency is in terms of the total estimated time burden of responding to official inquiries. The President’s Office of Management and Budget (OMB) oversees the ICB of each agency. Agencies must annually identify and obtain clearance from OMB for new or significant revisions to reporting and record keeping requirements.

Procedurally, the PRA requirements constrain what, how, and how frequently information will be collected from the public affected by a rule that requires reporting (e.g. harvested fish). New collections of information must be submitted to OMB for clearance before a final rule may take effect. For each rule that requires a collection of information, the agency must describe in detail what data will be collected, how it will be collected and how often, from whom it will be collected, how much time will be spent by each affected person in complying with the information requirements, why the information is necessary and how it will be used. OMB can take 60 days to review and clear a proposed information collection; hence, to avoid a PRA delay of a rule, NMFS tries to start the PRA review and clearance process at least 30 days before submission of a proposed rule for review in NMFS' central office. Information collections approved by OMB have a maximum effectiveness of three years. To be extended beyond that time requires another submission for OMB clearance. Required collections of information from the public cannot be enforced without being included in an approved ICB.

Freedom of Information Act (FOIA)

The original FOIA (5 U.S.C. 552) allowed the public to obtain government information, provided the information is not protected by one of the nine specific FOIA exemptions and requires that an agency respond to a FOIA request within specified time limits. Exempted information includes: classified secret matter of national defense or foreign policy, internal personnel rules and practices, information specifically exempted by other statutes, trade secrets and commercial and financial information, privileged interagency or intra-agency memoranda or letters, personal information affecting an individual's privacy, and investigatory records for law enforcement purposes.

In 1996, the Electronic FOIA (E-FOIA) amendments (Public Law 104-231) changed FOIA by (among other things) extending the time limit agencies had to respond to FOIA requests and requiring agencies to make reports available to the public by computer telecommunications or other electronic means, including listing their major information systems and a guide for obtaining information, and establishing an electronic reading room that includes agency policies, staff manuals, and an index of records released under FOIA requests.

All fishery management actions are subject to FOIA requests except for the exempted information detailed above. NMFS compliance with FOIA is guided by NOAA Administrative Order 205-14.

Executive Order 12866: Regulatory Planning and Review

Executive Order (EO) 12866 was signed by the President on September 30, 1993, published October 4, 1993 (58 FR 51735), and replaced EO 12291 and EO 12498. Its purpose, among other things, is to enhance planning and coordination with respect to new and existing regulations, and to make the regulatory process more accessible and open to the public. In addition, EO 12866 requires agencies to take a deliberative, analytical approach to rule making, including assessment of costs and benefits of the intended regulations. For fisheries management purposes, it requires NMFS to prepare (a) a regulatory impact review (RIR) for regulatory actions, and (b) a unified regulatory agenda twice a year which inform the public of the agency's expected regulatory actions.

The purpose of an RIR is to assess the potential economic impacts of a proposed regulatory action. As such, it can be used to satisfy NEPA requirements and as a basis for determining whether a proposed rule will have a significant impact on a substantial number of small entities which would trigger the completion of an IRFA under the RFA. For this reason, the RIR is frequently combined with an EA and an IRFA in a single EA/RIR/IRFA document that satisfies the analytical requirements of NEPA, RFA and EO 12866 for any proposed rule. Criteria for determining "significance" for EO 12866 purposes, however, are different than those for determining "significance" for RFA purposes. A "significant" rule under EO 12866 is one that is likely to:

(1) Have an annual effect on the economy (of the nation) of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local, or tribal governments or communities;
(2) Create serious inconsistency or otherwise interfere with an action taken or planned by another agency;
(3) Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
(4) Raise novel or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in EO 12866.

Although fisheries management actions rarely have an annual effect on the national economy of $100 million or more or trigger any of the other criteria, OMB makes the ultimate determination of significance under this EO based in large measure in the analysis in the RIR. An action determined to be significant is subject to OMB review and clearance before its publication and implementation.

An initial determination of significance, frequently without benefit of an RIR, is made for each proposed regulatory action by NMFS through a "listing document." The listing document is a brief description of a proposed regulatory action, including a regulatory identifier number (RIN), and the expected schedule for rule making. Listing documents are prepared by NMFS and submitted through NOAA General Counsel and Department of Commerce Office of General Counsel to OMB. If OMB concurs in a determination of "not significant" under EO 12866, then OMB will not need to review the rule. In practice, NMFS attempts to submit a listing document at least three months before submission of the proposed rule.

The regulatory planning function of EO 12866 is served by the unified regulatory agenda which is prepared twice a year to inform the public of the agency's expected regulatory actions and provide brief descriptions and timelines. In addition, a regulatory plan is prepared annually to report on the most significant regulatory actions that the agency reasonably expects to issue in proposed or final form in that fiscal year or later.

Executive Order 12630: Takings

This EO on Government Actions and Interference with Constitutionally Protected Property Rights came into effect on March 18, 1988. This EO requires that each federal agency prepare a "takings implications assessment" for any of its administrative, regulatory, and legislative policies and actions that affect, or may affect, the use of any real or personal property. Fishery management measures that limit fishing seasons, areas, catch quotas, the size of harvested fish, and bag limits do not appear to have any takings implications, and thus, no takings implications assessment is required. However, if a fishing gear type is prohibited, for example, in such a way that a fisherman leaving the fishery would be unable to sell his investment in the gear, or if a fisherman is prohibited by federal action from exercising property rights granted by a state, then a takings implication assessment may need to be prepared.

"Takings" issues are raised frequently in the context of limited access systems that confer a harvesting privilege on a fisherman in the form of a permit to catch a specific amount of fish or a license to enter and participate in a fishery. Although such permits and licenses may be transferrable and therefore increase (or decrease) in market value, they themselves do not convey any property rights in the fishery resource (i.e., the fish). If, however, the federal government were to drastically reduce the amount of fish that may be harvested from a fishery for which a fisherman had a limited license or permit, and thereby reduce the transfer value of that license or permit "takings implications" may exist.

Executive Order 12898: Environmental Justice

Executive Order 12898, issued in 1994, requires that federal agencies incorporate Environmental Justice into their mission by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minorities populations and low income populations in the U.S.

Executive Order 13132: Federalism

The "Federalism" EO was signed by the President on August 4, 1999, and published August 10, 1999 (64 FR 43255). This EO superceded the previous "Federalism" EOs (12612 and 13083) but supplements EOs 12372, 12866, and 12988. This EO is intended to guide federal agencies in the formulation and implementation of "policies that have federalism implications." Such policies include regulations, legislative comments or proposed legislation, and other policy statements or actions that have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government.

The EO establishes fundamental federalism principles based on the U.S. Constitution, specifies federalism policy making criteria and special requirements for preemption of state law. For example, a federal action that limits the policy making discretion of a state is to be taken only where there is constitutional and statutory authority for the action and it is appropriate in light of the presence of a problem of national significance. Also, where a federal statute does not have expressed provisions for preemption of state law, such a preemption by federal rule making may be done only when the exercise of state authority directly conflicts with the exercise of federal authority. Conflict between state and federal law is possible on fishery management issues, however, the Magnuson-Stevens Act (at sec. 306) explicitly establishes conditions for federal preemption of state regulations (and extension of state fishery management authority into the EEZ). This EO also requires consultation between federal and state officials, and requires a federalism impact statement for rules that have federalism implications.

Executive Order 12114: Environmental Effects Abroad

This EO, issued in 1979, directs agencies to consider the effects of major federal actions upon the environment of foreign nations of the “global commons”. These actions include those major federal actions that result in significant environmental effects that extend outside of the geographic borders of the U.S. In some cases, an EIS may be required. The EO encourages international agreements and an exchange of information between the affected nations and the United States.

Executive Order 13112: Invasive Species

Executive Order 13112 establishes guidelines to ensure that actions proposed by federal agencies, to the extent practicable by law, take into account and mitigate the introduction of invasive species. The EO also establishes an Invasive Species Council to provide national leadership regarding invasive species and to ensure that federal agency activities concerning invasive species are coordinated, cost-efficient, and effective.

Executive Order 13158: Marine Protected Areas

This new EO, signed by the President on May 26, 2000 and published on May 31, 2000 (65 FR 34909), directs the Department of Commerce and the Department of the Interior to jointly develop a national system of marine protected areas (MPAs). The purpose of the system is to strengthen the management, protection, and conservation of existing protected areas and establish new or expanded MPAs. The MPA system is to be scientifically based, representing diverse U.S. marine ecosystems, and the nation’s natural and cultural resources. Establishing such a system is intended to reduce the possibility that MPAs are harmed by federally-approved or funded activities.

Executive Order 12962: Recreational Fisheries

On June 7, 1995, the President signed E.O. 12962 to improve the quality, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities nationwide.

Executive Order 13089: Coral Reef Protection

In June, 1998, the President signed an Executive Order for Coral Reef Protection which established the Coral Reef Task Force (CRTF) and directed all federal agencies with coral reef-related responsibilities to develop a strategy for coral reef protection. The federal agencies were directed to work cooperatively with state, territorial, commonwealth and local agencies; non-governmental organizations; the scientific community and commercial interests to develop the plan. The Task Force was directed to develop and implement a comprehensive program of research and mapping to inventory, monitor and address the major causes and consequences of degradation of coral reef ecosystems. The order directs federal agencies to use their authorities to protect coral reef ecosystems and, to the extent permitted by law, prohibits them from authorizing, funding, or carrying out any actions that will degrade these ecosystems.

Executive Orders 13178 and 13196: Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve

President Clinton issued Executive Order 13178 on December 4, 2000, establishing the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, pursuant to the National Marine Sanctuaries Amendments Act of 2000. The EO was revised and finalized by Executive Order 13196, issued January 18, 2001. The principal purpose of the Reserve is the long-term conservation and protection of the coral reef ecosystem and related marine resources and species of the Northwestern Hawaiian Islands in their natural character.

The seaward boundary of the Reserve is 50nm from the approximate center geographical positions of Nihoa Island, Necker Island, French Frigate Shoals, Gardner Pinnacles, Maro Reef, Laysan Island, Lisianski Island, Pearl and Hermes Reef, Midway Atoll, and Kure Island. The inland boundary of the Reserve around each of these land areas is the seaward boundary of Hawaii State waters and submerged lands, and the seaward boundary of the Midway Atoll National Wildlife Refuge.

All currently existing commercial Federal fishing permits and current levels of fishing effort and take, which also includes the non-permitted level of trolling for pelagic species by currently permitted bottomfish fishers, as determined by the Secretary and pursuant to regulations in effect on December 4, 2000 shall be capped as follows:
(A) No commercial fishing may occur in Reserve Preservation Areas;
(B) There shall be no increase in the number of permits of any particular type of fishing (such as for bottomfishing) beyond the number of permits of that type in effect the year preceding the date of this order;
(C) The annual level of aggregate take under all permits of any particular type of fishing may not exceed the aggregate level of take under all permits of that type of fishing as follows:

> (1) Bottomfish fishing - the annual aggregate level for each permitted bottomfish fisher shall be that permittee's individual average taken over the 5 years preceding December 4, 2000, as determined by the Secretary, provided that the Secretary, in furtherance of the principles of the reserve, may make a one-time reasonable increase to the total aggregate to allow for the use of two Native Hawaiian bottomfish fishing permits;
> (2) All other commercial fishing - the annual aggregate level shall be the permittee's individual take in the year preceding December 4, 2000, as determined by the Secretary.

(D) There shall be no permits issued for any particular type of fishing for which there were no permits issued in the year preceding the date of this order; and
(E) The type of fishing gear used by any permit holder may not be changed except with the permission of the Secretary.
(F) Trolling for pelagic species shall be capped based on reported landings for the year preceding December 4, 2000.

All currently existing levels of recreational fishing effort, as determined by the Secretary and pursuant to regulations in effect on the day of this order, shall be capped (i.e., no increase of take levels or levels of fishing effort, species targeted, or change in gear types) throughout the Reserve.

To further protect Reserve resources, the following areas are hereby established as Reserve Preservation Areas until some or all are made permanent after adequate public review and comment:
(1) From the seaward boundary of Hawaiʻi State waters and submerged lands to a mean depth of 100 fathoms (fm) around:

(A) Nihoa Island, provided that commercial bottomfish fishing and commercial and recreational trolling for pelagic species shall be allowed to continue seaward of a mean depth of 25fm, unless and until the Secretary determines otherwise after adequate public review and comment;
(B) Necker Island, provided that commercial bottomfish fishing and commercial and recreational trolling for pelagic species shall be allowed to continue seaward of a mean depth of 25fm, unless and until the Secretary determines otherwise after adequate public review and comment;
(C) French Frigate Shoals;
(D) Gardner Pinnacles, provided that commercial bottomfish fishing and commercial and recreational trolling for pelagic species shall be allowed to continue seaward of a mean depth of 25fm, unless and until the Secretary determines otherwise after adequate public review and comment;
(E) Maro Reef, provided that commercial bottomfish fishing and commercial and recreational trolling for pelagic species shall be allowed to continue seaward of a mean depth of 25fm, unless and until the Secretary determines otherwise after adequate public review and comment;
(F) Laysan Island, provided that commercial bottomfish fishing and commercial and recreational trolling for pelagic species shall be allowed to continue seaward of a mean depth of 50fm, unless and until the Secretary determines otherwise after adequate public review and comment;
(G) Lisianski Island, provided that commercial bottomfish fishing and commercial and recreational trolling for pelagic species shall be allowed to continue seaward of a mean depth of 25fm, unless and until the Secretary determines otherwise after adequate public review and comment;
(H) Pearl and Hermes Atoll; and
(I) Kure Atoll.

(2) Twelve nautical miles around the approximate geographical centers of:

(A) The first bank immediately east of French Frigate Shoals;
(B) Southeast Brooks Bank, which is the first bank immediately west of French Frigate Shoals, provided that the closure area shall not be closer than approximately 3nm of the next bank immediately west;
(C) St. Rogatien Bank, provided that the closure area shall not be closer than approximately 3nm of the next bank immediately east, provided that commercial bottomfish fishing and commercial and recreational trolling for pelagic species shall be

allowed to continue, unless and until the Secretary determines otherwise after adequate public review and comment; shall be allowed to continue, unless and until the Secretary determines otherwise after adequate public review and comment;

(3) Twelve nautical miles around the approximate geographical centers of:

(A) The first bank west of St. Rogatien Bank, east of Gardner Pinnacles, provided that commercial bottomfish fishing and commercial and recreational trolling for pelagic species shall be allowed to continue for a period of 5 years from the date of this order; and

(B) Raita Bank, provided that commercial bottomfish fishing and commercial and recreational trolling for pelagic species shall be allowed to continue for a period of 5 years from the date of this order; and

(C) Provided that both banks described above shall only continue to allow commercial bottomfish fishing and commercial and recreational trolling for pelagic species after the 5-year time period if it is determined that continuation of such activities will have no adverse impact on the resources of these banks.

The following activities are prohibited within the Reserve Preservation Areas:

(A) Commercial and recreational fishing;

(B) Anchoring in any area that contains available mooring buoys, or anchoring outside an available anchoring area when such area has been designated by the Secretary;

(C) Any type of touching or taking of living or dead coral;

(D) Discharging or depositing any material or other matter except cooling water or engine exhaust; and

(E) Such other activities that the Secretary identifies after adequate public review and comment, and after consideration of any advice and recommendations of the Reserve Council.

APPENDIX C:

MARINE BOUNDARIES IN THE WESTERN PACIFIC REGION

(This appendix was prepared by the staff of the Western Pacific Regional Fishery Management Council)

Introduction

This section reviews the complex issues surrounding marine boundaries in the Western Pacific Region. Delineation of current marine boundaries is discussed and specific areas of contention between various federal and state authorities are summarized.

Exclusive Economic Zone

The 1976 Fishery Conservation and Management Act (the Magnuson Act, and later, after amendments, the MSFCMA) established US jurisdiction from the seaward boundary of the territorial sea out to 200 miles for the purpose of managing fishery resources. Passage of the Magnuson Act was the first unilateral declaration of jurisdiction over a 200-mile zone by a major power. Presidential Proclamation 5030 of March 10, 1983, expanded Magnuson Act jurisdiction by establishing the US exclusive economic zone; it declared, "to the extent permitted by international law ... sovereign rights for the purpose of exploring, exploiting, conserving and managing natural resources, both living and non-living, of the seabed and subsoil and the superjacent waters" in the 200-mile zone. The assertion of jurisdiction over the EEZ of the United States provided a basis for economic exploration and exploitation, scientific research, and protection of the environment under the exclusive control of the US government. Congress confirmed presidential designation of the EEZ in1986 amendments to the Magnuson Act. Under the Magnuson Act, fishery management authority in the EEZ off American Samoa, Guam, Hawaii, the Northern Mariana Islands, and other US islands in the central and western Pacific is the responsibility of the Western Pacific Regional Fishery Management Council.

The EEZ is measured from the "baseline" of US states and overseas territories and possessions out to 200 nautical miles. Under the Magnuson Act, the shoreward boundary of the EEZ is a line coterminous with the seaward boundary, baseline, of each "state." (As used elsewhere in this document, US territories and possessions in the Western Pacific fall within the definition of state under the Magnuson Act (16 U.S.C. 1802, MSFCMA § 3 104-297)). In the case of the CNMI and the PRIAs, the EEZ extends to the shoreline (Beuttler 1995).

Seaward boundaries (territorial seas) for states are recognized as extending out to a distance of three miles from the ordinary low-water mark, as established by the Submerged Lands Act (SLA) of 1953.[38] The Territorial Submerged Lands Act (TSLA) of 1960 was enacted to convey to the

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[38]Under the SLA, the term "boundaries" or the term "lands beneath navigable waters" is interpreted as extending from the coastline to three geographical miles into the Atlantic Ocean or the Pacific Ocean, or three marine leagues (9 miles) into the Gulf of Mexico.

governments of American Samoa, Guam and Virgin Islands the submerged lands from the mean high-tide line out to three geographic miles from their coast lines (Beuttler 1995).

The CNMI was part of the United Nations Trust Territory of the Pacific Islands (administered by the US) until 1978 when its citizens chose to be become a US commonwealth by plebiscite and agreed to by Congress. Although title of the emergent land was conveyed to the Commonwealth, the US government withheld title to the submerged lands of the archipelago.[39] Submerged lands and underlying resources adjacent to CNMI remain owned by the federal government and subject to its management authority (Beuttler 1995).

In the PRIAs, for which there are no sovereign entities similar to states or territories, various federal agencies have jurisdictional authority. Authority is often established through statutes, Executive Orders, and Presidential Proclamations, and marine boundaries are often unclear. For this reason, the extent to which an agency exercises its jurisdictional authority is subject to legal interpretation.

Territorial Seas

State of Hawaii

The State of Hawaii consists of all islands, together with their appurtenant reefs and territorial waters, which were included in the Territory of Hawaii under the Organic Act of 1900. Under the Admissions Act of 1959, Congress granted to Hawaii the status of statehood and all amenities of a state, which included the reversion of title and ownership of the lands beneath the navigable waters from the mean high-tide line seaward, out to a distance of three miles, as stated by the SLA of 1953. Congress excluded Palmyra Atoll, Kingman Reef, and Johnston Atoll, including Sand Island, from the definition of the State of Hawaii in 1959. The federal government also retained 1,765 acres of emergent land in the NWHI, which had been set aside by Executive Order 1019 in 1909, establishing the Hawaiian Islands Reservation (HIR). The HIR was later renamed the Hawaiian Islands National Wildlife Refuge (HINWR) after it was transferred from the Department of Agriculture to the Department of Interior in 1939 (Yamase 1982).

Territories of Guam and American Samoa

Pursuant to the TSLA of 1960, the Territories of Guam and American Samoa own and have management responsibilities over the marine resources out to three “geographic” miles. In general, the authority of the MSFCMA begins at three nautical miles from the shoreline at Guam and American Samoa. There are, however, exceptions to the management authority in the

[39] The Territorial Submerged Lands Act was enacted for CNMI on October 5, 1974 (Beuttler 1995). Congress approved the mutually negotiated “Covenant to Establish a Commonwealth of the Northern Marianas (CNMI in political union with the US)”. However, the Covenant was not fully implemented until 1986, pursuant to Presidential Proclamation number 5564, which terminated the trusteeship agreement (Beuttler 1995).

Territories. For example, the federal government administers waters in National Wildlife Refuges and naval defense sea areas (NDSA)(see below).

US Fish and Wildlife Refuges and Units

The USFWS has been given authority to manage a number of NWRs in the Western Pacific Region. The USFWS asserts the authority to manage marine resources and activities, including fishing activities within Refuge boundaries pursuant to the National Wildlife Refuge System Administration Act (NWRSAA) of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, and other authorities (Gillman 2000). The USFWS asserts that NWRs are closed to all uses until they are specifically opened for such uses. They also claim that the USFWS is "solely" charged with making decisions whether to open NWRs for specific purposes that are compatible with the refuge's primary purposes and mission (Smith 2000a).

Executive Order 1019 reserved and set apart Laysan and Lisanski Islands, and Maro and Pearl and Hermes Reefs, excluding Midway, "as a preserve and breeding ground for native birds" to be administered by the Department of Agriculture. The HIR was transferred to the DOI in 1939 and in 1940 renamed the HINWR through Presidential Proclamation 2466, with control transferred to the USFWS. Within the HINWR, the USFWS asserts management authority over coral reef resources to a depth of 10 fm around all islands with the exception of Necker Island, where it asserts a 20 fm boundary. The USFWS acknowledges that all HINWR islands are part of the State of Hawaii, but asserts that the islands are federally owned and administered as a NWR by the USFWS (Smith 2000b; USFWS (US Fish and Wildlife Service) 1999b).

Kure Atoll was initially included in Executive Order 1019 in 1909, which established the HIR. However, Kure Atoll was returned to the Territory of Hawaii in 1952 by Executive Order 10413 (Yamase 1982). Kure Atoll is the only State Wildlife Refuge in the NWHI and extends out three miles, to the State's seaward boundary (Feder pers. com.).

In the PRIAs, the USFWS—based on interpretation of Executive Order 7358—asserts that its refuge boundaries extend to the extent of the NDSA, which was administered by the Department of Defense before the transfer of surplus land to the USFWS. The USFWS currently manages seven wildlife refuges in the PRIAs: Palmyra Atoll, Kingman Reef, Jarvis, Baker, and Howland Islands, and Johnston and Midway Atolls (Smith 2000b).

On January 18, 2001, the USFWS, through Secretarial Order 3223, declared Kingman Reef and the surrounding submerged lands and waters as a National Wildlife Refuge out to a distance of 12 nautical miles. Additionally, Secretarial Order 3224, issued the same day, declared the tidal lands and submerged lands and waters of Palmyra Atoll as a National Wildlife Refuge out to a distance of 12 nautical miles.[40]

Midway Atoll NWR, established under Executive Order 13022 in 1996, is located in the NWHI and has a refuge boundary that is within a 22 by 22 mile quadrant surrounding the atoll (the exact boundary is disputed). The Navy established a Naval Air Facility at Midway in 1941. The USFWS established an overlay refuge in 1988 to manage the fish and wildlife on the Atoll. Through the Base Alignment Closure Act of 1990, as amended, the Naval Air Facility closed in 1993 and the property was transferred to the USFWS in 1996 (USFWS 1999a). The mission of the refuge is to protect and restore biological diversity and historic resources of Midway Atoll, while providing opportunities for compatible recreational activities, education and scientific research (Shallenberger 2000). Through a long-term cooperative agreement with a private company (Midway Phoenix Corp.), the refuge has been open to the public for marine recreation and education (Shallenberger 2000). This agreement was terminated as of January 2002.

Johnston Atoll NWR is managed cooperatively with the Navy. The atoll was first established as a federal bird refuge on June 29, 1926, through Presidential Executive Order 4467 to be administered by the Department of Agriculture. In 1934, through Executive Order 6935, the atoll was placed under the jurisdiction of the Navy for administrative purposes and has been used as a military installation since 1939. In 1941 Executive Order 8682 designated Johnston and other Pacific atolls NDSAs. In July 1, 1948, the US Navy, through an interagency transfer, gave operational control of Johnston Atoll to the US Air Force. Since 1976, the USFWS, under agreement with the military, assists in management of fish and wildlife resources on the atoll. The USFWS manages a recreational fishing program in the NWR (Smith 2000b).

Administration of Jarvis, Howland, and Baker Islands was transferred from the Office of Territorial Affairs to the USFWS in 1936 to be run as NWRs. The USFWS asserts refuge boundaries out to three nautical miles, and it prohibits fishing and any type of unauthorized entry

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[40] A September 15 2000, legal opinion by Randolph Moss, Assistant Attorney General, US Department of Justice, states that they are "unconvinced that the President has the authority to establish or expand a wildlife refuge within the U.S. territorial sea (12 miles) or the EEZ using presidential authority recognized in *Midwest Oil*." Because the National Wildlife Refuge System Administration Act does not itself contain a provision authorizing the President to withdraw land for a wildlife refuge, the DOI argues that the President could rely on the implied authority to reserve public lands recognized in *United States v. Midwest Oil Co.* 236, U.S. 459 (1915). The Federal Land Policy and Management Act (FLPMA) of 1976 repealed the President's authority, effective on and after approval of the Act, to make withdrawals and reservations resulting from acquiescence of Congress (*U.S. v. Midwest Oil Co*.). Moss continued by stating that they find "it likely that a court would find that §704(a) of the FLPMA prohibits the President from relying on the implied *Midwest Oil* authority to withdraw lands, regardless of where those lands are located." Also, he notes that "they do not think history makes it clear that the President may continue to make *Midwest Oil* withdrawals in the territorial sea or EEZ following the enactment of the FLPMA."

(Smith 2000b). The USFWS acknowledges the Council's fishery management authority, in coordination with the NMFS, within the "200-nautical mile EEZ" (Smith 2000b).

Rose Atoll NWR, located in American Samoa, was established through a cooperative agreement between the Territory of American Samoa and the USFWS in 1973. Presidential Proclamation 4347 exempted Rose Atoll from a general conveyance of submerged lands around American Samoa to the Territorial Government. The boundary of the refuge extends out to three miles around the atoll and is under the joint jurisdiction of the Departments of Commerce and Interior, in cooperation of the Territory of American Samoa. Here too, the USFWS acknowledges fishery management authority of the Council, in coordination with the NMFS, within the "200-nautical mile EEZ" (Smith 2000b).

In the Ritidian Unit of the Guam National Wildlife Refuge, USFWS has fee title, which includes 371 acres of emergent land and 401 acres of submerged lands down to the 100-foot bathymetric contour. The submerged lands adjacent to Ritidian were never transferred to the Territory of Guam pursuant to the TSLA by the Federal government. In 1993, the USFWS acquired the emergent land of the Ritidian Unit and the surrounding submerged lands from the Navy at no cost (Smith 2000b).

Department of Defense Naval Defensive Sea Areas

A number of Executive Orders have given administrative authority over territories and possessions to the Army, Navy, or the Air Force for use as military airfields and for weapons testing. In particular, Executive Order 8682 of 1941 authorizes the Secretary of the Navy to control entry into NDSAs around Palmyra, Johnston, and Midway Atolls, Wake Island, and Kingman Reef. The NDSA includes "territorial waters between the extreme high-water marks and the three-mile marine boundaries surrounding" the areas noted above. The objectives of the NDSA are to control entry into naval defensive sea areas; to provide for the protection of military installations; and to protect the physical security of, and ensure the full effectiveness of, bases, stations, facilities, and other installations (32 CFR Part 761). In addition, the Airforce has joint administrative authority with the USFWS of Johnston Atoll and has recently transferred administrative authority over Kingman Reef to the USFWS. In 1996 Executive Order 13022 rescinded the Midway Atoll NDSA, and the Wake Island NDSA has also been suspended until further notice.

The Navy exerts jurisdiction over Farallon de Mendinilla in the CNMI and Ka'ula Rock in the main Hawaiian Islands, which are used as military bombing ranges. The Navy also exerts jurisdiction over a variety of waters offshore from military ports and air bases in Hawaii, PRIAs, Guam, and the CNMI.

Issues

Claims between "state" and federal resource management agencies involving marine boundaries over individual islands, reefs and atolls, continue to be unresolved in the Western Pacific Region. Tables 1 and 2 summarize these various claims.

Northwestern Hawaiian Islands

The NWHI are primarily uninhabited atolls, islands, banks and shoals and are currently under multi-agency jurisdiction including the State of Hawaii, the US Fish and Wildlife Service, the National Marine Fisheries Service and the Western Pacific Regional Fishery Management Council. Overlaps in jurisdiction and the varying regulatory authorities embodied in the management of this area can create numerous challenges and has led to contention regarding access and use for the region.

The State of Hawaii claims jurisdiction of all submerged lands from the shoreline to the extent of the State's jurisdiction in the NWHI. In accordance with the Hawaii Organic Act of April 30, 1900, c 339, 31 Stat 141 Section 2, and the Hawaii Admissions Act of March 18, 1959, Pub L 86-3, 73 Stat 4 Section 2, the Islands of the Hawaiian Archipelago, together with their appurtenant reefs and territorial waters, with the exception of Midway Atoll, are part of the territory of Hawaii and are managed by the State of Hawaii including all submerged lands and marine resources. The State of Hawaii, Department of Land and Natural Resources has stewardship responsibility for managing, administering and exercising control over the coastal and submerged lands, ocean waters and marine resources under State jurisdiction around each of the Northwestern Hawaiian Islands under Title 12, Chapter 171.3 Hawaii Revised Statutes. Under an Executive Order issued by President Truman, the emergent lands at Kure Atoll are also managed as a State Wildlife Refuge.

In addition to the State of Hawaii, the USFWS also claims jurisdiction over atolls, islands, banks and shoals in the NWHI. Following the Hawaii Admissions Act of March 18,1959, federal agencies were directed to inventory all lands for which there was a continuing need. The USFWS in 1963, reported a continuing need of 1,765 acres of land in the NWHI. This area consisted of only the emergent land in the NWHI as was claimed by the Department of Agriculture as the original boundary of the Hawaiian Islands Refuge (Yamase 1982). More recently however, the USFWS claims that the HINWR includes 252,000 acres of submerged lands based on their interpretation of the terms "reef and inlets" contained in Executive Order 1019 (US Fish and Wildlife Service 1986). Within the HINWR, the USFWS asserts management authority over coral reef resources to a depth of 10 fathoms around all islands with the exception of Necker Island where it asserts a 20 fathom boundary. The USFWS acknowledges that all HINWR islands are part of the State of Hawaii, but asserts that the islands are federally owned and administered as a

NWR by the USFWS (U.S. Fish and Wildlife Service 1999b, Smith 2000b). Other jurisdictional disputes also involve East and Tern Islands in French Frigate Shoals.[41] [42]

Issues have developed from a series of directives from President Clinton that focused public attention on protection of US coral reef ecosystems. Executive Order 13089, Coral Reef Protection, issued in June 1998, requires agencies to (1) identify actions that may affect US coral reef ecosystems; (2) use their programs and authorities to protect and enhance the condition of such ecosystems; and (3) ensure that any actions they authorize, fund, or carry out will not degrade the conditions of coral reef ecosystems. Agencies whose actions affect US coral reef ecosystems must provide for implementation of measures needed to research, monitor, manage and restore affected ecosystems, including, but not limited to, measures reducing impacts from pollution, sedimentation, and fishing. The E.O. also established the US Coral Reef Task Force composed of the heads of 11 federal agencies and the Governors of the seven states, territories, or commonwealths with responsibilities for coral reefs. In March 2000, the Task Force issued the National Action Plan to Conserve Coral Reefs, which presents a cohesive national strategy to implement EO 13089.

In May 2000, the President issued a Memorandum stating that it is time to implement the Coral Reef Task Force's recommendations in order to comprehensively protect the coral reef ecosystem of the NWHI.[43] The Memorandum directed the Secretaries of Interior and Commerce, in cooperation with the State of Hawaii, and in consultation with the WPRFMC, to develop recommendations for a new, coordinated management regime to increase protection for the NWHI coral reef ecosystem and provide for sustainable use. After considering their recommendations and comments received during the public visioning process on this initiative, President Clinton issued Executive Order 13178 on December 4, 2000, establishing the Northwestern Hawaiian

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[41]In 1940, Territorial Governor Poindexter issued an Executive Order in concurrence with the President of the U.S. to set aside East Island for the use and purpose of the United States as a radar station communication base under the DOC (Yamase, 1982). Prior to statehood, the DOC returned East Island to the Territory of Hawaii (Yamase, 1982). However, the DOI contends that East Island was part of the HIR as established by Executive Order 1019 in 1909 and later transferred to the DOI in 1939. Therefore, East Island remains included in the HINWR and under authority of DOI.

[42] Tern Island was expanded from 11 to 37 acres in 1942 by military dredging (Yamase 1982). In 1948, the Navy conveyed Tern Island to the Territory of Hawaii which then permitted the US Coast Guard in 1952 to establish a navigational Loran station (Yamase 1982). In 1979, USCG operations were terminated and the Hawaii State Legislature adopted resolutions requesting the Governor to take immediate action to acquire and return Tern Island for use as a fishing base to support commercial activities (Yamase 1982). The Federal government asserts that it retains jurisdiction over Tern Island based on Executive Order 1019 and that the Navy did not have the authority to legally convey title to the Territory of Hawaii, therefore, the conveyance is void (Yamase 1982).

[43] The President's directive coincided with Executive Order 13158, which requires federal agencies to establish a comprehensive national network of marine protected areas throughout US marine waters. The Executive Order calls for expansion of the nation's MPA system to include examples of all types of marine ecosystems. According to the executive order, a MPA means any area of the marine environment that has been reserved by federal, state, territorial, tribal, or local laws or has regulations to provide lasting protection for part or all of the natural and cultural resources therein.

Islands Coral Reef Ecosystem Reserve, pursuant to the National Marine Sanctuaries Amendments Act of 2000 (NMSA). The EO was revised and finalized by Executive Order 13196, issued January 18, 2001. Pursuant to Executive Order 13178 and the NMSA, NOAA is initiating the process to designate the Reserve as a national marine sanctuary (66 FR 5509, January 19, 2001). These actions to protect the coral reef ecosystem of the NWHI and provide for sustainable use of the area underscore the immediate need for a comprehensive assessment of the impacts of fishing activity on this ecosystem.

Given the ongoing nature of the sanctuary designation process, this EIS does not address the outcome of that process or possible impacts of the proposed sanctuary on all components of the human environment. Preliminary potential impacts to the human environment are addressed in the environmental consequences section of the EIS. However, two alternatives considered by this EIS (3 and 4, described in Chapter 2) are consistent with the concept of establishing marine reserves in the NWHI, as described in the CRE-FMP.

The USFWS and the Council have different opinions about primary fishery management responsibilities in EEZ waters within NWR boundaries. Since the late 1960s, citing USFWS interim administrative policy and interpretation of Executive Order 1019, the USFWS has asserted that they would enforce refuge regulations within the “de facto” boundaries of the HINWR, which include all emergent land and their surrounding waters out to a depth of 10 fm for all islands and later 20 fm around Necker Island (Smith 2000b). Under the authority of the MSFCMA, the Council promulgated crustacean fishery regulations that correspond with USFWS refuge boundaries of 0-10 fathoms within NWHI federal waters, except at Necker where refuge boundaries extend to 20 fm (WPRFMC 1986). The Council recognizes state waters in the NWHI from 0-3 miles and asserts management authority over fishery resources in all federal waters (3-200 miles), except at Midway where it asserts authority from 0-200 miles (Gillman 2000).

<u>Main Hawaiian Islands</u>

The State of Hawaii claims jurisdiction beyond its territorial seas of 0-3 nautical miles by claiming archipelagic status over channel waters between the main Hawaiian islands (MacDonald and Mitsuyasu, 2000). The Federal Government does not recognize the State’s claim of archipelagic jurisdiction, but interprets the State’s seaward authority to stop at 3 nautical miles from the baseline (Feder 1997, MacDonald and Mitsuyasu 2000). The authority of the Magnuson Act therefore, begins at 3 miles from the shoreline around all main Hawaiian islands in the State of Hawaii. However the State of Hawaii does not agree with this interpretation.

<u>American Samoa</u>

The legal relationship between the Territory of American and the US with regard to fisheries management is unresolved due to a discrepancy in the wording of the deeds of cession signed by the chiefs of what is now American Samoa and the law enacted by Congress which extended US sovereignty over the eastern Samoa islands in 1900. Language contained in the deeds of cession signed by the chiefs of Tutuila district state that they ceded, transferred and yielded up “all these islands of Tutuila and Aunu‘u and all other islands, rocks, reefs, foreshores and waters lying between the 13th degree and the 15th degree of south latitude and between the 171st degree and 167th degree of west longitude…." Likewise, the chiefs of the Manu'a Islands also ceded to the US "the whole of eastern portion of the Samoan Islands lying east of 171 degrees west of Greenwich and known as Tau, Olosega, Ofu and Rose Islands, and all other, the waters and property adjacent thereto...."

In contrast, Title 48 United States Code, Section 661, by which Congress accepted, confirmed and ratified these cessions by the chiefs, refers only to the islands, and not to the reefs, foreshores and waters or property adjacent lying between the referenced coordinates. Whether Congress deliberately or unintentionally failed to extend sovereignty over reef and ocean waters transferred by the chiefs of Tutuila and Manu'a is uncertain. However, many American Samoans assert that management over the waters and submerged lands surrounding these islands, including submerged lands within the EEZ should remain with the territorial government.

A central premise for ceding eastern Samoa to the U.S. was to preserve the rights and property of the islands' inhabitants. Additionally, American Samoa's constitution makes it government policy to protect persons of Samoan ancestry from the alienation of their lands and the destruction of the Samoan way of life and language and to encourage business enterprise among persons of Samoan ancestry. Therefore, any federal actions within the EEZ waters of American Samoa that would stymie these rights, including restriction of fishing, may be perceived to be contrary to American Samoa's constitution.

CNMI

Currently, the EEZ includes all waters surrounding CNMI from shore out to 200 miles. However, through the legal system CNMI is pursuing a claim that the Commonwealth is vested authority out to 12 miles from the archipelagic baseline. The Council, for the purposes of fisheries management, defers management in waters 0-3 nmi to the CNMI while managing fishery resources 3-200 nmi.

Guam

The Territory of Guam questions the legality of the transference of the Ritidian Unit from the Navy to the USFWS. In its property inventory to the General Services Administration, the Navy listed the Ritidian Unit as excess lands, not of continual need and available for reversion to the Territory. The area represents ancestral lands of Chamorro families. Therefore, the Territory asserts that the fee title should not have been transferred to the USFWS (Guthertz pers. comm.).

In 1976, the Federal Fishery Conservation Zone (later known as the EEZ) was extended to 200 nmi around Guam which gave the federal government authority to manage marine resources within the EEZ. In 1980, the Guam Legislature passed and the Governor signed legislation providing for a 200 mile territorial limit for Guam (DOI 1993). The purpose of this legislation, was to allow the government of Guam to sell foreign fishing rights within Guam's EEZ. In 1996, the Magnuson-Stevens Act authorized the Secretary of State to negotiate foreign fishing agreements for fishing within the EEZ at the request of the Governor of Guam. However, in addition to the "state" waters around Guam, the government has also expressed a continuing interest in obtaining greater authority in managing the EEZ surrounding Guam.

PRIAs

In the PRIAs, primary jurisdiction over nearshore fisheries is an ongoing issue between the Department of the Interior and the Department of Commerce. Management authority is currently unresolved because no clear baseline boundary has been designated from which the seaward boundaries of the PRIAs are measured. Seaward boundaries are not clearly defined because some islands in the PRIAs do not appear to have a seaward boundary as defined by US law (i.e., MSFCMA) (Beuttler 1995). For this reason, jurisdictional boundaries have been claimed by federal agencies in terms of fathoms, miles, or the territorial sea. Furthermore, it is recognized that various Executive Orders have given administrative authority of the PRIAs to either the DOD or DOI. However, Executive Orders themselves do not convey title of submerged lands, unless specifically stated. In any case, based on tentative interpretation by the NOAA legal counsel, MSFCMA authority applies to all marine waters around federally owned possessions (i.e., PRIAs), including marine resources within bays, inlets, and other marine waters to the shoreline (Beuttler 1995).

Additionally, because the NWRSAA does not explicitly authorize the President to withdraw land for a wildlife refuge, the DOI argues that the President could rely on the implied authority to reserve public lands recognized in *United States v. Midwest Oil Co.* 236, U.S. 459 (1915). However, since the Federal Land and Policy Act of 1976 repealed the President's authority, effective on and after approval of the Act, to make withdrawals and reservations resulting from the acquiescence of Congress (*U.S. v. Midwest Oil Co*.), it appears that since 1976 the President has not had the authority to establish or expand a wildlife refuge within the US territorial sea (12 miles) or the EEZ using presidential authority recognized in *Midwest Oil* (Moss 2000). This could call into question asserted marine boundaries of any NWRs established after enactment of the FLPMA.

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Table 1: Marine boundary claims by various jurisdictions in the Western Pacific Region.

				Proposed in CRE-FMP	
	State/Territory	DOC (WPRFMC)	Other Authorities	No-take MPA	Low-use MPA
PRIAs					
Howland I.		0-200 nm	FWS: 0-3 nm	0-50 fm	
Baker I.		0-200 nm	FWS: 0-3 nm	0-50 fm	
Jarvis I.		0-200 nm	FWS: 0-3 nm	0-50 fm	
Johnston I.		0-200 nm	FWS/Air Force: 0-3 nm		0-50 fm*
Kingman R.		0-200 nm	FWS: 0-12 nm [1]	0-50 fm	
Palmyra A.		0-200 nm	FWS: 0-12 nm [2]		0-50 fm*
Wake I.***		0-200 nm	Air Force: 0-3 nm		0-50 fm*
Midway A.		0-200 nm	FWS: 22x22 nm quad	0-50 fm*	0-50 fm*
Hawaii					
MHI	Hawaii: 0-3 nm	3-200 nm			
Nihoa I.	Hawaii: 0-3 nm	3-200 nm	FWS: 0-10 fm**	0-10 fm	10-50 fm
Necker I.	Hawaii: 0-3 nm	3-200 nm	FWS: 0-20 fm**	0-10 fm	10-50 fm

[1] Boundary formerly 0-3 miles under the jurisdiction of the US Navy. Secretarial Order 3224 extended Department of the Interior's jurisdiction to 12 nmi.
[2] Secretarial Order 3223 (Palmyra Atoll) extended USFWS administrative authority to 3 to 12 nmi.
*At Palymyra, Johnston, and Midway special permit fishing is only for recreational and on-island consumption; at Midway, the north half of the atoll would be a no-take MPA and the south half a low-use MPA.
**USFWS boundary begins at the shoreline; legally defined outer boundary of the Hawaiian Islands NWR is unresolved.
***Since 1962, the jurisdiction over Wake Island has resided in the Department of the Interior. Since 1994, the Department of the Army has maintained administrative control of Wake Island.

Table 1 (cont.)

	State/Territory	DOC (WPRFMC)	Other Authorities	Proposed in CRE-FMP No-take MPA	Low-use MPA
FFS	Hawaii: 0-3 nm	3-200 nm	FWS: 0-10 fm**	0-50 fm	
Gardner Pinnacles	Hawaii: 0-3 nm	3-200 nm	FWS: 0-10 fm**	0-10 fm	10-50 fm
Maro R.	Hawaii: 0-3 nm	3-200 nm	FWS: 0-10 fm**	0-10 fm	10-50 fm
Laysan I.	Hawaii: 0-3 nm	3-200 nm	FWS: 0-10 fm**	0-50 fm	
Lisanski I.	Hawaii: 0-3 nm	3-200 nm	FWS: 0-10 fm**	0-10 fm	10-50 fm
Pearl and Hermes R.	Hawaii: 0-3 nm	3-200 nm	FWS: 0-10 fm**	0-10 fm	10-50 fm
Kure A.	Hawaii: 0-3 nm	3-200 nm		0-10 fm	10-50 fm
Guam	Guam: 0-3 nm				
Ritadan Unit		0-200 nm	FWS: 100 ft. isobath		
CNMI	CNMI: 0-3 nm***	3-200 nm			
American Samoa	Am. Samoa: 0-3 nm	3-200 nm			
Rose Atoll		0-200 nm	FWS: 0-3 nm [3]	0-50 fm	

[3] At Rose Atoll, the Department of the Interior/US Fish and Wildlife Service has co-management agreement with the Territory of American Samoa and shares jurisdiction with the Department of Commerce.
**USFWS boundary begins at the shoreline; legally defined outer boundary of the Hawaiian Islands NWR is unresolved.
***The CRE-FMP proposes to defer management in 0-3 nm to the CNMI while managing fisheries 3-200 nm.

Table 2 : Comparison of No-take and Low-use Marine Protected Areas of the Coral Reef Ecosystem FMP with the NWHI Reserve Preservation Areas (RPAs), US Fish and Wildlife Service and State/Commonwealth/Territory

ISLAND OR AREA	CRE FMP	NWHI RESERVE	USFWS	State/Territory/ Commonwealth
Pacific Remote Island Areas				
Howland Island	No-take zone 0-50 fathoms.	–	Howland Island NWR to 3 nm; No fishing allowed.	–
Baker Island	No-take zone 0-50 fathoms.	–	Baker Island NWR to 3 nm; No fishing allowed.	–
Jarvis Island	No-take zone 0-50 fathoms.	–	Jarvis Island NWR to 3 nm; No fishing allowed.	–
Johnston Atoll	Low-use special permit zone 0-50 fathoms.	–	Johnston Atoll NWR/Air Force (Overlay Refuge) to 3 nm; Recreational fishing program..	–
Kingman Reef	No-take zone 0-50 fathoms.	–	Kingman Reef NWR to 12 nm; No fishing allowed.	–
Palmyra Atoll	Low-use special permit zone 0-50 fathoms.	–	Palmyra Atoll NWR to 12 nm; Recreational fishing proposed.	–
Wake Atoll	Low-use special permit zone 0-50 fathoms.	–	Air Force to 3 nm; Fishing allowed.	–
Midway Atoll	No-take zone 0-50 fathoms around north half of Midway. Low-use special permit zone around southern half of Midway.	–	Midway Atoll NWR between 28°5' and 28°25'; 177°10' and 177°30'; following fishing allowed within Refuge boundaries: 1 lobster/person/day; pelagic rec and charter fishing allowed; no bottomfishing.	–

ISLAND OR AREA	CRE FMP	NWHI RESERVE	USFWS	State/Territory/ Commonwealth
Hawaiian Islands				
Main Hawaiian Islands	Special permits for “potentially harvested” species.	–	–	State of Hawaii bottomfish area closures (20 closures across MHI); 10 Marine Life Conservation Districts and 14 Marine Fishery Management Areas in MHI (rules and regulations vary with location).
Nihoa	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms around Nihoa and nearby banks.	RPA extends from the seaward boundary of Hawaii State waters (3nm) out to a mean depth of 100 fathoms. Bottomfish and recreational trolling for pelagics permitted seaward of 25 fathoms.	HINWR to 10 fathoms. No fishing allowed.	State of Hawaii proposed NWHI Marine Fisheries Management Area (NWHI FMA).
Misc. banks around Nihoa and Necker (8).	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms.	–	HINWR to 10 fathoms. No fishing allowed.	–
Necker	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms.	RPA extends from the seaward boundary of Hawaii State waters (3nm) out to a mean depth of 100 fathoms. Bottomfish and recreational trolling for pelagics permitted seaward of 25 fathoms.	HINWR to 20 fathoms. No fishing allowed.	State of Hawaii proposed NWHI Marine Fisheries Management Area (NWHI FMA).
Unnamed bank east of French Frigate Shoals	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms.	RPA to 12 nm from geographic center. No fishing allowed.	HINWR to 10 fathoms. No fishing allowed.	–

ISLAND OR AREA	CRE FMP	NWHI RESERVE	USFWS	State/Territory/ Commonwealth
French Frigate Shoals	No-take zone 0-50 fathoms.	RPA extends from the seaward boundary of Hawaii State waters (3nm) out to a mean depth of 100 fathoms. No fishing allowed.	HINWR to 10 fathoms. No fishing allowed.	State of Hawaii proposed NWHI Marine Fisheries Management Area (NWHI FMA).
Brooks Banks (2)	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms around three banks southeast of St. Rogatien including two Brooks Banks and one bank NW of St. Rogatien.	RPA to 12 nm from geographic center of southeast Brooks Bank, but not closer than 3 nm to the next bank west (northwest Brooks Bank?). No fishing allowed.	HINWR to 10 fathoms. No fishing allowed.	–
St. Rogatien Bank	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms.	RPA to 12 nm from geographic center, but not closer than 3 nm to the next bank east. Bottomfish and recreational trolling for pelagics permitted.	HINWR to 10 fathoms. No fishing allowed.	–
Unnamed bank between Gardner Pinnacles and St. Rogatien Bank	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms.	RPA to 12 nm from geographic center. Bottomfish and recreational trolling for pelagics allowed for 5 years from order.	HINWR to 10 fathoms. No fishing allowed.	–

ISLAND OR AREA	CRE FMP	NWHI RESERVE	USFWS	State/Territory/ Commonwealth
Gardner Pinnacles	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms.	RPA extends from the seaward boundary of Hawaii State waters (3nm) out to a mean depth of 100 fathoms. Bottomfish and recreational trolling for pelagics permitted seaward of 25 fathoms.	HINWR to 10 fathoms. No fishing allowed.	State of Hawaii proposed NWHI Marine Fisheries Management Area (NWHI FMA).
Raita Bank	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms.	RPA to 12 nm from geographic center. Bottomfish and recreational trolling for pelagics allowed for 5 years from order.	HINWR to 10 fathoms. No fishing allowed.	–
Maro Reef	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms.	RPA extends from the seaward boundary of Hawaii State waters (3nm) out to a mean depth of 100 fathoms. Bottomfish and recreational trolling for pelagics permitted seaward of 25 fathoms.	HINWR to 10 fathoms. No fishing allowed.	State of Hawaii proposed NWHI Marine Fisheries Management Area (NWHI FMA).
Laysan	No-take zone 0-50 fathoms. (Crustaceans FMP: Lobster fishing prohibited to 20 nm from geographic center).	RPA extends from the seaward boundary of Hawaii State waters (3nm) out to a mean depth of 100 fathoms. Bottomfish and recreational trolling for pelagics permitted seaward of 50 fathoms.	HINWR to 10 fathoms. No fishing allowed.	State of Hawaii proposed NWHI Marine Fisheries Management Area (NWHI FMA).

ISLAND OR AREA	CRE FMP	NWHI RESERVE	USFWS	State/Territory/ Commonwealth
Misc banks near (SW of) Laysan (4).	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms.	–	HINWR to 10 fathoms. No fishing allowed.	–
Pioneer Bank	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms.	Preservation Area to 12 nm from geographic center. Bottomfish and recreational trolling for pelagics permitted.	HINWR to 10 fathoms. No fishing allowed.	–
Lisianski	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms.	RPA extends from the seaward boundary of Hawaii State waters (3nm) out to a mean depth of 100 fathoms. Bottomfish and recreational trolling for pelagics permitted seaward of 25 fathoms.	HINWR to 10 fathoms. No fishing allowed.	State of Hawaii proposed NWHI Marine Fisheries Management Area (NWHI FMA).
Misc banks near (W of) Lisianski (2).	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms.	–	HINWR to 10 fathoms. No fishing allowed.	–
Pearl and Hermes	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms.	RPA extends from the seaward boundary of Hawaii State waters (3nm) out to a mean depth of 100 fathoms. No fishing allowed.	Hawaiian Islands NWR (HINWR) to 10 fathoms. No fishing allowed.	State of Hawaii proposed NWHI Marine Fisheries Management Area (NWHI FMA).
Misc. banks in the vicinity of Kure, Midway and Pearl and Hermes (4).	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms.	–	HINWR to 10 fathoms. No fishing allowed.	–

ISLAND OR AREA	CRE FMP	NWHI RESERVE	USFWS	State/Territory/ Commonwealth
Kure	No-take MPA in federal waters shallower than 10 fathoms. Low-use special permit zone 10-50 fathoms.	RPA extends from the seaward boundary of Hawaii State waters (3nm) out to a mean depth of 100 fathoms. No fishing allowed.	–	State of Hawaii Wildlife Refuge shoreline to 3 nm. Fishing not prohibited.
American Samoa and Guam				
Rose Atoll	No-take zone 0-50 fathoms.	–	Rose Atoll NWR to 3 nm; no fishing allowed.	A.S co-management agreement with DOI and shared jurisdiction with DOC.
Ritidian Unit of the Guam NWR	–	–	Ritidian Unit to 100 foot contour. Recreational fishing allowed.	–

APPENDIX D:
2002 BIOLOGICAL OPINION

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, Maryland 20910

MAR 8 2002

MEMORANDUM FOR: John H. Dunnigan
Director, Office of Sustainable Fisheries

FROM: Donald R. Knowles David Cottingham for
Director, Office of Protected Resources

SUBJECT: Endangered Species Act Section 7 Consultation on the Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries in the Western Pacific Region

This document transmits the National Marine Fisheries Service's (NMFS) Biological Opinion for the formal consultation on the Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries in the Western Pacific Region, in accordance with section 7 of the Endangered Species Act of 1973 as amended (16 U.S.C. 1531 *et seq.*).

The Biological Opinion concludes that the proposed action is not likely to jeopardize the continued existence of any threatened or endangered species under NMFS' jurisdiction or destroy or adversely modify critical habitat that has been designated for them. Although the Opinion anticipates the take of endangered Hawaiian monk seals in the proposed fisheries, the Opinion does not provide an incidental take statement because the take is not currently authorized under section 101(a)(5) of the Marine Mammal Protection Act, as amended. Once NMFS authorizes that take under the MMPA, the Office of Protected Resources will amend this Opinion to include an incidental take statement. The Opinion also includes discretionary Conservation Recommendations.

NMFS is required to reinitiate section 7 consultation on this fishery if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

We look forward to further cooperation with you in implementing the conditions of this Opinion. Please feel free to call upon my staff for assistance as needed.

Attachment

MAR 14 2002

cc: F/SWR - McInnis
F/SWR3 - Lecky, Ruvelas, Dupree
GCSW - D Harwood
F/PR3 - P Williams

NATIONAL MARINE FISHERIES SERVICE
ENDANGERED SPECIES ACT - SECTION 7 CONSULTATION
BIOLOGICAL OPINION

Agency:	United States Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Sustainable Fisheries Division, Southwest Region, Pacific Islands Area Office
Proposed Action:	Management of the Bottomfish and Seamount Groundfish Fisheries in the Western Pacific Region According to the Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region
Consultation Conducted By:	The National Marine Fisheries Service, Southwest Region and the Office of Protected Resources, Endangered Species Division
Approved By:	David Cottingham
Date of Issuance:	March 8, 2002

Section 7(a)(2) of the Endangered Species Act (ESA) (16 U.S.C. § 1531 et seq.) requires that each Federal agency shall ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When the action of a Federal agency may affect a protected species, that agency is required to consult with either the National Marine Fisheries Service (NMFS) and/or the U.S. Fish and Wildlife Service, depending upon the protected species that may be affected. For the actions described in this document, the action agency is the Southwest Region, Pacific Islands Area Office (Sustainable Fisheries Program) of NMFS. The consulting agency is the Protected Resources Division, also of NMFS. Section 7(b) of the Act requires that the consultation be summarized in a biological opinion detailing how the action may affect protected species.

This document is NMFS' biological opinion (opinion) on the implementation of the Fishery Management Plan for the Bottomfish and Seamount Groundfish Fishery in the Western Pacific Region (Bottomfish FMP)[1], that includes management areas in the waters surrounding Hawaii,

[1]The Western Pacific Regional Fishery Management Council is developing an amendment to the bottomfish FMP to include the Commonwealth of the Northern Mariana Islands and the U.S. Pacific

Guam and American Samoa, and the effects of this action on the endangered blue whale (*Balaenoptera musculus*), endangered fin whale (*Balaenoptera physalus*), endangered humpback whale (*Megaptera novaeangliae*), endangered right whale (*Eubalaena glacialis*), endangered sei whale (*Balaenoptera borealis*), endangered sperm whale (*Physeter macrocephalus*), endangered/threatened[2] green turtle (*Chelonia mydas*), endangered hawksbill turtle (*Eretmochelys imbricata*), endangered leatherback turtle (*Dermochelys coriacea*), threatened loggerhead turtle (*Caretta caretta*), endangered/threatened[3] olive ridley turtle (*Lepidochelys olivacea*), endangered Hawaiian monk seal (*Monachus schauinslandi*), and the designated critical habitat for the Hawaiian monk seal, in accordance with section 7 of the ESA.

Consultation History

The Bottomfish FMP has been amended seven times since its implementation in 1986. Two section 7 consultations have been completed for the Bottomfish FMP. The first was completed in 1986, and considered the effects of the implementation of the newly established Bottomfish FMP. The second was completed in 1991, and considered the effects of the fishery on Hawaiian monk seals and the proposed action to close certain portions of the Northwestern Hawaiian Islands (NWHI) to fishing to create a "protected species study zone" as per Amendment 4 to the Bottomfish FMP, which included the following measures: 1) expansion of the 50 nm study zone to include Nihoa Island, Necker Island, and Maro Reef; 2) institution of a framework process for NMFS to modify the study zone; and 3) a requirement that vessels fishing in the NWHI take an observer upon request of NMFS. The protected species zone was initially implemented through emergency regulation (55 FR 49050), later amended to include modification of the zone at the discretion of NMFS (56 FR 24351). The rule-making allowed NMFS to place observers on bottomfish vessels in the protected species zone to collect information on protected species interactions in the fishery. Both the 1986 and the 1991 consultations determined that the fishery was not likely to jeopardize the continued existence of the Hawaiian monk seal or listed sea turtles.

The NMFS Southwest Region Pacific Islands Office Sustainable Fisheries Program, requested reinitiation of consultation under section 7 of the ESA on October 16, 2000, regarding the proposed continued operation of the bottomfish fishery in the NWHI according to the Bottomfish FMP. Consultation was reinitiated due to the amount of time that has lapsed since issuance of the last biological opinion on the FMP and because the FMP is currently undergoing a National Environmental Policy Act (NEPA) analysis.

Remote Island Areas as bottomfish management areas under the Bottomfish FMP.

[2]In 1978, under the ESA, the green turtle was listed and classified as threatened, except for the breeding populations in Florida and on the Pacific coast of Mexico, which were classified as endangered (50 CFR 17.11).

[3]The nesting populations of olive ridleys along the Pacific coast of Mexico are listed as endangered and all others are listed as threatened (50 CFR 17.11).

The Western Pacific Regional Fishery Management Council (WPRFMC) prepared a Preliminary Draft Environmental Impact Statement on November 2, 2000, (PDEIS) that reviewed the Bottomfish FMP.[4] The PDEIS outlines several alternatives for the operation of the fishery, including one alternative to close the fishery. The preferred alternative analyzed in the PDEIS is the continued operation of the fishery according to current regulations. The PDEIS discusses the potential effects of the bottomfish fishery component located in the NWHI on the endangered Hawaiian monk seal and sea turtle species (WPRFMC, 2000a). The continued operation of the fisheries under the Bottomfish FMP is the proposed action considered in this consultation, and the reader is directed to the PDEIS prepared in accordance with the NEPA for full details of the proposed action (WPRFMC, 2000a). To ensure completeness, this consultation considers the proposed action as it occurs for all areas covered by the bottomfish FMP, however, the analysis concentrates on the effects of the action around the NWHI due to concerns about interactions with the monk seal as identified in the PDEIS.

The NWHI Coral Reef Ecosystem Reserve (Reserve) was established on December 4, 2000, by Presidential Executive Order (E.O.) 13178. On January 18, 2001, E.O. 13178 was amended by E.O. 13196. This amendment included conservation measures that made permanent certain Reserve Preservation Areas within the Reserve. With some exceptions, all fishing activities are prohibited within the Reserve. Bottomfishing is allowed only under permit and limitations are placed on area, catch, and depth of fishing. Bottomfish fishing by Native Hawaiians for subsistence will be allowed under the Reserve system. This consultation considers the effects of the Bottomfish FMP, as modified by the Reserve based on the above mentioned Executive Orders and regulatory implementation of these orders as of October 2001, on species listed as endangered or threatened under the ESA (listed species). Bottomfishing in the Reserve Preservation Areas is more fully described in the Description of the Proposed Action.

I. Description of the Proposed action

NMFS, Sustainable Fisheries Division proposes to continue operation of a fishery under the Bottomfish FMP, in accordance with the principles of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended. The following describes the principles of the MSA, the areas affected by the fishery, and the techniques used to capture bottomfish.

A. Principles of the Magnuson-Stevens Fishery Conservation and Management Act

The MSA is the principal Federal statute governing the management of Federally permitted marine fisheries. The MSA's purpose and policy statements (§2(b)-(c)), elaborated upon through a declaration of ten National Standards (Table 1), serve as the overarching objectives for fishery conservation and management (§301(a)). The MSA has been amended frequently since 1976, most recently by the 2000 Shark Finning Prohibition Act (H.R. 5461). However, several basic

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[4] NMFS announced its intention to prepare a comprehensive Environmental Impact Statement (DEIS) for the Bottomfish FMP on August 16, 1999 (64 FR 44476).

principles have not changed over the course of its amendment history. These include: 1) the biological conservation of a fishery resource is of high priority; 2) conservation and management decision making must be based on the best available scientific information; and 3) information considered must include social, economic and ecological factors.

Table 1. MSA National Standards (16 U.S.C. 1851, Sec. 301(a)).

(a) IN GENERAL. – Any fishery management plan prepared, and any regulation promulgated to implement any such plan, pursuant to this title shall be consistent with the following national standards for fishery conservation and management:	
(1)	Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.
(2)	Conservation and management measures shall be based upon the best scientific information available.
(3)	To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.
(4)	Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.
(5)	Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.
(6)	Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.
(7)	Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.
(8)	Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.
(9)	Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.
(10)	Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

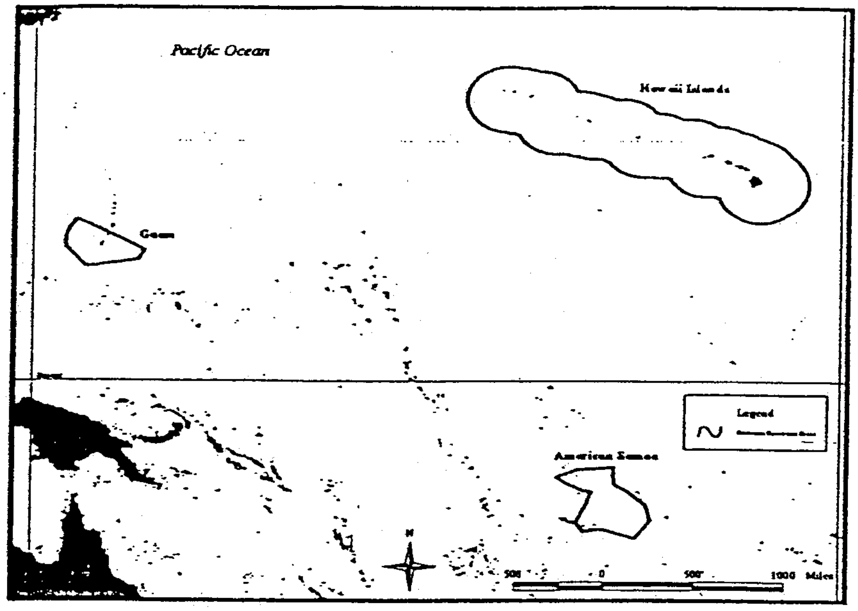
B. The Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific and Description of the Action Area

The action area is all the areas that will be affected directly or indirectly by the fisheries managed under the Bottomfish FMP. These fisheries occur within the Exclusive Economic Zone (EEZ) around U.S. islands in the central, western, eastern and northern Pacific Ocean. These islands include the Northwestern Hawaiian Islands (a chain of largely uninhabited islets, atolls and banks), the main Hawaiian Islands, American Samoa, and Guam (Figure 1).

The Bottomfish FMP's management areas are further subdivided for Hawaii. These areas are: 1) The Main Hawaiian Islands (MHI) EEZ; and 2) the waters around the NWHI which are further divided into the Ho'omalu zone (area west of 165° 00' W longitude) and the Mau zone (area between 161°20' W longitude and 165°00' W longitude); and 3) Hancock seamount (west of

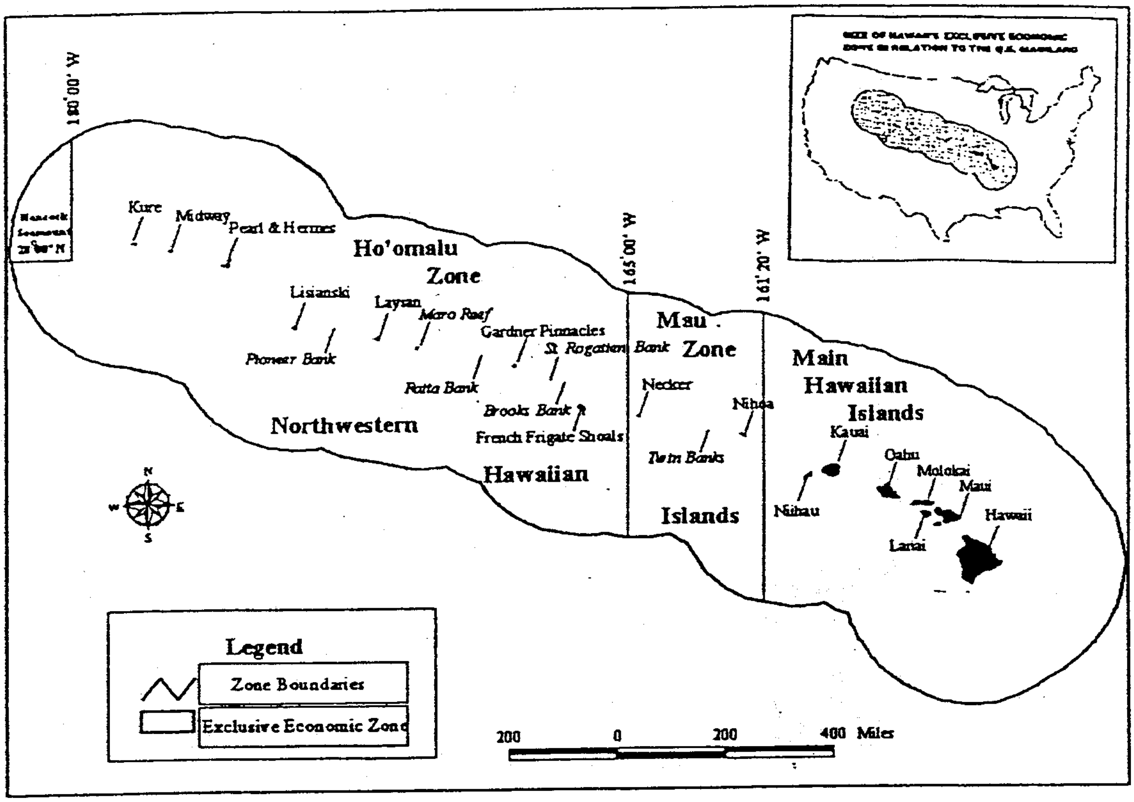
180°00' W longitude and north of 28°00' N latitude) (Figure 2)[5]. The management area for Guam extends to boundaries that are equidistant between Guam and the Commonwealth of the Northern Mariana Islands (CNMI).

Figure 1. Western Pacific Bottomfish Fishery Management Areas (Source: WPRFMC. 2000a)



[5]A moratorium on fishing at the Hancock seamounts began in 1986 and continues through August 31, 2004 (50 CFR 660.68). There are no plans to re-open this fishery.

Figure 2. Bottomfish Fishery Management Subareas in the Hawaiian Archipelago (Source: WPRFMC, 2000a)



In the MHI, an estimated 20 - 30 percent of the bottomfish landed are caught in federal waters, with the remainder of bottomfish caught in State waters (Katekaru, pers. comm., 2001). In American Samoa and Guam, information on bottomfish landed from federal and territorial waters is not available; however, NMFS estimates that most of the emperor fishes and other shallow complex bottomfish are caught within territorial waters and most of the eteline snappers and deep complex bottomfish are caught from the offshore federal waters. The bottomfish fishery around the MHI, Guam, and American Samoa is currently not regulated under the Bottomfish FMP.

C. Management Unit Species (MUS).

Several target species of bottomfish and seamount groundfish are managed under the Bottomfish FMP. The bottomfish management unit species include snappers (*Lutjanidae*), jacks (*Carangidae*), groupers (*Serranidae*) and emperor fishes (*Lethrinidae*). A list of the Management Unit Species (MUS) is provided in Table 2.

Table 2. MUS included in the Bottomfish FMP

Management Unit Species Habitat	HAWAII	GUAM	AMERICAN SAMOA
Shallow water	(Depth 0-100 m) Snappers: *Aprion virescens, Lutjanus kasmira* Jacks: *Pseudocaranx dentex, Caranx ignobilis, C. lugubris, Seriola dumerili*	(Depth 0 - 100 m) Snappers: *Aprion virescens, Lutjanus kasmira* Jacks: *Caranx ignobilis, C. lugubris, Seriola dumerili* Groupers: *Epinephilus fasciatus, Variola louti* Emperor Fishes: *Lethrinus amboinensis, L. rubrioperculatus*	(Depth 0-100 m) Snappers: *Aprion virescens, Lutjanus kasmira* Jacks: *Pseudocaranx dentex, Caranx ignobilis, C. lugubris, Seriola dumerili* Groupers: *Epinephilus fasciatus, Variola louti* Emperor Fishes: *Lethrinus amboinensis, L. rubrioperculatus*
Deep water	(Depth 100-400 m) Snappers: *Etelis carbunculus, E. coruscans, Pristipomoides filamentosus, P. auricilla, P. sieboldii, P. zonatus, Aphareus rutilans* Groupers: *Epinephelus quernus*	(Depth 100 - 400 m) Snappers: *Etelis carbunculus, E. coruscans, Pristipomoides filamentosus, P. auricilla, P. flavipinnis, P. sieboldii, P. zonatus, Aphareus rutilans*	(Depth 100 - 400 m) Snappers: *Etelis carbunculus, E. coruscans, Lutjanus kasmira, Pristipomoides filamentosus, P. flavipinnus, P. zonatus,*
Seamount Groundfish (seamounts 80-600 m) Closed Fishery	(Depth 80 - 600 m) *Psedopentaceros richarsoni, Hyperoglyphe japonica, Beryx splendens*		

Bycatch and incidental catch in the bottomfish fishery includes pelagic species[6] such as tuna, marlin, ono, and mahi mahi; carangids (jacks), various shark species, and miscellaneous reef fish (Table 3). Fish species that are in the near shore environment, including those of the inshore reef complex and coastal pelagic species, are not managed under the Bottomfish FMP. These species include goatfishes (weke), soldier fishes (menpachi), hogfishes (a'awa), scorpionfishes (hogo), bigeye scad (akule), and mackerel scad (opelu). These species are not covered by any other FMP or Federal regulations at this time.[7]

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[6]These pelagic species are also sometimes targeted by bottomfishers. Presently, the bottomfish observer forms are being modified to provide more information regarding target, bycatch, and incidental catch species by trip and fishing day.

[7]The WPRFMC has prepared a new FMP for the Coral Reef Ecosystems of the Western Pacific Region. This FMP includes management unit species inhabiting the nearshore habitat. If approved by the Secretary of Commerce, this FMP is expected to be implemented in 2002.

Table 3. Percent Discards from Bottomfish Fishing Trips with NMFS Observers, 1990-1993 (Source: Nitta 1993)

SPECIES	NO. CAUGHT	NO. DISCARDED	% DISCARDED
Kāhala	2438	2266	92.9
Kalekale (yellowtail)	40	22	55.0
Sharks	176	92	52.3
Misc. fish	115	59	51.3
Ulua (white)	127	62	48.8
Misc. snapper/jack	189	91	48.1
Butaguchi	3430	1624	47.3
Ulua (black)	23	10	43.5
Ta'ape	110	40	36.4
Misc. fish unidentified	174	26	14.9
Kalekale	874	52	6.0
'ōpakapaka	5092	107	2.1
Ehu	1185	20	1.7
Uku	2209	28	1.3
Hāpu'upu'u	1593	19	1.2
Gindai	459	3	0.7
Onaga	1141	8	0.7
Alfonsin	1	0	0.0
Armorhead	1	0	0.0
Lehi	3	0	0.0

Federal observer program data from 1990-1993 indicate a 0 - 92.9 percent species discard rate for the NWHI portion of the Hawaii bottomfish fishery (Table 3). This includes damaged target species or non-target species. Many fish are not kept because of their low marketability. Association with ciguatera biotoxins is another reason for the discard of certain species, such as jacks, and amberjacks (WPRFMC, 2000a). [8]

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[8] Ciguatera poisoning may result from the ingestion of fish or other marine animals containing high concentrations of naturally occurring toxins. The toxins are produced by epibenthic dinoflagellates associated with many coral reef communities. These toxins are transferred to through he food chain from smaller fish to larger fish. Ciguatera poisoning in humans may result in modification of nerve and muscle communication and other critical physiologic processes. (Woods Hole Oceanograhic Institution,

As discussed below in the status of the species section, the bottomfish fishery affects listed species only during operations around the Hawaiian Islands. Therefore, after a full description of the proposed action, the remainder of this opinion will focus on fishing activity in the U.S. EEZ around Hawaii only. The regulations implementing the Bottomfish FMP may be found at 50 CFR 660 and are summarized in the PDEIS. For the purposes of this consultation, it is important to note that the following sections apply to activities under the Bottomfish FMP: 1) gear restrictions (no bottom trawls, bottom set gillnets, poisons, explosives, or other intoxicating substances are to be employed in the management areas); 2) a limited entry permit program for fishing in the NWHI which, as of October 1, 2001, consisted of 12 permit holders: six in the Ho'omalu Zone and six in the Mau Zone; 3) a requirement that vessel operators in the NWHI bottomfish fishery attend a NMFS protected species workshop; 4) 72 hour notification requirement and observer placement option for NMFS for fishing in the protected species zone[9]; 5) a discretionary observer requirement throughout the fishery; and 6) reporting and record keeping of MUS, which includes the calculation of Maximum Sustainable Yield (MSY), an annual evaluation of the conditions of the fishery, and information on habitat degradation.

From October 1990 through December 1993, the NMFS conducted an observer program for the bottomfish fishery in the Protected Species Study Zone of the NWHI. Observer coverage began on a voluntary basis in October 1990, and became mandatory (i.e. vessels were required to carry observers on board as ordered by the Southwest Regional Administrator) in November of that same year due to the proximity of bottomfishing operations to monk seal habitat. The objectives of the observer program were to document and characterize any interactions of the bottomfish fishery with protected species and to collect catch and effort data for the bottomfish fishery (Nitta, 1993). NMFS is considering the reactivation of the observer program for the bottomfish fishery. However, the form of the program (e.g. period of coverage, coverage beyond the Protected Species Study Zone, possible use of video technology, etc.) has not been determined as of October 2001. The objectives of the reactivated program will be consistent with prior objectives. In short, the level and character of interactions with protected species and other information will be recorded for analysis and development of fishery management, as appropriate.

D. Fishing Methods Practiced in Action Area

Bottomfishers use mechanical handlines with electric, hydraulic or hand powered reels to raise and lower the lines. The main line used is made of various materials woven into 400-450 lb test line. The hook leaders are usually within the range of 80-120 lb test monofilament. The hooks utilized in the bottomfish fishery are circle hooks, generally of the Mustad sizes11/0, 12/0 and 13/0. A typical bottomfish rig has 6-8 hooks branching off the main leader. The lead weight at

1993)

[9]The Protected Species Zone was created in 1991 (56 FR 1991, 24731). The zone is a 50 nm area around Nihoa, Necker Island, French Frigate Shoals, Gardner Pinnacles, Maro Reef, Laysan Island, Lisianski Island, Pearl and Hermes Reef, Midway Islands, and Kure Island. Longline fishing within this zone is prohibited unless the vessel operator has notified the NMFS Regional Administrator and provided an opportunity for NMFS to place an observer aboard the vessel.

the end of the main leader typically weighs 5-6 lbs. The lines off the main leader to each hook may be 2-3 ft long and connected to the main leader with a 3-way swivel. The spacing between each "hook" line may be 6 ft. The bait generally used is squid, but this may be supplemented with a chum bag containing chopped fish (anchovies) or squid suspended above the highest hook (Nitta and Henderson 1993). Additional shark distracting line may be used to distract sharks from fishing activities. These lines are usually rope or some other heavy line with a float, hook, and discard fish attached.

Vessels fishing in the NWHI range in size from 40 - 65 feet, and are usually equipped with electronic navigation and fish-finding equipment that allow a skilled captain to harvest target species with little bycatch (WPRFMC, 2000a). Bottomfish trips usually last 10 to 25 days, and vessels travel as far as Kure Atoll. Historically, bottomfish fishing was not restricted in the NWHI. Table 4 details the approximate percentage of total catch some areas have historically represented.

Implementation of the Reserve in the NWHI may result in decreased catches and a redistribution of bottomfishing effort in the NWHI. Due to the closed area and fishing caps, change(s) in fishing effort and potential decrease in catch are unknown at this time. However, future (post-Reserve) landings will be no greater than the average of those over the last five years as required by E.O. 13178 as amended by E.O. 13196. Furthermore, the area fished by the bottomfish fishery is restricted under the these executive orders as they establish closed areas in the NWHI such that some of the areas formerly fished by the bottomfish fishery are now closed. These areas include: areas out to 25 fathoms around Nihoa, Necker, Gardner Pinnacles, Maro Reef, Laysan Island, and Lisianski Island. Furthermore, Reserve Preservation Areas now exist around French Frigate Shoals, Pearl and Hermes Reef, Kure Atoll, Brooks Bank, St. Rogatien Bank, Raita Bank, and Pioneer Bank. Bottomfish fishing, although allowed under around St. Rogatien, Raita , and Pioneer Banks, is subject to the restrictions set forth in 7(a)(1) and 7(a)(2) of the E.O.13178 as amended by E.O. 13196 which charges the Department of Commerce to establish fishing caps tied to bottomfishing activities over the preceding five years (not to exceed average of prior five year catch levels) and may provide for a one time increase in the total catch to allow for the use of two Native Hawaiian bottomfishing permits. Additionally, bottomfish fishing around Raita and St. Rogatien Banks will be allowed for only five years if it is determined that the continuation of the fishing activity will have no adverse impact on the resources of these banks. ((Exec. Order No. 13196 (January 18, 2001) 7(a)(1) and 7(a)(2) apply to all Preserve Areas in which bottomfishing is allowed.

At the present time, resource managers are devising regulatory mechanisms and policies to implement these executive orders, potentially including the conversion of the boundaries (and restricted areas) to straight-line boundaries for clarity and ease of identification as well as setting fishing caps. The current (pre-Reserve) prohibition on bottomfish fishing within the boundaries of the Midway Atoll National Wildlife Refuge between the parallels of 28°5' and 28°25' North latitude and between the meridians of 177°10' and 177°30' West longitude remains intact and does not constitute a change in the bottomfish fishery area of operation. (Exec. Order No. 13022, 63 Fed. Reg. 11624 (1998)) The current proposed fishing cap scenarios (Scenarios A-E) are listed at Appendix A.

Table 4. Approximate Percentage of Total Catch in NWHI Bottomfish Fishery from Selected Areas Based on Historical Fishing Data. (Source: WPRFMC, 2000a)

AREA	PERCENT OF TOTAL CATCH
Nihoa Island and Twin Banks	16.6
Brooks Bank and St. Rogatien Bank	14.2
Laysan Island	13.6
Necker Island	13.0
Gardner Pinnacles	12.9
Lisianski Island	6.8
French Frigate Shoals	5.6
Kure Atoll	4.4
Maro Reef	4.2
Pioneer Bank	4.0
Raita Bank	2.6
Pearl and Hermes Reef	2.1
Midway Atoll	0.0

Bottomfishing in the MHI employs methods similar to those in the NWHI. However, MHI vessels are typically smaller and return to port after a single day of fishing. Commercial fishers and some larger vessels in the MHI with larger vessels make trips longer than 24 hours, typically to the islands of Kauai, Niihau, east Maui, and Penguin Banks. The favored fishing grounds within state waters in the MHI are off the islands of Molokai, Maui, Lanai and Kauai. Bottomfish fishing grounds within Federal waters around the MHI include Middle Bank, most of Penguin Bank, and approximately 45 nm of 100 fathom bottomfish habitat in the Maui-Lanai-Molokai complex. The following figures (Figures 3-4) show the number of vessels participating in the MHI and the bottomfish fishery of the MHI and the NWHI (Mau and Ho'omalu Zones). The NWHI fishery is not expected to differ substantially from the average participation patterns as shown over the last five years. However, the fishing effort (location) may change because of the Reserve restrictions, with the total amounts of fishing days, catch rates, and total catch of individual fish species dependent upon the reaction of the bottomfishers to the Reserve restrictions, markets, and environmental factors. These figures show the increase in the number of bottomfish vessels participating in the MHI and the stability of the number of vessels participating in the NWHI since 1989 and 1999 when the Bottomfish FMP was amended to establish a limited entry permit system for the Ho'omalu Zone and Mau Zone, respectively. (WPRFMC, 2000a). In 1999 the number of vessels participating in the Mau and Ho'omalu Zones were 7 and 6, respectively. In 2000, the number of vessels participating in the Mau and Ho'omalu Zones were 6 and 5, respectively. This indicates a drop in vessel participation from 13 in 1999 to 11 in 2000 (WPRFMC, 2001a).

Figure 3: Number of Vessels Participating in the Main Hawaiian Islands, 1989-1998 (Source: WPRFMC, 2000a)

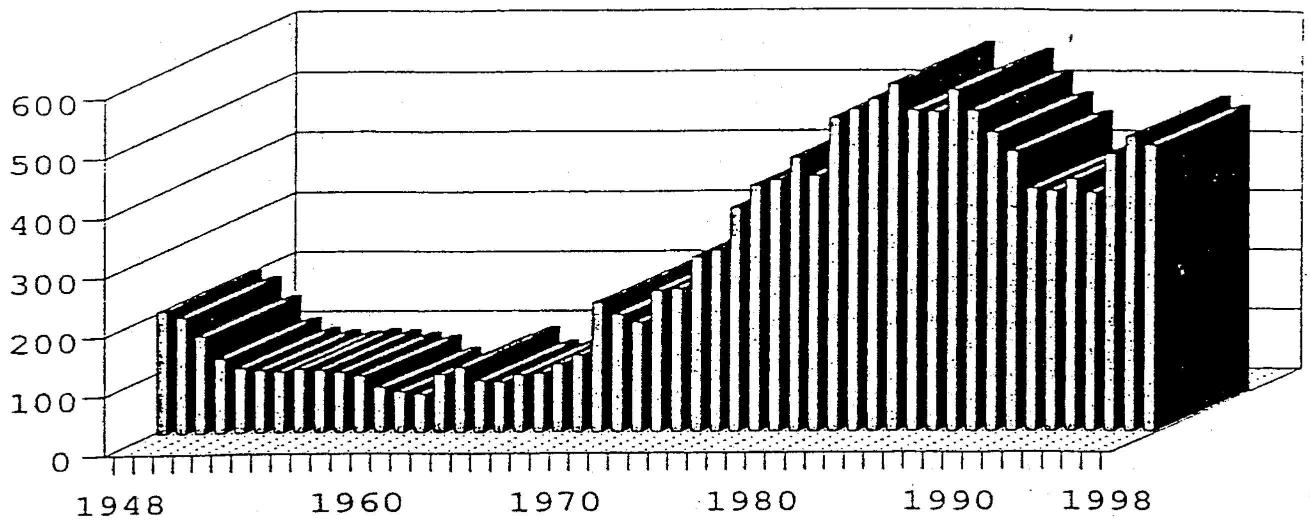
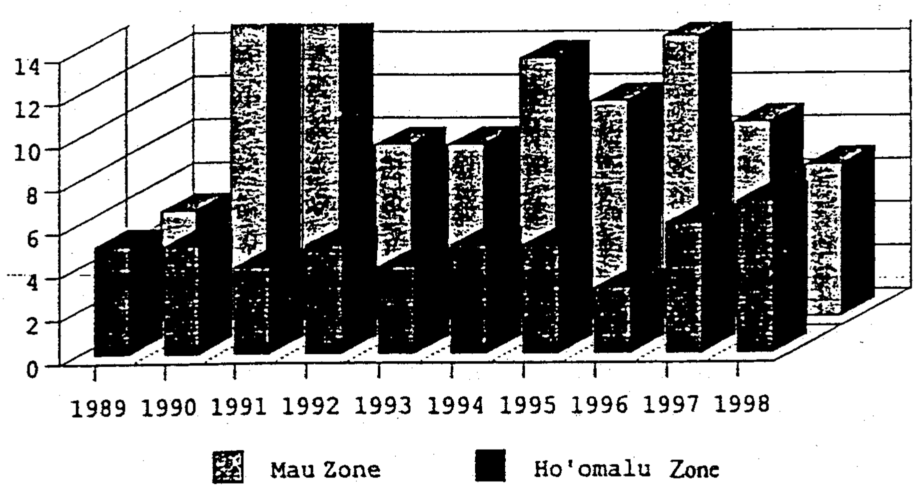
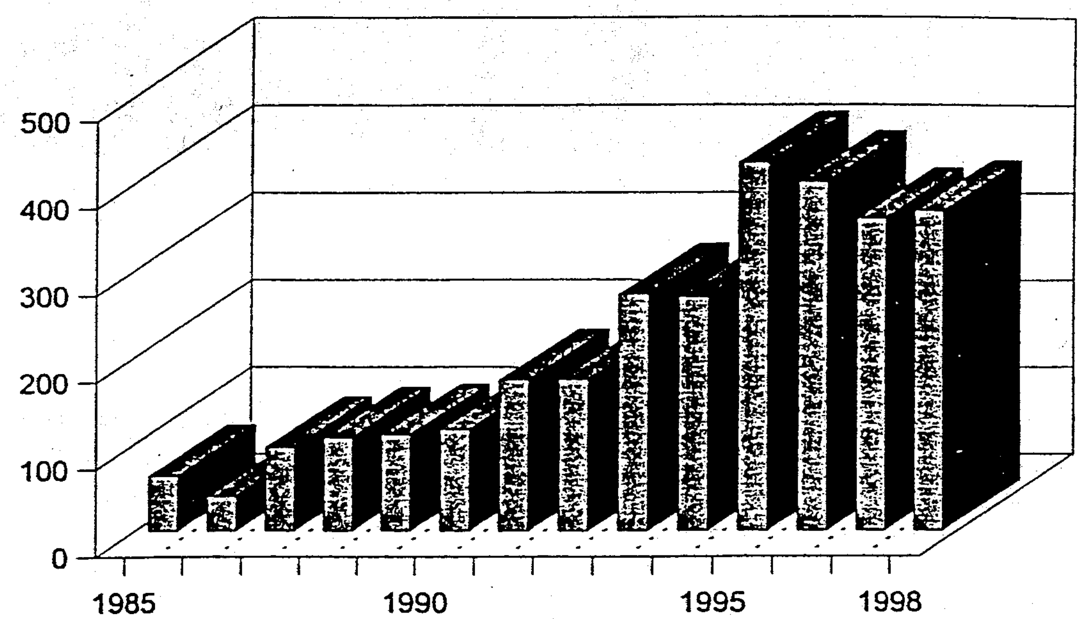


Figure 4. Number of Vessels Fishing in the Mau Zone and Ho'omalu Zone, 1989-1998 (Source: WPRFMC, 2000a



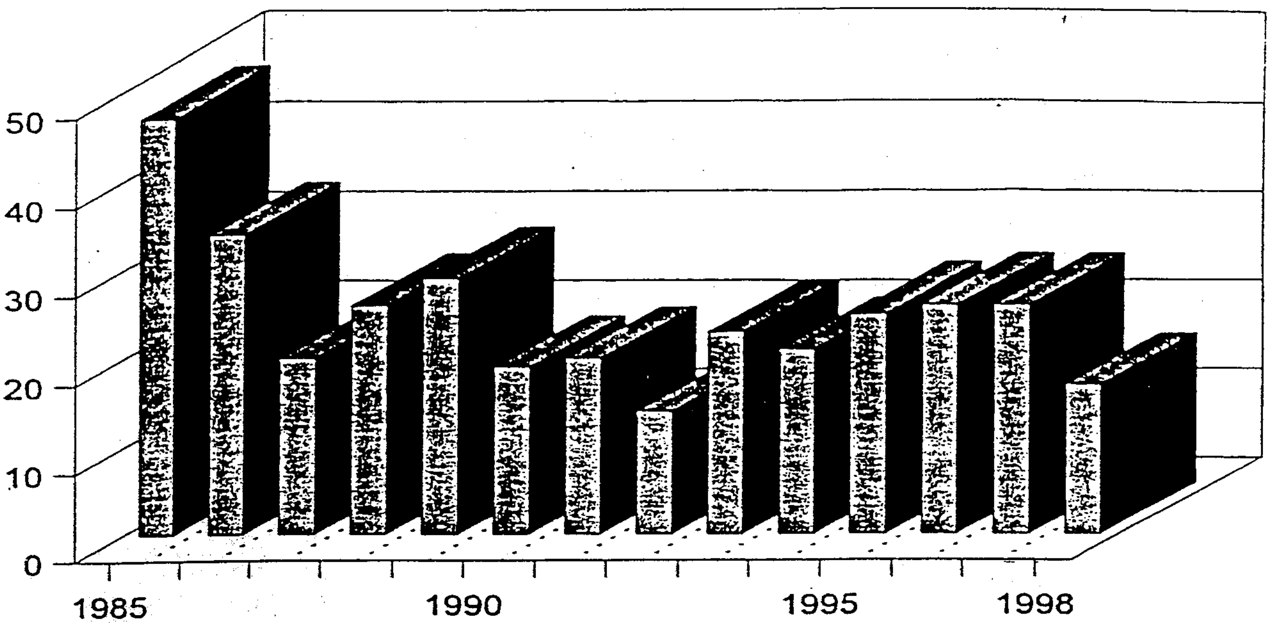
In Guam the bottomfish fishery has two distinct components. The deepwater component (500 - 700 ft) targets snappers and groupers. The shallow-water component, that occurs primarily within Guam territorial waters, targets reef dwelling snappers, groupers, emperors, and jacks. Guam bottomfish vessels are typically 25 ft and utilize small spincasting reels in the shallower waters and electric reels with main lines with multiple hooks in the deeper waters. Skipjack tuna is used for bait, and chumming is used to attract fish. The Guam fishery is seasonal due to weather conditions, with most bottomfish fishing occurring during the summer months (May through September) (DEIS p. 3-61). Figure 5 shows the increase in the number of vessels participating in the Guam bottomfish fishery 1965 through 1998.

Figure 5. Number of Vessels Participating in the Guam Bottomfish Fishery, 1985-1998 (Source: WPRFMC, 2000a)



In American Samoa, the small boat fleet uses wooden hand reels for both trolling and handlining, and skipjack tuna is used for bait. American Samoa bottomfish vessels are typically 28 ft aluminum catamarans, and are not equipped with electronic navigation and fish-finding equipment. Most boats do not carry ice, making it unfeasible to fish longer than one over night trip at a time. Recently, vessels larger than 35 ft with cold storage capabilities have joined the fleet, allowing the potential for expanded bottomfish fishing operations. Further expansion may not be realized, however, as bottomfish vessels convert to pelagic longlining operations (WPRFMC, 2000a). Figure 6 shows the increase in the number of vessels participating in the American Samoa bottomfish fishery 1965 through 1998.

Figure 6. Number of Vessels Participating in the American Samoa Bottomfish Fishery, 1985-1998 (Source: WPRFMC, 2000a)



E. Observed Interaction Events

The endangered Hawaiian monk seal (*Monachus schauinslandi*), and the threatened green turtle (*Chelonia mydas*), occur within the NWHI and the MHI in the action area. Critical habitat for the Hawaiian monk seal extends to 20 fathoms, some of which is located within Federal waters of the bottomfish fishery in the NWHI.

From October 1990 - October 1993, NMFS observers completed 26 cruises on 11 vessels to document interactions[10] between the bottomfish fishery and protected species (13 percent observer coverage). A later estimate, which included all the observed trips, indicated that monk seals interacted with bottomfish fishing operations once every 67.7 hours of fishing, with no confidence intervals provided (Nitta, 1993). In total, interactions with monk seals and fishing operations were observed on 10 out of 26 of the observed trips, involving a maximum of 26 different seals. In an effort not to overestimate the number of seals interacting with the fishery, the observers noted, to the extent possible, when the same seal interacted on multiple occasions. No other listed species interactions were observed during these trips.

[10]An Interaction was defined in the report as "an instance in which fish caught during bottomfishing operations were stolen or damaged by marine mammals or marine mammals and/or other protected species were caught or entangled in bottomfishing gear." (Nitta, 1993, p. 5). However, it should be noted that observers did not witness any entanglements or hookings of monk seals or any other listed species.

II Status of Affected Species

A. Listed Species/Critical Habitat in the Action Area

The following endangered and threatened species are present in the action area of domestic fisheries in the Western Pacific Region under the Bottomfish FMP.

Marine Mammals	Status
Blue whale (*Balaenoptera musculus*)	Endangered
Fin whale (*Balaenoptera physalus*)	Endangered
Hawaiian monk seal (*Monachus schauinslandi*)	Endangered
Humpback whale (*Megaptera novaeangliae*)	Endangered
Right whale (*Eubalaena glacialis*)	Endangered
Sei whale (*Balaenoptera borealis*)	Endangered
Sperm whale (*Physeter macrocephalus*)	Endangered

Sea turtles	Status
Green turtle (*Chelonia mydas*)	Endangered/Threatened
Hawksbill turtle (*Eretmochelys imbricata*)	Endangered
Leatherback turtle (*Dermochelys coriacea*)	Endangered
Loggerhead turtle (*Caretta caretta*)	Threatened
Olive ridley turtle (*Lepidochelys olivacea*)	Endangered/Threatened

Critical Habitat

In May 1988, NMFS designated critical habitat for the Hawaiian monk seal out from shore to 20 fathoms in 10 areas of the Northwestern Hawaiian Islands. Critical habitat for this species includes "all beach areas, sand spits and islets, including all beach crest vegetation to its deepest extent inland, lagoon waters, inner reef waters, and ocean waters out to a depth of 20 fathoms around the following: Pearl and Hermes Reef, Kure Atoll, Midway Islands, except Sand Island and its harbor, Lisianski Island, Laysan Island, Maro Reef, Gardner Pinnacles, French Frigate Shoals, Necker Island, and Nihoa Island" (53 FR 18990, May 26, 1988, 50 CFR § 226.201). As described earlier (*See* discussion *supra* part I.D.), the Reserve sets forth Reserve Preservation Areas which encompass critical habitat and exclude all fishing, including commercial and consumptive bottomfishing from in the areas of critical habitat around Pearl and Hermes Reef, Kure Atoll, Lisianski, Laysan, Maro Reef, French Frigate Shoals, Gardner Pinnacles, Necker Island, and Nihoa Island. Around Midway Islands, the current prohibition on commercial bottomfishing remains intact under the regulations set forth for the Midway Atoll National Wildlife Refuge.[11] (*See* discussion *supra* part I.D.)

[11] A charter boat and recreational fishery targeting pelagic fish and including fishing for bottomfish species in lagoons and nearshore waters exists at Midway Atoll. The fishery is operated by a private company, Midway Sports Fishing, as authorized by the U.S. Fish and Wildlife Service.

Critical habitat for the other species listed above has not been designated or proposed within the action area.

B. Listed Species and Critical Habitat Not Likely to Be Adversely Affected by the Proposed Fishery

Although blue, fin, humpback, right, sei, and sperm whales may be found within the action area and could interact with the FMP bottomfish fishery, there have been no reported or observed incidental takes of these species in the history of the bottomfish fisheries. Also, based upon the dearth of sightings/observations of these species in the area of the proposed action indicate that the probability of an encounter of these species with the bottomfish fishery is extremely low. Therefore, NMFS concludes that the proposed action is not likely to adversely affect blue, fin, humpback, right, sei, and sperm whales, and these species will not be considered further in this Opinion.

Although hawksbill, leatherback, loggerhead, and olive ridley turtles may be found within the action area and could interact with the FMP bottomfish fishery, there have been no reported or observed incidental takes of these species in the history of the bottomfish fisheries. In addition, hawksbill, leatherback, and olive ridley turtle species are likely to occur only very rarely in the action area. Therefore, NMFS concludes that the proposed action is not likely to adversely affect hawksbill, leatherback, loggerhead, and olive ridley turtles, and these species will not be considered further in this Opinion.

Prior biological opinions discussed the potential for adverse effects from vessel lighting and activity near and around nesting beaches utilized by the green turtle. There are no documented green turtle takes resulting from past fishery operations near nesting beaches. There are also no documented takes of green turtles from past fishing operations. The green turtle population has increased in the NWHI in recent years without corresponding interactions with the bottomfish fishery (Laurs, 2000). Therefore, NMFS concludes that the proposed action is not likely to adversely affect green turtles and these species will not be considered further in this Opinion.

Critical habitat was designated in order to enhance the protection of habitat used by monk seals for pupping and nursing, areas where pups learn to swim and forage, and major haul-out areas where population growth occurs. The Bottomfish FMP manages areas included in the critical habitat for the Hawaiian monk seal (i.e. ocean waters out to 20 fathoms depth), although the fisheries operating pursuant to the Bottomfish FMP do not adversely affect the physical features identified as critical habitat, such as substrate, waters, or nesting beaches. However, the proposed action may affect forage species of monk seals and therefore the proposed action may affect the critical habitat designated for the monk seal.

C. Status of the Species/Critical Habitat

This section presents the biological and other information relevant to formulating the biological opinion. Appropriate information on each species' life history, its habitat and distribution, and other data on factors necessary to its survival, are included to provide background for analyses in later sections of this document. The Hawaiian monk seal, the only species determined likely to be adversely affected by the proposed action, and its critical habitat are considered in this section.

1. Hawaiian monk seal

The Hawaiian monk seal was listed as endangered under the ESA in 1976[12] (41 FR 33922). They are endemic to the Hawaiian Archipelago, and are one of the most endangered marine mammals in the United States. Hawaiian monk seals are also the only endangered marine mammal which exists wholly within the jurisdiction of the United States. Monks seals are one of the most primitive genus of seals. They are brown to silver in color, depending upon age and molt status, and can weigh up to 270 kg. Adult females are slightly larger than adult males. It is thought that monk seals can live to 30 years. Females reach breeding age at about 5 to 10 years of age, depending on their condition, and give birth about once every year at most. It is estimated that 40 - 80 percent of adult females give birth in a given year (NMFS unpub. data, 2001). After birth, pups take up to 6 weeks to wean. During this time, the mother suckles the pup, rarely leaving it to feed. After weaning, the mother leaves and the pup must forage independently. Newly weaned pups are somewhat more gregarious than adults. Pups tend to stay in the reef shallows, entering into more diverse and deeper waters to forage as they age. Male aggression is somewhat common, as males compete for females for breeding purposes. Male aggression has resulted in a number of injuries and deaths to females, juveniles, and pups. Monk seals may stay on land up for about two weeks during their annual molt. Monk seals are nonmigratory, but recent studies show their home ranges may be extensive (Abernathy and Siniff, 1998). Counts of individuals on shore compared with enumerated subpopulations at some of the NWHI indicate that monk seals spend about one-third of their time on land and about two thirds in the water (Forney et al., 2000).

Population Status

Before human habitation of the Hawaiian Archipelago, the monk seal population may have measured in the tens of thousands as opposed to the hundreds of thousands or millions typical of some pinniped species. When population measurements were first taken in the 1950s, the population was already considered to be in a state of decline. The year 1998 minimum population estimate (N_{MIN})[13] for monk seals is 1436 individuals (based on enumeration of

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[12]In 1976, the Hawaiian monk seal was also designated as a depleted species under the Marine Mammal Protection Act of 1972, and its population status is considered to be below the optimum sustainable population. The Hawaiian monk seal Recovery Team was formed pursuant to the ESA to develop a Hawaiian Monk Seal Recovery Plan. Supported by NMFS, the HMSRT is a forum in which expertise regarding species recovery and recovery plan implementation are discussed and recommendations for actions forwarded to NMFS.

[13]Under the Marine Mammal Protection Act of 1972, PBR is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: $PBR = N_{MIN} \times 0.5R_{MAX} \times FR$. Based on an estimate derived by Wade and Angliss in Barlow et al., 1997 for N_{MIN} (1,436 seals), an estimate of R_{MAX} (0.07) and a default recovery factor (0.1) for this stock, thus, PBR = 1,436 x (0.07 x (0.5)) x 0.1), or PBR = 5.026 or 5 seals (Forney, et al., 2000).

individuals of all age classes at each of the subpopulations in the NWHI, derived estimates based on beach counts for Nihoa and Necker, and estimates for the MHI) (Forney et al., 2001). Taking into account the first year survival rates, NMFS Southwest Fisheries Science Center - Honolulu Laboratory estimates the species population to be between 1300 to 1400 individuals (Laurs, 2000). Monk seals are found at six main reproductive sites in the NWHI: Kure Atoll, Midway Island, Pearl and Hermes Reef, Lisianski Island, Laysan Island and French Frigate Shoals. Smaller populations also occur on Necker Island, and Nihoa Island. NMFS researchers have also observed monk seals at Gardner Pinnacles and Maro Reef. Monk seals are also found in the MHI, and preliminary aerial surveys counted fewer than 50 individuals. Additional sightings and at least one birth have occurred at Johnston Atoll, excluding eleven adult males that were translocated to Johnston Atoll (9 from Laysan Island[14] and 2 from French Frigate Shoals) over the past 30 years.

Various surveys of the six islands and atolls in the NWHI that support the six main monk seal breeding subpopulations indicate that the NWHI non-pup population (juveniles, sub-adults and adults) declined 60 percent between the years 1958 and 1993 (See Figure 7). Trends in population are measured by beach counts for each of these populations. Population trends vary within the NWHI. For instance, from 1990 to 1998, the populations at Lisianski Island and Laysan Island have been stable, while the population at Kure Atoll increased at about 5 percent per year from1983 to 1998. The population at Pearl and Hermes Reef experienced the highest increase of 7 percent per year between 1983 and 1998. Researchers have been able to enumerate the main breeding subpopulations, and in 2000 the preliminary number of monk seals identified was 130 at Kure Atoll, 70 at Midway Atoll, 235 at Pearl and Hermes Reef, 205 at Lisianski Island, 316 at Laysan Island, and 348 at French Frigate Shoals (NMFS, unpub. data; see also Figure 8). Population decline over the last decade is attributable to low reproductive recruitment and high juvenile mortality at the largest of the subpopulations at French Frigate Shoals. At this site, the count of animals older than pups is now less than half the count in 1989. Poor survival of pups has resulted in a relative paucity of young seals, so that further decline is expected for this subpopulation as adults die and there are few juveniles to replace them. Survival from weaning to age 1 at French Frigate Shoals has declined to as low as 14 percent in 1997 from about 90 percent in the mid-1980s (Figure 9) (Laurs, 2000).

Over the last decade, the causes of the poor survival for these age classes at French Frigate Shoals have been related to poor condition from starvation, and from shark predation, male aggression, habitat loss, and entanglement in marine debris. A decrease in prey availability may be the result of decadal scale fluctuations in productivity or other changes in local carrying capacity for seals at French Frigate Shoals or a combination of factors (Craig and Ragen, 1999; Polovina, 1999). While other subpopulations of monk seals in the NWHI are stable, increasing or declining slightly, the overall population status is being driven by the French Frigate Shoals population, which comprises about 25 percent of the total monk seal population. However, girth

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[14]Nine adult male monk seals that had been identified as participating in mobbing behavior were translocated to Johnston Atoll by the NMFS in 1984. This was an attempt to reduce the frequency and/or severity of mobbing incidents involving injury or death of female seals, not to equalize the sex ratio at Laysan Island.

of weaned pups (Figure 10), French Frigate Shoals, which may correlate to prey availability to females during gestation and resulting increased ability to nourish pups, has increased in recent years (Laurs, 2000).

In sum, beach counts of the Hawaiian monk seal have declined by 60 percent since the late 1950s, and a recent decline of about 5 percent per year occurred from 1985 to 1993. Counts from 1993 to 2000 remained at about the same level. On the basis of systematic beach counts, long-term Hawaiian monk seal population trends reported in the 2000 Stock Assessment Report (Forney et al., 2000) indicated that the population declined at a rate of 3 percent per year from 1985 to 1998. A more recent statistical evaluation of population trends from 1985 to 2000 (NMFS, unpublished data) identified two distinct trends in population growth, with a trend shift occurring in 1993. Linear regression of beach counts on year for the period from 1993-2000 results in a slope, or rate of change in population growth, of 0.09 per year (95 percent confidence bounds: -1.8 to 2.0). This slope is not significantly different from zero, or the population's growth rate has not changed ($p = 0.93$ for the null hypothesis of zero slope). These results suggest that the population has neither increased nor decreased over the last 8 years, although the total population size is still too small to protect this species from extinction in the foreseeable future.

Population trends for monk seals are determined by the highly variable dynamics of the six main reproductive subpopulations. At the species level, demographic trends over the past decade have been driven primarily by the dynamics of the French Frigate Shoals subpopulation, where the largest monk seal population is experiencing an increasingly unstable age distribution resulting in an inverted age structure.[15] This age structure indicates that recruitment of females and pup production may soon decrease. In the near future, total population trends for the species will likely depend on the balance between continued losses at French Frigate Shoals and gains at other breeding locations.

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[15]An inverted age structure is present in a population with a relatively low abundance of individuals in younger age classes. Unless a substantial number of individuals immigrate, such a population will dwindle until the number of young individuals increases and survives to breed.

Figure 7. Historical trend in beach counts (non-pups) of Hawaiian monk seals at the six main reproductive subpopulations. (Source: Laurs, 2000)

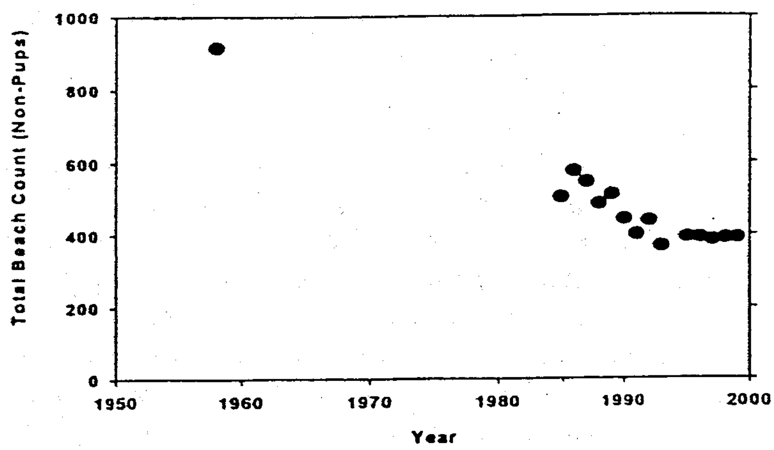


Figure 8. Recent trends in beach counts (non-pups) of Hawaiian monk seals at each of the six main reproductive subpopulations. (Source: Laurs, 2000)

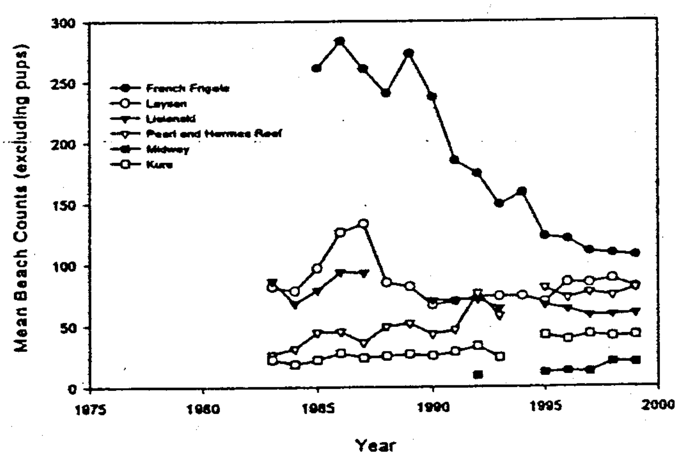


Figure 9. Survival of Hawaiian monk seals from weaning to age 1 year at the six main reproductive subpopulations. (Source: Laurs, 2000)

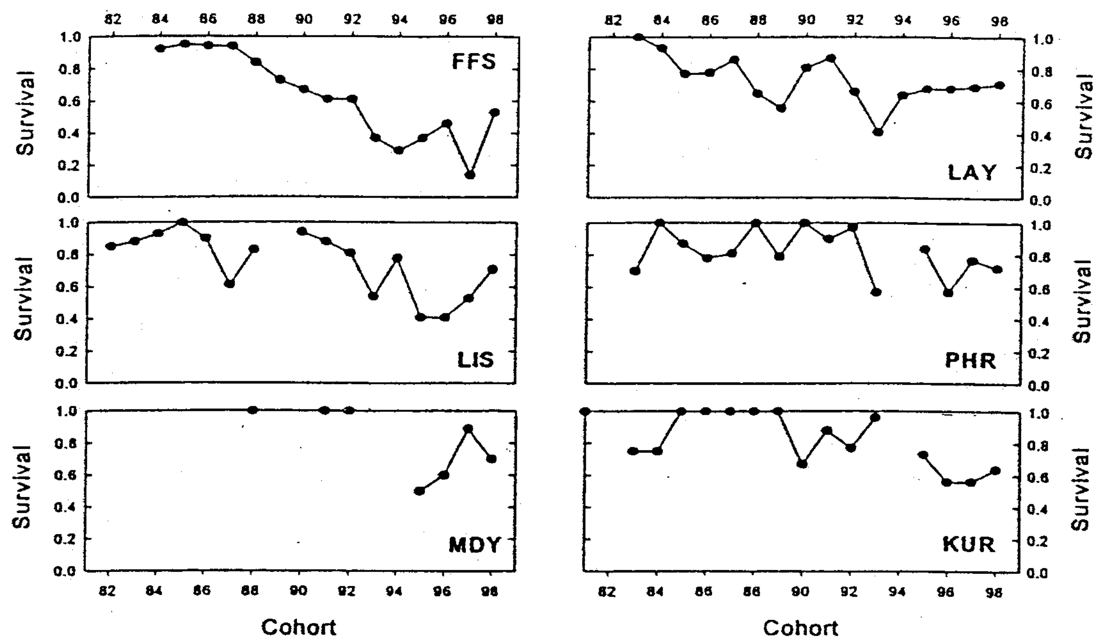
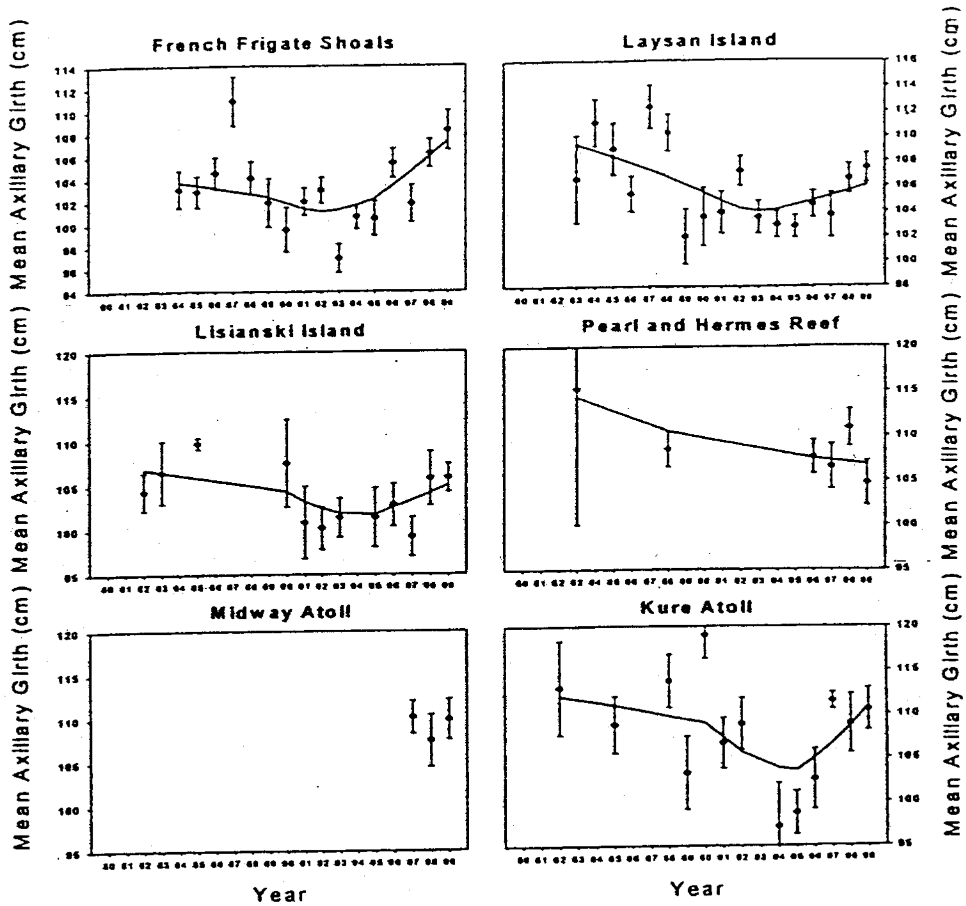


Figure 10. Trends in Axillary Girth of Hawaiian Monk Seal Pups Measured Within 2 Weeks of Weaning at the Six Main Reproductive Islands. (Source: Laurs, 2000)



Diet of the Hawaiian monk seal

Monk seals feed on a wide variety of teleosts, cephalopods and crustaceans, indicating that they are highly opportunistic feeders (Rice, 1964; MacDonald, 1982; Goodman-Lowe, 1999). Research to identify prey species is currently underway using several methods: collection of potential prey items and blubber samples for fatty acid analysis; Crittercam[16] recording of foraging behavior; correlation of dive/depth/location profiles with potential prey species habitat; and analysis of monk seal scat and spew samples for identifiable hard parts of prey. To date, completed studies indicate little or no overlap between monk seal prey items and the target and bycatch/incidental catch species of the bottomfish fishery.

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[16]A Crittercam is a self contained video camera that has been mounted on a monk seal to record its foraging behavior.

Table 5 identifies adult male monk seal prey families as indicated by Crittercam studies at French Frigate Shoals.

Table 5. Crittercam study: Prey Items Eaten by Free Swimming Adult Male Monk Seals at French Frigate Shoals (Data Source: Parrish, et al., 2000; WPRFMC, 2000a)

Family	number seen	Bottomfish Target Species: Y = Yes, ? = Maybe, N = No	Bottomfish Bycatch Species: Y = Yes, ? = Maybe, N = No
Anthiinae	2	N	N
Balistidae	1	N	N
Bothidae	1	N	N
Cheilinninae	2	N	N
Congridae	1	N	?
Pentacerotidae (groundfish)	1	N	N
Pomacentridae	1	N	N
Tetradontidae	1	N	N
Unidentified Eels	2	N	?
Unidentified fish	8	?	?
Octopus	2	N	?

In a study at five of the principle breeding sites for the monk seal (French Frigate Shoals, Laysan Island, Lisianski Island, Pearl and Hermes Reef, and Kure Atoll) focused on identifying items eaten by monk seals, Goodman-Lowe (1998) analyzed scat and spew samples to identify prey, and to obtain size estimates of the more common cephalopod species.[17] This study also examined the temporal differences in diet among years. The frequency of occurrence (FO) was calculated as the number of samples in which an identified prey type was found. The percent frequency of occurrence (percent FO) was calculated as the FO divided by the total number of scat and spew samples (n=940) (Table 6).

[17]Scat and spew analysis is known to be biased due to differential digestion of various prey types. However, scat and spew analysis is, at this time, the best available scientific information for investigating monk seal diets.

Table 6. Goodman-Lowe Results of Prey found in Scat and Spew samples Referenced to Bottomfish MUS and Bycatch Families (Data Source: Goodman-Low, 1998: WPRFMC, 2000a)

Family	FO/%FO n=940	Bottomfish Target Family: Y = Yes, ? = Maybe, N = No	Bottomfish Bycatch Family:, Y = Yes, ? = Maybe, N = No
Labridae	194/20.6	N	N
Balistidae	123/13.1	N	N
Scaridae	99/10.5	N	N
Acanthuridae	71/7.6	N	?
Pomacentridae	44/4.7	N	N
Tetraodontidae	41/4.4	N	N
Kyphosidae	32/3.4	N	N
Monacanthidae	29/3.1	N	N
Synodontidae	25/2.7	N	N
Pomocanthidae	17/1.7	N	N
Kuhliidae	14/1.5	N	N
Cirrhitidae	12/1.3	N	N
Chaetodontidae	10/1.1	N	N
Diodontidae	10/1.1	N	N
Bothidae	9/0.9	N	N
Cheilodactylidae	6/0.6	N	N
Scorpaenidae	5/0.5	N	N
Ostraciidae	1/0.1	N	N
Unidentified Eels	207/22.0	N	?
Holocentridae	135/14.4	N	Y
Muraenidae	53/5.6	N	Y
Congridae	52/5.5	N	Y
Priacanthidae	40/4.3	N	Y
Apogonidae	9/0.9	N	N
Opichthidae	6/0.6	N	N
Mullidae	58/6.2	N	Y
Lutjanidae	24/2.6	Y	Y

Family	FO/%FO n=940	Bottomfish Target Family: Y = Yes, ? = Maybe, N = No	Bottomfish Bycatch Family: Y = Yes, ? = Maybe, N = No
Carangidae	11/1.1	Y	Y
Polymixiidae	9/1.0	N seamount groundfish	?
Serranidae	5/0.5	N	Y
Belonidae	1/0.1	N	N
Unidentified remains	330	?	?

Both the Crittercam data and the scat and spew analyses indicate little overlap with the target and bycatch fish families of the bottomfish fishery. Moreover, overlap at the family level may not reflect an overlap at the species level because many species within families occur in both deep and shallow waters. More information about the foraging activities of monk seals is available through the additional analysis of dive/depth/location profiles and the correlation with the habitat of potential prey families. Recent information suggests monk seals may forage in beds of precious corals, which are habitat for known monk seal prey items such as eels (Parrish et al., in press).

Foraging Range and Behavior

The foraging and dive patterns of monk seals and the availability of prey items to monk seals are important to understand when determining the potential impact of the bottomfish fishery in terms of area fished, potential for gear interaction, and prey competition. The foraging range of the monk seal extends to areas managed under the Bottomfish FMP. Various studies have been undertaken to determine the habitat use patterns of monk seals (Schlexer, 1982; DeLong et al., 1984; Abernathy and Siniff, 1998; Stewart, 1998; Parrish et al., 2000). These studies used various technologies, including radio tags, dive depth recorders, Crittercams, and satellite telemetry, to study the foraging behavior of monk seals. The results of these studies vary by location.

DeLong et al. (1984) instrumented seven monk seals at Lisianski Island with radio transmitters and multiple depth of diving recorders and recorded movements for an aggregate of 94 days in which 4,817 dives were recorded. Most dives (59 percent) were in the 10-40 m depth range, and the remainder of dives were to deeper depths. Thirteen dives were recorded to depths of at least 121 m. The outer edge of the reef around Lisianski Island is generally delineated by the 40 m isobath. DeLong et al., (1984) concluded that males during breeding season at Lisianski Island depend entirely upon the food resources on the coral reefs, sandy beach flats and deeper reef slopes around that island.

Schlexer (1982) also recorded diving patterns of monk seals at Lisianski Island. In this study, eight monk seals (five adult males, one juvenile male, one subadult female, and one juvenile female), tracked with radio transmitters and multiple depth of diving recorders, were recorded diving within the 0 - 70 m range. One subadult female and one juvenile female dove in the shallow range of 10 - 40 m, with some dives recorded from 150 - 180 m. None of the adult males instrumented dove to depths greater than 70 m.

Stewart (1998) investigated diving patterns of 24 monk seals at Pearl and Hermes Reef using satellite-linked radio transmitters to record dive depth and duration. This study concluded that the monk seals at Pearl and Hermes Reef foraged in relatively shallow waters, and that foraging activity was different for males and females and among age classes. At Pearl and Hermes Reef, juveniles foraged almost exclusively within the fringing reef, adult males foraged mostly on the inside and outer edge of the fringing reef, and adult females foraged mostly within the center of the atoll and near the atoll's southwestern opening (Stewart, 1998). Adult males generally dove within the 8 - 40 m range, with a secondary mode at 100 - 120 m. Male juveniles generally dove within the 8 - 40 m range. Adult females rarely dove deeper than 40 m, although one female made a number of dives to 60 - 140 m.

Abernathy and Siniff (1998) instrumented adult seals at French Frigate Shoals with satellite-linked time depth recorders. Data showed that instrumented adult male monk seals appeared to utilize the banks to the northwest, with a daytime diving range between 50 - 80 m and a nighttime range between 110 - 190 m. The study also suggested that seals that did not leave the vicinity of French Frigate Shoals rarely dove deeper than 80 m during the day, but made more dives closer to 80 m at night. The study also identified a few seals that were extremely deep divers. These seals' daytime dives reached depths > 300 m on a ridge to the east of the atoll. The researchers modeled the home range of individuals and concluded that the average home range was 6,467 km^2 (n=28, SE=3,055 km^2). For example, individuals have been documented traveling between French Frigate Shoals and to Gardner Pinnacles, St. Rogatien Bank, Brooks Bank, and Necker Island. (Abernathy and Siniff, 1998). The conclusion of Abernathy and Siniff (1998) is that monk seals forage on benthic and epibenthic species, and on other prey items in the fringing reef complex.

Parrish et al. (2000) provided further information that monk seal foraging behavior and range are extensive. During a recent study, 24 monk seals were outfitted with Crittercams. The Crittercam recorded the habitat depth and bottom type at locations where monk seals were identified as successful in the capture of prey items. Parrish et al. (2000) found that the diurnal pattern of foraging by male adults occurred mainly at the 60 m isobath. A few seals foraged at depths >300 m. Some of these areas were outside the critical habitat area and overlapped with areas fished by both lobster and bottomfish fisheries.

Since 1995, abundance of shallow water (<20 m) reef fish has been surveyed at French Frigate Shoals and Midway. The data are checked as a potential indicator for changes in abundance of monk seal prey. The surveys are conducted annually by NMFS and are designed to detect changes of 50 percent or greater in fish densities (Laurs, 2000). So far, surveys have not indicated any statistically significant changes in prey abundance at either site (DeMartini, et al., 1999; DeMartini, et al., 1996).

III Environmental Baseline

This section is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including designated critical habitat) and ecosystem within the action area. This section does not include the effects of the action under review in this consultation. Past effects and expected future effects of the FMP bottomfish fishery are described in the *Effects of the Action* section below.

Hawaiian monk seal

A. Status of the Species within the Action Area

The action area is all areas that will be affected, directly or indirectly, by the fisheries managed under the Bottomfish FMP. These fisheries occur throughout the central, western, eastern and northern Pacific Ocean, including inside the EEZ around U.S. islands in the western Pacific. These islands include the Northwestern Hawaiian Islands (a chain of largely uninhabited islets, atolls and banks), the main Hawaiian Islands, American Samoa, and Guam. The action area does not include the area within the 3 mile limit for state and territorial waters around the State of Hawaii, the Territory of American Samoa, and the Territory of Guam.

Hawaiian monk seals occur only within a subset of the action area, the NWHI and MHI fishing areas. Thus, for the remainder of this opinion, "action area" refers to this subset of the larger area affected by the Bottomfish FMP where monk seals occur. For the status of the species in the action area, the reader is referred to the *Status of the Species* section above.

B. Factors Affecting the Hawaiian Monk Seal Environment within the Action Area

This analysis describes factors affecting the environment of the species or critical habitat in the action area, including state, local, and private actions already affecting the species or actions that occur contemporaneously with the consultation in progress. Unrelated Federal actions affecting (adverse or beneficial effects) the same species or critical habitat are also part of the environmental baseline considered in this section.

(1.) Fisheries

Several fisheries operate in the areas utilized by the Hawaiian monk seal. Some of the fisheries are federally managed fisheries. These are: the bottomfish fishery (this is the action under consideration in this biological opinion), the pelagic longline fishery (transit only), the crustacean fishery, and the precious coral fishery. Other fisheries that operate in areas utilized by the monk seal include fisheries managed by the State of Hawaii. These fisheries include: the state-managed MHI bottomfish fishery, commercial and recreational nearshore fisheries, akule fishery, collection for the aquarium trade, and commercial and recreational gillnet fisheries.

a. *The Hawaii-based Pelagic Longline Fishery*

The Hawaii-based pelagic longline fishery targets pelagic species of swordfish and tunas. Under the Fishery Management Plan for the Pelagic Fisheries in the Western Pacific Region (Pelagics FMP), NMFS permits up to 164 vessels, but only 114 permitted vessels are currently active.

There was some evidence in the early 1990s that longline operations were adversely affecting the monk seals, as indicated by the sighting of a few animals with hooks and other non-natural injuries. Amendment 2 to the Pelagics FMP required longline permit holders to notify NMFS if intending to fish within 50 miles of any NWHI and required all vessel operators to attend a training session. These measures were later deemed insufficient. In 1991, Amendment 3 established a permanent 50-mile protected species zone around the NWHI that closed the area to longline fishing. Establishment of the protected species study zone around the NWHI in April 1991 appears to have eliminated monk seal interactions with the longline fleet. Since 1993, no interactions with monk seals in the pelagic longline fishery have been reported. Longline observer data recorded only one sighting of a monk seal during transit through the protected species zone near Nihoa Island in 1995 (NMFS unpubl. data).

b. *The NWHI Crustacean Fishery*

The NWHI lobster fishery is managed under the Fishery Management Plan for the Crustacean Fishery for the Western Pacific Region (Crustaceans FMP). The lobster fishery began in the 1970's and annual landings peaked at 1.92 million lobsters in 1985. Since then, landings have decreased. The number of vessels participating in the lobster fishery has ranged from 0 to 17, with only 5 and 6 vessels participating during 1998 and1999, respectively (Al Katekaru, NMFS, pers. comm., 2001).

Historically, effort has been concentrated near the islands and atolls of the NWHI where monk seals occur. Data reports[18] show no monk seal entanglements or other interactions. However, in 1986 near Necker Island, one monk seal died as a result of entanglement with a bridle rope from a lobster trap. This incident was reported by NMFS research cruise personnel. Separate from the bridle rope incident, a precautionary measure was taken in 1983 to redesign the entrance cone to ensure that monk seals could not get caught in lobster traps entrances.[19]

Lobster is a known prey item of the monk seal, but the importance of lobster in their diet has not been quantified. Ongoing foraging and prey identification studies will help understand the effect, if any, of the lobster fishery on monk seal populations in the NWHI.

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[18]The lobster fishery was "observed" on a voluntary basis starting in 1997. NMFS scientific data collectors were dispatched on each of the lobster trips during 1997 through 1999. In 2000 and 2001 the lobster fishery was closed.

[19]Plastic dome-shaped single-chambered traps with two entrance funnels or cones located on opposite ends are employed in the lobster fishery. All traps are required to have escape vents (for smaller lobster). The traps are usually set in strings of about one hundred per string, with several strings fished at a time.

The lobster fishery was closed in1993 based on the harvest quota set for the fishery under Amendment 7 of the Crustacean FMP. The fishery re-opened in 1994 with five vessels participating in the fishery; in 1995 the fishery was closed; however, one vessel was allowed to fish under an experimental fishing permit issued by NMFS to obtain scientific information on the lobster stock. From 1996 through 1999 the fishery had 5, 9, 5, and 6 vessels participating respectively. Although the lobster fishery was not overfished, NMFS closed the fishery in 2000 through 2001 because of an increased level of uncertainty in the model assumptions used to estimate the lobster harvests (65 FR 39314). Harvest guidelines for the 2001 fishery were not issued by NMFS (66 FR 11156, Feb. 22, 2001). NMFS intends to extend the closure of the fishery for a portion of the fishery (Area 4: all areas except Gardner Pinnacles, Necker Island, and Maro Reef) until 2002. (NMFS, 2000a)

Under the authority of the National Marine Sanctuaries Act, President Clinton approved Executive Orders 13178 (Dec. 4, 2000) and 13196 (Jan. 18, 2001) permanently establishing the NWHI Coral Reef Ecosystem Reserve. The Executive Orders effectively close the NWHI lobster fishery as a result of conservation measures that severely restrict all consumptive and exploitative activities throughout the Reserve, including the harvest of lobsters, bottomfish and precious corals (discussed below).

c. *The Precious Coral Fishery*

Precious corals are harvested under the Fishery Management Plan for Precious Coral Fisheries of the Western Pacific Region (Precious Corals FMP). NMFS has determined that the harvest would not adversely affect the monk seal (NMFS, 2000). Regulatory changes to the Precious Corals FMP recommended by the WPRFMC in 2000, are intended to conserve precious coral resources, promote optimal utilization of the resource and minimize waste, facilitate effective monitoring and enforcement of harvest quotas, and protect precious coral beds that provide foraging habitat for some monk seals in the NWHI (65 FR 53692).

Pink, gold and bamboo varieties of coral are typically found at depth ranges between 350 to 1500 m, while black coral occurs at considerably shallower depths of less than 100 m. Exploitable beds have been surveyed at seven locations. The six known beds of pink, gold and bamboo corals are Keahole Point, Makapuu, Kaena Point, Wespac, Brooks Bank and 180 Fathom Bank. A seventh bed was recently discovered near French Frigate Shoals. The only exploitable black coral bed is located in the MHIs in the Auau channel. (WPRFMC, 2001).

The contribution of coral beds to prey aggregation and prey availability for monk seals remains unclear. As discussed previously, monk seal diet studies indicate that monk seals are opportunistic and feed on a wide variety of prey (Goodman-Lowe 1998). Research from Parrish et al., (in press) and Abernathy and Siniff (1998) indicate that some seals forage at depths where precious coral beds occur. However, the absence of deep diving activity at Pearl and Hermes suggests that monk seals at French Frigate Shoals may vary their foraging behavior depending on the availability of prey resources.

Potential increases in fishing pressure on precious coral beds near French Frigate Shoals and the possible importance of precious coral beds as foraging areas for monk seals prompted the NMFS and the Western Pacific Regional Fishery Management Council to suspend harvest of all corals at French Frigate Shoals and the MHI Makapuu gold coral bed. Limitations placed on the harvest of black corals will avoid the potential for destruction of foraging habitat.

d. Recreational Fisheries

(i.) NWHI Recreational Fishing

In the NWHI, The U.S. Fish and Wildlife Service allows a concession that operates an ecotourism station at Midway Island. Recreational fishing is allowed in the lagoon and waters around the island. To date, no adverse interactions (e.g. entanglements) with monk seals in this recreational fishery have been reported. Fishers are advised to stop fishing and move out of the area if monk seals approach a vessel. A study conducted in 1998 recorded monk seal interactions at 6 locations during fishing activities. The report indicated that chum in the water may not influence monk seal behavior. However, it was reported that when two monk seals "took note of the fisher/observer" they "swam on and out of the area" (Bonnet and Gilmartin, 1998). Inquisitive, newly weaned pups sometimes approach fishing activities, presumably to investigate human activity. (Shallenberger, pers. comm., 2001).

Three monk seals were reported to have been hooked as a result of recreational fishing during the operation of the U.S. Coast Guard station at Kure Atoll, which closed in 1993 (Forney et al., 2000).

(ii.) The MHI Bottomfish Fishery and Recreational Fisheries (State Managed Fisheries)

In the MHI, the state regulated bottomfish fishery operates off-shore of shoreline areas where monk seals are sometimes observed. There have been no reported interactions between monk seals and this fishery. Some areas off-shore of regularly utilized monk seal haul-out areas have been closed to bottomfish operations due to concerns about overfishing.

The fisheries for big game (*ulua*) and small game (*papio* and other smaller fish) are two of the largest components of the shore-based recreational fisheries in Hawaii. The term *ulua* mainly refers to two species; the White ulua (*Caranx ignobilis*) and the Black ulua (*C. lugubris*). Ulua can also be used to refer to larger Caranx (ten or more lbs). The term *papio* can refer to *Caranx ignoblis* and *C. lugubris* under 10 lbs as well as to six to eight other smaller Carangids commonly found in near-shore waters. The two fisheries differ more in the gear used rather than the target species. Any of the species can be and are taken in both fisheries. The two predominant fishing methods employed are the "slide-bait" and "shore casting" fisheries.

Big game shorefishing, primarily targeting large ulua (jacks), usually utilizes slide-baiting techniques. Slide bait rigs have a large hook tied or crimped to a short length of wire or heavy monofilament leader which is in turn tied or crimped to a "slide bait" swivel. The slide-bait fishery almost exclusively employs circle hooks of sizes corresponding to Mustad sizes 14/0 and larger. This leader and hook set up is independent of the wired weight set up. These two independent sets of gear combine to make a whole slide bait rig. The weight is cast out and anchored before the slide bait hook rig is attached to mainline and allowed to "slide" down and out to its final fishing position. The preferred baits are moray eels, "white eel" or "tohei"(conger eel), and octopus. Live reef fish of all kinds are also among the preferred baits.

The mainline (line on the fishing reel) used in slide baiting varies according to the individual, but is generally heavy line in the 80-100 lb plus test weight. The fishing weights generally have 4-5 inch soft wires extending from the terminal end. These wires are bent into a grapnel shape to snag onto rocks and coral to provide a solid anchoring point from which to suspend the large baits off the bottom and prevent the rig from moving with the current or swell. The limited movement prevents tangling with other rigs. The wires used are malleable enough to be straightened with pressure from the rod. The line connecting the weight to the swivel is of a lesser strength than the mainline and designed to break should the weight become inextricably stuck on the bottom.

Small game fishing uses a general rig in which a hook(s) and lead is attached to a swivel and is cast as a single unit. It uses smaller hooks and lighter leaders. The major difference between big game fishing and small game fishing is the kind of rig used and the size of the gear and the general kinds of areas that are preferred by each. The slide-bait fishery is generally associated with close proximity of deep water (20-100 ft) because the technique depends on gravity or the live bait to take the bait down the mainline to the strike zone. Shorecasting for small game is done anywhere along the shoreline.

The third shore based fishery is locally referred to as "whipping." Whipping involves standing on the shore, usually a rocky area, and casting and quickly retrieving an artificial lure into breaking waves headed towards shore. The lure usually has treble or double hooks attached. Fishing line in the 20-50 lb test weight range is commonly used in this fishery. Often the leader, the first few feet of line directly attached to the lure, is a thicker line for protection from chafing on the fish's teeth or the reef and rocks. Whipping is also successfully done from boats.

Ulua are also fished from boats. A variety of gear may be employed; typical are the trolling set-up, with down riggers or trolling planes, and surface plugs or casting jigs. Trolling usually takes place at depths of 50-200 ft, with depth fished highly dependent on local conditions and bottom topography. Artificial lures, e.g. plugs and lead-head jigs, are used just outside the breaking surf. The lures used generally have either treble or double hooks attached directly to the lure. The line weights vary from 20 lb or heavier test weight.

The gear used in these recreational fisheries varies, but the most popular gear composition is a circle hook with a slide bait swivel on a wire leader. There is some overlap with the type of hook used (circle hooks) in the bottomfish fishery although the size of the *ulua* circle hook tends to be larger than that used in the bottomfish fishery. Some of the hooks embedded in monk seals have been identified as gear used in the state *ulua* fishery based on gear, size of hook, and location of the monk seal when discovered, while other hooks have been identified as bottomfish fishery hooks (see Table 7).

Table 7. List of Hooks and Net Entanglements as a Source of Information on Fishery Interactions. (Source: NMFS, unpubl. data 2001)

	Date and Location	Description	Outcome
1	1982 French Frigate Shoals	Adult female was observed with bottomfish hook in mouth.	Resighted without hook at French Frigate Shoals
2	1985 NWHI - Kure Atoll	Female weaned pup hooked in lip	Hook removed by NMFS personnel; small hook and rig characteristic of on-site recreational fishery
3	1990 MHI - Kauai	Juvenile observed with hook	NMFS response included capture and hook removal. Hook identified as type used in the *ulua* shore-based fishery.
4	1991 NWHI - Kure Atoll	Weaned female pup observed with hook in lip	NMFS personnel captured seal and removed hook. Hook was small, characteristic of on-site recreational fishery.
5	1991 NWHI - Kure Atoll	Subadult female observed with hook in corner of mouth	Seal subsequently seen without hook; hook never recovered or identified.
6	1994 NWHI- French Frigate Shoals	Pregnant female with hook	Hook stated by observers to be a swordfish fishery hook. No confirmation of report (NMFS, 1996)
7	1994 MHI - Oahu	Report of dead seal in gillnet off Waianae	reliable but unconfirmed report, no seal recovered
8	1994 NWHI-"No Name Bank"	Active hooking of adult seal during bottomfishing; seal had stolen catch and had become hooked	Fisherman pulled seal to boat and cut leader 12"-18" from the seal.
9	1995 MHI - Kauai	Juvenile male found dead, necropsy revealed fishhook in lower esophagus observed	mortality; hook was "slide rig" characteristic of shore-based *ulua* fishery
10	1996 MHI - Oahu (Ala Moana Beach) (first sighted on Maui)	Adult male observed with hook in mouth. The seal was identified as a seal that had been translocated from Laysan Island, NWHI.	Hook removed by NMFS. Hook identified as from slide rig, shore based *ulua* fishery.
11	1996 NWHI - French Frigate Shoals	Adult male observed with hook in mouth	Hook removed by researchers. Hook identified as type used in the *ulua* shore-based fishery and bottomfish fishery.

	Date and Location	Description	Outcome
12	1998 MHI - Maui	Hooked seal reported to NMFS; Juvenile female. Observers stated it was a #7 or #9 *ulua* hook	NMFS response included capture and physical exam. No hook was found, but some minor trauma was observed in mouth where hook had been present
13	2000 MHI - Molokai	Juvenile male observed with 2 hooks and line embedded in chest (ventral) area.	NMFS response included capture and physical exam of seal. No hooks or line present, but slight injury was documented by veterinarian.
14	2000 MHI - Kauai (Ha'ena Beach)	Adult female observed with hook in mouth.	NMFS response included capture and hook removal. Hook identified as type used in the *ulua* shore-based fishery.
15	2001 MHI - Kauai (Mahaulepu Beach)	Juvenile female with hook in lower lip and base of jaw.	Hook removed by DLNR personnel. Hook and leader determined to be from recreational ulua fishery
16	2001 MHI - Kahoolawe	Adult male with hook in abdomen or front flipper	Hook not removed as of July, 2001. Fishery type unknown.

Although there is only one report of a hooking of a monk seal on gear being actively fished, several monk seals have been observed with embedded hooks. Sometimes the hooks have trailing which poses a potential entanglement hazard. NMFS researchers and veterinarians have responded to some of these reports and have treated the monk seals and provided descriptions of the wounds caused by the hook. Based on these descriptions and outcome (when known), the injuries sustained by monk seals from embedded hooks have been classified into injuries or serious injuries. An embedded hook was considered a serious injury if it hooked in the mouth deeper than the lip. Thus, hooks embedded inside the mouth, in the tongue, the mandible or upper jaw, throat, or deeper are classified as serious injuries, whereas "lip hookings" and other shallow embedded hooks are considered nonserious. The rationale for this division is that foraging would likely be impeded by the serious injuries. Hooks embedded in the lip or shallowly embedded hooks in other body areas would most likely fall out and would not impair feeding or other activities. Considering the information available, the above classification approach is consistent with the views expressed by researchers and veterinarians in a workshop held to discuss the serious injury guidelines.[20]

[20]"Injury of pinnipeds: A brief discussion of injuries reported for pinnipeds indicated that an animal hooked in the mouth (internally) or trailing gear should be considered seriously injured. Some participants felt that an animal hooked in its body would likely not be seriously injured." (Differentiating Serious and Non-Serious Injury of Marine Mammals taken Incidental to Commercial Fishing Operations: Report of the Serious Injury Workshop held in Silver Spring, MD, April 1-2, 1997)

e. *Documented Monk Seal Interactions with Other Fishing Operations in the NWHI*

Reports suggest that the distribution of interaction events with monk seals is non-random with respect to location and vessel. Fishery participants have reported seeing monk seals in the vicinity of breeding islands. For example, Humphreys (1981) reviewed three categories of data for observations and interactions with fishing operations in the NWHI (French Frigate Shoals and Lisianski Island). Although the review was undertaken to characterize the interaction level with the lobster fishery in the NWHI, other fishery operations were considered. The review included commercial vessels, NMFS research vessels and charter vessels. Data pooled from all three sources yielded 35 sightings and 3 interactions with listed species. Two of the three interactions occurred near French Frigate Shoals and involved monk seals that seemed attracted to vessel lighting during night research/fishing operations[21]. In one instance, two monk seals interfered with mackerel (scad) fishing under a light by removing hooked fish from lines before the fish could be retrieved. In another instance, a monk seal interfered with night-light operations by chasing fish away from the light and tugging on the light cord with its mouth. No hookings of monk seals were reported. (Humphreys, 1981)

(2.) *Vessel groundings/Vessel collisions*

In April, 1999, a longline vessel (*F/V Van Loi*) grounded on a reef off of Kapaa, Kauai. The vessel had 16,000 gallons of diesel fuel onboard and was carrying 3 tons of bait and gear. All fuel, bait, and gear (including monofilament line and hooks) went overboard into the marine environment. Monk seals and sea turtles were observed in the area, but no adverse interaction with fuel or gear was reported by wildlife resource managers on scene.

In August 1998, Tesoro Hawaii Corporation fuel operations resulted in a spill of about 5,000 gallons of bunker fuel off of Barber's Point, leeward Oahu. The waters and shoreline of Kauai were affected, and oiled monk seals were reported in the area. During September 1998, up to 5 oiled monk seals were observed. One monk seal had its entire oral mucosa coated with red, blood-like fluid. This monk seal was later resighted and exhibited signs of a respiratory infection. Another monk seal exhibited "gagging behavior". As there were no physical exams conducted on the animals observed, the wildlife resource agencies could not reach a conclusion about the effects of the oil on the monk seals (Natural Resources Trustees, 2000).

In addition to the vessel groundings, a pup born at the Pacific Missile Range Facility on Kauai was reported dead in 1999. There was an anonymous and unconfirmed report that the pup may have been hit by a zodiac-type vessel employed in the tourist industry.

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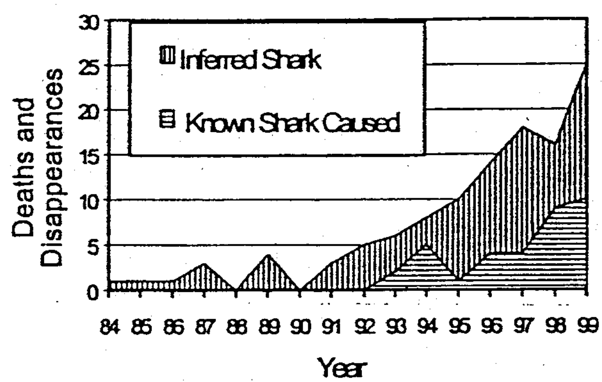
[21] One leatherback turtle interaction occurred during lobster fishing operations from a commercial vessel.

(3.) Shark Predation

Shark related injury and mortality has been documented in the NWHI at French Frigate Shoals. Although researchers had concluded shark predation was not the cause of the population decline at that location (Ragen, 1993), NMFS considers shark predation to be a significant factor in pup mortality at French Frigate Shoals. NMFS Honolulu Laboratory infers shark related mortality whenever a newborn to approximately three-week old pup disappears at French Frigate Shoals, especially during periods when large sharks are observed patrolling near pupping beaches. Shark predation is inferred to be the primary cause of disappearance of these pups because attacks by male adults (the other possible primary cause of mortality) are unlikely because nursing pups are defended by their mothers. However, sharks have been observed killing pups in this age category despite their mother's defense tactics against shark predation. In 1999, shark predation was estimated to account for the deaths of 51.1 percent (23 out of 45) of the pups born at Trig Island, French Frigate Shoals. Overall, 9.4 percent (25 out of 244) of pups born in the NWHI were inferred or known to be preyed upon by sharks in 1999 (Figure 11). One shark was removed pursuant to a shark removal plan implemented in 2000 to improve pup survival and possibly slow the French Frigate Shoals population decline (thereby facilitating recovery).

Figure 11. Trends in number of known and inferred shark-caused deaths of Hawaiian monk seal pups at French Frigate Shoals. (Source: Laurs, 2000)



The dramatic increase in deaths and disappearances from shark attacks at French Frigate Shoals has been the result of an increased number of Galapagos sharks (*Carcharhinus galapagensis*) in the immediate vicinity of monk seal pupping areas. The occurrence and escalation of Galapagos shark predation on pups may be related to an episode of adult male monk seal aggression against pups, which resulted in pup deaths and the presence of carcasses remaining in the waters surrounding the pupping area. These carcasses may have attracted sharks to the new prey resource of nursing seal pups. Also, the disappearance of Whale-Skate Island, which had been a large pupping site, may have resulted in more pups being born at Trig Island where sharks can easily approach the shoreline.

(4.) Marine Debris and Contaminants

Marine Debris

Monk seal death and injury attributable to entanglement in marine debris has been documented in the NWHI. Lines, nets, and other debris have been removed from monk seals by government personnel. Although steps have been taken to reduce the debris load in the NWHI, the debris accumulation in these areas is incessant due to contributions from various sources (vessels of unknown origin) and currents to the NWHI. Much of this debris comes from north of the Hawaiian Archipelago (Kubota, 1999).

Information on marine debris entanglement and injuries, including mortalities, has been collected by NMFS since 1982. For the purposes of this biological opinion, NMFS reviewed documented entanglements of monk seals for the period 1982-2000 to determine the effects of marine debris. Entanglements in all debris types (fishery related debris and non-fishery related debris) were considered (Table 8). Fishery related gear was considered to comprise of nets, any net/line aggregate, "eel cones" (cones from hagfish traps), monofilament line, any line with attached floats, and lines with head/foot rope from a net. All other identified entangling items were considered non-fishery related. These items included unspecified lines (e.g. "ropes"), packing straps, plastic rings of unknown source, and assorted miscellaneous objects. Entanglements by unknown items, which were documented only by the presence of a recently acquired entanglement scar on a seal, were assigned to fishery or non-fishery items by multiplying the total unknowns times the ratio of known fishery items to all known items.

Table 8. Categories of Marine Debris that Entangle Monk Seals 1982-2000. (Source: NMFS, unpublished data, 2001; Henderson, 1990)

	category	description
	Nets	All nets or net fragments of fishery origin, including drift nets, trawl nets, or seines.
	Lines	All "ropes" or fishing line; lines are certainly of maritime origin, but are not necessarily of fishery origin.
	Net/Line Combination	Collection of nets and lines, probably aggregated at sea by ocean currents. Because nets are a part of the aggregate, the item is considered of fishery origin.
	Cone	Black plastic mesh cones which are part of traps used in the hagfish fishery.
	Rings	All rings other than the cones noted above. This category may include rims from plastic lids or other circular items; origin unknown.
	Straps	Plastic packing band used around boxes; origin fishery and non-fishery.
	Other/Unknown	All items not in previous categories which have entangled monk seals; Monk seals with scars/wounds attributed to entanglement are considered to have been entangled by an unknown item.

The data were examined to determine which incidents resulted in "serious injuries", i.e. any injury that will likely result in mortality. The following were considered serious injuries:

1. Any entanglement which caused a wound, i.e. in which the seal's skin was broken. This definition includes seals observed with an entanglement scar, since the scar resulted from a wound.

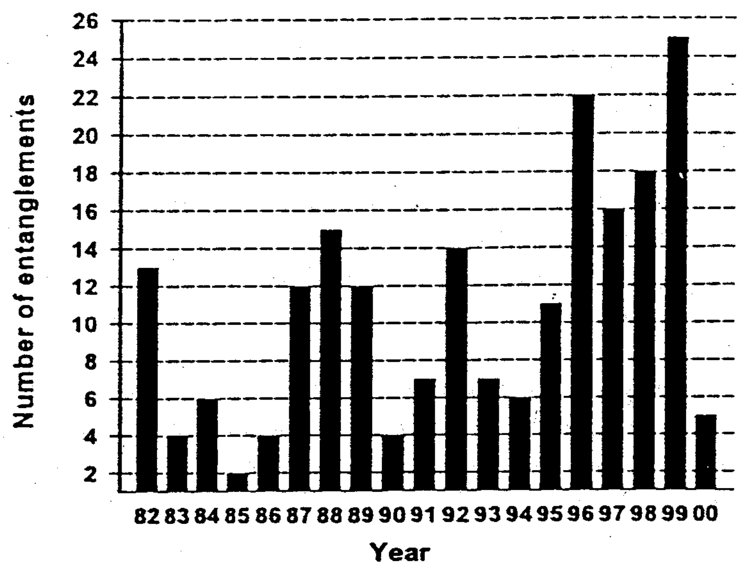
2. Any entanglement in which the seal was immobilized by entangling debris on an offshore reef, even if the seal was released by humans without having incurred a wound. Any seal so trapped would likely have died from drowning, predation, or starvation had it not been released.

3. Any entanglement in which the entangling item was removed without having inflicted an external wound, but for which the observer specifically stated that the item would not have come off without human assistance, or that the seal probably would have died.

Considering the information available, the above classification approach is consistent with the views expressed by researchers and veterinarians in a workshop held to discuss the serious injury guidelines.[22]

[22] In the discussion on the entanglement and injury of pinnipeds, one veterinarian noted that, "lesions from netting or packing bands are often infected and associated with necrotic tissue. If such an injury is in the neck region and if the infection surpasses the ability of the lymph system to control it, the lungs will often become infected, often leading to mortality. In addition, microbes that enter the blood stream can cause secondary infections in the heart (e.g. heart valves), brain, or other vital organs. . . ." (Differentiating Serious and Non-Serious Injury of Marine Mammals taken Incidental to Commercial Fishing Operations: Report of the Serious Injury Workshop held in Silver Spring, MD, April 1-2, 1997, p. 23).

Figure 12. Number of Hawaiian monk seal entanglements observed, 1982-2000. (Source: Laurs, 2000)



Injuries

A total of 204 entanglements were documented (see Figure 12), 96 by fishery items (5.05 per yr), 96 by non-fishery items (5.05 per yr), and 12 by unknown items (0.64 per yr). Assigning the unknowns to fishery or non-fishery according to the formula given above results in 102 entanglements by fishery items (5.37 per year) and 102 entanglements by non-fishery items (5.37 per yr).[23]

Serious Injuries

Of the total number of entanglements, a total of 47 serious injuries from entanglement were documented, including 27 by fishery items (1.42 per year), 8 by non-fishery items (0.42 per year), and 12 by unknown items (0.64 per year). Assigning the unknowns to fishery or non-fishery results in a total of 36 serious injuries from entanglements in fishery items (average of 1.91 per year) and total of 11 serious injuries from non-fishery items (average of 0.58 per year).

Mortalities

Mortalities from entanglement were also documented: 7 mortalities were documented (0.37 per year), 6 mortalities were from fishery items (0.32 per year) and 1 was from a non-fishery item

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[23]The assignments of unknowns were allocated according to the ratio of known items causing serious injury (not merely entanglement) and known items causing nonserious injury.

(0.05 per year) (see Table 9).

Table 9. Known Marine Debris Related Mortalities 1982-2000. (Source: NMFS, unpublished data, 2001)

No.	Year and Location	Description
1	1986– French Frigate Shoals	Weaned male tangled in wire which was relic of USCG or Navy occupation; in water
2	1987–Lisianski Is.	Pup (uncertain if nursing or weaned) dead in aggregate of trawl net and line on shore
3	1987–French Frigate Shoals	Juvenile dead in aggregate of trawl net and line on shore
4	1988–Lisianski Is.	Weaned pup dead in large trawl net on shore
5	1995–Pearl and Hermes Reef	Bones of adult found scattered in line awash on shore
6	1997-French Frigate Shoals	Subadult dead in trawl net on reef
7	1998–Laysan Island	Weaned pup dead in trawl net on nearshore reef

As most of the monk seal population is located on uninhabited islands and atolls, observation and monitoring by NMFS and other agencies occurs during only part of each year. The serious injuries and mortalities documented above represent a minimum combined serious injury and mortality rate of 2.48 per year (1.91 serious injuries and 0.74 mortalities). It cannot be assumed that entanglements would be observed at a directly proportionally increased rate if year-round observations were made. For instance, NMFS biologists on site in the NWHI during pupping season have observed more weaned pups entangled in marine debris than other size classes of monk seals (Henderson 1990). At this time, the 2.48 rate of serious injury and mortality from fishery related marine debris should be considered a minimum serious injury and mortality rate.

(5.) Contaminants

Contaminants in the marine and terrestrial environment also pose a potential but unknown risk to monk seal recovery and survival. Effects on monk seals are unknown at this time. However, tissue samples from monk seals indicate that PCB levels are lower than other pinnipeds and the values at French Frigate Shoals are below similar samples obtained from monk seals at Midway Islands (NMFS unpub. preliminary data, 1999). The significance of these levels to monk seals health is unknown at this time. However, the ecological effects of clean-up and containment operations at Tern Island (French Frigate Shoals), Johnston Atoll, and Midway Island may have short-term adverse effects on the surrounding corals, fish and invertebrates. Reductions in prey abundance due to clean-up efforts could reduce foraging success and survival rates of monk seals near these areas.

(6.) Tern Island Sea Wall Entrapment

Monk seals at Tern Island, French Frigate Shoals, have been entrapped behind a deteriorating sea wall. The seawall was built by the U.S. Navy when it converted the 11-acre sandbar into a 34 acre expanse with an airfield and area for support facilities. The U.S. Fish and Wildlife Service regained possession of Tern Island in 1979. Records from 1988 show that monk seals have been entrapped behind the seawall. Most of these monk seals have been redirected to the water by U.S. Fish and Wildlife Service (FWS) and NMFS personnel on site. Two subadult male monk seals have died as a result of becoming entrapped behind the sea wall. The numbers of entrapments and deaths (indicated by an asterisk) are listed below in Table 10. The restoration of the Tern Island sea wall is planned to take place in 2002 and is the subject of a separate section 7 consultation. The restoration should eliminate the entrapment hazard. (USFWS, 2001).

Table 10: Incidence of Monk Seal Entrapments and Deaths on Tern Island From 1988 - 2000 (Source: USFWS, 2000)

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
# of sealS	1*	3	1	6 1*	4	2	3	3	0	0	5	4	4

(7.) Human Interactions

a. Disturbance at Haul-Out Sites

Some monks seals hauled-out on beaches are viewed by tourists and residents who are often unfamiliar with the take prohibitions and/or the normal behavior of monk seals. NMFS receives at least 2 reports per week of "stranded" monk seals. Some people attempt to haze the animal back into the water. Most often, the animal reported is exhibiting normal haul-out behavior. Another common harassment is people approaching too closely to take photographs of the seal on land or in the water. One female monk seal was intentionally harassed when a resident threw coconuts at it (Henderson, pers. comm., 2001). On Kauai, a monk seal was bitten by a pet dog (Honda., pers. comm., 2001). Disturbance to monk seals may result in modified behavior making them more susceptible to predators when forced to enter the water or causing an unnecessary expenditure of energy required for thermal homeostasis or catching prey. These incidents may increase as monk seal haul-outs increase in the MHI (Ragen, 1999).

b. Research in NWHI

Since 1982, Hawaiian monk seals have been removed from the wild or translocated between locations by the Marine Mammal Research Program (MMRP) of the Honolulu Laboratory as part of research and management to facilitate recovery of the species. These removals and translocations are summarized below.

Selective criteria are used to identify monk seals for research, removal, and translocation. All criteria are designed to minimize risks to the monk seal population. For example, monk seals collected for rehabilitation were selected because of their low probability of survival in the wild. When these monk seals moved to Kure Atoll, some of them are known to have contributed to increased numbers of pups born into that population. Additionally, the removal of monk seals selected for translocation because of concerns for aggressive behavior resulted in fewer deaths at French Frigate Shoals and, probably at Laysan Island.

Rehabilitation-Release

Pups which wean prematurely from their mothers may be in poor condition, and are known to have a minimal probability of surviving their first year; some of these animals, as well as emaciated juvenile monk seals, have been collected for rehabilitation and release back into the wild. This project was initiated to salvage the reproductive potential of the females that would have otherwise been lost due to their high mortality rate. A total of 104 seals (mostly females) have been so taken; 68 were successfully rehabilitated and released into the wild, 22 died during rehabilitation, and 14 were judged to be unsuitable for release and were placed into public aquaria and oceanaria for research. Of the 68 monk seals which were rehabilitated and released from 1984 through 1993, 19 were alive as of 1999 (Johanos and Baker, in press, 1999). Some of the surviving 19, most of which are located at Kure Atoll, are pupping. However, a precise number of pups born to these released monk seals is unknown (NMFS unpub. data, 2001; Johanos and Baker, in press, 2001).

Of the remaining 49 monk seals that were rehabilitated and released, the following information has been gathered: 29 disappeared within one year of release; 15 disappeared from 2-11 years after release; and 5 were found dead within one year of release. Overall the mortality rate for all rehabilitated seals was lower than the rate if none of them had been rehabilitated. NMFS selected candidates for rehabilitation that were undersized at weaning, and NMFS had assessed that the mortality rates for these selectees in the wild would have been 100%. Regarding the expected success rate, the success of the program was somewhat lower than expectations, primarily because of very poor survival rate of 18 seals which were released at Midway rather than Kure Atoll.

Aggressive male translocation and removal

Adult male monk seals have been documented to injure and kill other monk seals, including adult females, immature monk seals of either sex, and weaned pups. Some of the attacks have been made by groups of adult males, while others were by individual males. To reduce injuries and mortalities, NMFS has removed aggressive adult males from some sites. A total of 40 adult male seals have been taken; 32 were translocated to locations distant from the site where the attacks had occurred (21 were moved to the MHI in 1994 and 11 were moved to Johnston Atoll (9 in 1984 and 2 in 1998)); 5 were placed into permanent captivity; 2 died while being held in temporary pens for translocation, and 1 was euthanized. Although there is no systematic sighting effort for the 21 adult males translocated to the MHI, one sighting was made on Kauai in April, 2001.[24] The effects of male aggression are considered separately below. None of the adult monk seals translocated to Johnston Atoll have been resighted since the year in which they were translocated.

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[24]Salt Pond City and County Beach Park, Kauai. A monk seal with a red tag # 4A0 was reported acting aggressively toward another monk seal (Freeman, pers. comm., 2001). That tag number was confirmed by NMFS to be the tag number of an adult monk seal relocated from Laysan in 1994 (Henderson, pers. comm., 2001).

Other Translocations

Monk seals have been moved between populations for reasons other than mitigation of adult male attacks. A total of ten seals have been so taken; five healthy female weaned pups were translocated from French Frigate Shoals to Kure Atoll in an effort to bolster the population and increase the reproductive potential at Kure, and four healthy seals born in the main islands were translocated, after having weaned, to areas less utilized by humans to minimize the potential of human harassment.

Of the five monk seals translocated from French Frigate Shoals to Kure Atoll in 1990, two are known to remain alive at Kure as of 1999. Of the four monk seals relocated from sites in the MHI, one was observed alive at Kure Atoll in 1999, two were observed alive on Kauai in 2000, and one which was translocated to Niihau was reported to have been killed sometime after 1994 by a boat propellor, although this report is unconfirmed (Henderson, pers. comm., 2001).

Permanent Captivity

In addition to using unsuccessfully rehabilitated monk seals or aggressive males as captive research animals, some monk seals have been collected from the wild and placed directly into captivity. From 1983 to 1991 a total of 4 animals were taken; 2 monk seals were collected from the NWHI, and 2 monk seals found badly injured in the MHI, were treated and placed into permanent captivity (NMFS unpub. data, 2001).

In 1995, twelve monk seal pups were taken into captivity by NMFS for the purposes of rehabilitation and eventual return to the wild population. At the time of capture, some of the pups exhibited clinical signs associated with conjunctivitis, red eyes, blepharism, blepharospasm, and photosensitivity. Of the twelve monk seals pups, nine later developed corneal opacities and subsequent cataracts, and one developed cataracts (with no corneal opacities), and two of these total of ten monk seals later died (due to causes unrelated to blindness). (NMFS, 1997 - workshop report) The remaining 10 monk seals (eight blind and two sighted) were transferred to Sea World of Texas where they are research animals.

Research Handling

The MMRP handles monk seals in the wild as part NMFS' research to monitor the population and facilitate recovery. Takes have included tagging, instrumentation, and sampling for health assessment. MMRP has handled seals 3,343 times as part of its research activities since 1981. Three seals (3) died during research handling. All three individuals were adult male seals. Results of necropsies on these seals varied, but in general all three were older seals whose health had been compromised by chronic illness.

c. *Intentional Injuries to Monk Seals*

There is no recent evidence of intentional injuries from acts such as clubbing or shooting to monk seals in the NWHI. The NMFS Marine Mammal Research Program annually monitors all major breeding populations of monk seals, and collects data on any injuries or other events which could affect the survival of individual seals. The program has not documented any injuries or mortalities in the NWHI that could be attributed to clubbing, shooting, or other intentional wounding of monk seals since the establishment of the Protected Species Zone in 1991. (Johanos and Ragen, 1996a, 1996b,1997, 1999a, 1999b; Johanos and Baker, 2000). Although a Court Order[25] has found that intentional acts to monk seals occur, NMFS' monitoring of monk seal populations thus far indicates that intentional acts in the NWHI are not occurring.

(8.) Disease

Although some information concerning medical conditions affecting the Hawaiian monk seal is available, the etiology and impact of disease on wild animals at the population level is far from clear. There are substantial data gaps regarding the prevalence of disease conditions in populations of Hawaiian monk seals in the wild, and thus their potential impact on population dynamics is unknown. In the wild, even massive epizootics in remote locations may pass undetected (Aguirre, 2000).

There have been periods of unusually high mortalities in subpopulations located in the NWHI. A die-off occurred in 1978 at Laysan Island (Johnson and Johnson, 1981). More than 50 seal carcasses were found in an advanced state of decomposition, and although the cause of the mortality was not identified, it may have been disease related. Also, survival of immature seals severely declined at French Frigate Shoals after 1987, and the reproductive potential of the species was being seriously compromised by the loss of young females. The cause has been attributed to emaciation/starvation; however, the role of endoparasites or disease is unknown. During 1992-93, undersized pup and juvenile seals from French Frigate Shoals were rehabilitated and released at Midway Atoll with poor success.

Health assessment and collection of baseline information on diseases is considered important to the recovery of the Hawaiian monk seal population (Gilmartin 1983, Aguirre et al., 1999). Banish and Gilmartin (1992) summarized pathological conditions found in 42 carcasses recovered from 1981 to 1985. Frequent findings included parasites, trauma, cardiovascular disease, and respiratory infections. Emaciation was a common condition. Banish and Gilmartin (1992) did not assess causes of death from any of their samples, but nonetheless concluded that there was no evidence of any disease phenomenon affecting the population in a manner which would significantly hinder recovery of the species. A series of examinations of 23 dead seals collected from 1989 to 1995 (T. Work, unpubl. data) ascribed causes of death as follows: emaciation (7); emaciation compounded by senescence (1); trauma (2); foreign body aspiration (1); and euthanasia(1) (see (g.) Male Aggression and Mobbing, below). Cause of death was not determined in 11 animals.

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[25]The Order Granting in Part and Denying In Part Plaintiffs' Motion for Summary Judgement, Granting in Part and Denying in Part Defendants' Cross-Motion for Summary Judgement, and Granting in Part Plaintiffs' Motion for a Permanent Injunction Motion for Summary Judgement in Greenpeace Foundation, *et. al.*, v. Norman Mineta, *et. al.* Civil No. 00-00068SPKFIY. U.S. District Court of Hawaii, November 15, 2000, p. 30.

The relative significance of disease and related factors and their effect on population trends are poorly understood. Disease processes may be important determinants of population trends through long-term low levels of mortality, or through episodic die-offs. Table 11 describes the findings of health and disease studies on monk seals between 1925 and 1997.

Table 11. Health and disease studies in Hawaiian monk seals (*Monachus schauinslandi*), 1925-97. (Source: Aguirre, 1999)

1925	Internal parasites were first reported (Chapin, 1925).
1952	Diphyllobothriid cestodes were first reported (Markowski, 1952).
1959	The Acanthocephalan *Corynosoma* sp.was first reported (Golvan, 1959).
1969	Diphyllobothriid cestodes were reported (Rausch, 1969).
1978	Known as the Laysan epizootic, ≥50 monk seals were found dead. Specimens from 19 dead and 18 live seals were collected. All carcasses found with stomach ulceration and heavy parasite burdens and in severe state of emaciation. Livers from two carcasses tested positive to ciguatoxin and maitotoxin. There was serologic evidence to caliciviruses but serum specimens were negative for *Leptospira*. *Salmonella sieburg* was isolated from a rectal swab. Many parasite ova and products in coprologic exams were identified. Diagnosis was inconclusive (Johnson and Johnson, 1981; Gilmartin et al., 1980).
1979	*Contracecum* ulceration of a young seal was first reported (Whittow et al., 1979).
1980	Lung mites from the family Halarechnidae were first reported (Furman and Dailey, 1980).
1980	The Hawaiian monk seal die-off response plan was developed with the support of the Marine Mammal Commission (Gilmartin, 1987).
1983	The Recovery Plan for the Hawaiian monk seal addressed the importance of disease investigations (Gilmartin, 1983).
1988	A coprologic survey for parasites was performed from field scats collected in 1985 (Dailey et al., 1988).
1988	The hematology and serum biochemistry of 12 weaned pups collected between 1984 and 1987 for their rehabilitation in Oahu were reported (Banish and Gilmartin, 1988).
1992	Pathology of 42 seals collected between 1981-85 was summarized (Banish and Gilmartin, 1992).
1992	The French Frigate Shoals relocation project of 19 immature seals was initiated. Basic hematology, serum biochemistry, serology for leptospirosis and calicivirus infection, virus isolation, fecal culture for *Salmonella* and coproparasitoscopic examination were performed for their disease evaluation. Two of seven seals died of bacterial and aspiration pneumonia in *(sic)* Oahu, with positive titers to *Leptospira*. Detection of calicivirus by cDNA hybridization probe in 13 seals with viral particles seen by electron microscopy occurred in five seals. It was concluded that endemic disease agents identified in those seals were *Salmonella* and endoparasites (Gilmartin, 1993a; Poet et al., 1993).
1993	Inoculation of four monk seals with a killed virus distemper vaccine was experimentally performed on three seals at the Waikiki Aquarium (Gilmartin, 1993b; Osterhaus, unpubl. data 1997).
1995	An eye disease of unknown etiology was first diagnosed in 12 female monk seal pups that were transported to Oahu for rehabilitation. To date the cause remains unknown (NMFS files 1995-97, unpubl. data).
1996	Histopathology of selected tissues collected from 23 seals between 1989 and 1995 was performed by personnel of the National Wildlife Health Research Center, Honolulu Station (T. Work, unpubl. data, 1996).
1997	Two captive seals died of causes unrelated to the eye disease. One seal was diagnosed with *Clostridium* septicemia and another seal with hepatic sarcocystosis (Yantis et al., 1998).

1997	The Monk Seal Captive Care Review Panel developed recommendations to evaluate the health assessment and future disposition of 10 captive seals and the future of captive care and release efforts to enhance the recovery of the species (NMFS, unpubl. data, 1997).

2001 Unusual Mortality Event in the NWHI

In April, 2001, an "Unusual Mortality Event[26]" was declared on the basis of four juvenile monk seal deaths within nine days at Laysan Island, a death of a yearling at Midway, discovery of three decomposed carcasses (one subadult, one pup, and two juveniles) and one fresh dead carcass at Lisianski Island, a death of a yearling at French Frigate Shoals, and lethargic, thin juvenile monk seals observed at Laysan and Midway Islands. The relationship of these deaths and observed conditions of the seals is not known at this time. (NMFS unpub. data, 2001)

(9.) Male Aggression and Mobbing Behavior

Male aggression, including singular or multiple adult males attacking another seal (mobbing), can lead to monk seal injury and death. Removal of aggressive males has been undertaken to improve pup, juvenile and female survival rates. At French Frigate Shoals, individual adult males have presented more of a problem than groups of males. Individuals which were directly observed injuring or killing pups were removed, either by translocation or euthanasia. At Laysan Island, injuries and deaths have tended to result from massed attacks, or mobbings, by large numbers of adult males. The problem may be more related to an imbalanced adult sex ratio than to individual "rogue" males as evidenced by the decrease in mobbings and related injuries at sites where sex ratios were imbalanced but later came into balance (Johanos, et al., 1999). Males that were removed from Laysan Island included seals which had been observed participating in mobbings, as well as other animals whose behavioral profile matched that of known "mobbers". Removal was effected either by translocation or by transfer into permanent captivity. Ten males were removed in 1984, 5 in 1987, and 22 in 1994.

Removal of individual male seals from French Frigate Shoals markedly decreased the number of injuries and deaths attributable to adult male aggression (See Table 12 below). The results of removing adult males from Laysan Island are less clear (See Figure 13). Injuries and deaths from adult male aggression at Laysan Island have diminished, but it is not known how much male removal has contributed to this decline.

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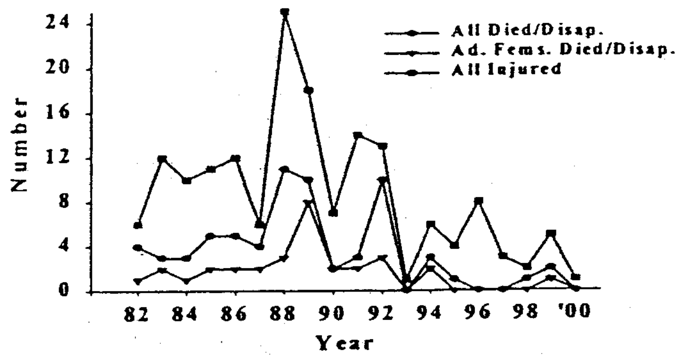
[26]The MMPA defines an Unusual Mortality Event (UME) to be an occurrence which 1) is unexpected; 2) involves a significant die-off of a marine mammal population; and 3) demands an immediate response. In addition to the above conditions, an immediate response is warranted under two other circumstances: 1) mass stranding of an unusual species of cetacean; and 2) small numbers of a severely endangered species of marine mammal are affected.

Table 12. Record of Monk Seal Removals and Pre and Post Removal Levels of Injuries and Mortalities caused by Adult Male Attacks. [27](Source: NMFS unpubl. data. 2001)

Location and Year of Removal and Location	No. of Injuries/Mortalities Caused by Adult Male Attacks in Year Prior to Removal	No. of Males Removed	No. Of Injuries/mortalities Caused by Adult Male Attacks in Year Subsequent to Removal
1984 Laysan	1983: 12 injuries; 3 mortalities	10 removed (9 translocated to Johnston, 1 died)	11 injuries; 5 mortalities
1984 Laysan	1983: 12 injuries; 3 mortalities	10 removed (9 translocated to Johnston, 1 died)	11 injuries; 5 mortalities
1987 Laysan	1986: 12 injuries; 5 mortalities	5 removed (translocated to permanent captivity)	1988: 25 injuries; 11 mortalities
1991 French Frigate Shoals	9 injuries; 4 mortalities (all mortalities attributable to single male) (as tallied from 1991, prior to male removal)	1 (euthanized)	5 injuries; 1 mortality
1994 Laysan	1993: 1 injury; 0 mortalities , plus an undetermined number of injuries before removal in 1994 for a total preremoval: 6 injuries; 3 mortalities.	22 (21 translocated to MHI, 1 died)	1995: 3 injuries; 1 mortality
1998 French Frigate Shoals	6 injuries; 11 mortalities	2 (translocated to Johnston Atoll)	2 injuries; 1 mortality

[27]NMFS is currently reviewing the data on injuries and mortalities caused by instances of male aggression.

Figure 13. Mortalities and Injuries to Monk Seals at Laysan Island from 1982 to 2000. (Source: NMFS unpub. data)



IV Effects of the Action

This section includes an analysis of the direct and indirect effects of the proposed action on the species and/or critical habitat and its interrelated and interdependent activities. The factors considered in this section include: 1) the status of the affected populations of species; 2) the level of removals attributed to the proposed action; and, 3) the impact of that removal on those populations in addition to all other direct and indirect human effects.

Information available for this Analysis

The State of Hawaii Division of Aquatic Resources does not systematically collect information regarding protected species interactions. NMFS PIAO Protected Species Program made available reporting cards to the fishery participants that could be used to anonymously report protected species interactions. To date, no cards have been returned to NMFS. In 2000, NMFS sent each bottomfish fishery permit holder marine mammal interaction reporting forms, but no reports of marine mammal injury or mortality have been received by NMFS. Therefore, the only information available to NMFS on monk seal interactions with the FMP bottomfish fishery is observer and other data discussed below.

Observer Data

NMFS observer data[28] collected from 1991- 1993 documented interactions of monk seals with bottomfish fishery operations. An interaction typically consists of monk seals approaching vessels and stealing fish either from hooks or from a competing predator (dolphins). Monk seals

[28]NMFS observer data for the bottomfish fishery discussed *infra* p. 10.

were not reported hooked or entangled, but were observed active in the "theft" of fish from handlines. Typically, they surfaced to consume the fish. Fish that were too large for consumption were abandoned. While some interactions involved a single fish, other interactions lasted as long as the retrieval of fish continued, with monk seals continually stealing fish. Some monk seals showed no fear of the vessels, approaching and remaining close to the vessels for long periods.

Some monk seals followed a vessel from station to station for several days. These monk seals could steal an average of 20 fish per day. Some seals, more wary of vessels, typically did not approach closely nor did they steal fish directly from handlines, but they did sometimes consume discarded fish. Monk seals also targeted shark-distracting lines baited with live bait.[29]

Reports of Hookings

There are several reports[30] of monk seals with hooks embedded either in their mouth or other various locations. All sightings to date are listed in Table 7. Some of these observations have been noted in past biological opinions for the bottomfish fishery and other reports as incidents of hookings in the bottomfish fishery. NMFS reviewed the existing data, including original reports (if available), and in some cases verbally confirmed the circumstances and identification of the hook type to assess identification of the hook as originating from the bottomfish fishery. The results of this data review (summarized in Table 12) revealed seven instances of hookings since 1982 that may be attributable to direct interactions with the bottomfish fishery. In 1982 an adult female monk seal was observed and photographed at French Frigate Shoals with a bottomfish hook in its mouth. That monk seal was later resighted without the hook. In 1990, NMFS researchers removed an *ulua* fishery or bottomfish fishery hook from a monk seal on the south shore of Kauai.[31] In 1991, NMFS researchers observed a monk seal with a hook at Kure Atoll, but the hook type could not be identified. In 1996 researchers removed a hook from an adult male at French Frigate Shoals. The hook was identified as a hook type used for *ulua* fishing and bottomfish fishing. Additionally, there have been two hookings of monk seals reported which could not be confirmed and are included in tally for hooks that may be attributable to the bottomfish fishery. In 2000, a hooked monk seal was observed on Molokai with two hooks embedded in its chest. NMFS responded by sending a team and a veterinarian to find, dehook, and treat the monk seal. The veterinary exam showed no hooks, but evidence of slight, nonserious injury where, presumably, the hooks had been embedded. In 2001, an adult male monk seal was observed with a hook and line on Kaho'olawe. Again NMFS responded by

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[29]Shark distracting lines are usually baited with kahala or discard fish that are often associated with ciguatoxin or ciguatoxin-like condition (Nitta, 1993). However, it is unknown at this time whether monk seals are affected by this or other biotoxins.

[30]NMFS has received reports of hooks from a variety of sources, including the public, researchers in the field, and others.

[31]The hook was reported as recurved and measured about two inches from the eye to the bottom of the hook, and had no attached gear (wire line, weights, etc.) that could be used to further identify the type of fishing activity involved.

sending a team to dehook the monk seal. However, efforts to locate this animal to date have been unsuccessful. An additional report may be found in the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region 1994 Annual Report (WPRFMC, 1995) which describes the hooking of a monk seal during bottomfish fishing operations in the Ho'omalu Zone in 1994. The monk seal reportedly took an uku and was hooked in the lower jaw. The line was cut so that 12-18 inches of line remained attached to the hook. Should fishers remove hooks and/or disentangle monk seals that become hooked/entangled with bottomfish gear, the injuries associated with hooking and/or entanglement may be reduced. Although the rate of reduction of injury (reduction of risk of post-release entanglement) may not be quantified, there is the potential for the reduction of effects of the take.

Table 13. Hookings of monk seals since 1982 that may be attributable to the Bottomfish Fishery (Source: NMFS, unpubl. data 2001)

	Date and Location	Description	Outcome	Report Confirmation Status
1	1982 French Frigate Shoals (AR[32]-1129)	Adult female was observed with bottomfish hook in mouth.	Resighted alive without hook at French Frigate Shoals	Photograph of hooked seal reviewed by NMFS to identify type of hook
2	1990 MHI - Kauai (AR-1129)	Juvenile observed with hook Serious Injury	NMFS response included capture and hook removal. Monk seal was released alive. Hook identified as type used in the *ulua* shore-based fishery.	NMFS researchers identified hook as *ulua* or bottomfish hook. No identifying gear attached to hook.
3	1991 NWHI - Kure Atoll	Subadult female observed with hook in corner of mouth	Seal subsequently seen without hook.	Hook never recovered or identified.
4	1994 NWHI - Ho'omalu Zone (AR-1289)	Monk seal hooked in lower jaw while stealing fish from line. Serious Injury	Line cut leaving 12-18 inch tailing line	NMFS received a call from the fisherman.
5	1996 NWHI - French Frigate Shoals (AR-1996)	Adult male observed with hook in mouth Serious Injury	Hook removed by researchers. Monk seal released alive. Hook identified as type used in the *ulua* shore-based fishery and bottomfish fishery.	Independent researchers identified hook as *ulua* or bottomfish hook. No identifying gear attached to hook.

[32]Administrative Record for Greenpeace Foundation, et al. v. Norman Mineta, et al. Civil No. 00-00068SPKFIY. U.S. District Court of Hawaii.

	Date and Location	Description	Outcome	Report Confirmation Status
6	2000 MHI - Molokai	Juvenile male observed with 2 hooks and line embedded in chest (ventral) area.	NMFS response included capture and physical exam of seal. No hooks or line present, but slight injury was documented by veterinarian.	Fishery type unknown.
7	2001 MHI - Kaho'olawe	Adult male with hook in abdomen or front flipper	Hook not removed as of July, 2001.	Fishery type unknown.

Positive attribution of these observed hooks embedded in monk seals to a particular fishery is difficult. However, since the hooks may have originated from the bottomfish fishery, and given the observed behavior of monk seals around bottomfish fishing vessels, NMFS conservatively assumes that the bottomfish fishery incidentally hooks monk seals during fishing operations. Therefore, hooks of unknown type and origin are included in Table 13. The level of hooking in the bottomfish fishery appears low, as there are few confirmed incidents of hookings, including a lack of observation of injured monk seals at locations where researchers routinely monitor the populations in the NWHI.

Interaction Estimates Based on Observer Data

One study (Kobayashi and Kawamoto, 1995) compared the existing NMFS observer data[33] (1990-1993) with data collected by the Hawaii Department of Aquatic Resources (HDAR) aboard chartered vessels during 1981-1982, for evaluation and estimation of economic impacts associated with shark, dolphin, and monk seal interactions. The study estimated a damaged fish ratio of 8.71 fish per 1000 fish attributable to shark damage, 2.67 fish per 1000 fish attributable to dolphin damage, and 0.45 fish per 1000 fish attributable to monk seal damage. The study also theorized that some of the unseen losses may be estimated using data on the hook loss rate using the assumption that hooks are lost primarily when a hooked fish is stolen by a predator. Based on the assumption that lost hooks are primarily attributable to sharks, the authors of the study estimated a ratio of stolen fish to damaged fish at 27:1 for sharks for the limited period of the study. However, the study recognized that one difficulty with an approach of estimating the relationship of fish loss to gear loss is that not all thefts of fish result in gear loss because dolphins and seals appear to be adept at pulling fish from the hook without breaking the line. Therefore due to the low incidence rate (0.45/1000 fish) of monk seal damaged fish one assumption may be that the monk seal ratio of stolen fish to hook loss is magnitudes lower than that for sharks which would indicate that gear is not usually lost during a monk seal interaction. There needs to be a better method to model dolphin and monk seal thefts independent of hook losses. The findings of this report provide some evidence for an increasing trend in these fishery interaction rates over time. The authors also state that "It cannot be ruled out that the samples used in this analysis may have, by chance, involved the extreme bounds of a natural cycle in

[33]NMFS observer data for the bottomfish fishery discussed *infra* p. 10.

activity or abundance". They also advocate that further study is needed to understand the temporal and spatial dynamics of shark, dolphin, and monk seal populations and their foraging behavior.

1. Analysis of the Effects on the Species

Hookings

As discussed in the previous section, NMFS assumes that a low level of hooking of monk seals may persist in the bottomfish fishery. From the data presented in Tables 7 and 13, an estimate of hooking that may be attributable to the bottomfish fishery may be calculated by taking the number of hooks observed in monk seals that are potentially attributable to the bottomfish fishery (7) and calculating the rate of hooking occurrence over the number of years since the first hook was observed (20 (from 1982 through 2001)). The resulting rate of hooking occurrence is 0.35 monk seals hooked per year, or one monk seal hooking every 2.9 years. NMFS expects that 57 percent of the monk seals incidentally hooked will survive the interaction essentially unharmed (nonserious injury) as based on the classification of past hooking incidents into the categories of serious injury and nonserious injury (Table 13). That results in a serious injury rate of 43 percent or one monk seal every 6.7 years. However, it should be recognized that the actual rate is dependent upon fishing effort and location. This figure represents the rate given the data available. Future hooking rates may be lower than the historical rate if the bottomfish fishing activities decrease in areas utilized by monk seals. Two monk seals were observed with hooks at French Frigate Shoals, where 5.6 percent of the total bottomfish catch reportedly occurs (WPRFMC, 2000a). More bottomfish fishing occurs at other areas in the NWHI (Lisianski Island 6.8 percent, Laysan Island 13.6 percent, Necker Island 13.0 percent). Although monk seals also utilize these areas, there have been no observed hooks in monk seals at these locations which are frequented by NMFS and contract research personnel who actively observe the monk seal populations at these locations. However, the WPRFMC reports that relatively shallow waters 11 - 92 meters (10-50 fm) were fished around French Frigate Shoals, and this may account for the higher level of observed monk seals with hooks at French Frigate Shoals. Monk seals have wide home ranges, and occasionally travel between the MHI and the NWHI. Thus, whenever a hooked monk seal is observed, identifying with certainty where a hooking took place is difficult as a seal observed in the MHI may have been hooked in the NWHI and vice versa. Without human intervention, a seriously injured monk seal may die. If the hook and associated gear is not removed from the monk seal during the interaction, there is a chance that the animal will become fouled in the line attached to the hook, possibly causing additional injuries after the initial hooking incident.

NMFS finds that the bottomfish fishery as managed under the FMP may incidentally hook monk seals. However, based on available information and the fishing participation and landing caps and current Reserve closed areas (all areas of critical habitat around areas where monk seals have been observed with hooks potentially attributable to the bottomfish fishery in the past), NMFS expects that the rate of incidental hookings will be very low, notably less than one monk seal per year. Consequently, the estimated rate of serious injury leading to mortality will be substantially lower. Based on the foregoing, it is reasonable to expect that few monk seals will be hooked and/or die as a result of interactions with the bottomfish fishery. The rate of serious injury leading to mortality of monk seals may be reduced if fishers remove hooks and/or disentangle monk seals from bottomfish gear coincident to the gear interaction. This rate of take is unlikely to reduce the numbers, reproduction, or distribution of the monk seal population.

Behavioral Modification

Hooking rates appear to be low; however, interaction rates could be much higher if monk seals are stealing large numbers of fish from the bottomfish fishery vessels. Although observer data have not been collected since 1993, and no reports have been submitted or collected from fishery participants, NMFS assumes an undetermined level of interaction persists, albeit at an unknown level. The distribution of these interactions is within both zones of the management area of the NWHI bottomfish fishery.

The effects of these interactions (monk seals stealing fish) on monk seal populations are unclear. Individual monk seals may habituate to the presence of fishing operations. The report, "Summary Report: Bottomfish Observer Trips in the Northwestern Hawaiian Islands October 1990 to December 1993 states that "(g)iven the artificial availability of these Bottomfish species to seals and dolphins as a result of the fishing gear and technique, the proximity of populations of seals and dolphins to the fishing grounds, and the practice of discarding unwanted fish, it is likely that predation of catch by seals and dolphins will continue in the NWHI (Nitta, 1993)."

These interactions (monk seals stealing fish) may modify monk seal feeding behavior. Individual monk seals may associate vessels with a source of food and develop preferences for vessel catch. Observer records of monk seals indicate that some monk seals followed fishing vessels for several days and stole fish or consumed discards. Some monk seals could expend considerable energy searching for and/or following vessels in lieu of normal foraging behavior.

Traveling with the vessel may displace effort on the part of monk seals to locate more permanent foraging locations. Monk seals tracked by Abernathy and Siniff (1998) showed site fidelity to foraging locations. Finding suitable foraging locations may be a product of exploration, and may suggest that time spent following vessels that visit the same location intermittently may displace natural foraging habitat exploration and identification.

Observations of monk seals, and data from foraging behavior studies indicate that younger monk seals tend to forage nearer to shore, and adults, especially males, will forage at farther locations and deeper depths (Abernathy and Siniff, 1998). This may suggest that juveniles are more susceptible than adults to fishery interactions in shallow water. However, more information is needed in order to determine which component of the monk seal population interacts with the fishery.

Because direct information is scarce, the possible effects of individual monk seals following bottomfish fishing vessels and consuming catch or discards on the monk seal population are difficult to determine. Individual seals could have better growth rates and reproductive success when they rely upon the easy prey of hooked fish. On the other hand, reliance on fishing vessels for food could hinder the growth and reproductive success of individual seals when vessels move out of an area and seals must learn to forage on their own, or if the prey they obtain from the vessels is inadequate for the monk seal's dietary needs. In addition, use of the vessels as a food source increases the likelihood that an individual seal will become hooked or entangled in fishing gear. If juvenile seals are the primary component of the population that modifies normal behaviors to prey off of bottomfish fishing vessels, and if the low survival rates of this stage are affected more by starvation than shark predation, it is possible that these behavioral changes are having adverse effects on population survival.

Discard Consumption

Monk seals may feed on discards, including fish species associated with ciguatoxin, because fishery participants feed the monk seals and/or dump discards in the presence of monk seals. NMFS observers reported that fishery participants illegally fed discards to monk seals during hand line retrieval in order to distract the monk seals from stealing valuable catch. The prevalence of feeding discards as a means of distracting seals is unknown, but is not believed to be practiced routinely throughout the fishery (Katekaru, pers. comm., 2001). Feeding of discards to monk seals is prohibited under both the ESA and the MMPA.

Discard availability may affect monk seals in several ways. As discussed above, the availability of discards to monk seals may modify normal monk seal foraging behaviors. Also, monk seals that forage on vessel discards or catch may not obtain the nutritional variety available in their natural diet.

Although a Court Order[34] concluded that illegal discard practices in the bottomfish fishery are poisoning monk seals, NMFS' monitoring of monk seal populations, health and disease studies, and diet studies indicate that monk seals, even if consuming ciguatoxins, are not considered to be adversely affected by the consumption (Work, 1999). NMFS believes that it is unlikely that monk seals are or would be poisoned by consuming lost (fish that inadvertently come off gear while fishing) discarded fish which are ciguatoxic. Monk seals are known to commonly consume other species (e.g. moray eels) that contain high levels of ciguatoxin (Hokama, 1980), and no monk seal sickness or death has been attributed to ciguatoxin poisoning (Work, 1999; NMFS, 2000; Gilmartin et al., 1980; Nitta, 1993). The investigation of the mass die-off at Laysan Island in 1978 included necropsy and analysis of 18 monk seals. Of the 18 monk seals tested, only two tested positive for ciguatoxin and maitotoxin; reaction to these toxins was not proven to be the cause of death (Work, 1999).

Reduction of Prey Available to Monk Seals

Available data on monk seal prey indicate that there is little overlap of the bottomfish management unit and bycatch species and the known prey items of monk seals. Tables 5 and 6 indicate that there is no evidence that monk seals depend on the species targeted in the fishery, although some overlap between bycatch families and monk seal prey families are evidenced by

[34]In Judgement, and Granting in Part Plaintiffs' Motion for a Permanent Injunction Motion for Summary Judgement in Greenpeace Foundation, et al. v. Norman Mineta, et al. Civil No. 00-00068SPKFTY. U.S. District Court of Hawaii, November 15, 2000, p. 30.

reports of monk seals stealing catch and discard fish from bottomfish fishing vessels. However, this overlap may be indicative of opportunistic feeding on bottomfish target/bycatch/incidental catch species and not evidence that these species are a component of the normal monk seal diet. Available information indicates that monk seals are not foraging on identifiable teleost prey at deep water in lieu of shallow water teleosts. Therefore, it seems unlikely that the bottomfish fishery is competing directly or indirectly with monk seals for the same fish species.

Summary of Effects

It appears that the population size of Hawaiian monk seals has remained stable over the last 8 years, although their total abundance is still to small to protect this species from extinction in the foreseeable future. Population trends in this species are determined by the highly-variable dynamics of the six main reproductive subpopulations. At the species level, demographic trends over the past decade have been driven primarily by the dynamics of the French Frigate Shoals subpopulation, where an increasingly inverted age structure indicates that recruitment of adult females and pup production may soon decrease. At French Frigate Shoals, the count of animals older than pups is now less than half the count in 1989. Poor survival of pups has resulted in a relative paucity of young seals, so that this population of monk seals is expected to experience further population declines as adults die and there are few juveniles to replace them. Because this subpopulation has the largest number of animals, declines in this subpopulation would cause the species' total abundance to decline (unless other subpopulations experience increases that are large enough to offset decreases at French Frigate Shoals).

Over the last decade, the causes of the poor survival for these age classes at French Frigate Shoals have been related to poor condition from starvation, shark predation, male aggression, habitat loss, and entanglement in marine debris. A decrease in prey availability may be the result of decadal scale fluctuations in productivity or other changes in local carrying capacity for seals at French Frigate Shoals or a combination of factors (Craig and Ragen, 1999; Polovina, et al., 1994; Polovina and Haight, 1999). At this point it is speculative to indicate whether or not fishing effort in these areas has been intense enough to change the forage base.

Therefore, NMFS anticipates that changes in feeding behavior in response to fishing vessel activity may have negative consequences for individual seals, but these behavioral changes do not appear to affect the survival of seal populations. Population survival may be more affected by changes in forage base that are associated with phenomena like decadal shifts in productivity.

Given the expected low rates of hooking and the seemingly low level of competition for fishery resources from the bottomfish fishery, the bottomfish fishery is unlikely to have direct or indirect effects that would diminish the value of foraging areas within monk seal critical habitat. Nor is the bottomfish fishery likely to reduce appreciably the likelihood of both the survival and recovery of the Hawaiian monk seal in the wild by reducing the reproduction, numbers, or distribution of the species.

V Cumulative Effects

Cumulative effects include the effects of future state, local, and private actions that are reasonably likely to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. NMFS has no information about cumulative effects that are reasonably certain to occur in the action area, other than the ongoing impacts of activities identified in the *Environmental Baseline* section above. Therefore, there are no new cumulative effects anticipated.

VI Conclusion

After reviewing the current status of monk seals, the environmental baseline for the action area, the effects of the proposed fishery, and the cumulative effects, it is NMFS' biological opinion that the proposed bottomfish fishery as described is not likely to jeopardize the continued existence of the Hawaiian monk seal or result in the destruction or adverse modification of its critical habitat.

VII Incidental Take Statement

Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in such conduct of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant.

By definition, a species or population stock which is listed as threatened or endangered under the Endangered Species Act (ESA) is also considered depleted under the Marine Mammal Protection Act of 1972, as amended (MMPA). Accordingly, before the agency can provide NMFS Sustainable Fisheries Division with a written statement regarding incidental take of marine mammals, any incidental take must be authorized pursuant to section 101(a)(5)(E) of the MMPA, 16 U.S.C. § 1371(a)(5)(E). Section 101(a)(5)(E) provides that the Secretary shall allow the incidental taking of individuals from marine mammal stocks listed as threatened or endangered under the ESA in the course of commercial fishing operations falling under category (c)(1)(A)(iii) of section 118[35] if the Secretary determines that the incidental mortality and serious injury will have a negligible impact on the affected species or stock and that a recovery plan has been developed or is being developed for such species or stock under the ESA.

NMFS is not including an incidental take authorization for the Hawaiian monk seal at this time

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[35]One in which there is a remote likelihood of or no known incidental mortality or serious injury of marine mammals. The bottomfish fishery is classified as a Category III fishery (66 FR 6545, January 22, 2001).

because the incidental take of marine mammals has not been authorized under section 101(a)(5) of the Marine Mammal Protection Act and/or its 1994 Amendments. Following issuance of such regulations or authorizations, the Service may amend this biological opinion to include an incidental take statement for monk seals, as appropriate.

VIII Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The conservation recommendations for this action are:

1. Reactivation of the NMFS observer program in the bottomfish fishery in the NWHI. Data collected by the observer program should include the number of interactions and the circumstances of each interaction, information regarding the size/age class of animal and the type of fish taken by the animals, photographs of any protected species hooked or entangled in gear (if available), and other items of information which are deemed necessary for formulating plans for minimizing the interactions.

2. Exploration and implementation of monitoring programs for the bottomfish fishery.

In order for NMFS to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, NMFS Protected Resources Division requests notification of the implementation of any conservation recommendations.

IX Reinitiation of Consultation

This concludes formal consultation on the bottomfish fishery as conducted under the Bottomfish FMP. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) The amount or extent of incidental take is exceeded; (2) new information reveals the effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this biological opinion; (4) if a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, formal consultation shall be reinitiated immediately.

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XI Appendices

Appendix A

Summary Data
Northwestern Hawaiian Islands Bottomfish Fishing Caps

(I) Average annual fishing caps (all species); (II) Annual fleet totals (all species); (III) Historical percent of harvest which is bottomfish; (IV) Likely annual fleet totals of bottomfish to be harvested.

Scenario (ranked as low to high fishing caps)	I Fishing Cap Average pounds allowed per permit holder per year (all species combined)	II Fleet total pounds allowed per year (all species combined)*	III Historic percent of harvest which is bottomfish in NWHI	IV Likely fleet total pounds per year of bottomfish to be harvested*
Baseline	34,252	479,529	82%	394,609
E	48,068	672,952	84%	567,379
B	50,934	713,071	84%	601,687
D	51,803	725,239	84%	610,221
A	51,888	726,436	84%	611,185
C	58,633	820,859	83%	679,863

* Note: Sixteen permit holders appear to qualify for fishing caps (they held NWHI bottomfishing permits as of 12/4/00), however the fleet totals shown here are based on 14 vessels as two of the 16 permit holders have no catch history based on the NWHI Reserve EO requirements on which to derive the caps.

Key to scenarios:

Baseline= total fleet catch over the past five years, average catch per vessel is this number divided by 14. This row includes active and non-active fishing years.

E = Set each permit holder's cap to equal their average catch over those years (of the past five) in which they were active. "Active" is defined as a year in which a vessel met the minimum landing requirements applicable as of 12/4/00.

B = Set each permit holder's cap to equal to their average catch in the those active years (of the past five) in which their catch was a certain percent of their average catch in their best three active years out of the last five years. 75% was used as the applicable percent, years were again ranked based on total catch of all species combined.

D = Set each permit holder's cap to equal the catch resulting from multiplying their average number of trips during their three busiest active years (those with the most trips) times their average catch per trip from all five years.

A = Set each permit holder's cap to equal to their average catch from their best three active years out of the last five years. Years were ranked based on the permit holder's total catch of all species combined.

C = Set each permit holder's cap to equal to their catch in their best year (of the past five). Years were again ranked based on total catch of all species combined.

cleared: September 5, 2001

APPENDIX E:
PREPARERS OF THE ENVIRONMENTAL IMPACT STATEMENT

The following people contributed to the preparation of the EIS:

- George Krasnick, M.S. - Project manager and editor
- Donald Schug, Ph.D. - Assessment of economic and social impacts and impacts on the Hawaiian monk seal
- Wayne Haight, M.S. - Assessment of biological impacts
- Carlos Andrade, Ph.D. candidate - Assessment of impacts on the Native Hawaiian Community
- Karen Hiu, B.A. - GIS cartography

GLOSSARY

Adaptive Management: A process through which natural resource management measures are modified in consideration of information derived from monitoring of the resource to better satisfy the goals and objectives of the management regime.

Bycatch: Any species caught in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards.

Charter Fishing: 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 recreation fishing.

Commercial Fishing: 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. For the purposes of this Fishery Management Plan, commercial fishing includes the commercial extraction of biocompounds.

Ecosystem: The interdependence of species and communities with each other and with their non-living environment.

Ecosystem-Based Fishery Management: Fishery management actions aimed at conserving the structure and function of marine ecosystems, in addition to conserving the fishery resource.

Ecotourism: Observing and experiencing, first hand, natural environments and ecosystems in a manner intended to be sensitive to their conservation

Environmental Impact Statement (EIS): A document required under the National Environmental Policy Act, that assesses alternatives and addresses the impact on the environment of a proposed major federal action.

Essential Fish Habitat (EFH): Those waters and substrate necessary to fishery resources for spawning, breeding, feeding or growth to maturity.

Exclusive Economic Zone (EEZ): The zone established by Proclamation numbered 5030, dated March 10, 1983. For purposes of application, the inner boundary of that zone is a line coterminous with the seaward boundary of each of the coastal states, commonwealths, territories or possessions of the United States.

Fishery: One or more stocks of fish that can be treated as a unit for purposes of conservation and management and that are identified on the basis of geographical, scientific, technical, recreational and economic characteristics; and any fishing for such stocks.

Fishery Management Plan (FMP): A plan prepared by a Regional Fishery Management Council or by NMFS (if a Secretarial plan) to manage fisheries and/or their impact(s) on coral reef ecosystems.

Fishery Management Unit Species (MUS): The fishery resources managed under the FMP.

Fishing: The catching, taking or harvesting of fish; the attempted catching, taking or harvesting of fish; any other activity that can reasonably be expected to result in the catching, taking or harvesting of fish; or any operations at sea in support of, or in preparation for, any activity described in this definition. Such term does not include any scientific research activity that is conducted by a scientific research vessel.

Habitat: Living place of an organism or community, characterized by its physical or biotic properties.

Habitat Area of Particular Concern (HAPC): Those areas of EFH identified pursuant to Section 600.815(a)(9). In determining whether a type or area of EFH should be designated as a HAPC, one or more of the following criteria must be met: (1) ecological function provided by the habitat is important; (2) habitat is sensitive to human-induced environmental degradation; (3) development activities are, or will be, stressing the habitat type; or (4) the habitat type is rare.

Handline: Fishing gear that is set and pulled by hand, and consists of one vertical line to which may be attached leader lines with hooks.

Hook and line: Fishing gear that consists of one or more hooks attached to one or more lines.

Longline: A type of fishing gear consisting of a main line which is deployed horizontally from which branched or dropper lines with hooks are attached.

Main Hawaiian Islands (MHI): The high islands of the State of Hawaiʻi consisting of Niʻihau, Kauaʻi, Oʻahu, Molokaʻi, Lanaʻi, Maui, Kahoʻolawe, Hawaiʻi and all of the smaller associated islets (from 154°W longitude to 161°20'W longitude).

Maximum Sustainable Yield: A management goal specifying the largest long-term average catch or yield (in terms of weight of fish that can be taken, continuously (sustained) from a stock or stock complex under prevailing ecological and environmental conditions, without reducing the size of the population.

National Marine Fisheries Service (NMFS): The component of the National Oceanic and Atmospheric Administration (NOAA), Department of Commerce, responsible for conservation and management of living marine resources.

Northwestern Hawaiian Islands (NWHI): The EEZ of the Hawaiian islands archipelago lying to the west of 161°20'W longitude.

Optimum Sustainable Population (OSP): OSP means the number of animals which will result in the maximum productivity of the population or species, keeping in mind the carrying capacity of the habitat and the health of the ecosystem.

Overfishing: Fishing at a rate or level that jeopardizes the capacity of a stock or stock complex to produce maximum sustainable yield on a continuing basis.

Pacific Island Area: American Samoa, Guam, Hawaiʻi, the Commonwealth of 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.

Recreational Fishing: Fishing primarily for sport or pleasure.

Recruitment: A measure of the weight or number of fish which enter a defined portion of the stock such as fishable stock (those fish above the minimum legal size) or spawning stock (those fish which are sexually mature).

Reef: A ridge like or mound like structure built by sedentary calcareous organisms and consisting mostly of their remains. It is wave-resistant and stands above the surrounding sediment. It is characteristically colonized by communities of encrusting and colonial invertebrates and calcareous algae.

Remote U.S. Pacific Islands: Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Midway Island, Wake Island and Palmyra Atoll and includes all islands and reefs appurtenant to such islands, reefs and atolls.

Stock of Fish: A species, subspecies, geographical grouping or other category of fish capable of management as a unit.

Subsistence Fishing: Fishing primarily to obtain food for personal use rather than for sale or recreation.

Target Resources: Management Unit Species selectively targeted by fishermen by selecting appropriate gear, fishing depth, time-of-day or other means.

Trap: A portable, enclosed device with one or more gates or entrances and one or more lines attached to surface floats.

Western Pacific Regional Fishery Management Council (WPRFMC or Council): The entity charged with development of management plans for fisheries occurring in the U.S. EEZ around State of Hawaiʻi, the Territories of American Samoa and Guam, the Commonwealth of the Northern Mariana Islands and the remote territories and possessions of the U.S. in the Pacific.